

TVA'S COLUMBIA DAM PROJECT ON THE
DUCK RIVER IN TENNESSEE

THIRTY-FIRST REPORT

BY THE

COMMITTEE ON GOVERNMENT
OPERATIONS



DECEMBER 11, 1980.—Committed to the Committee of the Whole House
on the State of the Union and ordered to be printed

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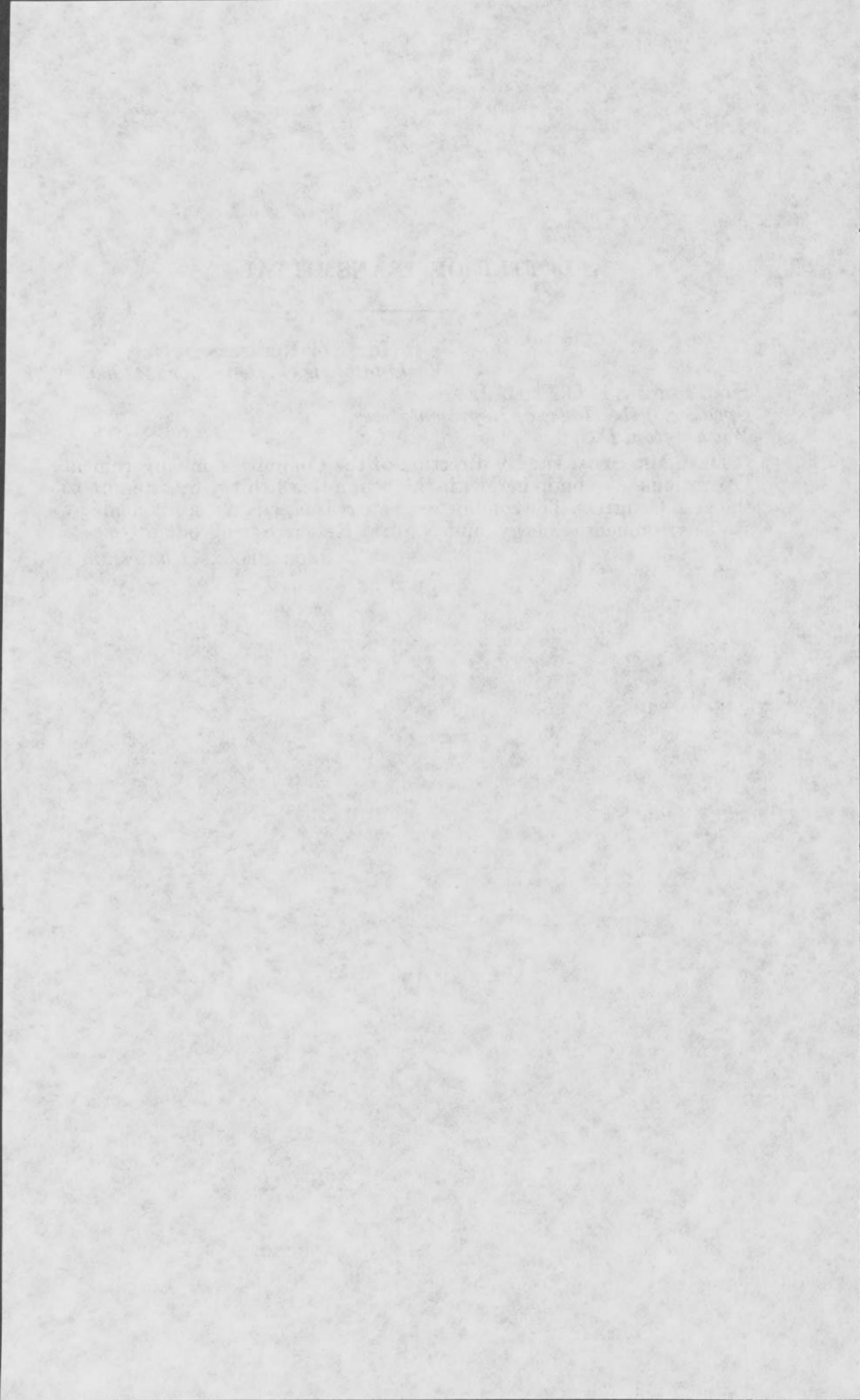
HOUSE OF REPRESENTATIVES,
Washington, D.C., December 11, 1980.

HON. THOMAS P. O'NEILL, JR.,
Speaker of the House of Representatives,
Washington, D.C.

DEAR MR. SPEAKER: By direction of the Committee on Government Operations, I submit herewith the committee's thirty-first report to the 96th Congress. The committee's report is based on a study made by its Environment, Energy, and Natural Resources Subcommittee.

JACK BROOKS, *Chairman.*

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TVA'S COLUMBIA DAM PROJECT ON THE DUCK RIVER IN TENNESSEE

DECEMBER 11, 1980.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. BROOKS, from the Committee on Government Operations,
submitted the following

THIRTY-FIRST REPORT

BASED ON A STUDY BY THE ENVIRONMENT, ENERGY, AND NATURAL RESOURCES
SUBCOMMITTEE

On December 2, 1980, the Committee on Government Operations approved and adopted a report entitled "TVA's Columbia Dam Project on the Duck River in Tennessee." The chairman was directed to transmit a copy to the Speaker of the House.

I.—EXECUTIVE SUMMARY

The Committee's report on the Tennessee Valley Authority's (TVA) Columbia Dam project is the culmination of a six-month investigation by its Subcommittee on Environment, Energy, and Natural Resources under the direction of Chairman Toby Moffett (D-Conn.). In conducting its investigation, the subcommittee reviewed TVA's project files for the past 15 years, conducted an on-site investigation, interviewed numerous TVA and other government officials, met with citizen proponents and opponents of the project, and held three days of public hearings. The Subcommittee received testimony from representatives of TVA, the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and the U.S. Army Corps of Engineers who were directly involved with the Columbia project. Witnesses who appeared before the subcommittee are listed in Appendix I.

Completion of the planned Columbia dam and reservoir would exact a heavy environmental toll. It would turn 54 miles of the scenic Duck River into an artificial lake that would be dramatically reduced in size six months of the year, exposing thousands of acres of mudflats.

The project would destroy significant farmlands and fish and wildlife habitats as it requires 27,000 acres, including 13,000 acres of farmland that will be permanently flooded or otherwise removed from production. The loss of valuable cropland, the loss of a major portion of the Duck River, and the loss of fish and wildlife could be justified conceivably by a project that satisfied essential non-environmental needs. The Columbia project is not essential, however. Nor does it provide a single benefit that cannot be met by an alternative proposal fashioned by the TVA. At this writing, the project's fate is currently in the hands of assistant secretary of the Army for civil works. He must determine on behalf of the Army Corps of Engineers whether the Columbia project is in the public interest. The Committee expects that this report will be of considerable benefit to the assistant secretary in reaching that public interest determination.

II.—ORIGINS OF THE COLUMBIA DAM

The Columbia Dam is the key component of a multi-purpose water resource project being constructed by the Tennessee Valley Authority (TVA) on the Duck River in Maury County, two miles east of Columbia, Tennessee. The Duck River flows generally east to west in southern middle Tennessee for 289 miles and empties into the Tennessee River at Kentucky Lake. The Columbia Dam project was designed originally as part of a two-dam Duck River project consisting of the Columbia and Normandy dams. The Normandy dam, 112 miles upriver from the Columbia Dam, was completed in 1976 at a cost of \$37.4 million.¹

Work on the Columbia dam and reservoir was initiated in 1973. Originally, its cost was projected at \$50 million, but cost overruns and inflation have pushed projected construction costs to over \$140 million.² The project is now approximately 35 percent complete in terms of dollar expenditures.³

The Columbia Dam project will not generate electricity. Nor will it improve navigation. Its primary purpose or benefit is recreation, such as swimming, boating, water skiing, picnicking, hiking, hunting and fishing, on or near the 12,600-acre artificial lake and 236 miles of shoreline that will be created during the summer months by the dam. Together, these activities comprise over 60 percent of the total project benefits as most recently calculated by TVA.⁴

¹ Testimony of S. David Freeman, chairman, Tennessee Valley Authority, before the Subcommittee on Environment, Energy, and Natural Resources, "The Columbian Dam: A TVA Project," August 21, September 24 and 25, 1980 (hereinafter cited as Hearings), p. 181.

² TVA, "Report to OMB on Columbia Dam Alternatives," April 1979 (hereinafter cited as TVA, Alternatives Report), pp. 7-8. All memorandums, studies, documents and other material cited in this report or analyzed by the subcommittee are available for public review at the subcommittee office.

³ The concrete portion of the dam itself is nearly completed, but it represents less than 30 percent of total project costs.

⁴ TVA, "Report on Preliminary Studies of Alternatives to Completion of Columbia Dam February 2, 1979 (hereinafter cited as TVA, Staff Alternatives Report), Table 1. One commentator on the Duck River Project noted that when TVA completed its original program to turn the Tennessee into a navigable river,

"[I]ncreasing focus was placed upon development of tributary streams. Associated with this shift in focus was an increase in the number of water-related purposes considered in planning. The Duck River Project, for example, considers eight purposes that were not specifically provided for in the original legislation. Indeed, now projects frequently do not even consider purposes such as navigation and electric power generation." (Leonard A. Shabman, "The Use of Economic Analysis in the Tennessee Valley Authority: The Case of the Duck River Project," *Southern Journal of Agricultural Economics*, July 1973 (hereinafter cited as Shabman), p. 249.

A. JUSTIFYING THE DAM

In 1951 TVA first considered, but rejected, the idea of constructing a pair of dams on the Duck River. Such dams, when evaluated on the basis of improved navigation, flood control and power production were found uneconomical.⁵ From that point on, it was apparent that dams on the Duck River, to have any pretense of economic feasibility, would have to be justified in large measure on some other basis, such as recreation, and industrial development.⁶

The initial push for dams along the Duck River did not originate with TVA, but with local proponents who wanted a recreational facility to complete their dream of a life of "beauty and pleasure." According to Sam D. Kennedy, owner and publisher of the Columbia Daily Herald:

. . . [W]e, as an area, multi-county area, sought out TVA for construction of these dams. We had a dream, a dream of an area suitable for people, for an environment for people. We put together a multi-county plan by blood, sweat, and tears and cooperation. We got people together to build an area where people would live in beauty and pleasure, with recreation, our one great fault, being provided, our nonexistent asset being provided.⁷

The origins of the present Columbia Dam can thus be traced to a meeting of local business and civic leaders called by W. D. Hastings, the president and general manager of the Columbia Daily Herald in 1959. The meeting led to the formation of the Duck River Development Association (DRDA) in 1960.⁸ In September 1962, DRDA officers "made it plain to TVA representative John Mitchell that they thought their only true function was to put pressure on TVA and politicians to get dams built."⁹ A new group, the Upper Duck River Development Association, was formed in July 1964 to supersede the DRDA. A resolution passed later that year petitioned then-Representative Joe L. Evins (D-Tenn.) to "oppose all efforts, from whatever source, to curtail the tributary development program."¹⁰

The following year, the Tennessee legislature, in response to a request from the Upper Duck River Development Association, created the Upper Duck River Development Agency as a "public body corporate and politic" to develop and effectuate "plans and programs for comprehensive development including the control and development

⁵ TVA, "The Duck River Project: Normandy & Columbia Reservoirs." Planning Report No. 65-100-1, September 1968 (hereinafter cited as 1968 Planning Report), p. 19.

⁶ The Duck River was not the only tributary in the Tennessee Valley on which dams were no longer easy to justify based on TVA's traditional policy—still in effect in 1961—of not using recreation or "secondary" benefits as part of the credit/cost analysis. Public Works Appropriations, Hearings before a Subcommittee of the Committee on Appropriations, 86th Cong., 2d session (1960), p. 829. In the 1960's, TVA justified five major projects by adding recreation, shoreline development, enhanced employment, and general economic development benefits to its calculations. These were: Duck River Project (1.3:1); Tellico (1.3:1); Upper French Broad (1.3:1); Bear Creek (1:1); and Tim's Ford (1.2:1). Public Works for Water, Pollution Control and Power Development and Atomic Energy Commission Appropriation Bill, 1971, 91st Cong., 2d session (1970), pp. 194-220.

⁷ TVA, "Record of the Public Hearing on the Proposed Duck River Project," August 24, 1971 (hereinafter cited as TVA, 1971 Public Hearing), p. 160.

⁸ Frank Ivy and Peter D. Hollenbeck, *The Duck River Project: Chronological History of Events* (an undated, unpaginated manuscript on file with the subcommittee) (hereinafter cited as Ivy and Hollenbeck).

⁹ *Ibid.*

¹⁰ *Ibid.*

of the water resources."¹¹ The Upper Duck River Development Association, a citizen's group, and the Upper Duck River Development Agency, a state agency, have the same goals and objectives and share the same staff.¹²

TVA, meanwhile, having determined that electric power generation on the Duck River was not practicable, was busy planning the construction of reservoirs on the Duck with major recreational components. A 1965 TVA reconnaissance study identified three dam sites on the Duck River which, if developed, could provide for recreational and lakeshore development.¹³ The Duck River sites were at Columbia, Normandy, and the County Line at river mile 101. The County Line site was subsequently eliminated because of engineering difficulties.¹⁴ The study further identified nine tributaries of the Duck River that might similarly be developed.¹⁵

A feasibility study completed the following year projected the capital costs that could be justified for the Duck River project based on the estimated annual benefits. A 100-year service life and a 3 $\frac{1}{8}$ percent discount rate to reflect the cost of borrowing money were used.¹⁶ That report showed a negative capital benefit/cost ratio for the Columbia dam and reservoir of 0.9:1, and a negative capital benefit/cost ratio for Normandy of 0.7:1.¹⁷ The accompanying economic analysis showed the following estimated percentages for capital benefits for the 100-year life of the project.

[In percent]

	Columbia	Normandy
Flood control.....	17.4	16.7
Water supply and water quality control.....	13.9	7.2
Recreation.....	42.8	58.0
Shoreline development.....	18.2	10.2
Fish and wildlife.....	7.7	7.9
Benefit/cost ratio.....	.9:1	.7:1

Source: TVA, 1966 Planning Report.

Because the benefits cited only justified construction expenditures of \$30.9 million for Columbia and \$13.7 million for Normandy, when the actual projected cost was \$33.5 million for Columbia and \$19.5 million for Normandy, negative capital benefit/cost ratios resulted.¹⁸

Undeterred by the negative benefit/cost ratios for the two projects, TVA determined that, although "the estimated costs exceed the benefits evaluated, they are close enough to warrant some further study. . ." ¹⁹

¹¹ TVA, 1968 Planning Report, *supra*, p. 1.

¹² Deposition of Claybourne Ross, executive secretary, Upper Duck River Development Association, before the Tennessee Water Quality Control Board, In the Matter of the Petition to Appeal of the Environmental Defense Fund, Inc., et al., from the Division of Water Quality Control's Certification of TVA's Columbia Dam Project Pursuant to Section 401 of the Clean Water Act, August 10, 1980 (hereinafter cited as Ross deposition), pp. 22-23.

¹³ Memorandum from Don H. Mattern, chief, project planning branch, to Reed A. Elliott, director of water control planning, September 10, 1965.

¹⁴ TVA, Alternatives Report, *supra*, pp. 6-7.

¹⁵ Mattern to Reed memorandum, *supra*, p. 4.

¹⁶ TVA, "Water Resources Development Potential—Main Stream Upper Duck River," Report No. 0-6570, April 1966 (hereinafter cited as 1966 Planning Report), p. 9.

¹⁷ *Ibid.*, Table 2, Economic Appraisal.

¹⁸ *Ibid.*

¹⁹ Memorandum to L. J. Van Mol, general manager, from Reed A. Elliott, director of water control planning, "Upper Duck River—Water Resources Development of Main Stream Feasibility Report," April 29, 1966.

B. THE EMERGENCE OF REDEVELOPMENT BENEFITS

By the next year, TVA had completed a new study that represented "a definite proposal for development of the Columbia multi-purpose water control project on the upper Duck River."²⁰ The Columbia part of the Duck River Project, now estimated to cost \$50 million, had attained a 1.1:1.0 benefit/cost ratio, partially through the addition of a small, but critical, \$159,000 annual benefit for "redevelopment," the employment of otherwise subemployed or unemployed persons on the construction, maintenance and operation of the project.²¹ TVA also mentioned for the first time, although it did not claim benefits for, "future development," or the addition of new and permanent jobs for the subemployed group in the industries that might be attracted by the project.²²

	Amount	Percent
Flood control:		
Systemwide.....	\$85,000	3.9
Local.....	121,000	5.6
Water supply.....	306,000	14.2
Water quality control.....	172,000	8.0
Recreation.....	900,000	41.8
Shoreline development.....	210,000	9.8
Fish and wildlife.....	200,000	9.3
Redevelopment.....	159,000	7.4
Total annual benefits.....	2,153,000	
Total, annual costs.....	1,967,000	
Benefit/cost ratio.....	1:1:1.0	

Source: TVA, 1967 Planning Report.

The project, as recommended in the 1967 Planning Report, has changed relatively little in succeeding years. It would require 30,500 acres, 12,600 of which would be inundated by the reservoir.²³ Of the land to be flooded, almost 11,000 acres were described as farm land, the remainder as wood land.²⁴ In designing the project, TVA engineers had attempted to balance the need for an optimum-sized reservoir to enhance recreational opportunities with the need to meet water storage requirements in case of winter flooding.²⁵ Those goals conflicted dramatically. In the summer the normal reservoir maximum pool level would be held at 630 feet above sea level which would create a 12,600-acre artificial lake. After October 15, the reservoir would be lowered to 603 feet above sea level to provide flood control capability. That annual drawdown would reduce the reservoir area to 4,300 acres, thus exposing over 8,000 acres of winter mudflats.²⁶ The conflict between the recreational and flood control goals of the project was reflected further by the fact that the reservoir would not reach the desired summer level in one summer of every four following the winter drawdown because of a lack of rain.

²⁰ TVA, "The Columbia Project on the Duck River," Planning Report No. 65-100, August 1967 (hereinafter cited as TVA, 1967 Planning Report), p. 1.

²¹ *Ibid.*, p. iii. For a full discussion of the propriety of including this benefit, see pp. — — —, *infra*.

²² TVA, 1967 Planning Report, *supra*, pp. 41-42.

²³ *Ibid.*, p. 21.

²⁴ *Ibid.*

²⁵ *Ibid.*, p. 14.

²⁶ *Ibid.*, Exhibit 3.

TVA did not cite any adverse impacts resulting from the project. There were only four "adjustments" that would be required. The first "adjustment" involved the relocation of some 350 mostly farm families whose lands would be covered by the proposed reservoir.²⁷ Other adjustments included the destruction of 36 miles of roads and two bridges, the need for utility line relocation and the possible loss of some small mineral claims.²⁸

Notable by its absence was any mention of the multi-million-dollar loss of farm production and farm-related business. The loss of thousands of acres of farm land was tossed off with the following statement:

Much of the reservoir area is farm land, the dwellings and farm buildings on which [farmland] are old but generally in fair condition. Near Columbia, however, particularly in the Fountain Heights area and Blue Springs community, there are a number of better residences.²⁹

Another adverse effect that was not even mentioned in passing was the loss of 54 miles of free-flowing river. The importance of a natural river was not unnoticed, even in 1967. The Duck was one of ten Tennessee rivers included in the Bureau of Outdoor Recreation's original "Wild River Study." In 1967, the Tennessee Department of Conservation and the Tennessee Game and Fish Commission recommended that the Duck River be designated a national scenic river. The river was included in the original bill that resulted in the Tennessee Scenic River Act of 1968, but was removed by pro-dam forces.³⁰ The loss of that major section of the Duck River was especially noteworthy for another reason. Since passage of the TVA Act in 1933, TVA had concentrated almost exclusively on dam building in developing the area's water resources on the Tennessee River and its tributaries. That activity, combined with similar emphasis on the part of the U.S. Army Corps of Engineers in the development of the Cumberland River system, had resulted in the construction of some 40 major impoundments in Tennessee. The result was 628,000 acres of inundated land which became artificial lakes with 11,000 miles of shoreline—more miles than surround all five Great Lakes combined. Additionally, TVA had acquired over 1 million acres of land adjacent to those lakes. In contrast, TVA had not developed a single, free-flowing river in its natural state anywhere in the valley.³¹

The offsetting advantages to these "adjustments" were many. As described by TVA, the dam "would provide benefits in the controls of floods, would improve the quality of water available for municipal

²⁷ *Ibid.*, p. 22. The relocation eventually affected 440 families and a total of 1,540 people. Undated notes entitled "Columbia Dam Meeting" from the files of S. David Freeman. Also memorandum to files from John R. Meldorf, research analyst, January 24, 1972.

²⁸ TVA, 1967 Planning Report, *supra*, pp. 22, 25.

²⁹ *Ibid.*, p. 22. Dr. Billy J. Bond, TVA's assistant director, division of agricultural development, testified in 1973 that the earliest estimate of agricultural losses was made in September of 1971. Pre-trial deposition of Billy J. Bond, *Duck River Preservation Association v. TVA*, Civil Action No. 1130 (E.D. Tenn.), December 4, 1973, p. 5.

³⁰ Governor Ellington then recommended it for inclusion in the National Wild and Scenic Rivers System. Shabman, *supra*, p. 249.

³¹ Testimony of Frank M. Fly regarding the Tennessee Valley Authority water resources development program before the U.S. Senate Committee on Public Works, May 2, 1975 (hereinafter cited as Fly testimony), p. 1, reprint. In 1980, TVA still has not developed or begun to administer a free-flowing river, but appears to be concentrating on nuclear power plant construction and a variety of energy conservation programs, similar to the activities of private utilities.

and industrial use; would create recreational opportunities, including fishing and hunting, in and around the reservoir; and would make available land for development along the shoreline for public and private use."³²

Planning, meanwhile, for the Normandy Dam continued and resulted in a 1968 report that presented Columbia and Normandy as units of a single proposed Duck River Project.³³ The benefit/cost ratio for the two-unit project had miraculously increased to 1.2:1. Although the 1968 Planning Report did not provide a detailed breakdown of the benefits and costs for each dam, that can be obtained with reasonable accuracy for those pre-inflation years by simply subtracting out the 1967 projected annual benefits and costs for Columbia from those of the total project.

	Duck River project	Columbia	Normandy
Flood control:			
System.....	\$180,000	\$85,000	\$95,000
Local.....	185,000	121,000	64,000
Water supply.....	810,000	306,000	504,000
Water quality control.....	365,000	172,000	193,000
Recreation.....	1,275,000	900,000	375,000
Shoreline development.....	370,000	210,000	160,000
Fish and wildlife.....	200,000	200,000	0
Transportation savings.....	50,000	¹ 32,000	¹ 18,000
Redevelopment.....	80,000	² 51,000	² 29,000
Expansion.....	1,445,000	¹ 915,000	¹ 530,000
Total, annual benefits.....	4,960,000	2,992,000	1,968,000
Total, annual costs.....	4,050,000	2,566,000	1,486,000
Cost of project.....	79,000,000	50,000,000	29,000,000
Benefit/cost ratio.....	1.2:1.0		

¹ These categories of benefits were not included in the 1967 list for Columbia, and thus have been pro-rated for each dam in the same ratio as the costs for Columbia and Normandy compare to the total costs of the Duck River project.

² In 1967, redevelopment benefits of \$159,000 were claimed for Columbia alone. For purposes of this table, the 1968 redevelopment benefit has been pro-rated as described above.

Note: All benefits and costs for Normandy have been calculated by the subtraction of Columbia benefits and costs from the total project figures.

Source: TVA, 1968 Planning Report.

What is notable about the 1968 report is the increase in projected capital cost for the Duck River project in 1966 from \$53 million to \$79 million in 1968. Obviously that increase mandated that TVA find some new benefits to justify construction.³⁴ The answer was the inclusion of \$1,445,000 in "expansion" benefits.

As defined in the 1968 report, expansion was

[a] larger and longer lasting benefit from more productive use of subemployed labor in the region . . . provided by the creation of more jobs in industrial and related trades and services employment. The industrial growth would occur on sites located downstream from the dams which would be benefited primarily by an assured water supply of high quality and also by increased flood protection. Lack of availability of these project services is currently a limiting factor to industrial development.

³² TVA 1967 Planning Report, supra, p. i.

³³ TVA, 1968 Planning Report, supra.

³⁴ This was necessary, despite the fact that in computing the annual costs of the project, TVA did not amortize the cost of the reservoir land over the life of the project, thus reducing annual costs. TVA, 1968 Planning Report, supra, p. 67. Also, Shabman, supra, p. 248.

In 25 years, there would be 3,000 new jobs in "high-wage industries," although not all of them would hire subemployed or unemployed persons.³⁵ This benefit was massive, comprising 29 percent of the total annual project benefits.

The following year, TVA provided its own detailed breakdown of the benefits and costs for each dam in a supplementary report.³⁶ Using a $4\frac{7}{8}$ -percent discount rate and an 100-year life, TVA, with the addition of another \$525,000 in expansion benefits (which were now classified as "enhanced employment"), and the mysterious reduction of \$200,000 in annual interest charges³⁷ had come up with a 1.3:1.0 benefit/cost ratio for the entire project. The revised figures are displayed below.

	Duck River project	Columbia	Normandy
Annual costs:			
Interest and amortization.....	\$3,485,000	\$2,355,000	\$1,130,000
Operation and maintenance including replacements.....	355,000	235,000	120,000
Other public investments.....	75,000	35,000	400,000
Total, annual costs.....	3,915,000	2,625,000	1,290,000
Annual benefits:			
Flood control:			
System.....	155,000	115,000	400,000
Local.....	190,000	150,000	40,000
Water supply.....	707,000	365,000	405,000
Water quality control.....	295,000		295,000
Recreation.....	1,200,000	850,000	350,000
Shoreline development.....	370,000	290,000	80,000
Fish and wildlife.....	190,000	160,000	30,000
Transportation savings.....	50,000	45,000	5,000
Redevelopment.....	85,000	50,000	35,000
Enhanced employment.....	1,970,000	600,000	1,370,000
Total, annual benefits.....	5,275,000	2,625,000	2,650,000
Benefit-cost ratio.....	1.3:1.0	1.0:1.0	2.1:1.0
Construction cost.....	\$79,500,000	\$54,000,000	\$25,000,000

Source: TVA, 1969 Supplementary Notes.

Enhanced employment now comprised 51.7 percent of the total benefits for Normandy, and 22.9 percent for Columbia. However, it was not at all clear that TVA was allowed to claim those benefits under "Senate Document 97,"³⁸ which was at that point the guide that TVA adhered to in its benefit/cost analyses.

Senate Document 97 allowed the inclusion of enhanced employment benefits, but only under very select circumstances for which the Duck River project did not qualify. Section V(A)(3) reads as follows:

Formulation and evaluation of plans or alternative plans shall be accomplished in such a way as to permit timely application of standards appropriate to conditions of . . . (b)

³⁵ TVA, 1968 Planning Report, *supra*, pp. 65-66.

³⁶ TVA, "Supplementary Notes on the Duck River Project: Normandy and Columbia Reservoirs," October 1969 (hereinafter cited as TVA, 1969 Supplementary Notes).

³⁷ Even though there was a \$500,000 increase in total capital costs and a $\frac{1}{4}$ percent increase in the discount rate used, TVA found that the annual interest and amortization cost dropped from \$3,685,000 to \$3,485,000. TVA, 1969 Supplementary Notes, *supra*, p. 22.

³⁸ Officially, "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources," U.S. Government Printing Office, 1962.

chronic and persistent unemployment or underemployment in designated areas . . . Standards appropriate to condition (b) shall be used where an area has been so designated under the Area Redevelopment Act of 1961 (75 Stat. 47) or other authorized procedures relating to resource underemployment.

In condition (b) project benefits shall be considered as increased by the value of the labor and other resources required for project construction, and expected to be used in project operation, project maintenance, and added area employment during the life of the project, to the extent that such labor and other resources would—in the absence of the project—be unutilized or underutilized. Such benefits should be clearly identified as redevelopment benefits for the purposes of cost allocation, cost-sharing procedures, and to indicate their significance for project justification (emphasis added).³⁹

None of the four counties benefiting from the project had been designated as areas of "chronic and persistent unemployment." Moreover, TVA had taken the liberty of classifying only the small percentage of jobs resulting from project construction and maintenance as "redevelopment" jobs.⁴⁰

The main economic principle underlying the enhanced employment benefit, according to Dr. M. I. Foster, then TVA's director of the division of navigation development and regional studies, was

the idea that there are human resources that are underutilized in the four county project area, and if the project can change the economic system for the four-county area so that these human resources can be better utilized, the difference in the productivity from subutilization or underutilization of more normalized or better utilization would be a national benefit since that would be a net increase in the total product of the national economy . . .⁴¹

CALCULATING INDUSTRIAL GROWTH

As the enhanced employment benefit results directly from the projected industrial growth of a project, the manner in which TVA calculated that growth must be reviewed. In the "1969 Supplementary Notes", TVA attributed 3,150 new jobs in both industries and related trades and services to the first 25 years after the project was completed and 5,950 at the end of 50 years.⁴²

Those jobs that would not likely be filled by the subemployed have been eliminated from the computations and, for the remaining jobs, the benefit has been claimed only for the

³⁹ Senate Document 97, *supra*, p. 5.

⁴⁰ TVA told the General Accounting Office four years later that the TVA authorizing legislation was one of the "authorized procedures relating to resource underemployment" which allowed it to claim enhanced employment benefits. GAO, "Improvements Needed in Making Benefit-Cost Analyses for Federal Water Resources Projects," September 20, 1974 (hereinafter cited as *GAO Report*). Appendix II, p. 55. There is little support for this position.

⁴¹ Pretrial deposition of M. I. Foster, in *Duck River Preservation Association v. TVA*, Civil Action No. 1130 (E.D. Tenn.), December 11, 1973 (hereinafter cited as *Foster deposition*), pp. 4-5.

⁴² TVA, 1969 Supplementary Notes, *supra*, pp. 19-21.

difference between wages to be paid and an average alternative of \$3,300 per annum [the then-current minimum wage].⁴³

Although the breakdown between jobs for subemployed and other persons was not made in the 1969 report, Dr. Foster subsequently stated in a deposition that TVA had claimed 1,900 new jobs for subemployed persons in calculating the benefits.⁴⁴ (The exact number of jobs claimed was actually 1,575, exactly half of the projected new jobs for the first 25 years.⁴⁵) However, in an evaluation done 2 years later by TVA's staff, it was clear that TVA had claimed benefits for new jobs that were not water-related. "If it is further assumed that only 50 percent of the projected growth in manufacturing employment in the area is affected by the water restriction, a conservative estimate of the impact of removing the water restriction is 3,150 manufacturing jobs by the year 2020 [the first 50 years]," George B. Tully, chief of TVA's navigation economic branch, wrote to his boss, W. G. O'Neal, chief of the project planning branch.⁴⁶ In the first 25 years, then, 1,575 total jobs could be claimed as having resulted from the project but not all of them would go to subemployed persons. TVA, however, claimed all 1,575 for the subemployed group.

In addition, the higher wage levels which the subemployed persons supposedly would obtain were based on the national average wage levels in the industries that TVA had projected might locate along the Duck River. Since they included management salaries and national wage levels higher than those of the four-county area, TVA's projected wage levels for the previously subemployed were obviously inflated.⁴⁷

The new jobs for the subemployed, according to Dr. Foster, were based on what TVA considered "to be a reasonable estimate of the number of firms that would locate in the area because of market location or resource location factors, if the water shortage image in the area can be changed to one of an area with an adequate supply of water."⁴⁸

In arriving at that result, TVA identified nine separate industries that might consider locating in the area and projected that five would actually build there within 25 years.⁴⁹ Although TVA did not reveal those industries in its planning reports, for Normandy they were: soap and other detergents,⁵⁰ tires and inner tubes, fabricated rubber products, mineral wool, cooper rolling and drawing, and farm machinery and equipment. The three industries for Columbia were: dyes and pigments, paper coating and glazing, and electric motors.⁵¹

TVA chose the industrial groups in the following manner: For Normandy, "[s]ix industry groups which use large quantities of untreated

⁴³ Ibid., pp. 19-20.

⁴⁴ Foster deposition, supra, p. 8. Jobs were not claimed after 25 years.

⁴⁵ Memorandum from George B. Tully, chief, navigation branch, to W. G. O'Neill, chief, project planning branch, June 22, 1971.

⁴⁶ Memorandum from Tully to O'Neill, supra.

⁴⁷ Foster deposition, supra, Exhibit 1.

⁴⁸ Ibid., p. 13.

⁴⁹ Ibid., p. 18.

⁵⁰ The soap and detergent industry was picked no doubt because of the area's phosphate resources. The removal of phosphates from detergents, beginning in the late 1960s made such a plant unlikely, however.

⁵¹ Memorandum from D. O. Nichols, chief, navigation resources branch, to Don H. Mattern, chief, project planning branch, March 5, 1968.

water were selected from the list of industries oriented to the Upper Duck area . . ." ⁵² For Columbia, TVA designated three industries that, in addition to using "large" amounts of water, used "large amounts of electric power, manufacture products which are being imported into Tennessee and the Southeast from outside the area and use inputs which are generally available within 125 miles of the Upper Duck area." ⁵³

Although TVA in its final published planning report described the six industries it had identified for Normandy as "large" water users and the three for Columbia as "medium or large" water users, ⁵⁴ on the basis of Commerce Department data, TVA understood that only two of those industries ranked in the top 25 percent of industrial water users. ⁵⁵ Those industries were dyes and pigments and paper coating and glazing. This is not surprising since two University of Tennessee business professors had found that a streamflow of about 400 cubic feet per second (cfs)—not the 200 cfs planned for Columbia and 166 cfs for Normandy—was the minimum necessary to attract water-oriented manufacturing to the Tennessee Valley region. ⁵⁶ More interesting, when the business and industry work group of the Upper Duck River Development Association conducted a direct survey of the manufacturing firms already in the area, it provided 10 location factors to be ranked by the manufacturers in terms of their importance but did not include water supply, even though several of those companies used the Duck River for processing and pollution dilution. ⁵⁷

Obviously, the link between the project and the plants was highly tenuous. TVA had no documentation, such as industry inquiries or recorded development at similar reservoirs, to support the movement of any plants to the area. Further, according to Dr. Foster, the project would not attract nor "induce" that movement, but would only "permit" it. ⁵⁸ The industries projected to move to the area were described by Dr. Foster as "the types in our judgment that would not be able to locate or would not consider the four-county area unless something is done about either the actual water supply or the water shortage *image* the area has (emphasis added)." ⁵⁹ That may explain why TVA has never sought to amplify on the reasons why industry would be attracted to the privately owned areas that it had singled out below Normandy and Columbia, given the entire Tennessee Valley in which to relocate.

In summary, it must be emphasized that the enhanced employment benefit was conceived late in the project planning stage to push the persistently negative benefit/cost ratio over to the positive side. That highly speculative benefit:

(1) was not properly allowable for projects outside of areas of chronic unemployment;

⁵² Ibid.

⁵³ Memorandum from M. I. Foster, chief, navigation resources branch, to Don Mattern, chief, project planning branch, April 25, 1967.

⁵⁴ TVA, 1969 Supplementary Notes, *supra*, pp. 19-20.

⁵⁵ Foster deposition, *supra*, Exhibit 2, p. 2.

⁵⁶ Charles B. Garrison and Albert S. Paulson, "Effect of Water Availability on Manufacturing Employment in the Tennessee Valley Region," "Water Resources Research," April 1972.

⁵⁷ TVA, "Upper Duck Valley: Summary of Resources," July 1965, p. B-17.

⁵⁸ Foster deposition, *supra*, p. 22.

⁵⁹ Ibid., pp. 19-20.

(2) was based on industrial growth projections which had very little basis in fact; and

(3) included job expansion which was not based on the availability of the projected water supply.

