Comment number	Comments	Responses
	STATEMENT OF CAROLINE O'ROURKE 433-A Howle Ave. Charleston, SC 29412 November 13, 1983 Mr. Melvin Sires U.S. Dept. of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801 Dear Mr. Sires:	
ET-1	I am opposed to the opening of the L-Reactor of the Savannah River Plant for several reasons. Generally, the reopening would result in an increase of high level nuclear waste in the area, particularly into underground aquifers. Also, there likely would be run-off of radioactive cesium into the Savannah River. Lastly, when the extremely hot water from the reactor operation is discharged into the river, there would be localized die-off of endemic flora and fauna.	See the response to comment BA-5 regarding high-level radioactive waste, the responses to comments AA-2 and BT-2 regarding radiocesium, and the response to comment AB-13 regarding information contained in this EIS regarding cooling-water mitigation alternatives.
	Please take these comments into consideration. Sincerely yours, Caroline O'Rourke	

Comment number	Comments	Responses

STATEMENT OF D.M. McEACHIN, JR.

House of Representatives
State of South Carolina
314-A Blatt Building
Columbia, S.C. 29211
November 14, 1983

D.M. McEachin, Jr.
District No. 63-Florence County
Drawer 150
Florence, S.C. 29503

Committee:
Ways and Means

Mr. Melvin J. Sires, III
U.S. Department of Energy
Savannah River Operations Office
Post Office Box A
Aiken, South Carolina 29801

ATTN: EJS for L-Reactor

Dear Mr. Sires:

As a boy growing up in South Carolina, I would hear accounts of how the air and water were polluted in the North. I was also told how fortunate I was to live in South Carolina. I realize that South Carolina industrialization has engendered wastes that are toxic to the environment. The consternation over the destruction to our environment has been slow coming in South Carolina but it has arrived.

The consequences to the environment of the start-up of the L-Reactor is like a fireball in the night to many South Carolinians of all walks of life.

Comment number	Comments	Responses
EU-1	I implore you to comply with federal and South Carolina environmental standards applicable to commercial reactor sites. Good citizenship requires that all steps be taken to avoid damage to the environment before start-up. With kind regards, I am, Yours very truly, D.M. McEachin, Jr.	Chapter 7 of the EIS presents the Federal and state environmental protection regulations that are applicable to the restart of L-Reactor. The restart of L-Reactor will comply with all of these regulations. For example, the proposed restart of L-Reactor will be in compliance with an NPDES permit issued by the State of South Carolina, and the restart of L-Reactor will be in compliance with DOE radiation protection standards that are comparable to those of the Nuclear Regulatory Commission (10 CRF 20) for a production facility (i.e., 500 millirem to the whole body in anyone calendar year). With respect to engineered safety features such as a containment dome, the need for specific engineered safety features is based upon limiting potential radiological consequences. The potential radiological consequences are related to the design and operation of the specific type of reactor being considered; for example, the Fort St. Vrain reactor, which is a gas-cooled commercial reactor in Colorado, has no containment dome and was licensed for operation by the NRC.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	COMMENTS ON APPENDIX D OF THE DEPARTMENT OF ENERGY'S DRAFT ENVIRONMENTAL IMPACT STATEMENT: L-REACTOR OPERATION AT THE SAVANNAH RIVER PLANT By JOHN M. CROOM QUANTITATIVE APPLICATIONS Environmental and Statistical Sciences 1000 Montreal Road, 55A Clarkston, Georgia 30021 November 9, 1983 Prepared for: Energy Research Foundation 2530 Devine Street Columbia, SC 29205 1. P. D-4, Section D.2.1.1, first full paragraph:	
EV-1	(a) Listing of mechanisms of association between Cs-137 and sediments implies ranking of importance. Data are available from Fig. D-2: Graphs A, B, and C to test the correlation between cation exchange capacity (CEC) in C and %'s clay and organic material in A and B respectively. Analyze with regression or correlation (as per their inherent assumptions) and present proportions of CEC sum of squares attributable to clay and OM.	There was no intent to imply any ranking to the importance of the mechanisms of association between cesium-137 and the sediments of Steel Creek.
EV-2	(b) Reference to Kiser (1979) and Prout (1958) concerning "affinity of Cs-137 for... and suspended solids" is contradictory to last two sentences in paragraph two of page 3-66 and the last two sentences in the first paragraph on P. D-21. Which is correct?	The Kiser (1979) and Prout (1958) studies are not contradictory with the last two sentences in paragraph 2 of page 3-66 of the Draft EIS. The Kiser and Prout studies were considered to show the affinity (K_d) of cesium -137 had for the sediments or suspended solids. The sentences in questions refer to transport modes (dissolved versus suspended). At low suspended solids concentrations, the dissolved fraction will carry more cesium-137 than the suspended solid. This is not contradictory to the K_d concept.

