4.3 Par Pond

Par Pond, a 2,640-acre (10.7-square-kilometer) reservoir (Figure 4-32), was created in 1958 by building an earthen dam (the Cold Dam) across the upper reaches of Lower Three Runs (Wike et al. 1994). It has an average depth of 20 feet (6.2 meters) and a maximum depth of 59 feet (18 meters) (Du Pont 1987b). At full pool, the reservoir storage volume is approximately 52,800 acre-feet (65 million cubic meters).

From August 1958 to October 1961, Par Pond received thermal effluent only from R-Reactor. Heated effluent was discharged to the Middle Arm of Par Pond through precooler Pond C. From November 1961 to June 1964, both P- and R-Reactors discharged heated effluent to Par Pond: R-Reactor to the North Arm via precooler Pond B, and P-Reactor to the Middle Arm via a series of precooler ponds and Pond C (Du Pont 1987b). In July 1964 the Atomic Energy Commission suspended operations of R-Reactor and placed it on standby. After 1964, Par Pond received thermal effluent only from P-Reactor, and Pond B never again received heated discharge.

TE Pumphouse No. 6 (see Figure 4-32) in the west arm (Intake Arm) of Par Pond allowed recirculation of water from Par Pond to P-Area where it mixed (in the 186-Basins) with makeup water pumped from the Savannah River. During reactor operations, recirculating water flowed through the reactor heat exchangers, where it reached temperatures of approximately 158°F (70°C), and discharged through a series of precooler ponds and canals into Pond C (Du Pont 1987b). Heated cooling water from Pond C passed through a concrete culvert below an earthen dam (Hot Dam) from the bottom of Pond C into Par Pond. Water lost from the Par Pond system due to evaporation and seepage was replaced by makeup water pumped from the River. Other than the addition of the makeup water and the overflow and seepage to Lower Three Runs via the Cold Dam, Par Pond operated as a closed loop system. At present, no river water is pumped to Par Pond. Rainfall and inflows from the watershed and groundwater maintain reservoir levels above 195 feet (59.4 meters).

Simple replacement time for the total volume of water in Par Pond by rainfall and runoff from 1962 to 1977 averaged 704 days (Du Pont 1987b). However, reactor operations reduced actual replacement time to 68 days. The shorter replacement time caused increased mixing in the lake and resulted in a more homogeneous distribution of nutrients and plankton than would have occurred without pumping activities.

The natural morphometry of southern portions of Par Pond was altered by earth-moving activities during the creation of the impoundment, which resulted in level areas near the pumphouse (the Intake Arm) and noticeably steep slopes on the east side of the reservoir near the Hot Dam (Du Pont 1987b). The construction activities did not significantly change the North Arm, which as a result is more riverine and shallow.

Pond B is a 200-acre (0.8 square-kilometer) reservoir 2 miles (3 kilometers) northwest of Par Pond (see Figure 4-25). From 1961 to 1964, Pond B was the precooler pond for R-Reactor cooling water effluent. After the R-Reactor shutdown in 1964, Pond B had significantly lower concentrations of total phosphorus, nitrate, silica, potassium, magnesium, calcium, sodium, chloride, inorganic carbon, and total dissolved solids in the euphotic zone than Par Pond (Du Pont 1987b). The higher solids and nutrient levels in Par Pond were attributed to the higher levels of nutrients and suspended solids in Savannah River makeup water entering Par Pond.

Releases from R-Reactor in the form of process leaks, purges, and makeup cooling water contaminated Par Pond with low levels of radioactive materials, primarily cesium-137. Releases

(except tritium) stopped after the shutdown of R-Reactor in 1964. Most of the cesium-137 in Par Pond lies in the upper 1 foot (0.3 meter) of fine sediments, and is concentrated in the area of the original stream corridor. An estimated 43 curies of cesium-137 remain, two-thirds of which occur below the 190-foot (58-meter) contour (DOE 1995a).

Elevated levels of mercury were found in Par Pond bottom sediments in the 1960s. An estimated 40 pounds (18 kilograms) of mercury were in Par Pond water, sediments, and biota in the early 1970s (Newman and Messier 1994), approximately half of which DOE assumed to have come from Savannah River water and half from natural sources (i.e., soils inundated when the reservoir was filled). The sources of mercury in the river water were industrial and manufacturing operations upstream of the SRS that discharged mercury-laden wastes to the River. With the implementation of the Clean Water Act and National Pollutant Discharge Elimination System regulations in the mid-1970s, these industries dramatically reduced levels of pollutants in their permitted discharges. Levels of mercury entering SRS waterbodies with river water showed a corresponding decline (Newman and Messier 1994).

