

4 AFFECTED ENVIRONMENT

This chapter describes the environment that will be affected by the construction and operation of the Fuel Materials Facility (FMF) at a site within the existing 200-F Separations Area at the Savannah River Plant (SRP).

4.1 SITE LOCATION

The proposed FMF site will use 6.4 acres of the 192,000-acre DOE Savannah River Plant, which is located in Aiken, Barnwell, and Allendale Counties, South Carolina, on the Savannah River (see Figure 4-1). As shown in Figure 4-2, the site is in the northeast part of the 200-F Area between Upper Three Runs Creek and Four Mile Creek.

Augusta, Georgia, is about 37 kilometers northwest of the proposed FMF site; Aiken, South Carolina, is about 27 kilometers to the north; and Columbia, South Carolina, is about 93 kilometers to the northeast. Two small South Carolina towns are within 20 kilometers of the site--Jackson (1980 population: 1780) and New Ellenton (1980 population: 2630). The Barnwell Nuclear Fuel Plant of Allied-General Nuclear Services and the Chem-Nuclear Services radioactive burial ground facilities are within the 20-kilometer radius, as is the Georgia Power Company's Alvin W. Vogtle nuclear power plant, currently under construction in Burke County, Georgia. The remaining area within the 20-kilometer radius is primarily the controlled-access land of the Savannah River Plant.

4.2 DEMOGRAPHY, LAND USE, AND SOCIOECONOMICS*

Approximately 90 percent of the current SRP work force resides in Aiken, Bamberg, Barnwell, and Allendale Counties, South Carolina, and Columbia and Richmond Counties, Georgia. The urban counties--Aiken, Columbia, and Richmond--experienced a combined population growth of approximately 19 percent between 1970 and 1980. The rural counties--Allendale, Bamberg, and Barnwell--which had a net population decline from 1950 to 1970, experienced significant reversals of this trend between 1970 and 1980, when their population increases ranged from 9 to 16 percent (U.S. Bureau of the Census, 1981a,b).

In a 13-county area** surrounding the Savannah River Plant, urban uses account for approximately 5 percent of the total land area. The most intensively developed land areas occur in and around the cities of Aiken, South Carolina, and Augusta, Georgia. Agricultural land uses, forests, wetlands, and water bodies account for almost 70 percent of the land area.

*This section is based on data contained in DOE, 1981.

**This area includes Columbia, Burke, Screven, and Richmond Counties, Georgia, and Aiken, Allendale, Bamberg, Barnwell, Edgefield, Hampton, Lexington, Orangeburg, and Saluda Counties, South Carolina.

Generally, the six counties surrounding the Savannah River Plant provide adequate public services and facilities to the existing population. In the 1979-1980 school year, approximately 5000 classroom spaces were available for new students; however, some districts and schools operated near or above capacity levels. Similarly, public water and municipal waste-treatment systems have the capacity to provide additional services; however, some rural communities are experiencing waste-treatment problems. Health and fire protection services tend to be concentrated in the urban areas of Aiken and Augusta.

The average annual increase in housing units in the six-county area from 1970 to 1979 ranged from a low of 2.4 percent in Allendale County, South Carolina, to a high of 9.3 percent in Columbia County, Georgia. Half of the increase in total housing units in Aiken County during the past decade has resulted from a high rate of mobile home use.

Employment levels in the six-county area have increased significantly in recent decades as both the total labor force and population employment participation rates increased. For example, the labor force in the Lower Savannah Region grew by 20,000 employees in the 1960-1970 decade, and population employment participation rates increased from 34 percent to 43 percent of the total adult 1960-1970 population.

4.3 GEOLOGY AND SEISMOLOGY

Located in the Aiken Plateau physiographic division of the Atlantic Coastal Plain, the FMF site is about 40 kilometers southeast of the fall line that separates the Atlantic Coastal Plain and the Piedmont tectonic province of the Appalachian system. Relief in the site area, about 30 meters, is related primarily to stream incision.

Several fault systems occur in and adjacent to the Piedmont and the Valley and Ridge tectonic provinces of the Appalachian system; the closest of these is the Belair Fault Zone, about 40 kilometers from the site. No evidence exists of any recent displacement along the faults within 300 kilometers of the site. In addition, no apparent association exists between local seismicity and specific faults, except perhaps for the Cooke fault in the meizoseismal area of the 1886 Charleston earthquake, which occurred approximately 145 kilometers from the Savannah River Plant (Behrendt et al., 1981).

4.4 HYDROLOGY

The Savannah River Plant adjoins the Savannah River and is drained by the river and its onsite tributaries. Downstream from Augusta, Georgia, the river is a Class B waterway, which is defined as being suitable for agricultural and industrial use, and for the propagation of fish; after treatment, the water is suitable for domestic use. The average river flow between 1962 and 1978 near Augusta was 299 cubic meters per second; the minimum daily flow during the same period was 126 cubic meters per second. The peak historical flood between 1796 and the present corresponds to a stage of about 36 meters, which is 40 meters below the elevation of the FMF site.

The FMF site, which is between Upper Three Runs Creek and Four Mile Creek, is entirely within the drainage basin of Upper Three Runs Creek.