Comment number	Comments	Responses
	2. P. D-6, Table D-2:	
EV-3	Sum of "Percentage of total Cs-137 inventory in interval" equals 99, not 100. Is difference due to rounding?	The difference is due to rounding.
	3. P. D-8, Table D-3 and references to it on P. D-8, first full paragraph:	
EV-4	(a) Units of radioactivity concentration appear to be incorrect. How do changes affect subsequent impact estimates and conclusions?	Units presented in Table D-3 (D-8) are indeed incorrect and should be microcuries per square meter. This is an undetected typographical error and does not affect subsequent estimates of impact. Transport estimates were derived independently of inventory estimates.
EV-5	(b) In column "Total Curies" provide error estimates so that readers can evaluate precision of presented distribution.	Inventory estimates were made using three different techniques based on stratified random sampling, aerial gamma spectroscopy, and a "weighted" analysis of radiocesium contents (microcuries per square meter) of individual soil cores. Error estimates could be calculated only for the stratified random sampling estimate: 56.89 ± 8.86 Ci (± 95 percent confidence limit). This estimate provided the lowest estimate (mean) of the radiocesium inventory. The highest inventory estimate was derived from the "weighted" soil core analysis (67.09 Ci). This highest estimate was used as the inventory in Steel Creek. Greater detail on these analyses is presented in Smith et al., 1982, Chapter VI).
	4. P. D-6, last sentence and its continuation on P. D-8 with reference to Table D-6:	
EV-6	Statement is true for only 4 of 7 comparisons; the average difference is less than 7. How does this change in the Co/Cs ratio affect subsequent sections involving Co inventories and concentrations based on Co/Cs ratios?	The statement in question has been revised in the EIS to reflect the mean factor of 15.15, which is based on the mean Co-60/Cs-137 ratio. The seventh point is an outlier and therefore was not included in the calculations. As noted in Section 4.1.2.4, Co-60 contributes very little to the dose to the hypothetically maximally exposed individual. Cobalt-60 contributes less than 1.0 percent to this dose even though the calculated transport ratio (Co-60/Cs-137) for the first year is about 0.06. Thus, small errors in estimating the concentration of Co-60 released to the Savannah River will have minute effects on the calculated dose.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	5. P. D-8, Table D-6:	
EV-7	How was outlier in footnote b. identified? Include method reference and parameters for outlier identification and justify testing for outlier occurrence.	Although the ratio (Co-60/Cs-137) of 0.6 could be identified statistically as an outlier, it is unlikely that such a high ratio could exist at the present time in the Steel Creek swamp system. A high ratio is unlikely on the basis of the radioactively decayed release data which provides a ratio of about 0.015. In addition, the isopleths of exposure rate for Co-60 and Cs-137 do not support a high concentration ratio (Boyns and Smith, 1982; EGG Report 1183-1816, "An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina").
EV-8	Value 0.119 is incorrect. What are triple hyphens in columns 5 and 7?	Table D-6 of the EIS has been corrected to reflect the correct value, 0.112 versus 0.119. The hyphens are used to indicate the radioactivity was below the limit of detection.
	6. P. D-8, first full paragraph, lines 8-12.	
EV-9	Provide statistics supporting these statements including level of confidence.	Throughout the Steel Creek system (corridor and delta), 45 percent of the variation in gamma exposure rates [1 m (mR/hr)] was explained using multiple regression techniques (error df = 79). Surface-soil radiocesium content [0.1 m^3 (1 m^2 area x 0.1 m depth)] alone explained 36.9 percent of the variation. Woody plant species leaf Cs-137 concentrations and subsurface-soil texture were also significant ($p<0.10$) variables in the regression but explained relatively little of the variation (<3%) in exposure rates. When regressions were performed using data from individual stream sections, however, $\underline{r}^2$ values ranged from 0.35 to 0.82.
	7. P. D-11, Table D-4:	
EV-10	(a) Provide data for sediment densities so that "Total Curies" in Table D-3 can be verified.	Soil bulk density values were extremely heterogeneous throughout Steel Creek. Average surface soil (0-10 cm) bulk densities (g-dry/cm^3) ranged from 1.43 to 0.48 at different sampling locations along the stream floodplain while subsurface (10-20 cm) soil bulk density averaged from 2.01 to 0.57 at different locations.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EV-11	(b) Footnotes a. and c. appear contradictory, i.e., N versus "composite"; provide explanation.	Rather than a composite sample, the table was derived from data for all samples collected at the 12 locations. Footnote "a" has been reworded to reflect this.
	8. P. D-11, Tables D-4 and D-5:	
EV-12	Footnotes b. in both tables ask the reader to accept that visual inspection can objectively and numerically with precision, distinguish between particles sized 0.05-0.002 mm (silt) and less than 0.002 mm (clay). I do not accept "visual inspection" as a precise method. Provide quality control data to standardize differences between observers and demonstrate observer accuracy and precision.	While visual classification of soils is not a substitute for grain-size analyses, visual classifications do provide a valid means for characterizing the soils of the Steel Creek corridor. Visual classifications are often performed in the field by soil scientists and engineers. Standard grain-size analyses are being performed and the results are being evaluated in relation to cesium concentrations.
	9. P. D-12, Table D-7:	
EV-13	Number of observations do not total to 1851.	Table D-7 in the Draft EIS contained two typographical errors. The number of observations at location 10 is 60 rather than 10 and the number of observations at location 110 is 138 rather than 135. These changes have been made in the EIS.
	10. P. D-13, Section D.2.1.2, second and last sentences:	
EV-14	The second sentence states "no significant change" whereas the last sentence shows a 52% decline between 1974 and 1977, which I regard as significant. What is the purpose of the apologia in this paragraph?	The "no significant change" refers to cesium-137 concentrations in the sediments observed in 1976 and 1977; these concentrations averaged 34.1 ± 50.3 picocuries per gram in 1976 and 39.9 ± 57.4 picocuries per gram in 1977. Based on these data, the sediment sampling interval in Creek Plantation Swamp was changed to once every five years, and the use of TLDs on a yearly basis. There is a change of 52 percent in the 1974 and 1977 data.
	11. P. D-13, Section D.2.1.3, first two sentences:	
EV-15	These two sentences are contradictory. Which is correct?	The two sentences are not contradictory; the first is a general statement most applicable to the main channel and the second sentence provides exceptions to the general statement.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	12. P. 15, Table D-8:	
EV-16	What is meant by hyphens in data columns?	The hyphens mean no analyses were performed; this table has been revised to include more recent monitoring data.
	13. P. D-15, Table D-9:	
EV-17	Only the last two numbers in Column 3 (Cs-137) and the next to last number in column 4 (K-40) are significantly different ($p = 0.05$) from zero. Comparisons of these data in Section D.2.1.4 are misleading because of zero inclusion in confidence interval and should be corrected.	The data in Table D-9 of the Draft EIS were provided to characterize the concentrations of cesium-137 and potassium-40 in sediments at the two water treatment plants. These concentrations are at or near the limit of detection. The comparisons are not misleading for the reader has access to Table D-9.
	14. P. D-16, Section D.2.2, first full paragraph on P. D-16 and referenced Table D-10:	
EV-18	(a) What types of vegetation (leaves, branches, etc.), and what species are included in these samples?	The vegetation along the Steel Creek corridor included emergent type vegetation that grow in the shallow inundated portion of the creek. This vegetation included cattails, knot weed, duck weed, etc.
EV-19	(b) These data are amenable to analysis of variance which would provide confidence to conclusions drawn from this analysis. As presented now, I cannot accept that 1973 is statistically less than 1972 as stated and likewise 1972 from 1971; there appears to be sufficient within year variation so that between year differences may be difficult to demonstrate.	Statements made in Section D.2.2 concerning Table D-10 of the Draft EIS do not require judgments about absolute differences between years, just general trends. It is noted however that the slope of the time trend for sample point 9 is not statistically different from zero. From 1970-1973 all sample points except 9 and 4 show decreasing concentrations with time; after 1970 the concentrations decrease with time at sample point 4. As noted in the text, all sample points from 1973-1976 exhibit concentrations that do not change appreciably with time. However, the 1977 sample points all have cesium-137 concentrations that are greater than their corresponding 1975 and 1976 sampling points, with the exception that sample point 6 in 1976 had a higher concentration than in 1977. Many of the 1977 concentration data are greater than their corresponding 1975 points by a factor of 2 or more.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EV-20	(c) At minimum, error terms should be included with "Averages" to allow reader to decide if stated between year differences are accurate.	This suggestion has been adopted in the EIS.
EV-21	(d) Arithmetic calculations of "Averages" should be verified; four out of five checked were incorrect.	The arithmetic calculations have been checked and errors corrected in the EIS.
EV-22	(e) Smith et al. (1981) data for 1981 should be included in Table D-10 as it appears to be available; likewise for 1980 data if it is available.	Data compiled by Smith et al. (1982) are not comparable on a one-by-one basis with the data presented in Table D-10 because their locations are not identical and their methodologies differ from that used to develop Table D-10. However, results of their studies have been summarized in Appendix D of this Final EIS.
	15. P. D-16, Section D.2.2, second full paragraph on P. D-16:	
EV-23	This paragraph should be rewritten to clarify what is being compared; "generally less" must be suported by statistics or defined.	The text of Section D.2.2 has been revised to reflect the concern expressed by this comment.
	16. P. D-16, Section D.2.2, third and fourth full paragraphs on P. D-16:	
EV-24	(a) What tissues (or whole body?) are being discussed for deer and hogs?	Muscle tissue (edible portions) of hogs and deer were measured for cesium-137 concentrations.
EV-25	(b) Provide error estimates where concentrations are means to allow reader to decide if differences exist.	Information from a recent study on the cesium-137 concentrations in deer from SRP and the South Carolina Coastal Plain is presented in Section D.2.2 of the EIS.
	17. P. D-18, Section D.2.2, first paragraph on P. D-18 and referenced Table D-12:	
EV-26	(a) Justify selection of the "fish flesh bioaccumulation factor" of 3000. Arithmetic weighted average ± standard deviation of data in D-12 is 2746 ± 1833; perhaps a factor of 4579 (mean + standard deviation) would be more conservative in the sense that a factor considerably above average is used in computing potential human health impact.	The EPA notes in comment DA-21 that the use of 3000 for the bioaccumulation in the EIS dose assessments probably overestimates the cesium-137 in fish; they indicate that values of 40 to 1300 for freshwater fish are generally used in dose assessments. The NRC computer code LADTAP-II uses a default cesium-137 bioaccumulation factor of 2000. The choice of 3000 for use in this EIS is reasonably conservative because it is (1) more than twice that considered adequate by EPA; (2) 1.5 times that normally used in safety analyses; (3) nearly 1.5 times the mean of 527 specimens (2019) obtained from Steel Creek below Road A.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EV-27	(b) What human doses would result from model runs with the bioaccumulation factor of fish equal to 4579?	If the bioaccumulation factor for freshwater fish were 4579, the dose to the hypothetical maximally exposed individual would be 5.3 millirem during the first year after resumed operation, using the same assumptions used to calculate this dose with a 3000 bioaccumulation factor. The use of a bioaccumulation factor above 3000 is unwarranted.
EV-28	(c) Exponential transformation (cited in Table D-12, footnote d.) is applied because of distributional properties of data and not simply because they "vary widely." Support the use of exponential transformation or use arithmetic calculation.	The geometric mean should be used when the bioaccumulation data are lognormal. As the distribution of the data is unknown the arithmetic mean is provided.
	18. Table D-11:	
EV-29	Provide estimates of error associated with mean concentrations to allow reader decision of differences between means.	Standard error data are presented in Table 1 of Ribble and Smith (1983). To convert cesium-137 concentrations in dry weight to concentrations in wet weight, divide by 5.
	19. P. D-18 and D-21, Section D.2.3.1, first two paragraphs:	
EV-30	Provide 1982 data comparable to "November and December" 1981 data with associated error estimates.	No data measurements were made in November and December 1982. The mean cesium-137 concentration in the seven water samples from Steel Creek was 5.31 ± 1.81 (2 standard errors) picocuries per liter.
	20. P. D-21, Section D.2.3.1, first full paragraph on P. D-21:	
EV-31	Since this ratioing estimate of Co-60 concentrations is used several times in Appendix D, a brief description along with error estimates would be very helpful to the reader and would strengthen confidence in estimates of Co-60 concentrations.	Of the approximately 250 samples analyzed in the Spring 1982 cesium-137 transport study, Co-60 was detected in only 4 suspended solids samples and was below the limit of detection (0.2 picocurie per liter) in all of the soluble fractions. Therefore the procedure followed by Hayes and Watts (1983; DPST-83-673) was used to estimate the concentration of Co-60. It is noted that Co-60 contributes very little to the dose to the hypothetically maximally exposed individual, less than 1.0 percent (Section 4.1.2.4). Thus, small errors in estimating the concentration of Co-60 released to the Savannah River will have minute effects on the calculated dose.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	21. P. D-23, Section D.2.3.3, first and fourth full paragraphs on P. D-23 and Table D-14:	
EV-32	(a) Demonstrate and provide supporting statistics that 0.033 pCi/l is higher than 0.028 pCi/l.	There is no statistical difference between 0.033 and 0.028 pCi/l.
EV-33	(b) Recent measurements of finished water at Beaufort-Jasper (0.028 pCi/l of Cs-137) and Cherokee Hill (0.033 pCi/l of Cs-137) demonstrate a much smaller reduction in finished water concentrations of Cs-137 than originally estimated by 1965 studies. The latest Steel Creek Cs-137 concentration available in the DEIS is for 1981 (5.30 pCi/l) which results in a predicted Cs-137 concentration of 0.04 pCi/l at Highway 301 (See Table D-17). From 0.04 pCi/l at Highway 301, finished water at Beaufort-Jasper and Cherokee Hill contain 0.028 pCi/l of Cs-137 (a reduction of 30% rather than 79.3% as in Table D-14) and 0.033 pCi/l of Cs-137 (a reduction of 18% rather than 97.5% as in Table D-14), respectively. Please respond to this interpretation of data presented in Section D.2.2.3.	The cesium-137 measurements made during Spring 1983 at the two water treatment plants were part of the initial phases of a monitoring program that has been established prior to the restart of L-Reactor. This program, which uses specialized sampling and analytic techniques, will be extended to monitor the finished water from these plants following the restart of L-Reactor as well as Savannah River water at several locations (Section 6.2.4). The analysis proposed by the commentor is flawed because it is not based on synchronous measurements at the locations needed to establish the appropriate reduction factors. The 0.04 picocurie value used in Table D-17 of the DEIS represents the average conditions at the Highway 301 bridge for the 1979 to 1982 period (see footnote "b" of the table). No special measurements were made at the 301 bridge during the period of the special finished water monitoring study. On the other hand, the reduction factors calculated by Hayes and Boni (1983) and presented in the Table D-14 of the DEIS are based on synchronous measurements at the different locations. The ongoing measurements at the Beaufort-Jasper and Cherokee Hill water-treatment plants are being supplemented by measurements upriver and downriver from SRP and by measurements of the raw water being treated by these plants. When these measurements are completed, a thorough evaluation of the river-related reduction factors and treatment plant removal factor will be made.
	22. P. D-24, Table D-14:	
EV-34	Are all of these data from 1965 sampling and if so were they taken in the same time period?	As noted in Hayes and Boni (1983; DPST-82-1077), all data were obtained 10-17 December 1965.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	23. P. D-26, Section D.3.5:	
EV-35	Does the estimate of 0.4 Ci of Cs-137 in vegetation include roots or is it above-ground vegetation?	The transport during the first year attributable to biotic transport is based on a surficial biomass inventory of 304 grams per square meter. Based on Tables D-3 and D-10 of the Draft EIS and the biomass estimate of 304 grams per square meter, the transport estimate is about 0.13 curie, some 3 times less than the 0.4 curie used in the total transport estimate of 4.4 ± 2.2 curies during the first year.
	24. P. D-26, Section D.3.6:	
EV-36	Are these estimates of volume and travel time consistent with the hypothesis in the third full paragraph on P. D-32 where a four day "lag" was proposed to link highest flow in March 1982 with highest concentrations per liter of Cs-137; explain and clarify?	Yes, the information provided in Section D-3.6 is based on current flow conditions which do not normally reach the creek floodplain except during periods of high runoff. It is noted that the concentration of cesium-137 in the creekbed sediments are typically much less than in the sediments of the creek floodplain.
	25. P. D-27, Section D.3.8:	
EV-37	Which of these estimates of Co-60 inventory is considered best?	No preference is assigned to either inventory estimate. These estimates are meant to characterize the environment. Calculations of cobalt-60 resulting from the restart of L-Reactor were made independent of any inventory of cobalt-60 in Steel Creek.
	26. P. D-29, Section D.4.1, first paragraph on P. D-29 and referenced Figure D-10:	
EV-38	Why was change in flow not considered in modeling Cs-137 leaching from sediments? Flow and temperature must interact otherwise Section D.4.3 has no purpose in face of an r^2 = .88 (square of the correlation coefficient). Elaborate on how experiment was structured including monitoring of effluent temperature and flow in Steel Creek.	There is nothing to show that more leaching (higher Cs-137 concentrations) would occur from higher water flow rates. The rather flat profiles of the floodplain would indicate that higher flows would decrease the Cs-137 concentrations in water because of an increase in the water volume to floodplain area ratio. In the absence of data on continued high water-temperature flow in Steel Creek, it was assumed that the Cs-137 concentration would follow the measured concentrations at the Cypress Bridge location. Laboratory studies on Cs-137 extraction by hot water would indicate that about 5 percent could be extracted. The laboratory conditions of vigorous stirring of sediment would not be duplicated in the Steel Creek environment.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		The calculations were based on environmental monitoring data on Cs-137 concentrations (weekly composites) at Cypress Bridge. The outlet temperatures from SRP reactors (during operation) are relatively constant (typically about 70°C) and flows were measured by a USGS gauging station at Cypress Bridge. [Also see the description of June 1976 study of hot water flows from P-Reactor (Du Pont, 1982; DPST-81-241)]. The correlation coefficient of 0.94 ($r^2 = 0.88$) was developed for equation fit to the data developed from the June 1976 studies (Figure D-10 of the Draft EIS).
	27. P. D-29, Section D.4.1, second sentence of second paragraph and associated, although not referenced, Table D-15:	
EV-39	Regression analysis of data in Table 15 probably would not support a slope significantly different from zero as purported in the text sentence.	The desorbed fraction as given in Table D-15 of the Draft EIS, is a combination of the dissolved fraction and the amount left in suspension after centrifugation for one-hour. The dissolved fraction represented 49.9 percent at 70°C; 30.8 percent at 52°C; 16.7 percent at 43°C and 3.8 percent at 22°C of the total, desorbed activity. These data showed that the higher temperature extracted more dissolved Cs-137 than the lower temperatures.
	28. P. D-29, Section D.4.1, third paragraph (one sentence):	
EV-40	What are "these analyses"? There has been nothing presented to indicate how the desorption estimate of 1.7 Ci of Cs-137 was calculated. Desorption is a critical issue and must be substantiated.	The Cs-137 concentration data at Cypress Bridge were fit with an exponential representation of the data, integrated and a full flow of 1.1×10^6 m^3/day was used to estimate the 1.7 Ci/year (Du Pont 1982; DPST--81-241): Total Ci = $1.7\ [e^{-0.026563t_1} - e^{-0.026563t_2}]$ where t = days.
	29. P. D-31, *Section* D.4.3.1, *first paragraph, line* 8:	
EV-41	How was the "20-percent-per-year decrease" estimated? On P. D-35, first paragraph, line 6 of Section D.4.4, it is stated that "a 20 percent reduction in transport is assumed." Support this assumption.	The assumed reduction in transport in the third and subsequent years of 20-percent decrease per year is based on engineering judgment.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	30. P. D-32, Section D.4.3.1, full paragraphs 1, 2, 3, and 4, Table D-16, and Figure D-11:	
EV-42	(a) Collection of data at Cypress Bridge (flow) and at the mouth of Steel Creek (Cs-137/l) appear to obviate calculation of Cs-137 transport because nothing is known about flow rates in Pen Branch which joins Steel Creek between its mouth and Cypress Bridge. In the presented analysis, Pen Branch is assumed to flow at a constant 12.7 m^3/sec (greater than ten times the flow in Steel Creek). In late winter-early spring, there is heavy rainfall in the piedmont-coastal plain of South Carolina resulting in large fluctuations of creek flows. It is not surprising that there is no significant correlation between the Cs-137 transport (mCi/day) and flow (m^3/day) since fluctuating dilution by Pen Branch cannot be factored out of the variation between transport and flow in Table D-16 and Figure D-11.	K-Area discharges cooling water to Pen Branch at a rate of about 11 m^3/sec during operation of the reactor, and at about about 2.5 m^3/sec when the reactor is not operating. These discharges dominate any natural flow that may be present in Pen Branch (estimated to be 1.7 m^3/sec). The flow from K-Area is relatively constant (12.7 m^3/sec) most of the year and combines with Steel Creek flow in the swamp below the Steel Creek delta (see Figure D-1). Pen Branch is not expected to contribute to the remobilization of cesium-137 in the Steel Creek system.
EV-43	(b) How is similarity between March 21-28, 1982 and resumed L-Reactor operation shown in Figure D-11 and Table D-16? Flow during March 21-28, 1982 is not significantly different (p = 0.05) from the previous 8-day perod (March 13-20, 1982).	The flow during the period of March 21-28, 1982, is not significantly different from the that of the previous week. The concentration of Cs-137 is relatively constant (within counting error) over the period shown in Table D-16. However, the March 21-28, 1982, data resulted in a higher estimate of Cs-137 transport which was used in the final estimation.
EV-44	(c) The third and fourth full paragraphs on P. D-32 are not supportable in light of comments 31a and 31b above. Also, present the hydraulic model of Steel Creek that demonstrates that flow rate and rate of erosion are linearly related as purported in the calculation of Cs-137 transport in the fourth full paragraph on P. D-32.	There is no data to date on suspended solids concentration in onsite streams to indicate other than a simple linear hypothesis would be applicable. The lower part of the streams are a depositing rather than an eroding environment (Ruby et al., 1981). The cesium-137 released to Steel Creek was transported and deposited under flow conditions that are expected to be similar to those when L-Reactor operation isresumed, about 11 cubic meters per second. Steel Creek has received thermal discharges up to 22 cubic meters per second (1961-1963) and thermal discharges of about 11 cubic meters persecond until L-Reactor was placed in standby status in 1968 (Section 3.4.1.2).

