

Analytical Results of the 1997 R-Reactor Disassembly Basin Sampling Program

by

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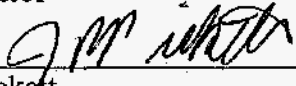
**ANALYTICAL RESULTS OF THE 1997 R-REACTOR DISASSEMBLY BASIN
SAMPLING PROGRAM**

**Prepared by J. B. Pickett
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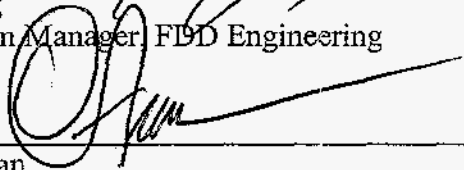
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R-REACTOR DISASSEMBLY BASIN ANALYTICAL SAMPLING RESULTS

OBJECTIVE

The primary objective of this document (FDD-ENG-98-0029) is to provide the analytical results of the sampling program conducted in 1997 in the R-Reactor Disassembly Basin. The key conclusions on the analytical results are summarized, and the current results are compared to previous sampling campaign results. One of the key objectives of this program was to conclusively define whether the sediment layer at the bottom of the basin is a PCB/TSCA waste (i.e., a material containing greater than 50 mg/kg Polychlorinated Biphenyl compounds). It was determined that the sediment layer is NOT a PCB hazardous waste.

The radiation survey conducted as a part of this program and the sampling techniques and sampling locations sampled during this study are described in a companion report (FDD-ENG-98-0019).

BACKGROUND

Fuel and target assemblies were discharged from R-Reactor into the water filled disassembly basin. The reactor assemblies were initially stored in the Vertical Tube Storage (VTS), or Temporary Tube Storage, where the short-lived radionuclides decayed. The assemblies were then disassembled in the "Machine Basin" (MB), with the disassembled pieces stored in the "Bucket Storage" (BKS) and/or "Dry Cave Section (DCS) areas. Two other smaller areas, the "Monitor Pin Basin" (MPB) and the "Transfer Bay" (TB) are also included in the R-Reactor Disassembly Basin. The Emergency Disassembly Basin (EB) was the location of a 1957 experiment involving a fuel assembly inside a calorimeter, which ruptured during testing. In 1964 the EB was drained of water, backfilled with clay, and topped with a concrete cap.

The sampling conducted in this campaign determined that there is a sediment layer at the bottom of the basin which is ~1/4 to 3/8 inch deep. The sediment is approximately 6 wt. % solids and is composed primarily of fine particles of iron hydroxide, or iron oxide (rust), aluminum hydroxide, and sand.

Previous Sampling Study Results

The previous sampling campaigns in 1994 and 1996 were conducted to meet the objective of the Reactor Division Disassembly Management Plan, which was to transition the reactor basin to a Safe Storage Condition. The sediment and the water in the basin were sampled and analyzed in three previous sampling episodes, and the results were summarized in Ref. 1. Two composite samples were measured in 1994 by an off-site laboratory for a full suite of inorganic and organic constituents. The only constituent of concern detected in those programs was Aroclor 1254, a Polychlorinated Biphenyl (PCB) compound, at concentrations of 15.2 and 99.2 mg PCB/kg of sediment. The 99.2 mg/kg (ppm) analysis exceeded the PCB regulatory limit of 50 ppm.

1997 ANALYSIS SUMMARY

Chemical and Radionuclide Analytical Results Summary

The 1997 analytical results indicate that the sediment is not a PCB waste. Aroclor 1260 was detected at a mean concentration of 1.87 ppm, well below the regulatory limit of 50 ppm. A statistical analysis of the PCB concentration data indicates that the PCB concentration in the sediment is less than 2.86 ppm., at a 99% confidence level (Table 7). This is far below the limit of 50 ppm.

A thin film was observed to be present on the surface of the basin liquid. The film is estimated to be ~1/16 to 1/8" thick. The film itself is ~1000 ppm wt. % solids, and is believed to be primarily calcium carbonate, with some oil and grease (400-500 ppm). Since the majority of the ~5,000,000 gallons of liquid is supersaturated with calcium (vs. precipitation of calcium carbonate) the film is believed to be similar to a hard water "bath tub ring", i.e., calcium and magnesium carbonates, with some low density oils and greases. One PCB (Aroclor 1260) was detected in the film portion, at less than 0.07 ppm; Table 2.

The primary chemical constituents present in the liquid portion are Ca, K, and Na hydroxides, at an almost neutral pH of 7.6. PCB concentrations in the liquid portion were determined to be less than 0.1 µg/L (ppb).

The primary radionuclides detected in the film and liquid portions were Cs-137 (~90,000 pCi/L), Sr-90 (~25,000 pCi/L), and tritium (~38,000 pCi/ml). Carbon 14 was detected at a 25-200 pCi/L level, while all other radionuclides were less than 50-100 pCi/L. The film and liquid radionuclide data is given in Tables 3 and 5.

The primary radionuclides detected in the sediment portion were: Cs-137 (21,000 pCi/gm), Sr-90 (3,000 pCi/gm), Co-60 (48,000 pCi/gm), Pu-241 (22,600 pCi/gm), C-14 (6,000 pCi/gm), and tritium (397,000 pCi/gm). The sediment radionuclide data is given in Table 8.

The primary chemical constituents in the sediment are Al, Fe, Ca, Mn, Zn, and silica. At the sediment pH of 8.1, the metals are believed to be primarily present as hydroxides, although the visual appearance of the sediment (a dark reddish brown), indicates that the Fe is probably present as ferrous or ferric oxide.

There were no major differences between the current (1997) results and those conducted by SRTC and Rust Engineering Lab. in 1994, with two exceptions; the Cs-137 and Co-60 results in the sediment were approximately 10x higher in the 1997 study vs. the 1994 SRTC results.

DISCUSSION

Surface Film

The surface film was sampled by drawing an open mouth container across the surface of the water. This obtained mostly the liquid below the film, and only a slight amount of film. The film chemical and radionuclide analyses of film and liquid are very similar. Tables 1 and 3 compare the film's liquid chemical and radionuclide analytical results.

Only one of the four film samples that was collected contained a significant amount of film material (VTS-1; Table 2). This is evidenced by the higher total wt. % solids (194 ppm) vs. the other film samples and the liquid samples; ~145 ppm. The VTS-1 sample was also the only film sample to have any measured suspended solids (~72 ppm).

