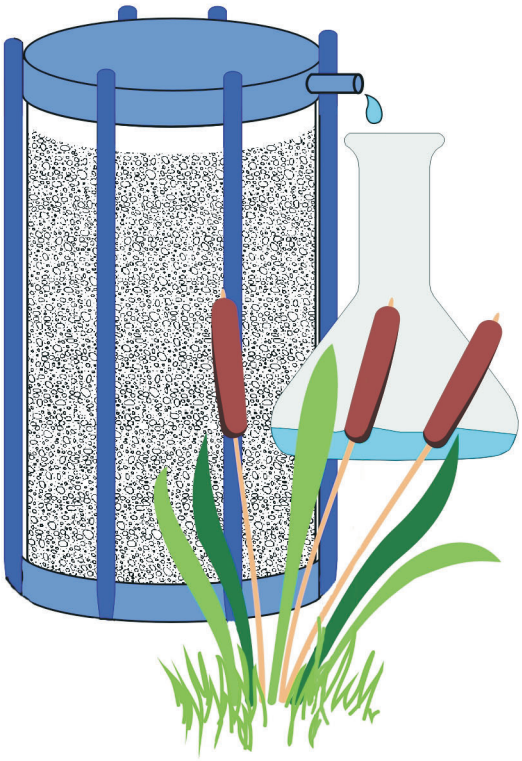
GJO–2002–332–TAR
ESL–RPT–2002–05

Environmental Sciences Laboratory

Leaching Characteristics of Radioactive Sands

Long-Term Surveillance and Maintenance Program
Lowman, Idaho, Site

May 2002



Prepared for
U.S. Department of Energy
Grand Junction Office
Grand Junction, Colorado

Work Performed Under DOE Contract No. DE–AC13–96GJ87335
DOE Task Order No. MAC02–06

ESL–RPT–2002–05
MAC–LLOW 10.7–1

Leaching Characteristics of Radioactive Sands

Long-Term Surveillance and Maintenance Program
Lowman, Idaho, Site

May 2002

Prepared for
U.S. Department of Energy
Grand Junction Office
Grand Junction, Colorado

Work Performed Under DOE Contract No. DE–AC13–96GJ87335

S0077000

Signature Page

Leaching Characteristics of Radioactive Sands

Long-Term Surveillance and Maintenance Program
Lowman, Idaho, Site

May 2002

Prepared By: _____
Stan Morrison, Principal Scientist
Environmental Sciences Laboratory

Prepared By: _____
Jody Waugh, Principal Scientist
Environmental Sciences Laboratory

Prepared By: _____
Greg Smith, Senior Project Engineer
Long-Term Surveillance and Maintenance Program

Reviewed By: _____
Carl Jacobson, Manager
Long-Term Surveillance and Maintenance Program

Approved By: _____
Art Kleinrath, Project/Technical Manger
U.S. Department of Energy Grand Junction Office

Contents

Page

Tables

Figures

Appendices

Acronyms

DOE	U.S. Department of Energy
GJO	Grand Junction Office
LTSM	long-term surveillance and maintenance
MCL	maximum concentration limits
µg/L	micrograms per liter
pCi/L	picocuries per liter
Ra-226	radium-226
Ra-228	radium-228
UMTRCA	Uranium Mill Tailings Radiation Control Act

End of current text

Executive Summary

Routine inspections of the Lowman, Idaho, Disposal Site in the Long-Term Surveillance and Maintenance Program include observations that plants are being established on the disposal cell. Roots from the plants have penetrated the cover and could cause an increase in infiltration of water into the radioactive sands. We evaluated data collected in previous investigations to determine if contaminants are likely to leach from the radioactive sands and contaminate ground water if the engineered cover were to be breached by biointrusion. Four lines of evidence based on available data suggest that it is unlikely that any significant contamination will occur even if infiltration increases in the future: (1) resistate nature of the mineralogy of the radioactive sands, (2) low concentrations of contaminants in pore fluids, (3) low concentrations of contaminants in effluent from batch leach tests with neutral pH water, and (4) low concentrations of contaminants in ground water beneath the disposal cell. Therefore, termination of the plant control program is not likely to increase risks to human health or the environment.

End of current text

1.0 Introduction

The U.S. Department of Energy Grand Junction Office (DOE–GJO) Long-Term Surveillance and Maintenance (LTSM) Program provides stewardship services for DOE sites across the country that contain low-level radioactive materials (www.gjo.doe.gov/programs/ltsm/). Included in the LTSM Program are uranium mill tailings disposal cells constructed under the auspices of the Uranium Mill Tailings Radiation Control Act (UMTRCA) to contain contaminants for 1,000 years. In 1998, the LTSM Program initiated the Cover Monitoring and Long-Term Performance Project to evaluate how changes in UMTRCA disposal cell environments, both observed changes and changes projected over hundreds of years, may alter the performance of disposal cells (DOE 2001a). The LTSM Program and the DOE Environmental Sciences Laboratory at GJO are evaluating the hydrologic performance of the Lowman, Idaho, Disposal Cell. The U.S. Nuclear Regulatory Commission included the Lowman Disposal Cell site under general license in 1994. After 1994, the LTSM Program has been responsible for the long-term safety and integrity of the site (DOE 2002).

Personnel with the LTSM Program recently observed encroachment of vegetation, including ponderosa pine, redosier dogwood, whortleberry, Norway cinquefoil, common mullein, and bull thistle, on the top and side slopes of the Lowman Disposal Cell (DOE 2001b). Roots from these plants could increase the saturated hydraulic conductivity of the cover. If the hydraulic conductivity were to increase, water could penetrate the radioactive sands in the disposal cell and eventually percolate into ground water beneath the site. As part of the regular maintenance activities conducted by the LTSM Program, plants are removed if necessary to protect the integrity of the disposal cell. However, the plant removal would not be required if it is demonstrated that there is no additional risk to human health and the environment by allowing forest vegetation to establish on the cover.

Previous informal internal correspondence among GJO scientists suggested that no significant quantity of hazardous chemicals would be leached from the radioactive sands even if biointrusion were to cause increased water infiltration. This report reviews pertinent data and evaluates the probability that pore fluids in the radioactive sands in the Lowman Disposal Cell could contaminate the ground water. This report does not contain new data but rather compiles and evaluates data generated in previous studies.

End of current text

2.0 Processing of Ores and Remedial Action

About 200,000 tons of heavy-mineral placer sands mined from dredging operations in Bear Valley, about 17 miles northeast of the Lowman site, was processed at the former Lowman mill from 1955 to 1960 (Dayvault et al. 1986; DOE 1991a). Ores consisted of resistate minerals derived from quartz monzonite and granite of the Idaho Batholith (Dayvault et al. 1986). The placers, or surficial mineral deposits, were formed from detrital grains deposited following erosion of pegmatite dikes and pods in the batholith. Sedimentary sorting processes concentrated the ore minerals in specific strata because the ore minerals are denser (Table 1 provides specific gravities) than the more abundant labile grains such as quartz and feldspar that both have a specific gravity of about 2.7. Heavy-mineral placer sands such as these are common in sedimentary strata and are infrequently concentrated sufficiently to warrant extraction for mineral processing.

The milling operation at Lowman was relatively small. The U.S. Atomic Energy Commission purchased 365,231 pounds of uranium oxide (as U_3O_8) from the Lowman site between 1957 and 1960 (Albrethsen and McGinley 1982). Only 2 of the 32 uranium mills (Lakeview, Oregon, and Hite, Utah) inventoried by Albrethsen and McGinley (1982) had less uranium production than the Lowman mill; the average uranium production per uranium mill is 10,865,520 pounds of U_3O_8. The combined content of columbite, euxenite, and monazite in the Bear Valley ore sands was 0.14 pound per cubic yard (Kline et al. 1953). The uranium ore ranged in grade from 0.01 to 0.22 percent U_3O_8 (Albrethsen and McGinley 1982).

The Lowman mill was designed to recover columbite, euxenite, and monazite concentrates (Dayvault et al. 1986). By-product concentrates included magnetite, ilmenite, zircon, and garnet (FBD 1981). Mineral concentrates were separated using a variety of wet and dry mechanical processes. Magnetite was separated using an electromagnetic separator (Dayvault et al. 1986). Processed products were sent to the Mallinckrodt chemical works at Hematite, Missouri, where columbium (an earlier name for the element niobium [Nb] [Hawley 1987]) and tantalum (Ta) pentoxides, uranium oxide, other rare-earth elements, titanium, and thorium-iron residues were produced (DOE 1991a).

Prior to site remediation, storage areas contained four types of processed sands: black sands, white sands, grey sands, and red sands (Figure 1). In addition, about 5,000 tons of unprocessed mill feed with a concentration of 0.22 percent U_3O_8 remained on the site (Albrethsen and McGinley 1982). Total radioactivity, estimated at 12 curies of radium-226 (Ra-226), is low compared to other UMTRCA sites (DOE 2002). Remedial actions were initiated in 1991 to stabilize the radioactive sands (DOE 1994). The separate piles of radioactive sands were consolidated in a single above-grade 8.2-acre disposal cell on the millsite. Material from the mill yard, ore storage area, windblown/waterborne area, settling ponds, and vicinity properties was placed on top of the black sands (Figure 1). The tailings pile, containing 129,400 cubic yards of radioactive material, was stabilized with a 1.5-foot-thick layer of compacted earth (radon barrier) overlain by a 0.5-foot-thick layer of sandy bedding material and riprap rock cover (DOE 1994).

End of current text

3.0 Characteristics of the Radioactive Sands

Jacobs (1991) indicates that the black sands contain ilmenite, magnetite, and garnet; white sands contain quartz, feldspar, and sphene; grey sands contain quartz, feldspar, and ilmenite; ore sands contain ilmenite, magnetite, quartz, feldspar, garnet, zircon, columbite, euxentite, and monazite; and red sands contain garnet. In contrast, Dayvault et al. (1986) provide a more comprehensive list of minerals in the ore sands including ilmenite, magnetite, garnet, sphene, monazite, zircon, fergusonite, brannerite, xenotime, and columbite with lesser amounts of samarskite, euxenite, ilmenorutile, allanite, spinel, rutile, gold, epidote, and siderite (Table 1). Many of these minerals contain rare earth elements (cerium, lanthanum, neodymium, thorium, and yttrium), but only a few contain uranium. Uranium is not an essential element in any of the ore minerals except brannerite; uranium constitutes 26.5 to 43.6 percent of brannerite (Frondel et al. 1967).

Ra–226 concentrations in samples collected from 64 borings and 320 surface/subsurface soils were determined by gamma spectroscopy. Table 2 provides volume-weighted average values determined in various groups of the residual sands. The unprocessed ores have the highest concentrations of Ra–226, but the concentrations are lower than those for typical uranium ores.