Moreover, the project would make possible the creation of only 788 jobs for the subemployed (half of the claimed 1,575)—525 at Normandy and 263 at Columbia after 25 years while destroying immediately at least 440 jobs from the destruction of 440 farms. Even assuming TVA was correct in all of its projections and calculations, the Duck River project was, at best, a wash in terms of new jobs.

It should also be emphasized that not a single company, 12 years after the Normandy and Columbia projects were first recommended, and four years after completion of Normandy in 1976, has even suggested that it might locate a plant in the area because of either of the dams.⁶⁰ That fact is particularly significant, since TVA projected that 400 industrial and related jobs would be created within five years after completion of Normandy.⁶¹

C. REJECTING VIABLE ALTERNATIVES

The enhanced employment benefit, as calculated by TVA, flowed from the claimed water supply and water quality benefits. Those benefits were set at 14 percent for Columbia and 26 percent for Normandy. But TVA revealed in its 1969 report that the Columbia water supply could be obtained by constructing a small, single-purpose dam on Fountain Creek, above Columbia. According to TVA, that dam

. . . would satisfy the county requirements, including industry for a period of 50 years. At that time [assuming TVA's projected level of industrial growth] another dam impounding a similar size reservoir could be constructed on Rutherford Creek just below the city but upstream from the industrial complex. The two reservoirs could then satisfy all future industrial and municipal needs of the county, through the year 2075.⁶²

That low-cost alternative had the added benefit of enabling TVA to meet its projected water supply needs for Maury County in 50-year increments in case its projected industrial growth forecasts failed to materialize. In lieu of Normandy, TVA acknowledged the feasibility of building a small dam on Garrison Fork and supplying the cities of Tullahoma and Manchester with water from Tims Ford Reservoir,⁶³ a TVA project that had been previously justified on the basis of being able to meet Tullahoma's future water supply needs, "if it is assumed" that Tullahoma and a neighboring town "will need large supplies for industrial processing."⁶⁴

The water supply alternatives to Normandy and Columbia were estimated to have an annual cost of \$770,000.⁶⁵ TVA thus had identified

⁶⁰ Ross deposition, *supra*, p. 59.

⁶¹ TVA, 1969 Supplementary Notes, *supra*, p. 19.

⁶² *Ibid.*, p. 13.

⁶³ *Ibid.*, pp. 11-13.

⁶⁴ TVA, "The Tims Ford Project on Elk River," Planning Report No. 54-100, October 1965, p. 35.

⁶⁵ TVA, 1969 Supplementary Notes, *supra*, p. 13.

an alternative that would have provided approximately 50 percent of the annual project benefits (water supply and enhanced employment) for 20 percent of the annual project costs. That in turn raises the question of why TVA rejected the lower cost and less environmentally damaging alternatives of constructing two small tributary dams. Insight into TVA's thinking on that point was again provided by Dr. Foster:

Q. So you're saying that either then from a scientific and economic and analytic point of view the alternatives would satisfy all the water supply and water quality requirements the Duck River project is setting out to do, that that still wouldn't be good enough because there would not be a change in image?

Dr. FOSTER. There wouldn't be as much change in image.

Q. How do you go about calculating or determining in any kind of meaningful quantitative terms a change in image?

Dr. FOSTER. I think you'll have to accept my twenty years of experience for that.

* * * * *

Q. What you're saying is that a small impoundment even if it can do the same job as a big reservoir in terms of water quality and water supply does not have the same image appeal as a great big reservoir?

Dr. FOSTER. In a water short area like this that's right in my judgment.

Q. And that is a factor in your decision to proceed with the construction of a great big reservoir rather than one or two small impoundments that could do the same job?

Dr. FOSTER. . . . [R]egardless of whether or not there is a physical difference, which I think there is, there is the psychological impact of the larger impoundment over a pipeline from Tims Ford [another TVA impoundment] or a series of small impoundments.

Q. Is it generally your experience that the bigger the impoundment the better the image?

Dr. FOSTER. Within bounds I'd say if water supply is a sensitive factor, I would think yes.⁶⁶

Dr. Foster's "big is better" approach in supplying water to meet the fact or the image of a water supply problem is key to understanding TVA's motivation and that of the Upper Duck River Development Association in promoting the Duck River project. It was an attitude spawned by the notion that the Upper Duck River Valley "needs," and is entitled to, two major dams since the Duck was the only river of consequence in the area without a dam. As one project supporter put it, ". . . with dams all around us, we need dams bad."⁶⁷ Leonard Shabman, an agricultural economist, described the problem in another way:

⁶⁶ Foster deposition, *supra*, pp. 46-48.

⁶⁷ TVA, 1971 Public Hearing, *supra*, p. 276.

. . . [W]hile the number of purposes considered in planning now reflects a true multiple purpose perspective, the means considered for addressing these purposes have often remained as narrow as the original legislation dictated—the building of large dams and reservoirs as water control structures . . . Local and congressional interests seeking both satisfaction of such needs and economic progress through the TVA structure must frequently support what is recognized by law and “custom” as the single alternative available to the Authority. This support enforces the tendency toward promotion of that single option. In fact, it appears that careful planning could identify a number of alternative means of meeting the purposes identified as important in the Duck River area. To suggest that TVA implement such alternatives may demonstrate . . . economic wisdom . . . but ignores limitations of authority and custom on what TVA can and will consider in their program. Thus, the TVA water resource management program can best be characterized as “multiple purpose-limited means.”⁶⁸

TVA’s determination that the Normandy and Columbia dams were not necessary for water supply purposes put it in the position of building those dams primarily to add reservoir recreational purposes. In 1969, the benefits justifying Columbia, for example, were 32 percent recreational. That stated benefit was in addition to a claimed 6 percent fish and wildlife benefit and was based on the creation of an artificial lake at Columbia for swimming, power boating, sailing, etc. The need for such a facility was justified by TVA in the following terms:

At present, the *Upper Duck River Watershed* has no major impoundments to complement the area’s existing natural and man-made recreation attractions. The Duck River Project would provide opportunities for a variety of water-based recreation activities, thus enhancing the recreational appeal of the *watershed* and its future role in the region (emphasis added).⁶⁹

The key word quoted above is “watershed.” That statement should not be read to mean that there are no impoundments in the area, only that there are none on the Duck River. As recognized by a 1971 article in the Reader’s Digest:

. . . [T]here is not the slightest need, now or in the foreseeable future, for more flat-water recreational facilities in Tennessee. TVA has been building reservoirs since 1933 . . . In fact, within fifty miles of the Duck River Project, there are already nine reservoirs with 160,000 acres of surface and 3,000 miles of shoreline.⁷⁰

A similar point was made by TVA in a 1965 report on resources in the Upper Duck River Valley that noted that the area “is surrounded

⁶⁸ Shabman, *supra*, p. 250.

⁶⁹ TVA, 1968 Planning Report, *supra*, p. 56.

⁷⁰ James Nathan Miller, “Needed: A Bill of Rights for Our Rivers,” Reader’s Digest, July 1971, p. 3, reprint.

by major recreation regions . . . all offering extensive water-oriented recreation opportunities.”⁷¹ Additionally, the four-county area itself includes 12 lakes of varying sizes.⁷² In sum, the Columbia Project as presented by TVA in 1969 was a break-even proposition from a benefit/cost perspective, even assuming the doubtful validity of the 32 percent “recreational benefit” in an area saturated with reservoirs and the 23 percent “enhanced employment” benefit.

D. OBTAINING FUNDING

Nonetheless, in September of 1967, even before it had developed a positive benefit/cost ratio, TVA submitted a funding request to President Johnson for the Duck River project. Another request—this one for \$4.6 million—was made in September of 1968, and a similar one was made in September of 1969. All of those requests were denied by either President Johnson or President Nixon.⁷³

But in October of 1969, the same month in which TVA first revealed its positive benefit/cost data for the Columbia and Normandy project, the House Appropriations Public Works Subcommittee, of which Representative Evins fortuitously was chairman, added \$1.3 million for the Duck River project into the 1970 public works appropriations bill. They did so on the recommendation of TVA Board Chairman Aubrey Wagner, who testified that:

The Duck River area suffers particularly from a water shortage which is limiting its economic growth, and the Duck River Project would be important from the standpoint of breaking that bottleneck whenever the funds can be made available.⁷⁴

The Appropriations Committee’s addition for land acquisition costs survived in the final bill which was signed into law later that year by President Nixon.

In 1970, after initial funding for the Duck River project had been approved by Congress, state officials sought unsuccessfully to offer an alternative plan that would provide increased recreational benefits at a lower cost and without destroying the river. Recreational benefits for the area, for example, could be obtained by providing increased access to the Duck River for canoeing, fishing, hiking, and camping. The idea of preserving the river and developing its recreational potential as an alternative to damming the river to create artificial lakes was broached by the Tennessee State Planning Commission in 1970 in a meeting with the Upper Duck River Development Agency. According to the minutes of the meeting:

As the presentation proceeded there were several questions asked and it became obvious to the group that the [state] planners were planning for just the people residing in the

⁷¹ TVA, “Upper Duck River Valley: Summary of Resources,” supra, p. R-1.

⁷² Ibid., p. R-4.

⁷³ Deposition of Lynn Seeber, TVA general manager, December 5, 1973, in *Duck River Preservation Association v. TVA*, Civil Action No. 1130 (E.D. Tenn.) (hereinafter cited as Seeber deposition), pp. 29-31.

⁷⁴ Public Works Appropriations for 1970 for Water and Power Resources Development and the Atomic Energy Commission, Hearings before a Subcommittee of the Committee on Appropriations, 91st Congress, 1st session (1969), p. 953.

Upper Duck River area and that the [reservoir-oriented] recreation development was being curtailed. The planners have not accepted the Columbia and Normandy reservoirs and they were presenting alternative plans for scenic river development. It was on a motion by Jennings, seconded by Eoff, "*Resolved* that the alternate recreation plan be deleted and that there would be nothing in the regional plan that would suggest or imply any alternative to the construction of both the Columbia and Normandy dams. Motion carried unanimously. Meeting adjourned."⁷⁵

In 1970 and 1971, the administration again refused to include money for the Duck River project in its budget, but—again—Representative Evins and Congress put the money back in. In Fiscal Year 1971, for example, that amount was \$3.3 million, although TVA had asked for \$7.5 million.⁷⁶

The administration responded by impounding all but \$300,000 of the appropriated money through its Office of Management and Budget (OMB) in early 1971. White House and OMB officials held that the Upper Duck River Valley area was required by federal law to reimburse the federal government for the increased water supplies to be generated by the project and said that they would continue to withhold funds until the local areas agreed to such repayment.⁷⁷

On July 1, 1971, the Upper Duck River Development Agency agreed to repay \$16.2 million by entering into a contract with TVA. The agency, in turn, signed contracts with five cities in the area which agreed to assess residents 5 cents per 1,000 gallons of water consumed to meet the \$16.2 million obligation.⁷⁸

TVA Chairman S. David Freeman, in testimony before the subcommittee, on September 25, 1980, while acknowledging that "local support for a dam is not novel," claimed that local "support for this project is special" by virtue of the \$16.2-million agreement.⁷⁹ Chairman Freeman's analysis ignores, however, that such repayment was required under federal law and is potentially misleading to the extent it suggests that area residents agreed to the water surcharge in a surge of popular support for the project. In fact, the water surcharge has never been put to a popular vote.⁸⁰ There is reason to suspect, moreover, that some city officials agreed to the surcharge while assuring their constituents that the fee would never be levied. Manchester Mayor Eugene Jackson was quoted, for example, as stating that the city board "might as well go ahead and take some action" on the contract since officials in Washington had indicated that the cities would never actually be called upon to help finance the dam once federal funding was approved.⁸¹

The \$16.2 million agreement also has been used by TVA to suggest that it would be a gross breach of faith, and perhaps a breach of con-

⁷⁵ Ivy and Hollenbeck, *supra*.

⁷⁶ Seeber deposition, *supra*, pp. 32, 36.

⁷⁷ Letter from Max L. Friedersdorf, special assistant to the President, to Joe L. Evins, April 9, 1971.

⁷⁸ To date, the five cities have collected \$2.4 million in water use fees to meet the \$16.2-million obligation. Ross deposition, *supra*, p. 41. The amount required has not increased, although the project costs have.

⁷⁹ Hearings, *supra*, p. 181.

⁸⁰ Ross deposition, *supra*, p. 40.

⁸¹ The Manchester Times, June 25, 1971, cited in Ivy and Hollenbeck, *supra*.

tract, for TVA not to complete the Columbia dam and reservoir.⁸² The contract itself states nothing of the kind; in fact, it is full of provisions that would allow TVA to abort the project without penalty or to partially complete it.

Under the contract, TVA committed itself to acquire the land and design and construct the Duck River project "in general accord" with the 1968 Planning Report, "subject to such modifications as TVA shall, on the basis of further investigation of the dam sites and reservoir areas, or otherwise, deem necessary or desirable."⁸³ That commitment, however, was conditioned upon appropriations by Congress, and the conditions of Section V of the contract.⁸⁴

Section V, the repayment section, required the development agency to make the first repayment of \$5.7 million on June 30 of the first federal fiscal year following the tenth full federal fiscal year after Normandy reservoir "first becomes available for water supply purposes as determined by TVA."⁸⁵ Obviously, if TVA did not complete Normandy or did not determine that it was available for water supply purposes, no repayment would ever be due and the money collected from the water surcharge could be used for other developmental purposes.⁸⁶ The next repayment of \$2 million was not due until June 30 of the first federal fiscal year following the tenth full federal fiscal year after Columbia reservoir first became available for water supply purposes as determined by TVA. Subsequent annual payments would total the amount equal to 5 cents per thousand gallons from the "sale or use of water from the Duck River" by the water systems of the cities of Manchester, Tullahoma, Shelbyville, Lewisburg, and Columbia.⁸⁷

Then, however, the contract went on to make additional provisions if the Columbia reservoir were not built. If, at the time the first repayment was due, construction on Columbia had not begun, no subsequent repayment by the development agency beyond \$5.7 million was required.⁸⁸ After specifying the amounts of water that the agency could contract to provide to each city system "from the Duck River or the Normandy Reservoir, following the completion of that reservoir, for a period of not more than 50 years," the contract went on to state that "any agreements by the Agency under this section are to be expressly conditioned upon the operation by TVA of Normandy and/or Columbia Reservoirs in a manner which, in its sole judgment, promotes all project purposes, *it being expressly understood that neither TVA nor Agency guarantees the availability of the foregoing amounts of water* (emphasis added)."⁸⁹

Obviously, TVA, as any prudent contractor would do, had not committed itself to provide services or water when it knew the number of unforeseen contingencies that could arise. It had retained a great deal of flexibility for itself.

⁸² Hearings, supra, p. 181. TVA, Alternatives Report, supra, p. 4.

⁸³ "Agreement between Tennessee Upper Duck River Development Agency and TVA," Contract No. 35326A, July 1, 1971 (hereinafter cited as TUDRDA contract), p. 3.

⁸⁴ Ibid.

⁸⁵ Ibid., p. 12.

⁸⁶ A member of TVA's office of the general counsel told the subcommittee staff that TVA has never officially determined that Normandy is available for water supply purposes, but that it was presumed that the reservoir was available in 1976.

⁸⁷ TUDRDA Contract, supra, p. 13.

⁸⁸ Ibid.

⁸⁹ Ibid., pp. 13-14.

The development agency subsequently made contracts with the five cities that resulted in a 5-cents-per-thousand-gallon surcharge on water usage to provide for the initial payment. The effect was that the chief beneficiaries of any increased streamflow would be the industries that take water directly from the Duck River, as those located below Normandy and below Columbia do. They are not subject to the surcharge.

By 1971, therefore, the Upper Duck River Development Association had succeeded in getting TVA committed to the construction of two dams on the Duck River, a commitment that has intensified over the years and taken on a life of its own. By that date also, the Congress had appropriated money to acquire land for the dams and the association had devised and implemented a water repayment plan acceptable to OMB. But circumstances were changing. Congress was enacting new laws that reduced TVA's long-held autonomy and control over the Valley. TVA had great difficulty accepting those Congressionally mandated changes. They put the agency on the defensive in its continued promotion of the Duck River project.

III.—THE RAISING OF ENVIRONMENTAL CONCERNS

TVA Chairman S. David Freeman, in testifying before the subcommittee, went to great lengths to disassociate TVA, and especially himself and Director Richard Freeman, from any responsibility for the Duck River project, preferring to place the blame on Congress. Congress, he stated, "has reaffirmed its support" every year since 1969.⁹⁰

Furthermore, "[t]he basic issue of whether or not this project should be built," Mr. Freeman said, "was decided long before we came on board, and it has never been one for the TVA board to consider." But, when questioned further by Rep. Joel Deckard (R-Ind.), Mr. Freeman acknowledged that he had taken it upon himself not to reconsider the project.

MR. DECKARD. . . . the reason I asked the question is that in August of 1977, Mr. Bill Chafin, executive director of the Maury County Chamber of Commerce, which is in strong support of the project, wrote to you urging you to consider all the facts before you made up your mind concerning the project. You responded on September 20 assuring Mr. Chafin that you had not made up your mind concerning the project . . .

You obviously knew at that time that Congress had been appropriating money for the project, yet you seem to be very clearly promising Mr. Chafin that you would review the facts and come out either for or against the project in spite of the congressional language.

MR. FREEMAN. I did write him and tell him that I had no opinion. Perhaps he could have inferred from that that I would form an opinion, but as I got on the job and realized all of the important live issues that TVA had before it. I have chosen basically not to get into this issue.

There is no necessity to form a judgment because there is no occasion for it. The Congress continued to direct us to

⁹⁰ Hearings, *supra*, p. 181.

build it, and we have 50,000 employees and a power program with \$3.5 billion cash flow, more paper, and more live issues. I have chosen to spend my time putting together the nation's strongest energy conservation program, getting the solar program off the ground, and numerous other things.⁹¹

Not only does that recitation ignore the fact that Congress supported the Duck River project over the years at the specific recommendation of TVA, but also that TVA has the unilateral right to drop projects, as it did in the case of the Upper French Broad project.⁹² TVA General Manager Lynn Seeber in 1973 described TVA's funding as follows:

SEEBER. TVA's appropriations are so-called lump sum appropriations. That is, our appropriation bill is only about two inches long on a piece of paper and they, in effect, appropriate a lump sum to us and it isn't a lined item appropriation where they freeze things, that you can only spend so many dollars and cents for certain specific things and this [dropping projects] is sometimes done.

QUESTION. Do you customarily give notice to the Office of Management and Budget or to the Bureau of Budget that this is done?

SEEBER. Yes. We notify the Office of Management and Budget and did in this case [Upper French Broad], and also the Congressional appropriations committees.⁹³

In addition, TVA and other federal agencies must construct projects consistent with the statutes governing such projects.⁹⁴

Prior to 1969, TVA's practical autonomy over its water projects, although subject to Congressional review, was virtually complete, especially with regard to their environmental impact. TVA was exempt from the Fish and Wildlife Coordination Act of 1934, and the National Historic Preservation Act of 1966 barely infringed on the periphery of TVA's consciousness.

Beginning in 1969, however, with passage of the National Environmental Policy Act (NEPA), Congress enacted a series of measures that impacted significantly on federal water projects. Those laws included the 1972 Federal Water Pollution Control Act (FWPCA)⁹⁵ and the 1973 Endangered Species Act.⁹⁶

Each of those measures, as administered by the states, the Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service, increased TVA's burden of defending the Duck River project.

⁹¹ *Ibid.*, pp. 184-185.

⁹² The Upper French Broad project was very similar to the Duck River Project. It was a multi-purpose water control system with enhanced employment as a major benefit. Even so, its benefit/cost ratio was 1.3:1. Described by TVA as "a pioneering effort in cooperative federal-state-local long-range planning for development of water and related land resources," it was later abandoned by TVA despite Congressional appropriations because of funding limitations by the administration and a "waning" of public support. Senate hearing on 1974 Public Works Bill, Senate Appropriations Committee, 93rd Cong., p. 3480.

⁹³ Seeber deposition, *supra*, p. 38.

⁹⁴ *TVA v. Hill*, 437 U.S. 153 (1978).

⁹⁵ 42 U.S.C. 4321 et seq.

⁹⁶ 16 U.S.C. 1531 et seq.

A. NATIONAL ENVIRONMENTAL POLICY ACT

One month after President Nixon signed the fiscal year 1970 energy and water appropriations bill, which included money for land acquisition for the Duck River project, the National Environmental Policy Act went into effect. TVA was thus required to prepare an environmental impact statement (EIS) for the project and to follow the mandate of the act that it is

the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.⁹⁷

To carry out that policy, federal agencies were given the following guidelines:

(b) . . . [I]t is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;

(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.⁹⁸

That mandate was to be carried out in the planning stages of a project through a "systemic, interdisciplinary approach" to environmental planning and evaluation "in decisionmaking which may have an impact on man's environment."⁹⁹ The acting federal agency was to consult with and obtain the comments of any federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved.¹⁰⁰

⁹⁷ 42 U.S.C. 4331(a).

⁹⁸ 42 U.S.C. 4331(b).

⁹⁹ 42 U.S.C. 4332(2)(A).

¹⁰⁰ 42 U.S.C. 4332(2)(C).

By 1971, the courts had made it clear that preparing a detailed statement about the environmental impacts of a project was not sufficient to meet the requirements of NEPA. A federal agency is "... not only permitted, but compelled, to take environmental values into account." It must also study, develop and describe appropriate alternatives. The purpose of the EIS was to ensure that the balancing of environmental versus other benefits of a project was actually carried out. And the decisionmaker would be the governing body, not the agency staff.¹⁰¹

1. *The Draft Environmental Impact Statement*

TVA circulated a draft EIS in June of 1971. It was a brief, 28-page document in which one page was addressed to adverse environmental effects which could not be avoided. Those included an increase in mud-diness during the construction phase that might cause "temporary" increases in treatment requirements downstream; water low in dissolved oxygen if a "record summer flood" occurred; the loss of 15,800 acres of wildlife habitat through inundation (which TVA claimed would be replaced by an unidentified habitat of equal value): destruction of a rare beetle and millipede species; loss of 14 miles of stream for canoe or raft trips and the relocation of 440 families.¹⁰²

TVA's discussion of alternatives was a bit longer (it took three pages). TVA stated that there was no flood control alternative. For water supply, it did not even mention the possibility of using the area's large, untapped, ground water resources; the area needed "low-flow augmentation" to maintain water quality that "can be achieved only through the use of a reservoir. TVA said it had investigated the possibility of using detention dams for flood control and single-purpose dams for water supply and low-flow augmentation. It claimed, however, that those alternatives "are neither environmentally nor economically more favorable than multi-purpose reservoirs. Detention reservoirs are not conducive to fish and wildlife survival and neither detention reservoirs nor single-purpose reservoirs afford the net environmental benefits of multi-purpose projects." Only the reservoirs could bring recreation, fish and wildlife, and shoreline benefits to the area, TVA concluded. And the enhanced employment benefits also would not accrue without the project.¹⁰³

Circulation of the draft EIS was significant on two counts. First, it provided the citizens of Tennessee their first opportunity to comment on the Duck River project (but not before TVA had developed "appropriate techniques and information to be supplied to organizations in the Upper Duck River area for use in combatting efforts of so-called wilderness preservation groups opposed to the Duck River project").¹⁰⁴

Second, it provided other federal and state agencies an opportunity to comment on the project.

¹⁰¹ *Calvert Cliffs' Coordinating Committee v. AEC*, 449 F. 2d 1109 (D.C. Cir. 1971).

¹⁰² TVA, "Environmental Statement," April 28, 1972 (hereinafter cited as TVA, Final Environmental Statement), pp. A-17-18.

¹⁰³ *Ibid.*, pp. A-19-22.2.

¹⁰⁴ Memorandum from Greer C. Tidwell, June 11, 1971. The Whitesburg, Kentucky, Mountain Eagle reported that TVA in combatting citizen opposition to Tellico had its private security force maintain files on Tellico critics. James Branscome, "The TVA: It Ain't What it Used to Be," 28 *American Heritage*, (hereinafter cited as Branscome), pp. 68-78, 78.

The overall inadequacies of the draft EIS were probably most concisely described by George Marienthal, the acting director of EPA's Office of Federal Affairs.¹⁰⁵ "The statement is lacking in sufficient information to enable an accurate environmental appraisal of the total project," he wrote. "In general, proper consideration has not been given to problems of water quality, project alternatives, secondary environmental effects, environmental degradation during construction, or operational procedures."¹⁰⁶

In the detailed comments accompanying Mr. Marienthal's letter, EPA listed deficiencies in TVA's consideration which included almost all of the controversial issues that still plague the project today. The EIS was "insufficient to support the contention that the project is necessary, environmentally sound, and constitutes the best choice of alternative solutions in the water resource problems of the region." TVA was called to task for failing to

carefully compare the benefits of a free-flowing stream to those of a manmade lake. The creation of two new lakes, offering virtually the same recreational benefits as the existing lakes in the region; and the sacrifice of a free-flowing river, with the potential for classification as a scenic river, are two effects of the project which should be justified in the environmental impact statement.¹⁰⁷

As a result, EPA said, the EIS should be revised to provide information on the state of the current water quality of the Duck River; discuss why flow augmentation was better than tertiary treatment of pollutants; survey in "reasonable detail" the biological system of the river; review the effect of the project on fish and wildlife; describe operational procedures to alleviate the environmental problems of impoundments such as silt loads and algae blooms; explore the effects of the industrial and commercial development on the environment; explore in detail the possible alternatives, giving "adequate information, data, or other evidence on all alternatives, in addition to reasons for the elimination of each alternative considered."

Moreover, the overall environmental benefits ascribed to the project "should be compared in detail with those values of the free-flowing river which will be sacrificed." EPA pointed out specifically that the recreational benefits should be compared; there should be discussion of the "net agricultural benefit to the region considering that more acreage will be permanently flooded by the reservoirs than will be saved from occasional flooding downstream;" and that, since higher water quality and increased water supply could be realized only if the water in the reservoir was of sufficiently high quality, specifics about obtaining that quality should be outlined. Finally, EPA said, the statement should contain a reasonable estimate of project life, taking into consideration sediment buildup in reservoirs and changes in the physical nature and course of the river.¹⁰⁸

The Fish and Wildlife Service's response to the draft EIS suggested that the document was too "simplistic" with respect to pri-

¹⁰⁵ TVA, Final Environmental Statement, *supra*, p. B-16.

¹⁰⁶ *Ibid.*

¹⁰⁷ *Ibid.*, pp. B-2, B-8.

¹⁰⁸ *Ibid.*, pp. B-2-10.

mary and secondary effects.¹⁰⁹ More specifically, it criticized the inference that 15,800 acres of terrestrial wildlife would be replaced by fish and waterfowl habitat of equal value. Such a statement "does not adequately evaluate the impact of the project on the fish and wildlife resources of the projected area," Acting Assistant Secretary W. W. Lyons wrote to TVA.

It implies that the reservoir habitat will replace adequately the fish and wildlife habitat to be inundated by the project. It is suggested that this statement either be deleted or modified to avoid any misinterpretation of the comparability . . .¹¹⁰

The statement should also spell out the means and measures to be used, or proposed, to eliminate or minimize the adverse effects of the project on fish and wildlife so they can be evaluated properly. And TVA should not mention a game management area if, in fact, land for it was not included within the project plan, FWS said.¹¹¹

At the public hearing, support for and against the project appeared evenly divided. Its supporters said the area needed increased water supply and recreational facilities to grow. Its detractors were concerned with the loss of 27,500 acres of valuable farmland upriver supposedly to protect 9,000 acres downriver and a short strip of land along the river in Columbia from flooding¹¹² and claimed the need for water supply to attract industry was specious¹¹³ and that the benefit/cost figures had been juggled.¹¹⁴ Richard Coleman, representing the Sierra Club, questioned TVA's claiming of wildlife benefits when over 9,000 acres of bottom land, which was supporting a population of small game, would "be replaced by a biologically sterile area of dry mud." Coleman, and others, also questioned TVA's enhanced employment projections.

¹⁰⁹ According to FWS, the environmental assessment would be greatly improved if the effects of the Columbia and Normandy Reservoirs were discussed separately as well as in combination. The environmental complexities and magnitude of trade-offs having both positive and negative environmental implications involved in a project such as that proposed for the Duck River become masked by oversimplification. *Ibid.*, p. B-32.

¹¹⁰ *Ibid.*, pp. B-33-34.

¹¹¹ *Ibid.*, p. B-34.

¹¹² Vincent Banks, a farmer near Normandy, presented the views of the Coffee County Farm Bureau as follows:

"Most of Coffee County comprises what early settlers called the Barrens, because of the generally meager productivity of the soil. But the one place where naturally fertile soils occur is along the Duck River and its tributaries. Here the alternative risings and fallings of the river have left a rich soil deposit . . . which is not only the richest land in the county, but some of the richest in the whole state . . . This rich bottomland would be gone if a dam is built near Normandy . . . If we choose to stay in Coffee County, and remain in farming, we will have to settle on land of far less fertility . . . If we decide to relocate on land of quality similar to what we now have, our chances of finding it are remote since TVA has overflowed the most productive land in the valley with its reservoirs." TVA, 1971 Planning Hearing, *supra*, pp. 225-26.

¹¹³ *Ibid.*, p. 268.

¹¹⁴ William Russell, president of the Tennessee Citizens for Wilderness Planning accused TVA of "deliberately distort[ing] the net recreation figures. The reservoir recreational benefits calculated by TVA in a 1970 report on a Hiwassee Dam proposal were actually only about one-half of the potential recreation benefits of a free-flowing river . . . The evaluation assumed, presumably correctly for almost anywhere in Tennessee, that most recreationists who would use the reservoir were already using some other reservoir in the region. On the Duck, the potential expansion of river recreation has been ignored, and TVA has chosen a figure for river recreation which, instead of being higher than that for reservoir recreation . . . was only one percent of it . . . It seems clear that the net recreation benefits claimed for the Duck Reservoir which amounts to more than twenty-five percent of the benefits of the whole Duck Project, were calculations contrived to bring the benefit-cost ratio of the project to slightly above 1.0." *Ibid.*, p. 62.

As TVA's records will probably show, such projections of industrial benefits are estimates and in fact have seldom been realized. A quick look at the nine major reservoirs within a 50-mile radius of the proposed project, some nearing 30 years of age, indicate that projected industrial development seldom materializes.¹¹⁵

TVA Chairman S. David Freeman has subsequently lent credence to statements that industrial development does not always occur just because a reservoir is built. In testimony before the House fisheries subcommittee in 1978, he said:

I was at Melton Hill Reservoir the other day and there is a lot of land on the lakefront that has been there for years where no industry has yet located. It is not accurate to say we have used up all the lakefront land, or if we form a lake, the place is going to become an industrial area very quickly.¹¹⁶

2. *The Final Statement*

Although the final EIS was a much longer document than the draft statement, the major portion of the addition was composed of appendices which included the draft itself, comments on the draft, lengthy archaeological and endangered species surveys and a detailed explanation of TVA's relocation assistance program. Not a single change in the design of the project was made; the benefit/cost figures were not recalculated, but remained as they were in 1969; and the consideration of alternatives was again perfunctory. The question of why 27,500 acres of farmland should be destroyed to save 9,000 acres was never answered. TVA detailed the "significant adverse environmental impacts" of the proposed project on wildlife in the appendices. Those included the loss of 28,000 acres in upland wildlife habitats, reduction of some rare and endangered species of fish; displacement of other desirable fish; and a 35-percent reduction in mussel habitat.¹¹⁷ In an appendix, TVA also noted that breeding habitat for wood ducks would be lost; that the often-touted Cedar Creek waterfowl refuge would attract Canadian geese only by concentrating them at Cedar Creek instead of somewhere else; and that the population of furbearers, such as mink and muskrat, would decline.¹¹⁸

Displaced animals would have doubtful chances for survival. The document stated:

Because of the reproductive potential for wildlife, natural habitats are normally filled to capacity so that there is no room for additional numbers. Eventually (and usually rather

¹¹⁵ *Ibid.*, p. 67.

¹¹⁶ Hearings before the subcommittee on fisheries and wildlife conservation and the environment of the Committee on Merchant Marine and Fisheries, 95th Congress, 2d session (June 23, 1978), p. 775.

Doug Goddard, county executive of Jefferson County in East Tennessee, is persuaded that TVA's promises of industrial development are more myth than reality. Jefferson County includes Douglass Reservoir, that offers 555 miles of shoreline. According to Mr. Goddard, the area "could be a major agricultural center if it weren't for that reservoir." If "these reservoirs are supposed to bring in all that industry, I'd like to know where it is." he was quoted as saying. "We do not have one industry here because of that reservoir and it's been here since 1943," he claimed. Marvin Bailey, "Tellico: Grave Marker to a People," *The [Memphis] Commercial Appeal* (February 17, 1980), p. G-3.

¹¹⁷ TVA, Final Environmental Statement, *supra*, Appendix N, pp. N-1-4. Rare and endangered mussels were not mentioned in the body of the report.

¹¹⁸ *Ibid.*, Appendix L, p. L-1a.

quickly) the excess numbers of animals will be eliminated by predation, disease, and accidents, and the population will return to the same level that existed before inundation (or to a somewhat depressed level).¹¹⁹

Nonetheless, according to TVA, there was an important benefit to wildlife resulting from this destruction: It was

the stability in tenure of terrestrial habitat afforded by the virtue of the change from private ownership to Federal ownership. This change in ownership will provide opportunities for management of upland wildlife on lands that otherwise might not receive such attention.¹²⁰

To be fair to the staff of TVA, this report must note their attempts to both mitigate some of the adverse effects of the project and recalculate benefits. The division of forestry, fisheries, and wildlife, tried repeatedly to get the TVA board to establish a promised 4,000-acre wildlife management area.¹²¹ When it was unsuccessful, TVA's director of forestry, fisheries and wildlife recommended that "to be more honest . . ." the EIS should disclose that the wildlife management area was only a contingency and that funding for its purchase was not included in the project's cost estimates.¹²² Nevertheless, the final EIS clearly implied that the wildlife management area would be developed.¹²³ The recreation resources branch tried to include the cost and benefits of a planned float stream development below Normandy Dam, but "the decision had been made to say very little about this project in the environmental statement."¹²⁴ That branch also refused to support a Duck River use study because of its bias against the river in its present state.¹²⁵

TVA's manager of agricultural and chemical development noted that the final EIS "inaccurately depicts agriculture as a declining industry" when in fact increasing farm sales and income have helped "develop urban and industrial activities within the region." More importantly, TVA's claim that the agricultural losses would be mitigated as farmers moved to other idle land and made it productive could not be supported.

We do not agree that sufficient unsettled land exists for even a substantial portion of 176 "working" farmers to easily move to comparable farms and immediately resume profitable operations . . . Most available land exists in fragmented tracts and tends to be of inferior quality to that which must be taken for the project. It will take several years for the farmers to become re-established on new land and regain their previous income flow level. The increasing gap between farm prices

¹¹⁹ *Ibid.*, Appendix L, p. L-3.

¹²⁰ *Ibid.*

¹²¹ See, *inter alia*, memoranda from Thomas H. Ripley to H. Peter Claussen, September 3, 1971; memorandum from Gordon E. Hall to George R. DeVeney, December 6, 1971.

¹²² Memorandum from Thomas H. Ripley, director of forestry, fisheries, and wildlife development to John S. Rozek, March 20, 1972.

¹²³ TVA, Final Environmental Statement, *supra*, pp. 22, and Appendix B, p. B-53.

¹²⁴ Memorandum to the file from John L. Needy, January 5, 1972.