Based on the results for VTS-1, it was calculated that the film comprised approximately 7% of the overall VTS-1 sample. The oil and grease was then calculated to be ~500 ppm in the film portion itself (Table 2). The only chemical constituent that was elevated in the VTS-1 sample (vs. the other film samples) was calcium. Calcium was calculated to be approximately 660 mg/L in the film vs. 12-13 mg/L in the liquid.

The calcium is believed to be present as calcium carbonate, since the concentration of Ca in the basin liquid exceeds the solubility product (k_{sp}) of CaCO_3 . The k_{sp} of CaCO_3 is 9×10^{-9} , and the Ca concentration needed to precipitate CaCO_3 is 3.8 mg/L. The calcium in the liquid is 12-13 mg/L, so the liquid is super-saturated with respect to CaCO_3 precipitation.

This explains the field observation that the film appeared to be thicker, or denser (more opaque) at the conclusion of the sampling program vs. the beginning. The agitation of the radiation survey instrument and submersible pump probably created small crystals, or dispersed small crystals into the liquid, which initiated precipitation of the carbonate. This can be expected to occur during the eventual treatment of the liquid or sediment, and should be considered when designing the filtration equipment. Sodium carbonate or bicarbonate could be added to the liquid prior to the initial roughing filtration, which should remove most of the calcium and magnesium. This would prevent fouling of the subsequent Sr-90 and Cs-137 removal systems.

Liquid Portion

The chemical and radionuclide results for the liquid portion in the Disassembly Basin are given in Tables 4 and 5. The current, 1997 analyses are compared to the results of the 1994 sampling program. The only significant difference is that Sr-90 was detected in the 1997 campaign, whereas it was not requested to be analyzed in the 1994 program. The chemical analysis conducted by Clemson Technical Center (CTC) - Rust Engineering Lab., on one sample of liquid in 1994 are quite different in most constituents from the 1997 results. Since the 1994 SRTC and 1997 GEL results agree well on most chemical constituents, the Rust results will not be further utilized.

Sediment Results

The sediment results are believed to be a fairly accurate representation of the layer at the bottom of the basin, due to the setting characteristics of the material. The sediment settled very quickly in the sample collection carboys (usually overnight), resulting in a dense layer and a clear supernate. As described in the companion report, 50 to 60 gallons of sediment/water mixture were collected, which was then allowed to settle out - in some cases for 1 to 2 weeks. The resulting 4 to 6 inch deep sediment layer in the collection bottle (15 gallon carboy) was fairly homogeneous, as observed during the transfer of the sediment to the laboratory sample bottles. The weight % solids (~6%) in the R-Basin sediment is also similar to that measured in the L-Basin Settler tank, and is what might be expected of a hydroxide precipitate in contact with a large volume of liquid.

The chemical and radionuclide results (Tables 6 & 8) from the 1997 study agree reasonably well with the 1994 results, except for Cs-137 and Co-60. Since the GEL analyses had significantly lower detection limits (pCi/gm) than the 1994 SRTC analyses (µCi/gm), the higher GEL values are preferred.

One of the main objectives of this study was to determine if the sediment layer contained significant concentration of PCB's. The PCB analyses are given in Table 7, and are quite consistent. The standard deviation for the 11 composites, and one split sample, is 1.26 mg/Kg (ppm). The upper limit for the PCB concentration is 2.86, at a 99 % confidence level. This is based on a "one-tailed t-statistic" probability calculation (Ref. 2), given below:

The upper limit for the PCB concentration = $\text{mean} + t_{(0.99, n-1)} s/n^{1/2}$. The t statistic at the 99th percentile for 12-1 = 11 values; is 2.718. The mean is 1.87, the standard deviation (s) is 1.26, n = 12.

Therefore, $1.87 \text{ ppm} + (2.718 \times 1.26/3.464) = 1.87 + 0.99 = 2.86 \text{ ppm}$.

This 99th % value of 2.86 ppm is far below the regulatory limit of 50 ppm, so it is concluded that the R-Basin sediment is not a PCB/TSCA waste.

Radionuclide Summary

Radionuclide	Curies in Liquid	Curies in Sediment	Total Ci
Tritium	714	0.45	714
Sr-90	0.44	0.004	0.44
Cs-137	1.74	0.02	1.76
Co-60	-	0.05	0.05

Where T^3 in liquid = $38,000 \text{ pCi/L} \times 5,000,000 \text{ gallons liquid} \times 3.75 \text{ L/Gal.}$, and
 10^{12} pCi/Ci

T^3 in sediment = $397,000 \text{ pCi/gm} \times 5,000 \text{ gallons sediment} \times 3.75 \text{ L/Gal.} \times 6 \% \text{ solids.}$
 10^{12} pCi/Ci

Definitions and Acronyms

Sediment For this study, the sediment is defined as the ~1/4 to 3/8 inch deep layer of material at the bottom of the Disassembly Basin. The analyses indicated ~5-10 % total solids.

Supernate This is defined as the liquid in direct contact with the sediment solids, and that liquid which can be separated from the sediment by filtration or decanting.

Basin Liquid The majority of the liquid in the basin, above the sediment layer to the surface.

Basin Surface This top layer of liquid in the basin, which has an "oil sheen" and a surface film. The film layer is ~1/32 to ~1/8 inch thick. The surface layer was sampled to a depth of 2-3 inches.

BOD Biological Oxygen Demand
 BETX Benzene, Ethylbenzene, Toluene, and Xylene
 COD Chemical Oxygen Demand
 CTC Clemson Technical Center, Rust Engineering Laboratory, Clemson, SC
 EPA U. S. Environmental Protection Agency
 GEL General Engineering Laboratory, Charleston, SC
 PCB's Polychlorinated Biphenyl compounds
 PPE Personal Protective Equipment
 PVC Polyvinyl Chloride
 TDS Total Dissolved Solids
 TPH Total Petroleum Hydrocarbons
 TSS Total Suspended Solids
 SRTC Savannah River Technology Center
 TSCA Toxic Substances Control Act

Sample Areas

VTB Vertical Tube Storage
 MB Machine Basin
 BKS Bucket Storage Section
 DCS Dry Cave Section
 MPB Monitor Pin Basin
 TB Transfer Basin

REFERENCES

1. J. B. Pickett, "R-Reactor Disassembly Basin Radiation Survey and Sampling Plan", FDD-ENG-97-0044, Rev. 1, August 13, 1997 (Rev. 1 is dated 4/8/98).
2. U. S. Environmental Protection Agency, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance", PB-89151047, February, 1989, Washington, DC.