End of current text

4.0 Pore Water Chemistry in the Radioactive Sands

Pore water was collected from 13 lysimeters placed near the bottom of the radioactive sands prior to remediation activities (Figure 1). Jacobs (1991) provides a summary of the results. Fourteen of 26 hazardous constituents did not exceed the method detection limit. For the 12 hazardous constituents that exceeded the method detection limit, means were calculated for each type of radioactive material (black sand, white sand, grey sand, red sand, ore sand, and mill yard). The potential for pore water to contaminate ground water is estimated by comparing the pore water concentrations to maximum concentration limits (MCLs) or, for those constituents that do not have MCLs, to risk-based concentration limits (EPA 2001). This approach is conservative because even if pore waters exceed ground water MCLs, the ground water concentrations can be less than MCLs due to dilution. As discussed below, pore water concentrations measured in lysimeter samples indicate that it is unlikely that the radioactive sands will significantly contribute to ground water contamination.

On the basis of analysis of pore fluids, Jacobs (1991) concluded that no hazardous constituents exceed MCLs; however, antimony and vanadium in pore fluids in the radioactive sands exceeded the statistical maximum for background ground water. Neither antimony nor vanadium has MCLs under the UMTRCA Ground Water Project (EPA 1995). Risk-based concentration limits for antimony and vanadium are 150 and 260 micrograms per liter (μg/L), respectively (EPA 2001). Concentrations of antimony in all pore water samples from 11 lysimeters are less than the risk-based concentration limit (data presented in Appendix A). Some of the vanadium concentrations in the pore fluids exceeded the risk-based concentration limit; the maximum vanadium concentration in a pore fluid sample was 580 μg/L. However, Jacobs (1991) estimated the weighted mean concentration for vanadium in the radioactive sands pore fluids at 149.3 μg/L, which is less than the risk-based concentration limit.

Pore water samples from only five of the lysimeters were analyzed for Ra-226 and Ra-228; all the samples were from the black sands (Appendix A). All concentrations of Ra-226 and Ra-228 were less than the detection limit (1 picocurie per liter [pCi/L]) in these five samples, suggesting that radium is not leaching from the black sands. Concentrations in pore fluids are one of the best indications of the tendency for release of contamination because the water has been in contact with the radioactive sands for long time periods.

End of current text

5.0 Review of Batch Leaching Test Data

Fifteen batch leaching tests were conducted with water with a neutral pH value and eight batch leaching tests were conducted with water with low pH values (DOE 1991b). The 15 samples used for the batch tests conducted under neutral conditions consisted of 4 samples of grey ore, 4 samples of black sand, 2 samples of red sand, 2 samples of grey sand, and 3 samples of white sand (data presented in Appendix A). The eight batch tests conducted under acidic conditions used 2 samples of grey ore, 2 samples of black sand, 2 samples of white sand, and 2 samples of grey sand. Fluid and solids were combined using 37.5 percent solids, by weight, and the mixtures were agitated for 48 hours (DOE 1991b, Table 3.12). The final pH values of the acidic tests ranged from 3.02 to 4.89; neither the initial pH values nor the type of acid used was indicated in the reports. Concentrations of selected hazardous constituents were determined in the effluents.

None of the hazardous constituents in samples from the neutral pH batch leach tests were above MCLs, except one value of radium from one test (DOE 1991a). This effluent was from the grey ore and was barely above the MCL with a combined Ra-226 and Ra-228 concentration of 5.5 pCi/L (MCL for combined Ra–226 and Ra–228 is 5 pCi/L).

Although none of the other constituents exceeded MCLs in the acidic tests, combined Ra-226 and Ra-228 exceeded MCLs in all 8 tests ranging from 8.1 to 47.0 pCi/L (Appendix A). Apparently, some of the radium-bearing material is dissolved or radium desorbs from mineral surfaces at low pH values. Unfortunately, the type of acid used and the starting pH value are not known. Some of the mineral grains, particularly feldspars, would provide some buffering of pH. The initial pH value was probably about 2 or 3. Such low pH values would not occur by the passage of water through the cover materials. Therefore, although radium is released from the radioactive sands at low pH value, this finding does not indicate that pore waters will have high radium values.

End of current text

6.0 Review of Ground Water Chemistry

The site formerly occupied by the Lowman mill lies on a terrace consisting of colluvium, alluvium, and glacial outwash, above Clear Creek. The uppermost aquifer is alluvium and weathered granodiorite (DOE 1994). Analyses of samples of ground water collected at the site prior to remediation detected no concentrations of contaminants above background (DOE 1991b).

Antimony was designated as a potential contaminant because its concentration in the pore water of the radioactive sands exceeded the statistical maximum background ground water value of 0.007 milligram per liter (DOE 1994). Analyses of ground water samples collected form the alluvial aquifer at the site from 1994 to 2001 by the LTSM Program did not detect the presence of antimony (DOE 2001b). The ground water compliance strategy for the Lowman site is no remediation based on data that confirmed that no contamination was present in the ground water (DOE 1996).

End of current text

7.0 Discussion

Four lines of evidence suggest that it is unlikely that contaminants will be leached from the radioactive sands: (1) mineralogy of the radioactive sands, (2) contaminant concentrations in pore fluid samples, (3) results of batch leaching tests, and (4) contaminant concentrations in ground water samples.

1. Mineralogy of the Radioactive Sands—The material impounded in the Lowman Disposal Cell is referred to in this report as radioactive sands to distinguish it from "tailings" that are present at most UMTRCA disposal sites. Tailings contain residues from many chemicals used in the milling process; for example, sulfate is often a constituent of tailings that results from sulfuric acid used in milling processes. No chemicals other than water were used at the Lowman mill processing, thus, the only potential for contamination to ground water is from the minerals themselves. Because the Lowman ore is composed primarily of resistate sand grains, there is low potential for dissolution and release of contamination into pore fluids at the Lowman millsite.
2. Concentrations in Pore Water—Concentrations of contaminants measured in pore fluids in the radioactive sands are low compared to concentrations measured in tailings pore fluids at most other UMTRCA sites. On a volume-weighted basis, all concentrations are less than MCLs or risk-based standards. Data from analysis of samples from lysimeters indicate that pore fluids are unlikely to contaminate ground water. Development of pine forest and associated organic soils may reduce pH in the root zone to 6.0 or perhaps even lower. The batch leaching test results suggest that at low pH values (less than 5.0) some leaching of radium could occur. It is unlikely that pH values will be low enough to leach significant concentrations of radium.
3. Results of Batch Leach Tests—One value of radium in neutral pH batch tests effluents was slightly above the MCL. The neutral pH tests confirm that leaching of contaminants is limited at pH values consistent with conditions expected in pore fluids. Radium concentrations in acidic effluents were well above the MCL, but these conditions are not representative of the conditions expected in pore fluids within the radioactive sands.
4. Concentrations in Ground Water—The radioactive sands were exposed to the atmosphere from about 1955 to 1991, during which time there was opportunity for contaminants to leach into the ground water. Analyses of ground water samples from the Lowman site indicate that no contamination is present in the uppermost aquifer, providing compelling evidence that leakage of contaminated pore water from the radioactive sands is unlikely to contaminate the ground water.

Based on the evidence presented, we conclude that termination of the plant control program is not likely to result in significantly increased risk to human health or the environment.

End of current text

8.0 References

Albrethsen, H. Jr. and McGinley, F.E., 1982. *Summary History of Domestic Uranium Procurement Under U.S. Atomic Energy Commission Contract Final Report*, GJBX–220(82), U.S. Department of Energy Grand Junction Area Office, Colorado, 139 p.

Bates, R.L. and Jackson, J.A., (eds.) 1980. *Glossary of Geology Second Edition*, American Geological Institue, Falls Church, Virginia, 751 p.

Dana, E.S., 1964. *A Textbook of Mineralogy With An Extended Treatise on Crystallography and Physical Mineralogy*, Fourth Edition, revised by W.E. Ford, John Wiley & Sons, Inc., New York, 851 p.

Dayvault, R.D., Krabacher, J.E., Jr., Hardy, L.C., and Colby, R.J., 1986. *Radiological Characterization of the Lowman, Idaho, Uranium Mill Tailings Remedial Action Site*, GJ–53, UNC Technical Services, Inc., prepared for the U.S. Department of Energy UMTRA Site Characterization Project, Grand Junction, Colorado, 29 p.

DOE (U.S. Department of Energy), 1991a. *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Lowman, Idaho*, UMTRA–DOE 050512.0000, Appendix B of the Cooperative Agreement No. DE-FC04-85AL0533, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 1991b. *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Lowman, Idaho*, UMTRA–DOE 050512.0000, "Appendix B of the Cooperative Agreement No. DE-FC04-85AL0533, Attachment 3 – Groundwater Hydrology Report," U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 1994. *Long-Term Surveillance Plan for the Lowman, Idaho, Disposal Site*, DOE/AL/62350–36, Rev. 1, U.S. Department of Energy UMTRA Project Office, Albuquerque, New Mexico, 128 p.

———, 1996. *UMTRA Ground Water Project Management Action Process (MAP) Document*, DOE/AL/62350–220, Rev. 0, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2001a. *Long-Term Surveillance and Maintenance Program 2000 Annual Report*. GJO–2000–181–TAR, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2001b. *2001 Annual Compliance Report, Lowman, Idaho, Disposal Site, LTSM Program 2001 UMTRCA Title I Annual Report*, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2002. "Lowman, Idaho, Disposal Site, Fact Sheet, Long-Term Surveillance and Maintenance Program," www.gjo.doe.gov/programs/ltsm, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

EPA (U.S. Environmental Protection Agency) 1995. "Groundwater Standards for Remedial Actions at Inactive Uranium Processing Sites; Final Rule," *Federal Register*, Part IV, January 11.

———, 2001. Risk-Based Concentration Table. Memo from J. Hubbard to Risk-Based Concentration Table Users. www.epa.gov/reg3hwmd/risk/riskmenu.htm.

FBD (Ford, Bacon, & Davis), 1981. *Engineering Assessment of Radioctive Sands and Residues, Lowman Site, Lowman, Idaho*, DOE/UMT-0118S, FBDU-360-17S, UC 70, prepared for U.S Department of Energy Uranium Mill Tailings Remedial Actions Project Office, Albuquerque, New Mexico.

Frondel, J.W., Fleischer, M., and Jones, R.S., 1967. *Glossary of Uranium- and Thorium-Bearing Minerals*, Bulletin 1250, U.S. Geol. Surv., 69 p.

