APPENDIX F. DESCRIPTION OF L-LAKE SEDIMENT DATA AND DATA SOURCES

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L-Lake sediment data used quantitatively in this Final Environmental Impact Statement (EIS) were obtained from initial sampling in 1995 and a four-phase series of studies which were conducted in 1996-1997 in support of this Final EIS and a Site Evaluation (SE) for L-Lake. The data were collected in accordance with CERCLA protocols to support the SE and subsequent investigations, if any, that may be conducted under the Federal Facility Agreement between EPA, SCDHEC, and DOE. Descriptions of the methods employed in the initial sampling and the first three phases are presented below. The fourth phase has not yet been conducted.

F.1 Initial Sediment Core Sampling

Prior to the initiation of Phases I-III, sediment core sampling was conducted in Par Pond, Pond C, and L-Lake in July 1995 (Koch, Martin, and Friday 1996). The study was conducted to develop a defensible characterization of contaminants in Par Pond, Pond C, and L-Lake sediments, and to serve as the basis for future studies to determine in detail the distribution and ecological effects of those contaminants. Since this section is limited to descriptions of L-Lake data, only data from L-Lake will be discussed.

Sediment cores in L-Lake were collected by vibracoring. In simple terms, the vibracore machine is a gasoline-powered engine with a vibrating head on a flexible steel wire. A 3-inch diameter (7.6-centimeter), thin-walled, aluminum pipe about 15-foot (4.6-meter) long is attached to the head. The pipe is raised to a vertical position and vibrated by the engine. Thus, the head vibrates the aluminum pipe into the sediment, capturing a core of sediment material. For deeper water samples, the apparatus is attached to a coring barge, and is slightly modified to advance the pipe under water.

In L-Lake, sampling locations were established by longitude and latitude coordinates using a digitized SRS map. Two cores were collected at each location to provide enough sample volume for analysis. Following retrieval, cores were transported to the sample processing facility where they were cut longitudinally using a circular saw. Each core was divided into five segments corresponding to depths of 0-1 foot, 1-2 feet, 2-4 feet, 4-6 feet, and 6-8 feet (0-0.3 meter, 0.3-0.6 meter, 0.6-1.2 meters, 1.2-1.8 meters, and 1.8-2.4 meters). Subsamples from approximately half the samples were immediately collected for volatile organic analyte analysis. Samples were also analyzed for a suite of other nonradiological contaminants and radiological contaminants. Non-radiological data from L-Lake samples were validated using standard data validation techniques.

[1] Appendix F is a new appendix that was not part of the DEIS.

F.2 Phase I

The Phase I study consisted of the collection of surface sediment samples in summer 1996 in L-Lake for radionuclide and trace metal analysis (Dunn, Gladden, and Martin 1996). Sampling locations were selected based on aerial photographs, the results of previous studies, and the SRS soil survey. Locations were selected to include dominant soil types and sites known or suspected to have been used as disposal sites for clean vegetation. These are sites where vegetation was piled up and burned during lake construction. Hence they are referred to as "ash pit" samples. Sites were also selected to include areas where radionuclide-contaminated soils were removed and buried during lake construction. A Global Position System was used to locate precise locations. A total of 45 sampling locations were identified. Thirteen reference sites were also selected from Steel Creek and Meyers Branch, its main tributary.

L-Lake samples were collected with an Ekman dredge, and reference samples were collected with an auger-type tool. L-Lake samples were collected from 0-0.5-foot (0-0.15-meter) depth, while reference samples were collected from 0-1-foot (0-0.3-meter) and 1-4-foot (0.3-1.2-meters) depth intervals. The sediment samples were analyzed for all EPA Target Analyte List metals (except cyanide), gross alpha activity, nonvolatile beta activity, gamma-pulse-height, plutonium alpha series isotopes, and uranium alpha series isotopes. All nonradiological and radiological data were validated using standard data validation techniques.