Comment number	Comments	Responses
	31. P. D-36, Table D-17, Footnotes a and b:	
EV-45	Provide all reduction factors and flow rates in one table. I could not find values for flow at (1) Steel Creek mouth, and (2) Savannah River at 1.5 river miles below Steel Creek. Also, I could not determine factor relating current inventory transported values between Steel Creek mouth and Savannah River at 1.5 miles below Steel Creek.	As noted in Section 3.4, the flow in Steel Creek at Cypress Bridge is about 1.5 cubic meters per second. The direct discharge of L-Reactor cooling water to Steel Creek will increase this flow by about 11 cubic meters per second (Section 4.1.1.2). Thus, the total flow across the delta (with L-Reactor up) will be about 12.5 cubic meters per second. Contributors of flow from the swamp and Pen Branch enter Steel Creek below the delta and are not expected to contribute to the remobilization of cesium-137 and cobalt-60 in the Steel Creek system. The physiography of the Savannah River 1.5 river miles downstream from the creek mouth greatly promotes mixing of the river water (Section 4.1.1.4). The decrease in concentration of cesium-137 between the mouth of Steel Creek and the Savannah River, 1.5 river miles downstream from the mouth, is based on changes in the flow regime in Steel Creek (3.95×10^{11} liters per year) and that of the river (9.31×10^{12} liters per year). Between SRP and the Highway 301 bridge, the flow of the Savannah River increases on the average by at least 6 percent. The decrease in cesium-317 concentrations in the Savannah River between the Highway 301 and 17 bridges is based on the DEIS Table D-14 (Hayes and Boni, 1983; DPST-82-1077).
	32. Appendix D and Figure D-9: Comment on the relative error of impact estimates and probable direction of the error.	
EV-46	Where error estimates were presented for data in the data chain culminating in impact estimates, relative error was calculated as the standard deviation divided by its mean; this statistic is the coefficient of variation. For seven sets of data in the impact estimate data chain, the average unweighted coefficient of variation was 36.3%. Assuming that impact estimates are from a normally distributed population, the 95% confidence interval (±) about any specific estimate of impact would be plus or minus 60% of the value ascribed to the impact estimate. For example, if an impact estimate equaled 10, the 95% confidence interval (±) would be from 4 to 16. That is, one can expect, by chance, that the estimate of impact will be a value less than 4 or	Inventory estimates for cesium-317 and cobalt-60 remaining in Steel Creek and the offsite Creek Plantation swamp are presented in Section D.3. This information is used in the environmental characterization provided in Section 3.7.2. The transport calculations were made independently of the inventory estimates. The magnitude of the inventory did not enter in the transport calculations.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	greater than 16 five times out of one-hundred. In the portion of the L-Reactor radiological impact estimate presented in Appendix D, the direction of the impact estimate error will probably be to the plus side. This judgment is based on the fact that 55 of the 198 curies of Cs-137 (28%) located in the Savannah River watershed below L-Reactor cannot be accounted for so that estimates of curies of Cs-137 located in areas of the watershed are most probably biased low. If more than 198 curies could be accounted for, the judgment would be that the estimates were biased high. In conclusion, whatever the impact estimate (e.g., Cs-137 concentration of Cs-137 inventory), the actual value is probably greater than the estimated value.	
	33. PP. D-27 through D-37, Section D.4: Comment on Section D-4 "Remobilization of Radiocesium and Radiocobalt" wherein an alternative model is presented.	
EV-47	Critical parameters of the model in Section D.4 are (1) radionuclide desorption by hot water from sediments and (2) radionuclide-in-sediments movement by erosion-transport by dramatically increased water flow in Steel Creek. Parameter estimates presented in Section D.4.4 were demonstrated to be based on insufficient data (Comments 27 and 28 [desorption] and Comment 31 [erosion-transport]) and are therefore questionable. There are no additional data presented from which alternative parameter estimates can be made, so a logical model is the sole basis from which radionucide-sediment remobilization may be estimated. It is given that hot water and higher flow are expected to remobilize radiocesium and radiocobalt in Steel Creek and move them into the Savannah River. It is intuitive that remobilization in the first year will be greater than 0% but less than 100% of the	To support an estimate of 29 Ci discharged to the Savannah River the first year of L-Reactor operation would require the transport of large amounts of sediment. Greater than 95 percent of the Cs-137 in the Steel Creek system is located in the sediments in floodplain. The average concentration of Cs-137 in these sediments is estimated to be less than 125 pCi/g in the upper 10 cm of sediment. The amount of sediment containing this Cs-137 concentration would be greater than (57.9 Ci x 1 x 10^{12} pCi/g /125 pCi/g) 4.6 x 10^{11} g. If 29 curies of Cs-137 were to be remobilized during the first year after restart, greater than 2.2 x 10^{11} g would have to be moved at suspended sediment levels of more than 550 mg/l across Steel Creek delta. These suspended sediments would have to be sustained for a year. Suspended sediment concentration data do not support a sustained suspended solids concentration of 550 mg/l or short duration suspended loads of higher magnitude in South Carolina Coastal Plain streams.

Comment number	Comments	Responses
	radionuclide inventories in Steel Creek sediments. The least biased estimate of radionuclide remobiliza-tion in the first year is the midpoint of the range of possibilities, in this case 50%. Remobilization in subsequent years can be shown by the same argument to again be 50% of what remains. That is, 29 curies of Cs-137 (50% of the 57.9 curies in Steel Creek sediments) are remobilized in the first year of L-Reactor reoperation, leaving 29 curies still in Steel Creek sediments. In the second year, 14.5 curies of Cs-137 (50% of the remaining 29 curies) are remobilized leaving 14.5 curies. Each subsequent year, 50% of radiocesium (and radiocobalt) are trans-ported from Steel Creek to the Savannah River. Assuming that Cs-137 in vegetation (0.4 curie [Sec-tion D.4.2]) is transported to the Savannah River in the first year (as assumed in Section D.4.2) the total first year input would be 29.4 curies of Cs-137. The second year input would be 14.5 curies and in the tenth year only 0.1 curie would be trans-ported from Steel Creek to the Savannah River; cumu-lative Cs-137 transport (including Cs-137 in vegeta-tion in the first year) will have been 58.2 curies. Impacts on finished water at Beaufort-Jasper and Cherokee Hill are greater due not only to an alterna-tive model but also to reestimation of reduction fac-tors between Highway 301 and the two-water treatment facilities (refer to comment 22b). Reestimated re-duction factors for Beaufort-Jasper and Cherokee Hill are 18% and 30% respectively. Impacts to water qual-ity (natural and finished water) due to the alterna-tive model and reestimation of reduction factors associated with water treatment facilities are pro-vided in a revised Table D-17 from the DEIS. Table format and assumptions in footnotes are unchanged; only Cs-137 inventories and concentrations are dif-ferent. The resulting impacts in the first year of L-Reactor reoperation to finished water at Beaufort-Jasper and Cherokee Hill are 203 and 36 times greater under this analysis than under the analysis presented in the DEIS for L-Reactor.	Appendix D has been updated to include results of radiocesium monitoring in Steel Creek during the 18 week period from April through August, 1983. Thse results support the sediment-water transport estimate of 2.3 ± 1.8 curies per year during the first two years; they do not support the contention that transport should be 29 ci during the first year.