Hawley, G.G., 1987. *Hawley's Condensed Chemical Dictionary*, Eleventh Edition, Revised by N.I. Sax and R.J. Lewis, Sr., Van Nostrand Reinhold, New York, 1288 p.

Jacobs, 1991. *Calculation of Source Contaminants*, Calculation Number LOW-12-90-12-06, Jacobs Engineering, prepared for U.S. Department of Energy UMTRA Project, Albuquerque, New Mexico, 74 p.

Kline, M.H., Carlson, E.J., Storch, R.H., and Robertson, A.F., 1953. *Bear Valley Radioactive Mineral Placers, Valley County, Idaho*, U.S. Bureau of Mines RME–3130, issued by U.S. Atomic Energy Commission Technical Information Service, Oak Ridge, Tennessee.

Table 1. Properties of Ore Minerals

Mineral	Chemical Formula[a]	Specific Gravity[b]
Major Minerals		
Ilmenite	$FeTiO_3$	4.74.5-5
Magnetite	$(Fe,Mg)Fe_2O_4 \pm Ti$	5.168-5.180
Garnet	$(Ca, Mg, Fe^{+2}, Mn^{+2})_3(Al, Fe^{+3}, Mn^{+3}, V^{+3}, Cr)_2(SiO_4)_3$	3.15-5.3
Sphene	$CaTiSiO_5$	3.4-3.56
Monazite	$(Ce, La, Nd, Th)(PO_4, SiO_4)$	4.9-5.3
Zircon	$ZrSiO_4$	4.68-4.70
Fergusonite	$Y(Nb,Ta)O_4 \pm$ Er, Ce, Fe, Ti, U	5.8
Brannerite	$(U, Ca, Ce)(Ti, Fe)_2O_6$	4.5-5.4
Xenotime	$YPO_4 \pm$ Er, Ce, Th, U, Al, Ca, Be, Zr, and others	4.45-4.56
Columbite	$(Fe, Mn)(Nb, Ta)_2O_6$	5.3-7.3
Minor Minerals		
Samarskite	$(Y, Ce, U, Ca, Fe, Pb, Th)(Nb, Ta, Ti, Sn,)_2O_6$	5.6-5.8
Euxenite	$(Y, Ca, Ce, U, Th)(Nb, Ta, Ti)_2O_6$	4.7-5.0
Ilmenorutile	$(Ti, Nb, Fe)_3O_6$	5.14
Allanite	$(Ce, Ca, Y)(Al, Fe)_3(SiO_4)_3(OH)$	3.0-4.2
Spinel	$(Mg, Fe, Zn, Mn)(Al, Fe, Cr)_2O_4$	3.5-4.1
Rutile	TiO_2	4.18-4.25
Gold	Au	15.6-19.3
Epidote	$Ca_2(Al, Fe)_3Si_3O_{12}(OH)$	3.25-3.5
Siderite	$FeCO_3 \pm Mg, Mn$	3.83-3.88

[a]Bates and Jackson (1980).
[b]Dana (1964).

Table 2. Estimated Volumes and Ra–226 Content of Residual Materials Left at the Lowman Site (DOE 1991a)

Location/Source	Estimated Volume (cubic yards)[a]	Area (acres)	Average Ra–226 (pCi/g)
Mill Yard	5,715	2.8	58
Ore Storage	7,132	0.9	438
Pond Area	6,404	0.8	245
White Sands # 1	5,604	0.4	57
White Sands # 2	7,794	1.1	36
Black Sands	28,997	6.0	64
Grey Sands	13,287	1.3	180
Waterborne	3,734	3.0	22
Windblown	3,476	3.2	21
Vicinity Properties	38,730		30
TOTAL	**127,481**	**19.5**	

[a]Volume estimates differ slightly between Tables 1.1 and 6.1 in DOE (1991a).
pCi/g – picoCuries per gram

End of current text

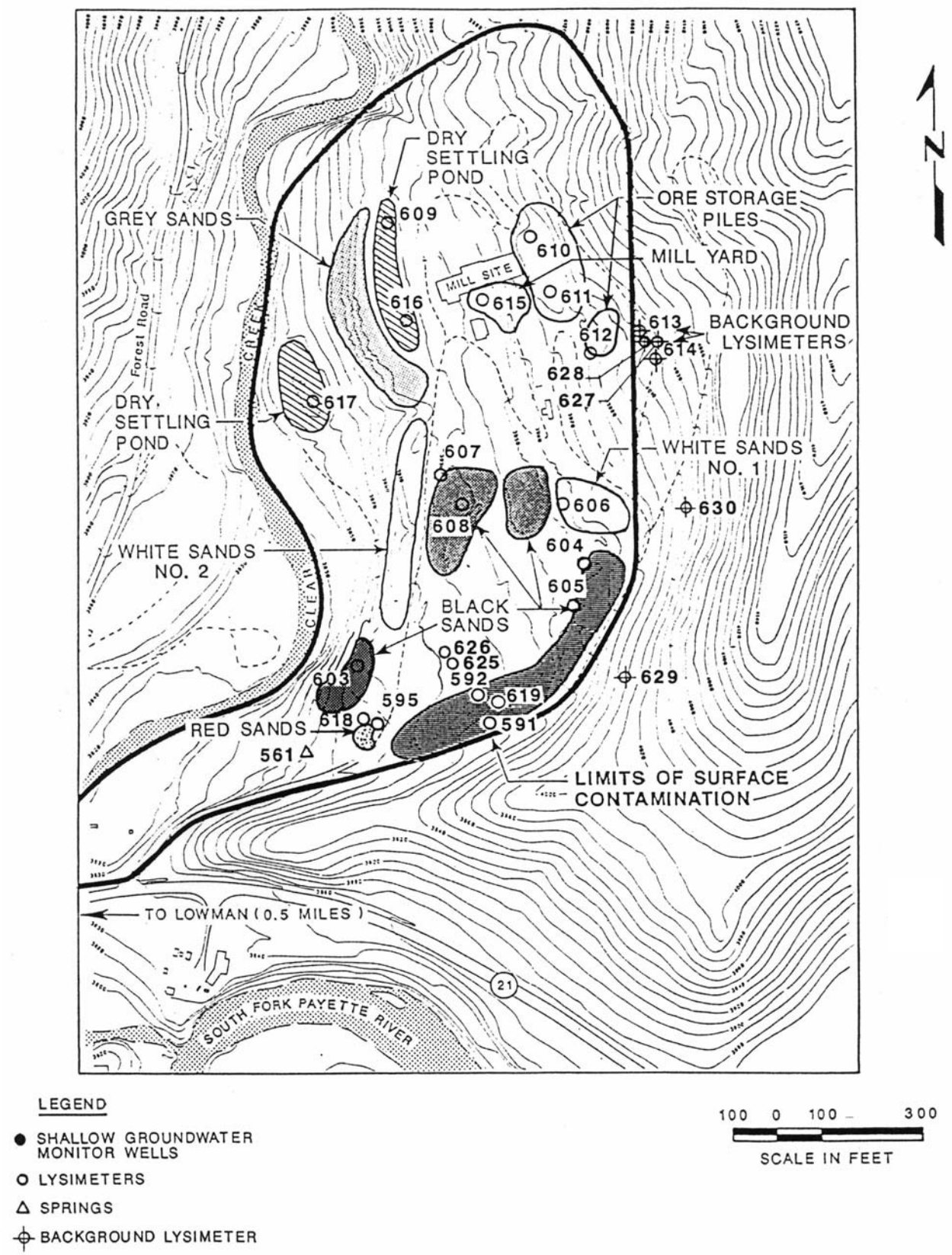


Figure 1. Locations of Piles of Radioactive Sands and Lysimeters Before Consolidation (from Jacobs 1991)

Appendix A

Pore Water Concentrations and Batch Test Results

(DOE 1991b)

Pore Water Concentrations

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0605	Alkalinity	07-Oct-90	21	mg/L	0	
0606	Alkalinity	07-Oct-90	2	mg/L	0	
0610	Alkalinity	07-Oct-90	14	mg/L	0	
0611	Alkalinity	07-Oct-90	7	mg/L	0	
0591	Aluminum	28-Aug-87	0.16	mg/L	0.1	
0591	Aluminum	11-Jan-88	0.06	mg/L	0.1	
0592	Aluminum	11-Jan-88	0.05	mg/L	0.1	
0604	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0604	Aluminum	26-Apr-90	0.05	mg/L	0.1	U
0605	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0605	Aluminum	26-Apr-90	0.05	mg/L	0.1	U
0605	Aluminum	07-Oct-90	0.1	mg/L	0.1	U
0606	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0606	Aluminum	26-Apr-90	0.05	mg/L	0.1	U
0606	Aluminum	07-Oct-90	0.1	mg/L	0.1	U
0608	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0609	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0609	Aluminum	26-Apr-90	0.05	mg/L	0.1	U
0610	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0610	Aluminum	07-Oct-90	0.1	mg/L	0.1	U
0611	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0611	Aluminum	07-Oct-90	0.1	mg/L	0.1	U
0612	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0614	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0615	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0618	Aluminum	10-Dec-89	0.1	mg/L	0.1	U
0618	Aluminum	26-Apr-90	0.05	mg/L	0.1	U
0626	Aluminum	30-Jun-90	0.4	mg/L	0.1	
0591	Ammonium	02-Apr-88	0.1	mg/L	0.1	U
0592	Ammonium	02-Apr-88	0.1	mg/L	0.1	U
0595	Ammonium	02-Apr-88	0.1	mg/L	0.1	U
0604	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0604	Ammonium	26-Apr-90	0.2	mg/L	0.1	
0605	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0605	Ammonium	26-Apr-90	0.1	mg/L	0.1	
0606	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0606	Ammonium	26-Apr-90	0.1	mg/L	0.1	
0608	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0609	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0609	Ammonium	26-Apr-90	0.4	mg/L	0.1	
0610	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0611	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0612	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0615	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0618	Ammonium	10-Dec-89	0.1	mg/L	0.1	U
0618	Ammonium	26-Apr-90	0.1	mg/L	0.1	
0591	Antimony	28-Aug-87	0.01	mg/L	0.01	U
0604	Antimony	10-Dec-89	0.022	mg/L	0.003	
0604	Antimony	26-Apr-90	0.008	mg/L	0.003	
0605	Antimony	10-Dec-89	0.016	mg/L	0.003	
0605	Antimony	26-Apr-90	0.06	mg/L	0.003	