F.3 Phase II

The Phase II study of the four-phase investigation consisted of the collection of L-Lake sediment cores for radionuclide and trace metal analysis in August 1996 (Dunn, Koch, and Martin 1996). The vibracoring technique described above was used for sample collection. A GPS system was used to identify specific sampling locations. Each core was divided into sampling intervals. Four foot cores were sampled at 0-1-foot and 1-4-foot (0-0.3- and 0.3-1.2-meter) intervals, and 8-foot cores were sampled at 0-1, 1-4, and 4-8-feet (0-0.3-, 0.3-1.2-, and 1.2-2.4-meter) intervals. A maximum of 17 sample cores were collected, but this number of subsamples was not available for each depth. The same reference data described for the Phase I sampling were also used during the Phase II study (a total of 13 samples). All samples were analyzed for Target Analyte List metals (except cyanide), gross alpha, nonvolatile beta, Pu series, U series, and gamma spectroscopy. All nonradiological and radiological data were validated using standard data validation techniques.

F.4 Phase III

Phase III of the four-phase investigation consisted of *in situ* analysis for gamma-emitting radionuclides in L-Lake in summer 1996 (Dunn 1996). A GPS system was used to locate exact sampling locations, and 192 locations were sampled. At each location, an underwater gamma-detector, a High Purity Germanium detector (HPGe), was used to measure gamma-emitting radioisotopes, primarily cesium-137 and cobalt-60. The detector was lowered by a winch until its housing rested on the sediment surface. Two-minute counting intervals were made at each location. The goal of the HPGe sampling was to determine the edge of the gamma-emitting radionuclide contamination in the lakebed and compare it with the contour established in 1985.

In addition, grab samples of the bottom sediments were also collected. These samples were taken to determine the incidence of man-made radionuclides present in the sediments at levels below the detection limit of the underwater gamma detector. Grab samples were analyzed with low-level HPGe in the Underground Counting Facility.

F.5 L-Lake Sediment Data Reduction for the EIS

The full data sets from the studies described above were reduced and manipulated for use in the L-Lake human health evaluation (Appendix A and Section 4.1.8) and the L-Lake ecological risk assessment (Appendix B and Section 4.1.5) included in this Final EIS. The data used in these evaluations are described below.

F.5.1 L-LAKE SEDIMENT DATA USED IN THE HUMAN HEALTH EVALUATION

Validated analytical data from three of the data sets described above were combined for use in the Human Health Evaluation in this Final EIS (Dunn and Martin 1997a). The first data set included the 0-1-foot (0-0.3 meter) segments from 1995 sediment cores collected from shallow and deep-water locations in L-Lake (Koch, Martin, and Friday 1996). Secondly, 0-0.5-foot (0-0.15-meter) samples collected in submerged portions of the L-Lake basin as part of Phase I sampling were included in the data set (Dunn, Gladden, and Martin 1996). Third, 0-1-foot (0-0.3-meter) segments from 1996 Phase II sediment cores in submerged portions of L-Lake were included in the data set (Dunn 1996). Again, these data, both radiological and nonradiological, were combined into a single database prior to use in the evaluation. All constituents with 100 percent non-detects were then removed from the database. Additionally, if any constituent had an analytical result greater than the detection limit and with no data disqualifier, then the constituent was retained in the database. Also, reference soil data for the 0-1-foot (0-0.3-meter) segments collected during the 1996 Phase I study were used (Dunn, Gladden, and Martin 1996).

The remedial investigation reported in Appendix A used the three data sets described above and also used data from the Phase III underwater gamma study and data from an underwater gamma study conducted in 1995 (WSRC 1995). Due to the nature of the data described above, only cesium-137 data were used in Appendix A.

F.5.2 L-LAKE SEDIMENT DATA USED IN THE ECOLOGICAL RISK ASSESSMENT

For the ecological risk assessment, 0-0.5-foot (0-0.15-meter) Phase I sediment samples from both the floodplain and stream channel beneath L-Lake were used to obtain contaminant concentrations, both radiological and nonradiological (Dunn, Gladden, and Martin 1996). This is the horizon of sediments that terrestrial receptors may be exposed to when water levels recede or fluctuate. Only validated data were included in the data set (Dunn and Martin 1997b). All sample results were retained, and constituents with 100 percent non-detects were excluded from the data set. However, when a contaminant was present in one sample above the detection limit and did not possess a data disqualifier, one-half the detection limit was used for all non-detects of that constituent.

F.6 References

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