Comment number	Comments	Responses
	What are resulting doses to humans from revised water quality impacts presented above and in Comment 18.	
EV-48	To summarize, analysis of data employed in the draft Environmental Impact Statement for L-Reactor (SRP) (Sect. D-4) to estimate parameters demonstrates that (1) data are insufficient to support parameter calculations, or (2) alternative calculations resulting in much higher impact estimates are as defensible as impact estimates presented in the DEIS. As a result, I have no confidence in DEIS conclusions concerning movement of radionuclides now in Steel Creek into the Savannah River. Apparently data do not exist from which radionuclide movement can be estimated. In the absence of such information with which impacts to human health can be estimated, cooling water from L-Reactor should not be discharged into Steel Creek.	Appendix D contains a thorough characterization of cesium-137 and cobalt-60 in the affected environment. The appendix also provides a rational approach for calculating the transport of cesium-137 and cobalt-60 from Steel Creek, in the Savannah River and to downstream water users. These transport estimates are independent of the inventories in Steel Creek. Remobilization and transport from Steel Creek are calculated from a data base developed from (1) cooling-water flow tests of the L-Area equipment at ambient water temperatures and discharges from L-Reactor outfall at rates up to 56 percent of the anticipated discharge when L-Reactor is operating; (2) laboratory desorption test; (3) transport during a hot-water diversion from P-Reactor at discharges up to 20 percent of the anticipated L-Reactor discharge; and (4) conservative estimates of Cs-137 transport in vegetation expected to be killed by the L-Reactor cooling-water flow. Transport calculations in the Savannah River and water-treatment plants are based on synchronous measurements at several river locations and of the finished water from the treatment plants. The approach used by the commentor to estimate a transport of 29 curies of cesium-137 during the first year has been shown to be invalid on the basis of suspended solid transport considerations.

Comment number	Comments	Responses

Revised Table 4-15. Alternative Model (Comments 32 and 33)

Estimates of cesium-137 remobilization from Steel Creek compared with current transport values[a]

Location	River Mile	Inventory transported (Ci/yr)				Concentration in water (pCi/l)			
			After restart				After restart		
		Current values	1st year	2nd year	10th year	Current values	1st year	2nd year	10th year
Steel Creek mouth	141.6	0.25	29.0	14.5	0.1	5.3	73.6	36.8	0.03
Savannah River at 1.5 river miles below Steel Creek	140.1	0.41[b]	29.0	14.5	0.1	0.04[b]	3.10	1.55	<0.01
Hwy. 301 bridge	118.7	0.39[b]	28.3	14.2	0.1	0.04[b]	2.90	1.45	<0.01
Hwy. 17 bridge	21.4	0.20[b]	14.8	7.4	0.1	0.02[b]	1.52	0.76	<0.01
WATER-TREATMENT PLANTS									
Finished water									
Beaufort-Jasper	39.2	--	--	--	--	0.028	2.03	1.02	<0.01
Cherokee Hill	29.0	--	--	--	--	0.033	2.93	1.20	<0.01
EPA interim primary drinking-water standard	--	--	--	--	--	200	200	200	200

[a]Based on mean transportation estimates made by Hayes (1983) and Hayes and Watts (1983) and data presented in Table D-14, and average flow rates in the Savannah River at locations indicated. Estimates of concentration *and transport for the first, second, and tenth years represent only the contribution resulting from the remobili-*zation of cesium-137 and cobalt-60 in Steel Creek by the resumed operation of L-Reactor. No alteration of existing water-treatment-plant systems were assumed.

[b]1979-1982 average concentration measured at the Hwy. 301 bridge was 0.04 picocurie per liter; other values derived using appropriate flow rates and reduction factors.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	STATEMENT OF LEGAL ENVIRONMENTAL ASSISTANCE FOUNDATION (LEAF) 1102 Healey Building, 57 Forsyth St., Atlanta, GA 30303 (404/688-3299) November 14, 1983 The Legal Environmental Assistance Foundation (LEAF) appreciates this opportunity to comment on the Draft Environmental Impact Statement of the proposed restart of the L-Reactor at the Savannah River Plant. NEED	
EW-1	The most glaring error of the DEIS is its failure to convincingly state the need for a vast and immediate increase in nuclear weapons materials production, particularly in light of the U.S. public's overwhelming endorsement of the nuclear weapons freeze movement.[1] DOE provides us with no evidence that the partial production option combining accelerated use of the Mark-15 at the SRP reactors and production of less-than-6-percent plutonium at the N-Reactor will not adequately meet U.S. nuclear weapons material needs. Nowhere do we find evidence that U.S. national security will be threatened by the delay of the L-Reactor operation until such crucial mitigations as cooling towers and reactor domes can be constructed.[2] Thus, DOE has failed to show the need for the resumption of L-Reactor in January 1984. GROUNDWATER CONTAMINATION	The approval of the Nuclear Weapons Stockpile Memoranda by the President and the subsequent authorization and appropriation of funds by the Congress constitute the DOE mandate to produce specific types and quantities of nuclear materials and weapons. The national policy on the deployment of nuclear weapons and the increased need for weapons is beyond the scope of this EIS. Section 2.1.2.4 of this Final EIS has been modified to state that none of these options or combinations of options can provide the needed defense nuclear materials required, nor can they fully compensate for the loss of the material that could be produced by L-Reactor. Also see the response to comment AB-2. National security concerns and the policy on nuclear weapons deployment is beyond the scope of this EIS.
EW-2	The DEIS inadequately addresses the nature and extent of groundwater contamination which would result from increased affluent and waste discharges.	The EIS provides extensive discussions on the ground-water regime at SRP (Section 3.4.2 and Appendix F) and of potential impacts to the ground waters beneath the SRP from operation of L-Reactor and its support facilities (Sections 4.1.1.3, 4.1.2.2, 4.4.3, 5.1.1.2, and 5.1.1.4). Also see the responses to comment AJ-1, DA-2, and DA-4 regarding ground water.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EW-3	The DEIS concedes that contamination of the superficial Barnwell aquifer has occurred from seepage basins at M-Area. This contamination would be exacerbated by the use of seepage basins for L-Reactor waste water. The DEIS then assumes that no contamination will occur in the lower aquifers because of the impermeable clay layers that separate the aquifers. An assumption is not adequate; the FEIS must consider data from monitoring wells in these aquifers. The State of South Carolina has already documented groundwater contamination of the Tuscaloosa which is the lowest lying aquifer. The DEIS must address these findings and provide its own data on this problem. The seepage basin method is no longer considered to offer adequate groundwater protection and such a method may violate RCRA requirements. Detritiation is being considered for implementation at the entire SRP and should therefore be implemented as part of the restart of the L-Reactor.	Information on ground-water contamination in M-Area is provided in Sections 5.1.1.2, 5.1.1.4, and F.5.4 of the EIS. Alternatives to the use of seepage basins are discussed in Section 4.4.3. Use of other seepage basins on SRP is being evaluated on a sitewide basis (Section F.6). Also see the responses to comments DA-2 and DA-4 regarding ground water. Documentation concerning groundwater contamination at SRP was compiled by DOE and Du Pont and promptly reported to the State and EPA. The detection of chlorinated hydrocarbons in two Tuscaloosa producing wells was publicly announced by DOE on April 8, 1983.
EW-4	The impact of additional groundwater withdrawals is also inadequately addressed. The DEIS data relies on current use; the impact of additional withdrawals on aquifer pressure must be considered. Any excessive withdrawal from an aquifer can result in head reversal allowing contamination of a lower lying aquifer from a more superficial one. The impact of withdrawals for increased population and anticipated increased irrigation use must be discussed. This is especially important because the area surrounding the SRP is not in a capacity use area, therefore not subject to state control of new or additional groundwater withdrawals.	The impacts associated with additional ground-water withdrawal from the operation L-Reactor and its support facilities are discussed in Sections 4.1.1.3, 5.1.1.2, and 5.1.1.4. Also see the responses to comments AW-1 and BT-7 regarding additional ground-water withdrawal.
	AIR QUALITY	
EW-5	The DEIS inadequately discusses the impact on air quality of the use of a coal-fired generator for the L-Reactor. The DEIS notes a 15% increase in emissions and states that no violations will occur, but there is no information as to whether or not the SRP is in a non-attainment area or one subject to prevention of significant deterioration. Even assuming it is an attainment area, the DEIS must address the increment that these emissions will use.	The impact on air quality of the use of a coal-fired generator for the L-Reactor is discussed in Sections 4.1.1.6, and 5.1.1.3 of the EIS. The operation of the L-Reactor will not violate any ambient air quality standards. As noted in Chapter 7, the authority for the regulation of air emissions has been delegated by EPA to SCDHEC. SCDHEC issues operating permits and performs PSD reviews. As stated in Section 7.7 of the EIS, since all L-Reactor support facilities for steam supply and electric power generation will comply with existing permits, no new SCDHEC operating permits will be required. SRP is in an attainment area.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	ENDANGERED AND THREATENED SPECIES	
	The startup of the L-Reactor would also have potentially adverse effects on the area's endangered and threatened species.	
	Most of these adverse effects are traceable to 1) the thermal discharges released into the Steel Creek area[3] and 2) the increased water levels brought about by the release of cold water into the area, which is mentioned in the Environmental Assessment as being standard operating procedure for the reactor while it is on standby status. (The Environmental Assessment referred to here and in the draft EIS is the original assessment. A more current assessment is due around the first of December, and it is imperative that the questions presented herein be addressed in that assessment.)	
	Of primary concern are the wood storks from the Birdsville Rookery in Millen, Georgia, which use the Steel Creek area as a feeding ground. Several questions regarding the effect of the reactor on this wood stork colony have been left unanswered in both the draft EIS and the Environmental Assessment. Among these questions which must be addressed are:	
EW-6	1) How important a feeding ground is this particular area? If it is vitally important (for instance, if the storks travel longer distances to the SRP site than they do to alternative feeding grounds), it may be a critical habitat for the birds which are currently on the federal list of threatened species and under consideration for endangered status under the Endangered Species Act of 1973.	See the responses to comments AD-1 and AD-4 regarding the wood stork.
EW-7	2) Are there other areas which could serve as reasonable alternative feeding sites? (These areas must be available on a long-term basis, as opposed to being small temporary wetlands which would dry up after a short time.)	Other foraging sites on the SRP include those of Beaver Dam Creek, Four Mile Creek, and portions of the Savannah River Swamp.
EW-8	3) What is the average number of wood storks seen feeding at the SRP site in comparison to the number seen at off-plant sites? A significant difference could be another indication of the value of the SRP site to the local wood stork population.	See the responses to comments AD-1 and AD-2 regarding use of SRP and off-plant sites.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EW-9	4) How would the startup of the L-Reactor affect the fish population in the area, and thus the stork's attraction to Steel Creek? It is pointed out in the Patterson Associates report (commissioned by the Beaufort/Jasper Water Authority) that fish eggs and fish larvae cannot survive temperatures higher than 80 degrees Centigrade. A diminution in the fish population in the area would make it less attractive not only for the storks, but for a number of other birds and mammals, as well as the endangered American alligator, that feed in the area.	The restart of the L-Reactor with direct discharge would eliminate foraging habitat of the wood stork because water temperatures would be too high to support fish, the major food. This impact, including those to other species such as the American alligator, reptiles, birds, and mammals, is discussed in Section 4.1.1.4 of the EIS.
EW-10	5) What is the number of wood storks using SRP wetlands on any single day, and how does that compare to the number using other off-plant sites? The draft EIS (page C-38) shows 147 individuals using SRP wetlands on July 14. This is over 60 percent of the entire population of breeding adults.	The number of wood storks that were observed on the SRP in 1982 and 1983 is presented in Table C-7, Appendix C of the EIS.
EW-11	6) Are there other areas which could serve as reasonable alternative feeding sites? (These areas must be available on a long-term basis, as opposesd to being small temporary wetlands which would dry up in a short time.)	See the response to comment EW-7.
EW-12	7) What is the fledgling success rate of this colony in contrast to published fledgling rates for Florida populations? If the Birdsville colony is able to produce young at a higher than normal rate, then recognizing that this is an endangered - or nearly endangered species - it should not be disturbed nor should its food base be disrupted.	See the response to comment AD-9 regarding fledgling success rate.
EW-13	8) What are the predicted land use patterns and their effects on the non-SRP sites? Most of the non-SRP areas used by the Birdsville colony are probably on private lands. These sites may be in danger of conversion into agricultural lands over the next decade or so. The SRP wetlands, on the other hand, are part of the buffer area around the reactors and should be unaffected by changing land use patterns.	See the response to comment AD-10 regarding predicted land-use patterns and their effect.
EW-14	9) Why were there no wood storks recorded using the Steel Creek area after July 12? Had the colony dispersed or were the cold water releases (as mentioned in the Environmental Assessment as being standard) responsible for the storks' absence? If raised water levels were created artificially this suggests a strong bias in the data in terms of the actual amount of	See the response to comment AD-11 regarding observations of wood storks after July 12th.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	usage that Steel Creek might have received without the raised water levels. If this is so, why weren't the fluctuating water levels mentioned in the DEIS as a possible source of bias in the data?[4]	
EW-15	10) On page 3-52 of the DEIS it says that the SRP wetlands appear to be important post breeding feeding habitat. Table C-7 shows heavy usage of SRP wetlands during June and July. Page C-37 states that birds were nesting in July 1980. On what data were the "post breeding" conclusions drawn?	See the response to comment AD-12 regarding "post breeding" habitat.
EW-16	11) Is it possible that the observed number of wood storks seen using the SRP wetlands in 1983 is a minimum number, due to variation in the timing of surveys? For instance, if a feeding site is surveyed early in the morning it may show fewer birds than a similar survey conducted in the early afternoon after thermals[5] have had a chance to develop.	Based on surveys from 23 June to 31 August 1983, a total of 238 breeding adults was counted at the Birdsville rookery. Surveys on the SRP, which were conducted from as early as 9:01 a.m. to as late as 9:00 p.m., showed a maximum single observation of 147 individuals and a cumulative total of 478 observations. Also, see the response to comment AD-15 regarding the timing and methodology of the surveys.
EW-17	It is necessary to bear in mind that this colony of wood storks is the northernmost in the world, and for purposes of genetic diversity, it is therefore vitally important. Any adverse effect on this colony may cause irreparable damage to the entire species. Congress has recognized the importance of preservation of the world's genetic diversity as an important goal. Preservation of the diversity within species is also recognized as necessary. This is shown by the extension of the Endangered Species Act to cover subspecies and local populations. Besides mere genetic factors, protection of peripheral colonies of a rare species also helps to insure against the impact of a local catastrophe (such as hurricanes or prolonged drought). The effect of the reactor on the wood stork population would be considerably reduced if some provision could be made to reduce the amount of thermal effluents released into the wetlands and the Steel Creek area. The problem here is that, since 1980 when President Carter decided to increase the production of	See the responses to comments AD-16 and AD-17 concerning the Birdsville rookery. In addition, alternative cooling systems are addressed in Section 4.4.2 of the EIS.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	nuclear materials, there has been an apparent presumption that the L-Reactor could be restarted without any control of the thermal discharge. This presumption was apparently based on the prior operation of the plant and did not account for pollution laws enacted subsequent to the reactor being placed on standby status in 1968. Since then, the area has recovered to a great extent. The proposed startup, with no provisions for treatment of the thermal discharges, would reverse the recovery.	
	OFF-SITE TRANSPORTATION	
EW-18	The DEIS notes that the startup of the L-Reactor will increase both on-site and off-site transportation of radioactive materials. Although these shipments are subject to DOT shipping regulations, they are not subject to the NRC pre-notification requirements. The fact that increased amounts of radioactive materials will move through numerous states with no notification to the respective state governments should be addressed in the FEIS.	See the response to comment AY-10 regarding transportation of radioactive materials.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	FOOTNOTES	
	1. In May 1983, 278 members of the U.S. House of Representatives and 40 members of the U.S. Senate voted in support of HJRes 13 and SJRes 2, respectively, the Nuclear Freeze Resolutions, calling for a bilateral nuclear freeze between the Soviet Union and the U.S. In September 1983, 77% of the U.S. public polled by Louis Harris and Associates said they would "favor Congress passing a resolution that would call upon the U.S. to negotiate a nuclear freeze agreement with the Soviet Union that would encourage both sides to ban the future production, storage and use of nuclear weapons."	
EW-19	2. While DOE maintains that a closed loop cooling system at the L-Reactor would cost $39 million and take more than three years to install, the Chicago consulting firm of Patterson Associates, Inc. estimates that such a system would cost 8 to 9 million dollars with an installation time of 10 to 16 months. 3. The DEIS inadequately addresses the impact of the startup of the L-Reactor on the biologic systems in the affected area. The DEIS asserts that 1,000 acres of wetlands will be affected by thermal discharges. This information is based on an early biological assessment which was based on insufficient data. An independent study by Patterson Associates, Inc., for the Beaufort/Jasper Water Authority found that in fact 28,000 acres of wetland would be affected. This divergence should be addressed in the FEIS. 4. Wood storks require areas with lowered water levels, where their prey (fish) have been concentrated. By adding water to Steel Creek, the water levels may be raised too high for the storks to forage successfully. 5. Wood storks, like other soaring birds, use thermals (columns of heated rising air) in order to easily travel long distances. Thermals do not normally develop until mid- to late-morning.	Responses to the Patterson Associates, Inc., report were submitted at the February 9, 1983, Senate Armed Services Committee hearing. With respect to the costs estimates of cooling towers, the Patterson Associates, Inc., report did not account for several significant cost elements and is thus in error. With respect to wetlands, the Patterson report erroneously included upland areas in the estimate of wetlands.