¹²⁵ The bias resulted because observation periods were mainly in the summer when river usage was low, and because of a per-mile, instead of a person-hours-per-water-surface-acre, use calculation. Memorandum from John L. Needy to John R. Meldorf, January 21, 1972. The projected use of the Duck for canoeing was completely eliminated from the final report.

and costs of farm inputs has made increasing size of farms and volume of business necessary in order to maintain profitable operations. Farms in the inundated area and the area to be taken are somewhat larger than the average of the region . . . We suggest deleting the entire paragraph or recognizing the adverse impact.¹²⁶

TVA deleted the paragraph.

TVA's chief of the environmental staff sought unsuccessfully to persuade his superiors of the need for an "impartial" EIS. "It should stick to truly environmental issues and not be used to justify the subject project," he urged.¹²⁷

The EIS, in discussing future water needs, projected "that over the 100-year period ending in 2075, the population will increase from 135,000 to almost 375,000."¹²⁸ Those were the same projections as in TVA's earlier published reports.¹²⁹ The EIS population forecast did not take into account, however; as pointed out by TVA staff, that TVA had lowered its 2075 population forecast from 370,000 to 275,000 to reflect the area's reduced population as reported in the 1970 census.¹³⁰ Had TVA revealed that 24 percent decline in the population forecast in its EIS it would have been compelled to reevaluate the need for the project and its benefit/cost ratio.

The Duck River Preservation Association subsequently recorded the attempts of the TVA staff to recalculate the entire benefit/cost determination.

Responsible TVA officials recommended a reevaluation of the 1968 cost-benefit evaluation in light of data produced in the mandated NEPA process. Notwithstanding this, TVA General Manager Lynn Seeber, made the decision not to revise or even reconsider the cost-benefit determination. TVA has steadfastly maintained that since a minute portion of the funds for the dams was appropriated by Congress in 1969, NEPA, which became effective on January 1, 1970, requires no reevaluation of the project economics . . . With no such reevaluation, the decision making process contemplated by NEPA never occurred.¹³¹

Yet TVA was also told in no uncertain terms in 1972 by the Sixth Circuit that

Congress did not intend, by approving funds for the [Tellico Project], to repeal the NEPA . . . other federal courts have similarly concluded that congressional appropriations for a project subject to NEPA are not to be taken as expressing any view with respect to compliance with NEPA.¹³²

¹²⁶ Memorandum from Lewis R. Nelson, manager of agricultural and chemical development to F. E. Gartell, director of environmental research and development, March 17, 1972.

¹²⁷ Memorandum from Greer C. Tidwell, chief, environmental assessment, to F. E. Gartell, February 2, 1971.

¹²⁸ TVA, Final Environmental Statement, *supra*, p. 36.

¹²⁹ TVA, 1968 Planning Report, *supra*, p. 47; TVA, 1969 Supplementary Notes, *supra*, p. 11.

¹³⁰ Memorandum from A. J. Gray to John R. Meldorf, December 12, 1970; memorandum from John R. Meldorf to F. E. Gartell, February 24, 1971.

¹³¹ TVA, "Supplement to Final Environmental Statement: Duck River" Project, July 1974 (hereinafter cited as TVA, EIS), Appendix F, Supplement, pp. F-2-7 and 8.

¹³² *EDF v. TVA*, 4 ERC 1850, 1860 (6th Cir. 1972).

Perhaps TVA Chairman S. David Freeman's statement in 1978 regarding the Tellico project also sheds some light on the cavalier way in which TVA approached its legal mandate to reevaluate and perhaps modify or adopt an alternative to the Duck River project in light of various environmental policies. Mr. Freeman made the statement when appearing before the House subcommittee on fisheries, wildlife, conservation and the environment as part of its oversight of the Endangered Species Act.

Despite the requirements of NEPA, TVA had "steadfastly refused to evaluate any alternatives to the dam and reservoir approach to the project," Mr. Freeman reported. "For that reason, the TVA files contain no cost and benefit figures on alternatives other than cursory evaluations as part of the environmental impact statement in 1971." And, even though the scenic river approach showed a more favorable benefit/cost ratio compared to the total cost of the original Tellico project, "the analysis did not cause any change in the project which was already well underway."¹³³

Freeman went on:

The refusal by TVA to consider alternatives goes at least as far back as 1965 when the project was first proposed to Congress. The files revealed pleas from local citizens and even the governor of the State of Tennessee in 1971 to consider an alternative development that did not "flood" the river. But TVA continued to build the dam. Since the Tellico project was proposed in 1965, Congress passed the Historic Preservation Act in 1966, the National Environmental Policy Act in 1969, and the Endangered Species Act in 1973, but TVA did not modify its project in any material way to reflect the values which these acts were designed to protect. . . .¹³⁴

The National Environmental Protection Act in requiring the preparation of EIS's did so to require federal agencies to take environmental issues into account in reaching decisions. An EIS is not intended for use as a public relations document after those decisions have been reached. Nevertheless, TVA's board of directors authorized construction of the Duck River project on July 1, 1971, one year and six months after the effective date of NEPA and ten months before completion of its final EIS on May 1, 1972.¹³⁵

3. *The Lawsuit under NEPA*

In July of 1972, the Environmental Defense Fund, the Duck River Preservation Association and five individuals whose lands were to be condemned challenged the legal sufficiency of the EIS in federal district court. They charged that the EIS did not fully disclose the impact of the project upon agriculture, the recreational activities available, plant life, aquatic habitat and wildlife; did not disclose the environmental effects of the secondary development TVA said would result; did not adequately disclose alternatives; did not ade-

¹³³ "Hearings on Endangered Species Authorization—H.R. 10883: Endangered Species Oversight" before the Subcommittee on Fisheries and Wildlife, Conservation and the Environment of the Committee on Merchant Marine and Fisheries, 95th Cong., 2nd session (June 23, 1978), Part 2, Serial No. 95-39, p. 747.

¹³⁴ *Ibid.*

¹³⁵ Plaintiff's Additional Suggested Findings of Fact in *Duck River Preservation Association v. TVA*, Civil Action No. 1130 (E.D. Tenn.), p. 7.

quately consider responsible public and private comment; included outdated economic analysis; and that TVA never undertook a good faith consideration of the impact of the project.¹³⁶

The case was not tried until 1974. In the interim, TVA proceeded with construction of both dams, but concentrated primarily on Normandy, which was completed in 1976. In a confusing decision, the court found that TVA did not reach its decision to proceed with construction after a "full, good faith consideration" of some of the environmental factors. But the fatal defect was its failure to disclose certain information it had available, not its failure to consider the information in the actual balancing process.¹³⁷

Witnesses at the trial testified that TVA General Manager Seeber had said that he wanted the EIS to be a "public information" document, that he wanted it to reflect more of the "good" and less of the "bad" aspects of the project, and that he did not want to hear any more about what was going to happen to the "bunny rabbits" as a result of the project.¹³⁸ In its opinion, the court disapproved of that directive by Seeber and also his recommendations to the TVA board to eliminate a discussion of agricultural losses, but to include a discussion of the wildlife management area for which TVA had not provided funds. It did not, the court said, "comport with NEPA."¹³⁹

The court then ordered TVA to include in a supplemental EIS information on the adverse effects of the project on agriculture and agriculturally related business; to change an implication that a wildlife management area near Normandy would actually be provided although TVA had already abandoned the idea; and to disclose the full effect on recreation of the project.¹⁴⁰ The court specifically refused to force a recomputation of the benefit/cost analysis because "... [TVA] included in its EIS the benefit-cost ratio on the basis of which the project was approved and advanced therein its reappraisal thereof in the light of NEPA."¹⁴¹ TVA's "advancement" of benefits and costs was a single statement in the Environmental Statement that "[s]ince price increases since 1969 would increase both benefits and costs proportionately, the ratio is valid as an indicator of the relationship of costs and benefits."¹⁴²

¹³⁶ *Duck River Preservation Association v. TVA*, Civil Action No. 1130 (E.D. Tenn.).

¹³⁷ *Ibid.*, Memorandum Opinion, March 7, 1974, p. 24.

¹³⁸ Fly testimony, *supra*, p. 4.

¹³⁹ *Duck River Preservation Association v. TVA*, Memorandum Opinion, *supra*, pp. 17-21 (also cited at 6 ERC 1789, 1793).

¹⁴⁰ *Ibid.*, pp. 21-22.

¹⁴¹ *Ibid.*, p. 23.

¹⁴² TVA, Final Environmental Statement, *supra*, p. 34. The court apparently ignored a decision on the Army Corps of Engineers' Trinity Project (a 363-mile, "multi-purpose" channel from Houston to Dallas) which held that the courts could not.

"On the basis of the present record and the intended thrust of NEPA, bypass an examination of the benefit-cost analysis, at least insofar as it is relevant to environmental considerations within the Trinity and Wallisville Projects. As a close scrutiny will reveal, the present procedures tend to intertwine environmental and non-environmental factors in such a way that certain environmental 'benefits' have been quantified in economic terms and included in the benefit-cost analysis; yet, at the same time, certain of the environmental 'costs' have not been quantified or considered at all. The result is that the meaning of the benefit-cost ratio which is represented to the Congress, this Court and the public as an objective evaluation of all quantifiable factors involved in these various projects, is open to considerable question."

The court specifically questioned a claimed, 100-year project life instead of the Corps' usual 50-year life. ("It should be axiomatic that an artificially long projected life span for a project involving combined environmental economic 'benefits and costs' would be unacceptable under NEPA; the resulting ratio would be artificially high, thus suggesting a false 'balancing' between technical, economic, and environmental factors.") It also was skeptical about a project with a large percentage of recreational benefits when recreational facilities building costs were minimal. *Sierra Club v. Froehke*, 359 F. Supp. 1289 (S.D. Texas 1973). The Trinity Project was not built, although approved by Congress in the early 1960's. The Corps subsequently found another barge canal to build; the questionable Tennessee-Tombigbee Project.

In a footnote, the court said that TVA would be "well-advised" to consider other criticisms of the plaintiff, even though plaintiff had been "overly technical and hypercritical in much of its criticisms."¹⁴³ TVA chose to ignore that directive.

B. THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972

The Federal Water Pollution Control Act (FWPCA) of 1972 was passed with the stated purpose of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters.¹⁴⁴ Sections 404 and 401 of the act were of particular relevance to the Duck River project. Section 404¹⁴⁵ established a permit program, to be administered by the U.S. Army Corps of Engineers, to regulate the discharge of dredge and fill materials into the nation's navigable waters. Under the Corps' interim final regulations, published on July 25, 1975, the issuance of such permits was to be based on guidelines developed jointly by the Environmental Protection Agency and the Corps. Those guidelines limited the issuance of such permits to activities determined to be in the "public interest." In conducting that "public interest" review, the Corps must consider all relevant factors, including:

conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, and, in general, the needs and welfare of the people.¹⁴⁶

Section 401 required all applicants for a federal permit to obtain a state certification indicating that they complied with applicable federal and state water quality standards.¹⁴⁷ Although the 1972 law was unclear on whether federal agencies were required to obtain that certification, the 1977 Clean Water Amendments deleted the controversial section and included federal bodies.¹⁴⁸

Since the construction of dams requires the filling of waterways, Section 404 assigned to the Corps major responsibilities concerning federal water projects. At the effective date of its regulations, the Corps became the ultimate arbiter of whether the Duck River project was, and is, in the public interest.

1. TVA's resistance to jurisdiction

TVA's initial reaction in 1975 to the Corps' review authority was that TVA was exempt from the FWPCA in all of its activities in the Tennessee River system because of the broad scope of its authorizing legislation. As a result, it never applied for a 404 permit for Normandy Dam, which was completed in January 1976, and began construction of Columbia in 1974 without a permit application. Its opposition—and construction—were to continue until 1978.

The Corps set about in 1976 to bring TVA into line. In a letter dated February 9, 1976 (responding to a TVA letter of November 24,

¹⁴³ *Duck River Preservation Association v. TVA*, Memorandum Opinion, *supra*, p. 25.

¹⁴⁴ 33 U.S.C. 1251(a).

¹⁴⁵ 33 U.S.C. 1344.

¹⁴⁶ 333 C.F.R. 320(a). Energy needs, safety and food production were added after the 1977 Clean Water Amendments to the FWPCA.

¹⁴⁷ 33 U.S.C. 1341.

¹⁴⁸ 33 U.S.C. 1341(a).

1975), Colonel Henry J. Hatch, then the Nashville District engineer, told TVA Chairman Aubrey J. Wagner that

TVA activities are clearly within the scope of Section 404. As expressed in 33 CFR 209, 120 (e) (4), this is the position of the Corps of Engineers as to all Federal agencies, many of which, like TVA, have broad authorizing legislation.¹⁴⁹

Hatch cited Section 313 of the FWPCA as his authority for the Corps position. That section states in part that

[e]ach department, agency, or instrumentality of the executive, legislative, and judicial branches of the Federal Government (1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result in the discharge of runoff of pollutants shall comply with Federal, State, interstate, and local requirements respecting control and abatement of pollution to the same extent that any person is subject to such requirements.¹⁵⁰

"This unequivocal declaration by Congress," Hatch concluded, "appears to supersede that portion of Section 26(a) of the TVA Act of 1933 which you cite in your letter . . . Accordingly I hereby request that TVA submit appropriate applications to this office . . ." ¹⁵¹

According to an internal Corps memorandum, the 1975 TVA position was a reversal from that taken by its general manager in 1973. That official, according to General E. R. Heiberg III, the division engineer, recognized that TVA was subject to the permit requirements of Section 404 and "would apply for needed permits in the manner provided for other Federal agencies."¹⁵² Colonel Hatch described TVA's attempts to claim exemption from various acts by virtue of Section 26(a) of the Tennessee Valley Authority Act of 1933 a "continuing source of unique and complex jurisdictional difficulties between this office and TVA." If TVA's position that the TVA Act exempted it from all past and future requirements was allowed to stand, TVA would be virtually immunized "from any requirement Congress might seek to impose on Federal agencies," Colonel Hatch feared. But TVA's position on Section 404 also appeared to be inconsistent. "I note that TVA routinely applies for NPDES [National Pollution Discharge Elimination System] permits from the Environmental Protection Agency pursuant to Section 402 of the FWPCA."¹⁵³

TVA did not back down. As a result, Colonel Hatch responded that, if TVA did not apply for permits for the discharge and fill work going on at Columbia, he would have no alternative but to follow the procedure for unauthorized activities, which was to refer the matter to the Justice Department for civil and/or criminal prosecution.¹⁵⁴

The threat, however, was not carried out. The two agencies instead spent the remainder of 1976 attempting to work out a proposed memorandum of understanding for their relationship under Section 404. In April of 1977, Colonel Hatch forwarded to General Heiberg a draft

¹⁴⁹ Letter from Colonel Henry J. Hatch to Aubrey J. Wagner, February 9, 1976.

¹⁵⁰ 33 U.S.C. 1323(a).

¹⁵¹ Letter from Colonel Hatch to Mr. Wagner, *supra*.

¹⁵² Memorandum from Gen. E. R. Heiberg III to HQDA, Wash., January 8, 1976.

¹⁵³ Memorandum from Col. Henry J. Hatch to HQDA, Wash., January 5, 1976.

¹⁵⁴ Letter from Col. Henry J. Hatch to Aubrey J. Wagner, April 9, 1976.

which treated TVA differently than other agencies although "there exists no legal basis" for doing so. Colonel Hatch thought, however, that the suggested arrangement might allow the two agencies to work together. TVA would not file any permit applications, but would inform the Corps of its intention to discharge dredge or fill material. If both agencies decided the action would affect the "quality of the human environment," the Corps would help in the preparation of an EIS for the project. "Minor" activities by TVA would come under a to-be-negotiated blanket approval.¹⁵⁵

General Heiberg rejected the proposal in no uncertain terms.

TVA is asserting its exception to the 404 program using the same theory under which it has been disputing the Corps' authority under the Section 10 program [of the Rivers and Harbors Act of 1899] and under the legislation dealing with the operation of Barkley and Kentucky dams . . . The execution of this MOU would deteriorate the strength of the Corps' position.¹⁵⁶

Heiberg pointed out that TVA's arguments for not being required to comply with Section 10 were the reverse of its position on Section 404, and went on to note:

From the background that we have dealing with TVA concerning Barkley and Kentucky dam operation activities, we can see that when it is not in TVA's basic interest, negotiations will continue without a final conclusion ad infinitum. For instance, we have been negotiating *since 1944* the operating manual for the Kentucky and Barkley discharges and have yet to have a final document (emphasis added).¹⁵⁷

The proposed MOU, according to Heiberg, gave TVA the control over what information the Corps received and left open the definition of a minor activity, how letters of approval were to be enforced, why the Corps would expend money preparing an EIS when it did not result in a permit, who determined whether a public hearing should be held, etc.¹⁵⁸ Heiberg concluded by stressing the

emphasis placed upon the 404 program by the present administration and by the Chief of Engineers as part of total water resource regulation and manager. Therefore, granting special exceptions to TVA . . . would be moving away from the public interest concern which Section 404 . . . is to meet.¹⁵⁹

2. *Acquiescence to Corps' Authority*

On June 30, 1977, Colonel Hatch wrote Chairman Wagner and told him that TVA would have to go through the same procedures as did other applicants.¹⁶⁰ On August 11, 1977, TVA, still protesting its exemption, acquiesced "without prejudice to TVA's position regarding interpretation of Section 404 and the TVA Act at some future

¹⁵⁵ Draft attached to memo from Col. Henry J. Hatch to Division Engineer, April 5, 1977.

¹⁵⁶ Memorandum from General E. R. Heiberg III to District Engineer, June 1, 1977, p. 4.

¹⁵⁷ *Ibid.*, p. 5.

¹⁵⁸ *Ibid.*, pp. 5-6.

¹⁵⁹ *Ibid.*, p. 7.

¹⁶⁰ Letter from Col. Henry J. Hatch to Aubrey Wagner, June 30, 1977.

time."¹⁶¹ On November 1, 1977, TVA filed a 404 permit application for the Columbia dam.

Colonel Hatch's suspicions about TVA's delaying tactics were not unfounded. A subsequent TVA legal memorandum indicated that TVA knew that its legal positions were weak. In 1978, attorneys J. William Bain and W. Walter LaRoche, both of whom had been with TVA for some time, told David G. Powell, assistant general counsel, that TVA's attempts to claim exemption because the project had been authorized by Congress prior to 1972 or because of TVA's authorizing act were equally questionable. They suggested that TVA emphasize that the federal government had already reviewed the project through the EIS and the appropriations procedure, and that further "detailed review . . . is unwarranted."¹⁶²

As might be expected, TVA had not delayed construction of Columbia Dam while it argued with the Corps over the Corps' 404 authority. By the time TVA had accepted its responsibility to file a 404 permit application, 117,000 of the planned 276,200 cubic yards of fill had already been discharged into the Duck River.¹⁶³ TVA did not stop its work until ordered to do so by Colonel Robert K. Tener, in March of 1978.¹⁶⁴ In that same letter, Colonel Tener ordered TVA to get a 401 certification as the Clean Water Act of 1977 had made it clear that federal agencies were not exempt from 401 requirements.¹⁶⁵ TVA's willful refusal to apply for the 401 permit while proceeding with construction of the Columbia project put the Corps in the difficult position of having to decide the fate of a project on which \$53 million had already been spent.

C. THE FISH AND WILDLIFE COORDINATION ACT OF 1934 AND THE ENDANGERED SPECIES ACT OF 1973

One of the few statements about the Duck River Basin that appears undisputed is that it is an area unusually rich in aquatic, plant and wild life. In its 1972 environmental impact statement, TVA reported more than 100 species of fish and a diversified river bottom life of mussels, snails, crayfish, shrimp, mayflies, caddis flies, sponges and other species were found in the Duck.¹⁶⁶

In 1979, the Wildlife Management Institute said the Duck had been classified as "the most diverse aquatic ecosystem in North Ameri-

¹⁶¹ Letter from Aubrey J. Wagner to Col. Robert K. Tener, August 11, 1977.

¹⁶² Memorandum from J. William Bain and W. Walter LaRoche to David G. Powell, June 13, 1978. It is interesting to note that TVA, which had filed its 404 permit application by this date, was still exploring avenues of exemption or special treatment.

¹⁶³ "Proposed Fill for Columbia Dam at Duck River, Miles 136.6, 136.9, and 156.0." Application Number 44,212, November 1, 1977 (hereinafter cited as Columbia Dam 404 Application).

¹⁶⁴ Letter from Colonel Robert K. Tener to TVA's director of the division of navigation development and regional studies, March 13, 1978.

¹⁶⁵ TVA tried to claim that, even so, it was still exempt under Section 67(r) of the Clean Water Act which provides for exemptions for federal projects "specifically authorized by Congress, whether prior to or on or after the date of enactment of this subsection" if information on the effects of the discharge were included in an EIS statement which had been submitted to Congress before actual discharge and prior to either authorization or an appropriation of funds for construction. The Corps determined that the Columbia Dam had not been specifically authorized by Congress, nor had Congress had benefits of all the information about the effects of the discharge since the EIS had not considered them. Memorandum from district counsel to district engineer, January 23, 1978.

¹⁶⁶ TVA, Final Environmental Statement, *supra*, pp. 18-20.

ca supporting approximately 143 species of fish and many species of invertebrates . . . Many of these species thrive only in stream systems and several are only in the Duck River."¹⁶⁷ That is despite the fact that in recent years artificial changes in the movement of the river, its use as a sewage and chemical waste disposal system and the commercial harvesting of some species have resulted in a decline in the variety and number of individual populations.

The name of the river itself is evidence of its role as an historic habitat for ducks, especially the wood duck.¹⁶⁸ The river and the nearby woods provide denning cover and habitat for racoon, deer, rabbits, quail, squirrels, mink, muskrat and a variety of water and song-birds.¹⁶⁹

The record of TVA and the U.S. Fish and Wildlife Service in their respective roles as trustees of this national treasure is perhaps the best example of how difficult it is to stop, or even modify, a water project once it has started. It is a record of arrogance, bad faith and broken promises by a powerful agency and weakness and political accommodation by a less powerful one.

The lack of cooperation was historical in its beginnings. The Fish and Wildlife Coordination Act of 1934, which authorized the Department of the Interior to provide assistance to, and cooperate with, federal, state and public or private organizations to protect and control wildlife, exempted the newly created Tennessee Valley Authority.¹⁷⁰ For other agencies, a consultation process was provided to prevent loss of, and damage to, wildlife resources in water-resource developments by any body with a federal permit or license.¹⁷¹

In 1968, however, TVA and the U.S. Fish and Wildlife Service signed a memorandum of agreement "intended to provide for the continued free exchange of information and frank discussions between the two agencies on the fish and wildlife aspects of the former's water-control projects."¹⁷² TVA was to provide the Fish and Wildlife Service at the beginning of each fiscal year with a list of those water-control projects which TVA expects to "investigate" during the year and of projects on which previously initiated investigations will continue.

The Duck River Project Planning Report, issued in 1968, addressed the issue of fish and wildlife only in very general terms. It reported that annual benefits, based mainly on fishing in the reservoir and downstream in a manmade trout fishery and on goose and dove hunting in a proposed waterfowl refuge and hunting area, would be \$200,000.

As was typical in TVA analyses of the Duck River Project, a growth rate was factored in only for the proposed benefits, not the present ones that would be eliminated by the project. It also appears that, although

¹⁶⁷ Comments of Wildlife Management Institute submitted to U.S. Corps of Engineers, "Public Hearing to Consider an Application by TVA for a Department of the Army Permit Pursuant to Section 404 of the Clean Water Act for Fill Activities Associated with the Columbia Dam Project," November 27, 1979 (hereinafter cited as Corps' 1979 Hearing), p. 2.

¹⁶⁸ TVA, Final Environmental Statement, *supra*, p. 21.

¹⁶⁹ *Ibid.*

¹⁷⁰ 16 U.S.C. 666c.

¹⁷¹ 16 U.S.C. 662.

¹⁷² Agreement between the Tennessee Valley Authority and the Fish and Wildlife Service, Department of the Interior, March 22, 1968.

the cost of land acquisition was included in the overall project costs, no annual operation and maintenance costs for the fish and wildlife projects were included. In November of 1968, TVA sent the planning report to the Fish and Wildlife Service's Decatur, Alabama, office for review. In response, the acting FWS regional director stated: "We believe that your planing for developments to benefit wildlife and fishery resources is comprehensive and follows sound resource management principles." However, the Service questioned the development of a goose refuge because it would only draw from other geese wintering facilities further south, as opposed to mitigating for lost habitats. It also found a mathematical error in the values assigned to the waterfowl refuge and hunting area, which reduced its annual benefits by \$9,000.¹⁷³ This was the only exchange of information on the Duck River Project under the agreement.

Mr. MOFFETT. [I]ts agreement with the Fish and Wildlife Service notwithstanding, the TVA failed absolutely to coordinate with your Service on this project from 1969 to the present in terms of the impact of the dam on overall fish and wildlife values.

Mr. GREENWALT. That is correct.

Mr. MOFFETT. Did you object?

Mr. GREENWALT. We, as I think my testimony indicated, responded under the NEPA process from which they are not exempt and pointed out the deficiencies we saw in their EIS.

They were, however—to what degree, Mr. Chairman, I cannot tell you because I am just not sure if they were discussing these kinds of problems with the State of Tennessee, for which the Fish and Wildlife Act also provides—

Mr. MOFFETT. That is fine but that does not in any way fill the mandate—

Mr. GREENWALT. Absolutely not and for that reason I suggest that we were very strong in our most recent stipulations to the 404 permit—to make sure that they were keeping faith with and were honest with the Tennessee Wildlife Resources Agency—

Mr. MOFFETT. That is not a bad deal for them. They get to go ahead with the project and then they say once again that they will coordinate with you. I am not sure that that is something that has a lot of teeth.

The issue here is, first of all, did you object? Apparently you did not object. Apparently there were no memos sent to the Secretary of the Interior, no calls to fish and wildlife supporters on Capitol Hill, saying "These guys made a deal with us and for ten or eleven years, a decade, they have not kept their deal."

That is a question which sort of hangs out there begging to be answered, namely, why in the world that was not done.

At any rate, I think it is clear, is it not, that without this coordination that the 1968 agreement was supposed to provide the Service was not able to evaluate fully the impact of the

¹⁷³ Letter from W. L. Towns to Charles J. Chance, April 22, 1969.

dam on fish and wildlife and to propose alternative courses of action? Is that not correct?

Mr. GREENWALT. That is absolutely correct, sir.¹⁷⁴

As previously discussed, the Fish and Wildlife Service criticized both the draft environmental impact statement for the Duck River project and the 1974 supplement for its failure to sufficiently consider and mitigate the adverse effects of the project on fish and wildlife.

1. *The Endangered Species Act Reaches TVA*

In the meantime, the Endangered Species Act of 1973 had become law. Described as the first statute to authorize a comprehensive national program for the conservation of endangered or threatened species of fish, wildlife and plants, it specifically directed each federal agency to insure that its actions did not jeopardize listed species or result in the destruction or adverse modification of their critical habitats.¹⁷⁵ The Secretaries of Interior and Commerce were given authority to list endangered or threatened species, and all federal agencies were, in consultation with the Secretary of Interior, to carry out the act. Unlike the Fish and Wildlife Coordination Act, the Endangered Species Act did not exempt TVA. In June 1973, Keith Schreiner, then chief of the Office of Endangered Species at Interior, told TVA that 11 mollusks in TVA's drainage system were being considered for inclusion to the endangered species list.¹⁷⁶

In January of 1974, Curtis Bohlen, then Interior's deputy assistant secretary for fish and wildlife and parks, stated to both the Environmental Defense Fund and TVA ("by copy of this letter I am reminding the Tennessee Valley Authority of our concern in this matter") that there were nine species and two sub-species of mollusks and snails threatened by extinction because of the Columbia and Normandy dams on the Duck River.¹⁷⁷ Bohlen's letter mentioned for the first time that Interior thought construction should be stopped until the problem could be resolved—a suggestion which was immediately rejected by TVA, and which would be made and rejected again in 1976-77.¹⁷⁸

In June 1976, five mussel species were listed as endangered species.¹⁷⁹ The General Accounting Office subsequently criticized the Fish and Wildlife Service for its failure to list some of the other species and to establish critical habitats for those already listed. In a March 30, 1977, memorandum, FWS Director Lynn Greenwalt identified seven mussels, three fish and four snails as listed, proposed or about to be proposed for listing as endangered or threatened which would be di-

¹⁷⁴ Hearing, *supra*, p. 115.

¹⁷⁵ 16 U.S.C. 1536.

¹⁷⁶ Hearings, p. 108.

¹⁷⁷ Letter from Curtis Bohlen to James Tripp, EDF, Jan. 14, 1974.

¹⁷⁸ *Ibid.*, p. 4. The Bohlen letter stated that:

"The following thoughts are offered in response to your question concerning what actions might be taken to prevent the extirpation of one or more of these forms:

"1. Work on the two subject dams authorized and funded for construction on the Duck River . . . should be suspended until such construction and the resultant dam and reservoir can be shown to pose no serious threat to the continued existence of these life forms.

"2. Pollution abatement is required for the restoration of these mollusks, including abating pollution from Manchester, tannery wastes and to some extent siltation from phosphate ore mining.

"3. Pollution abatement is required for the restoration of these mollusks.

"4. Attention should be paid to the maintenance and restoration of adequate populations of species of fish which are essential as hosts to the larval forms of these mollusks."

¹⁷⁹ 41 Fed. Reg. 24064 (June 14, 1976).

rectly and indirectly jeopardized by completion of Columbia dam. In that letter, Mr. Greenwalt also stated that FWS "will not and cannot support any action with regard to the Duck River project which would result in the extinction of any of the species that occur in that river." However, according to GAO, by May 31, 1979, FWS had not published a proposed regulation, under review for 17 months, specifying critical habitats for three of the species; had not listed the four snail species; and had never completed a proposed listing of the three fish species.¹⁸⁰

GAO concluded:

The Columbia Dam project represents one of the most imminent irresolvable conflicts, and the Endangered Species Committee may be requested to determine if an exemption should be granted. Since FWS had not listed all the species affected by the project, and specified the critical habitats of the listed species, the Committee will be precluded from fully considering the benefits of conserving the species. Further, if an exemption is granted, the project may again be stopped if additional species are listed . . .¹⁸¹

One Interior attorney told the GAO team that the mussels' critical habitats were not specified because "fishes must be selected carefully, and a few mussels are not worth losing the act for."¹⁸² One of the species was soon to be destroyed by inundation from the closing of the Normandy Dam.¹⁸³ TVA was informed of the listing of the mussels and also of two snail species thought to be in the Duck.¹⁸⁴

The Committee does not intend to overemphasize the importance of the mussels, or any other species, to overall wildlife resources. However, mussels play a key role in aquatic life, as evidenced by the following exchange between Rep. Arlan Stangeland (R-Minn.) and FWS Director Lynn Greenwalt:

Mr. STANGELAND. Do you believe that it is important for us as a nation to be concerned with the survival of lower forms of animal life, such as mussels and snail darters?

Mr. GREENWALT. Absolutely, sir . . . I feel very strongly about the idea that the intent of the Endangered Species Act is fundamentally to recognize the very real and inextricable relationship that plants, animals and their environments have to one another, and that one cannot readily begin to unweave this fabric without running some real risk, not only to the well-being of our fellow creatures but to ourselves as well.

. . . [T]he larger creatures feed on the smaller ones. The smaller ones generally outnumber the larger ones by several orders of magnitude, and at the top of the food chain are the larger and more obvious, and frequently, much more popular creatures.

Nevertheless, the existence of an eagle, or a grizzly bear, or indeed, you and me, Mr. Chairman, is dependent upon having all of the food chain intact.

¹⁸⁰ GAO, "Endangered Species—A Controversial Issue Needing Resolution," Report No. CED 79-65, July 2, 1979 (hereinafter cited as GAO, Endangered Species Report), p. 17.

¹⁸¹ *Ibid.*, p. 18.

¹⁸² *Ibid.*, p. 17.

¹⁸³ *Ibid.*, p. 11.

¹⁸⁴ Letter from Kenneth Black, FWS regional director, June 22, 1976.

MR. STANGLELAND. I understand that mussels offer a direct, practical benefit to man. As one example, they are an excellent indicator of water pollution . . .

MR. GREENWALT. . . . These small creatures . . . are in fact very good indicators of water quality. They are floater feeding animals, in that they pass through themselves great quantities of water from which they extract very much smaller forms of life, more numerous and smaller members of the food chain.

If there is an environmental problem, one that effects the mussel, it is rather rapidly displayed, not only in the opportunity to examine the chemical composition of the mussel and its tissue itself, but if their growth rates diminish, if they begin to show problems of reproduction, one can rather quickly assume that there are environmental concerns of the sort involving water quality.¹⁸⁵

2. Consultation and Construction

Formal consultation on the endangered species problem was initiated by TVA in August of 1976. On November 22, 1976, Regional Director Kenneth Black wrote to Lynn Seeber, then TVA's general manager, setting up the first meeting between TVA, the Tennessee Wildlife Resources Agency and the Service for December 7-8, 1976.¹⁸⁶ But different sections of TVA were responding to the listing of the species in entirely different ways. Thomas H. Ripley, then director of the forestry, fisheries, and wildlife division of TVA, told Gordon E. Hall, chief of the fisheries and waterfowl branch, that "we need to begin immediately developing a comprehensive conservation program for the listed species."¹⁸⁷ Biologist Richard B. Fitz developed an outline for such a plan by December 1, 1976.¹⁸⁸

However, during the first consultation session, Fish and Wildlife representatives were "distressed to learn that in the month following TVA's request for consultation (September 1976), the Authority began pouring cement at the Columbia Dam site. By the time of the first consultation session, 40 percent of the dam abutments and foundation had been poured." In a strongly worded letter, Assistant Secretary Bohlen accused TVA of "literally setting your decisionmaking in concrete, at the estimated cost of \$40,000 per day, and presuming the completion of the Columbia Dam and the flooding of the affected endangered species habitat." Bohlen stated that construction activities should be suspended pending completion of the consultation, which he promised would be expeditious.¹⁸⁹

¹⁸⁵ Hearings, *supra*, pp. 9-11.

¹⁸⁶ Letter from Kenneth Black to Lynn Seeber, Nov. 22, 1976.

¹⁸⁷ "The program I have in mind should track the completeness and overall quality of the conservation plan developed for the snail darter. The final product should present a complete package which we can take to the U.S. Department of Interior, the State of Tennessee, other states with potential involvement, and members of the scientific community for review and comment in the course of coordination and consultation . . . I realize that we have been doing some experimental transplants with some species of mussels—one of which is now on the national endangered species list. I hope we can use information gained from these limited activities to identify portions of the range which could be critically affected by TVA and to assess the feasibility of transplants and evaluate potential habits." Memorandum from Thomas H. Ripley to Gordon E. Hall, Nov. 18, 1976.

¹⁸⁸ TVA, "Outline: Program for the Conservation of *Conradilla caelata*," December 1976.

¹⁸⁹ Letter from Curtis Bohlen to Lynn Seeber, Dec. 30, 1976.

Seeber's immediate response charged Bohlen with being "precipitous in light of the facts of the situation and . . . certainly contrary to our understanding of the relative responsibility of TVA and the Department of the Interior regarding the project." Setting forth a position that TVA was to maintain for 2 years while it continued to build the project, Seeber said "nothing is occurring at the project which has any biological significance. This concrete work is simply a normal continuation of construction activities begun several years earlier." Seeber continued:

We are troubled by the fact that the position taken in your letter is completely contrary to the respective responsibilities of TVA and Interior under the Act and your own agency's guidelines and policies. We have always understood that it is the responsibility of the program agency to decide the course to be followed by it during and after consultation, not the responsibility of your agency to tell them what to do . . . The Duck River project has been the subject of specific congressional authorization since 1969, including funding after Congress was informed that rare and endangered mussels could be affected by the project. Certainly TVA is in the best position to reconcile the various factors involved, including its continuing responsibilities to Congress, in determining whether construction should proceed in the interim.¹⁹⁰

And, in any event, "the habitats of the endangered mussels are well removed from the construction site," Seeber pointed out, and therefore the construction posed "no interim threat." TVA would continue to build.¹⁹¹

In his appearance before the subcommittee on September 24, 1980, FWS Director Greenwalt described TVA's position as one that was "extraordinarily conservative." (It is also one that FWS later accepted as legitimate.)