ATTACHMENTS

- 1 J. D. C. Crawford to B. Nora, "Job 97047F (50 Day TAT)", January 30, 1998. GEL Laboratory results (metals and radionuclides) for film samples collected 8/27/97.
2. J. D. C. Crawford to J. B. Pickett, "Job 97344 - Attached are the results from General Engineering Laboratory for Job 97344", February 5, 1998. GEL Laboratory results (organics and anions) for film samples collected 12/03/97.
- 3 J. D. C. Crawford to B. Nora, "Job 97293F", February 20, 1998. GEL Laboratory results (metals, organics, and radionuclides) for liquid samples collected 12/08/97.
- 4 J. D. C. Crawford to J. B. Pickett, "Job 97428F - Attached are the results from General Engineering Laboratory for Job 97428F", March 31, 1998. GEL Laboratory results (metals, organics, and radionuclides) for sediment samples collected 1/14/98.

Note, the Attachments are only attached to the author's copy and the FDD/TIS file copies

1997 R-DISASSEMBLY ANALYTICAL RESULTS: SURFACE LAYER, METALS

Sample Location	VTS	MB	DCS	BKS/MPB	Average, Surface	Average, Liquid	
Sample ID	97047-1	97047-2	97047-3	97047-4			
Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	
Lab. ID	9711581-01	9711581-02	9711581-03	9711581-04		(Table 4)	
Date Sampled	8/27/97	8/27/97	8/27/97	8/27/97	8/97	12/97	
% Solids, mg/L (ppm)	164	147	143	143	149	146	
% Film in Sample*	0.0018	0.0001	Neg.†	Neg.†			
Total Constituent Concentration, µg/L (ppb)							
Total Metals							
Aluminum	µg/L	99.3	46.9	121	59.5	81.7	103.7
Antimony	µg/L	0.44	0.39	0.43	0.37	0.41	0.6
Arsenic	µg/L	16.6	16.2	16.1	17.1	16.5	21
Barium	µg/L	8.1	4.71	4.52	4.6	5.48	5.53
Beryllium	µg/L	0.001	0.001	0.003	0.002	0.002	0.03
Boron	µg/L	21.1	20.7	20.5	20.5	20.7	28.9
Cadmium	µg/L	2.06	0.086	0.019	0.062	0.56	0.08
Calcium	µg/L	13,500	12,400	12,400	12,200	12,625	12,275
Calcium, in film**	mg/L	660	-	-	-	-	-
Cesium	µg/L	0.10	0.09	0.10	0.10	0.10	0.28
Chromium	µg/L	2.78	2.23	2.35	2.03	2.35	1.65
Cobalt	µg/L	0.16	0.07	0.08	0.07	0.10	0.07
Copper	µg/L	7.13	1.05	1.72	0.82	2.68	0.84
Iron	µg/L	630	200	297	137	316	116
Lead	µg/L	3.97	0.39	2.08	0.69	1.78	0.06
Magnesium	µg/L	504	475	483	451	478	486
Manganese	µg/L	1.57	1.54	2.32	1.16	1.65	27.4
Molybdenum	µg/L	7.76	1.01	0.89	0.89	2.64	1.01
Nickel	µg/L	3.93	1.64	1.75	1.38	2.18	0.59
Potassium	µg/L	32,200	31,400	30,600	31,800	31,500	27,575
Selenium	µg/L	69.3	68.5	65.1	65.1	67	93
Silver	µg/L	0.18	0.02	0.006	0.003	0.05	0.06
Sodium	µg/L	16,100	16,500	15,500	15,200	15,825	16,475
Strontium	µg/L	163	153	155	153	156	150
Thallium	µg/L	0.11	0.07	0.04	0.01	0.06	0.05
Tin	µg/L	0.32	0.15	0.14	0.70	0.33	0.71
Titanium	µg/L	5.64	4.94	3.88	3.1	4.39	1.49
Uranium	µg/L	2.72	1.9	1.87	1.89	2.10	1.76
Vandium	µg/L	12.8	17.3	13.2	12.6	14.0	32.7
Zinc	µg/L	682??	16.1	15.5	16.5	12.0	14.7

VTS=Vertical Tube Storage Basin; MB = Machine Basin; DCS = Dry Cave Section;
BKS/MPB = Open area between Bucket Storage Section and Monitor Pin Basin

% Film in sample; assume film is 1000 mg/L total solids (same as Table 3),
and average % solids in liquid portion is 146 mg/L (Table 4)

Then, for the VTS, 164 mg/L - 146 mg/L = 18 mg/L from the film, at 1000 mg/L, this equates to 18 ml in one Liter, or 0.0018 %

**Ca, mg/L in film: The difference between the VTS Ca concentration (13.5 mg/L) and the average liquid Ca (12.3 mg/L) is
1.2 mg/L. Therefore, 18 ml (in 1 liter of sample) accounts for 1.2 mg of Ca, or
0.0018 L * x mg/L Ca = 1.2 mg Ca; = 1.2 mg Ca/0.0018 L = ~660 mg/L Ca in the film