Comment number	Comments	Responses
	STATEMENT OF BASIL G. SAVITSKY Basil George Savitsky Post Office Box 50228 Columbia, SC 29250 November 12, 1983 Mr. M. J. Sires Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, SC 29801 Dear Mr. Sires: I am a graduate student in the Department of Geography at the University of South Carolina. My area of interest is agricultural remote sensing, but I am concerned about all forms of resource management.	
EX-1	As a student of the earth sciences, I've been following with interest reports about the Savannah River Plant, particularly the draft EIS concerning the status of the L-Reactor. It appears to me that the EIS should take into account all possible consequences of an operational L-Reactor. One such consequence is the actual use of nuclear weapons, and the potential purpose of the L-Reactor in such an environmental catastrophe cannot be overlooked. Although it would be easy to pass the responsibility for such an action from the realm of science to the political and military decision-making process, I recommend that scientific knowledge available on the environmental effects of nuclear war not be excluded from the EIS. I have enclosed a summary of findings from the recent Conference on the Long-Term Worldwide Biological Consequences of Nuclear War. The large number of participants in the conference and the eminence of the scientists representing the	The national policy on nuclear weapons, their deployment, and the need for increased weapons is beyond the scope of this EIS.

Comment number	Comments	Responses
	physical and biological disciplines gives an extremely high level of validity to the findings of the conference. Research was done on biological damage from various scales of nuclear war, so findings on the effects of a limited nuclear conflict could prove especially significant. Results of research on atmospheric dust content, lethal temperature changes, and the impact on the food supply represent new environmental hazards to those previously recognized such as radioactive fallout and fire. I strongly urge that the Proceedings from the conference be obtained, since they represent years of research on the environmental impact of the catastrophic use of what the L-Reactor would produce. And I would submit these summarized findings as enclosed for the record. Sincerely, Basil G. Savitsky Enclosure	

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses

THE WORLD AFTER NUCLEAR WAR
CONFERENCE ON THE LONG-TERM
WORLDWIDE BIOLOGICAL CONSEQUENCES
OF NUCLEAR WAR
OCTOBER 31-NOVEMBER 1, 1983

Summary of Conference Findings

CONFERENCE FINDINGS INDICATE STARTLING
CHANGES IN EARTH'S CLIMATE AFTER NUCLEAR WAR
COULD HAVE DEVASTATING IMPACT ON SURVIVORS

Embargoed until Midnight October 30, 1983.

INTRODUCTION

The world's nuclear arsenal today stands at over 12,000 megatons (MT), enough to destroy one million Hiroshimas. Recent studies estimate that anywhere from 300 million to 1 billion people would be killed outright in a large-scale nuclear war (5,000-10,000 MT yield) and an equal number would suffer serious injuries requiring immediate medical attention--which would be largely unavailable. But what of the longer-term effects of nuclear war? What kind of world would survivors face? New evidence suggests that the lingering atmospheric and biological consequences may be even more serious than the immediate ones.

These findings will be presented at the Conference on the Long-Term Worldwide Biological Consequences of Nuclear War being held in Washington, D.C. October 31 - November 1, 1983.

The findings are largely the result of studies done over the last two years by Richard P. Turco; Owen B. Toon, Thomas P. Ackerman and James B. Pollack, of NASA Ames Research Center; and Carl Sagan, of Cornell University, on the optical and climatic impacts of the dust and smoke particles which would be generated in nuclear war. Their work has been critically reviewed by some 100 eminent physicists, atmospheric scientists and biologists from the U.S. and other countries who participated in a series of meetings held earlier this year in Cambridge, Massachusetts.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses

The atmospheric findings, which augment earlier studies and introduce previously unforeseen consequences of nuclear war, have been reported in a paper entitled "Global Atmospheric Consequences of Nuclear War" (referred to as the "TTAPS" paper, after the names of its authors). The authors conclude that a nuclear war, even at the level of 100-1,000 MT could cause profound climatic and meteorological disturbances, including darkness and extreme cold, and that exposure to radioactivity would be much greater than previously projected.

Some 40 biologists reviewed the atmospheric findings, determined the biological consequences and also considered other potential ecological effects not caused by atmospheric changes. Their conclusions are outlined in a separate paper entitled "The Long-Term Biological Consequences of Nuclear War."* Their unanimous view is that the atmospheric stresses resulting from nuclear war could so disrupt the earth's biological support systems that the extinction of a significant proportion of the earth's animals and plants would occur. They conclude that the possibility of human extinction cannot be excluded.

At the Conference, Dr. Sagan will present the atmospheric and climatic consequences and Dr. Paul R. Ehrlich of Stanford University will present the biological consequences. The Conference begins at 2 P.M., Monday, October 31, in the Cotillion Ballroom of the Sheraton Washington Hotel.

METHODOLOGY

To study the optical and climatic effects of dust and smoke clouds generated in a nuclear war, the physicists ran computer models of dozens of different nuclear war scenarios. They adopted as a baseline case a 5,000 MT exchange with 20% of the explosive power (yield) expended on urban or industrial targets in the Northern Hemisphere. Given current arsenals, this is a realistic possibility for a full-scale war. Other cases studied ranged in total yield from 100 to over 10,000 MT.

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*See Appendix 1 for names of the principal authors.