Mr. MOFFETT. . . . What [TVA was] really saying was that it was all right to pour concrete, as long as they did not pour it on the endangered species. Is that not right?

Mr. GREENWALT. That is in essence the position that they at that time took and one that was extraordinarily conservative as it relates to the impact of the Endangered Species Act.

Mr. MOFFETT. What does that say about this whole preconstruction consultation process, if its goal is to prevent conflicts between an endangered species and a partially completed project?

Mr. GREENWALT. In terms of the preconstruction consultation, obviously there was none as it relates to the Columbia Dam project, inasmuch as they were in business and were in business to the degree that we had to warn them that their continued business would effect this species.¹⁹²

¹⁹⁰ Letter from Lynn Seeber to Curtis Bohlen, Jan. 7, 1977. Contrary to Seeber's statement, the project had not been specifically authorized.

¹⁹¹ *Ibid.*

¹⁹² Hearings, *supra*, pp. 131-132.

As promised, FWS expeditiously issued its first biological opinion on February 16, 1977. If TVA completed the project as planned, ". . . the continued existence of the birdwing pearly mussel (*Conradilla caelata*) and the Cumberland monkeyface pearly mussel (*Quadrula intermedia*) will be jeopardized," Director Greenwalt warned. "The impoundment behind the Columbia Dam would completely inundate the only localities where these species are presently known to naturally occur within the Duck River." TVA was also alerted that FWS would soon propose critical habitats for those species.¹⁹³

TVA, however, continued to build, despite the provisions of the Endangered Species Act.¹⁹⁴ Nor did it initiate the conservation program its biologists had suggested. It also opposed the naming of critical habitats for the listed mussels.¹⁹⁵

In November of 1977, despite the negative biological opinion, TVA applied for a permit under Section 404 of the Federal Water Pollution Control Act to allow it to carry out dredge and fill operations necessary for the project,¹⁹⁶ throwing yet another problem into the arms of the Corps in determining whether the Columbia dam and reservoir were in the public interest.

IV.—GENERAL ACCOUNTING OFFICE'S BENEFIT-COST REPORT: 1974

While TVA was preparing its court defense of the environmental impact statement for the Duck River project, the General Accounting Office was reviewing the benefit/cost analysis of the project and finding it lacking in several significant areas.¹⁹⁷

TVA officials told the GAO that they followed the policies for benefit/cost analyses of water projects as outlined in what was commonly called "Senate Document 97,"¹⁹⁸ although not required by law to do so. Senate Document 97 described in some detail the factors to be taken into account by federal agencies in justifying their projects. An important provision concerned the formulation and evaluation of plans or alternative plans to permit timely application of standards appropriate to conditions of ". . . (b) chronic and persistent unemployment or underemployment in designated areas."¹⁹⁹ Standards appropriate to condition (b) were to be used when an area had been so designated under the Area Redevelopment Act of 1961 or "other authorized procedures relating to resource underemployment." The benefits to be allowed in those situations were clearly defined:

In condition (b) project benefits shall be considered as increased by the value of the labor and other resources required

¹⁹³ Letter from Lynn Greenwalt to Lynn Seeber, Feb. 16, 1977. Formal biological opinions are required only for the impact of federal actions on endangered species and not for their impact on wildlife resources overall.

¹⁹⁴ The General Accounting Office, in its review of the Endangered Species Act, cited TVA's insistence on continuing construction at Columbia in the face of an adverse biological opinion as an example of obstructive behavior by federal agencies which the 1978 amendments to the act were designed to cure. GAO, Endangered Species Report, *supra*, pp. 2, 5.

¹⁹⁵ Letter from Gary T. Myers, executive director for the Tennessee Wildlife Resources Agency, to Col. Robert K. Tener, May 22, 1978.

¹⁹⁶ Columbia Dam 404 Application, *supra*.

¹⁹⁷ GAO, "Improvements Needed in Making Benefit-Cost Analyses for Federal Water Resources Projects," September 20, 1974 (hereinafter cited as GAO, Benefit-Cost Analyses Improvements Report).

¹⁹⁸ See footnote 38, *supra*.

¹⁹⁹ *Ibid.*, p. 5.

for project construction, and expected to be used in project operation, project maintenance, *and added area employment during the life of the project*, to the extent that such labor and other resources would—in the absence of the project—be utilized or underutilized. Such benefits should be clearly identified as redevelopment benefits for the purposes of cost allocation, cost-sharing procedures, and to indicate their significance for project justification (emphasis added).²⁰⁰

Senate Document 97 also specifically defined “primary” and “secondary” benefits. Primary benefits were the “value of goods or services directly resulting from the project, less associated costs incurred in realization of the benefits and *any induced costs not included in project costs*”²⁰¹ (emphasis added). Those benefits included water supply, irrigation, water quality control, navigation, electric power, flood control, land stabilization, drainage, recreation and fish and wildlife benefits. The last two were to be claimed only if there were *net increases* resulting from the project.²⁰² Secondary benefits were defined as the “increase in the value of goods and services which indirectly result from the project under conditions expected with the project as compared to those without the project. Such increase shall be net of any economic nonproject costs that need be incurred to realize those secondary benefits (emphasis added).”²⁰³

“Induced costs,” as defined in Senate Document 97, were [a]ll uncompensated adverse effects caused by the construction and operation of a program or project, whether tangible or intangible. These include estimated net increases, if any, in the cost of Government services directly resulting from the project and net adverse effects on the economy such as increased transportation costs. Induced costs may be accounted for either by addition to project economic costs or deduction from primary benefits.²⁰⁴

Although TVA officials told the GAO investigators that the agency “generally” relied on primary benefits for justifying water resource projects, they described the enhanced employment category included in the benefits resulting from the Duck River project as “national secondary benefits,” and therefore includable in the benefits analysis.²⁰⁵ What TVA apparently did not mention to the GAO investigators was that the enhanced employment benefit had been defined for years—in fact, is still defined today—as a benefit for the unemployed and subemployed persons in the Duck River Basin, clearly a redevelopment benefit under condition (b) and required to be so identified. However,

²⁰⁰ Ibid.

²⁰¹ Ibid., p. 9.

²⁰² Ibid., p. 10.

²⁰³ Ibid., p. 9.

²⁰⁴ Ibid., p. 11.

²⁰⁵ TVA claimed that any jobs brought into the area by the Duck River Project which would employ unemployed and “subemployed” persons would represent a net increase to the productivity of the nation as a whole, and not merely a regional increase resulting from the transfer of jobs from one area to another. TVA, 1969 Supplementary Notes, *supra*, p. 18. A regional increase would have been calculated separately under Senate Document 97. TVA’s support for its assumption of an increase in national productivity is unclear. The result, however, is not. It put the project into the plus side in the benefit-cost analysis.

the Duck River Basin did not qualify because it was not a designated area of chronic unemployment or underemployment.²⁰⁶ Secondary benefits, if used, would have allowed TVA to claim all jobs resulting from the project, not just those for underemployed persons. It also would have required TVA to compute the amount of national and non-national secondary benefits with an explanation of the methods used and also to calculate the benefit "net of any economic nonproject costs" that would be incurred to realize those benefits.²⁰⁷ None of that was done.

The result of the improper categorization of the enhanced employment benefit apparently kept GAO from reviewing it under the redevelopment criteria. (TVA included a much smaller redevelopment benefit resulting only from project construction, maintenance and operation which GAO attacked as not being proper under condition (b).)

The GAO report found numerous holes in TVA's benefit/cost analysis for the Duck River project. The most serious were: induced costs were not fully considered; benefit computations were not adequately supported; and the benefits were not based upon an analysis of conditions with and without the project.

The largest amount of induced costs which TVA had ignored, according to GAO, were those which would result from the removal of 41,000 acres of farmland from production. GAO reported that TVA had calculated annual losses of \$7.1 million: \$1.3 million in farm sales; \$3.3 million in farm-dependent business; and \$1.5 million in net wages lost and in the reduced volume of business to be suffered by industries serving the lost farms.²⁰⁸ Although TVA claimed then—and has claimed subsequently—that payments made to the farmers for the land, the relocation of farms and regeneration of farm business, and the much larger number of non-farm jobs which would be generated by project construction and the project itself would compensate for the loss from a national perspective, GAO pointed out that TVA did not have any supporting studies.²⁰⁹

GAO also found that the induced costs of wildlife habitat loss and the adverse effects of industrial expansion and related growth, such as increased waste treatment, had not been included. "TVA concluded that no induced costs relating to project-related growth were appro-

²⁰⁶ When TVA was not maintaining that the enhanced employment was a national secondary benefit, it argued that its authorizing legislation was an "authorized procedure relating to resource underemployment" under condition (b), GAO, Benefit-Cost Analyses Improvements Report, supra, Appendix II, p. 55.

²⁰⁷ Senate Document 97, supra, p. 9; TVA, 1969 Supplementary Notes, supra, pp. 18-21.

²⁰⁸ GAO, Benefit-Cost Analyses Improvements Report, supra, p. 38.

²⁰⁹ TVA's staff had already quarreled with the conclusion that the agriculture industry was declining and that land was available upon which farmers could relocate. See Section III, supra. Another negative view came from Gerald G. Williams, TVA director of agricultural development, in the context of the EIS review. Although Mr. Williams stated that the EIS was not a "cost-benefit study and therefore does not attempt to balance off all the advantages and disadvantages of the project . . . some of the more important tangible and intangible benefits as well as detrimental effects are included. In this context, a serious omission is the failure to assess even in a general way the impact on agriculture." Since 13,800 acres of "good soils suitable for growing high-value crops such as corn" would be inundated to reduce flooding on 9,700 acres of land, "the net effect upon agriculture is a substantial loss of land and farm income." Mr. Williams then pointedly commented: "We would have made a number of more specific suggestions had we had an opportunity to review the statement in early draft form prior to its distribution outside TVA . . ." Memorandum from Gerald G. Williams to Lewis B. Nelson, manager of agricultural and chemical development, August 3, 1971.

appropriate for inclusion in the benefit-cost analysis. However, we noted that a study was not performed by TVA to determine such adverse effects," GAO stated.²¹⁰ Concerning the wildlife losses, GAO found that TVA had computed losses only for the inundated land, and not for the land around the reservoir that would be developed.²¹¹

The recreation benefits claimed by TVA for the Duck River project were not supported by sufficient documentation, GAO concluded. Normandy's recreational benefits were based on visitation at another reservoir, but there was insufficient documentation to support that reservoir's selection, which just happened to result in a three-fold increase in the number of projected visitors at Normandy.²¹² The recreational benefits of the project also were not determined after an appropriate comparison both with the project and without the project. The shoreline development category suffered from the same shortcomings.²¹³

GAO also questioned the claiming of any fish and wildlife benefits. The Bureau of Sport Fisheries and Wildlife (now the U.S. Fish and Wildlife Service) had indicated that, even though mitigation was not provided for wildlife losses in most water projects, wildlife benefits were still claimed.²¹⁴ TVA claimed wildlife benefits for the Duck River Project, but had decided not to provide the wildlife management area which would have—at least partially—mitigate the losses.

TVA responded to the GAO study in a cavalier manner. General Manager Lynn Seeber blithely asserted that no induced costs or other costs had been left out of the benefit/cost analysis. If they had, it was because they would be more than offset by a variety of benefits or because GAO had misunderstood the application of the induced-cost principles.²¹⁵

V.—TVA'S "ALTERNATIVES" REPORT TO THE OFFICE OF MANAGEMENT AND BUDGET (1979)

Presidential opposition to the Duck River project, as reflected by both the Johnson and Nixon administrations, continued into the Carter Administration. President Carter in 1977 initiated a major effort against pork barrel federal water projects that culminated in his recommended deletion of funds for 18 projects for a total first-year savings of \$2.5 billion.²¹⁶ "In balancing the budget, cutting back on inflation and making the federal government more responsive to the needs of the people, difficult choices have to be made," the President said. "Activities which are wasteful, unsafe or economically unsound simply cannot be pursued."²¹⁷ Included on the President's list of projects recommended for termination was the Columbia Dam, the remaining portion of the original Duck River project after the completion of Normandy in 1976.²¹⁸

Early in 1975, even before Normandy was completed, the General

²¹⁰ GAO, Benefit-Cost Analyses Improvements Report, *supra*, p. 39.

²¹¹ *Ibid.*

²¹² *Ibid.*, p. 35.

²¹³ *Ibid.*, p. 28.

²¹⁴ *Ibid.*, p. 19.

²¹⁵ *Ibid.*, *supra*, Appendix II.

²¹⁶ White House, Office of the Press Secretary, "Statement on Water Projects," April 18, 1977, p. 1.

²¹⁷ *Ibid.*

²¹⁸ *Ibid.*, p. 4.

Accounting Office had reported a 49 percent cost overrun. In July of 1976, the TVA Board approved a revised project authorization document that estimated a new cost of \$142 million for Columbia, compared to the \$50 million originally projected, an increase of almost 200 percent.²¹⁹

The Carter Administration's intensified opposition to the Columbia project was spurred by that overrun and a March 1977 preparation of a new benefit/cost ratio that found Columbia to have a negative 0.8:1.0 benefit/cost ratio as based on remaining project benefits and costs. That figure was computed by TVA, OMB and personnel from other federal agencies for the President's screening committee on federal water projects.²²⁰ It used 1969 price levels, including a 6 $\frac{3}{8}$ -percent discount rate, and disallowed the previously claimed enhanced employment benefit as improperly used by TVA in preparing its 1969 benefit/cost ratio. The inter-agency review was extremely limited, however, in failing to question TVA's assumptions underlying the project. The study accepted on faith, for example, the recreation and fish and wildlife benefits claimed by TVA and the presumed need for an additional recreational lake in the area. It did not include the agricultural losses induced by the project. It did not, moreover, seek to determine the extent of the area's legitimate water supply and flood control needs and whether those needs could be met through less costly and environmentally damaging alternatives.

Those questions were covered, however, in a follow-up request from OMB in early 1978. In keeping with the Administration's opposition to Columbia, as based on the project's recently disclosed negative benefit/cost ratio and 200 percent cost overrun, OMB requested TVA to:

... [I]nvestigate and report on modifications of the Columbia Dam project that *should satisfy the essential water supply and flood control needs of the area in a more cost/effective manner* and not violate the Endangered Species Act or any other existing statutes (emphasis added).²²¹

OMB had good reason to believe that TVA would undertake a good faith review of the Columbia project. The TVA board members who had committed TVA to an ambitious program of dam building had left or were about to leave TVA.²²² The nation was coming to appreciate that marginal dams and the taming of less than rampaging rivers was not necessarily synonymous with progress and beginning to recognize the need to preserve—where possible—peaceful, uncrowded, unpolluted, natural, and scenic areas such as the Duck River.

Additionally, President Carter, who felt that TVA had lost its sense of mission in becoming "dormant and just another power company,"²²³ had nominated, and the Senate had confirmed, S. David Freeman for the TVA board in August 1977. The following May, Mr.

²¹⁹ Statement of William Chandler, executive director, Tennessee Citizens for Wilderness Planning, Feb. 6, 1978.

²²⁰ OMB, "Tennessee Valley Authority: Duck River Project," March 1977.

²²¹ Letter to Aubrey J. Wagner, chairman, TVA, from James T. McIntyre, acting director, OMB, Jan. 31, 1978, p. 2.

²²² By that point, TVA had built 20 dams on the 650-mile-long Tennessee River. The concrete, rock and earth laid in the path of the river and its tributaries were 12 times the bulk of the Great Pyramids. The volume of water behind its dams could cover the entire state of Illinois to a depth of 6 inches. Branscome, *supra*, p. 74.

²²³ "A Conservationist Shakes the TVA," *Time Magazine*, May 29, 1978, p. 81.

Freeman was appointed TVA board chairman. Mr. Freeman brought to TVA a well-publicized claim of sensitivity to environmental values plus an "impression" that "TVA is continuing its dam building program as much out of habit as out of necessity."²²⁴

In keeping with his announced willingness to chart new paths for TVA, in an interview published in the Knoxville Journal four days after he joined the TVA board, Mr. Freeman called the Clinch River breeder reactor in Oak Ridge a "turkey," said that he thought it embarrassing for TVA to be sued over Clean Air Act standards and said that the Endangered Species Act should not be amended to allow completion of the Tellico Dam. Mr. Freeman did not take a stand on the Tellico and Columbia Dams, stating that he was still trying to learn the facts about each. But he said, "There's a burden of proof on somebody who wants to stop something like a dam [such as Tellico] that's over 80 or 90 percent complete," although, he added, "just because something's started, doesn't mean it has to be finished." In addressing Columbia, Mr. Freeman said, "If the future benefits are less than the future costs, then I think that burden might well be sustained."²²⁵

In keeping with his stated determination to learn the facts about Columbia, Mr. Freeman suggested shortly thereafter to the TVA staff that he visit the area and preside over a public meeting on the project. "What I have in mind," he said:

is to allocate about two hours for each side (TVA staff could make a presentation in favor of the project if they wished). The presentation would not be limited to lawyers. On the contrary, I would encourage anyone who wished to speak, imposing limitations depending on the number of people who wished to participate. Written comments would also be received and I would attempt to read them.

My purpose is to involve as much public participation as possible in an evenhanded and thorough decisionmaking process on the controversial issues on which the Board has already taken a position.²²⁶

Mr. Freeman did not convene a public meeting on Columbia. In mid-October, however, he visited the dam site and met with opponents and proponents of the project. In a letter to Lon T. MacFarland, attorney for the Duck River Development Association, following that visit, Mr. Freeman wrote,

Lon, I'm spending time now trying to separate fact from opinion concerning the Columbia Dam before reaching my personal assessment of the project. I'd appreciate any additional information you can provide to help me reach a judgment.²²⁷

A similar letter was sent that same day to Frank Fly, a leading dam opponent, although, as a possible harbinger of events to come, Mr.

²²⁴ Testimony of S. David Freeman. Hearings before the Committee on Environment and Public Works, U.S. Senate, Aug. 1, 1977, p. 58.

²²⁵ "TVA Future?" the Knoxville Journal, Aug. 16, 1977, p. 1.

²²⁶ Memorandum to Lynn Seeber from S. David Freeman, Sept. 14, 1977.

²²⁷ Letter to Mr. and Mrs. Lon T. MacFarland from S. David Freeman, November 2, 1977.

Fly was not asked to provide any additional information on Columbia.²²⁸ But long before the alternative report was completed—in fact, before it was barely started—Mr. Freeman apparently had made a unilateral decision about Columbia Dam which he was expressing to a select few. “I have progressed in my thinking about Columbia Dam to the point where I’m inclined to believe TVA needs to finish a dam, but some questions remain about the optimum dam height and related questions concerning ways to speed the project’s completion and reduce the costs,” he wrote to Judge Taylor Rayburn of Maury County, a long-time supporter of the dam. “When those studies are completed, I would like to meet with you and the people in the project area before making a firm decision.”²²⁹

A. THE STAFF REPORT

On February 2, 1979, the TVA staff submitted its report of alternatives to completion of the planned Columbia dam project to TVA General Manager Leon Ring, Jr., for “review by you and the Board.”²³⁰ The staff draft is included as Appendix II of this report.

According to the staff report:

While the impact on endangered species has stimulated the search for alternatives, increased cost must also be considered. Columbia Dam had a marginal benefit/cost ratio in 1968 when at a cost of \$50 million, it was planned as one unit of the Duck River Project. The cost of the Columbia segment has now risen to \$140 million with \$44 million already obligated.²³¹

The project alternatives identified by the TVA staff were keyed to its important finding that “Normandy Reservoir operations can be modified to meet water quality control objectives and projected supply needs in the Columbia area for at least 50 years.”²³² The increased release of water, according to the staff report, would not result in any “significant adverse impacts” on Normandy²³³ and, in particular, “would not adversely impact reservoir levels at Normandy or the temperate regime for the cold water fishery downstream from the dam.”²³⁴ That finding is hardly surprising, considering that TVA had found 10 years earlier that a single small impoundment on a tributary would meet Columbia’s projected water needs.

The staff’s discovery that the Normandy dam could be operated to provide sufficient water to meet Columbia’s (and Maury County’s) projected water needs for the next 50 years meant, of course, that the Columbia dam was superfluous for meeting those needs. That in turn enabled the staff to fashion two alternatives to the planned Columbia dam and reservoir.

The low-pool alternative—involving modifications of the Columbia dam to create a reservoir one-fourth the size of the planned reser-

²²⁸ Letter to Frank Fly from S. David Freeman, November 2, 1977.

²²⁹ Letter to Taylor Rayburn from S. David Freeman, May 4, 1978.

²³⁰ Memorandum to Leon Ring, Jr. from John L. Furgurson, February 2, 1979, enclosing “Report on Preliminary Studies of Alternatives to Completion of Columbia Dam” (hereinafter cited as TVA, Staff Alternatives Report).

²³¹ TVA, Staff Alternatives Report, *supra*, p. 2.

²³² *Ibid.*, p. 3.

²³³ *Ibid.*, p. 44.

²³⁴ *Ibid.*, p. 43.

voir—would avoid the destruction of endangered mussel species, leave 18 additional miles of the river in their natural state, and inundate 6,200 acres less than would be inundated by the original proposal.²³⁵

Since the low-pool alternative would not provide any flood control benefits for Columbia, the staff proposed that it be supplemented with a voluntary downstream relocation program for the relatively few residents and commercial buildings in the city of Columbia flood plain.²³⁶ The low-pool/voluntary relocation program, according to the TVA staff report, could be completed for \$55 million.²³⁷ The report noted, however, the possibility of water quality problems associated with that alternative since the relative shallowness of the reservoir would not provide a sufficiently deep layer of algae-free water for downstream release.²³⁸

The second, and more far-reaching, alternative discussed in the TVA staff report was again based on increasing the water flow from Normandy. It called for the abandonment of the Columbia dam (and the preservation of the river), the planned development of the recreational potential of the natural river, and the voluntary downstream relocation program to satisfy flood control requirements. The additional cost of that alternative was estimated to be from \$15 million to \$25 million, depending on the amount of river development included.²³⁹

Significantly, according to the staff report:

The no impoundment-downstream relocation alternative has a favorable benefit-cost ratio using current methodology; whereas the project as planned and the low pool-downstream relocation alternative do not. It also would have the least impact on the environment of any of the three options. Comparison of economic benefits and costs and of environmental impacts are shown in tables 1 and 2, respectively.²⁴⁰

The economic analysis referred to above and included in the Staff Alternatives Report was based on 1978 price levels over a 50-year economic life and a 6 $\frac{7}{8}$ percent discount rate.²⁴¹ Since portions of

²³⁵ *Ibid.*, Table 2.

²³⁶ TVA Staff Alternatives Report, *supra*, p. 1.

²³⁷ *Ibid.*, p. 2.

²³⁸ *Ibid.*, p. 39.

²³⁹ *Ibid.*, p. 3. The land required for the alternatives and the project as planned was reported by TVA in the final Alternatives Report, table 2, as follows:

	Acres (approximate)			
	Required	Acquired land ¹ to be retained	Additional to be acquired	Excess to be sold
Reservoir as planned.....	27,500	11,100	16,400	-----
Low pool.....	18,500	11,100	7,400	-----
No impoundment—River development;				
Maximum.....	13,200	9,600	3,600	1,500
Medium.....	9,400	7,100	2,300	4,000
Minimum.....	5,100	4,500	600	6,600

¹ The study is based on 11,100 acres of land acquired through Sept. 30, 1978. Since that date some 1,000 additional acres have been acquired.

²⁴⁰ *Ibid.*

²⁴¹ *Ibid.*, p. 51.

the project had been completed, the analysis was limited to remaining costs and benefits, thus favoring the project as planned.²⁴² The economic analysis referred to in the staff report, but completed a few days later with the inclusion of the recreation benefits, was consistent with the description included in the staff report, except that the benefit/cost ratio for the low-pool alternative was found to be 1:1. Since, as noted in the staff report, Normandy dam could be operated to meet the projected water supply needs for Marshall and Maury Counties for the next 50 years, the economic analysis included a third alternative, liquidation of the entire project since "it would achieve the water supply and enhanced employment benefits through the reservoir operational change at Normandy."²⁴³

In keeping with the finding concerning the modification of Normandy, the water supply and enhanced employment benefits were constant in all of the alternatives. Except for updating its 1979 figures and combining of some of the benefit categories, TVA's 1979 economic analysis employed the same methodology used in its 1969 analysis with one critical exception.

The TVA staff used a recreational analysis method that it had perfected on the just-released "Alternatives for Completing the Tellico Project,"²⁴⁴ which it described as "conceptually superior."²⁴⁵ Known as the "willingness-to-travel" methodology, this approach swelled the annual recreational benefits for the Columbia reservoir to \$4.5 million, over 60 percent of the total benefits, up from the \$1.1 million, or just under 40 percent of the total attributed to recreation in the 1969 justification. Under the 1969 methodology, the annual benefits for the project would have been only \$2.2 million.²⁴⁶ As a result of this recalculation, Columbia dam once again became primarily a recreational project.

But the staff made an important distinction in the figures it used in computing the recreation benefits for Tellico and those it used for Columbia. For Tellico

[b]ecause of the paucity of data on regional riverine recreation . . . we have assumed the initial net demand for the river alternative is equal to that for the reservoir. In view of the increasing popularity of river recreation and the relative scarcity of river recreation in the region, we have calculated benefits for somewhat different ranges of assumptions about growth rates and substitutability for the two alternatives. Growth rates are dampened in the same way as for the reservoir.²⁴⁷

The result was that an initial net annual visitation of approximately 672,000 persons was projected for Tellico,²⁴⁸ regardless of whether a reservoir or a riverine development program was chosen. For Colum-

²⁴² *Ibid.*

²⁴³ *Ibid.*

²⁴⁴ TVA, "Alternatives for Completing the Tellico Project," December 1978 (hereinafter cited as the Tellico Alternatives Report).

²⁴⁵ Memorandum to Edward H. Lesesne, director of water management, from Thomas H. Ripley, director of forestry, fisheries and wildlife development, September 29, 1978.

²⁴⁶ Memorandum from Furgurson to Ring, *supra*.

²⁴⁷ TVA, Tellico Alternatives Report, *supra*, p. 114.

²⁴⁸ *Ibid.*

bia, however, the reservoir and the riverine options had separate initial visitation rates which favored the reservoir by about a 2 to 1 margin. Annual 1980 visitation projections for the reservoir ranged from 1.7 to 2.0 million, depending on the level of development included, while between 500,000 and 1 million were expected to visit the river.²⁴⁹

The \$4.5-million figure was not the final recreational benefit for the project as planned. It, along with the numbers for the other alternatives, was high, according to Columbia Project Manager Jack L. Furgurson. "I received preliminary recreation benefit estimates from the Division of Forestry, Fisheries and Wildlife Development Wednesday which they agree are obviously high, especially for the reservoir options," Mr. Furgurson wrote to General Manager Leon Ring.²⁵⁰ Reductions of between 10 and 16 percent were made in the recreation benefits of the alternatives, so a somewhat higher reduction in the benefits of the project as planned to under \$4 million should be supposed.

The effect of the new methodology was to push the benefits of the project as planned nearer to the magic 1.0:1.0 ratio, while not really changing that of the riverine alternatives, which would have retained a positive benefit/cost ratio under either methodology.

The relative benefits of the alternatives were further deflated by the \$7-million price tag attributed to the downstream relocation program for the City of Columbia. In terms of monetary damage, Columbia does not have very serious floods. The TVA staff estimated the annual potential flood damage at \$34,300, which the project as planned would reduce to about \$4,300.²⁵¹ The voluntary relocation program, according to the final report, would provide for the removal of 26 "residences and businesses" in the Riverside section of the city and an additional 17 "structures" in the Helms Branch area for a total of 43.²⁵² That program would reduce annual potential flood damage to \$9,600.²⁵³

The staff report did not contain any details of the voluntary relocation proposal, but earlier memoranda prepared for the staff draft raise questions about the \$7-million figure. According to those documents, 42 structures could be removed at a cost of \$2,580,000. A school could be floodproofed at a cost of \$52,000, which would not justify 50 years of annual benefits of \$500. However, another structure used as a tobacco warehouse would cost as much to acquire as the other 42 structures, bringing the total cost of the program to \$5.7 million, or \$1.3 million short of the published projected cost.²⁵⁴

When asked by Chairman Moffett to further describe the 43 structures that TVA claimed to be in the flood plain,²⁵⁵ TVA was able to

²⁴⁹ TVA does not seem to be able to explain why the assumption about equal initial visitation for the reservoir and the riverine alternative was not used for Columbia. It also has been less than candid in explaining which visitation figures were used in calculating the recreation benefits for the Alternatives Report. The computer runs done by Midwest Research, Inc., a Kansas City consulting firm, provided figures for 15 separate areas and levels of development. Despite repeated requests from the subcommittee to review internal records, no one at TVA seems to be able to remember which level of development was used in the final calculation of benefits.

²⁵⁰ Memorandum to Leon E. Ring from John L. Furgurson, February 2, 1979, *supra*. TVA did not include the benefits of the project as planned in the final report. However, the recreation listed for the various alternatives were lowered between 10 and 16 percent. As noted above, TVA's staff has had difficulty in remembering or explaining to the subcommittee any of the details concerning the recreation benefit calculations. As a result, no one has been able to remember why or how the benefits were reduced.

²⁵¹ "Draft: Flood Control Benefits—Removal Plan," October 6, 1978.

²⁵² TVA, Alternatives Report, *supra*, p. 25.

²⁵³ "Draft: Flood Control Benefits—Removal Plan," *supra*.

²⁵⁴ *Ibid.*

²⁵⁵ Letter from Chairman Moffett to Chairman Freeman, July 1, 1980.

identify 16 residences and 24 in-use commercial establishments for a total of 40 structures.²⁵⁶ The subcommittee staff, in a tour of the area, which included numerous shack-type, abandoned, commercial structures (bait shops, snack bars, etc.) and a junk yard, was unable to find many of the businesses that had been identified by TVA. Of eleven reported businesses said to exist along one section of the river by TVA, only five were listed in the 1979 Columbia telephone directory.

With an annual benefit of \$29,000, the reason that the staff report concluded that the "downstream removal program is not supported by the flood control benefit" is self-evident.²⁵⁷ Over 50 years, only \$1.45 million could be justified. However, TVA failed to mention that the \$100,000 in annual flood control benefits of the project as planned, which allow for a capital cost of \$5 million, were just as clearly unjustified.²⁵⁸

According to TVA's 1969 Supplementary Notes, the direct cost for flood control was determined by taking the difference between the cost of the multiple-purpose project, as planned, and the cost of a project at the same site with flood storage eliminated from the reservoir.²⁵⁹ Since a project without flood storage was basically the low-pool alternative, the cost of flood control in the project as planned—at 1978 figures—should be computed at \$48 million. For every dollar spent for flood control over the 50-year life of the project, 10.4 cents would be returned. For the no-dam alternative, 20.7 cents would be returned. Obviously TVA's argument that the flood control benefits in the alternatives are not justified can be made against the project as planned as well.

B. COMPARISON OF THE ALTERNATIVES

The economic analysis and comparison of the project as planned and the low-pool, no-dam and liquidation alternatives were presented by the TVA staff in tabular form. The table is reprinted on the following page exactly as prepared except for the percentages and benefit/cost ratios which were calculated by the Subcommittee. (The capital costs are based on 1978 dollars. If the actual construction schedule is factored in, the total cost to complete was \$96 million for the project as planned; \$55 million for the low-pool alternatives; and \$15-25 million for the various levels of riverine development.)

As revealed in this table, the project as planned, even with the inclusion of a 63 percent recreation benefit, had a slightly negative benefit/cost ratio of .96:1. The low-pool/voluntary downstream relocation

²⁵⁶ Letter from Chairman Freeman to Chairman Moffett, July 21, 1980, Attachment 1.

²⁵⁷ The final figure for annual flood control benefits for the no-dam alternative was \$29,000. TVA, Staff Alternatives Report, supra, p. 51.

²⁵⁸ Flood control benefits which were 10 percent of the total benefits of the project as planned in 1969, had taken a dive by the time of the 1978 calculations, when they accounted for only 1.4 percent of the benefits. The staff indicated that system-wide flood-control benefits claimed in 1969 were no longer "significant." TVA, Staff Alternatives Report, supra, p. 21. Those benefits had accounted for about 43 percent of the flood control benefits claimed. The other flood control benefits were also reduced, with \$5,000 attributed to "land enhancement," and \$20,000 to agriculture. "Draft: Flood Control Benefits—Removal Plan," supra. The agricultural benefits were claimed even though TVA now admits that crops are seldom damaged by floods at Columbia. "Response to Questions Regarding Flood Impact on Farmlands in the Columbia, Tennessee Vicinity," November 1980 memorandum to the subcommittee from the U.S. Corps of Engineers.

²⁵⁹ TVA, 1969 Supplementary Notes, supra, p. 22.

alternative had a 1:1 ratio. But, most significantly, the no-dam/downstream removal/river development alternatives had positive benefit/cost ratios that ranged from 2:1 to 3.3:1 based on remaining project benefits and costs. The liquidation alternative had a staggering 8.8:1 positive benefit/cost ratio.

TABLE 1.—ECONOMIC DEVELOPMENT

[Dollar amounts in millions]

Item	Project as planned	No impoundment, downstream removal				Liquidation ²
		Low pool, downstream removal	Maximum river development	Medium river development	Minimum river development	
Capital costs:						
TVA.....	\$72.0	\$46.0	\$21.0	\$19.0	\$12.0	\$4.0
Non-TVA.....	6.0	.703	.004	.003	.001	.....
Total capital costs.....	78.0	46.703	21.004	19.003	12.001	4.0
Annual costs:						
Interest and amortization ¹	6.739	3.616	1.512	1.370	.870	0.285
Operation and maintenance, replacements:						
TVA.....	.156	.400	.350	.325	.075	.....
Non-TVA.....	.200	.040	.040	.035	.025	.....
Recoverable costs foregone.....	.307	.307	.245	.181	.072	.....
Total annual costs.....	7.402	4.363	2.147	1.911	1.042	.285
Annual benefits:						
Flood control.....	.100	.012	.029	.029	.029	.....
Percent.....	(1.4)	(0.03)	(0.07)	(0.07)	(0.08)	.....
Water supply.....	1.326	1.326	1.326	1.326	1.326	1.326
Percent.....	(18.7)	(28.9)	(30.3)	(33.3)	(39.0)	(53.1)
Recreation.....	4.500	2.000	1.700	1.300	.800	.....
Percent.....	(63.4)	(43.6)	(38.8)	(32.7)	(23.5)	.....
Agriculture.....	.....	.076	.152	.152	.076	.....
Percent.....	.....	(1.7)	(3.8)	(3.9)	(2.2)	.....
Enhanced employment.....	1.170	1.170	1.170	1.170	1.170	1.170
Percent.....	(16.5)	(25.5)	(26.7)	(34.4)	(34.4)	(46.9)
Total annual benefits.....	7.096	4.584	4.377	3.977	3.401	2.496
Net annual benefits.....	-.306	.221	2.230	2.066	2.359	2.211
Annual benefit/cost ratio.....	0.96:1	1:1	2:1	2.1:1	3.3:1	8.8:1

¹ This assumes modification in Normandy operation.

² Interest equals 6½ pct, economic life equals 60 yr, 1978 price levels.

Source: TVA, Staff Alternatives Report, table 2.

The TVA staff report, as presented to the TVA board, despite the previously discussed juggling of numbers that worked to the economic benefit of the project as planned and to the economic detriment of the project alternatives, had nonetheless succeeded in identifying more cost-effective alternatives to the original project. To that extent, the staff report was responsive to OMB's request and ready for final action by the TVA board.