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0605	Antimony	07-Oct-90	0.03	mg/L	0.003	
0606	Antimony	26-Apr-90	0.06	mg/L	0.003	
0606	Antimony	07-Oct-90	0.017	mg/L	0.003	
0608	Antimony	10-Dec-89	0.023	mg/L	0.003	
0609	Antimony	10-Dec-89	0.014	mg/L	0.003	
0609	Antimony	26-Apr-90	0.05	mg/L	0.003	
0610	Antimony	10-Dec-89	0.03	mg/L	0.003	
0610	Antimony	07-Oct-90	0.021	mg/L	0.003	
0611	Antimony	10-Dec-89	0.017	mg/L	0.003	
0611	Antimony	07-Oct-90	0.03	mg/L	0.003	
0612	Antimony	10-Dec-89	0.011	mg/L	0.003	
0614	Antimony	10-Dec-89	0.031	mg/L	0.003	
0615	Antimony	10-Dec-89	0.014	mg/L	0.003	
0618	Antimony	10-Dec-89	0.034	mg/L	0.003	
0618	Antimony	26-Apr-90	0.06	mg/L	0.003	
0626	Antimony	30-Jun-90	0.008	mg/L	0.003	
0591	Arsenic	28-Aug-87	0.001	mg/L	0.01	U
0591	Arsenic	11-Jan-88	0.01	mg/L	0.01	U
0591	Arsenic	02-Apr-88	0.001	mg/L	0.01	U
0592	Arsenic	11-Jan-88	0.01	mg/L	0.01	U
0592	Arsenic	02-Apr-88	0.002	mg/L	0.01	
0595	Arsenic	02-Apr-88	0.001	mg/L	0.01	U
0604	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0604	Arsenic	26-Apr-90	0.01	mg/L	0.01	U
0605	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0605	Arsenic	26-Apr-90	0.01	mg/L	0.01	U
0605	Arsenic	07-Oct-90	0.01	mg/L	0.01	U
0606	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0606	Arsenic	26-Apr-90	0.01	mg/L	0.01	U
0606	Arsenic	07-Oct-90	0.01	mg/L	0.01	U
0608	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0609	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0609	Arsenic	26-Apr-90	0.01	mg/L	0.01	U
0610	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0610	Arsenic	07-Oct-90	0.01	mg/L	0.01	U
0611	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0611	Arsenic	07-Oct-90	0.01	mg/L	0.01	U
0612	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0614	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0615	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0618	Arsenic	10-Dec-89	0.01	mg/L	0.01	U
0618	Arsenic	26-Apr-90	0.01	mg/L	0.01	U
0626	Arsenic	30-Jun-90	0.01	mg/L	0.01	U
0591	Barium	28-Aug-87	0.15	mg/L	0.1	
0591	Barium	11-Jan-88	0.19	mg/L	0.1	
0592	Barium	11-Jan-88	0.1	mg/L	0.1	U
0604	Barium	10-Dec-89	0.1	mg/L	0.1	U
0604	Barium	26-Apr-90	0.01	mg/L	0.1	U
0605	Barium	10-Dec-89	0.1	mg/L	0.1	U
0605	Barium	26-Apr-90	0.01	mg/L	0.1	U
0605	Barium	07-Oct-90	0.1	mg/L	0.1	U
0606	Barium	10-Dec-89	0.1	mg/L	0.1	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0606	Barium	26-Apr-90	0.01	mg/L	0.1	U
0606	Barium	07-Oct-90	0.1	mg/L	0.1	U
0608	Barium	10-Dec-89	0.1	mg/L	0.1	U
0609	Barium	10-Dec-89	0.1	mg/L	0.1	U
0609	Barium	26-Apr-90	0.01	mg/L	0.1	U
0610	Barium	10-Dec-89	0.1	mg/L	0.1	U
0610	Barium	07-Oct-90	0.1	mg/L	0.1	U
0611	Barium	10-Dec-89	0.1	mg/L	0.1	U
0611	Barium	07-Oct-90	0.1	mg/L	0.1	U
0612	Barium	10-Dec-89	0.1	mg/L	0.1	U
0614	Barium	10-Dec-89	0.1	mg/L	0.1	U
0615	Barium	10-Dec-89	0.1	mg/L	0.1	U
0618	Barium	10-Dec-89	0.1	mg/L	0.1	U
0618	Barium	26-Apr-90	0.01	mg/L	0.1	U
0626	Barium	30-Jun-90	0.1	mg/L	0.1	U
0604	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0604	Beryllium	26-Apr-90	0.005	mg/L	0.005	U
0605	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0605	Beryllium	26-Apr-90	0.005	mg/L	0.005	U
0605	Beryllium	07-Oct-90	0.01	mg/L	0.01	U
0606	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0606	Beryllium	26-Apr-90	0.005	mg/L	0.005	U
0606	Beryllium	07-Oct-90	0.01	mg/L	0.01	U
0608	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0609	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0609	Beryllium	26-Apr-90	0.005	mg/L	0.005	U
0610	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0610	Beryllium	07-Oct-90	0.01	mg/L	0.01	U
0611	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0611	Beryllium	07-Oct-90	0.01	mg/L	0.01	U
0612	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0614	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0615	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0618	Beryllium	10-Dec-89	0.01	mg/L	0.01	U
0618	Beryllium	26-Apr-90	0.005	mg/L	0.005	U
0626	Beryllium	30-Jun-90	0.01	mg/L	0.01	U
0605	Boron	07-Oct-90	0.1	mg/L	0.1	U
0606	Boron	07-Oct-90	0.1	mg/L	0.1	U
0610	Boron	07-Oct-90	0.1	mg/L	0.1	U
0611	Boron	07-Oct-90	0.1	mg/L	0.1	U
0606	Bromide	07-Oct-90	0.1	mg/L	0.1	U
0611	Bromide	07-Oct-90	0.1	mg/L	0.1	U
0591	Cadmium	28-Aug-87	0.005	mg/L	0.005	U
0604	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0604	Cadmium	26-Apr-90	0.001	mg/L	0.001	U
0605	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0605	Cadmium	26-Apr-90	0.001	mg/L	0.001	U
0605	Cadmium	07-Oct-90	0.001	mg/L	0.001	U
0606	Cadmium	10-Dec-89	0.001	mg/L	0.001	
0606	Cadmium	26-Apr-90	0.001	mg/L	0.001	U
0606	Cadmium	07-Oct-90	0.001	mg/L	0.001	U
0608	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0609	Cadmium	10-Dec-89	0.001	mg/L	0.001	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0609	Cadmium	26-Apr-90	0.001	mg/L	0.001	U
0610	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0610	Cadmium	07-Oct-90	0.001	mg/L	0.001	U
0611	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0611	Cadmium	07-Oct-90	0.001	mg/L	0.001	U
0612	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0614	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0615	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0618	Cadmium	10-Dec-89	0.001	mg/L	0.001	U
0618	Cadmium	26-Apr-90	0.001	mg/L	0.001	U
0626	Cadmium	30-Jun-90	0.001	mg/L	0.001	U
0591	Calcium	28-Aug-87	25.8	mg/L	0.01	
0591	Calcium	11-Jan-88	21.1	mg/L	0.01	
0591	Calcium	02-Apr-88	22	mg/L	0.01	
0592	Calcium	11-Jan-88	7.72	mg/L	0.01	
0595	Calcium	02-Apr-88	28.5	mg/L	0.01	
0604	Calcium	10-Dec-89	3.06	mg/L	0.01	
0604	Calcium	26-Apr-90	1.96	mg/L	0.01	
0605	Calcium	10-Dec-89	42.9	mg/L	0.01	
0605	Calcium	26-Apr-90	3.89	mg/L	0.01	
0605	Calcium	07-Oct-90	15.2	mg/L	0.01	
0606	Calcium	10-Dec-89	1.47	mg/L	0.01	
0606	Calcium	26-Apr-90	0.88	mg/L	0.01	
0606	Calcium	07-Oct-90	6.39	mg/L	0.01	
0608	Calcium	10-Dec-89	4.14	mg/L	0.01	
0609	Calcium	10-Dec-89	19.5	mg/L	0.01	
0609	Calcium	26-Apr-90	3.01	mg/L	0.01	
0610	Calcium	10-Dec-89	2.75	mg/L	0.01	
0610	Calcium	07-Oct-90	8.51	mg/L	0.01	
0611	Calcium	10-Dec-89	5.82	mg/L	0.01	
0611	Calcium	07-Oct-90	1.08	mg/L	0.01	
0612	Calcium	10-Dec-89	57	mg/L	0.01	
0614	Calcium	10-Dec-89	28.6	mg/L	0.01	
0615	Calcium	10-Dec-89	15.4	mg/L	0.01	
0618	Calcium	10-Dec-89	20.6	mg/L	0.01	
0618	Calcium	26-Apr-90	5.13	mg/L	0.01	
0626	Calcium	30-Jun-90	50.3	mg/L	0.01	
0591	Chloride	28-Aug-87	1	mg/L	1	
0591	Chloride	02-Apr-88	1	mg/L	1	U
0595	Chloride	02-Apr-88	10	mg/L	1	
0604	Chloride	10-Dec-89	1	mg/L	1	
0604	Chloride	26-Apr-90	2.5	mg/L	1	
0605	Chloride	10-Dec-89	12	mg/L	1	
0605	Chloride	26-Apr-90	1.4	mg/L	1	
0606	Chloride	10-Dec-89	3	mg/L	1	
0606	Chloride	07-Oct-90	1	mg/L	1	
0608	Chloride	10-Dec-89	3	mg/L	1	
0609	Chloride	10-Dec-89	6	mg/L	1	
0610	Chloride	10-Dec-89	2	mg/L	1	
0611	Chloride	10-Dec-89	2	mg/L	1	
0611	Chloride	07-Oct-90	1	mg/L	1	U
0615	Chloride	10-Dec-89	3	mg/L	1	
0618	Chloride	26-Apr-90	2.1	mg/L	1	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0626	Chloride	30-Jun-90	20	mg/L	1	
0591	Chromium	28-Aug-87	0.01	mg/L	0.01	U
0591	Chromium	11-Jan-88	0.01	mg/L	0.01	U
0592	Chromium	11-Jan-88	0.01	mg/L	0.01	U
0604	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0604	Chromium	26-Apr-90	0.01	mg/L	0.01	U
0605	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0605	Chromium	26-Apr-90	0.01	mg/L	0.01	U
0605	Chromium	07-Oct-90	0.01	mg/L	0.01	U
0606	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0606	Chromium	26-Apr-90	0.01	mg/L	0.01	U
0606	Chromium	07-Oct-90	0.01	mg/L	0.01	U
0608	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0609	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0609	Chromium	26-Apr-90	0.01	mg/L	0.01	U
0610	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0610	Chromium	07-Oct-90	0.01	mg/L	0.01	U
0611	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0611	Chromium	07-Oct-90	0.01	mg/L	0.01	U
0612	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0614	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0615	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0618	Chromium	10-Dec-89	0.01	mg/L	0.01	U
0618	Chromium	26-Apr-90	0.01	mg/L	0.01	U
0626	Chromium	30-Jun-90	0.01	mg/L	0.01	U
0591	Cobalt	28-Aug-87	0.01	mg/L	0.05	U
0604	Cobalt	26-Apr-90	0.03	mg/L	0.05	U
0605	Cobalt	26-Apr-90	0.03	mg/L	0.05	U
0605	Cobalt	07-Oct-90	0.05	mg/L	0.05	U
0606	Cobalt	26-Apr-90	0.03	mg/L	0.05	U
0606	Cobalt	07-Oct-90	0.05	mg/L	0.05	U
0609	Cobalt	26-Apr-90	0.03	mg/L	0.05	U
0610	Cobalt	07-Oct-90	0.05	mg/L	0.05	U
0611	Cobalt	07-Oct-90	0.05	mg/L	0.05	U
0618	Cobalt	26-Apr-90	0.03	mg/L	0.05	U
0591	Copper	28-Aug-87	0.01	mg/L	0.02	U
0604	Copper	10-Dec-89	0.04	mg/L	0.02	
0604	Copper	26-Apr-90	0.03	mg/L	0.02	
0605	Copper	10-Dec-89	0.04	mg/L	0.02	
0605	Copper	26-Apr-90	0.1	mg/L	0.02	
0605	Copper	07-Oct-90	0.04	mg/L	0.02	
0606	Copper	10-Dec-89	0.04	mg/L	0.02	
0606	Copper	26-Apr-90	0.09	mg/L	0.02	
0606	Copper	07-Oct-90	0.03	mg/L	0.02	
0608	Copper	10-Dec-89	0.03	mg/L	0.02	
0609	Copper	10-Dec-89	0.03	mg/L	0.02	
0609	Copper	26-Apr-90	0.14	mg/L	0.02	
0610	Copper	10-Dec-89	0.05	mg/L	0.02	
0610	Copper	07-Oct-90	0.04	mg/L	0.02	
0611	Copper	10-Dec-89	0.02	mg/L	0.02	
0611	Copper	07-Oct-90	0.03	mg/L	0.02	
0612	Copper	10-Dec-89	0.04	mg/L	0.02	
0614	Copper	10-Dec-89	0.11	mg/L	0.02	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0615	Copper	10-Dec-89	0.06	mg/L	0.02	
0618	Copper	10-Dec-89	0.05	mg/L	0.02	
0618	Copper	26-Apr-90	0.13	mg/L	0.02	
0591	Fluoride	28-Aug-87	0.05	mg/L	0.1	U
0604	Fluoride	26-Apr-90	0.1	mg/L	0.1	
0605	Fluoride	26-Apr-90	0.1	mg/L	0.1	
0610	Fluoride	10-Dec-89	0.1	mg/L	0.1	
0611	Fluoride	10-Dec-89	0.1	mg/L	0.1	
0615	Fluoride	10-Dec-89	0.2	mg/L	0.1	
0618	Fluoride	26-Apr-90	0.1	mg/L	0.1	U
0626	Fluoride	30-Jun-90	0.3	mg/L	0.1	
0605	Gross Alpha	26-Apr-90	6.6	pCi/L	1	
0591	Iron	28-Aug-87	0.01	mg/L	0.03	U
0591	Iron	11-Jan-88	0.01	mg/L	0.03	
0592	Iron	11-Jan-88	0.01	mg/L	0.03	
0604	Iron	10-Dec-89	0.03	mg/L	0.03	U
0605	Iron	10-Dec-89	0.04	mg/L	0.03	
0605	Iron	07-Oct-90	0.03	mg/L	0.03	U
0606	Iron	10-Dec-89	0.07	mg/L	0.03	
0606	Iron	07-Oct-90	0.03	mg/L	0.03	U
0608	Iron	10-Dec-89	0.04	mg/L	0.03	
0609	Iron	10-Dec-89	0.03	mg/L	0.03	U
0610	Iron	10-Dec-89	0.05	mg/L	0.03	
0610	Iron	07-Oct-90	0.03	mg/L	0.03	U
0611	Iron	10-Dec-89	0.03	mg/L	0.03	U
0611	Iron	07-Oct-90	0.03	mg/L	0.03	U
0612	Iron	10-Dec-89	0.05	mg/L	0.03	
0614	Iron	10-Dec-89	0.12	mg/L	0.03	
0615	Iron	10-Dec-89	0.05	mg/L	0.03	
0618	Iron	10-Dec-89	0.04	mg/L	0.03	
0591	Lead	28-Aug-87	0.02	mg/L	0.02	U
0591	Lead	11-Jan-88	0.01	mg/L	0.01	U
0592	Lead	11-Jan-88	0.01	mg/L	0.01	U
0604	Lead	10-Dec-89	0.01	mg/L	0.01	U
0604	Lead	26-Apr-90	0.01	mg/L	0.01	U
0605	Lead	10-Dec-89	0.01	mg/L	0.01	U
0605	Lead	26-Apr-90	0.01	mg/L	0.01	U
0605	Lead	07-Oct-90	0.01	mg/L	0.01	U
0606	Lead	10-Dec-89	0.01	mg/L	0.01	U
0606	Lead	26-Apr-90	0.01	mg/L	0.01	U
0606	Lead	07-Oct-90	0.01	mg/L	0.01	U
0608	Lead	10-Dec-89	0.01	mg/L	0.01	U
0609	Lead	10-Dec-89	0.01	mg/L	0.01	U
0609	Lead	26-Apr-90	0.01	mg/L	0.01	U
0610	Lead	10-Dec-89	0.01	mg/L	0.01	U
0610	Lead	07-Oct-90	0.01	mg/L	0.01	U
0611	Lead	10-Dec-89	0.01	mg/L	0.01	U
0611	Lead	07-Oct-90	0.01	mg/L	0.01	U
0612	Lead	10-Dec-89	0.01	mg/L	0.01	U
0614	Lead	10-Dec-89	0.01	mg/L	0.01	U
0615	Lead	10-Dec-89	0.01	mg/L	0.01	U
0618	Lead	10-Dec-89	0.01	mg/L	0.01	U
0618	Lead	26-Apr-90	0.01	mg/L	0.01	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0626	Lead	30-Jun-90	0.01	mg/L	0.01	U
0591	Magnesium	28-Aug-87	3.48	mg/L	0.001	
0591	Magnesium	11-Jan-88	3.01	mg/L	0.001	
0591	Magnesium	02-Apr-88	3.08	mg/L	0.001	
0592	Magnesium	11-Jan-88	1.18	mg/L	0.001	
0595	Magnesium	02-Apr-88	5.89	mg/L	0.001	
0604	Magnesium	10-Dec-89	1.08	mg/L	0.001	
0604	Magnesium	26-Apr-90	0.36	mg/L	0.001	
0605	Magnesium	10-Dec-89	4.81	mg/L	0.001	
0605	Magnesium	26-Apr-90	0.78	mg/L	0.001	
0605	Magnesium	07-Oct-90	1.87	mg/L	0.001	
0606	Magnesium	10-Dec-89	1.4	mg/L	0.001	
0606	Magnesium	26-Apr-90	0.48	mg/L	0.001	
0606	Magnesium	07-Oct-90	0.79	mg/L	0.001	
0608	Magnesium	10-Dec-89	1.14	mg/L	0.001	
0609	Magnesium	10-Dec-89	2.71	mg/L	0.001	
0609	Magnesium	26-Apr-90	0.89	mg/L	0.001	
0610	Magnesium	10-Dec-89	1.48	mg/L	0.001	
0610	Magnesium	07-Oct-90	1.51	mg/L	0.001	
0611	Magnesium	10-Dec-89	1.04	mg/L	0.001	
0611	Magnesium	07-Oct-90	0.49	mg/L	0.001	
0612	Magnesium	10-Dec-89	6.96	mg/L	0.001	
0614	Magnesium	10-Dec-89	6.54	mg/L	0.001	
0615	Magnesium	10-Dec-89	2.75	mg/L	0.001	
0618	Magnesium	10-Dec-89	4.25	mg/L	0.001	
0618	Magnesium	26-Apr-90	1.38	mg/L	0.001	
0626	Magnesium	30-Jun-90	15.2	mg/L	0.001	
0591	Manganese	28-Aug-87	0.01	mg/L	0.01	
0591	Manganese	11-Jan-88	0.01	mg/L	0.01	
0592	Manganese	11-Jan-88	0.01	mg/L	0.01	U
0604	Manganese	10-Dec-89	0.03	mg/L	0.01	
0604	Manganese	26-Apr-90	0.01	mg/L	0.01	
0605	Manganese	10-Dec-89	0.04	mg/L	0.01	
0605	Manganese	26-Apr-90	0.01	mg/L	0.01	
0605	Manganese	07-Oct-90	0.07	mg/L	0.01	
0606	Manganese	10-Dec-89	0.04	mg/L	0.01	
0606	Manganese	26-Apr-90	0.01	mg/L	0.01	
0606	Manganese	07-Oct-90	0.01	mg/L	0.01	
0608	Manganese	10-Dec-89	0.03	mg/L	0.01	
0609	Manganese	10-Dec-89	0.03	mg/L	0.01	
0609	Manganese	26-Apr-90	0.03	mg/L	0.01	
0610	Manganese	10-Dec-89	0.04	mg/L	0.01	
0610	Manganese	07-Oct-90	0.04	mg/L	0.01	
0611	Manganese	10-Dec-89	0.02	mg/L	0.01	
0611	Manganese	07-Oct-90	0.02	mg/L	0.01	
0612	Manganese	10-Dec-89	0.04	mg/L	0.01	
0614	Manganese	10-Dec-89	0.33	mg/L	0.01	
0615	Manganese	10-Dec-89	0.05	mg/L	0.01	
0618	Manganese	10-Dec-89	0.04	mg/L	0.01	
0618	Manganese	26-Apr-90	0.04	mg/L	0.01	
0591	Mercury	28-Aug-87	0.0002	mg/L	0.0002	U
0604	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0604	Mercury	26-Apr-90	0.0002	mg/L	0.0002	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0605	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0605	Mercury	26-Apr-90	0.0002	mg/L	0.0002	U
