L.3.4.2 Subsurface hydrology

The Coastal Plain sediments, which contain several prolific and important aquifers, consist of a wedge of stratified sediments that thickens to the southeast. Near L-Reactor, the sediments are about 400 meters thick and consist of sandy clays and clayey sands. The sandier beds form aquifers and the clayier beds form confining beds. The Coastal Plain sediments across the SRP generally consist of the Barnwell (combined with the Hawthorn as one mapping unit), McBean, Congaree, Ellenton, and Tuscaloosa Formations (Figure 3-5). Among these, the Tuscaloosa Formation is a particularly prolific ground-water unit because of both its thickness and its high permeability. Surficial deposits, including terrace sediments and alluvium, are not important sources of ground water at SRP. The lithology and water-bearing characteristics of the hydrostratigraphic units underlying the Savannah River Plant are described in Table 3-8. Additional detail is provided in Table F-1 and the text of Appendix F.

In the central part of the Savannah River Plant (including F-, H-, and L-Areas), the Barnwell and McBean Formations, and the McBean and Congaree Formations are separated by layers informally called the "tan clay" and the "green clay," respectively. The lowest unit of the Barnwell Formation is the tan clay. Borings in the Separations Areas and about 2 kilometers east of the Central Shops (Figure 3-2) indicate that the tan clay is about 2 meters thick, and that it commonly consists of two thin clay layers separated by a sandy zone (Du Pont, 1983c, D'Appolonia, 1980). In the L-Area, the tan clay is not readily evident from foundation borings, drillers logs, or geophysical logs; however, even in other areas of the SRP where it supports a significant head difference, this clay is not always apparent in soil cores alone.

In the L-Area the green clay, based on geophysical logs of water wells 104L and 55-2, is about 7 meters thick. At the Par Pond pumphouse, along the strike from L-Reactor, the green clay also apparently supports a large head difference; it also appears to have protected the Congaree ground water effectively from the large (27,000 picocuries per liter) concentrations of tritium in Par Pond (Ashley and Zeigler, 1981). In the central part of the SRP, this clay directs much of the water in the McBean laterally to local creeks.

Throughout the SRP, the clay at the base of the Congaree and the upper clay layer of the Ellenton Formation provide an effective confining unit for the sands of the Ellenton-upper Tuscaloosa Aquifer (see Table F-1).

As shown on Figure 3-8, the heads in the Ellenton and Tuscaloosa Formations are higher than those in the Congaree (upward head differentials) in the central portion of the SRP, thus preventing the downward movement of water from the Congaree to the Ellenton where this condition exists. This condition is caused by the drawing down of the head in the Congaree by natural drainage into Upper Three Runs Creek and the Savannah River. Figure 3-4 shows an approximation of the area where the head difference is upward from the Tuscaloosa to the Congaree; F-, H-, and L-Areas are within this area, but M-Area is not.

Figure 3-9 shows the locations of areas where there is a head reversal between the Congaree and the Tuscaloosa Formations (i.e., the latter's head is higher than the former's). This map shows that the head in the Tuscaloosa is higher than the head in the Congaree in a broad area within about 10 kilometers of the Savannah River and Upper Three Runs Creek. The head in the Congaree is higher than that of the Tuscaloosa in an area surrounding M-Area and in the vicinity of Par Pond.

A more detailed discussion of the hydrostratigraphic units and their head relationships across the entire site and in specific areas is given in Appendix F and in Du Pont (1983c).

L.3.5 Severe weather

The types of severe weather that might affect the cooling-lake operation are heavy precipitation and extreme winds.

The strongest winds in the SRP area occur in tornadoes, which can have wind speeds as high as 116 meters per second. The next strongest surface winds occur during hurricanes. During the history of the Savannah River Plant, only Hurricane Gracie, in September 1959, had winds in excess of 34 meters per second. Occasional winter storms with winds as high as 32 meters per second have been recorded (Du Pont, 1982b). Thunderstorms can generate winds as high as 18 meters per second with stronger gusts. The fastest 1-minute wind speed recorded at Augusta between 1951 and 1980 was 28 meters per second.