In keeping with his earlier pledges to evaluate the Columbia Dam project, Chairman Freeman in October 1978 promised that the TVA board would make a final decision on Columbia in considering the Alternatives Report. "Now that the TVA Board has a quorum,²⁶⁰ I

²⁶⁰ Richard Freeman joined the TVA board on October 16, 1978. The current third TVA board member, Robert N. Clement, did not become a member until August 3, 1979, after the release of the Alternatives Report.

am hopeful that we will soon reach a firm decision on a course of action at Columbia," he promised one dam supporter.²⁶¹

C. TVA BOARD REFUSES OPINION

Although the Staff Alternatives Report was materially changed by Chairman Freeman and Director Freeman, it was never officially considered by them in their capacity as the TVA board. According to Chairman Freeman:

We reviewed the draft with the staff and what they had come with. Individually, Director Richard Freeman and I made some suggestions.

I never went over that report with the idea that it was a decisionmaking document that I personally or the board as a group would take responsibility for in that sense, but as a person with some background and interest and since it was going out as a TVA document, we did comment on it and we made a number of suggestions. I have forgotten what they were.²⁶²

Chairman and Director Freeman's failure to officially consider the Alternatives Report and to put themselves personally and the TVA board collectively on record concerning Columbia was contrary to Chairman Freeman's longstanding commitment to bite the bullet on Columbia and to his October 1978 pledge to have the TVA board "reach a firm decision on Columbia." The reluctance of Chairman Freeman and Director Freeman to publicly commit themselves on the Columbia dam and reservoir extended to the subcommittee's hearing. In response to questioning by Rep. Joel Deckard (R-Ind.), Chairman Freeman testified that he had never studied the project. He claimed to have done so would have been inappropriate since Congress had already appropriated money for it.²⁶³ Asked by Chairman Moffett and Rep. Deckard for his current opinion concerning the Columbia Dam, Chairman Freeman again refused to commit himself, insisting that "I do not have an expert opinion to give, because I have not looked into it . . . I do not have an opinion on this project."²⁶⁴ Director Freeman provided similar testimony as recorded below:

Mr. MOFFETT. Representatives of our Subcommittee met with you, Mr. Freeman, in your office on September 11. At that meeting, it has been reported to me that you made the following points:

One was that you did not have an opinion as to whether or not the project is in the public interest. Two was that you

²⁶¹ Letter from Chairman Freeman to Judge Taylor Rayburn, October 25, 1978. Chairman Freeman wrote similar letters to Pearl Gilliam (October 12, 1978) and Bill Chafin (January 4, 1979). Ms. Gilliam's September 14 letter to Chairman Freeman said in part:

"We are counting on you to see through this Columbia dam mess. It's never been looked into close. There has been too much of it covered up in the name of progress when it runs all the people off their land and cover it with water . . .

"Where is food going to be raised in a few years and who can buy? . . .
"I am not against progress, but where is progress going to stop and common sense going to start?"

²⁶² Hearings, *supra*, p. 193. In his prepared testimony Chairman Freeman said that "Dick Freeman and I also gave our input to the report and all of these comments were reflected in the final report." *Ibid.*, p. 182.

²⁶³ *Ibid.*, p. 186.

²⁶⁴ *Ibid.*

have not studied the project with a view to determining whether or not it is in the public interest. Three was that you had more important things to concern yourself with²⁶⁵ even though, I might add, as Mr. Deckard has rightly pointed out, that this is a project that will cost well in excess of \$150 million and destroy a major portion of a river.

Is that a fair summation of what you said?

Director FREEMAN. Yes, although maybe I did not say it quite that cryptically.²⁶⁶

Following that testimony, Subcommittee Chairman Moffett noted the irony of the Army Corps of Engineers' on-going determination of whether the Columbia project is in the public interest, given the refusal of Chairman Freeman and Director Freeman (two-thirds of the TVA board) to testify on that point.

Mr. MOFFETT. Therefore, the Corps has to bite the bullet and you will not, will you? The Corps has to come up with that judgment without getting any real assistance from you in terms of making that determination.

Chairman FREEMAN. They have received responses to every question that they have asked us. We have supplied all of the information that the Corps has requested from us. Certainly, we are not responsible for the Corps' decisionmaking process.

Mr. MOFFETT. Did they ever ask if it was in the public interest?

Chairman FREEMAN. I do not believe so. They have asked a lot of specific questions about the engineering and environmental facts.

Mr. MOFFETT. If you received a letter from the Corps tomorrow asking you, Chairman Freeman, is the Columbia Dam project in the public interest? What would your response be?

Chairman FREEMAN. I would like to think about it a little bit more, but my offhand reaction would be that I would write them a letter enclosing a copy of my testimony this morning.

Mr. MOFFETT. Isn't that like the Johnny Mathis song, "It's Not for Me to Say?"²⁶⁷

The failure of Chairman Freeman and Director Freeman to offer an opinion on the Columbia Dam project out of deference to Congress is poor government and a total misreading of Congressional intent. Congress in the final analysis is only as good as the information provided it. Chairman Freeman's refusal to respond to the subcommittee's invitation to offer testimony "that details why you and TVA believe that the Columbia project as planned is in the public interest"²⁶⁸ ignores the fact that the appropriations process occurs annually. To be most effective, the process demands the informed opinion of officials throughout government. Chairman Freeman's refusal to offer an opinion on Columbia out of deference to the appropriations process was in conflict, moreover, with his previous testimony on Tellico in

²⁶⁵ In meeting with the subcommittee staff, Mr. Freeman said that he spent much of his time editing TVA reports.

²⁶⁶ Hearings, supra, p. 188.

²⁶⁷ Ibid., p. 196.

²⁶⁸ Letter from Chairman Moffett to Chairman Freeman, September 8, 1980.

which he strongly criticized TVA for failing to re-evaluate that project even after funding had been approved by Congress.²⁶⁹

D. BOARD REVISIONS OF STAFF REPORT

Chairman Freeman and Director Freeman, although reluctant to publicly discuss the Columbia project, displayed little reticence when it came to fashioning the final version of the Alternatives Report behind closed door. In the course of being reviewed by the two Freemans, the report emerged as a totally different document. The changes rendered at the "unofficial" board level prompted the TVA staff to reject the suggestion that the final report be released as a TVA "staff study." Consequently, the final report was issued as a study "Prepared by the Tennessee Valley Authority."²⁷⁰

The changes rendered in the final Alternatives Report consisted primarily of the following:

1. Minimizing the significance of the staff's finding that the Normandy Dam could be operated to meet projected water supply needs for a minimum of 50 years by referring to higher "local" projections.²⁷¹
2. Deleting all water supply and enhanced employment benefits for the alternatives, even while admitting the modification of Normandy would provide the water needed to support those benefits.
3. Stating that the project alternatives were "not reasonable."²⁷²
4. Enhancing the economic attractiveness of the original project by claiming that TVA had identified a potential thermal power plant site in the Columbia reservoir area.²⁷³
5. Recommending that the project be completed as planned, plus a conservation program for the endangered species.²⁷⁴

The reasons advanced by the "Tennessee Valley Authority" in continuing to promote the Columbia dam and reservoir in the Alternatives Report were at best specious and in some instances demonstrably false. TVA's bases for continuing to endorse Columbia despite the staff's conclusion that the dam and reservoir were not necessary to meet TVA's water supply, flood control, and enhanced employment objectives are discussed more fully below.

1. *Water Supply*

The staff's report that Columbia reservoir was unnecessary to meet the area's projected water supply needs for the foreseeable future destroyed the basic justification for the project as planned. The final ver-

²⁶⁹ Testimony before House Subcommittee on Fisheries, Wildlife Conservation, and the Environment, *supra*, p. 4. At his confirmation hearing, Chairman Freeman pledged that in case of a policy conflict with Congress or the Administration, "I would feel that TVA would be duty bound to stick by its guns and persevere in the policies that it felt were required under the TVA Act for the benefit of the people of the Valley and the people of the United States." Confirmation hearing, *supra*, p. 83.

²⁷⁰ TVA, Alternatives Report, *supra*, title page. The Tellico report by contrast was issued as a "staff report."

²⁷¹ TVA, Alternatives Report, *supra*, p. 15.

²⁷² *Ibid.*, pp. 33-34.

²⁷³ *Ibid.*, p. 4.

²⁷⁴ *Ibid.*

²⁷⁵ *Ibid.*

sion of the Alternatives Report sought to minimize that staff finding in claiming:

the Board of Public Utilities for the city of Columbia believes that the water grid system which they developed for Maury County, will require more than three times the water that TVA has projected. In addition, Williamson County officials have shown an interest in receiving water from the Duck River. Under those circumstances Normandy Reservoir would not be able to meet the future needs in the Columbia area without reservoir levels being adversely affected.²⁷⁶

The report itself contained no supporting documentation for that claim. However, in the "Comments" appendix, tables from the Columbia Board of Public Utilities were attached to a letter from Lon MacFarland, the attorney for the Duck River Development Association. The tables, prepared by J. P. Woodruff, general manager of the Columbia utility, projected a water demand by the year 2025 of 292 cubic feet per second during "prolonged extreme drouth [sic] periods," compared to TVA's projected requirement of 200 cubic feet per second.²⁷⁷

The TVA staff was not unfamiliar with either Mr. Woodruff's or "local people's" projections. They had been alluded to for years, but had not been considered valid enough to mention in its own draft. Nor were the numbers unknown to the TVA board. Those same tables had been sent to TVA a month before and referred to Columbia Project Manager John L. Furgurson by TVA Director Richard M. Freeman during Freeman's review of the staff study. "Any merit to his numbers?" Mr. Freeman asked of Mr. Furgurson.²⁷⁸ In reply, Mr. Furgurson described the water board's individual county water use projections as "reasonable" since they were taken from TVA's 1969 Supplementary Notes. But the totals were "misleading," he said, for failing to note that most of the water used by cities above Columbia would be returned to the river for reuse at Columbia. The result was inflated water requirements.²⁷⁹ According to Mr. Furgurson:

Knowing there will be some re-use, we estimated that 65 mgd [million gallons per day] (100 cfs) [cubic feet per second] flow maintained in the Columbia area would meet our projected municipal and industrial demand for the year 2025. Add to this the requirements for Williamson County of 10 mgd, most of which would not be returned to the Duck River, and a flow of 75 mgd (115 cfs) would have to be maintained.

Our studies of modifying the operation at Normandy show we can maintain 100 cfs for water quality control . . . The operation studies show that [Normandy] reservoir levels during summer recreation periods would not vary significantly from that expected under current operation. We have computer plots for 45 years of record to show this.²⁸⁰

²⁷⁶ TVA, Alternatives Report, supra, p. 15.

²⁷⁷ Letter from Lon MacFarland to S. David Freeman, with attachment, March 1, 1979 as reprinted in TVA, Alternatives Report, Appendix E.

²⁷⁸ Memorandum from Richard Freeman to John Furgurson, February 13, 1979.

²⁷⁹ Memorandum from John L. Furgurson to Richard M. Freeman, February 15, 1979.

²⁸⁰ Ibid., p. 2.

When the same projections came to TVA again, via Mr. MacFarland's letter, however, the TVA board members "suggest[ed] that the more optimistic local forecasts for water demand should at least be recognized in our revised report."²⁸¹ Although TVA printed responses to other comments it apparently determined were misleading, it did not respond to Mr. MacFarland's letter or the attached tables in the Alternatives Report.

In his testimony before the subcommittee, Mr. Furgurson claimed that TVA had not relied on the "misleading" table for the statement in its report about the Columbia utility board's projections but upon "another letter several years before, that pointed out projections for the city of Columbia that were three times what we had anticipated . . . [It] stated flatly that they expected the needs in the area . . . they gave a figure which was three times what we had estimated."²⁸²

Chairman Freeman, on the other hand, said that it was at his suggestion that the utility board's contention be included because he had not studied the area adequately enough to make a judgment.

Chairman FREEMAN. . . . I had not looked into this water issue and I was uncomfortable with the report simply dismissing it out-of-hand. I recall that I said: "Well, this is our conjecture about how many industries they will get and whether the water supply will be used for other counties or not. These people are making a claim. I do not know if they are right or not and I do not know about these other staff studies, so let us just in effect state the contentions . . .

This is one of the issues that I would have to get into in some depth before I could render a judgment . . .

Mr. MOFFETT. . . . Let me just say in conclusion that that is the point. There are a whole lot of issues that ought to be looked at by someone. This Subcommittee is trying to do its share, but there are so many people who are wrestling with whether or not this whole project is in the public interest. The Army Corps is. The state is to some extent.

I still read those OMB concerns as cost concerns . . .

You really have not addressed yourself to the costs of this project and whether or not it is a good deal.

In fact, I think what you seem to be saying to us is . . . that you are getting out of the dam business, and so on that you came in and found this turkey sitting there on the table and there is no way to take the turkey off the table.²⁸³

Subsequent to the hearing, Mr. Furgurson provided the subcommittee with the report that he had referred to in his testimony. It was a letter from Mr. Woodruff to Chairman Freeman written in October of 1977, before modification of Normandy was discussed and apparently as part of the barrage of letters on Columbia that Mr. Freeman received from all sides after his appointment earlier in the year. Mr. Woodruff's concern was that the unmodified flow from Normandy alone would not meet TVA's projected needs of 200 cubic feet per sec-

²⁸¹ Memorandum from the office of the general manager, March 27, 1979.

²⁸² Hearings, *supra*, pp. 217-218.

²⁸³ *Ibid.*, pp. 218-219.

ond at Columbia during "extreme drouths [sic]." ²⁸⁴ Attached was an unexplained graph displaying Mr. Woodruff's higher water use projections. Obviously, TVA did not have valid alternate projections from other sources. More importantly, the TVA board knew that it did not.

Another statement often bandied about in TVA documents was the apparently insatiable demand of nearby Williamson County, a fast-growing Nashville suburb, for water which Columbia supporters said could be met by the dam and, therefore, must be considered in evaluating the dam. The staff study, for good reason, did not even suggest that "Williamson County officials have shown an interest in receiving water from the Duck River," as stated in the final report. ²⁸⁵

Williamson County officials, in fact, have displayed only a minor interest in obtaining water from Columbia. The county planner wrote in late 1979—long after the Alternatives Report was published and in context of the Corps' public interest review—that "the possibility does exist that the Duck River project could create a cost-effective source of water for a part of the county." ²⁸⁶ One reason for the lack of interest may have been a joint study completed by TVA and the Army Corps of Engineers less than 1 month after release of the Alternatives Report. That study concluded that the development of Williamson County's large ground water resources provided the most cost-effective means of meeting the county's growing water needs. ²⁸⁷ Since the report on Williamson County was primarily a summarization of previously published studies, TVA was well aware that Williamson County was not dependent on the Duck River for its water supply, except for the water sold under existing contracts (and already factored into growth projections) with water districts in the southern portion of the county. ²⁸⁸

Moreover, Williamson County was not included in the planning of the Duck River project and is not part of the \$16.2-million water repayment agreement entered into by TVA and the Duck River Development Association. Nonetheless, it is that agency which, in seeking to further justify the Columbia dam, suggested initially to TVA in March of 1978 that a study of prospects for developing a water source on the Columbia reservoir for Williamson County be done. ²⁸⁹

2. Deletion of Benefits or Alternatives

The TVA staff discovery of a valid and cost-effective alternative to the Columbia Dam project never saw the light of day. The board deleted the staff's conclusion that, for the no-dam alternative,

[w]ith the modifications in Normandy Reservoir operation, there would be sufficient storage in Normandy Reservoir to maintain streamflow of up to 250 cfs at Columbia for water

²⁸⁴ Letter from J. P. Woodruff to S. David Freeman, October 27, 1977.

²⁸⁵ TVA, Alternatives Report, *supra*, p. 15.

²⁸⁶ Memorandum from Morton Stein to TVA, November 27, 1979.

²⁸⁷ TVA, "Williamson County, Tennessee: Water Supply Concept," May 1979.

²⁸⁸ Additional information on the availability of ground water in Williamson County can be found in "Ground Water in the Carbonate Rocks of the Franklin Area, Tennessee," U.S. Geological Survey, 1980.

²⁸⁹ Letter from H. Peter Claussen to John W. Ray, Upper Duck River Development Agency, April 14, 1978.

quality and water supply purposes. This level of streamflow would be sufficient to provide 155 cfs at Columbia for water quality control and up to 100 cfs for water supply which would satisfy the water supply needs for at least the next 50 years. *The water supply benefit and associated enhanced employment benefit would be the same as for Project as Planned . . . (emphasis added).*²⁹⁰

The board then told the staff that the water supply and enhanced employment benefits should be deleted from the various alternatives' benefit/cost ratios. The result was the elimination of all economically feasible alternatives.

This fancy footwork was not obvious to the public. Contrary to the Tellico Alternatives Report, which included a great deal of explanation about how the various benefits were determined, the Columbia report included none. The benefit/cost table, even with the new, favorable figures, was eliminated. TVA employees, in meeting with subcommittee staff, said the board was afraid the public would "jump to conclusions" and not read the entire report if the table was included.²⁹¹

Also, since the staff's comparative discussion of the project as planned was eliminated, the result was an alternatives report which, rather than reviewing "more cost effective" means of meeting "essential water supply and flood control needs" as requested by OMB, was now limited to discussing alternatives to a project without comparison to the original project. It left its readers to raise the question, as Chairman Moffett did, of how one makes a comparison with only one side of the equation.

Mr. MOFFETT. I assume that OMB was primarily concerned about cost overruns on the project, which had already doubled the costs, since budget control is the role of that office.

When Mr. McIntyre asked for more cost-effective modifications, it seems logical to assume that he meant compared to the project as planned. Is that not fair to say?

Chairman FREEMAN. I do not believe so.

Mr. MOFFETT. What could he possibly have meant then and what was the frame of reference?

Chairman FREEMAN. [He was] concerned I think, as the language states, about the Endangered Species Act. The language—

Mr. MOFFETT. No, only partly. OMB was more concerned, if you look at this letter with project costs than with mussels or things like that.

²⁹⁰ TVA, Staff Alternatives Report, supra, pp. 43-44.

²⁹¹ One critic familiar with both the Tellico and Columbia alternatives reports wrote of the published TVA draft report: "My overall impression is that the [Columbia] draft report is too general and offers little in the way of specifics to evaluate. It falls far short of the quality of a similar report on the Tellico project. I trust the final version will include more detail and provide a more meaningful comparison of the alternatives . . . A few important omissions were noted in the report. There were no benefit-cost figures presented on the dam-reservoir project as previously planned and as presently planned. These computations must be included to make any meaningful evaluation. If TVA plans to make a prudent evaluation of the benefits and costs in the final report, these computations must be carefully analyzed and presented." Letter from Chester A. McConnell, southeast representative, Wildlife Management Institute, to S. David Freeman, March 20, 1979.

Chairman FREEMAN. The language says in a cost-effective manner and do not violate the Endangered Species Act . . . The problem at that time . . . was that we were building this project, and it looked as if it were crashing head-on into the Endangered Species Act . . . It is my recollection that the OMB letter came after discussions we had with the staff of OMB about alternatives to beat that problem. That was the problem that we had all of the discussions about.

* * * * *

Mr. MOFFETT. You looked at the alternatives, but you never looked at the original project. You never re-analyzed the original project as planned. All you did was to analyze alternatives to the project. Let us face it.

Chairman FREEMAN. We did what we were asked.

Mr. MOFFETT. No, you did not, not really. I cannot believe that one could read this letter and in any way conclude that OMB wanted you to analyze alternatives but not analyze the original project.

Chairman FREEMAN. Mr. Chairman, I hesitate to differ. The sentence does speak for itself. It, in plain language, says that you are requested "to investigate and report on modifications that should satisfy the essential water supply and flood control needs in a more cost effective manner." That to my mind, means what it says.²⁹²

Eliminating the water supply and enhanced employment benefits cleared the way for TVA to give as the major reason for rejecting the no-dam alternative the supposed fact that

[i]n the case of both the low-pool and the no-impoundment alternatives the *additional* benefits do not exceed the cost of providing the benefits.

In light of the *limited* benefits of the alternatives to the project as planned, and the difficulty of operating the low-pool reservoir, it would appear that these are not reasonable alternatives (emphasis added).²⁹³

It is not clear from the report just what the term "additional" benefits encompasses. It may refer only to an earlier statement that the flood control benefits of the no-pool alternative did not exceed the cost of the downstream relocation program.²⁹⁴

Even if Chairman Freeman's defense of the board's decision not to reanalyze the project as planned is accepted, the result of the board's changes to the Staff Alternatives Report was to conceal from the public, the Congress, and the Corps of Engineers the fact that the TVA staff, pursuant to the OMB request, had identified a more cost-

²⁹² Hearings, supra, pp. 192-193.

²⁹³ TVA, Alternatives Report, supra, p. 4.

²⁹⁴ TVA calculated a lower flood control benefit for the no-impoundment and low-pool alternatives, apparently on the theory that clearing the flood plain of structures and allowing it to function as a natural flood plain was less beneficial than protecting it and allowing intensive development there. This appears to be contrary to Executive Order No. 11988, which directs federal agencies to avoid taking action within the flood plain unless it is the only practicable alternative. Even then, they are to restore and preserve the natural and beneficial flood plain values.

effective alternative to the Columbia dam and reservoir that would save the river and provide the original benefits. Moreover, it was an alternative with a positive benefit/cost ratio in hard figures as computed by TVA.

3. Potential Thermal Plant

The Alternatives Report, in further justifying the Columbia dam and reservoir at the expense of the no-dam alternative, claimed that:

... TVA has identified a potential thermal [coal or gas-burning] plant site in the Columbia Reservoir area. With the completion of the reservoir as planned, this site would be enhanced and it could add appreciably to the economic benefit of the project previously claimed.²⁹⁵

An almost identical statement to that effect was made by Chairman Freeman in his 1979 testimony before a House appropriations subcommittee.²⁹⁶

As was true in the cases cited above, the TVA staff report did not claim the discovery of a potential power plant in the Columbia reservoir area, although Chairman Freeman during his review of the staff report requested Mr. Furgurson to supply an economic value for a fossil power plant site.²⁹⁷ Mr. Furgurson, in reply, recommended that the reference to the potential power plant site not be included in the final report on the basis of an enclosed staff analysis that stated that the Columbia reservoir area could not support a fossil plant "because of solid waste disposal limitations."²⁹⁸ Chairman Freeman obviously did not accept Mr. Furgurson's recommendation as evidenced by the final version of the Alternatives Report.²⁹⁹

The speciousness of this claim was further demonstrated in TVA's responses to adverse comments given in April of 1979, the same month the Alternatives Report was released to the Corps of Engineers as part of the 404 permit process.

The purposes for which the dam is being built are well known (FES [Final Environmental Statement] at 1.) These are the purposes which Congress approved and for which funds have been appropriated. Although as indicated in the Alternatives Report, Columbia Reservoir may contain one

²⁹⁵ TVA, Alternatives Report, supra, p. 4.

²⁹⁶ Energy and Water Development Appropriations for 1980 Hearings before a Subcommittee on Appropriations, House of Representatives, 96th Cong., 1st Sess., Part 4, March 1, 1979, p. 228.

²⁹⁷ Memorandum from John L. Furgurson to Leon Ring, general manager, April 13, 1979.

²⁹⁸ Ibid, and enclosed memorandum from Robert N. Kennedy, chief power supply branch, April 10, 1979. A group of staff members, commenting on the proposed final draft made a similar recommendation, "Suggest this [reference to power plant site] be deleted. We have said this site no longer being considered. Also it was reviewed for nuclear only," stated Dick Fitz, Richard Urban, Billy Isom, Bruce Brye and Ralph H. Brooks in a memorandum to John L. Furgurson on April 11, 1979. The Tennessee Citizens for Wilderness Planning, commenting on the publicly circulated draft report, also was aware of TVA's earlier denials that it would place a power plant at Columbia. "The power plant site possibly would seem to us to require a revised Environmental Impact Statement for Columbia Dam, inasmuch as the reservoir would be a prerequisite for the plant. It should also be noted that TCWP some years ago inquired of TVA whether a power plant was projected and received a denial." Letter from Liane B. Russell, TCWP, to S. David Freeman, March 22, 1979.

²⁹⁹ TVA provided the subcommittee with all internal memoranda, documents, studies and work papers on the Duck River Project from 1977 to the present. Those materials do not include any reference to a study that identified, much less discussed, the feasibility of a fossil fuel plant for Columbia.

or more sites which could be suitable for a power plant, TVA has no present plans to construct a power plant on the Duck River now being considered by TVA for that purpose.³⁰⁰

E. TVA'S CONSERVATION PLAN FOR "SAVING" THE MUSSELS

The Staff Alternatives Report, as requested by OMB, had succeeded in identifying two less costly alternatives to the project as planned that additionally would not threaten any endangered species. The staff report did not contain any recommendations other than noting the prospects of water quality problems associated with the low-pool alternative.³⁰¹ The final report as shaped by the TVA board recommended, however, the "option" of proceeding with the project as planned in combination with a "conservation plan" to satisfy the requirements of the Endangered Species Act. The formulation of the "conservation plan" after submission of the staff report came one year after passage of an amendment to the 1973 Endangered Species Act. That amendment established a procedure permitting federal agencies to obtain an exemption from the Act upon a showing, among other things, that a project was in the "public interest."

As noted by the House Committee on Environment and Public Works, although the original act provided for a consultation process between the U.S. Fish and Wildlife Service and the acting agency to resolve conflicts,

[i]t is clear, nevertheless, that there will continue to be some Federally authorized activities which cannot be modified in a manner which will avoid a conflict with a listed species. For example, the Tennessee Valley Authority's Columbia Dam project appears to pose a serious threat to several listed species.³⁰²

The committee also reported allegations by the General Accounting Office that the Fish and Wildlife Service has deliberately refrained from listing two species of insects which might have posed a serious conflict with the New Melones Dam in California for fear of "provoking the Congress into major revisions of the Endangered Species Act. The committee considered these allegations to be extremely serious. Those individuals charged with the administration of the act do not have the legal authority to weigh the political importance of an endangered species."³⁰³

The solution was the 1978 amendments to the Endangered Species Act which provided a procedure to exempt projects from the act's restrictions. That authority to grant exemptions was to be vested in an Endangered Species Committee composed of the secretaries of Agriculture, the Army, and Interior; the chairman of the Council of Economic Advisers; the administrator of the Environmental Protection Agency; the administrator of the National Oceanic and Atmospheric Administration; and a representative of the affected state(s). Section

³⁰⁰ Letter from Leon E. Ring to Colonel Robert K. Tener, April 3, 1979, enclosure 2.

³⁰¹ TVA, Staff Alternatives Report, *supra*, p. 39.

³⁰² H.R. 98-1625, September 25, 1978, p. 13.

³⁰³ *Ibid.*

7(e). This membership was designed to balance "all possible points of view."³⁰⁴

To be eligible for an exemption, however, a project had to survive a stringent review. There could be (1) no reasonable and prudent alternatives to the agency action; (2) the benefits must "clearly" outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat; (3) the action must be in the public interest; and (4) the action must be of national or regional significance. Section 7(e).

The amendments further defined the consultation process between the Fish and Wildlife Service and the acting Federal agency. They strengthened it by prohibiting any Federal agency from making any irreversible or irretrievable commitment of resources once consultation has been initiated if it would foreclose efforts to avoid the adverse impacts on the species or the habitat.³⁰⁵

Although the Columbia Dam project was cited as posing a serious threat to several listed species, TVA did not seek an exemption for Columbia under the 1978 amendments.³⁰⁶ Instead, on December 21, 1978, Chairman Freeman wrote Cecil D. Andrus, the Secretary of Interior, asking that formal consultation under Section 7 be reinstated. Freeman made a point of telling Andrus that Congress wanted Columbia Dam built, and that only the biological opinion of the Fish and Wildlife Service stood in the way.³⁰⁷ Andrus, in turn, assured Freeman that he was "very aware of the sensitive issues involving the project, and I assure you that the Department of Interior is committed to assisting you in meeting your mandates while complying with the Endangered Species Act."³⁰⁸

Chairman Freeman, at his appearance before the subcommittee, indicated that TVA had taken this course at the urging of Secretary Andrus.

Mr. FREEMAN. . . . I remember Secretary Andrus, when we discussed Tellico with him, very pointedly said to me that if TVA used the Endangered Species Act, and, if rather than suing us, they would work with us, we would make a good-faith effort on the Columbia Dam project and not have another Tellico, which just exhibited a complete failure of the Federal agencies to work together.³⁰⁹

The first meeting with the Service, the agency which under the Endangered Species Act was to "suggest those reasonable and prudent alternatives which . . . would avoid jeopardizing the continued existence of any endangered . . . species,"³¹⁰ was set for February 21-22, 1979.

³⁰⁴ *Ibid.*, p. 15.

³⁰⁵ *Ibid.*, section 7(d), p. 20.

³⁰⁶ TVA has not fared particularly well under the exemption process. The Tellico Dam, which prompted the 1978 amendments, was sent by Congress to the endangered species committee in a special expedited procedure. Although the project was virtually complete, the committee, by unanimous action, denied the application, describing the project as "ill conceived and uneconomical in the first place." Ronald H. Rosenberg, "Federal Protection of Endangered Species," 58 N.C. Law R. 491 (1980), p. 552. After being turned down in an attempt to attach a congressional exemption for Tellico to the 1979 amendments to the Endangered Species Act, its supporters finally passed an exemption as a rider on the 1980 Energy and Water Development Act.

³⁰⁷ Letter from S. David Freeman to Cecil D. Andrus, December 21, 1978.

³⁰⁸ Letter from Cecil D. Andrus to S. David Freeman, January 19, 1979.

³⁰⁹ Hearings, *supra*, p. 192.

³¹⁰ Section 7(b).

On February 1, 1979, the TVA staff presented the board with its draft of the Alternatives Report for the Office of Management and Budget. The report stated that a single endangered mussel species would be inundated by the originally planned project.³¹¹ No mitigation or conservation plan was recommended, nor did a review of TVA's internal files reveal any mention of a discussion of such a plan in the context of the Alternatives Report.

1. Staff Skepticism

However, John Jenkinson, a recently hired TVA malacologist (mussel specialist), testified that sometime in late January or early February, he was called in to prepare a mussel conservation plan which involved transplanting the endangered species.³¹² During that time, however, Jenkinson's superior, Thomas H. Ripley, gave Chairman Freeman what he described as a "situation assessment" on one of the species and the project itself. The likelihood of completing the dam with an agreement "based on the potentials to mitigate" was "very low and clearly related to the survival chances of the endangered mollusk, *Conradilla caelata*," Ripley stated. (TVA at that time believed only one endangered species existed in the impoundment area.)

The largest population of that mussel was in the Duck, and "only scattered individuals of the species have been collected in the Powell and Clinch Rivers in the past decade, and some coal washing problems threaten these areas."

Ripley, who had requested the initiation of a transplant program two years earlier—without response—was not particularly sanguine about the possibility of success, however.

Establishment of additional *C. caelata* populations through transplantation has some (limited) potential as a method for recovering the species. To achieve transplantation in rivers where it does not now occur with any measure of optimism, however, would take several years of habitat analysis and life history study of the species beginning with a search for its host fish species. Additionally, transplants elsewhere in the Duck River do not seem appropriate because past transplants have not proved successful, probably due to degraded water quality. In fact, the mussel faunal complexes of the Duck River have been declining sharply in diversity and numbers for many years. We feel the Powell and/or Clinch have the greatest potential for transplantation; however, as suggested, several years would be needed to evaluate success, and I emphasize *years*. We are dealing with a considerably complex organism about which we actually know relatively little (emphasis added).³¹³

Ripley then suggested that the exemption provided for in the 1978 amendments to the Endangered Species Act might be pursued.

³¹¹ TVA, Staff Alternatives Report, supra, p. 26.

³¹² Hearings, supra, p. 168; memorandum from Richard B. Fitz to Steven A. Ahlstedt and John J. Jenkinson, thanking them for "the job both of you have done on Columbia thus far. I know it has involved long hours, extending well into the early hours of the morning on several occasions," February 16, 1979.

³¹³ "Situation Assessment—*Conradilla caelata* and the Columbia Dam Project," February 9, 1979.

Ripley's report to Chairman Freeman was followed on February 14, 1979, by a review from Jenkinson.³¹⁴ Jenkinson concluded that the mussel was producing normally in its Lillard Mill habitat in the Duck River (which would be inundated); that it was much less common in the Powell River; and was extremely rare and possibly not reproducing in the Clinch River. Because of the very small reach of their habitats, each population could be easily destroyed by localized pollution, flood scour of the shoals, gravel dredging or other occurrences.

More importantly, the Powell River is beginning to receive increased amounts of strip mine runoff and coal washings which, if not stopped, can be expected to degrade water quality enough to kill mollusks . . .

Nonetheless, 12 days later, in the Draft Alternatives Report, which was released to the public for comment, TVA described a new concept for Columbia Dam: the project as planned with mitigation. TVA described this approach as an "option," instead of an alternative; therefore, a cost/benefit review was not required.³¹⁵ The Draft Alternatives Report thus contained one "option" and three rejected alternatives.

2. *The Plan*

Without mentioning that endangered species were involved, the final Alternatives Report admitted that Columbia Dam would necessarily modify the most significant Cumberlandian mollusk habitat remaining in the Duck River. (Significant populations of mussels remained only in the three shoals between Normandy and Columbia, all of which would be inundated by the Columbia reservoir.)³¹⁶ As a result, "several environmental mitigation schemes" (a strangely candid choice of words) were included to reduce that impact.

Since the decline in mussel population was most likely due to changes in water quality, TVA would operate the Columbia Dam to simulate "as closely as possible, natural flow rates, temperature fluctuations, silt loading and water quality conditions" to restore natural biota. "Additionally, discharges of effluents to the river will be required to meet stringent pollution standards to maintain the recreated natural character of the river."³¹⁷ That would not be accomplished until after an initial aging process for the reservoir of three to five years, however.³¹⁸

In addition, TVA would protect natural shoals in the river from gravel dredging and other adverse impacts, although earlier transplants of mussels had been destroyed by unauthorized gravel dredging which TVA apparently had not been able to stop.³¹⁹ Recolonization of mollusks will "occur by natural processes or may be augmented by transplants." If necessary, TVA would transplant "all of the freshwater mussels" from the impounded sections of the river to oases either in the Duck between Normandy and Columbia or elsewhere. Good

³¹⁴ "The Present Status of *Conradilla caelata*," February 14, 1979.

³¹⁵ TVA, Draft Alternatives Report, *supra*, p. E-1.

³¹⁶ *Ibid.*, p. 18.

³¹⁷ *Ibid.*, pp. 18-19.

³¹⁸ TVA has yet to explain how it is going to control the effluent discharges beyond the already-planned sewage treatment works by various municipal discharges.

³¹⁹ Letter from Thomas H. Ripley to Lon MacFarland, November 15, 1978.

candidate sites were reaches of the Clinch, Powell and North Fork Holston Rivers. Furthermore, TVA would propose to appropriate state agencies that sanctuaries be created and enforcement of protective measures be supported. Those agencies would be "encouraged" to restrict gravel dredging and other taking or disturbance of "certain" species in "some" areas.³²⁰

Finally, "special programs will be developed to abate existing severe environmental problems on these rivers to include actual reclamation of disturbed land areas, upgrading of municipal waste treatment systems, and improving soil erosion control practices in the Clinch-Powell watersheds."³²¹ TVA did not, however, indicate the cost nor specify what agency, or agencies, would be responsible for what appeared to be a massive environmental clean-up program that would require the cooperation of the states of Virginia and Tennessee and several federal agencies.

The draft report waxed eloquent over the benefits of the mitigation program: Even though the effect of the dam was to transform the positive cleansing benefits of 54 miles of a free-flowing river into a stagnant impoundment, TVA viewed its plan as the environmental salvation of the river.