SURFACE LAYER; ORGANICS/PCB's/ANIONS

Sample Location		VTS	MB	DCS	BKS/MPB
Sample ID		97344-4	97344-2	97344-1	97344-3
Laboratory		GEL	GEL	GEL	GEL
Lab. ID		9712179-04	9712179-02	9712179-01	9712179-03
Date Sampled		12/3/97	12/3/97	12/3/97	12/3/97
Total wt % Solids (Measured)	mg/L	194	151	142	145
Total Dissolved Solids (TDS)	mg/L	143	145	144	138
Total Suspended Solids (TSS)	mg/L	71.6	4.8	2.4	5.4
Wt % Film in Sample (Calculated)*	%	7.2	0.48	0.24	0.54
Total wt % Solids; (Calculated**)	mg/L	204	150	146	143
pH		7.84	8.23	-	8.20
Oil and Grease (measured)	mg/L	30.8	0.73	1.47	3.4
Oil and Grease (calculated in film portion)	mg/L	428	152	613	630
Total Organic Carbon (TOC)	mg/L	1.35	0.14	<0.145	0.13
Total Organic Carbon (calculated in film portion)	mg/L	19	29	-	24
Biological Oxygen Demand (BOD)	mg/L	7.0	6.0	8.0	6.0
Chemical Oxygen Demand (COD)	mg/L	42.7	5.3	6.0	1.9
Volatile Organics					
Diesel Range	mg/L	0.19	0.021	0.015	0.016
Gasoline Range	µg/L	<100	<100	<100	<100
BETX (ppb)					
Benzene	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
Ethyl-Benzene	µg/L	<1	<1	<1	<1
Xylenes	µg/L	<1	<1	<1	<1
Extractable Organics (ppb)					
PCB-1016	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1221	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1232	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1242	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1248	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1254	µg/L	<0.1	<0.1	<0.1	<0.1
PCB-1260	µg/L	1.98	0.088	0.17	0.058
PCB-1260 (calculated in film portion)	µg/kg	28	18	71	11
Bromide	mg/L	28.2	27.8	27.4	27.5
Chloride	mg/L	12.7	12.7	12.3	12.6
Fluoride	mg/L	<0.035	<0.035	<0.035	<0.035
Nitrite (as N)	mg/L	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.46	0.43	0.42	0.43
SO4	mg/L	3.19	3.29	3.06	3.14
Total PO4	mg/L	<0.02	0.05	<0.023	0.10

VTS=Vertical Tube Storage Basin; MB = Machine Basin; DCS = Dry Cave Section;
BKS/MPB = Open area between Bucket Storage Section and Monitor Pin Basin

*Wt % Film Calculation:

ASSUME film wt. % solids is 1000 mg/L, or 1 mg/mL (0.1 Wt %) solids

Example; for the VTS sample, where TSS = 71.6 mg/L, TDS=143 mg/L, and Total solids = 194 mg/L, and if all the suspended solids are associated with the film.

**Then the calculated total Wt. % solids = xml film x 1mg/ml = 71.6 mg ; Film volume = ~72 mls (in 1 liter)

Then, 928 ml x 0.143 mg/ml = 132 mgs in liquid portion

72 mgs in film + 132 mgs in liquid = 204 mgs/L total solids calculated, vs. 194 mg/L total measured

TABLE 3
SURFACE LAYER - RADIONUCLIDES

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Note, data analysis indicates the "surface sample" was primarily liquid, with very little surface film

Sample Location		VTS	MB	DCS	BKS/MPB	Average, Surface	Average, Liquid
Sample ID		97047-1	970472	97047-3	970474	GEL	GEL
Laboratory		GEL	GEL	GEL	GEL		
Lab. ID		9711581-05	9711581-06	9711581-07	9711581-08		(Table 5)
Date Sampled		8/27/97	8/27/97	8/27/97	8/27/97	8/97	12/97
Gross Alpha	pCi/L	<5.16	<4.94	<3.12	<4.42	<5.0	171
Non-volatile Gross Beta	pCi/L	109,000	95500	91600	109000	101,275	56,125
Alpha Spectroscopy, Nuclides Detected							
U-233/234	pCi/L	0.83	0.51	0.53	0.66	0.63	23.0
U-238	pCi/L	0.65	0.67	0.54	0.51	0.59	8.7
Pu-239/240	pCi/L	1.94	0.04 *	0.38 *	1.7	1.02	0.22
Am-241	pCi/L	0.05	* < Det. Lim.	0.07	3.08	1.07	-
Gamma PHA Scan - Radionuclides Detected							
Cesium 137	pCi/L	92900	90300	91800	92400	91,850	92,800
Other Radionuclides Detected							
Strontium 90	pCi/L	24800	26700	23700	27900	25,775	23,500
Tritium	pCi/ml	37900	36300	36200	37100	36,875	38,075
Alpha Spectroscopy, Nuclides Below Analytical Detection Limit							
U-235	pCi/L	0.06	* 0.08	* 0.03	* 0.1	0.07	10
Np-237	pCi/L	7.11	* 8.2	<11.3	5.61	* 7.0	0.53
Pu-241	pCi/L	7.7	* 16.9	* 10.1	* 10.7	* 11	-
Pu-242	pCi/L	0.3	* 0.16	* 0.17	* 0.05	* 0.17	0.18
Gamma PHA Scan - Radionuclides Below Analytical Detection Limit							
Actinium 228	pCi/L	1.77	* 8.56	* 14.9	* <17	8.4	3.5
Antimony 124	pCi/L	<143	18.3	* 22.2	* 5.11	* 15	-
Antimony 125	pCi/L	1.97	* <178	78.2	* 46	* 42	-
Barium 133	pCi/L	17	* <64	<59	40	* -	3.9
Californium 249	pCi/L	61.4	* <63	<57	20	* -	-
Californium 251	pCi/L	<163	<153	<143	<155	-	-
Cerium 141	pCi/L	<981	<872	<827	9.8	* -	14.9
Cerium 144	pCi/L	<367	157	* <298	<357	-	-
Cesium 134	pCi/L	<35	6.5	* 0.67	* 1.7	* 3.0	-
Cesium 135	pCi/L	<203	61	* <188	<195	-	-
Cobalt 57	pCi/L	<48	<39	18.8	* <47	-	-
Cobalt 58	pCi/L	0.88	* 2.9	* 3	* <18	2.3	0.15
Cobalt 60	pCi/L	6.67	* 1.2	* 0.89	* 5.44	* 3.6	2.7
Europium 152	pCi/L	29.5	* 5.2	* <129	13	* 16	-
Europium 154	pCi/L	1.3	* <13	0.45	* 0.4	* 0.72	-
Europium 155	pCi/L	21.4	* 5	* <106	<152	-	-
Lead 212	pCi/L	<38	<81	36.6	* 30	* -	9.4
Manganese 54	pCi/L	0.91	* <7.2	<6.7	1.4	* -	-
Neptunium 239	pCi/L	9.89	* 91	* 32.8	* <262	45	-
Niobium 94	pCi/L	1.41	* 0.2	* 4.1	* <5.8	1.9	-
Potassium 40	pCi/L	21.3	* 72	35.4	* 0.5	* 32	48
Promethium 144	pCi/L	1.23	* <8.6	<7.4	<8.1	-	-
Promethium 146	pCi/L	39.8	* 43	* 9	* 0.09	* 23	-
Ruthenium 103	pCi/L	40	* <485	44	* <471	-	-
Ruthenium 106	pCi/L	104	* 23	* 48	* <394	58	37
Sodium 22	pCi/L	0.5	* <5	0.19	* 0.14	* 0.28	-
Tin 113	pCi/L	9.91	* 6.5	* 67	* 23	* 27	-
Tin 126	pCi/L	1.5	* 0.6	* <5.8	1.2	* 1.1	1.5
Yttrium 88	pCi/L	<8.33	0.7	* 1.9	* <8.7	-	0.8
Zinc 65	pCi/L	<10.4	<14	0.08	* <12	-	-
Zirconium 95	pCi/L	29.1	* <38	<40	0.57	* -	2.4
Other Radionuclides Below Analytical Detection Limit							
Nickel 59	pCi/L	340	* 207	* <274	<340	-	-
Carbon 14	pCi/L	40	* 18	* 22.8	* 14.7	* 24	207
Iodine 129	pCi/L	2.12	* 2.3	* 1.13	* 3.79	2.7	2.8
Selenium 79	pCi/L	<45.3	<49	<46	<48	-	-
Technicium 99	pCi/L	<18.4	5.9	* 3.2	* <20	-	29