Heavy precipitation can occur in the SRP area in association with either localized thunderstorms or hurricanes. The maximum 24-hour total was about 15.2 centimeters, which occurred during August 1964 and was associated with Hurricane Cleo.

Severe weather values were used as design bases in Section L.2.3. More detailed severe weather information is presented in Section 3.5.3.

L.3.6 Ecology

The natural areas that could be affected by the construction and/or operation of the proposed cooling lake include Steel Creek, the Steel Creek corridor, the Savannah River swamp (including the Steel Creek delta), and the Savannah River. Section 3.6 and Appendix C contain baseline descriptions of the ecology of these areas. This section summarizes the major points in those descriptions; it emphasizes those environments that would be affected by this cooling alternative.

L.3.6.1 Terrestrial ecology

L.3.6.1.1 Vegetation

The preferred alternative would impact plant communities in two wetland areas: (1) those associated with the Steel Creek corridor from Road B to the delta, and (2) those associated with the Steel Creek delta and that portion of the swamp near the confluence of Steel Creek with the Savannah River. The structure and species composition of these areas reflect not only the heterogeneity of the physical environment but also the impacts of earlier reactor operations.

The upland areas that would be inundated by the lake consist almost entirely of coniferous forest. Some areas contain almost pure stands of pine and others include an admixture of hardwood species.

Steel Creek corridor

The vegetation of the Steel Creek corridor, which is classified as palustrine wetland (Cowardin et al., 1979), varies markedly above the delta (Figure C-3). More than 85 species of plants representing 50 families were listed from this area in the summer of 1981 (Appendix C). This parcel consists of aquatic beds, emergents, scrub-shrub wetland, and forested wetland (Section 3.6.1.2.1).

Steel Creek delta

The Steel Creek delta contains 10 vegetative associations and four zones differentiated by the degree of prior reactor discharges of thermal effluent (Figure C-4). Impacted zones that have experienced structural reductions of the vegetative canopy include deepwater habitats and the deltaic fan. Bottomland hardwoods and deepwater and upland habitats comprise the nonimpacted zones. Since the shutdown of L-Reactor in 1968, vegetative recovery has varied according to the hydrologic regime (Figure C-4). Figure C-5 shows the distribution of the principal plant communities of the delta.

L.3.6.1.2 Wildlife

The abundance and diversity of wildlife that inhabit the Savannah River Plant reflect the interspersion and heterogeneity of the habitats occurring there. Emphasis has been given to those fauna that inhabit Steel Creek and the Savannah River swamp. No species have been found in the Steel Creek system that have not been found elsewhere on the SRP site.

Amphibians and reptiles

Because of its temperate climate and the variety of aquatic habitats, the SRP site contains a diversified and abundant herpetofauna. Species include 17 salamanders, 26 frogs and toads, 10 turtles, 1 crocodilian, 9 lizards, and 31 snakes that have zoogeographic ranges that include the Savannah River Plant (Conant, 1975). The ranges of many other species are peripheral to the Plant, and they could also occur on SRP lands. Gibbons and Patterson (1978) provide an overview of the herpetofauna, including the abundance and distribution of peripheral species. The endangered American alligator, which occurs in the area, is discussed in Section L.3.6.1.3.

Birds

Birds of the Steel Creek ecosystem were studied in the summer of 1981. A total of 1062 birds representing 59 species was tabulated during the summer survey; these species presumably breed locally. The white-eyed vireo was the most abundant species based on all census techniques, followed closely by the Carolina wren (Smith, Sharitz, and Gladden, 1981).

Because of the interspersion of habitats and isolation from public hunting, the Steel Creek delta and Savannah River swamp provide an important sanctuary and refuge for regional waterfowl. Based on ground counts and aerial surveys, nine species of waterfowl have been observed in the Steel Creek delta area. The mallard and wood duck were the most predominant species of waterfowl; both used the Steel Creek delta extensively for roosting and feeding.