Operating Columbia Dam to assure desirable water quality and controlling discharges into the river would restore a major portion of the Duck River . . . includ[ing] the revival and maintenance of the fish and other fauna . . . If the project were to achieve its goals, enhanced resident populations of sport fish would exist throughout the river as would numerous species of mollusks and other animals and plants characteristic of a flowing stream.³²²

Large numbers of many fish species would migrate annually from the Kentucky Lake impoundment on the Tennessee River to spawn in the Duck. "This self-sustaining system could harbor an especially wide variety of many types of species, which could be used to recolonize newly reclaimed streams throughout the Tennessee and lower Ohio drainage basins." And the mussel fauna might be reestablished and protected in the river. "These species would represent a fair proportion of the diversity of freshwater mussels present in the entire Tennessee drainage basin. Indeed, the Duck River could serve as a refuge for these species while other streams in the Valley were undergoing similar reclamation projects."³²³

During his appearance before the subcommittee, TVA Chairman S. David Freeman was asked about how the agency could have unequivocally preferred the mitigation plan when its own biologists cautioned about the very real lack of knowledge of the endangered species, the failure of earlier transplants, the lengthy time required for success, and the serious habitat and water pollution problem.

Chairman MOFFETT. It does not seem that you are getting much support from your technical staff here. Ripley is say-

³²⁰ TVA, Draft Alternatives Report, *supra*, pp. 18-20.

³²¹ *Ibid.*, p. 20.

³²² *Ibid.*

³²³ *Ibid.*, p. 21.

ing the best chance is to transplant into the Powell and the Clinch, not the Duck. Jenkinson says the pollution in the Powell is going to kill the mussels.

* * * * *

Mr. FREEMAN. I am certainly no biologist. I relied on the advise I got. I think the record should show what was in my head and why I went forward . . . I was persuaded by our biologist, first of all, that those endangered mussels were dying . . . that if you were to let nature take its course and let Lillard Dam [site of the endangered populations] stay where it is and if you did not complete the Columbia Dam Project at all, that the long-term trend was a deterioration of the mussel population and that they were dying out . . ." ³²⁴

One factor that TVA failed to mention was that one very important reason that mussel fauna throughout the Tennessee Valley was shrinking was because of TVA dam impoundments. ³²⁵

In direct contradiction to the information given to him by Ripley, Freeman testified, "Our biologists felt that they had learned enough about the habitat where they were surviving, at Lillard Dam, so that there was a reasonable chance that it could be duplicated in the upper Duck, in the Powell, and in other rivers. This is not a sure thing, but it was something that they felt they could do." ³²⁶

Another plus to the plan, Mr. Freeman said, was TVA's obligation to clean up the Powell River.

Chairman FREEMAN. . . . That is a plus, Mr. Chairman. I make no apology for the fact that, as a result of mitigation plans, we may clean up some of the pollution from strip mining in the Powell River. That is one of the aspects of this that motivated me to go ahead with it.

Here is a chance to take a project and turn it into an environmental cleanup of these rivers. ³²⁷

But Mr. Freeman then admitted that the conservation plan would not succeed if the State of Virginia did not cooperate, and that TVA "does not clean up rivers," although it has some leverage to force others to do so. ³²⁸

TVA presented its plan to the consultation team from the Fish and Wildlife Service at the initial meeting of the two agencies on March 6-8, 1979. The Fish and Wildlife team indicated that it would consider a "no jeopardy" biological opinion for the project with mitigation if the dam was operated as a self-regulating structure with no permanent impoundment above elevation 570 until successful mitigation was demonstrated. It also wanted to see a discussion in the final Alternatives Report on how TVA proposed to operate the dam in interim. ³²⁹ Under that procedure, the reservoir would not back up the river far enough to flood and destroy the endangered mussels.

³²⁴ Hearings, supra, p. 207.

³²⁵ Isom, Yokley and Gooch, "Mussels of the Elk River Basin in Alabama and Tennessee—1965-67," 89 *American Midland Naturalist* 437, April 1973, pp. 441-42.

³²⁶ Hearings, supra, p. 207.

³²⁷ Ibid.

³²⁸ Ibid., p. 208.

³²⁹ Memorandum from John Furgurson to Leon E. Ring, general manager, TVA, March 12, 1979.

Chairman Freeman was apparently outraged by the caution of the Fish and Wildlife Service staff, according to Richard B. Fitz, TVA senior fishery biologist.

When told that the biological opinion would declare no jeopardy for the reservoir as planned alternative provided the mitigation actions were successful, Freeman felt this was unreasonable. His point was that if TVA was willing to take the risk of spending many millions of dollars to complete the project and perhaps not be allowed to impound, then the FWS ought to be willing to accept some risk insofar as not requiring the time period for proof of mitigation success to extend beyond some reasonable point. He said further that he could not go to Congress and get money for the project and at the same time tell them that it might be 10 or 20 years before the river could be impounded.³³⁰

Fitz recognized that the Fish and Wildlife Service probably had no business agree to such a plan ("although under the existing legislation such flexibility by the FWS would be difficult"), but he articulated the threat that would force FWS' acquiescence: ". . . everyone involved, I am sure, realizes that to fail to reach some compromise will make the act the most endangered species of all."³³¹

The final Alternatives Report contained a few changes in the mitigation plan. The most significant was that the dam would operate as a "self-regulating" dam "until the Department of Interior determined that the conservation program has been carried out."³³²

Initially, TVA's staff attempted to maintain an aura of fairness around the board's consideration of the proposed report. In preparation for public release of the draft, General Manager Leon E. Ring requested adequate and expeditious distribution to the people in the Columbia area. Furthermore,

[a]t the time the paper is released, we will need to make a public statement, probably through a news release, that Columbia project alternatives study is a TVA staff paper. The release should make it clear that TVA's Board will examine the report with no preconceived views or preferences.³³³

On that same day, Lee C. Sheppard, acting director of information, recommended that Chairman Freeman refuse a request to speak to the Maury County Chamber of Commerce on March 12.

SDF's tight schedule for March would justify the request for a raincheck to speak to that group at a later date. This delay would give us enough time to know the outcome of the March 1 and 2 Appropriations Hearings as well as time for the Board to review the staff's recommended alternatives for Columbia.³³⁴

³³⁰ Memorandum from Richard B. Fitz, senior fishery biologist, to Thomas H. Ripley, TVA manager of natural resources, March 13, 1979.

³³¹ *Ibid.*

³³² TVA, Alternatives Report, *supra*, p. 18.

³³³ Memorandum from Leon Ring to E. H. Lesesne and L. C. Sheppard, February 1, 1979.

³³⁴ Memorandum from Lee C. Sheppard to David Powell/Suzanne Connor, February 1, 1979.

The situation changed significantly during the next month. First, the staff apparently refused to allow the final draft report to be published as a staff report. The draft was released on February 21, 1979. Then, on March 12, the same day on which TVA announced that comments on the draft report were to be received by March 31, Chairman Freeman appeared at the meeting of the Maury County Chamber of Commerce. In the words of Columbia's Daily Herald publisher Sam D. Kennedy, Freeman "committed [himself] to the completion of the dam."³³⁵ Apparently, earlier letters committing the board to "serious consideration" of the comments of those "deeply interested in the project" were ignored.

In fact, TVA had received only one comment on the draft report at the time of Chairman Freeman's March 12 speech.³³⁶ When an opponent of the dam protested that her group had not received a copy of the draft in time to make a detailed study or "obtain the opinion of experts," TVA said it could not extend the comment time "because of the need to provide the final report to the Office of Management and Budget."³³⁷ By that time, the report was already nine months overdue.

As the subcommittee hearing, Chairman Moffett asked Chairman Freeman how he could commit himself to completing the project while still eliciting public comment.

Mr. MOFFETT. How, in the course of a single day, can you elicit public comment on a report that dealt with alternatives and at the same time announce that you were committed to completing the project? Are we just misreading this, or is that an unfair characterization?

Chairman FREEMAN. I do not remember all of the sequences of events, but quite frankly, I believe that, by the time we put out the draft report, very candidly, I was persuaded by my staff that we had an excellent conservation program—

Mr. MOFFETT. Therefore, any member of the public or any group that took this whole process of public comment seriously—

Chairman FREEMAN. No. Any time you put out a proposal, you believe what you are saying at the time. I certainly do not believe that my mind is ever closed on anything, I believe that a public official is entitled to say what is in his head at the time.

I was persuaded at that time that we had a conservation program that was worth pursuing.

There were a number of comments on the report that we got which dealt with numerous other issues. Quite frankly, I do not know that we got any comments on that conservation program at all.

In any event, my speech is a public document and the document that you cite was also a public document.

³³⁵ Daily Herald, March 13, 1979, p. 4.

³³⁶ TVA, Alternatives Report, supra, Appendix E.

³³⁷ Letter from Leon E. Ring to Dr. Liane B. Russell of the Tennessee Citizens for Wilderness Planning, April 26, 1979. It took TVA almost a month to even answer Dr. Russell's request.

Mr. MOFFETT. This is sort of like the myth of objective neutrality that we are witnessing. You keep saying that you really did not have a position and that Congress was telling you to do this, but the fact is that there is a momentum.

While it was obviously pushed along by the Congress, it has also been helped by the TVA, it seems to me.³³⁸

With the Alternatives Report complete, and all alternatives rejected, TVA had only three more hurdles to leap in its drive to complete Columbia Dam. It needed a favorable biological opinion from the Fish and Wildlife Service, a certificate of acceptable water quality from the State of Tennessee, and a 404 permit from the Corps of Engineers attesting to the "public interest" value of the project.

VI.—OBTAINING A SECTION 404 DREDGE AND FILL PERMIT: THE ENDANGERED SPECIES ISSUE

TVA applied for a Section 404 permit to dredge and fill work in the Duck River on November 1, 1977. The application indicated that approximately 117,000 cubic yards out of a total of 276,000 cubic yards of fill had already been placed.³³⁹

Since the Clean Water Amendments to the Federal Water Pollution Control Act were passed subsequent to TVA's application, the Corps' first step was to determine whether TVA was exempt from filing for a 404 application under Section 67(r) of the amendments. That section provided that a federal project "specifically authorized" by the Congress was not subject to the 404 regulation if information on the effects of the discharge of dredged or fill material, including consideration of the guidelines developed under Section 404(b)(1), was included in an EIS statement which had been submitted to Congress before the actual discharge. The Corps quickly determined that the Columbia project had not been "specifically authorized" by Congress, nor had TVA included the necessary information in an EIS.³⁴⁰

On March 9, 1978, the Corps issued a 30-day public notice to solicit comments. At the same time, it notified TVA that, since the Clean Water Amendments had also clearly removed any claim of federal agencies to exemption from the Section 401 state water quality certification, TVA was required to obtain that certification from the State of Tennessee.³⁴¹ On April 7, 1978, the chief of the engineering division, notified the chief of the operations division that endangered species were found in the Duck River, necessitating the Corps' "complete consultation" with the U.S. Fish and Wildlife Service under the Endangered Species Act.³⁴² That consultation was initiated on April 19, 1978.³⁴³

In response to its notice for public comment, the Corps received

³³⁸ Hearings, *supra*, p. 195.

³³⁹ Columbia Dam 404 Application, *supra*. The total amount was not given in the original application, but was included in the notice of the joint public hearing held by the Corps of Engineers and TVA. Notice of Public Hearing, Application No. 44,212, October 25, 1979.

³⁴⁰ Memorandum from Fred B. Shelton, district counsel, to the district engineer, January 23, 1978.

³⁴¹ Letter from Col. Robert K. Tener to TVA's director of the division of navigation development and regional studies, March 13, 1978.

³⁴² Memorandum from "Moore," April 7, 1978.

³⁴³ Letter from Col. Robert K. Tener to Kenneth E. Black, FWS, April 19, 1978.

250 replies.³⁴⁴ Following standard permit processing procedures, it transmitted copies of all comments to TVA for "your proposed resolutions or rebuttals to the comments from the Government agencies and all substantive adverse comments." The decision whether to hold a public hearing was not made until the Corps had received TVA's response and final comments had been obtained from appropriate federal and state agencies.³⁴⁵

The Corps' regulations for issuing a Section 404 permit require that it determine as part of its public interest review that the following statutes have been "followed and considered": The National Environmental Policy Act; the Fish and Wildlife Coordination Act; the Historical and Archaeological Preservation Act; the National Historic Preservation Act; the Endangered Species Act; the Coastal Zone Management Act; the Marine Protection, Research and Sanctuaries Act of 1972, as amended; and the Federal Water Pollution Control Act.³⁴⁶

A. CONFLICTING POSITIONS OF FWS AND TVA

In order to begin the process of accumulating the necessary information to begin evaluation of the Columbia dam project, Colonel Robert K. Tener, the Nashville district engineer, convened a meeting of relevant state and federal agencies on April 25, 1978.³⁴⁷ It was basically an information-gathering meeting. "The Corps needs to determine what issues require preparation of agency's position or pass on any item of information which will be beneficial to all parties."³⁴⁸

TVA and Fish and Wildlife quickly established their conflicting positions. Harold Benson, the FWS assistant regional director for federal assistance, said a negative biological opinion was in effect. David Powell, TVA assistant general counsel, said Congress had given the agency "considerable" money to spend that year, and TVA intended to continue with construction.³⁴⁹

In May 1978, following the meeting with the Corps, the Fish and Wildlife Service produced both its comments under the Fish and Wildlife Coordination Act (from which TVA is exempt, but the Corps is not) and the Endangered Species Act, as required by the Section 404 regulations.³⁵⁰

The FWS Cookeville field station had recommended to the Atlanta regional office of FWS that the Corps deny the permit because of the adverse impacts of the project on overall fish and wildlife resources. In its draft, the field station unequivocally stated that "[t]his Service

³⁴⁴ U.S. Army Corps of Engineers, News Release 78-23, April 26, 1978.

³⁴⁵ Letter from Howard Boatman, chief, operations division, to M. I. Foster, director, navigational development and regional studies, April 19, 1978.

³⁴⁶ 33 C.F.R. 320(j)(4). The Corps also is to carry out objectives of Executive Order 11988 (protection of wetlands) and the guidelines in a memorandum from the Council on Environmental Quality entitled "Analysis of Impact on Prime and Unique Farmland in Environmental Impact Statements."

³⁴⁷ Some of the local supporters of the project also managed to attend the meeting and give a pitch for the project. Both Judge Taylor Rayburn of Maury County and the Columbia Water System's J. P. Woodruff were in attendance, along with representatives from the Upper Duck River Development Agency. "Columbia Dam Project, Minutes of Meeting, April 25, 1978.

³⁴⁸ *Ibid.*, p. 1.

³⁴⁹ *Ibid.*, pp. 2-3. EPA's representative indicated that under its regulations EPA would have to recommend denial of the permit based on damage to the endangered species. *Ibid.*, p. 3.

³⁵⁰ 33 C.F.R. 320.4(c).

believes that the Duck River system and the fish and wildlife resources associated with this system are considerably more valuable to public use and enjoyment than the proposed reservoir."³⁵¹

The final FWS response to the Corps, although highlighting the general fish and wildlife concerns, recommended denial of the permit solely on the basis of impacts to the endangered mussels. It also accused TVA of acting in bad faith in its relationship with Fish and Wildlife. "In your consideration of public interest, we believe that it is important for you to be apprised of our longstanding concern about the proposal to dam and impound the Duck River," FWS acting regional director Ray R. Vaughn wrote to the Corps. Vaughn then outlined FWS' attempts to bring wildlife and endangered species' problems to TVA's attention. "We believe that the record is clear and that TVA has not acted in good faith. We further believe that the fact that the dam is now 95 percent complete should not weigh favorably in behalf of the applicant."³⁵²

Fish and Wildlife policy guidelines state that FWS will oppose all federal projects that have an adverse impact on fish and wildlife unless there are no reasonable alternatives to the project.³⁵³ The subcommittee asked FWS Director Greenwalt why his agency did not continue to oppose the Columbia project on that more general basis as recommended by its field station. Director Greenwalt replied that "someone" at TVA had said there was no alternative to the project. When Rep. Joel Deckard (R-Ind.) questioned why TVA made the decision about alternatives, the following exchange resulted:

Mr. DECKARD. Is TVA in a position to tell Fish and Wildlife Service what is unacceptable and what is acceptable?

Mr. GREENWALT. With a dam constructed—

Mr. DECKARD. Do you not have the legislative mandate to carry out Fish and Wildlife's mission regardless of what someone in TVA thinks?

Mr. GREENWALT. We are obliged to and we strive, let me assure you, to do the things you have described . . .

* * * * *

Mr. MOFFETT. The thing that bothers me is that you are helping to make it happen. That is the fact. There is something called the myth of objective neutrality. You are taking a position here which is not the position that I think you are mandated to take, as explained in, among other places, this 1974 Fish and Wildlife Service position paper.

You are assuming, as I think Mr. Deckard has just focused on, that there is something sacred about the TVA enthusiasm—if it really is enthusiasm—about this project and you

³⁵¹ Draft, attached to memorandum from David R. Parsons, acting field supervisor, to Atlanta regional office, May 17, 1978. The staff draft described the Duck as supporting both a diverse, high-quality aquatic community and "some of the best small game habitat in Southern Middle Tennessee. . . . The above resources provide valuable consumptive and nonconsumptive recreational opportunities to the public. . . . We believe that issuance of the proposed permit will result in overall adverse impacts to the aforementioned fish, wildlife, and recreational values. . . . Mitigation of project-induced fish and wildlife habitat losses has not been adequately provided by the applicant."

³⁵² Letter from Ray M. Vaughn to the district engineer, U.S. Army Corps of Engineers, May 31, 1978.

³⁵³ "Position Paper of the Fish and Wildlife Service Relative to Losses to Fish and Wildlife Habitat," 1974.

are jumping ahead several steps to assume that this thing is fait accompli . . . Part of the problem, of course, is this notion that public interest is defined by what the appropriations committees in the Congress decide on these projects . . .³⁵⁴

At the same time, the Service sent a biological opinion to the Corps stating that the issuance of the 404 permit allowing placement of the earth fill portion of the dam and other associated works resulting in dam closure would be likely to jeopardize the continued existence of two listed species.³⁵⁵ By adopting this narrower reasoning, although it may have been a stronger legal position, the Service had established a direct confrontation between the Endangered Species Act and the project.³⁵⁶

During the summer of 1978, TVA did nothing to counter the Service's adverse opinion. In August, it began surveying the distribution of the *Conradilla caelata*, one of the endangered mussel species, in various Tennessee Valley rivers and reviewing the success of earlier transplants of the species. The review of the transplants did not result in an easy solution for the endangered species problem. The transplants of 1974-76 were markedly unsuccessful. Unauthorized dredging had apparently wiped out the population in one location; in the two others, the mussels had disappeared.³⁵⁷

B. RESOLVING THE CONFLICT

On December 21, 1978, during the preparation of the Alternatives Report, TVA reinitiated consultation with FWS on the endangered species problem.³⁵⁸ The first meeting of the consultation teams was held in March of 1979, at which time TVA presented the mussel "conservation plan" included in the Alternatives Report. By May, however, the FWS staff was on the verge of proposing another "jeopardy" opinion, according to an internal memo. The first reason was simple. Since TVA did not know the host fish necessary for the development of the young mussels, it could be transplanting mussels into an area of the river where the necessary fish were not present.³⁵⁹

³⁵⁴ Hearing, supra, p. 123. Greenwalt also stated at the hearing that the difference between the recommendation in the draft and that in the final letter ". . . was based on the feeling that the fundamental information available to us to recommend denial solely on the basis of impacts to fish and wildlife . . . was not as good as, and certainly was sharply overwhelmed by, the problem confronted by the two endangered species." Ibid., p. 109.

³⁵⁵ Letter from Ray M. Vaughn to Colonel Robert K. Tener, May 16, 1978.

³⁵⁶ At least some officials at TVA apparently thought the confrontation might be used as a way to stop the project, which had not yet been sanctioned by TVA Chairman David Freeman. In a note to Freeman, David G. Powell, then Freeman's special assistant, wrote:

DOI [Department of Interior] has commented that completion of the project as originally designed will violate the Endangered Species Act. Our people concur. Thus the only way we can respond is to agree. The Corps . . . should then notify us that the 404 permit will not be issued. Then it is the Endangered Species Act that stops the project.

³⁵⁷ Letter from Thomas H. Ripley to Lon MacFarland, Supra, November 15, 1978.

³⁵⁸ Letter from S. David Freeman to Cecil Andrus, supra, December 21, 1978.

³⁵⁹ The life cycle of these mussels is both complex and lengthy. In its early stages, it involves a parasitic phase. After fertilization of the eggs occurs, glochidia (larvae) develop on the adult females. The glochidia cling to the females for varying amounts of time, depending upon the species and the season of fertilization. (For the one species, fertilization occurs in the fall, and the glochidia are retained through the winter.)

Upon release from the females, the glochidia attach themselves to the gills of a host fish where they remain until development into juvenile mussels. Without a host fish, no successful propagation could take place. When the miniscule young mussels drop from the fish and sink to the bottom of the river where they will spend the remainder of their life cycle, they are not yet mature. Until two or three years of age, they are difficult to find because of their size. Reproduction begins at about five years of age. Specimens up to the age of 20 years have been found in surveys of the Duck and Powell rivers. The age of the mussels is fairly easy to determine because they display growth rings similar to trees.

Secondly, TVA wanted to be allowed to continue work to divert the river through the spillways and complete construction of the earthen dam while carrying out the studies to identify the host fish and effect the transplant.³⁶⁰ This would present a "small biological risk because diversion would increase the rate of water flow" with an undetermined effect on the mussels, TVA contended, but it also would involve the irreversible commitment of resources.

[W]hile there would be no legal problem in working on roads or bridges nearby or acquiring land for the project, it would seem to be an irreversible and irretrievable commitment of resources to continue construction of the dam when there is a possibility that after the host fish is identified, the mere presence of the dam would cause the likelihood of jeopardy which could not be alleviated by a transplant. In the latter event, the continued construction of the dam would be an irreversible and irretrievable commitment of dollars and manpower which could not be claimed. (It is our understanding that the cost-benefit ratio of this dam is also on the negative side although we all understand that this is a problem for the Endangered Species Committee.)³⁶¹

But the policymakers at Interior were not at all sure that they wanted to present Congress with another Tellico-type situation, especially while the Tellico exemption to the Endangered Species Act—vehemently opposed by Interior Secretary Andrus³⁶²—was being considered in Congress. Harold O'Connor, chief of Interior's Endangered Species Office, justified that position by stating that the risk of failure of the conservation program at Columbia was "more than adequately justified by the research that would be performed and the transplant that would be affected at TVA's expense." In addition, Ronald Lambertson, then in the solicitor's office, "believes he may see a way around" the legal obstacle of prohibition of a commitment of irreversible resources. "If so I recommend we allow TVA to proceed with construction while the host species work is being accomplished. I think it is a justifiable trade-off," O'Connor stated.³⁶³

Before this "trade-off" could be implemented, a new problem entered the consultation process. TVA uncovered the existence of another endangered mussel species in the Duck River: *quadrula intermedia*. As a result, FWS asked for further intensive mussel surveys on the Duck, Clinch and Powell rivers before a new biological opinion was developed.³⁶⁴

With the consultation process underway, TVA also was bound by Section 7(d) of the Endangered Species Act to make no irreversible commitment of resources that would preclude alternatives to the project as planned.³⁶⁵ Nonetheless, when the radial gates for the 630

³⁶⁰ Memorandum from Harold O'Connor, Office of Endangered Species, to Assistant Secretary Robert Herbst, May 15, 1979.

³⁶¹ *Ibid.*

³⁶² See, e.g., letter from Cecil Andrus to Thomas O'Neill, Jr., Speaker of the House, July 23, 1979.

³⁶³ O'Connor memorandum, *supra*.

³⁶⁴ Letter from Lynn Greenwalt to Thomas H. Ripley, May 30, 1979.

³⁶⁵ That section had been added to the act in 1978 by Congress to further the integrity of the consultation process and keep the agencies from ignoring FWS' biological opinions. Rosenberg, 58 N.C. Law R. 491, *supra*, p. 543.

elevation of the dam arrived in June of 1979, TVA began installing them.³⁶⁶

There is significant dispute over whether TVA has ever stopped work on the Columbia project. Despite some claims that work is at a virtual standstill, a recent article about the ironworkers, for example, indicated that work was going full steam ahead. "With all the reinforcing steel, structural steel fabrication, loading and unloading, we haven't had any slack at all," the foreman, who has been with the project since 1976, was quoted as saying.³⁶⁷

In the summer of 1979, TVA completed intensive surveys of the Duck and Powell rivers. Overall, it found two areas in the Duck with high diversity and abundance of mussel fauna. Both would be inundated by water held back from the dam, but "have the potential for recolonization or establishment of new mussel communities with proper maintenance or reclamation strategies."³⁶⁸ The Powell River showed more diversity and abundance in its mussel population, but the *Conradilla caelata* was more abundant in the Duck River, while the *Quadrula intermedia* was more abundant in the Powell River.³⁶⁹ However, no Powell River specimen from either species was less than eight years of age, and there was no evidence of recent reproduction.³⁷⁰

In comments attached to copies of the survey sent to the Fish and Wildlife Service, TVA indicated that portions of the upper Powell River populations of the endangered species were being "subjected to relatively high amounts of silt and coal particles in the water, apparently derived from orphan and existing coal mines. If continued on a long-term basis, this condition could prove detrimental to these riffle-dwelling animals."³⁷¹

By September 5, 1979, when Steve Freudenthal, Secretary Andrus' special assistant, needed to "know the latest" on the endangered species problem, FWS Director Lynn Greenwalt described the situation as "dicey . . . it seems there will be a clear 'jeopardy' finding unless TVA is willing to make some concessions. I will take a personal look at the whole thing before I sign something, hoping to eke out the last drop of flexibility in the process so that we can avoid another conflict in this instance."³⁷²

The September 7 FWS staff draft of a biological opinion found

³⁶⁶ It is unclear whether FWS was ever contacted about the installation of the gates. TVA's Office of the General Counsel "sees no legal problems with erecting the gates and considers it to be a policy matter," Columbia Project Manager John L. Furgurson informed TVA General Manager Leon E. Ring. Mr. Furgurson, however, recommended that Interior at least be informed of the plans. Memorandum from Furgurson to Ring, June 20, 1979. Chairman Freeman agreed, although there is no record of the transmittal of the information to FWS in either TVA's or FWS' files. There is, however, a memorandum in Chairman Freeman's files in reference to this matter which states: "On 6/20, SDF wrote note for Furgurson to handle. However, on 6/29 the Board met with G. H. Kimmons [manager of engineering design and construction] and the matter was settled at this time. No further response was necessary." Memorandum from Office of the General Manager to J. L. Furgurson, October 4, 1979.

³⁶⁷ "The Ironworker," November 1980, p. 6.

³⁶⁸ TVA "An Evaluation of the Mussel Populations in the Duck River, Tennessee, May-June 1979," p. 3. The *Conradilla caelata*, one of the endangered species, was "viable and well-distributed" over 28 river miles, all of which would be inundated by the planned reservoir. Specimens from 2 to 15 years were found, indicating reproductive viability. Two specimens of *Quadrula intermedia*, aged 12 years, were found, but there was no evidence of their recent reproduction.

³⁶⁹ TVA, "An Evaluation of Mussel Populations in the Powell River, Tennessee and Virginia, June 1979," p. 5.

³⁷⁰ *Ibid.*, pp. 2-3.

³⁷¹ Enclosure attached to letter from S. David Freeman to Harold O'Connor of the Fish and Wildlife Service, August 2, 1979.

³⁷² Memorandum from "Lynn" to "Steve," September 5, 1979.

that the project as planned and a low-pool impoundment, as described in the Alternatives Report would jeopardize the mussels. The staff recommended that TVA consider, as its first alternative, the riverine development proposal.³⁷³ If that was not acceptable, it should "develop and implement successfully" a series of studies and a conservation program "prior to making final decisions regarding completion of the earthfill portion of the dam, closure of the dam, and the extent of water impoundment. The third alternative was a permanent self-regulating dam at the elevation of 571 feet."³⁷⁴

C. THE SEPTEMBER 28, 1979, BIOLOGICAL OPINION

As promised, Director Greenwalt did "eke out" considerable flexibility in the final opinion, overriding his staff to do so. The staff recommendation for the riverine development was deleted in the September 28, 1979 official biological opinion. The Fish and Wildlife Service found that the project as planned and the low-pool alternative both would jeopardize the continued existence of the two endangered species. The project as planned would do so because it provided only that TVA carry out a conservation program, but not that the program be successful. The low-pool alternative was rejected because it inundated portions of the species, because fish from the reservoir might prey on the mussels, host fish, and because of possible changes in water chemistry in the mussel shoals resulting from the proximity of still water.³⁷⁵ Only the riverine development would not jeopardize the species.

However, the opinion read, since "[i]t is our understanding that TVA only considers their first alternative to be consistent with project objectives," FWS had agreed to address that alternative. In what it headlined as a "reasonable and prudent alternative," FWS stated that the project as planned should be modified primarily to require TVA to "complete with proven success a conservation program" for the two endangered mussel species that had been identified by TVA. The "proven success" of conservation, moreover, "must occur prior to the closure of the dam and *determination of the extent of the water impoundment* (emphasis added)." The biological opinion provided, however, that under this option TVA could continue to construct the dam to the point where it could be operated as a self-regulating dam so as not to disrupt the natural river flow in the mussels' habitat. Having proposed this change in the project as planned by TVA, Fish and Wildlife came up with its own suggested "reasonable and prudent alternative" to the project as planned, a permanent self-regulating dam that would create a smaller reservoir and not jeopardize the mussels.³⁷⁶ Concerning Section 7(d), the prohibition of an irreversible commitment of resources, FWS held that, regardless of the course of action TVA took,

TVA may continue with some facets of the total project, such as land acquisition, road realignment, etc., as long as they determine that these actions do not constitute an irreversible

³⁷³ Draft of biological opinion addressed to Thomas H. Ripley, TVA director, division of forestry, fisheries, and wildlife development, September 7, 1979, p. 4

³⁷⁴ *Ibid.*, pp. 10-12.

³⁷⁵ Biological opinion addressed to Thomas H. Ripley, director, division of forestry, fisheries and wildlife development, from Lynn Greenwalt, September 28, 1979, p. 7.

³⁷⁶ *Ibid.*, pp. 7-10.

and irretrievable commitment of resources which have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would avoid jeopardizing the continued existence of the referenced mussel species.³⁷⁷

John Jenkinson, TVA's mussel expert, immediately analyzed the biological opinion and noted that, contrary to TVA's Alternatives Report, the FWS was requiring the "proven success" of the mussel conservation program prior to closure of the dam. Jenkinson observed, however, that FWS had not defined "proven success." He concluded by warning of the lengthy time that would be required for the conservation effort.

It is important to remember that these animals are atypical members of the freshwater fauna in many ways . . . characteristics such as slow growth rate and delayed sexual maturity will undoubtedly frustrate many attempts to arrive at quick results in such areas as life history experiments or transplant evaluations.³⁷⁸

A reasonable estimate would be two to three years to complete the baseline life history and ecological studies and then three to five additional years to determine reproductive success; that would total five to eight years. "Much of the relatively long time involved in this timetable would be dependent on natural factors associated with the mussels that are completely beyond the control of the project staff," Jenkinson cautioned.³⁷⁹ The malacologist had, however developed a workplan for the pre-transplant phase of the program.³⁸⁰

In November, Thomas H. Ripley, the manager of TVA's Office of Natural Resources, sent letters to various state and federal agencies requesting them to join TVA and FWS on an interagency coordination team that would review the conservation program and related dam construction.³⁸¹ The day before the Corps' November 27, 1979, public hearing on the 404 permit, TVA agreed to the conditions the Fish and Wildlife Service's biological opinion. TVA would not close the dam until the "proven success" of its mussel conservation program had been demonstrated. Under that arrangement, TVA could continue to operate Columbia dam indefinitely as a self-regulating dam so as not to impact the mussels. TVA's acceptance of the biological opinion was reiterated in a January 4, 1980, letter to Sanford W. Harvey, director of EPA's regional enforcement division, who insisted on a commitment from TVA to provide the funds necessary to implement its mussel conservation program.³⁸²

³⁷⁷ *Ibid.*, p. 7.

³⁷⁸ "A Biologist's Analysis of the Columbia Biological Opinion," October 2, 1979, p. 2.

³⁷⁹ *Ibid.*, pp. 2-3.

³⁸⁰ TVA, "Cumberlandian Mollusk Conservation Program Workplan," August 1979. Jenkinson's warnings of the length of the conservation program were made known to both Chairman Freeman and Director Freeman, as they were duly noted in a preliminary report on the activities to be completed on the Columbia Dam Project sent to the board. Memorandum from John L. Furgurson to William F. Willis with attachment, October 5, 1979.

³⁸¹ See, e.g., letter from Thomas H. Ripley to Gary T. Myers, Tennessee Wildlife Resource Agency, November 20, 1979. Mr. Ripley's title changed several times during the course of the Columbia project, but his job responsibilities appeared to remain constant.

³⁸² "We are enclosing a copy of TVA's November 28 letter to Mr. Greenwalt agreeing to his modifications to TVA's proposed conservation plan. TVA is committed to carry out the conservation program. . . . You will note that TVA has committed approximately \$2 million to this program through F.Y. 1981." Letter from Thomas H. Ripley to Sanford W. Harvey, Jr., January 4, 1980.

TVA's response satisfied EPA. In what appeared to be a perfunctory review of the endangered species issue, EPA indicated that it would not object to the issuance of a Section 404 permit if it included the condition that TVA could not raise the water level beyond 571 feet until FWS certified that TVA had satisfactorily implemented the program in the September 28, 1979, FWS opinion and had demonstrated that a successful conservation program "is possible and will be carried out." It did not address the issue of whether resources could be committed in the interim to prepare for the project as planned nor require that the conservation program demonstrate success.³⁸³

D. "CLARIFYING" THE OPINION

On February 6, 1980, the Environmental Defense Fund and eight other public interest groups protested, on NEPA grounds, the understanding reached by TVA and Fish and Wildlife. In letters to both the Corps of Engineers and TVA, EDF charged that "the purported alternative of indefinite or permanent operation of Columbia Dam as a so-called 'self-regulating' dam"—the alternative clearly set out by FWS in its September 28, 1979, biological opinion which TVA endorsed—"cannot be implemented by TVA, consistent with the National Environmental Policy Act and other laws without first fully and publicly describing and evaluating that alternative, including its environmental and economic costs and benefits."³⁸⁴

EDF also charged that TVA had available to it since November 1978 the opportunity to clear Columbia Dam of its endangered species problems by obtaining an exemption from the endangered species committee. "If, as TVA has consistently maintained, Columbia Dam and Reservoir is economically justified, no difficulty in securing such an exemption should be experienced." Furthermore, "[s]ince TVA must necessarily believe that the purported alternative of indefinite or permanent operation of Columbia Dam as a self-regulating dam cannot achieve the magnitude of benefits claimed for the project as planned, TVA should recognize the wisdom of invoking the exemption process."³⁸⁵

On February 15, 1980, Interior issued a biological opinion to the Corps for its 404 proceedings. It basically reaffirmed the September 28, 1979, opinion.³⁸⁶ The 404 permit should not be issued for construction beyond the level of the self-regulating alternative until TVA was required to complete a successful conservation program. Specifically, Interior argued, the permit should be conditioned to allow only the placement of fill material necessary to construct the bridge approach fills to the level required for the impoundment of water to the 571-foot elevation necessary to complete the self-regulating dam. Otherwise, Section 7(d) would be violated.³⁸⁷

On February 19, 1980, Assistant Secretary Robert Herbst wrote another letter—this one to Michael Blumenfeld, the assistant secretary of the Army for civil works. There was, Herbst told Blumenfeld, "one

³⁸³ Letter from Sanford W. Harvey, Jr., to Colonel Robert K. Tener, January 22, 1980.