0605	Mercury	07-Oct-90	0.0002	mg/L	0.0002	U
0606	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0606	Mercury	26-Apr-90	0.0002	mg/L	0.0002	U
0606	Mercury	07-Oct-90	0.0002	mg/L	0.0002	U
0608	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0609	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0609	Mercury	26-Apr-90	0.0002	mg/L	0.0002	U
0610	Mercury	07-Oct-90	0.0002	mg/L	0.0002	U
0611	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0611	Mercury	07-Oct-90	0.0002	mg/L	0.0002	U
0615	Mercury	10-Dec-89	0.0002	mg/L	0.0002	U
0618	Mercury	26-Apr-90	0.0002	mg/L	0.0002	U
0591	Molybdenum	28-Aug-87	0.01	mg/L	0.01	
0591	Molybdenum	11-Jan-88	0.01	mg/L	0.01	U
0591	Molybdenum	02-Apr-88	0.01	mg/L	0.01	U
0592	Molybdenum	11-Jan-88	0.01	mg/L	0.01	U
0592	Molybdenum	02-Apr-88	0.01	mg/L	0.01	U
0595	Molybdenum	02-Apr-88	0.01	mg/L	0.01	U
0604	Molybdenum	10-Dec-89	0.01	mg/L	0.01	U
0604	Molybdenum	26-Apr-90	0.01	mg/L	0.01	U
0605	Molybdenum	10-Dec-89	0.05	mg/L	0.01	
0605	Molybdenum	26-Apr-90	0.01	mg/L	0.01	U
0605	Molybdenum	07-Oct-90	0.01	mg/L	0.01	U
0606	Molybdenum	10-Dec-89	0.04	mg/L	0.01	
0606	Molybdenum	26-Apr-90	0.01	mg/L	0.01	U
0606	Molybdenum	07-Oct-90	0.01	mg/L	0.01	U
0608	Molybdenum	10-Dec-89	0.01	mg/L	0.01	U
0609	Molybdenum	10-Dec-89	0.01	mg/L	0.01	
0609	Molybdenum	26-Apr-90	0.01	mg/L	0.01	U
0610	Molybdenum	10-Dec-89	0.01	mg/L	0.01	
0610	Molybdenum	07-Oct-90	0.01	mg/L	0.01	U
0611	Molybdenum	10-Dec-89	0.01	mg/L	0.01	U
0611	Molybdenum	07-Oct-90	0.01	mg/L	0.01	U
0612	Molybdenum	10-Dec-89	0.03	mg/L	0.01	
0614	Molybdenum	10-Dec-89	0.03	mg/L	0.01	
0615	Molybdenum	10-Dec-89	0.02	mg/L	0.01	
0618	Molybdenum	10-Dec-89	0.04	mg/L	0.01	
0618	Molybdenum	26-Apr-90	0.01	mg/L	0.01	U
0626	Molybdenum	30-Jun-90	0.01	mg/L	0.01	
0591	Nickel	28-Aug-87	0.01	mg/L	0.04	U
0604	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0604	Nickel	26-Apr-90	0.04	mg/L	0.04	U
0605	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0605	Nickel	26-Apr-90	0.04	mg/L	0.04	U
0605	Nickel	07-Oct-90	0.04	mg/L	0.04	U
0606	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0606	Nickel	26-Apr-90	0.04	mg/L	0.04	U
0606	Nickel	07-Oct-90	0.04	mg/L	0.04	U
0608	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0609	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0609	Nickel	26-Apr-90	0.04	mg/L	0.04	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0610	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0610	Nickel	07-Oct-90	0.04	mg/L	0.04	U
0611	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0611	Nickel	07-Oct-90	0.04	mg/L	0.04	U
0612	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0614	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0615	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0618	Nickel	10-Dec-89	0.04	mg/L	0.04	U
0618	Nickel	26-Apr-90	0.04	mg/L	0.04	U
0626	Nickel	30-Jun-90	0.2	mg/L	0.04	
0591	Nitrate + Nitrite as Nitrogen	02-Apr-88	89	mg/L	1	
0592	Nitrate + Nitrite as Nitrogen	02-Apr-88	9	mg/L	1	
0595	Nitrate + Nitrite as Nitrogen	02-Apr-88	61	mg/L	1	
0591	Nitrate as NO3	28-Aug-87	60	mg/L	1	
0591	Nitrate as NO3	02-Apr-88	89	mg/L	1	
0592	Nitrate as NO3	02-Apr-88	9	mg/L	1	
0595	Nitrate as NO3	02-Apr-88	61	mg/L	1	
0604	Nitrate as NO3	10-Dec-89	18.1	mg/L	1	
0604	Nitrate as NO3	26-Apr-90	1.9	mg/L	1	
0605	Nitrate as NO3	10-Dec-89	20.4	mg/L	1	
0605	Nitrate as NO3	26-Apr-90	8	mg/L	1	
0606	Nitrate as NO3	10-Dec-89	1.7	mg/L	1	
0606	Nitrate as NO3	26-Apr-90	2.6	mg/L	1	
0608	Nitrate as NO3	10-Dec-89	1.2	mg/L	1	
0609	Nitrate as NO3	10-Dec-89	29.2	mg/L	1	
0609	Nitrate as NO3	26-Apr-90	1	mg/L	1	U
0610	Nitrate as NO3	10-Dec-89	0.1	mg/L	1	U
0611	Nitrate as NO3	10-Dec-89	1	mg/L	1	
0612	Nitrate as NO3	10-Dec-89	0.1	mg/L	1	U
0615	Nitrate as NO3	10-Dec-89	3	mg/L	1	
0618	Nitrate as NO3	10-Dec-89	19.5	mg/L	1	
0618	Nitrate as NO3	26-Apr-90	2.3	mg/L	1	
0604	pH	10-Dec-89	7.5	s.u.	0	
0604	pH	26-Apr-90	6.36	s.u.	0	
0605	pH	10-Dec-89	7.8	s.u.	0	
0605	pH	26-Apr-90	6.64	s.u.	0	
0605	pH	07-Oct-90	5.65	s.u.	0	
0606	pH	10-Dec-89	7.31	s.u.	0	
0606	pH	26-Apr-90	7.46	s.u.	0	
0606	pH	07-Oct-90	6.78	s.u.	0	
0608	pH	10-Dec-89	7.49	s.u.	0	
0609	pH	10-Dec-89	7.26	s.u.	0	
0609	pH	26-Apr-90	6.43	s.u.	0	
0610	pH	10-Dec-89	7.73	s.u.	0	
0610	pH	07-Oct-90	5.93	s.u.	0	
0611	pH	10-Dec-89	8.29	s.u.	0	
0611	pH	07-Oct-90	6	s.u.	0	
0612	pH	10-Dec-89	8.33	s.u.	0	
0614	pH	10-Dec-89	8.12	s.u.	0	
0615	pH	10-Dec-89	8.21	s.u.	0	
0618	pH	10-Dec-89	8.09	s.u.	0	
0618	pH	26-Apr-90	6.32	s.u.	0	
0591	Potassium	28-Aug-87	1.9	mg/L	0.01	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0591	Potassium	11-Jan-88	2.1	mg/L	0.01	
0591	Potassium	02-Apr-88	1.82	mg/L	0.01	
0592	Potassium	11-Jan-88	0.83	mg/L	0.01	
0595	Potassium	02-Apr-88	16.7	mg/L	0.01	
0604	Potassium	10-Dec-89	1.8	mg/L	0.01	
0604	Potassium	26-Apr-90	0.49	mg/L	0.01	
0605	Potassium	10-Dec-89	2.1	mg/L	0.01	
0605	Potassium	26-Apr-90	1.31	mg/L	0.01	
0605	Potassium	07-Oct-90	2.4	mg/L	0.01	
0606	Potassium	10-Dec-89	1.2	mg/L	0.01	
0606	Potassium	26-Apr-90	0.8	mg/L	0.01	
0606	Potassium	07-Oct-90	0.9	mg/L	0.01	
0608	Potassium	10-Dec-89	0.8	mg/L	0.01	
0609	Potassium	10-Dec-89	2.5	mg/L	0.01	
0609	Potassium	26-Apr-90	1.44	mg/L	0.01	
0610	Potassium	10-Dec-89	1.1	mg/L	0.01	
0610	Potassium	07-Oct-90	1.5	mg/L	0.01	
0611	Potassium	10-Dec-89	1.8	mg/L	0.01	
0611	Potassium	07-Oct-90	0.6	mg/L	0.01	
0612	Potassium	10-Dec-89	2.4	mg/L	0.01	
0614	Potassium	10-Dec-89	4.9	mg/L	0.01	
0615	Potassium	10-Dec-89	1.9	mg/L	0.01	
0618	Potassium	10-Dec-89	3.9	mg/L	0.01	
0618	Potassium	26-Apr-90	3.2	mg/L	0.01	
0626	Potassium	30-Jun-90	3.8	mg/L	0.01	
0604	Radium-226	10-Dec-89	0	pCi/L	1	
0605	Radium-226	10-Dec-89	0	pCi/L	1	
0608	Radium-226	10-Dec-89	0	pCi/L	1	
0609	Radium-226	10-Dec-89	0	pCi/L	1	
0615	Radium-226	10-Dec-89	0	pCi/L	1	
0591	Selenium	28-Aug-87	0.001	mg/L	0.005	U
0591	Selenium	11-Jan-88	0.005	mg/L	0.005	U
0591	Selenium	02-Apr-88	0.005	mg/L	0.005	U
0592	Selenium	11-Jan-88	0.005	mg/L	0.005	U
0592	Selenium	02-Apr-88	0.005	mg/L	0.005	U
0595	Selenium	02-Apr-88	0.005	mg/L	0.005	U
0604	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0604	Selenium	26-Apr-90	0.005	mg/L	0.005	U
0605	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0605	Selenium	26-Apr-90	0.005	mg/L	0.005	U
0605	Selenium	07-Oct-90	0.005	mg/L	0.005	U
0606	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0606	Selenium	26-Apr-90	0.005	mg/L	0.005	U
0606	Selenium	07-Oct-90	0.005	mg/L	0.005	U
0608	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0609	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0609	Selenium	26-Apr-90	0.005	mg/L	0.005	U
0610	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0610	Selenium	07-Oct-90	0.005	mg/L	0.005	U
0611	Selenium	10-Dec-89	0.005	mg/L	0.005	
0611	Selenium	07-Oct-90	0.005	mg/L	0.005	U
0612	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0614	Selenium	10-Dec-89	0.006	mg/L	0.005	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0615	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0618	Selenium	10-Dec-89	0.005	mg/L	0.005	U
0618	Selenium	26-Apr-90	0.005	mg/L	0.005	U
0626	Selenium	30-Jun-90	0.005	mg/L	0.005	U
0591	Silica	11-Jan-88	29.2	mg/L	2	
0591	Silica	02-Apr-88	22	mg/L	2	
0592	Silica	11-Jan-88	20.8	mg/L	2	
0595	Silica	02-Apr-88	21.3	mg/L	2	
0605	Silica	07-Oct-90	24	mg/L	2	
0606	Silica	07-Oct-90	14	mg/L	2	
0610	Silica	07-Oct-90	12	mg/L	2	
0591	Silver	28-Aug-87	0.01	mg/L	0.01	U
0604	Silver	10-Dec-89	0.01	mg/L	0.01	U
0604	Silver	26-Apr-90	0.01	mg/L	0.01	U
0605	Silver	10-Dec-89	0.01	mg/L	0.01	U
0605	Silver	26-Apr-90	0.01	mg/L	0.01	U
0605	Silver	07-Oct-90	0.01	mg/L	0.01	U
0606	Silver	10-Dec-89	0.01	mg/L	0.01	U
0606	Silver	26-Apr-90	0.01	mg/L	0.01	U
0606	Silver	07-Oct-90	0.01	mg/L	0.01	U
0608	Silver	10-Dec-89	0.01	mg/L	0.01	U
0609	Silver	10-Dec-89	0.01	mg/L	0.01	U
0609	Silver	26-Apr-90	0.01	mg/L	0.01	U
0610	Silver	10-Dec-89	0.01	mg/L	0.01	U
0610	Silver	07-Oct-90	0.01	mg/L	0.01	U
0611	Silver	10-Dec-89	0.01	mg/L	0.01	U
0611	Silver	07-Oct-90	0.01	mg/L	0.01	U
0612	Silver	10-Dec-89	0.01	mg/L	0.01	U
0614	Silver	10-Dec-89	0.01	mg/L	0.01	U
0615	Silver	10-Dec-89	0.01	mg/L	0.01	U
0618	Silver	10-Dec-89	0.01	mg/L	0.01	U
0618	Silver	26-Apr-90	0.01	mg/L	0.01	U
0626	Silver	30-Jun-90	0.01	mg/L	0.01	U
0591	Sodium	28-Aug-87	4.12	mg/L	0.002	
0591	Sodium	11-Jan-88	4.05	mg/L	0.002	
0591	Sodium	02-Apr-88	2.34	mg/L	0.002	
0592	Sodium	11-Jan-88	5.34	mg/L	0.002	
0595	Sodium	02-Apr-88	33.5	mg/L	0.002	
0604	Sodium	10-Dec-89	4.19	mg/L	0.002	
0604	Sodium	26-Apr-90	0.77	mg/L	0.002	
0605	Sodium	10-Dec-89	13.2	mg/L	0.002	
0605	Sodium	26-Apr-90	3.5	mg/L	0.002	
0605	Sodium	07-Oct-90	2.48	mg/L	0.002	
0606	Sodium	10-Dec-89	7.5	mg/L	0.002	
0606	Sodium	26-Apr-90	3.4	mg/L	0.002	
0606	Sodium	07-Oct-90	1.82	mg/L	0.002	
0608	Sodium	10-Dec-89	4	mg/L	0.002	
0609	Sodium	10-Dec-89	8.25	mg/L	0.002	
0609	Sodium	26-Apr-90	5.9	mg/L	0.002	
0610	Sodium	10-Dec-89	6.31	mg/L	0.002	
0610	Sodium	07-Oct-90	1.83	mg/L	0.002	
0611	Sodium	10-Dec-89	3.67	mg/L	0.002	
0611	Sodium	07-Oct-90	1.73	mg/L	0.002	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0612	Sodium	10-Dec-89	15.5	mg/L	0.002	
0614	Sodium	10-Dec-89	11.1	mg/L	0.002	
0615	Sodium	10-Dec-89	8.59	mg/L	0.002	
0618	Sodium	10-Dec-89	10.3	mg/L	0.002	
0618	Sodium	26-Apr-90	4.1	mg/L	0.002	
0626	Sodium	30-Jun-90	12.6	mg/L	0.002	
0604	Specific Conductance	10-Dec-89	20	umhos/cm	0	
0604	Specific Conductance	26-Apr-90	10	umhos/cm	0	
0605	Specific Conductance	10-Dec-89	125	umhos/cm	0	
0605	Specific Conductance	26-Apr-90	25	umhos/cm	0	
0605	Specific Conductance	07-Oct-90	100	umhos/cm	0	
0606	Specific Conductance	10-Dec-89	30	umhos/cm	0	
0606	Specific Conductance	26-Apr-90	10	umhos/cm	0	
0606	Specific Conductance	07-Oct-90	42	umhos/cm	0	
0608	Specific Conductance	10-Dec-89	20	umhos/cm	0	
0609	Specific Conductance	10-Dec-89	95	umhos/cm	0	
0609	Specific Conductance	26-Apr-90	30	umhos/cm	0	
0610	Specific Conductance	10-Dec-89	40	umhos/cm	0	
0610	Specific Conductance	07-Oct-90	55	umhos/cm	0	
0611	Specific Conductance	10-Dec-89	30	umhos/cm	0	
0611	Specific Conductance	07-Oct-90	15	umhos/cm	0	
0612	Specific Conductance	10-Dec-89	240	umhos/cm	0	
0614	Specific Conductance	10-Dec-89	175	umhos/cm	0	
0615	Specific Conductance	10-Dec-89	100	umhos/cm	0	
0618	Specific Conductance	10-Dec-89	320	umhos/cm	0	
0618	Specific Conductance	26-Apr-90	48	umhos/cm	0	
0591	Strontium	28-Aug-87	0.123	mg/L	0.1	
0604	Strontium	10-Dec-89	0.01	mg/L	0.1	U
0604	Strontium	26-Apr-90	0.03	mg/L	0.1	
0605	Strontium	10-Dec-89	0.35	mg/L	0.1	
0605	Strontium	26-Apr-90	0.03	mg/L	0.1	
0605	Strontium	07-Oct-90	0.2	mg/L	0.1	
0606	Strontium	10-Dec-89	0.01	mg/L	0.1	U
0606	Strontium	26-Apr-90	0.01	mg/L	0.1	U
0606	Strontium	07-Oct-90	0.1	mg/L	0.1	U
0608	Strontium	10-Dec-89	0.02	mg/L	0.1	
0609	Strontium	10-Dec-89	0.14	mg/L	0.1	
0609	Strontium	26-Apr-90	0.02	mg/L	0.1	
0610	Strontium	10-Dec-89	0.01	mg/L	0.1	U
0610	Strontium	07-Oct-90	0.1	mg/L	0.1	
0611	Strontium	10-Dec-89	0.04	mg/L	0.1	
0611	Strontium	07-Oct-90	0.1	mg/L	0.1	U
0612	Strontium	10-Dec-89	0.48	mg/L	0.1	
0614	Strontium	10-Dec-89	0.17	mg/L	0.1	
0615	Strontium	10-Dec-89	0.09	mg/L	0.1	
0618	Strontium	10-Dec-89	0.13	mg/L	0.1	
0618	Strontium	26-Apr-90	0.03	mg/L	0.1	
0626	Strontium	30-Jun-90	0.31	mg/L	0.1	
0591	Sulfate	28-Aug-87	0.5	mg/L	0.1	
0604	Sulfate	26-Apr-90	1.4	mg/L	0.1	
0605	Sulfate	26-Apr-90	2.3	mg/L	0.1	
0606	Sulfate	07-Oct-90	0.1	mg/L	0.1	U
0611	Sulfate	07-Oct-90	1.6	mg/L	0.1	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0618	Sulfate	26-Apr-90	2.8	mg/L	0.1	
0604	Temperature	26-Apr-90	12	C	0	
0605	Temperature	26-Apr-90	13	C	0	
0605	Temperature	07-Oct-90	16.5	C	0	
0606	Temperature	26-Apr-90	12	C	0	
0606	Temperature	07-Oct-90	14	C	0	
0609	Temperature	26-Apr-90	13	C	0	
0610	Temperature	07-Oct-90	11	C	0	
0611	Temperature	07-Oct-90	11	C	0	
0618	Temperature	26-Apr-90	13	C	0	
0604	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0604	Thallium	26-Apr-90	0.1	mg/L	0.1	U
0605	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0605	Thallium	26-Apr-90	0.1	mg/L	0.1	U
0605	Thallium	07-Oct-90	0.01	mg/L	0.01	U
0606	Thallium	26-Apr-90	0.1	mg/L	0.1	U
0606	Thallium	07-Oct-90	0.01	mg/L	0.01	U
0608	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0609	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0609	Thallium	26-Apr-90	0.1	mg/L	0.1	U
0610	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0610	Thallium	07-Oct-90	0.01	mg/L	0.01	U
0611	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0611	Thallium	07-Oct-90	0.01	mg/L	0.01	U
0612	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0614	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0615	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0618	Thallium	10-Dec-89	0.01	mg/L	0.01	U
0618	Thallium	26-Apr-90	0.1	mg/L	0.1	U
0626	Thallium	30-Jun-90	0.01	mg/L	0.01	U
0591	Thorium-230	11-Jan-88	0.5	pCi/L	1	
0591	Tin	28-Aug-87	0.003	mg/L	0.005	U
0604	Tin	26-Apr-90	0.01	mg/L	0.01	UI
0605	Tin	26-Apr-90	0.01	mg/L	0.01	UI
0605	Tin	07-Oct-90	0.014	mg/L	0.005	
0606	Tin	26-Apr-90	0.01	mg/L	0.01	UI
0606	Tin	07-Oct-90	0.005	mg/L	0.005	U
0609	Tin	26-Apr-90	0.01	mg/L	0.01	UI
0610	Tin	07-Oct-90	0.005	mg/L	0.005	U
0611	Tin	07-Oct-90	0.005	mg/L	0.005	U
0618	Tin	26-Apr-90	0.01	mg/L	0.01	UI
0609	Total Cyanide	10-Dec-89	0.01	mg/L	0.01	U
0591	Total Dissolved Solids	28-Aug-87	125	mg/L	10	
0606	Total Dissolved Solids	07-Oct-90	64	mg/L	10	
0611	Total Dissolved Solids	07-Oct-90	20	mg/L	10	
0626	Total Dissolved Solids	30-Jun-90	318	mg/L	10	
0604	Total Kjeldahl Nitrogen	26-Apr-90	1	mg/L	1	U
0605	Total Kjeldahl Nitrogen	26-Apr-90	1	mg/L	1	U
0606	Total Kjeldahl Nitrogen	26-Apr-90	1	mg/L	1	U
0609	Total Kjeldahl Nitrogen	26-Apr-90	1	mg/L	1	U
0618	Total Kjeldahl Nitrogen	26-Apr-90	2	mg/L	1	
0591	Total Phosphorus as PO4	28-Aug-87	0.1	mg/L	0.1	U
0606	Total Phosphorus as PO4	07-Oct-90	0.1	mg/L	0.1	U