* Analytical result, but less than analytical Detection Limit

A "<" indicates that the analysis was less than that detection limit, given as a negative number

VTS=Vertical Tube Storage Basin; MB = Machine Basin; DCS = Dry Cave Section;

BKS/MPB = Open area between Bucket Storage Section and Monitor Pin Basin

TABLE 4

1997 R-DISASSEMBLY ANALYTICAL RESULTS: LIQUID PORTION, METALS, PCB's, ANIONS

Sample Location Sample ID Laboratory Lab. ID Date Sampled	VTS 97293-1 GEL 9712279-01 12/8/97	MB 97293-2 GEL 9712279-02 12/8/97	DCS 97293-3 GEL 9712279-03 12/8/97	BKS/MPB 97293-4 GEL 9712279-04 12/8/97	Average, 97 Liquid GEL 12/97	Previous Results		
						Supernate	Liquid	
						SRTC	CTC	CTC
						8/94	7/94	7/94
% Solids, mg/L (ppm)	148	146	147	144	146			
pH	8.02	7.74	6.77	7.95	7.62	7.35		
Total Metals (ppb)								
Aluminum	52.7	54.9	45.1	262	103.7	410	2500	<60
Antimony	0.60	0.57	0.59	0.63	0.60	-	<50	<60
Arsenic	21.5	20.4	21.1	21	21	<200	<2	<3
Barium	4.98	4.68	4.68	7.78	5.53	32	600	-
Beryllium	0.05	0.02	0.03	0.02	0.030	-	<0.3	<5
Boron	23.6	22.7	21.3	48	28.9	106	140	-
Cadmium	0.07	0.04	0.01	0.19	0.08	11	12	<6
Calcium	12,700	12,200	12,000	12,200	12,275	18,100	21,100	340
Cesium	0.29	0.27	0.21	0.33	0.28	-	-	-
Chromium	0.97	0.82	0.67	4.12	1.65	57	10	<9
Cobalt	0.073	0.04	0.02	0.15	0.07	44	<5	-
Copper	0.84	0.76	0.53	1.24	0.84	47	15	<4
Iron	96.1	95.6	92.6	179	116	20	900	110
Lead	0.05	0.06	0.06	0.05	0.06	330	20	<42
Magnesium	444	452	439	610	486	1,190	900	<50
Manganese	1.57	0.56	0.49	107	27.4	10	450	9
Molybdenum	0.82	0.75	0.66	1.81	1.01	-	-	-
Nickel	0.5	0.21	0.25	1.41	0.59	59	7	<20
Potassium	28,500	27,400	27,000	27,400	27,575	N.A.	24,000	<1400
Selenium	94.2	92	93.4	92.3	93.0	-	<1	<3
Silver	0.08	0.05	0.02	0.07	0.06	40	4	<5
Sodium	14,400	15,000	14,700	21,800	16,475	12,850	14,000	890
Strontium	154	152	149	144	150	-	-	-
Thallium	0.05	0.05	0.05	0.05	0.05	-	-	-
Tin	0.43	0.36	0.68	1.37	0.71	-	-	-
Titanium	0.82	0.72	0.72	3.71	1.49	70	-	-
Uranium	1.86	1.81	1.72	1.65	1.76	-	-	-
Vandium	20.1	20.4	21.3	68.9	32.7	-	-	-
Zinc	11.2	11.7	11.5	24.4	14.7	80	10,500	53
Silica	1240	1250	1260	1520	1318	-	-	-
Extractable Organics (ppb)								
PCB-1016	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			
PCB-1221	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			
PCB-1232	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			
PCB-1242	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			
PCB-1248	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			
PCB-1254	<0.1	<0.11	<0.105	<0.104	<Det. Lim.			<0.2
PCB-1260	0.096	<0.11	<0.105	<0.104	<Det. Lim.			
Anions (ppm)								
Bromide	27	26.2	26.9	27.2	26.8			
Chloride	12.2	12.2	12.2	12.2	12.2			
Fluoride	0.35	0.28	0.32	0.27	0.31			
Nitrite (as N)	0.15	0.18	0.24	0.33	0.23			
Nitrate (as N)	0.99	1.78	0.71	1.01	1.1			
SO4	3.31	3.32	3.27	3.26	3.3			
Total PO4	0.02	0.02	0.02	0.02	0.02			

VTS=Vertical Tube Storage Basin; MB = Machine Basin; DCS = Dry Cave Section;
BKS/MPB = Open area between Bucket Storage Section and Monitor Pin Basin

* = Less than analytical Detection Limit, N. A. = Not analyzed

TABLE 5

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LIQUID PORTION - RADIONUCLIDES