³⁸⁴ Letter from Michael J. Bean to S. David Freeman, February 6, 1980.

³⁸⁵ *Ibid.*

³⁸⁶ Biological opinion from Lynn Greenwalt issued to Colonel Robert K. Tener, district engineer, February 15, 1980.

³⁸⁷ *Ibid.*, p. 4.

significant difference in the setting in which the two biological opinions were issued." For the September 28, 1979, opinion, the FWS consultation team was assured by TVA that a self-regulating dam was a reasonable and prudent alternative and "was given the impression that such an alternative would receive further analysis." However, since TVA had not yet developed that analysis at the time of the first opinion, only general guidance could be given concerning the continuation of construction to the point where the project could be operated as a self-regulating dam.³⁸⁸

The 404 permit, however, would authorize construction of project features beyond those necessary for a self-regulating dam, including the placement of 275,000 cubic yards of fill material. This work would be a irreversible and irretrievable commitment of resources, in violation of the Endangered Species Act, Herbst stated.

In our view, the only way that your Department can be assured that it is not violating this legal restriction is to request from TVA an analysis of project features which are planned for construction prior to the successful completion of the conservation program. To the extent that those features would not result in construction activities which go beyond that which is necessary for the operation and maintenance as a self-regulating dam, it is our view that there would be no legal violations since there would be no irreversible and irretrievable commitment of resources. . . .³⁸⁹

TVA Director Richard M. Freeman responded on March 5, 1980, with a complete reversal of TVA's on-the-record acceptance of the September 28 biological opinion. There had been a misunderstanding, Freeman said, "with respect to the engineering and scheduling considerations associated with completion of construction of the dam and upstream bridge." The bridge and road work, which were already partially complete, were required to meet area needs. Moreover, "[w]hile the design of the bridge and the completed approaches are at a height compatible with the completed reservoir it would be more costly today to complete the bridge at a lower elevation." If the bridge were not completed, funds "already invested" would be wasted and local residents would be deprived of the benefits. "TVA believes that placing the full height of fill (elevation 648) is necessary, once third-stage diversion takes place."³⁹⁰

Then Director Freeman, a railroad lawyer for many years before joining TVA, got to the crux of the matter. The placement of the remaining fill was not planned until 1983, at which time TVA should have identified the critical habitat characteristics of the mussels, located potentially suitable habitats for improvement, and transplanted mussels which had survived, along with larvae. "By 1983, certain tests can be identified to evaluate progress with the mussel conservation program. Although final language for interim and final tests [no mention of interim and final had been made in previous documents] remains to be developed by the coordinating committee,

³⁸⁸ Letter from Robert Herbst to Michael Blumenfeld, February 19, 1980, pp. 1-2.

³⁸⁹ *Ibid.*, p. 2.

³⁹⁰ Letter from Richard M. Freeman to Robert Herbst, Mar. 5, 1980, pp. 1-2.

it seems probable that two general tests by 1983 are feasible—one relates to habitat restoration and improvement and the other to population reinforcement through transplant.”³⁹¹ In effect, then, Director Freeman was proposing that TVA Director Freeman was proposing that TVA should be allowed to continue constructing the project as planned as if the endangered species problem had been solved—despite its not even having a final conservation work plan approved by FWS. At the same time, TVA Chairman Freeman was attempting to shorten the schedule his biologists had set for the conservation program.³⁹²

1. *Opposition Builds in Coordinating Committee*

The newly formed Columbia Dam coordinating committee for the conservation of endangered species, made up of biologists from FWS, TVA and the states of Tennessee and Virginia (an EPA representative was later added), was already raising questions about the schedule for the conservation plan. “Assuming everything goes exceptionally well, it would be possible to start transplanting in 1982,” the minutes of the December 6, 1979, meeting stated. The Virginia representative questioned not only how the success of a conservation plan for a species with a life span of 20 or more years could be evaluated in only five years, but also raised political questions. Virginia would be very concerned about a plan to transplant endangered species into the Powell and Clinch rivers in Virginia “since the project in question is in Tennessee. Political realities would be a real roadblock to ‘locking up’ areas of southwestern Virginia,” he warned the other participants.³⁹³

In October, the subcommittee sent a set of questions to the State of Virginia for an official response on its position concerning the Columbia conservation plan and the transplant of endangered mussels into the Clinch and Powell rivers. Those questions and answers are reprinted as Appendix III. The import of Virginia’s response was summed up in a letter from Maurice B. Rowe, the Virginia secretary of Commerce and Resources:

We support reasonable efforts to preserve endangered species in principle and practice. But shifting responsibility for protecting the mussels at issue would impose potentially onerous burdens upon Virginia’s citizens by artificially creating an obstacle to development where no such obstacle now exists, while in no way guaranteeing the mussels’ chances for survival in the long run.³⁹⁴

The response also made it clear that water quality improvement on the Powell and Clinch Rivers could not be expected by 1983.

The most serious water quality problem on the Powell River is from aggravated acid mine drainage . . . There is cur-

³⁹¹ *Ibid.*, p. 2.

³⁹² Memorandum from Edward H. Lesesne, director of water resources, to T. H. Ripley, manager of natural resources, Mar. 7, 1980:

This responds to your note “and give me feedback” concerning Chairman Freeman’s request that we review the timetable of the conservation program.

We see no way to shorten the timetable. Our schedule calls for transplanting mussels in 1982. We would then have three years to determine the success of the program in time for dam closure in January 1985 (emphasis added).

³⁹³ Minutes of Meeting in Asheville on Dec. 6, 1979, Jan. 30 1980, pp. 1–3.

³⁹⁴ Letter from Maurice B. Rowe to Chairman Moffett, Nov. 14, 1980, p. 2.

rently no way the State can legally enter into abating these problems. The Surface Mine Control and Reclamation Act may allow the State Division of Mined Land Reclamation to solve these problems several years down the road . . . There is also a considerable amount of sedimentation involved in coal mine pollution resulting from storm runoff from refuse piles, spoil areas and road cuts. The Clinch River is primarily affected by sedimentation with acid mine drainage of secondary importance in terms of overall contribution to water pollution . . . The increase in coal mining activities over the next several years will further jeopardize these endangered species.³⁹⁵

Virginia's basic control over water quality is now concentrated in the NPDES program, which Secretary Rowe described as a "gradual process of locating and permitting mines and bringing mine effluents into compliance with the law."³⁹⁶

In appearing before the subcommittee, TVA claimed that it no longer planned to transplant mussels into the Powell and Clinch rivers, despite the fact that the coordinating committee was concentrating on those rivers, as identified in TVA's conservation plan for the mussel transplants.³⁹⁷

STAFF. The alternatives report to OMB, the biological opinion, the coordinating committee concerns and their minutes have been only on the Clinch and the Powell. They have asked you twice now for workplans on how you are going to clean up the Clinch and the Powell. You have come in here today and told us that is not really a concern; we are going to put them in the Duck or the Elk or the Buffalo.

Is this coordinating committee not informed?

MR. JENKINSON. . . . The conservation program is directed at improving populations of the Cumberlandian mussel fauna wherever it occurs in the Tennessee Valley, be that the Clinch, the Powell, the Duck, the Paint Rock, wherever. It is not directed at one stream or two streams. It is directed at the Tennessee Valley.

STAFF. You are co-chairman of the committee, are you not?

MR. JENKINSON. That is true.

STAFF. And you have not corrected these minutes or made an addendum to them to say you're on the wrong track?

MR. JENKINSON. No, I have not. The reason is that certainly the Clinch and the Powell maintain the most diverse populations of these species. They are in the area in which a good deal of work certainly could or should be done.³⁹⁸

2. FWS Reversal

On March 20, 1980, Interior addressed another strong letter to TVA. Acting Assistant Secretary David Hales said that if TVA had rejected the self-regulating dam/full conservation program alternative that

³⁹⁵ Ibid., attached response.

³⁹⁶ Ibid.

³⁹⁷ Hearings, supra, p. 172.

³⁹⁸ Ibid., p. 175.

was developed "after a nine-month consultation period which included several meetings between our two agencies," further activity "related to the construction of the Columbia Dam and Reservoir would violate the mandates of Section 7 of the Endangered Species Act."³⁹⁹

Five days later, Mr. Hales withdrew his letter because it "had not received review by the Solicitor's Office prior to my signature." Since there had been recent conversations between TVA and Interior concerning conditioning the 404 permit, "[a] review of that position by the Solicitor is particularly important."⁴⁰⁰

There is evidence to suggest that Mr. Hales'—and Interior's—sudden reversal followed political pressures. Lon MacFarland, the attorney for the Upper Duck River Development Agency and a prime mover behind the dam, had called his friend (and former Columbia, Tenn., resident) Jim Free, who was then attached to the Congressional office of the White House.⁴⁰¹ Mr. Free helpfully set up a conference call with DOI Assistant Secretary Herbst and Mr. MacFarland.

"Herbst reported that he felt that TVA had misunderstood his [Hales] letter," Mr. MacFarland reported, "that there was a conference set up in his office on Monday, March 3, in an effort to work the situation out." On March 5, when Mr. MacFarland was in Washington, he "stopped by Herbst's office for a few minutes and discussed the situation with him." An exchange of letters was proceeding, Mr. Herbst told Mr. MacFarland,

and he felt the situation was working out satisfactory. *He was very positive that the Interior did not want another "Tellico."* After talking to him, I felt that he was making a sincere effort to work this situation out, and he was very cooperative.⁴⁰²

In addition, a cover memo to the MacFarland letter found in Chairman Freeman's files reported that Mr. Freeman had a meeting with Mr. Herbst on March 28.⁴⁰³

To make sure that the next biological opinion (or "clarification" as it was subsequently called) did not contain any restrictions on TVA's activities, it was closely coordinated with TVA. The review draft of the clarification, which was to be sent to the Corps' district engineer, was given to TVA on April 2 for comment.⁴⁰⁴

On April 3, 1980, Mr. Herbst, in a remarkable sleight of hand, said in an official "clarification" that Interior was not responsible for compliance with Section 7(d) of the Endangered Species Act. "Compliance with Section 7(d) is the responsibility of TVA and the Corps and is inapposite to the premises of the September 28, 1979 biological opinion," he wrote.⁴⁰⁵ Moreover, Interior had been given additional information—never clearly identified—which "necessitates clarification of the positions and understandings upon which the biological opinions of September 28, 1979 and February 15, 1980 were based."

³⁹⁹ Letter from David Hales to S. David Freeman, Mar. 20, 1980.

⁴⁰⁰ Letter from David Hales to S. David Freeman, Mar. 25, 1980.

⁴⁰¹ Free subsequently shifted to work on President Carter's re-election campaign.

⁴⁰² Letter from Lon MacFarland to David Freeman, Mar. 11, 1980.

⁴⁰³ Memorandum from Office of the General Manager to H. S. Sanger, Jr., Apr. 1, 1980.

⁴⁰⁴ Memorandum from Lewis E. Wallace to David Freeman, Mar. 24, 1980; "Basis upon which Columbia Project May Proceed," Mar. 27, 1980; review draft, Apr. 2, 1980.

⁴⁰⁵ Letter from Robert Herbst to Colonel Robert Tener, Apr. 5, 1980, p. 3.

Mr. Herbst said the only reason FWS had proposed a self-regulating dam alternative with its "tandem accelerated conservation program" was because TVA's preferred alternative did not include such a program. (The preferred alternative as proposed in the Alternatives Report to OMB was the project as planned with conservation, but it apparently was not "accelerated.")

The assistant secretary of Interior came to the interesting conclusion that if there was no "reasonable and prudent" alternative to the project as planned that would protect the species and avoid the irreversible commitment of resources as required by law, TVA, nonetheless, should be allowed to continue to build. Moreover, in a section phrased as if TVA had made additional commitments to the conservation plan beyond those in the September 28 opinion, Mr. Herbst approved road and bridge construction for the project as planned and placement of fill on schedule in 1983 if likely, not proven, success of the conservation program was demonstrated. Likely success was basically completion of TVA's work plan for identifying host fish and habitat restoration criteria. Transplantation of the mussels must have occurred, but no evidence of reproduction was required.⁴⁰⁶

Although TVA could not close the dam until the program was "proven successful" (a term still not defined and one obviously subject to interpretation and political pressure once the dam is completed, but not closed), it could place the fill necessary for the completed dam. The decision makers at Interior had, in essence, played the role of the Endangered Species Committee. They had decided, on their own, that the benefits of the project outweighed the costs and, therefore, the project should be built. The decision can only be seen as a *de facto* exemption.⁴⁰⁷

To summarize, Fish and Wildlife in its September 28, 1979, and February 15, 1980, biological opinions had stipulated that TVA could not close Columbia dam until it had demonstrated the "proven success" of its mussel conservation program. That program involved the transplant of endangered mussels in all likelihood to the Clinch or Powell rivers in combination with a program to clean up those river reaches to provide a suitable mussel habitat. In the interim, TVA would be permitted to construct the dam to the extent necessary to provide a self-regulating dam that would not inundate any endangered mussels. FWS also held out to TVA the option of maintaining the self-regulating dam indefinitely.

TVA had agreed to those conditions, including the prospects of a permanent self-regulating dam and a smaller reservoir, absent the "proven success" of its mussel conservation program. Shortly thereafter, however, TVA in an about-face, rejected the feasibility of a permanent self-regulating dam and persuaded Interior to permit TVA to continue to construct the project as planned short of third-stage diversion in 1983. At that juncture—a critical stage in the construction process in which the river would be directed toward the dam—TVA would be permitted to proceed with third-stage diversion by demonstrating the "likely success" of its conservation program. The

⁴⁰⁶ *Ibid.*, pp. 1-2.

⁴⁰⁷ The Endangered Species Committee has only met once. At this meeting, it refused to exempt the Tellico Dam and granted an exemption to the Grayrocks project in Wyoming.

risks of this new arrangement are obvious. By permitting TVA to continue construction and complete third-stage diversion on the basis only of the "likely success" of its conservation program, Interior had set the stage for the ultimate conflict in 1986. Then TVA, having basically completed all of the project work, could be prevented from closing the dam because of the lack of "proven success" in providing a solution to its endangered species problem. Were that to happen, TVA would have succeeded in maneuvering the Endangered Species Committee into having to choose between a virtually completed, \$140-million water project and the Endangered Species Act as represented by the two mussel species that would be flooded by the dam.

This is exactly the situation Congress sought to avoid with the 1978 amendments to the Endangered Species Act which were aimed at seeking an early resolution to endangered species problems through an exemption process. But TVA has refused to avail itself of the process—in keeping with its usual practice of proceeding with construction in the face of any and all regulatory constraints. It is clear that TVA has recognized that a project 90 percent complete is more difficult to stop than one 35 percent complete, regardless of its merits.

The path that TVA, with Interior's acquiescence, has embarked upon was the subject of the following exchange between Chairman Moffett and Fish and Wildlife Service Director Greenwalt.

Mr. MOFFETT. If, ultimately, the TVA is unable to complete successfully what possibly could be the world's first successful mussel transplant . . . and/or TVA is unable to provide a suitable habitat for mussels in the Powell River, could we face a situation in which the Congress would be forced to choose between the mussels and the dam?

Mr. GREENWALT. That is one prospect. The other is a reinitiation of consultation and a request for an exemption.

Mr. MOFFETT. The building is going on, right?

Mr. GREENWALT. That is correct . . .

Mr. MOFFETT. So, consultation while the blocks are being put in place is—

Mr. GREENWALT. Consultation upon some determination for example, that the milestone, which has, unfortunately, been characterized as "likely to succeed," having been touched is questionable—

Mr. MOFFETT. Consultation at that point is really consultation with a near-fait accompli, though, is it not?

Mr. GREENWALT. It certainly comes under the heading of what do you do next. And next conceivably might be a determination that they have no possibility of complying with the act and completing the dam as planned.

Mr. MOFFETT. . . . I asked you earlier, the Endangered Species Act does not envision the committee acting after the project is built, even though it is a committee of last resort. At some point, you are getting awfully close to that committee acting in that role that you say the Endangered Species Act does not envision. Am I right?

Mr. GREENWALT. It does not presuppose this kind of last-minute fixing.⁴⁰⁸

⁴⁰⁸ Hearings, supra, pp. 140-141.

E. GROWING CONCERN OF BIOLOGISTS

While TVA rushes to complete the project, the skepticism of the biologists on the coordinating committee concerning the feasibility of TVA's mussel conservation plan is growing. At its April 1980 meeting the committee, which included biologists from TVA, unanimously concluded that "likely" success for transplantation could not be determined by 1983. Under the best of conditions, the earliest evidence of likely success would be 1985 or 1986.⁴⁰⁹ Absent "likely success" in 1983, TVA, under the terms of its agreement with the Fish and Wildlife Service, would not be permitted to move to third-stage diversion, despite having been permitted to build in the interim. At that point, however, TVA would still not be in a position to confront the ultimate decisionmakers on the matter with a nearly completed project and an unresolved endangered species problem.

Fish and Wildlife, however, has taken to pressuring its biologists on the coordinating committee to interpret likely success in 1983 to mean only that TVA is on schedule in proceeding with its conservation plan, irrespective of whether the results of those interim steps constitute likely success as defined by the coordinating committee. The committee is to define likely success as it was characterized in the April 3, 1980, "clarification" from Interior: Specific areas for habitat restoration and improvement should be chosen and "activities underway." Transplantation must be accomplished with healthy females with glochidia in place surviving, and the host fish must have been identified and be present in the transplant site.⁴¹⁰

The biologists responded at their April meeting by stating that the committee was responsible for setting biological criteria for "likely success" and also by accusing Thomas H. Ripley, TVA's head of the Land and Natural Resources Division of misrepresenting to Assistant Secretary Herbst their view on the matter.⁴¹¹ The committee charged, moreover, that TVA was not taking "meaningful and necessary actions" to clean up the rivers; ". . . the Committee contends that there are presently identifiable critical action which TVA should be taking immediately toward habitat restoration and improvement and correcting specific sources of degradation and pollution." The memorandum concluded by pointedly referring to political activities in Washington. If there are "situations that arise in Washington where the committee must be informed about the interaction between TVA and the Department, this information should be transmitted to the joint chairmen of that Committee."⁴¹²

In July the committee met again and debated the definition of likely success. According to the minutes of that meeting, the committee resolved, "[d]espite probably political overtones," to "continue to address realistic biological criteria; and if, in our opinion, the likely success or probability of the conservation program is not assured, then it will so state this fact to the Director of the Fish and Wildlife Service."⁴¹³

⁴⁰⁹ Memorandum from Alex Montgomery, assistant regional director, FWS, to regional director, April 25, 1980.

⁴¹⁰ Memorandum from Ronald Lambertson to regional director, Region IV, May 9, 1980. A draft of this memorandum was sent to TVA for review, further demonstrating which agency was really in charge.

⁴¹¹ Memorandum from Clayton J. Lankford to director, FWS, May 15, 1980.

⁴¹² *Ibid.*

⁴¹³ Minutes of July 15, 1980 Committee Meeting, September 22, 1980.

The concerns of the coordinating committee biologists over the Service's and TVA's apparent determination to proceed with final construction in 1983 regardless of whether TVA had in fact demonstrated the likely success of its conservation program led to the following exchange between Chairman Moffett and FWS Director Greenwalt:

Mr. MOFFETT. It seems here we have a determination of this coordinating committee to resist pressures from Mr. Lambertson in its determination to "address realistic biological criteria."

It seems to me it is obvious what is happening here. The biological community, as represented on this committee, at least, understands that you have lent your support and your standing as a professional biologist to a totally unscientific approach to the endangered species issue . . .

You do not deny, do you, Mr. Greenwalt, that the biologist are of the opinion—it seems to be unanimous opinion—that this project should not be given the green light in 1983, as you and Mr. Lambertson seem prepared to do?

Mr. GREENWALT. I think it is their opinion. I am not sure it is unanimous, but it is a general opinion that they would prefer not to have it done that way certainly.⁴¹⁴

Chairman Moffett further noted that the July 15 minutes also pointed out that TVA representatives had said TVA might not be able to "effect change" in the Clinch and Powell rivers in describing the program only as an "information transfer system."

Mr. MOFFETT. . . . So again, back to the bottom line. It comes down to your having lent your support and credibility and that of the Fish and Wildlife Service to a plan that TVA's own staff acknowledges cannot be implemented by TVA.

Mr. GREENWALT. I think, in fairness to the TVA people generally and to that staff, they may not find that David Freeman agrees with it. For example, he may feel that he can, in fact, accomplish these things.

Mr. MOFFETT. It seems that the closer to the political core we get, the more people are convinced that things can be accomplished that the technical people do not think can be accomplished. Let's face it. Freeman is in a more political position. And the technical people, wherever we find them, in the TVA bureaucracy, on the coordinating committee, wherever we find them they seem to have doubts that are much more serious about this than the people who are closer to the political core and would be most influenced by the momentum of political support for this project. That is just an observation.

Mr. GREENWALT. And I think it is a very good one.⁴¹⁵

TVA's lengthy and involved discussions with Interior were not directed toward devising a conservation plan acceptable to the biologists.

⁴¹⁴ Hearings, *supra*, p. 157.

⁴¹⁵ *Ibid.*, p. 158.

TVA wanted to present the Corps with a valid and positive biological opinion to enable Colonel Tener to proceed with his final 404 determination. TVA apparently hoped that the Corps would not look behind that biological opinion, which now required TVA to complete what possibly could be the world's first successful mussel transplant program while providing an improved habitat for those mussels in some other river reach lest they be destroyed by pollution.

Having issued its final biological opinion on the endangered species, Fish and Wildlife's final official action prior to Colonel Tener's 404 decision was the completion of its consultation with the Corps on overall fish and wildlife resources. In so doing, FWS concluded:

Issuance of the proposed permit will result in significant overall adverse impacts to the aforementioned fish, wildlife, and recreational values. Approximately 54 miles of diverse river system will be converted to a less diverse reservoir system. Rock bass, smallmouth bass, and redhorse population are expected to be reduced dramatically. Fish species more associated with still water such as largemouth bass, crappie, bluegill, catfish, and undesirable rough fish will more than likely increase. Indications are that nutrient loading will lead to eventual eutrofication [sic] of the reservoir which will be conducive to increases of planktonic-feeding fish such as shads. Tributary streams will also become more conducive to supporting rough fish. . . . In addition to the loss of this section of the river, approximately 12,600 acres of land will be inundated.⁴¹⁶

The Service mourned the loss of free, naturally flowing rivers in "an area saturated with reservoirs (such as the Middle Tennessee area)."⁴¹⁷

It then complained again that it was not being included in wildlife mitigation discussions, a situation that had existed since 1969 despite the memorandum of understanding between the Service and TVA. The FWS Habitat Evaluation Procedures should be used in the TVA planning process.⁴¹⁸ and TVA should be required to follow the National Historic Preservation Act of 1966, Executive Order 11593, and the Historic Preservation Act of 1974,⁴¹⁹ FWS said.

William C. Hickling, FWS area manager, then recommended denial of the permit unless it was conditioned to implement certain measures, including the use of the Habitat Evaluation Procedures, to help offset fish, wildlife and cultural losses.⁴²⁰

Such late-blooming concerns about the general negative effects of wildlife appeared unlikely to deter TVA from its commitment to the dam—a commitment that had by this time thoroughly worn down the Service and its parent agency on the endangered species objections.

⁴¹⁶ Letter from William C. Hickling, FWS area manager, to Colonel Robert K. Tener, June 2, 1980, pp. 2-3.

⁴¹⁷ *Ibid.*, p. 3.

⁴¹⁸ The Habitat Evaluation Procedures require that the net wildlife habitat losses of projects be fully offset either by specified acquisitions of land and/or management measures. In reviewing the procedures, a TVA biologist concluded that the proposed Sowell-Tugas Bend wildlife management area would be insufficient to effect compensation under HEP. "Additional lands and/or more intensive management of existing TVA holdings would probably be required." Memorandum from Frank Bower, TVA, land and natural resources, to James Burger, office of general counsel. July 11, 1980.

⁴¹⁹ Hickling letter, *supra*, p. 3.

⁴²⁰ *Ibid.*, p. 3.

With the Service's qualms nullified, TVA had only the Corps of Engineers and the State of Tennessee blocking the path to a completed project.

VII.—OBTAINING A 401 WATER QUALITY CERTIFICATION FROM THE STATE OF TENNESSEE

Since the Corps' 404 public interest review ideally represents the culmination of the regulatory process for a federal water project, Colonel Tener quite properly advised TVA in March 1978 that he would not complete action on TVA's requested 404 permit until the State of Tennessee granted TVA a water quality certification under Section 401 of the Federal Water Pollution Control Act.⁴²¹ Section 401 requires the states in which proposed federal projects are to be constructed to certify that such projects comply with state water quality standards. Additionally, the memorandum of understanding between the Corps and EPA on the Section 404 public interest reviews authorizes EPA to override a state water quality certification should a state fail to consider relevant water quality considerations.⁴²²

Although EPA cited potential water quality concerns in its review of TVA's 1972 EIS, the issue was raised anew in 1978 by the staff of the Tennessee Division of Water Quality Control, Department of Public Health, in the course of its 401 water quality review. In November 1978, a background paper prepared by Stephen E. Anderson, assistant director for enforcement and planning, noted that the Duck River Basin was rich in nutrients which was conducive to an "overabundance of algae growth in a water body, especially under the conditions of an impounded reservoir" a process known as eutrophication.⁴²³ As further explained by Mr. Anderson, "The phenomenon of eutrophication is not adequately understood by the scientific community. For example, while most limnologists [freshwater scientists] agree that [the] Percy Priest [Reservoir] is highly eutrophic, there is

⁴²¹ Letter from Colonel Robert K. Tener to TVA's director of the division of navigation development and regional studies, Mar. 13, 1978.

⁴²² 33 C.F.R. 320.4(d).

⁴²³ Stephen E. Anderson, assistant director for enforcement and planning, Tennessee Division of Water Quality Control, "Columbia Dam and 401 Certification," November 1978 (hereinafter cited as Anderson study), p. 2. Eutrophication is a phenomenon of standing or stagnant water, such as found in some ponds, lakes or reservoirs. Flowing waters, such as the Duck River, are low in phytoplankton (minute plant life) and thus less "productive" than standing waters. When a dam is placed across a flowing stream, however, the newly formed reservoir begins a process of "aging," during which it becomes more productive. This abundance and species composition of plankton, bacterial, benthic and fish populations change as eutrophication progresses. When these changes result in dense populations of planktonic algae dominated by a few species of blue-green algae, the eutrophication process becomes undesirable. According to a TVA internal memorandum, the triggering mechanisms for nuisance-level biological responses in a given water body are not fully understood, but have been traditionally associated with high concentrations of the primary nutrients, nitrogen and/or phosphorous. TVA believes that the differences in the physical and hydraulic flow-through characteristics of man-made reservoirs, in comparison to lakes, reduces the nuisance-level algal growth in reservoirs. But it also admits that the phosphorous concentrations of the Duck unstream from Columbia are elevated above those of most streams in the Tennessee Valley because of the phosphorous-rich geologic conditions of the basin and agricultural run-off. TVA has maintained that the annual drawdown of the project as planned for flood control purposes also would reduce the possibility that nuisance-level algae would become implanted. The low-heel alternative was rejected because of the perceived eutrophication problems resulting from the lower water level and the lack of a drawdown. Memorandum from the Office of the General Manager to S. David Freeman, Sept. 25, 1978.

not general agreement as to the cause."⁴²⁴ On the basis of the state's experience with J. Percy Priest and other reservoirs, the state water quality division offered as its "unqualified opinion that Columbia Reservoir will be eutrophic. It is important to note that Normandy Reservoir, while only two years old, has shown signs of eutrophication already."⁴²⁵

Apart from the potential algae problem, Mr. Anderson warned that the Columbia reservoir would become a "sink" for iron, manganese, and sulfur compounds that would subsequently concentrate below the dam. "Problems for water users would be expected and, in fact, have occurred as a result of other reservoirs in Tennessee."⁴²⁶

There are two potential water quality problems associated with the Columbia dam and reservoir. The first concern relates to the reservoir and the extent to which algae growths will detract from its use for recreation, impact on fish and create an aesthetic and odor problem. The second concern involves downstream water quality. Since municipal water systems will not be drawing water from the reservoir, potential drinking water concerns are not a factor in terms of the reservoir per se. The City of Columbia, however, takes its water from the Duck River one mile below the dam. Algae growths in the reservoir could create health, taste and odor problems downstream while high manganese levels could cause water treatment and straining problems. The state water quality division was told that TVA planned to prevent significant water quality problems below the dam by the careful and selective withdrawal of water from various strata of the reservoir. Although it might have been a simple process to take algae-less water from the lower levels of the reservoir, that water also would be cold and low in dissolved oxygen. But TVA had promised in its Alternatives Report and to the Fish and Wildlife Service that it would provide the quality of water necessary to support a warm-water fishery downstream from the dam.⁴²⁷ The state water quality experts had reservations about the ability of TVA to successfully meet all those goals. According to Mr. Anderson:

The Division agrees that Columbia Reservoir does allow for unique operation; however, proposed operations are so complicated that it is not believed to adequately solve water quality problems. For instance, the dam will operate not only to consider eutrophication but must also maintain warm water fisheries below the dam, cannot withdraw from the reservoir's bottom (where iron and manganese will be excessive) . . . and must maintain a reasonable pool to allow recreation usage. The division is not aware of any TVA system which has successfully operated to allow for so many mitigations simultaneously.⁴²⁸

⁴²⁴ Ibid. J. Percy Priest reservoir is a Corps project in the Stones River Basin near Nashville that was completed in 1967. In 1978 the Corps determined that "In view of the existing water quality of the reservoir, there is considerable concern about future conditions. Unfortunately, the information available is not considered adequate to permit a realistic numerical projection of water quality conditions in the future . . . [but] there is little doubt increasing urbanization and development in the Stones Basin will have adverse effects." U.S. Army Corps of Engineers, "Water Quality Conditions in J. Percy Priest Reservoir," November 1978, pp. 1-5-6.

⁴²⁵ Anderson study, pp. 2-3.

⁴²⁶ Ibid., p. 3.

⁴²⁷ TVA, Alternatives Report, supra, p. 17.

⁴²⁸ Anderson study, supra, p. 3.

The water quality concerns raised by the state water quality division were addressed in a perfunctory manner in the Alternatives Report. TVA stated, without providing any details, that with the "operating flexibility built into the Columbia dam the potential problems associated with the occurrence of nuisance-level, blue-green algae blooms in the reservoir could be avoided in the releases."⁴²⁹

What the water quality board did not know was that, as yet, TVA had no plan for such operation, nor had it ordered the necessary structural modifications. TVA's statement was another of the numerous misrepresentations in the Alternatives Report. According to a staff position paper prepared in July 1979, the multi-level discharge points necessary for such an operating flexibility "were not provided in the Columbia Dam design because a warm water fisheries is to be enhanced downstream of the Columbia Dam. As such, the summer time flows from Columbia were to be from the surface."⁴³⁰

TVA's construction chief also was unaware of the flexible design until he read about it in the Alternatives Report. G. H. Kimmons stated that the Alternatives Report—

[i]ncluded substantial structural modifications to the sluiceway for the alternative Project as Planned—with Conservation. The report stated the added multi-level gated structure and sleeve valve are "To further improve operations for water quality . . ." This potential work item will require partial construction prior to stage III diversion. Therefore, we must proceed with the design, procurement, and construction as soon as possible.

We request that you review the proposed water control addition and provide verification that it is required. To our knowledge, the above-cited report is the only current reference to the proposed alteration.

To proceed, we also need detailed requirements for all gates, valves, and operating needs. A scope statement would be very useful in developing an economical and functional structure. The estimated direct construction cost made for the report and from a very preliminary study layout was \$1,197,000.⁴³¹

In terms of the reservoir, the Alternatives Report acknowledged the potential for considerable algae growth, but stated that such growth would be a problem only if the dominant strain was the "nuisance forms of blue-green algae." But "[d]ominance of these blue-green algae species has not occurred, with the exception of Cherokee Reservoir, in the TVA tributary reservoirs although sporadic blooms have and are expected to periodically occur in these reservoirs."⁴³²

Internally, TVA was not so sure. According to a memorandum from Richard D. Urban, manager of environmental studies, to Ralph H. Brooks, chief, water quality and ecology branch.

Based upon eutrophication models, Columbia Reservoir will definitely be eutrophic; however, it is our opinion that

⁴²⁹ TVA, Alternatives Report, supra, p. B-9.

⁴³⁰ Undated memorandum entitled "Discussion Related to Response to Letter, Fowinkle to Freeman, July 10, 1979," with attached TVA staff position paper, pp. 1-2.

⁴³¹ Memorandum from G. H. Kimmons to Thomas H. Ripley, June 18, 1979.

⁴³² TVA, Alternatives Report, supra, p. B-8.

with the 27-ft. drawdown capability the extent of eutrophication will be modified to the extent that nuisance species will not, generally, be the dominant species. The state's position that the reservoir will be highly eutrophic cannot be debated until real Columbia Reservoir data are available.⁴³³

The state division of water quality control was not sure either. In his comments on the report, D. Elmo Lunn, director of the division, disagreed with several of TVA's conclusions. For example:

4. This Division disagrees with the discussion dealing with limiting nutrients, whether it be phosphate or nitrogen. In our experience in studying nearby J. Percy Priest Reservoir, the concept of limiting nutrients was not valid. The excess phosphate mineral nutrient was found to be the driving force for blue-green algae blooms in the absence of any nitrogen nutrients. The phosphate nutrients going into Columbia Reservoir are greater than concentrations of phosphates going to J. Percy Priest Reservoir.

5. The proposed mitigation to blend epilimion and hypolimion water downstream of Columbia Dam to control algae blooms is not ecologically sound . . . Such temperature and chemical variations in water character is not compatible with the other stated objective, which is to develop a downstream warm water fishery.

Mr. Lunn further stated that the reservoir would have limited water quality in the summer which future water users "have not been made aware of . . . We feel that TVA should further acknowledge the complex water quality problems inherent with the selection of a dam site in a nutrient rich stream."⁴³⁴

TVA did acknowledge in the Alternatives Report that "during the initial few years of lake aging, soluble forms of iron and manganese would be expected to occur in the releases which could impact downstream water uses as well as biota in the downstream reach."⁴³⁵

A key statement on water quality included in the Alternatives Report concerned third-stage diversion, that stage in the construction process in which the river is routed toward the dam and through its spillway bays forming only a shallow lake. TVA admitted that if third-stage diversion "has to be continued for an extended period of time there will be little flexibility to prevent the releases from reflecting the impacts of any nuisance level algal blooms which may occur in the temporary impoundment."⁴³⁶ The significance of that statement was not explained.

However, since the shallow lake would be eutrophic, and since the dam cannot be operated at that point to selectively withdraw water from various strata of the impoundment, any delay in completing third-stage diversion could create significant downstream water quality problems for the City of Columbia.

A fuller discussion of that problem is contained in an internal TVA

⁴³³ Memorandum from Richard D. Urban to Ralph H. Brooks, September 11, 1978.

⁴³⁴ Letter from D. Elmo Lunn to John L. Furgurson, April 6, 1979, reprinted in TVA, Alternatives Report, supra, Appendix E.

⁴³⁵ TVA, Alternatives Report, supra, p. 20.