Comment number	Comments	Responses

In each case, the scientists calculated:

1. How much dust and smoke was generated;
2. How much sunlight was absorbed by the dust and smoke;
3. How much the temperature changed;
4. How the dust and smoke spread, and how long before it all fell back to the surface;
5. The extent of radioactive fallout over time;
6. How much ultraviolet light reached the surface after the soot and dust fell out.

The following conclusions reflect aggregate data from the baseline scenario in the original TTAPS paper and from the paper on "The Long-Term Biological Consequences of Nuclear War." They have been substantially edited. Complete scientific and technical support data will be provided at the Conference.

CONCLUSIONS

1. Unbroken Pall of Darkness Would Cover Northern Hemisphere

Within a week after the war, the amount of sunlight at ground level could be reduced to just a few percent of normal; an unbroken gloom could persist for weeks over the Northern Hemisphere. The light would be absorbed primarily by sooty smoke from nuclear fires ignited by surface bursts and airbursts. The total amount of smoke released in the baseline model is 225 million tons (released over several days). Smoke particles are extremely small, which lengthens the time they remain in the atmosphere. The soil dust raised by surface bursts, while important, would have less climatic impact since it is typically poorly absorbing.

- Low light level would disrupt photosynthesis, food chain.
  In the early months following a substantial nuclear exchange, the amount of light filtering through the cloud cover might not be adequate to sustain photosynthesis. Even assuming that plants would be otherwise undamaged, which is unrealistic, the lack of light would severely limit growth, and the consequences would cascade through all food chains.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	2. Effects on Southern Hemisphere Greater Than Previously Assumed Large disturbances in global circulation patterns could greatly accelerate the interhemispheric transport of smoke, dust and radioactivity. Rapid interhemispheric mixing means that the Southern Hemisphere could be subjected to massive injections of nuclear debris soon after an exchange in the Northern Hemisphere. Possible rapid transport of dust and smoke from the Northern to the Southern Hemisphere may involve the entire planet in after-effects. Previous studies have assumed that Southern Hemisphere effects would be minor. 3. Harsh "Nuclear Winter" Would Prevail Contrary to the conclusions reached in most earlier studies, nuclear war probably would have a major impact on climate lasting for several years. It would be manifested by a dramatic drop in land temperatures to subfreezing levels for several months, large disturbances in global circulation patterns, and dramatic changes in local weather and precipitation. Even if the war were to occur in the summer, many areas might be subject to continuous snowfall for months. o <u>Subfreezing temperatures would substantially reduce chances for human survival.</u> Except for areas near coastlines, land temperatures would plunge from -15°C(+5°F) to -25°C(-13°F), with dire consequences for survivors. The impact of dramatically reduced temperatures on plants would depend on the time of year at which they occurred, their duration, and the tolerance limits of the plants. The abrupt onset of cold is of particular importance, though, since plants that normally can withstand subfreezing temperatures would have no time to develop tolerance. A spring or summer war could kill or damage virtually all crops in the Northern Hemisphere. Most uncultivated food sources also would be destroyed, as would most farm animals. Many animals that survived would die of thirst, as surface fresh water would be frozen over the interior of continents. Available food supplies would	

Comment number	Comments	Responses

be rapidly depleted. Most of the human survivors would starve.

o <u>Non-target areas that import food directly affected.</u>

Nations that now require large imports of foods, including those untouched by nuclear detonations, would suffer the immediate cessation of incoming food supplies. These countries would be forced to rely on their local agricultural and natural ecosystems. This would be especially serious for many less-developed countries, particularly those in the tropics.

4. Exposure to Radioactive Fallout Worse than Expected

Exposure to radioactive fallout would be more widespread than is predicted by standard empirical exposure models because of the intermediate fallout which would extend over many days and weeks. With unprecedented quantities of fission debris released into the atmosphere, even areas remote from the explosion sites would be subject to large doses of fallout radiation.

o <u>Radiation doses approach lethal dose for humans.</u>

In the baseline case, roughly 30 percent of the land at Northern mid-latitudes (30°N to 60°N) would receive a radioctive dose greater than 250 rads over several months. About 50 percent of the Northern mid-latitudes would receive a long-term dose greater than 100 rads. (This dose includes radionuclides ingested from contaminated food.) These doses are roughly ten times larger than previous estimates. A 100 rad dose is the equivalent of approximately 1,000 medical x-rays. A 400 rad whole-body acute dose is usually considered lethal. Doses this large can affect the immune system and increase the probability of infectious disease, cancer and genetic and embryonic defects.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses

5. No Ice Age, but the Ocean Would Not Provide Relief

Because the climatic effects would not last longer than a few years, an Ice Age would probably not be generated. Subfreezing temperatures will freeze most freshwater systems to considerable depth, leaving survivors without surface water. The oceans will not freeze due to their enormous reservoir of heat. It has often been thought that the coastal areas would be a major source of food for survivors of a nuclear war. However, the combined effects of darkness, ultraviolet light, severe coastal storms due to enormous land-sea temperature differentials, run-off of silt and toxic chemicals from the land, destruction of ships and concentrations of radionuclides in fish and other marine life cast strong doubt on this contention.

6. Fire Would be a Major Problem With Serious and Unanticipated Consequences

About one-sixth of the world's urbanized land area, or about 240,000 km^2 would be partially burned by about 1,000 MT of explosions in the baseline scenario. The remaining 4,000 MT of yield could ignite wildfires and firestorms. Uncontrolled fires could sweep over large areas. For example, multiple airbursts over California in the late summer or early fall could burn off much of the state, leading to catastrophic flooding and erosion during the next rainy season.

- <u>Urban fires would generate large amounts of deadly toxins.</u>

  Cities hold large stores of combustible, synthetic materials that would release large quantities of toxic gases (pyrotoxins) as they burn, including carbon monoxide, cyanides, dioxins and furans. These pollutants might have only limited immediate effect on vegetation, but they would certainly hinder the recovery of vegetation devastated by nuclear blast and fire. Transport by winds to distant, initially unaffected ecosystems could be an important additional adverse side effect. This problem had not been addressed in previous studies.

Comment number	Comments	Responses

7. Ozone Depletion Would Increase Exposure to Ultraviolet Light (UV-B)

High-yield explosions would inject nitrogen oxides (NO_x) into the stratosphere, which would result in large reductions in the ozone layer. The ozone layer, only 3 millimeters thick if it were brought down to sea level, shields the earth from UV-B, a damaging type of radiation. In the baseline case, dust and soot would absorb the increased UV-B at first. But when the dust and soot cleared a few months later, UV-B doses roughly 1.6 times normal would be transmitted to the surface.

Increased levels of UV-B can harm biological systems in several ways. The immune systems of humans and other mammals are known to be suppressed by relatively low doses of UV-B. Given the conditions of increased radioactive fallout and other stresses, such suppression of the immune systems leads to an increase in the incidence of disease. Protracted exposure to increased UV-B also may lead to widespread blindness among humans and other mammals.

8. Tropical Forests Could Disappear

Tropical plants are less able to cope with even short periods of cold and dark than those in temperate zones. If darkness or cold, or both, were to become widespread in the tropics, the tropical forests, which are the major reservoir of organic diversity, could largely disappear. This would, in turn, lead to the extinction of a majority of the species of plants and animals on earth.

- <u>Dependence on imports threatens survivability in tropical and developing countries</u>

The dependence of urban populations in many tropical and developing countries on imported food would lead to severe effects, even if those areas were not affected directly by the war. Large numbers of people would be forced to leave the cities and attempt to cultivate the remaining areas of forest, accelerating their destruction and the consequent rate of extinction. Regardless of the exact distribution

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	of the immediate effects of the war, everyone on Earth would ultimately be profoundly affected. 9. Even Small Nuclear Exchanges Could Trigger Severe After-effects Relatively large climatic effects can result from small nuclear exchanges (100 to 1,000 MT). A scenario involving 100 MT exploded in the air over cities could produce a two-month interval of subfreezing land temperatures, with a minimum near -23°C. In this scenario thousands of fires would be ignited and the smoke from these fires alone would generate a period of cold and dark almost as severe as in the baseline (5,000 MT) case. IN SHORT: In the aftermath of a 5,000 MT nuclear exchange, survivors would face extreme cold, water shortages, lack of food and fuel, heavy burdens of radiation and pollutants, diseases and severe psychological stress -- all in twilight or darkness. It is clear that the ecosystems effects alone resulting from a large-scale thermonuclear war would be enough to destroy civilization as we know it at least in the Northern Hemisphere. These long-term effects, when combined with the direct casualties from the blast, suggest that eventually there might be no human survivors in the Northern Hemisphere. Human beings, other animals and plants in the Southern Hemisphere would also suffer profound consequences. The scenario described here is by no means the most severe that could be imagined with present world nuclear arsenals and those contemplated for the near future. ###	

Comment number	Comments	Responses

The World After Nuclear War
Conference on the Long-Term
Worldwide Biological Consequences
of Nuclear War
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George M. Woodwell
Chairman

Carl Sagan
Physical Sciences

Peter H. Raven
Biological Sciences

Chaplin B. Barnes
Executive Director

Appendix 1

THE LONG-TERM BIOLOGICAL
CONSEQUENCES OF NUCLEAR WAR

This paper was prepared following a meeting of biologists on the Long-Term Worldwide Biological Consequences of Nuclear War (Cambridge, Massachusetts, 25-26 April 1983). The consensus of the 40 scientists at the meeting is presented here, assembled by the following committee.

Principal authors: Paul R. Ehrlich, Stanford University; Mark A. Harwell, Cornell University; Peter H. Raven, Missouri Botanical Garden; Carl Sagan, Cornell University.

Committee: Edward S. Ayensu, Smithsonian Institution; Joseph Berry, Carnegie Institute of Washington; Anne H. Ehrlich, Stanford University; Thomas Eisner, Cornell University; Stephen J. Gould, Harvard University; Herbert D. Grover, University of New Mexico; John Harte, University of California, Berkeley; Rafael Herrera, IVIC, Venezuela; Robert M. May, Princeton University; Ernst Mayr, Harvard University; Christopher P. McKay, NASA Ames Research Center; Harold A. Mooney, Stanford University; David

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	Pimentel, Cornell University; John M. Teal, Woods Hole Oceanographic Institution; and George M. Woodwell, Marine Biological Laboratory, Woods Hole.	