An inspection of the Par Pond Dam in March 1991, led to the discovery of a small depression in the downstream face of the dam (DOE 1995a). DOE ordered a structural study of the dam and subsequently initiated a precautionary drawdown of the reservoir. During the June to September 1991 period, Par Pond was lowered from 200 feet (61.0 meters) to 181 feet (55.2 meters) above mean sea level, reducing its volume by approximately two-thirds (DOE 1995a). The drawdown exposed some 1,340 acres (5 square kilometers) of lakebed, roughly half the normal surface area of the reservoir (Marcy et al. 1994). In 1995 after dam repairs were completed, the reservoir was refilled under a Comprehensive Environmental Response, Compensation, and Liability Act interim action to reduce risks to human health and the environment from contaminants in exposed sediments.

The Environmental Assessment for the Natural Fluctuation of Water Level in Par Pond and Reduced Water Flow in Steel Creek Below L-Lake at the Savannah River Site (DOE 1995a) described the impacts of the 1991 to 1995 drawdown of Par Pond and the expected impacts of allowing the surface-water level of Par Pond to fluctuate from a full pool of approximately 200 feet (61.0 meters) to 195 feet (59.4 meters). This document determined that there would be three basic impacts: (1) instability in the littoral zone of the reservoir, (2) exposure of up to 500 acres (2 square kilometers) of contaminated sediments in the lakebed at the 195-foot (59.4-meter) elevation, and (3) loss of nutrient inputs to the reservoir. However, in a Finding of No Significant Impact (DOE 1995b), DOE concluded that the proposed action (a component of which was the natural fluctuation of the water level in Par Pond) was not a major Federal action "significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act."

4.3.1 GEOLOGY AND SOILS

4.3.1.1 Affected Environment

This section identifies the geologic and soil features of the Par Pond area that the alternatives described in this EIS could affect. Section 4.1.1 describes the regional geology and soils.

TE

4.3.1.1.1 Stratigraphy

By analyzing the geologic map of the site, it can be determined that the Tobacco Road Formation outcrops along approximately 60 percent of the western side of Par Pond and the Dry Branch Formation outcrops along the upper reaches of the lake. Section 4.1.1.1 describes these formations that could be affected (Prowell 1994).

TE/TC

4.3.1.1.2 Soils

The following soils occur commonly in the area west of Par Pond (see Figure 4-9) (USDA 1990):

- Blanton sand, 0 to 6 percent slopes (BaB)
- Fluvaquents, frequently flooded (Fa)
- Fuquay sand, 2 to 6 percent slopes (FuB)

4.3.1.2 Environmental Impacts

4.3.1.2.1 No Action

The erosion or deposition of soil and surface formations is likely to continue at the current rates. P-Reactor area is not operational. No contamination of geology or soils at Par Pond would occur since there is no active outfall. TE

4.3.1.2.2 Shut Down and Deactivate

If DOE deactivated the River Water System, Par Pond would no longer have the capability to receive river water. Soils are already known to be contaminated at Par Pond. DOE believes natural fluctuations will maintain lake levels above 195 feet (59.4 meters) above mean sea level through recharge by groundwater. Without the River Water System, DOE would not be able to refill Par Pond. TE TC

4.3.1.2.3 Shut Down and Maintain

The impacts discussed above for the Shut Down and Deactivate Alternative would apply to this alternative. However, if Par Pond levels fell below the 195-foot (59.4-meter) level, DOE could restart the River Water System to refill the lake.

4.3.2 SURFACE WATER

4.3.2.1 Affected Environment

Par Pond was a cooling water reservoir for P- and R-Reactors until 1964, when DOE shut R-Reactor down (Wilde 1985). It continued to receive heated cooling water until 1988, when DOE shut P-Reactor down (Paller and Wike 1996a). TE

4.3.2.1.1 Water Quality

Because watershed contributions to Par Pond (through rainfall and natural drainage) are considerably lower in nutrients than water pumped from the Savannah River, the addition of water to Par Pond through the River Water System resulted in nutrient enrichment. On the basis of its water chemistry and biological community characteristics, Par Pond is an oligotrophic to mesotrophic lake (reservoir).

A comprehensive biological monitoring program conducted from November 1985 to December 1992 investigated the L-Lake/Steel Creek System. During the latter part of this study, from 1990 to 1992, DOE used one sampling location on Par Pond, near the dam, for data comparison. The 1990-1992 water quality data from this location reflect post-reactor operation conditions, as listed in Table 4-48 (Wike et al. 1994). TE

In 1991 the water level of Par Pond was reduced from its historic level of 200 feet (61 meters) above mean sea level to 181 feet (55.2 meters) above mean sea level because of a defect in the Par Pond Dam. The drawdown began in June 1991 and the water level reached 181 feet by September 1991. DOE repaired the dam and refilled Par Pond to its previous level in early 1995. Par Pond was extensively studied before, during, and after the drawdown, resulting in the generation of considerable information on contaminant levels in the ecosystem and ecological changes resulting from the drawdown.

In February 1995 DOE began biweekly sampling to monitor changes in water chemistry during the refilling of Par Pond to its full pool, approximately 200 feet (61 meters) above mean sea level. The sampling program measures and monitors parameters and constituents that could quickly indicate impending anoxia (oxygen depletion) or eutrophication (nutrient enrichment).