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0611	Total Phosphorus as PO4	07-Oct-90	0.1	mg/L	0.1	U
0591	Uranium	28-Aug-87	0.0003	mg/L	0.003	
0591	Uranium	11-Jan-88	0.0003	mg/L	0.003	U
0591	Uranium	02-Apr-88	0.0003	mg/L	0.003	
0592	Uranium	28-Aug-87	0.0003	mg/L	0.003	U
0592	Uranium	11-Jan-88	0.0003	mg/L	0.003	U
0592	Uranium	02-Apr-88	0.0003	mg/L	0.003	
0595	Uranium	02-Apr-88	0.0003	mg/L	0.003	U
0604	Uranium	10-Dec-89	0.0003	mg/L	0.003	U
0604	Uranium	26-Apr-90	0.003	mg/L	0.003	U
0605	Uranium	10-Dec-89	0.0004	mg/L	0.003	
0605	Uranium	26-Apr-90	0.003	mg/L	0.003	U
0605	Uranium	07-Oct-90	0.0005	mg/L	0.0003	
0606	Uranium	10-Dec-89	0.0003	mg/L	0.003	U
0606	Uranium	26-Apr-90	0.003	mg/L	0.003	U
0606	Uranium	07-Oct-90	0.0003	mg/L	0.0003	
0608	Uranium	10-Dec-89	0.0003	mg/L	0.003	U
0609	Uranium	10-Dec-89	0.0003	mg/L	0.003	U
0609	Uranium	26-Apr-90	0.003	mg/L	0.003	U
0610	Uranium	10-Dec-89	0.0003	mg/L	0.003	U
0610	Uranium	07-Oct-90	0.0003	mg/L	0.0003	
0611	Uranium	10-Dec-89	0.0003	mg/L	0.003	
0611	Uranium	07-Oct-90	0.0004	mg/L	0.0003	
0612	Uranium	10-Dec-89	0.065	mg/L	0.003	
0614	Uranium	10-Dec-89	0.0043	mg/L	0.003	
0615	Uranium	10-Dec-89	0.0027	mg/L	0.003	
0618	Uranium	10-Dec-89	0.001	mg/L	0.003	
0618	Uranium	26-Apr-90	0.003	mg/L	0.003	U
0626	Uranium	30-Jun-90	0.0061	mg/L	0.003	
0591	Vanadium	28-Aug-87	0.22	mg/L	0.01	
0591	Vanadium	11-Jan-88	0.06	mg/L	0.01	
0592	Vanadium	11-Jan-88	0.09	mg/L	0.01	
0604	Vanadium	10-Dec-89	0.09	mg/L	0.01	
0604	Vanadium	26-Apr-90	0.04	mg/L	0.01	
0605	Vanadium	10-Dec-89	0.53	mg/L	0.01	
0605	Vanadium	26-Apr-90	0.05	mg/L	0.01	
0605	Vanadium	07-Oct-90	0.01	mg/L	0.01	U
0606	Vanadium	10-Dec-89	0.48	mg/L	0.01	
0606	Vanadium	26-Apr-90	0.06	mg/L	0.01	
0606	Vanadium	07-Oct-90	0.01	mg/L	0.01	U
0608	Vanadium	10-Dec-89	0.06	mg/L	0.01	
0609	Vanadium	10-Dec-89	0.19	mg/L	0.01	
0609	Vanadium	26-Apr-90	0.05	mg/L	0.01	
0610	Vanadium	10-Dec-89	0.25	mg/L	0.01	
0610	Vanadium	07-Oct-90	0.01	mg/L	0.01	U
0611	Vanadium	10-Dec-89	0.1	mg/L	0.01	
0611	Vanadium	07-Oct-90	0.01	mg/L	0.01	U
0612	Vanadium	10-Dec-89	0.48	mg/L	0.01	
0614	Vanadium	10-Dec-89	0.42	mg/L	0.01	
0615	Vanadium	10-Dec-89	0.23	mg/L	0.01	
0618	Vanadium	10-Dec-89	0.58	mg/L	0.01	
0618	Vanadium	26-Apr-90	0.06	mg/L	0.01	
0626	Vanadium	30-Jun-90	0.31	mg/L	0.01	