Four Mile Creek and three more southerly creeks have received cooling-water discharges from SRP reactors. Upper Three Runs Creek differs from the other SRP streams because: (1) it is a blackwater stream, (2) it is the only major stream that has not received reactor cooling-water discharges, and (3) its headwaters lie in forested areas and farmlands upstream from the Plant. The principal pollutants to Upper Three Runs Creek are associated with runoff from agricultural lands; however, minor amounts of Plant effluent enter the stream (DOE, 1981, Table 4-16).

Four Mile Creek lies in a narrow, wooded, moderately sloped valley and receives aqueous discharges from the F and H Separations Areas and the C-reactor. The natural stream channel downstream of its confluence with the C-reactor discharge canal has been scoured and widened considerably, and much of the bordering vegetation has been eliminated as a result of the thermal effluent.

The sediments underlying the 200-F Area are about 300 meters thick. The sedimentary beds with coarser textures form aquifers that are confined by clay and sandy clay units. Both the Tuscaloosa and Ellenton Formations are hydraulically separated from the Congaree Formation and are not recharged near the 200-F Area. Some Congaree ground water drains into Upper Three Runs Creek, which incises this artesian aquifer. The McBean Formation is also incised by both Upper Three Runs and Four Mile Creeks. Ground water in the Barnwell and Hawthorne Formations are under water-table conditions at depths of about 20 meters at the proposed Fuel Materials Facility site and 10 meters at the SRP Burial Ground (Langley and Marter, 1973).

4.5 ECOLOGY*

In 1972, the Savannah River Plant was designated as a National Environmental Research Park. It offers unique opportunities for studying the impacts of man's activities on the environment.

Approximately two-thirds of the SRP site was forested and one-third was cropland and pasture about 30 years ago. Since then, the abandoned fields either were allowed to pass through vegetational succession or were planted with pine trees; at present, 90 percent of the SRP lands are forested with pine trees and bottomland hardwoods. These forested areas support a diversity of wildlife habitats that are restricted from the public use. Forest and wildlife management practices include controlled cutting, reforestation, and hunting. The proposed FMF site is on a previously used open field inside the security fence that surrounds the 200-F Area, adjacent to other industrial development. It has been cleared and leveled and it supports low grasses and herbaceous vegetation. Habitat quality is minimal, except perhaps for small mammals and songbirds.

The flora and fauna of Upper Three Runs Creek are characteristic of relatively undisturbed soft, blackwater streams of the southeastern United States. Rooted aquatic plants occur where the sunlight penetrates the dense forest canopy. Macroinvertebrate fauna are extremely diverse and reflect the

*This section is based on data contained in DOE, 1981.

cool temperatures (because of shading in summer) and low suspended particulate load. Upper Three Runs Creek also supports many species of fish and might be seasonably important as a nursery habitat for a number of important species found primarily in the Savannah River.

Compared to Upper Three Runs Creek, the aquatic environment of Four Mile Creek upstream from the C-reactor cooling-water discharge canal is characterized by a lower diversity and abundance of fish and, to some extent, aquatic invertebrates. This might be attributed to the isolating influence of the thermal effluent on recruitment downstream and the process discharges from the F and H Areas.

4.6 METEOROLOGY AND AIR QUALITY

Located on the Atlantic Coastal Plain, the Savannah River Plant is subject to both coastal and continental climatic influences. The average winter temperature in the SRP area is about 9°C. Summers in the area are long, humid, and warm, with an average temperature of about 27°C. Although tornadoes occur infrequently, they are most common in the spring. The average annual rainfall is 120 centimeters.

Figure 4-3 shows wind direction and speed frequencies measured at a height of 62 meters near the Plant. About 30 percent of the time, a temperature inversion (stable conditions) extends to or beyond the 3- to 335-meter layer. The annual average mixing depth for the Plant is calculated to be about 1000 meters.

Aiken and Barnwell Counties, South Carolina, and Burke and Richmond Counties, Georgia, have been designated as "attaining" areas with respect to the national ambient air quality standards for total suspended particulates, sulfur and nitrogen oxides, ozone, and carbon monoxide. Table 4-1 compares the national and State ambient air quality standards for total suspended particulates, sulfur dioxide, and nitrogen dioxide against measured values obtained at monitoring stations near the Savannah River Plant.

REFERENCES FOR CHAPTER 4

Behrendt, J. C., et al. 1981. "Cenozoic Faulting in the Vicinity of the Charleston, South Carolina, 1886 Earthquake." Geology, Vol. 9, pp. 117-122.

DOE (U.S. Department of Energy). 1981. Draft Environmental Impact Statement, Defense Waste Processing Facility, Savannah River Plant, Aiken, South Carolina, DOE/EIS-0082D.

Du Pont. 1981. Environmental Monitoring in the Vicinity of the Savannah River Plant--Annual Report for 1980, DPSPU 81-30-1. E. I. du Pont de Nemours and Company, Savannah River Plant, Aiken, South Carolina.

Langley, T. M., and W. L. Marter. 1973. The Savannah River Plant Site, Savannah River Laboratory. E. I. du Pont de Nemours & Company, DP-1323.

U.S. Bureau of the Census. 1981a. Advance Reports, 1980 Census of Population and Housing, Georgia, Final Population and Housing Unit Counts. PHC80-V-12.

U.S. Bureau of the Census. 1981b. Advance Reports, 1980 Census of Population and Housing, South Carolina, Final Population and Housing Unit Counts. PHC80-V-42.