The endangered wood stork, which occurs in the area, is discussed in Section L.3.6.1.3.

Mammals

The Savannah River Plant includes zoogeographic ranges of more than 40 species of mammals, including the muskrat and black bear, which are known to occur near Steel Creek.

The short-tailed shrew, the least shrew, and the southeastern shrew were the most frequently captured small mammals during recent field investigations. The Steel Creek delta provides habitat for the rice rat, and probably for the eastern woodrat and the hispid cotton rat. The gray squirrel, the fox squirrel, and the southern flying squirrel were common in the upland and lowland forests along Steel Creek. Large mammals such as the feral pig and the white-tailed deer were common on the Steel Creek floodplain and delta. Other inhabitants of the floodplain and delta included the raccoon, the opossum and the gray fox. Beaver signs were common along the length of Steel Creek.

L.3.6.1.3 Threatened and endangered species

The American alligator and the wood stork are the only species listed as "endangered" by the U.S. Fish and Wildlife Service (USDOI, 1983, 1984) that have been identified in the area. No plant species with protective status has been found. No "critical habitat," as defined by the U.S. Fish and Wildlife Service, exists on the Savannah River Plant.

American alligator

Listed federally as endangered (USDOI, 1983), the alligator is common locally and breeds in Par Pond, in the Savannah River swamp (Gibbons and Patterson, 1978; Murphy, 1977), and along Steel Creek. The ecology of this species has been examined intensively on the Savannah River Plant. Early studies (Freeman, 1955; Jenkins and Provost, 1964) indicated that the alligator has always been a resident of the area. Its abundance probably increased greatly after the SRP was closed to the public in the early 1950s.

More recent studies of the alligator in the Steel Creek ecosystem were begun in 1981 (Smith, Sharitz, and Gladden, 1981, 1982a,b). These investigations have confirmed that alligators have utilized the Steel Creek ecosystem from the L-Reactor outfall to the Steel Creek delta and swamps, including other areas near Steel Creek such as Carolina bays, backwater lagoons, and beaver ponds. The population of alligators in the Steel Creek ecosystem was estimated to range between 23 and 35 individuals in 1981 and 1982 (Smith, Sharitz, and Gladden, 1982b). Sex ratio and size data suggest a higher reproductive potential in Steel Creek than is known for Par Pond, where nearly 80 percent of the adults are males (Murphy, 1977).

Studies of the wintering behavior and movements of alligators in the Steel Creek ecosystem were initiated in 1981 using radiotelemetry (Smith, Sharitz, and Gladden, 1982a). Generally, it was found that alligators on the Savannah River Plant do not utilize over-wintering dens, but remain active whenever winter temperatures are suitable. Several alligators moved between the lagoons near S.C. Highway 125. Individuals also utilized the swamp forest below the Steel Creek delta (Smith, Sharitz, and Gladden, 1982b). No alligator nests have been located in the Steel Creek system since 1981.

Based on the preferred cooling-water alternative (i.e., a 1000-acre lake), DOE prepared a new Biological Assessment and provided it to FWS (Sires, 1984b). This assessment included a March 1984 aerial survey of the proposed lake area, which contains marginal habitat for the alligator. Only one alligator was located in this area. The lake is expected to provide more suitable habitat than that currently in this area of Steel Creek, particularly in the portion that is maintained below 32.2°C; the critical thermal maximum for alligators is 38°C.

Wood stork

Recently listed as endangered by the U.S. Fish and Wildlife Service (USDOI, 1984), the wood stork uses the Steel Creek delta as one of its feeding grounds. A total of 102 individuals was observed feeding on or near the Steel Creek delta in late June to early July 1983. The maximum number of observations throughout the SRP swamp during this same period was 478 (Smith, Sharitz, and Gladden, 1983). The delta of Beaver Dam Creek also provides important feeding habitat for wood storks.