Comment number	Comments	Responses

TABLE 1

TEMPERATURES AND LIGHT LEVELS FOLLOWING A 10,000 MEGATON NUCLEAR WAR IN THE NORTHERN HEMISPHERE
(Severe But Not Implausible Scenario)

NORTHERN HEMISPHERE CONTINENTAL SURFACE TEMPERATURES*

Predicted Value	Duration	Area Affected	Possible Range
-45°F (-43°C)	4 mo	Midlatitudes	-63 to -9°F
-9°F (-23°C)	9 mo	Hemisphere	-27 to +27°F
27°F (-3°C)	1 yr	Hemisphere	+9 to +45°F

SOUTHERN HEMISPHERE CONTINENTAL SURFACE TEMPERATURES*

Predicted Value	Duration	Area Affected	Possible Range
0°F (-18°C)	1 mo	Midlatitudes	-27 to +27°F
27°F (-3°C)	2 mo	Midlatitudes	-9 to +45°F
45°F (+7°C)	10 mo	Midlatitudes	+9 to +55°F

NORTHERN HEMISPHERE SUNLIGHT INTENSITY AS PROPORTION OF NORMAL

Predicted Value	Duration	Area Affected	Possible Range
.01	1.5 mo	Midlatitudes	.003 to .03
.05	3 mo	Midlatitudes	.01 to .15
.25	5 mo	Hemisphere	.1 to .7
.50	8 mo	Hemisphere	.3 to 1.0

SOUTHERN HEMISPHERE SUNLIGHT INTENSITY AS PROPORTION OF NORMAL

Predicted Value	Duration	Area Affected	Possible Range
.1	1 mo	Midlatitudes	.03 to .3
.5	2 mo	Tropics & Midlatitudes	.1 to .9
.8	4 mo	Hemisphere	.3 to 1.0

*Coastal areas warmer but very stormy

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Executive Director

PANEL PARTICIPANTS
November 1, 1983

Atmospheric and Climatic Effects Panel

Thomas F. Malone, Moderator (See Program)

Paul J. Crutzen

Dr. Crutzen is currently Director of the Max-Planck-Institute for Chemistry in Mainz, Federal Republic of Germany; he previously headed up the Institute's Atmospheric Chemistry Division. He also serves as Affiliate Professor at the Atmospheric Science Department, Colorado State University, Fort Collins. He was previously Senior Scientist and Director of the Air Quality Division of the National Center for Atmospheric Research, Boulder, Colorado. In 1977, while serving at the Environmental Research Laboratories of the National Oceanic and Atmospheric Administration in Boulder, he received the NOAA Special Achievement Award.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	Georgiy S. Golitsyn	
	Dr. Golitsyn is Senior Scientist at the Institute of Atmospheric Physics of the Academy of Sciences of the USSR in Moscow. He is an expert in large-scale climatic dynamics, in planetary atmospheres and in turbulence theory. Dr. Golitsyn is a Corresponding Member of the Academy of Sciences of the USSR and is a member of the Joint Scientific Committee for World Climate Research Programs of the International Council of Scientific Unions and the World Meteorological Organization.	
	John P. Holdren	
	Dr. Holdren is Professor of Energy and Resources and Acting Chairman of the Energy and Resources Group, University of California, Berkeley. He holds concurrent positions as Participating Guest in the Energy and Environment Division of the University's Lawrence Berkeley Laboratory, Faculty Consultant in the Magnetic Fusion Energy Division of the Lawrence Livermore National Laboratory, and Senior Investigator at the Rocky Mountain Biological Laboratory.	
	He is Vice Chairman of the Federation of American Scientists and is currently Chairman of the U.S. Pugwash Group and a member of the Executive Committee of the International Pugwash Council. He is a Fellow of the American Academy of Arts and Sciences and serves as Vice Chairman of its Committee on International Security Studies.	
	In 1981 he was awarded a five-year MacArthur Foundation Prize Fellowship for distinction in the fields of physics, energy and environment.	
	Stephen H. Schneider	
	Dr. Schneider is Deputy Director, Advanced Study Program, National Center for Atmospheric Research. At NCAR he also serves as Senior Scientist and Head of the Visitors Program. He has written and consulted extensively and has participated in numerous forums on issues of climatic change, food and energy.	

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	He is a Founding Member of the Council on Science and Technology for Development and is Editor of the Journal Climatic Change. Richard P. Turco Dr. Turco has been a Research Scientist in atmospheric chemistry and physics at R&D Associates, Marina del Rey, California since 1971. Dr. Turco has made research contributions in areas of atmospheric science related to: stratospheric ozone photochemistry, aerosol physics and chemistry, and the chemistry of planetary atmospheres. He has served as a member of several national workshops and has written extensively on topics concerned with air pollution of the upper atmosphere. He is currently a member of the National Research Council's Committee on the Atmospheric Effects of Nuclear Explosions.	

Comment number	Comments	Responses

PANEL PARTICIPANTS
November 1, 1983

Biological Effects Panel

George M. Woodwell, Moderator (See Program)

Joseph A. Berry

Dr. Berry is a Staff Member, Department of Plant Biology, Carnegie Institution of Washington, Stanford, California, with which he has been affiliated since 1972. He also serves as Assistant Professor, Department of Biological Sciences, Stanford University. He holds degrees in Chemistry, Soil Science and Botany. His research interest is the physiological basis for plant-environment interaction.

Thomas Eisner

Dr. Eisner is Jacob Gould Shurman Professor of Biology at Cornell University, at which he has taught since 1957. He is an ardent naturalist, whose research deals with the behavior and ecology of insects, and with photographic and cinematographic documentation of little-known aspects of these animals. He has served as a director of Zero Population Growth, The Nature Conservancy, the National Audubon Society and The Federation of American Scientists and is currently a member of several committees of the American Association for the Advancement of Science. He is a Member of the National Academy of Sciences and a Fellow of the American Academy of Arts and Sciences.

John Harte

Dr. Harte is currently Professor of Energy and Resources, University of California, Berkeley, where he has taught since 1973. He also holds the position of Faculty Senior Scientist at the Lawrence Berkeley Laboratory. His research has ranged from theoretical elementary particle physics to environmental issues such as acid precipitation, water resource scarcity and toxic substance testing. He is the author of numerous papers

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	and is a member of and Principal Investigator at the Rocky Mountain Biological Laboratory. He has been a member of three National Academy panels concerned with problems of energy and environment. Mark A. Harwell Dr. Harwell is Research Associate, Ecosystems Research Center, and Assistant Professor, Natural Resources Department, Cornell University. He has initiated a number of activities related to the evaluation of the human and natural systems consequences of nuclear war, among them serving as a member of the Ecological Society of America's <u>ad hoc</u> committee on this topic.	

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	STATEMENT OF MAUREEN K. MURRAY Grade 8 Student of H.E. McCracken Middle School 13 Warbler Lane Hilton Head, SC 29928 Dear Mr. Sires:	
EY-1	I do not think that you should restart the L-Reactor because you and the DOE don't really know the risks and we, the people of the surrounding areas, do not want to be part of the death toll that makes up those statistics on risks. Most of us would like it very much if we could live our whole lives and go on living without the fear of a spill or explosion. I speak for everyone I know and for H.E. McCracken Middle School in South Carolina (about 74 miles away from the Savannah River Plant). The school did not make me write this. I went to one of your hearings and listened to both sides. In the beginning I was neutral, but later on as I heard more public speakers, I realized that the public was correct: The L-Reactor plant should stay closed. Sincerely, Maureen K. Murray Grade 8, Student of H.E. McCracken Middle School	The EIS contains thorough discussions of risks to the public health and safety and to the environment as a result of the restart of L-Reactor. Any exposure of the public to radiation resulting from L-Reactor operation would be minimal compared to exposure from natural or other manmade radiation sources. The risks due to possible reactor accidents are also small.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	STATEMENT OF DR. JUDITH E. GORDON November 14, 1983 SIERRA CLUB South Carolina Chapter	
	To: Dept. of Energy, Savannah River Plant Operations From: Dr. Judith E. Gordon Re: Draft EIS, L-Reactor Operation, SRP.	
	In my oral presentation at the Augusta hearings, October 31, 1983, I indicated that I would be submitting additional written comments. These are as follows:	
EZ-1	1. Impingement, p. 4-3, and 5-31. The EIS indicates a cumulative total of about 19 fish/day. However, more recent data suggest this figure is more likely to be 41.3 fish/day (ECS-SR-5, Sav. Riv. Aquatic Ecology Rept, Prelim 83).	Estimates of impingement, as calculated from the most recent available data, are presented in Section 4.1.1.2 and Appendix C of this EIS.
EZ-2	2. Thermal discharge, 4.1.1.4. This entire section is extremely confusing because of the different delta T's used in the charts and tables, along with varying river flows. How do Tables 4-4 and 4-5 relate to the suggested maximum delta T of 9° C? On p. 4-8 why were the most severe 5-day meteorological conditions only based on the short time span, 1976-1980?	See the response to comment AA-1 regarding cooling-water mitigation alternatives. Also note that due to other comments received the analysis of the reference case thermal discharge in relation to the August 1982 draft NPDES permit has been has been deleted in Section 4.1.1.4. An analytical procedure similar to that required by the NRC for establishing adverse heat dissipation criteria for the design of ultimate heat sinks was used to select the most severe 5-day meteorological conditions for evaluating the biological effects of alternative cooling water systems.
EZ-3	3. Fish management programs, p. 4-116. This approach is of questionable value to anadromous species, especially when they appear to show preferences for particular streams in the river drainage as reported in ECS-SR-5, see above. Further, this approach offers nothing for endangered fish species nor does it address other problems associated with loss of wetlands.	Section 4.4.2 of the Draft EIS described both the feasibilities and limitations of fishery management alternatives for anadromous and endangered species, i.e., shortnose sturgeon. Both the American shad and striped bass spawn primarily in the river. The blueback herring uses several creeks and adjoining floodplains for spawning throughout much of the Savannah River basin. The shortnose sturgeon is a bottom river spawner and is not adversely affected by the restart of L-Reactor based on the biological opinion from the NMFS.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
EZ-4	4. Wetlands, p. 5-24. The 1982 EA and this draft EIS show a discrepancy in wetlands acreage figures. For example, the EA says that SRP contains 39,000 acres, the draft EIS says 37,000. The wetlands acreage impacted in the EA is 2000, but it is 1600 in this EIS. Which figures are correct?	The land area of the SRP is 192,323 acres; standing water or seasonally moist areas total 39,870 acres (Du Pont 1983). Wetlands are addressed in Sections 4.1.1.4, 5.2.4, and Appendix I of the EIS.
EZ-5	5. As indicated in 3 above, it is not necessarily true that other suitable spawning habitat exists in other streams along the Savannah River (p. 5-30). Also, since many areas are privately owned, their protection is less likely than that for properly managed government holdings.	Recent fisheries surveys indicate that Steel Creek is one of several streams used along the Savannah River by resident river species such as yellow perch and crappie as well as the anadromous blueback herring. The floodplains below Augusta have been modified more by government activities such as flood control, channelization, and dredging than from SRP thermal effluents and from modification by private ownership. The wetlands (orginally floodplains) above Augusta have been modified extensively by several government-operated reservoirs. Appendix C of this Final EIS contains additional data from recent fisheries studies.
EZ-6	6. ANSP studies, p. 4-18. Given the infrequency of these studies, it is unlikely that they have much relevancy to the health or status of the Savannah River.	In addition to the ANSP studies that were performed for 6 years, more extensive quantitative ecological studies are currently being performed. Monitoring programs are discussed in Chapter 6 of the EIS.
EZ-7	7. River temperatures, p. 3-20. In comparing River mile 156.8 and 118.7, the number of times the temperature exceeded 28° C was given for River mile 156.8. What are these figures for River mile 118.7?	Records are not kept on the number of exceedances of various temperatures such as 28°C at the Highway 301 bridge monitoring station (River Mile 118.7).
EZ-8	8. Radiation levels, p. 3-60. Are the 66 mrem/year cited in addition to background radiation or is this included?	The 66 millirem per year includes background gamma radiation due to cosmic and terrestrial sources, which account for virtually all of it.
EZ-9	9. Dose to average individual, p. 3-59. A value of 195.3 mrem may be average, but it hardly represents the dose to an average individual. Most "average" persons do not receive 92.5 mrem of medical radiation each year, and these figures are thus misleading.	The "average" individual referenced is meant to provide a representative case for comparing levels of radiation exposure with those associated with L-Reactor restart and operation. By definition, the 92.5-millirem value is the average medical radiation exposure per person in the United States, not the medical exposure to an average person. It is recognized that the radiation dose to any specific individual will vary from the average depending on that person's exposure to controllable sources of radiation such as medical X-rays. In any case, even