Pore Water Concentrations (continued)

Lysimeter	Constituent	Sample Date	Concentration	Units	Detection Limit	Qualifier
0591	Zinc	28-Aug-87	0.038	mg/L	0.005	
0591	Zinc	11-Jan-88	0.047	mg/L	0.005	
0592	Zinc	11-Jan-88	0.04	mg/L	0.005	
0604	Zinc	10-Dec-89	0.043	mg/L	0.005	
0604	Zinc	26-Apr-90	0.043	mg/L	0.005	
0605	Zinc	10-Dec-89	0.051	mg/L	0.005	
0605	Zinc	26-Apr-90	0.045	mg/L	0.005	
0605	Zinc	07-Oct-90	0.104	mg/L	0.005	
0606	Zinc	10-Dec-89	0.689	mg/L	0.005	
0606	Zinc	26-Apr-90	0.04	mg/L	0.005	
0606	Zinc	07-Oct-90	0.074	mg/L	0.005	
0608	Zinc	10-Dec-89	0.043	mg/L	0.005	
0609	Zinc	10-Dec-89	0.037	mg/L	0.005	
0609	Zinc	26-Apr-90	0.103	mg/L	0.005	
0610	Zinc	10-Dec-89	0.073	mg/L	0.005	
0610	Zinc	07-Oct-90	0.055	mg/L	0.005	
0611	Zinc	10-Dec-89	0.025	mg/L	0.005	
0611	Zinc	07-Oct-90	0.041	mg/L	0.005	
0612	Zinc	10-Dec-89	0.043	mg/L	0.005	
0614	Zinc	10-Dec-89	0.257	mg/L	0.005	
0615	Zinc	10-Dec-89	0.376	mg/L	0.005	
0618	Zinc	10-Dec-89	0.051	mg/L	0.005	
0618	Zinc	26-Apr-90	0.116	mg/L	0.005	
0626	Zinc	30-Jun-90	0.038	mg/L	0.005	