A recent Biological Assessment on the wood stork was submitted to FWS for their consideration (Sires, 1984a). The assessment concluded that the proposed L-Reactor operation and 1000-acre lake construction and operation would not jeopardize the continued existence of the wood stork.

These species and those listed by the State of South Carolina and the U.S. Fish and Wildlife Service as endangered, threatened, or of "special concern" are discussed in greater detail in Appendix C.

L.3.6.2 Aquatic ecology

L.3.6.2.1 Aquatic flora

Approximately 400 species of algae have been identified from the Savannah River near the Savannah River Plant (Patrick, Cairns, and Roback, 1967). Aquatic macrophytes in the river, most of which are rooted, are limited to shallow areas of reduced current and along the shallow margins of tributaries.

In the SRP streams that receive thermal effluents, the flora is sparse, reflecting the influence of high flow and elevated (greater than 40°C) water temperatures. In these streams, thermophilic bacteria and blue-green algae thrive (Gibbons and Sharitz, 1974).

A deepwater zone occurs where the main flow of Steel Creek courses toward the Savannah River. In this area, the vegetation is currently dominated by submergent and emergent macrophytes. Patches of duckweed occupy mats of submerged vascular plants such as hornwort and parrotfeather. Where the water flow is slow moving, smartweed forms dense colonies (Smith, Sharitz, and Gladden, 1981).

L.3.6.2.2 Aquatic fauna

Aquatic invertebrates

Shallow areas and quiet backwaters and marshes of the Savannah River near the SRP site support a diverse aquatic invertebrate fauna. However, the bottom substrate of most open portions of the river consists of shifting sand that does not provide the best habitat for bottom-dwelling organisms (Appendix C). The faunal composition now present reflects earlier impacts of dredging and polluted water conditions from which the community has not yet completely recovered.

The macrobenthic invertebrate drift communities in the river and SRP canals and creeks (including Steel Creek) are dominated by true-flies (particularly chironomids), which is typical of most riverine systems (see Appendix C). The attached invertebrate communities on wood substrate and macrophytes in Steel Creek are believed to be highly productive.

Mollusks, such as snails and clams, are an important component of the Savannah River invertebrate community (Patrick, Cairns, and Roback, 1967). The Asiatic clam, Corbicula, is found in the Savannah River, larger tributary streams in the vicinity of the SRP, and most thermally affected habitat on the SRP.

Fish

The Savannah River and its associated swamp and tributaries are typical of southeastern coastal plain rivers and streams, and support a diverse fish fauna (Appendix C). The diversity and abundance of fish in the thermally affected streams are high only during periods of reactor shutdown (McFarlane, 1976). In addition, the fauna upstream of the thermal effluents is depauperate in both numbers and diversity. With the exception of the mosquitofish, few fish live in the SRP thermal streams when heated effluent is present. During reactor shutdown, the streams return to ambient temperature and are invaded quickly by many fish from adjacent nonthermal areas. The diversity and abundance of species in the headwater tributaries of Four Mile Creek and Pen Branch upstream from reactor thermal effluents are reduced greatly in contrast to comparable areas in Upper Three Runs Creek or Steel Creek (McFarlane, 1976). Collection efforts have revealed that the first- and second-order tributaries of these streams have a low diversity of fish.

Fish population studies conducted in the Steel Creek swamp system (Appendix C) indicate a high species diversity. Fish of all sizes were collected in the swamp and a wide range of sizes was collected for most species. The collections were representative of both relative abundance and species composition of the swamp fish community. A total of 5313 fish representing 55 species was collected from the Steel Creek river-swamp from November 1981 through July 1982.

The high diversity of fish species is the result of the wide array of habitat types and niches available within the creek-swamp environment. The greatest abundance and diversity of fish occurred in deepwater areas where the tree canopy was eliminated during previous reactor operations, and the vegetation currently is dominated by submergent and emergent macrophytes. Fewer fish species and small numbers were collected in the reaches of Steel Creek that will be inundated by the cooling lake, compared to collections in the delta and swamp.