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		If medical radiation was completely deleted as a consideration, the doses due to L-Reactor restart and operation still represent a small percentage of background radiation levels.
EZ-10	10. Probabilities, p. 4-54. What is the source of the probability figures used in this section?	See the responses to comments AY-9 and BL-12 regarding probabilities.
EZ-11	11. N-Reactor, p. 2-5. There is no discussion in this draft EIS as to why less-than-6-percent plutonium production at N-Reactor at Hanford was not a viable option to restart of the L-Reactor. Is this also classified information?	See the response to comment EW-1 regarding partial production options.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	STATEMENT OF L.L. GADDY L.L. Gaddy, Consulting Biologist Rte. 1, Box 223 Walhalla, South Carolina 29691 (803) 638-2863 November 12, 1983 Mr. M.J. Sires, III Assistant Manager, Health, Safety, & Environment Dept. of Energy Savannah River Operations Office Aiken Mr. Sires: This letter is to register my opposition to several of the cooling water alternatives proposed in Section 4.4.2 (Volume 1) of the Draft Environmental Impact Statement for the L-Reactor Operation: Savannah River Plant, Aiken, S.C. I. Direct Discharge of Thermal Effluents into Steel Creek.	
FA-1	I am opposed to this alternative because of the known consequences. High water temperatures would make most of Steel Creek and some of the Savannah River floodplain uninhabitable by most life forms. The endangered American alligator and the Wood Stork (proposed endangered), both of which are now present here, could not survive in such a thermally-stressed environment.	See the responses to comments AA-1 and AB-13 regarding cooling-water mitigation alternatives.
FA-2	Secondly, direct discharge of thermal effluent would possibly transport contaminated alluvium--radiocesium accidentally released from the L-Reactor in 1954-1968--downstream in suspended solution, reintroducing this now-buried radiocesium into the food chain.	Section 4.4.2 describes each alternative cooling-water system considered. The remobilization and transport of radiocesium has been considered for each alternative. Consideration is given to radiocesium transport in relation to the timing of mitigative action implementation, before or after restart of L-Reactor.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	II. All "Once Through" Systems Proposed.	
FA-3	I am especially opposed to the diversion of thermal effluent into Pen Branch, parts of which are relatively pristine. In 1981, I surveyed Pen Branch for endangered and threatened plants for the Savannah River Ecology Laboratory. I found no such plants; however, I did observe several interesting bogs and floodplain communities along the branch. These communities--some of which were dominated by relatively mature trees--would be destroyed under the "Once Through Cooling by Diversion to Pen Branch" plant.	Alternatives to direct discharge, other than diversions to Pen Branch are considered; they are compared in Section 4.4.2.5. Also see the response to comment AA-1 regarding cooling-water mitigation alternatives.
FA-4	I found much of the DEIS too general, with little or no hard data cited in some cases. In light of the statement in the press that the entire EIS process will cost around 1.5 million dollars, I was surprised to find that most of the studies cited were done prior to 1982. It seems that none of this money went for the collection of additional environmental data. In the final EIS, I think it would be interesting to see an itemized account of the costs of the EIS.	As described in the EIS, DOE has expended about $204 million in modernizing and renovating L-Reactor. The Department has also spent over $5 million in environmental studies and reports. Twelve public hearings have been held in South Carolina and Georgia, and an extensive support document library has been assembled. DOE will continue to conduct extensive environmental studies, including assessment of ground-water impacts and thermal mitigation. Also see the response to comment CD-2 regarding additional data that have been included since the Environmental Assessment.

Respectfully submitted,

L.L. Gaddy

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	STATEMENT OF KERRY COOKE The Snake River Alliance Box 1731 Boise, ID 83701 208/344-9161 November 14, 1983 Mr. Melvin Sires U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29801 SUBJECT: COMMENTS ON DEIS FOR L-REACTOR Mr. Sires:	
FB-1	The Department of Energy and the management of the Savannah River Plant have consistently downplayed the effects of the start-up of the L-Reactor on the Savannah River area. The environmental impact the Savannah River Plant will have on the future of the Savannah River area should dictate a high level of honesty and a willingness to do whatever can be done to protect the total environment from pollution and eventual damage.	Specific, quantitative evaluations of the impacts of the L-Reactor restart were developed and published in the Environmental Assessment. These impacts are further detailed in the EIS.
FB-2	However, it seems clear that the DOE does not share in this thinking. The DOE avoided doing a complete EIS until legally hardpressed to let the public comment on this project. Further, the DOE's attitude throughout this process has been one of eliminating hurdles to start up the L-Reactor. Never at any time in the months surrounding this controversy has the DOE given any sign that there was any significance placed on the concerns expressed by the public and state and local entities. Cost and time factors have consistently outweighed concern for the future.	DOE was charged by the President with restarting L-Reactor. DOE has consistently expressed its intention that the restart will be in accordance with all applicable Federal and state environmental protection regulations.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
FB-3	The Snake River Alliance, an Idaho citizens' group, requested a copy of the L-Reactor draft EIS in a letter to you dated October 7. You chose to respond to our letter on October 25, stating that a copy of the Draft EIS was enclosed. No EIS was enclosed, and we mistakenly assumed it would be coming under separate cover. As of November 14, the last day for comments, the EIS has not arrived. This sort of disregard for public involvement is indicative of the Department of Energy's attitude about the L-Reactor start up in general. The NEPA process was formulated to "encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation..." The DOE has chosen to disregard the intent of this policy and has violated the public trust in their handling of the L-Reactor start-up. The people of the Savannah River area live under the double threat of death by nuclear war, and death by nuclear material contamination. The abuses of shortsighted management must stop if we are to survive. The L-Reactor should not be restarted. Kerry Cooke for the Snake River Alliance	DOE distributed copies of the EIS to more than 750 individuals and groups and placed copies in 19 libraries. A copy of the EIS was intended to be sent to the Snake River Alliance on October 25, per their request; however, an error in the distribution of this copy occurred. DOE has corrected the problem and has again sent another copy of the draft EIS to the Snake River Alliance.

Comment number	Comments	Responses
	STATEMENT OF PAUL F. WALKER, PH.D. Klein Walker Associates, Inc. 68 Holworthy Street Cambridge, Massachusetts 02138 Telephone: (617) 497-6360 11 November 1983 Mr. M.J. Sires, III Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801 Dear Mr. Sires: The purpose of this letter is to provide written comments on the draft Environmental Impact Statement, "L-Reactor Operation Savannah River Plant, Aiken, S.C.," dated September 1983. For your information, I am a national security analyst and president of a social science consulting firm, Klein Walker Associates, in Cambridge, MA. For additional personal background, I would refer people to a recent article, "Smart Weapons in Naval Warfare" (Scientific American, May 1983), and a book, Winding Down: The Price of Defense (1st ed: New York Times, 1979; 2nd ed: W.H. Freeman, 1982). I will restrict my comments to the "need" requirement for L-Reactor.	
FC-1	The draft EIS posits in Chapter 1 that L-Reactor is required in order "to increase the supply of weapon-grade plutonium to a level that will satisfy near-term requirements" for modernization and improvement of existing stockpiles as well as for new weapons systems (pp. 1-1 - 1-2). Dr. Robert L. Shoup, author of Chapter 1, explains that these plutonium demands are driven by former President Jimmy Carter's 1980 Nuclear Weapons Stockpile Memorandum (NWSM), later updated by President Ronald Reagan in November 1982. He also states that congressionally delayed or non-funded weapons systems "do not significantly	See the responses to comments BL-16, BL-18, BL-19, and EW-1 regarding need and production alternatives and the scope of this EIS. The Nuclear Weapons Stockpile Memoranda (NWSM) reflect the latest requirements for plutonium; these requirements are based on efforts to modernize and improve stockpiled nuclear weapons and to provide warheads for new weapons systems scheduled for deployment during the next decade. The program to modernize existing weapon systems involves replacing older nuclear

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	change short- and intermediate-term requirements that L-Reactor must help to satisfy" (p. 1-2). Such a cursory explanation for the fundamental rationale behind the restart of L-Reactor is inadequate and must be more fully explained in the final report. Political and military delays and cutbacks, both past and proposed, in the major nuclear weapons programs have been considerable in recent years. They have either not been taken into account here or the NWSM has *recently increased its demand for plutonium for existing* warhead testing and modernization (as compared to new weapons procurement). There are currently at least nine major nuclear weapons in production (production goals in parens). Three of these are bombs: B-61 Mods 3 and 4 (1000) and B-83 (2500). One is an 8-inch artillery shell: W-79-1 (800). Three are cruise missiles: W-84 GLCM (560), W-80-0 SLCM (758), and W-80-1 ALCM (3500). And two are ballistic missiles: W-85 Pershing II (380) and W-76 Trident C-4 SLBM (1440). There are also at least another six nuclear weapons in RDT&E phases: W-87 MX ICBM (1055), W-87 Trident II SLBM (1440), W-82 155mm artillery shell (1000), W-81 SM-2 ship defense missile (500), and possible anti-submarine and anti-ballistic missile systems (2000±). One of these systems, MX or "Peacekeeper," has been cut back from a projected deployment of 200 missiles carrying 2000 MIRVs to half this number. Several other systems have been delayed in program development and production due to funding, political, and/or technical problems. Defense Department Program Acquisition Reports show, for example, the following five major delays/reductions: Pershing II - Procurement of 91 postposed from FY83 to FY84. Tomahawk SLCM - Procurement reduced in FY82 from 88 to 61 and in FY83 from 120 to 51. ALCM - Procurement reduced in FY 83 from 440 to 330 and cancelled for FY84 and FY85. GLCM - Procurement reduced in FY83 from 110 to 84.	nuclear warheads and existing delivery systems with modern, safer, and more effective warheads. Modernization, in many instances, has led to replacing older warheads that used uranium enriched in the isotope uranium-235 with new warheads that use weapons-grade plutonium.

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	MX - Procurement reduced in FY83 from 9 to 0. These figures indicate a clear reduction of 1000 warheads and delays of 1-4 years duration of another 1200±. (See Annual Report of the Secretary of Defense, and the Defense Department's Program Acquisition Costs by Weapon System for fiscal years 1980-1984.) If the planned production of L-Reactor is plutonium sufficient for 15± warheads annually (as reported by a Department of Energy official, New York Times, January 16, 1983), then it is clear that further evidence is required in order to adequately justify L-Reactor's restart. In addition to real past production delays and cancellations of nuclear weapons, the EIS needs assessment must also address itself to arms control and disarmament plans of the current U.S. Administration. This is essential, given the integral nature of arms control to national security and the sensitivity of near- and intermediate-term weapons projections to arms negotiations. President Reagan has proposed reducing deployment of Pershing II's and GLCM's in Europe to 420 or less, some 150 less than presently predicted. In strategic arms negotiations, U.S. proposals have included a one-third reduction (about 2500 warheads) in deployed MIRVs and a fifty-percent reduction (about 4000 warheads) in planned cruise missile deployments. In addition, Secretary of Defense Casper Weinberger announced in October, 1983 the withdrawal of about 1400 tactical nuclear weapons from Europe over the next five years. Should these reductions, both unilateral and negotiated, be realized, the procurement of nuclear weapons over the next decade may be reduced by as much as 45%. In addition, the availability of weapons-grade material from decommissioned weapons will rise. In light of such past program reductions and delays, and of future likely arms control and other drawdowns, the current and	

Table M-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	future stockpile of nuclear weapons would not be in need of plutonium production capacity of L-Reactor. Sincerely, Paul F. Walker, Ph.D. President PFW/fl	