Sample Location		VTS	MB	DCS	BKS/MPB	Average	Previous Results	
Sample ID		97293-1	97293-2	97293-3	97293-4	Liquid	Supernate	Liquid
Laboratory		GEL	GEL	GEL	GEL	GEL	SRTC	SRTC
Lab. ID		9712279-05	9712279-06	97122791-07	97122791-08			
Date Sampled		12/8/97	12/8/97	12/8/97	12/8/97	12/97	7/94	12/96
Gross Alpha	pCi/L	203	137	317	26.4	171		
Non-volatile Gross Beta	pCi/L	56,700	57,500	55,600	54,700	56,125		
Alpha Spectroscopy, Nuclides Detected								
U-233/234	pCi/L	3.07	23.8	28.6	34.7	23		
Gamma PHA Scan - Radionuclides Detected								
Cesium 137	pCi/L	36,100	92,900	92,500	93,000	92,800	80,000	110,000
Other Radionuclides Detected								
Strontium 90	pCi/L	18,800	23,100	25,300	26,800	23,500		
Tritium	pCi/ml	37,700	38,900	38,600	37,100	38,075	41,000	39,000
Carbon-14	pCi/L	233	246	191	159	207		
Technetium 99	pCi/L	<24.1	24.9	30.9	30.1	29		
Alpha Spectroscopy, Nuclides Below Analytical Detection Limit								
U-235	pCi/L	1.54	4.47	14.4	19.7	10		
U-238	pCi/L	3.07	<16.4	6.38	16.6	8.68		
Np-237	pCi/L	0.48	0.54	0.37	0.74	0.53		
Pu-238	pCi/L	<0.86	<1.1	<0.91	<1.1	-		
Pu-239/240	pCi/L	0.14	0.11	0.23	0.41	0.22		
Pu-241	pCi/L	<113	<126	<137	6.19	-		
Pu-242	pCi/L	0.12	0.08	0.27	0.24	0.18		
Am-241	pCi/L	<67.1	<105	40.8	<119	-		
Gamma PHA Scan - Radionuclides Below Analytical Detection Limit								
Actinium 228	pCi/L	2.22	6.14	5.19	0.61	3.5		
Antimony 124	pCi/L	<13.8	<33	12.2	12.8	-		
Antimony 125	pCi/L	7.67	26.2	<163	<168	-		
Barium 133	pCi/L	4.96	<58.2	5	1.82	3.9		
Californium 249	pCi/L	-	-	-	-	-		
Californium 251	pCi/L	-	-	-	-	-		
Cerium 141	pCi/L	4.16	18.3	22.1	<97	14.9		
Cerium 144	pCi/L	<89	47.3	<279	109	-		
Cesium-134	pCi/L	<11	1.02	3.1	<33	-		
Cesium-135	pCi/L	7.2	52.2	175	<214	-		
Cobalt 57	pCi/L	<11	<28	18.5	<38	-		
Cobalt 58	pCi/L	<2.5	2.02	2.1	2.29	0.15		
Cobalt 60	pCi/L	0.48	4.94	1.81	3.51	2.7		
Europium 152	pCi/L	<49	56.3	66.4	<144	-		
Europium 154	pCi/L	1.5	<11	<11	<11	-		
Europium 155	pCi/L	<44	<102	20.5	<155	-		
Lead 212	pCi/L	6.76	7.93	<74	13.6	9.4		
Manganese 54	pCi/L	<2.1	4.16	<5.4	1.52	-		
Neptunium 239	pCi/L	34.1	109	<267	<283	-		
Niobium 94	pCi/L	0.16	<5.8	<5.9	0.98	-		
Potassium 40	pCi/L	16	88.1	20.1	69.6	48		
Promethium 144	pCi/L	0.36	<5.9	0.13	2.34	-		
Promethium 146	pCi/L	5.04	<79	<85	44.4	-		
Ruthenium 103	pCi/L	<23	<61	16.1	<70	-		
Ruthenium 106	pCi/L	27.6	54.2	27.8	<328	37		
Sodium 22	pCi/L	0.55	<3.8	<4.1	<3.9	-		
Tin 113	pCi/L	14.2	28.6	<73	<75	-		
Tin 126	pCi/L	0.31	0.88	3.12	1.8	1.5		
Yttrium 88	pCi/L	0.59	<3.7	0.42	1.35	0.8		
Zinc 65	pCi/L	<4.3	<9.1	5.71	<9.1	-		
Zirconium 95	pCi/L	1.25	5.86	<12.1	0.023	2.4		
Other Radionuclides Below Analytical Detection Limit								
Nickel 59	pCi/L	<469	381	<355	83.7	-		
Iodine 129	pCi/L	<3.04	6.77	0.47	1.27	2.8		
Selenium 79	pCi/L	2.55	<47	<45	<47	-		

* Analytical result reported, but less than analytical Detection Limit, and the Reporting Limit

A "<" indicates that the analysis was less than that detection limit; reported as a negative number

VTS=Vertical Tube Storage Basin; MB = Machine Basin; DCS = Dry Cave Section;