The use of the Steel Creek delta-swamp area by anadromous fish species (e.g., American shad and blueback herring) was minimal during 1982, although some American shad and blueback herring spawned near the mouth of Steel Creek that year. There was greater utilization of the Steel Creek delta-swamp by adults of the species in 1983 than in 1982. Also, two striped bass were collected in the delta-swamp area in 1983, while none were found the previous year. With the exception of the American eel, no migratory fish have been observed to utilize the upper reaches of Steel Creek that will be inundated by the cooling lake or will be isolated above it.

Recent studies have shown that Steel Creek contained numerous fish larvae, predominantly minnows, yellow perch, sunfish, and bass. Many blueback herring eggs were also collected. When compared to 19 other creeks, Steel Creek ranked eighth in larval density of all species combined.

L.3.6.2.3 Threatened and endangered species

Two aquatic species listed as "endangered" by the Federal Government (USDOI, 1983) and/or the State of South Carolina (Forsythe and Ezell, 1979) are known to occur on or in the vicinity of the SRP. These are the shortnose sturgeon (Federal list) and the brother spike mussel (State list).

The shortnose sturgeon is found only on the east coast of North America in tidal rivers and estuaries. Prior to 1982, this species had not been reported in the middle reaches of the Savannah River in the vicinity of SRP. However, in 1982 and 1983, shortnose sturgeon larvae were collected in the river near the site, indicating that spawning occurred in the river. The only known occurrence of the brother spike mussel in the Savannah River occurred in 1972, approximately 15 river miles downstream from the mouth of Steel Creek.

L.3.7 Radiocesium and radiocobalt in Steel Creek and the Savannah River

L.3.7.1 Radiocesium

Since 1955, approximately 560 curies of radiocesium have been discharged to onsite streams of the Savannah River Plant. Of this total, about 284 curies were released to Steel Creek. Annual releases ranged from about 0.02 curie since 1978 to a maximum of about 53 curies in 1964. The primary source of this radiocesium was leaking failed fuel elements stored in disassembly basins in the P- and L-Areas. Water was released routinely from these basins to maintain the clarity needed for underwater manipulation of irradiated fuel elements, hence the release of radiocesium (with a cesium-134-to-cesium-137 ratio of about

1:20).* A sharp decrease in the release of cesium-137 to Steel Creek occurred in the late 1960s and early 1970s when (1) the P-Area basin was fitted with sand filters and water was demineralized before its release; and (2) the leaking fuel elements were removed to an environmentally safe storage area.

After the radiocesium was discharged from the P- and L-Areas to Steel Creek, it became associated primarily with the silts and clays in the Steel Creek system. Here the sediments and associated cesium-137 were subjected to continued resuspension, transport, and deposition by the flow regime in the creek.

In addition to SRP releases, nuclear weapons testing since the mid-1940s deposited approximately 2850 curies of radiocesium on the Savannah River watershed, including about 80 curies on the Savannah River Plant.

The subsections that follow describe radiocesium in Steel Creek and Savannah River sediments, the radiocesium inventory in Steel Creek, cesium-137 in biota, and cesium-137 in water. Appendix D provides more details.

L.3.7.1.1 Cesium in sediments

Radiocesium, primarily cesium-137 in Steel Creek, is predominantly associated with the bottom sediments. The principal mechanisms for this association are (1) cation exchange with kaolinite and gibbsite clay minerals; (2) sorption on minerals; and (3) chelation with naturally occurring organic material. A distribution coefficient (K_d = 3960) measured for sediments from Four Mile and Steel Creeks (Kiser, 1979) demonstrates the affinity of cesium-137 for the sediments in the Steel Creek system.