U = concentration is less than the detection limit

Batch Test Results (DOE 1991)

Sample (pH)	Source Material	Arsenic (0.05 mg/l)	Molybdenum (0.10 mg/l)	Radium 226 + 228 (5 pCi/l)	Selenium (0.01 mg/l)	Uranium (0.044 mg/l)	Lead (0.05 mg/l)	Polonium-210 (pCi/L)	Barium (1.0 mg/l)	Cadmium (0.01 mg/l)	Chromium (0.05 mg/l)	Mercury (0.002 mg/l)	Silver (0.05 mg/l)
ACID BATCH TESTS													
721 (3.56-4.85)	Gray ore	<0.01	<0.01	20.9	<0.005	0.005	<1.5 (pCi/l)	<1.0	NT[a]	NT	NT	NT	NT
722 (3.52-4.71)	Gray ore	<0.01	<0.01	47.0	<0.005	0.008	<1.5 (pCi/l)	<1.0	NT	NT	NT	NT	NT
723 (3.29-4.80)	Black sand	<0.01	<0.01	23.8	<0.005	0.005	<1.5 (pCi/l)	<1.0	NT	NT	NT	NT	NT
724 (3.21-4.70)	Black sand	<0.01	<0.011	8.1	<0.005	0.010	<1.5 (pCi/l)	<1.0	NT	NT	NT	NT	NT
725 (3.19-4.89)	White sand	<0.01	<0.01	30.5	<0.005	0.005	1.8 (pCi/l)	<1.0	NT	NT	NT	NT	NT
726 (3.02-4.50)	White sand	<0.01	<0.01	44.0	<0.005	0.008	<1.5 (pCi/l)	<1.0	NT	NT	NT	NT	NT
727 (4.41-4.82)	Gray sand	<0.01	<0.01	24.8	<0.005	0.028	1.6 (pCi/l)	<1.0	NT	NT	NT	NT	NT
728 (3.51-4.00)	Gray sand	<0.01	<0.01	42.0	<0.005	0.005	<1.5 (pCi/l)	<1.0	NT	NT	NT	NT	NT
NEUTRAL BATCH TESTS													
449 (6.6)	Gray ore	<0.01	NT	NT	NT	0.322[b]	0.11	NT	0.5	<0.001	0.02	<0.0002	<0.01
450 (6.6)	Gray ore	<0.01	NT	NT	NT	0.005	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
451 (6.6)	Black sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
452 (6.6)	Black sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
453 (6.6)	Red sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
454 (6.6)	Red sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
455 (6.6)	Gray sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
456 (6.6)	Gray sand	<0.01	NT	NT	NT	<0.003	<0.01	NT	<0.1	<0.001	<0.01	<0.0002	<0.01
701 (7.1)	Gray ore	NT	<0.01	5.5	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
702 (7.1)	Gray ore	<0.01	<0.01	3.8	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
703 (7.2)	Black sand	<0.01	<0.01	<1.0	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
704 (7.0)	Black sand	<0.01	<0.01	1.9	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
705 (7.6)	White sand	<0.01	<0.01	1.7	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
706 (7.8)	White sand	<0.01	<0.01	<1.0	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
707 (7.4)	White sand	<0.01	<0.01	<1.0	<0.005	<0.003	NT	NT	NT	NT	NT	NT	NT
		Aluminum (mg/L)	**Anitmony (mg/L)**	**Beryllium (mg/L)**	**Cyanide (mg/L)**	**Nickel (mg/L)**	**Thallium (mg/L)**	**Cobalt (mg/L)**	**Copper (mg/L)**	**Tin (mg/L)**	**Vanadium (mg/L)**	**Zinc (mg/L)**	
449 (6.6)	Gray ore	16.7	<0.003	<0.01		<0.04	<0.01	<0.05	0.03	<0.005	0.20	0.231	
450 (6.6)	Gray ore	0.6	<0.003	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	0.20	0.017	
451 (6.6)	Black sand	0.2	0.009	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	0.01	0.014	
452 (6.6)	Black sand	<0.1	0.006	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	<0.01	0.168	
453 (6.6)	Red sand	0.7	0.003	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	<0.01	0.098	
454 (6.6)	Red sand	0.5	0.007	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	<0.01	0.063	
455 (6.6)	Gray sand	0.6	0.004	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	<0.01	0.017	
456 (6.6)	Gray sand	0.2	0.004	<0.01		<0.04	<0.01	<0.05	<0.02	<0.005	<0.01	0.017	

[a]NT – not tested

[b]Analytical result possibly erroneous.