BKS/MPB = Open area between Bucket Storage Section and Monitor Pin Basin

TABLE 6
1997 R-DISASSEMBLY ANALYTICAL RESULTS: SEDIMENT PORTION; METALS

Sample Location Composite #	VTS COMP 1	VTS COMP 2	MB COMP 1	MB COMP 2	Dry Cave COMP 1	Dry Cave COMP 2	Bucket St. COMP 1	Bucket St. Duplicate	Bucket St. COMP 2	MPB COMP	TB COMP	Average, 11 Comp's	TOTAL COMP	Previous Data
Sample ID	97428-VTS1	97428-VTS2	97428-MB1	97428-MB2	97428DCS-1	97428-DCS-2	97428BKS-1	97428BKS-3	97428BKS-2	97428-MPB	97428-TB		97428-TBC	
Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL		GEL	SRTC
Lab. ID	9801375-03	9801375-04	9801375-01	9801375-02	9801375-05	9801375-06	9801375-07	9801375-09	9801375-08	9801375-10	9801375-11		9801375-12	
Date Sampled	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98		1/14/98	8/94
Dry Wt. % Solids, 105°	10.7	7.75	7.54	5.18	3.84	3.98	6.80	7.29	8.4	3.36	4.18	5.88	7.79	0.71
pH	7.97	7.93	8.24	8.11	8.16	8.26	-	-	-	-	-	8.11	8.21	
Total Metals (ppm, dry wt.)														
Aluminum mg/kg	35,900	83,200	75,000	61,300	18,700	23,100	27,200	23,400	67,500	11,600	35,600	38,809	35,300	39,700 Al
Antimony mg/kg	7.20	12.6	5.7	6.7	2.7	2.4	4.9	4.2	16.2	4.5	4.1	6.1	4.8	
Arsenic mg/kg	39.8	84.7	37.4	34	28.8	35.7	32.6	28.7	91.9	19	48.3	39	37.6	
Barium mg/kg	137	215	175	226	72.9	156	244	223	580	36.4	178	186	168	285 Ba
Beryllium mg/kg	0.17	0.83	0.77	0.48	<0.25	<0.3	0.12	0.11	0.42	<0.17	0.1	-0.2	0.2	
Boron mg/kg	10.5	36.3	15	10.8	11.4	18.8	12.1	10.8	15.4	7.7	15.5	14	22	65 B
Cadmium mg/kg	37.4	53.8	67	64.3	36.8	86.6	56.7	51.3	134	11.1	78.5	54	49.5	<30 Cd
Calcium mg/kg	6,270	7,290	12,900	6,800	2,950	7,130	7,300	6,970	13,000	1,280	6,090	6,445	5,490	10,600 Ca
Cesium mg/kg	0.16	0.49	0.45	0.13	0.04	0.05	0.07	0.06	0.23	0.04	0.07	0.16	0.12	
Chromium mg/kg	312	672	290	181	55.6	98.2	121	131	349	34.2	122	209	166	175 Cr
Cobalt mg/kg	12.8	22.5	15	20.9	15.4	14.9	15	13.1	41	9.1	21	16	12.5	
Copper mg/kg	270	411	309	574	143	292	219	195	504	99.9	384	274	224	80 Cu
Iron mg/kg	402,000	755,000	283,000	454,000	250,000	220,000	352,000	306,000	658,000	235,000	256,000	355,909	289,000	347,200 Fe
Lead mg/kg	424	933	422	454	419	756	506	534	994	217	265	514	380	<220 Pb
Magnesium mg/kg	668	2,380	5,310	1,300	455	678	990	900	1830	240	696	1,341	1,300	2,500 Mg
Manganese mg/kg	5,080	5,950	4,830	6,960	6,160	6,230	6,030	5,240	13,400	3,490	7,450	5,759	4,710	4,000 Mn
Molybdenum mg/kg	41.1	82.6	20.6	22.1	8.2	5.6	15.8	14.5	35	18.4	19	24	18.8	
Nickel mg/kg	74.6	103	99	136	46.3	79.7	87.1	78.5	163	26.6	274	81	78.6	245 Ni
Potassium mg/kg	588	1,350	1,330	753	595	830	665	615	1360	363	812	768	586	K
Selenium mg/kg	<1.7	<4.3	<1.7	<2.4	<2.7	<3.2	<2.1	<2.0	<4.2	<1.8	<2.9	<3.0	<1.7	
Silver mg/kg	2.4	5	3.5	3.3	1.7	2.3	2.2	2.1	4.5	1.4	1.9	3	1.9	<20 Ag
Sodium mg/kg	190	462	243	248	251	318	218	209	432	152	289	248	189	<110 Na
Strontium mg/kg	140	168	158	141	66.6	182	221	211	355	36.7	145	151	117	Sr
Thallium mg/kg	<243	<0.59	<0.24	<0.33	<0.38	<0.45	<0.3	<0.3	<0.5	<0.3	<0.4	<0.3	<0.2	
Tin mg/kg	73	142	56.2	33.3	10.4	14.2	31.2	30.2	78.5	25.6	22.1	45.0	40.7	<75 Sn
Titanium mg/kg	369	1,390	589	154	7.5	<6.5	71.9	69.3	288	52.3	76.9	-	236	Ti
Uranium* mg/kg	54.9/41.6	132/64	128/95	171/107	71.5/96.1	84.4/98.6	85.8/84.4	74.4/68.8	137/66.3	39.8/144	113/126	~100	87.6/90.1	73.8# U
Vandium mg/kg	77.3	172	65	39.2	15.6	18.4	1.9	4.6	44.9	4.5	13.7	40	27	
Zinc mg/kg	30,300	30,200	45,100	70,000	37,600	99,700	72,000	66,000	108,000	6,250	81,900	51,377	43,700	20,800 Zn
Silica mg/kg	13,800	25,900	28,300	47,500	27,400	35,800	41,100	33,600	70,800	14,200	36,900	30,582	21,500	56,600 Si
*ICP/Chem Check														
Total PO4 mg/kg	7.95	19.8	3.3	19.8	8.3	8.8	4.2	4.8	12.7	10.3	5.7	9.1	5.3	

VTS=Vertical Tube Storage Area; MB = Machine Basin; DCS = Dry Cave Section; MPB = Monitor Pin Basin; TB = Transfer Bay

Note, 90 micrograms U/gm solid x 10-6 gms U/microgm U x 3.4 x 10-7 Ci/gm U = 300 x 10-13 Ci/gm solid = 30 pCi/gm