Soil cores collected in 1974 at two transects in Steel Creek between Road A and the swamp showed that 69 percent of the radiocesium was located within the upper 20 centimeters of sediment and 86 percent was confined to the upper 40 centimeters. More extensive detailed coring conducted in 1981 at 12 transects between the Steel Creek delta and P-Reactor generally confirms the 1974 results; about 61 percent of the radiocesium was found in the upper 20 centimeters, and 83 percent in the upper 40 centimeters (Du Pont, 1982b; Smith, Sharitz, and Gladden, 1982a). Sediment samples taken in 1981 from the center of the creek had markedly lower radiocesium concentrations than the sediments near the edges of the floodplain. The radiocesium is predominantly associated with smaller soil particles (Table L-3).

*For convenience, the radiocesium will usually be described as cesium-137, when the presence of both cesium-134 and -137 is implied.

Table L-3. Range of cesium-137 concentrations (pCi/g dry weight) of soil types in Steel Creek, 1981

Soil type[a]	Number of samples	Percentage	Concentrations Mean	Standard error
1 (clay)	101	19	137	20
2	108	21	80	16
3	127	24	39	7
4	83	16	55	12
5 (sand)	106	20	17	3

[a]Soil samples were graded visually from 1 to 5, according to their "average" particle size; samples with the highest clay content are type 1 and those with the least clay and silt (i.e., predominantly sand) are type 5 (Smith, Sharitz, and Gladden, 1981).

L.3.7.1.2 Cesium in the Savannah River

Turbulence in the Savannah River generally keeps fine soil particles in suspension. These particles are deposited where the river velocity and turbulence are low (such as inside river bends, downstream from obstructions, in oxbow lakes, and on the floodplain), and where flocculation occurs in the estuary below River Mile 40. Riverbed sediments upstream from the Savannah River Plant normally have about 1 picocurie per gram or less of radiocesium (Du Pont, 1982b).

In 1974, riverbed sediments downstream of the Savannah River Plant had concentrations of about 2 picocuries per gram near the U.S. Highway 301 bridge and 6.5 picocuries per gram at the South Carolina Highway 119 bridge near Clyo, Georgia. Studies performed in 1978 showed that the radiocesium concentrations were about 0.6 picocurie per gram at the control station above the Savannah River Plant and less than 0.8 picocurie per gram at sampling stations between Little Hell Landing and the Highway 301 bridge (Du Pont, 1982b).

L.3.7.1.3 Cesium-137 in biota

Vegetation samples were collected at various times from 1970 to 1981 at 10 transects in Steel Creek between the delta and L-Reactor. Samples were also collected at 10 transects in the Savannah River swamp and Creek Plantation

Swamp. The average radiocesium concentrations in swamp vegetation are generally less than those in vegetation from the creek. The total radiocesium inventory in Steel Creek vegetation is about 0.4 curie (Du Pont, 1982b).

The concentration of radiocesium in wildlife is generally not high in Steel Creek, the Savannah River swamp, and Creek Plantation Swamp; concentrations in Savannah River fish are lower than those measured in fish from Steel Creek (Du Pont, 1982a). Additional details are provided in Appendix D.

L.3.7.1.4 Cesium-137 in water

Monitoring in the Savannah River by the Savannah River Plant shows that the concentration of radiocesium in river water has been very low in the past several years. From 1979 through 1982 the mean concentration of cesium-137 at the U.S. Highway 301 bridge was 0.08 picocurie per liter and near the limit of detection at the control station above the Plant (Du Pont, 1980b, 1981b, 1982c, 1983b). For the second quarter of 1983, measurements of the radiocesium in the potable (finished) water at the North Augusta, Beaufort-Jasper, and Cherokee Hill water-treatment plants averaged 0.006, 0.028, and 0.033 picocurie per liter, respectively. During this monitoring period, the radiocesium concentrations in the potable water were found to vary inversely with river flow (Kantelo and Milham, 1983). In 1982, the monthly average cesium-137 concentration in Steel Creek at the Cypress Bridge (just upstream from the delta; see Figure D-3) was about 3 picocuries per liter; this concentration is about the same as those measured during the previous 5 years.

In November and December 1981, seven water samples from Steel Creek between Road A and the delta were analyzed for their cesium-137 (and potassium) content (Ribble and Smith, 1983). The concentrations ranged from 3.9 to 7.9 picocuries per liter and had a mean value of 5.3 picocuries per liter (with a mean potassium concentration of 1.0 milligram per liter). About 84 percent of this value was associated with the dissolved fraction and 16 percent with the suspended solid fraction. Similarly, Shure and Gottschalk (1976) found that about 20 percent or less of the cesium-137 in water samples from Lower Three Runs Creek was associated with the suspended solid fraction.

More recently, Hayes (1983) reported the results of cesium-137 measurements in Steel Creek made from April through August 1983. During this period, the average transport of cesium-137 was 3.2 ± 1.5 millicuries per week at Cypress Bridge. From this basis, the annual transport would be about 0.17 ± 0.08 curie per year. These measurements indicated that about half the transported cesium-137 was due to remobilization from the creek floodplain system above L-Reactor.

Hayes (1983) also reported that the water that enters Steel Creek from L-Area, Meyer's Branch (the principal tributary of Steel Creek), and as local rainfall contained cesium-137 concentrations of less than 1 picocurie per liter. However, the measured cesium-137 concentrations at Cypress Bridge averaged about 3.7 ± 0.6 picocuries per liter during the April through August 1983 study period. Hayes contends that the cesium-137 concentrations are governed by a reequilibration process between the water and the cesium in the creekbed and floodplain sediments, because he could find no correlation during this period between cesium concentration and creek flow rate, or such other variables as suspended solid or tritium concentrations in Steel Creek water or rainfall in the area. Hayes concluded that the creekbed and floodplain sediments could support cesium concentrations as high as about 11 picocuries per liter at equilibrium, and that the lower concentrations (3.7 picocuries per liter) were probably due to insufficient time for the process to reach equilibrium between the water and the cesium-laden sediments. The travel time for water from L-Area to Cypress Bridge is less than 1 day.

L.3.7.2 Radiocobalt

Along with the radiocesium, small amounts of radiocobalt, 66 curies (Du Pont, 1983a), formed by neutron activation of stainless steel and dissolved in the fuel element storage basin water, were discharged to onsite streams. Of this total, approximately 27 curies were released to Steel Creek. As a result of radioactive decay, a small amount, about 2.1 curies, remains in Steel Creek or Creek Plantation Swamp, or has been transported to the river in a manner similar to radiocesium. Further examination of cobalt has not been performed because the inventories in both Steel Creek and the Savannah River system are significantly less than the bounding cesium inventories (Du Pont, 1983a). Additional details can be found in Appendix D.

L.3.7.3 Radiostrontium

During earlier operations, L- and P-Areas released approximately 0.5 curie of strontium-89 and 40.8 curies of strontium-90 to Steel Creek (Ashley, Zeigler, and Culp, 1982). Because of the short half-life of strontium-89 (50.5 days), no measurable quantities are likely to exist in the creekbed sediments. Strontium-90 has a half-life of about 28 years. About 14.3 curies of strontium-90 have been lost by radioactive decay. Based on ERDA (1977) and Marter (1974), another 20.8 curies have been transported to the Savannah River. Thus, about 5.7 curies of strontium-90 might still remain in the sediments of Steel Creek. Soil corings in Steel Creek at Road B and Cypress Bridge and near its mouth have detected strontium-90 concentrations ranging from 0.11-0.14 picocurie per gram in 1978 to 0.12-0.14 picocurie per gram in 1979. At the SRP control station, strontium-90 concentrations of soil samples were 0.06 picocurie per gram in 1978 and 0.14 picocurie per gram in 1979 (Ashley et al., 1982). These soil coring studies suggest that the inventory might be much less than 5.7 curies. It is not surprising that most of the strontium-90 has been transported from Steel Creek, because the kaolin clay particles of the creekbed sediments have little sorptive capacity for strontium. The distribution coefficient for strontium-90 in SRP kaolinitic soils might be as low as 20 (Oblath, Stone, and Wiley, 1983), which is at least 35 times less than that for cesium-137.