TABLE 7
1997 R-DISASSEMBLY ANALYTICAL RESULTS: SEDIMENT PORTION; PCB's, PESTICIDES, & ANIONS

Sample Location	VTs	VTs	MB	MB	Dry Cave	Dry Cave	Bucket St.	Bucket St.	Bucket St.	MPB	TB	Average,	TOTAL	Previous
Composite #	COMP 1	COMP 2	COMP 1	COMP 2	COMP 1	COMP 2	COMP 1	Duplicate	COMP 2	COMP	COMP	11 Comp's	COMP	Results
Sample ID	97428-VTS1	97428-VTS2	97428-MB1	97428-MB2	97428DCS-1	97428-DCS-2	97428BKS-1	97428BKS-3	97428BKS-2	97428-MPB	97428-TB		97428-TCB	
Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL	GEL		GEL	CTC
Lab. ID	9801375-03	9801375-04	9801375-01	9801375-02	9801375-05	9801375-06	9801375-07	9801375-09	9801375-08	9801375-10	9801375-11		9801375-12	
Date Sampled	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98	1/14/98		1/14/98	7/94
Dry Wt. % Solids, 105°	10.7	7.75	7.54	5.18	3.64	3.98	6.80	7.29	8.40	3.36	4.18	6.18	7.79	
pH	7.97	7.93	8.24	8.11	8.16	8.26	8.50	8.50	8.22	8.03	8.90	8.18	8.21	
PCB's (mg/kg, dry wt, ppm)														
PCB-1016	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
PCB-1221	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
PCB-1232	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
PCB-1242	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
PCB-1248	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
PCB-1254	mg/kg	0.88	2.75	1.71	1.53	0.92	0.62	2.26	2.18	2.57	0.91	5.12	1.00	15 & 99
PCB-1260	mg/kg	<0.13	<0.34	<0.25	<0.18	<0.11	<0.13	<0.32	<0.17	<0.33	<0.07	<0.55	<0.13	-
Pesticides, mg/kg														
4,4'-DDD	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
4,4'-DDE	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
4,4'-DDT	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Aldrin	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Dieldrin	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Endosulfan I	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Endosulfan II	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Endosulfan sulfate	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Heptachlor	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Heptachlor epoxide	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Methoxychlor	mg/kg	<0.025	<0.067	<0.051	<0.037	<0.022	<0.026	<0.064	<0.034	<0.065	<0.015	<0.11	<0.026	-
Toxaphene	mg/kg	<0.63	<1.68	<1.27	<0.92	<0.55	<0.66	<1.60	<0.84	<1.63	<0.36	<2.78	<0.65	-
Alpha-BHC	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
Alpha-Chlordane	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
Beta-BHC	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
Delta-BHC	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
Gamma-BHC	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
gamma-chlordane	mg/kg	<0.013	<0.034	<0.025	<0.018	<0.011	<0.013	<0.032	<0.017	<0.033	<0.007	<0.055	<0.013	-
Anions (ppm)														
Bromide	mg/kg												228	
Chloride	mg/kg												102	
Fluoride	mg/kg												4.6	
Nitrite (as N)	mg/kg												<3.0	
Nitrate (as N)	mg/kg												7.1	
SO4	mg/kg												106	
Total PO4	mg/kg	7950	19800	3300	1810	8320	8870	4170	4820	12700	1030	5730	6,615	5320

VTs=Vertical Tube Storage Area; MB = Machine Basin; DCS = Dry Cave Section; MPB = Monitor Pin Basin; TB = Transfer Bay

TABLE 8
SEDIMENT LAYER - RADIONUCLIDES

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Sample Location Sample ID Laboratory Lab. ID Date Sampled	Total Basin Composite (TBC)		Previous Results		
	97428-TCB GEL	Liquid Ave. GEL	Sediment SRTC	Liquid SRTC	Liquid SRTC
	9801375-13				
	1/14/98	12/97	7/94	7/94	12/96
Analyses reported as pCi/gm, dry wt.					
Gross Alpha	pCi/gm	12,500			
Non-volatile Gross Beta	pCi/gm	96,500			
Alpha Spectroscopy, Nuclides					
U-233/234	pCi/gm	1.4 *			
U-235	pCi/gm	< Det. Lim.(3.0)	0.9	N.D.	N.D.
U-238	pCi/gm	0.91 (30 ##) *	25 ###	N.D.	N.D.
Np-237	pCi/gm	1.4 *			
Pu-238	pCi/gm	20			
Pu-239/240	pCi/gm	162			
Pu-241	pCi/gm	22,600@			
Pu-242	pCi/gm	7.0			
Am-241	pCi/gm	103	270	N.D.	N.D.
Gamma PHA Scan - Radionuclides					
Actinium 228	pCi/gm	< Det. Lim.			
Antimony 124	pCi/gm	2.0 *			
Antimony 125	pCi/gm	12 *			
Barium 133	pCi/gm	< Det. Lim.			
Californium 249	pCi/gm	4.4 *			
Californium 251	pCi/gm	3.6 *			
Cerium 141	pCi/gm	14 *			
Cerium 144	pCi/gm	< Det. Lim.			
Cesium 134	pCi/gm	< Det. Lim.			
Cesium 135	pCi/gm	6.4 *			
Cesium 137	pCi/gm	20,500	2,550	80	110
Cobalt 57	pCi/gm	4.0			
Cobalt 58	pCi/gm	< Det. Lim.			
Cobalt 60	pCi/gm	47,900	1,760	N.D.	N.D.
Europium 152	pCi/gm	46			
Europium 154	pCi/gm	367			
Europium 155	pCi/gm	44			
Lead 212	pCi/gm	3.5 *			
Manganese 54	pCi/gm	7.3 *			
Neptunium 239	pCi/gm	14 *			
Niobium 94	pCi/gm	6.58 *			
Potassium 40	pCi/gm	< Det. Lim.			
Promethium 144	pCi/gm	< Det. Lim.			
Promethium 146	pCi/gm	< Det. Lim.			
Ruthenium 103	pCi/gm	< Det. Lim.			
Ruthenium 106	pCi/gm	0.71 *			
Sodium 22	pCi/gm	135			
Tin 113	pCi/gm	< Det. Lim.			
Tin 126	pCi/gm	< Det. Lim.			
Yttrium 88	pCi/gm	41			
Zinc 65	pCi/gm	78			
Zirconium 95	pCi/gm	46			
Other Radionuclides					
Nickel 59	pCi/gm	287			
Strontium-90	pCi/gm	3,160	N.A.	N.A.	N.A.
Tritium	pCi/gm	397,000	345,000	41,000	39,000
Carbon 14	pCi/gm	6,170			
Iodine 129	pCi/gm	11			
Selenium 79	pCi/gm	< Det. Lim.			
Technetium 99	pCi/gm	25			

* Analytical result reported, but it was less than analytical detection Limit

A "< Det. Lim." indicates that the analysis was less than the detection limit, given as a negative number

The Total Basin Composite sample was collected from 9 separate locations throughout the basin;

the residues (after PCB samples were taken) from the other 11 composite samples were also added to the TBC

@ *TRU limit for Pu-241 is 3,500,000 pCi/gm (3500 nCi/gm).

30 pCi/gm based on GEL's ICP analyses vs. alpha spectroscopy; ### is based on SRTC's ICP-MS result

N. D. = Not Detected; N. A. = not Analyzed