⁴³⁶ Ibid.

proposed work plan that was not drawn up until after the release of the Alternatives Report. It detailed how TVA in 1979, 12 years after it had first proposed to build Columbia dam, was now planning to "complete an in-depth study on the water quality and algae relationship in the Duck River."⁴³⁷ The algae study, according to the 1980 proposed work plan, was designed to answer questions raised by the state water quality division and "[o]ther water quality related issues included in the lack of flexibility to select the level of discharge during third stage diversion." During third-stage diversion, according to the proposed work plan:

[A] pool of water will form behind the concrete spillways of Columbia Dam. This shallow pool of water will extend upstream for approximately 18 river miles and will remain as low-level with no fluxion until the project is completed. At present time, Columbia Dam is not scheduled to be completed and operational until 1985. During this 5-year period (1980-1985), there will be no flexibility for withdrawing water from various depths within the third stage shallow pool. All water discharged from the dam during this 5-year period will be from the surface only. Therefore, any prior water quality conditions in the low-level pool will affect the reaches of the Duck River downstream of Columbia Dam including the reach of the river used by the city of Columbia as its raw water source. In addressing the WQC [water quality control] eutrophication questions on availability of nutrients in the Duck River Basin, previous algal-related problems at the upstream Normandy Reservoir, and our inability to mitigate potential water quality problems in the third stage pool, we have realized that we need to complete an in-depth study on the water quality and algal relationship in the Duck River.⁴³⁸

Although TVA's construction schedule was subsequently rearranged to seek to limit third-stage diversion to a two-year time frame, this interim water quality problem also is tied to the endangered species issue. TVA will be required to continue with third-stage diversion until it has demonstrated the "proven success" of its mussel conservation program. In the event that its mussel program has not been proven successful by 1986, TVA will have created a situation in which it has succeeded in completing a major dam and water project that not only may not be activated but which may well be the cause of significant water quality problems. That not-unlikely scenario underscores TVA's basic irresponsibility in not seeking an exemption from the Endangered Species Committee for the Columbia project. The prospects of significant algae-related problems during third-stage diversion and throughout the life of the project is further suggested by the results of the 1980 algae study that revealed, contrary to TVA's expectations, as reported in the Alternatives Report, that the dominant

⁴³⁷ Memorandum from Sam W. Hixson, environmental engineer, environmental studies program, to Alan H. Smalley, project manager, June 6, 1979, enclosing "Workplan for Duck River Limiting Nutrient Algal Assay (hereinafter cited as Algal Work Plan), p. 2.

⁴³⁸ Algal Work Plan, *supra*, pp. 1-2.

strain of algae expected to form in the reservoir will be the problem-causing blue-green variety.⁴³⁹

On June 6, 1979, the staff of the Tennessee Division of Water Quality Control recommended denial of the 401 permit.⁴⁴⁰

It is this Division's recommendation that the certification for the dam should be denied. Columbia Reservoir will degrade the water quality of the Duck River and violations of state water quality standards will occur. The Division also recognizes water quality improvements associated with the project; *however, with the exception of additional dilution below the dam, it is believed that these benefits are minor* (emphasis added).⁴⁴¹

Water quality impacts in both the construction phase and the impoundment were recognized. So were the political ramifications of denying the permit.

This Division well recognizes the repercussions that you will receive if certification is denied. You may find some route less than denial will be the better option. At the very least, the state has the obligation to make the public aware that Columbia Reservoir will have severe water quality problems and will not be another high quality lake.⁴⁴²

The specific violations included reductions in levels of dissolved oxygen, hardness and mineral compound violations because of concentrations of iron and manganese causing down stream treatment problems, violations of solids, floating materials and deposits criteria because of algae releases, and potential taste and odor problems.⁴⁴³

The response of Dr. Eugene Fowinkle, the Tennessee Commissioner of Health, was to ask TVA for an explicit description of the measures that it would take to deal with the problem.⁴⁴⁴ In its answer, TVA emphasized its experience in construction and operating reservoirs and the high quality of its technical people.⁴⁴⁵ The reason behind this emphasis was clear; TVA had no explicit measures. They were not included in the design of Columbia, and "it is not possible for the staff to provide the details without additional support data procurement."⁴⁴⁶ The response would have to emphasize "the reasonable assurance requested and the violations discussion will have to stress the degree and extent of the impaired use and use impact sections of the criteria."⁴⁴⁷ Specifically, TVA made the following representations:

Dissolved Oxygen.—TVA designed the project to ensure that releases from the impoundment would be high in dissolved oxygen. Despite the fact that the construction chief had just asked for a design plan,

⁴³⁹ TVA, "A Prediction of Impoundment Potentials for Flowing Waters of the Duck River in the Vicinity of Columbia, Tennessee (1980), p. ii.

⁴⁴⁰ Memorandum from Steve Anderson to Eugene W. Fowinkle, M.D., Commissioner, June 6, 1979.

⁴⁴¹ *Ibid.*

⁴⁴² *Ibid.*

⁴⁴³ *Ibid.*, p. 5.

⁴⁴⁴ Letter from Eugene Fowinkle to S. David Freeman, July 30, 1979.

⁴⁴⁵ Letter from S. David Freeman to Dr. Eugene Fowinkle, August 30, 1979, with attached responses.

⁴⁴⁶ "Discussion Related to Response to Fowinkle Letter," *supra*, attached TVA staff position paper.

⁴⁴⁷ *Ibid.*

TVA declared that it had already planned high-level gates and regulating sleeve valves to avoid any odor or decomposition problems from algae.⁴⁴⁸ “[T]here will always be sufficient dissolved oxygen in the releases from Columbia Dam to prevent significant odors of decomposition and other offensive conditions,” it promised.⁴⁴⁹

Hardness and Mineral Compounds.—With the passage of hypolimnion (lower level) releases through the regulating sleeve valves, iron would be readily reoxidized avoiding downstream problems. Manganese, however, might be a problem, and TVA would assist the City of Columbia in offsetting any increase in treatment costs. Compound precipitates would not hinder any use of the water.⁴⁵⁰

Solids, Floating Materials and Deposits.—Operation of the dam would avoid algae-laden water. Releases of other materials will be no worse than now existent. TVA would also assist in any treatment plant costs.⁴⁵¹

Taste and Odor Problems.—Although the extent of nuisance algae growth cannot be predicted and although TVA did not yet have an operating plan for Columbia to avoid releasing those algae, it “is currently initiating a study of Normandy Reservoir which, . . . when developed, would allow for early detection of potential adverse conditions” and allow for adjustments in operation. “Based on the results of our studies at Normandy, TVA will develop a similar automated monitoring system for Columbia,” TVA promised.⁴⁵² In addition, “in recognition of the need to provide greater flexibility to isolate algal-induced impacts in the reservoir from the releases,” TVA would modify Columbia to provide multi-level release capabilities.

Making yet another promise, TVA said:

Although the specific elevation and number of the additional outlet points needed at Columbia have not been finalized, modeling studies to be carried out in conjunction with the fine tuning operational studies to be implemented at Normandy will be utilized to establish this information. *Once the Columbia Dam is completed*, actual studies will verify the modeling studies and allow TVA to operate Columbia to preclude or minimize the occurrence of objectionable levels of algal-induced taste and odor compounds (emphasis added).⁴⁵³

In actuality, TVA had not yet begun the study of the Normandy Reservoir mentioned above. “I assume [this letter] gives us the go-ahead on the studies we discussed the other day,” Columbia Project Manager John L. Furgurson wrote to Billy J. Bond, assistant general manager.⁴⁵⁴ Mr. Furgurson also asked that the changes in the Columbia Dam discharge facilities mentioned in the Alternatives Report be finalized. “We propose to take the model developed for Normandy and apply it to Columbia Reservoir so that the operating flexibility of alternative discharge designs can be compared. We would then

⁴⁴⁸ Letter from Freeman to Fowinkle, August 30, 1979, *supra*, response to Question A.

⁴⁴⁹ *Ibid.*

⁴⁵⁰ *Ibid.*, response to Question B.

⁴⁵¹ *Ibid.*, response to Question C.

⁴⁵² *Ibid.*, response to Question D.

⁴⁵³ *Ibid.*

⁴⁵⁴ Memorandum from John L. Furgurson to Billy J. Bond, Aug. 30, 1979.

expect to have a recommended discharge configuration by September 1980," Mr. Furgurson added.⁴⁵⁵ (A subsequent memorandum indicated that the design work could not begin until August of 1980 when there would be enough information available from Normandy to do so.)⁴⁵⁶

Dr. Fowinkle was said to be overwhelmed by the information presented to him by his technical staff and spent more time studying the issues.⁴⁵⁷ TVA then provided him with responses to 12 issues he raised. In his cover letter, Chairman S. David Freeman maintained that the project not only would not degrade water quality, but would "on balance enhance" it.⁴⁵⁸ Furthermore, he reminded Dr. Fowinkle, Columbia would provide significant benefits to the area. "Thus we think that certification of Columbia Dam is consistent with your responsibilities and that you have sufficient flexibility in interpreting State water quality standards to proceed with certification."⁴⁵⁹

In its specific responses, TVA explained that enhancement of water quality would occur because of streamflow regulation and described the project as the first one to "include specific provisions for operation to ensure that the releases do not adversely impact downstream uses. No other water project has included this level of consideration for water quality in its justification and operational plan."⁴⁶⁰

Dr. Fowinkle, concerns of his staff notwithstanding, granted TVA a section 401 water quality permit in December 1979.⁴⁶¹ In granting the 401 permit, Commissioner Fowinkle considered only the likely impact of the dam on downstream water quality. He did not consider water quality in the reservoir on the basis of a memorandum from his director of the division of water quality that maintained that the state's water quality standards were not technically appropriate for judging the impact of the dam on the quality of the water in the reservoir.⁴⁶²

The Environmental Protection Agency, responding to a request by the Environmental Defense Fund nonetheless refused to get involved in the water quality issue at this point.

Given our early involvement in the project through the NEPA process (when our findings may well have contributed to the Tennessee Valley Authority's decision to proceed with the project), the fact that the project is almost completed, and the current findings of the State, EPA Region IV is of the opinion that an additional investigation of the potential effects of the Columbia Dam on the Duck River would not be productive at this time.⁴⁶³

The environmentalists appealed Dr. Fowinkle's ruling to the Tennessee Water Quality Board because of his finding that the state's

⁴⁵⁵ Ibid.

⁴⁵⁶ Memorandum from G. H. Kimmons to Thomas H. Ripley, Oct. 9, 1979.

⁴⁵⁷ Memorandum from John L. Furgurson to William E. Willis, general manager, Oct. 11, 1979.

⁴⁵⁸ Letter from S. David Freeman to Dr. Eugene W. Fowinkle, Nov. 23, 1979, with attached responses.

⁴⁵⁹ Ibid.

⁴⁶⁰ Ibid., attached responses, p. 1.

⁴⁶¹ Letter from D. Elmo Lunn, director, division of water quality control, to Howard Boatman, chief, operations division, U.S. Army Corps of Engineers, Dec. 6, 1979.

⁴⁶² Memorandum from D. Elmo Lunn to Dr. Eugene Fowinkle, Dec. 6, 1979.

⁴⁶³ Letter from John C. White, regional administrator, EPA, to James T. B. Tripp, counsel, EDF, Dec. 13, 1979.

existing water quality criteria did not apply to impoundments and because of various violations as determined by the water quality division.⁴⁶⁴ They also took their case—and Mr. Anderson's memo—to the new Region IV administrator, Rebecca Hanmer. In February of 1980, she recommended to the Corps of Engineers that the 404 permit be held in abeyance until EPA could review the state certification.⁴⁶⁵

In May 1980, the Tennessee Water Quality Board, in reviewing Commissioner Fowinkle's decision decided to hold a full *de novo* evidentiary hearing on the impact of the Columbia dam on the quality of the water both downstream and in the reservoir.⁴⁶⁶ The old 401 permit, under the board's ruling as interpreted by the state attorney general, remains valid, however, unless overturned by the Water Quality Board. The board decision is expected in early 1981 and will be directed to water quality considerations both downstream and in the proposed reservoir. In considering the latter, the board will address the anti-degradation statement in the Tennessee Water Quality Standards that states:

The criteria and standards shall not be construed as permitting the degradation of waters whose existing quality is better than the established standards unless and until it is affirmatively demonstrated to the Tennessee Water Quality Control Board that a change is justifiable as a result of necessary economic or social development and will not interfere with or become injurious to any assigned uses made of such waters . . .⁴⁶⁷

In considering the anti-degradation statement, the board will have to decide, therefore, whether any lowering of water quality in the reservoir that will result from the dam is the result of "necessary economic or social development."

Colonel Tener, the Nashville district engineer, rejected Ms. Hanmer's recommendation. Her action, however, under terms of EPA's Memorandum of Understanding with the Corps, precluded Colonel Tener from issuing the permit by limiting him only to recommending to his superior, General Harry A. Griffith, the division engineer, that the 404 permit be issued with "appropriate conditions."⁴⁶⁸

In testimony before the subcommittee, Ms. Hanmer explained that she blocked Colonel Tener from issuing the 404 permit on grounds that the state water quality control staff "believed that eutrophic conditions would likely be chronic in the Columbia reservoir," a fact apparently concurred in by TVA, "because they offered very little contention to this issue," and because the state certificate "was based on water quality conditions below the dam and not in the impound-

⁴⁶⁴ "Petition of the Environmental Defense Fund, Inc., Tennessee Scenic Rivers Association, Inc., Tennessee Citizens for Wilderness Planning, Inc., Tennessee Environmental Council, Inc., and Sierra Club" in The Matter of the Application of the Tennessee Valley Authority for Certification in Connection with Application for Corps of Engineers Permit, Columbia Dam Project, Jan. 10, 1980.

⁴⁶⁵ Letter from Rebecca Hanmer to Colonel Robert K. Tener, Feb. 13, 1980.

⁴⁶⁶ Hearings, *supra*, pp. 68-69.

⁴⁶⁷ Chapter 1200-4-3-.06 of the Rules of Tennessee Department of Public Health Bureau of Environmental Health Services, Division of Water Quality Control, General Water Quality Criteria for the Definition and Control of Pollution in the Waters of Tennessee.

⁴⁶⁸ "Proposed Fill Activities for Columbia Dam Project Miles 136.6, 136.9, and 156.1" (hereinafter cited as Tener Report), June 13, 1980, p. 39. The entire report is reprinted as Appendix IV.

ment."⁴⁶⁹ Ms. Hanmer cited the continued failure of TVA to provide information to her staff as further reason for wanting to review the results of the state water quality appeal proceeding. "Significant information and data were still being received from TVA in late July [1980] and the likelihood of further information, especially from TVA's current intensive monitoring of eutrophication data in Normandy Reservoir, makes a final water quality prediction difficult." Moreover,

Algae conditions in the Columbia Reservoir which adversely affect the in-lake uses and downstream water supplies cannot be dismissed as unlikely at this time. In the City of Columbia's water supply, high levels of trihalomethanes have been found. This problem will likely be compounded by higher algal production in the impoundment and will require corrective measures to meet public health requirements in drinking water.⁴⁷⁰

The Committee shares Administrator Hanmer's concerns over potential water quality problems downstream and in the reservoir. But, as with Ms. Hanmer, the Committee is not prepared to offer a final opinion on the matter pending completion of the state water quality control board review and pending completion of TVA's plans for operating Columbia dam.

VIII.—THE CORPS' PUBLIC INTEREST REVIEW

A decade of charges and counter-charges concerning the Duck River project were dropped into the lap of the U.S. Army Corps of Engineers through the Section 404 permit process. Colonel Robert K. Tener, then the Corps' Nashville district engineer, was the recipient of the volumes of materials which made up the conflicting views and data surrounding the Columbia project. Although required to make an independent decision, the Corps relied heavily upon the formal opinions of other federal and state agencies when evaluating the project. Colonel Tener, in conducting his public interest review, was hampered by incomplete data from TVA and its failure to supply needed information. TVA's actions in that regard were similar to its dealings with other agencies over the years concerning the Columbia project.

Whenever possible, the Corps relied heavily on the Alternatives Report prepared by TVA. As a result of the incomplete benefits included in that report for the low-pool and no-dam alternatives (no enhanced employment or water supply benefits were included), the Corps found a benefit/cost ratio of .43 to 1.0 for the low-pool alternative and .7-.8 to 1.0 for the no-dam alternative. "Therefore, the previous determination that completion of Columbia Dam is essential to the economic feasibility of the entire Duck River Project has been substantiated," a Corps economist informed Colonel Tener early in the review process.⁴⁷¹ But at a meeting on April 25, 1978, of all the govern-

⁴⁶⁹ Hearings, *supra*, p. 100.

⁴⁷⁰ *Ibid.*, pp. 101-102. Trihalomethanes, a suspected carcinogen, have been linked with algal biomass and algal extracellular product in community drinking water supplies. R. C. Hoehn, et al., "Algae as Sources of Trihalomethane Precursors," *American Water Works Association Journal*, 344 (1980).

⁴⁷¹ Robert Bailey, "Addendum to Economic Review of TVA's Columbia Dam Project," undated.

ment agencies concerned with the Columbia project, the Corps indicated that TVA would have to respond to accusations that the project as planned had less than a 1.0 to 1.0 benefit/cost ratio. Colonel Tener requested that TVA's response be "specific enough to allow us to make some determination on the economical benefits since TVA's response is the vehicle that will be used by the Corps."⁴⁷² The Corps attempted several times to obtain an updated benefit/cost ratio analysis from TVA, but was rebuffed and reduced to relying on the 1977 President's Executive Screening Committee figures with enhanced employment benefits added back in.

In January of 1980, after the public hearing had been held, the Corps' review staff began to outline its problems. Several had already been identified by GAO in 1974. Economist Robert F. Bailey, while finding that "no evidence exists that any violation of basic economic principles took place," also determined TVA used procedures not allowed under the Water Resource Council's Principles and Standards in computing its enhanced employment benefits.⁴⁷³ No supporting data for TVA's projections of new jobs for the subemployed were available.

A development plan for reservoir shorelines and the surrounding land to be a guide for future development was not provided. "However, TVA controls development only on TVA-owned lands; and it is likely that any major economic development thereon would have significant impact upon adjacent private property. In the absence of this development plan, no comment can be made regarding its merits or adverse effects," Bailey concluded. Nor could any comments be made on the recreation demand calculations in determining future visitation benefits because TVA did not provide corroborative data on the selection of the comparative reservoir.⁴⁷⁴ (For the Corps purposes, TVA did not use the travel-cost methodology developed for the "Alternatives Report," but computed recreation demand by multiplying shoreline miles by annual visits per shoreline mile at another reservoir.)

Furthermore, the Corps received no data supporting TVA's statement that farm losses would be offset by payments to the farmers for their land and relocation expenses, intensified production on relocated farms and increases in industrial employment. Wildlife losses for the reservoir land were not netted against wildlife benefits, and TVA failed to support its conclusion that there were no induced costs from industrial expansion and related urban growth.

On the water quality issue, Bailey also showed concern, even though the State of Tennessee had already issued a water quality permit.

Columbia, Tennessee, is located in the heart of the state's phosphate mining region. Any new chemical or other phosphate-oriented-type of industry could have adverse effects, not only on the quality of water, but other elements of the environment. As a matter of fact, TVA admits that the quality of Duck River water will be lowered by the Columbia Dam . . . Another area of concern is the eutrophication (rich in dissolved nutrients such as phosphates but often shallow

⁴⁷² Minutes, 25 April 1978, *supra*, pp. 5-6.

⁴⁷³ Bailey also correctly identified these as area redevelopment benefits.

⁴⁷⁴ Memorandum entitled "Tennessee Valley Authority's Columbia Dam (Duck River Project)" from Robert F. Bailey, January 11, 1980, pp. 3-5.

and seasonally deficient in oxygen) of the reservoir which is likely to occur in a relatively short period of time as phosphates collect behind the dam. Oxygen levels in the reservoir could drop below those needed to sustain many species of common sport fish.⁴⁷⁵

Bailey was willing to blame most of these shortcomings on the fact that TVA, "as a separate quasi-governmental corporate agency, generally has different policies and procedures in their planning operations than other government departments that are also involved in water resources development. Its corporate structure allows greater freedom of action in transacting business, unencumbered by certain policies and regulations that relate to congressional committees and policies."⁴⁷⁶

The chief of the Corps' engineering branch also expressed concern about the economic aspects of the project.

[S]erious questions remain, largely because of insufficient supportive data. The heavy dependence of future employment and recreation visitation (about 55 percent of the total benefits) relates to planning procedures that differ from most other governmental agencies involved in water resource development.⁴⁷⁷

The engineer questioned TVA's claim that it could operate the discharge of the dam to maintain natural temperature regime and dissolved oxygen concentrations in the tailwaters and to provide instantaneous flow to insure stream productivity. He did so because of the lack of knowledge about that process. "I must assume that TVA is cognizant of the State-of-the-Art on water quality releases from reservoirs," he wrote. "But since the then-valid state water quality certificate had been issued for releases, the releases must be assumed to meet state standards. However, the Corps should look at the water quality in the impoundment."

On February 13, 1980, EPA Regional Administrator Rebecca Hanmer asked the Corps to hold its decision until that agency could review the question of water quality in the proposed impoundment. Specifically, EPA wanted to delay until the Environmental Defense Fund's appeal of the water quality certification was decided.⁴⁷⁸ The Corps "was obligated to honor EPA's request," Lt. Colonel Kenneth W. Ashley, acting district engineer, told Rep. Robin Beard (R-Tenn.), but the Corps' review of the project would continue in the interim.⁴⁷⁹

A. THE CORPS DECIDES

By May, Colonel Tener had proposed findings of fact on the Columbia project which apparently recommended denial of the permit.⁴⁸⁰ The internal responses were very critical and re-emphasized

⁴⁷⁵ *Ibid.*, pp. 6-7.

⁴⁷⁶ *Ibid.*, pp. 7-8.

⁴⁷⁷ Memorandum from E. C. Moore, chief, engineering division, January 18, 1980.

⁴⁷⁸ Letter from Rebecca Hanmer to Colonel Robert K. Tener, February 13, 1980.

⁴⁷⁹ Letter from Lt. Colonel Kenneth W. Ashley to Representative Robin Beard, March 21, 1980.

⁴⁸⁰ Memorandum from E. C. Moore, chief, engineering division, to Colonel Robert K. Tener, May 12, 1980: "The Conclusions: page 76, are not strong enough. More detail on the positive and negative points of the project should be provided. The reasons we are denying this permit should be unequivocally presented."

the inability of the Corps to evaluate fully various components of the public interest because of lack of information.

For example, the analysis of the recreation benefits should "be replaced by a short statement that the presentation and accompanying data is inadequate for proper evaluation of recreation potential for the Columbia Dam," Joe Cathey of the environmental planning section concluded. Neither the 1974 EIS Supplement, which TVA offered, nor the Corps' subsequent analysis of recreation at Columbia were acceptable, he argued.

The EIS presentation is extremely biased as is the District's recreation analysis. The EIS contains meaningless data such as drainage area and proposed discharges and the Corps paper contains unsupported statements such as, "Clearly, Columbia Dam Reservoir is not needed for flat water boating and skiing." The Scenic river alternative should be evaluated separately. The two alternatives (Lake vs Stream) are entirely different and satisfy different segments of the general public. Also, different values can be assigned and there would be significant differences in costs.⁴⁸¹

Mr. Cathey also noted that the statement that Williamson County would use the reservoir for water was unverified, and the economic documents supplied by TVA contained insufficient supportive data for both recreational and future employment benefits.⁴⁸²

In early June, another draft was ready for internal review of its conclusions and recommendations for disposition. Two division heads and the district's lawyer reviewed the draft. One recommended denial and two recommended issuance of permit.

In recommending denial, Howard Boatman, chief of the operations division, said:

I have determined that there are reasonable and prudent alternatives available with benefit/cost ratios comparable to the proposed project which would provide equal benefits, minimize detriments and reduce costs. Alternatives also are available that would comply with Executive Orders 11988 (Flood Plain Management) and 11990 (Protection of Wetlands), the Endangered Species Act, a 30 August 1976 Memorandum from the President's Council on Environmental Quality, regarding the protection of farmlands, the National Historic Preservation Act, the Clean Water Act, and the Wild and Scenic Rivers Act.⁴⁸³

Robert Miller, the district counsel, in recommending issuance, emphasized that there was public support for the project and that no other federal agency had objected to the permit. Of the 18 public interest review factors identified in the report, Mr. Miller said, eight were within the purview of other agencies. Adverse comments for

⁴⁸¹ Memorandum for record from Joe Cathey, May 12, 1980, p. 1. TVA had claimed benefits of \$1.2 million annually for recreation, the same amount calculated in the 1977 screening committee's report. The "conceptually superior" travel-cost methodology it had used for the Alternatives Report had never been presented to the Corps for its review.

⁴⁸² *Ibid.*, p. 4.

⁴⁸³ Attachment to memorandum from Howard Boatman to district engineer, June 5, 1980.

three others were based on available alternatives. Sections dealing with "Land Use" and "Energy Needs" lacked basis, and Economics "is the responsibility of TVA," Miller said.

The decision whether to issue a permit for the discharge of fill material is being based upon the determination whether the project is found to be in the public interest. Official positions and determination by State and local officials and entities are presumed to reflect local factors of public interest. Determination by other Federal agencies should be given great weight in their areas of responsibility. Although there is a requirement of an affirmative determination that issuance be in the public interest, one must presume that the various positions proferred reflect this public interest. Disagreement with these positions does not in itself overcome this presumption. The determination whether issuance of the permit is within the public interest is different than the determination whether the project is good or bad, because the regulation requires that the District Engineer base his determination on various public interest factors and in many cases, this element of public interest is established by other entities.⁴⁸⁴

Furthermore, too much weight was given to alternatives, since TVA had already explored the alternatives Miller contended.⁴⁸⁵

E. C. Moore, the chief of the engineering division, commented that the draft was "deficient as a report purporting to present an objective evaluation," and, therefore, that the other state and federal agencies with the necessary expertise to evaluate the project should be relied upon. The permit should contain the conditions of the June 2, 1980, Interior letter on wildlife, however.⁴⁸⁶

On June 13, 1980, Colonel Tener recommended issuance of the Section 404 permit "supported" by a report that found adverse impact in almost every area he was required to consider under the public interest review.⁴⁸⁷ He gave "great weight" to the fact that no federal agency had objected (although EPA's views were being withheld because of the questionable water quality certification), and that Congress had appropriated funds for the dam year after year. "While not necessarily an affirmative determination of the public interest, I believed that the congressional appropriation process should be given great weight as an asset to the economic value of the investment."⁴⁸⁸ The division engineer, after determining that the state certification (which had not been withdrawn pending a de novo hearing) was still valid, also recommended issuance.⁴⁸⁹

B. COLONEL TENER'S CONCLUSIONS

Colonel Tener's report is attached as Appendix IV, a brief summary of the specific conclusions for various areas of public interest review follows:

⁴⁸⁴ Memorandum from Robert C. Miller, undated, p. 2.

⁴⁸⁵ *Ibid.*

⁴⁸⁶ Memorandum from E. C. Moore to Colonel Robert K. Tener, June 9, 1980.

⁴⁸⁷ Tener Report, *supra*.

⁴⁸⁸ Hearings, *supra*, p. 23.

⁴⁸⁹ Letter from Major General Harry A. Griffith to Rebecca Hanmer, June 28, 1980.

Recreation.—The recreation benefits to be gained from the Duck River as a free-flowing riverine system outweigh the projected recreation benefits from the reservoir. Colonel Tener relied upon the Corps' own study. With the medium level of development for the no-dam alternative, he projected 200,000 visitors annually for a benefit of \$650,000. TVA's recreation benefits of \$1.2 million for the project as planned annually were diminished when the Corps subtracted \$664,000 for the cost of developing and operating a recreation area.⁴⁹⁰

Economics.—A current benefit/cost ratio for the project as planned based on present financial conditions is not available. By using TVA's figures in the "Alternatives Report," ratios from .7 to 1.0 to .8 to 1.0 were calculated for the various alternatives.⁴⁹¹

Water Supply.—Future water supply demands for the Marshall and Maury County areas could be met through controlled releases from Normandy Reservoir without full impoundment of the Columbia Reservoir as planned.⁴⁹²

Water Quality.—No conclusion was drawn, but reference to the de novo state hearing on water quality was made.⁴⁹³

Fish and Wildlife Values.—There will be a significant adverse impact on fish and wildlife resources. Those would be mitigated to some extent by implementation of the Interior and Tennessee Wildlife Resources Agency recommendations.⁴⁹⁴

Endangered Species.—The approach in the April 3, 1980, clarification from Interior was adequate.⁴⁹⁵

Flood Plain Values.—The proposed dam would violate Executive Order 11988, and the no-dam alternative provides a practicable means for TVA to comply with the executive order.⁴⁹⁶

Wetlands.—The no-dam alternative provides a practicable means to avoid destruction of wetlands in violation of Executive Order 11990.⁴⁹⁷

Flood Hazards.—Flood control is needed in the Duck River Valley especially at the City of Columbia. That community is subjected almost annually to floods causing significant property damage. TVA has concluded that the no-dam or the low-pool alternative combined with local flood protection measures can provide adequate flood control solutions.⁴⁹⁸

Land Use.—The irreversible loss of 11,000 acres of farmlands resulting from the impoundment of Columbia Reservoir represents an overall negative environmental and economic impact.⁴⁹⁹

Cultural Values.—Cultural resources eligible for inclusion in the National Register discovered within the project area would be properly mitigated if TVA followed outlined procedures.⁵⁰⁰

Colonel Tener found that the local citizens' needs for improved

⁴⁹⁰ Tener Report, supra, pp. 13-14.

⁴⁹¹ Ibid., p. 25.

⁴⁹² Ibid., p. 28.

⁴⁹³ Ibid., pp. 29-30.

⁴⁹⁴ Ibid., p. 15.

⁴⁹⁵ Ibid., p. 16.

⁴⁹⁶ Ibid., pp. 16-17.

⁴⁹⁷ Ibid., pp. 17-18.

⁴⁹⁸ Ibid., p. 20.

⁴⁹⁹ Ibid., p. 21.

⁵⁰⁰ Ibid., p. 23. There have been charges that TVA built the dam and cleared the reservoir area without doing the proper archaeological search. Unfortunately, that topic is beyond the scope of this report.

water supply, flood protection, recreation, and industrial development were legitimate. However, "[b]ased on my review of TVA's 'Report on Columbia Dam Alternatives,' I have concluded that there are alternatives to the project as planned which would provide similar benefits without impoundment and at significantly reduced costs. TVA, however, has determined that these alternatives are not reasonable since they are not economically justified."⁵⁰¹

After making that determination, the district engineer nonetheless came to the conclusion that the economic benefits of the dam, including area redevelopment, industrial and recreational benefits and the improved water supply outweighed the reasonable foreseeable detriments of loss of agricultural land and food production, loss of a riverine environment and the loss of 400 acres of wetlands.⁵⁰²

Despite the overwhelmingly negative findings of the report and the obviously contradictory conclusions throughout, Colonel Tener then reached the bottom line. He decided to recommend approval of the permit, this time finding the alternatives were not appropriate.

I have considered the available alternatives and have determined that TVA's selected course of action . . . is the most appropriate alternative which would satisfy all project purposes.⁵⁰³

Subcommittee members, in questioning Colonel Tener about his apparently unsubstantiated conclusion, found that the district engineer had relied almost completely on TVA's incomplete analysis of costs and benefits in making his decision.

Mr. MOFFETT. No one, including TVA, has ever suggested anything that is backed up by any data that the Columbia Dam project has a positive benefit/cost ratio, and the President's Screening Committee found that the project will return only 80 cents on the dollar. In addition, there is good reason, I think, to suspect that the losses will be even greater based on some of these additional factors. With all that being established . . . why did you not request TVA to provide a new benefit/cost ratio given the variety of conflicting ratios, the most favorable of which was eleven years outdated?

Colonel TENER. Mr. Chairman, I was satisfied that the economic benefits calculated by TVA for the project were credible and that their economic evaluation of . . . the dam and the reservoir—as compared to other alternatives available—was economically the most favorable of the alternative available based on the data that we had available to us from the TVA.⁵⁰⁴

Concerning the enhanced employment benefits which his own staff had concluded were unsupported by TVA, Colonel Tener told Rep. Deckard that "we will have to take that 30 percent on faith since there are no specifics available as to where they come from." Rep. Deckard

⁵⁰¹ Tener Report, *supra*, p. 31.

⁵⁰² *Ibid.*, p. 38.

⁵⁰³ *Ibid.*, p. 39.

⁵⁰⁴ Hearings, *supra*, p. 31.

responded: "It appears to me, if I may make an observation, that this kind of project is based upon merely that, faith."⁵⁰⁵

Colonel Tener attempted to justify the water supply benefits of the dam, even though he admitted that Normandy could supply them as well, by an oblique reference to the theoretical Williamson County tie-in, again a contention questioned by his own staff. When shown an internal TVA document which stated that the Normandy modification made the real justification for Columbia look "minimal," Tener responded that the TVA analysis he was given was not consistent.⁵⁰⁶

Rep. Floyd Fithian (D.-Ind.) concisely analyzed the Corps report at the hearing.

MR. FITHIAN. . . . As I began to total these factors up, recreation is a minus. Flood damage is a minus. Industry and area redevelopment is not a plus. It may be a wash. It may be a minus. Water supply is not necessary. Fish and Wildlife is perhaps a minus. I am curious to know how you can add that many minuses and neutrals and get a plus at all, just mathematically, even with new math.⁵⁰⁷

C. THE PROJECT'S CURRENT STATUS

At the time of this report, the Columbia Dam project remains held up by the lack of a Section 404 permit. The Environmental Protection Agency has appealed the decision to issue the permit citing its Memorandum of Understanding with the Corps. That appeal at this writing is at the level of the assistant secretary of the Army (civil works) who must decide whether completion of the planned Columbia dam and reservoir is in the public interest.⁵⁰⁸ The most recent Corps recommendation, from Lt. General J. W. Morris, chief of engineers, was to issue the permit on February 28, 1981, whether or not the State of Tennessee had completed its water quality review, scheduled for hearing on December 15, 1980.⁵⁰⁹ At no level of the Corps to date has additional information about the merits of the project been reviewed.

If the State of Tennessee withdraws its Section 401 certification, construction on the Columbia dam will be stopped, at least until further modifications are made that will satisfy the state. The Corps of Engineers cannot issue a 404 permit without the state's certification. If the state declares the certification valid, and the assistant Secretary of the Army decides to grant the 404 permit, the administrator of EPA can still make a final appeal to the Secretary of the Army if EPA is not yet satisfied that all of the issues have been addressed. Even so, closure of the dam would remain dependent on the success of the conservation of the endangered species. Ultimately, it may be Congress that must decide between the project supporters and the Endangered Species Act.

⁵⁰⁵ *Ibid.*, p. 32.

⁵⁰⁶ *Ibid.*, p. 42.

⁵⁰⁷ *Ibid.*, p. 50.

⁵⁰⁸ Letter from Barbara Blum, EPA deputy administrator, to Assistant Army Secretary Michael Blumenfeld, October 15, 1980.

⁵⁰⁹ Letter from General J. W. Morris to Eckardt C. Beck, September 26, 1980.

IX.—COMMITTEE CONCLUSIONS

The Duck River project was planned and proposed by TVA in the mid-1960's at the urging of local political, business, and civic leaders as part of TVA's nearly completed program of damming the Tennessee River and its tributaries. That program has brought tremendous benefits to the Valley and to the nation. By that point, TVA had turned the 650-mile unpredictable and destructive Tennessee River into the nation's most controlled major river waterway, established a successful public power authority, rebuilt the region's eroded hills, and fulfilled President Roosevelt's hopes for an agency that "touches and gives life to all forms of human concerns." Current TVA Board Chairman S. David Freeman grew up in the area and remembers when Chattanooga was ravaged by floods before TVA dammed the Tennessee River. "If you were a member of the generation that saw the light bulb replace a kerosene lantern and benefited from the blessings of electric pumps that drew the water from the well, . . . then you really appreciated what TVA had accomplished," Mr. Freeman observed a few years ago.⁵¹⁰

The successes of TVA's dam building and related efforts were not without pitfalls. It appeared to have dulled TVA's sensitivity to the adverse impacts of increasingly marginal water projects on people and the environment and encouraged its disregard of its critics and other federal agencies. Additionally, TVA seemingly grew reluctant or unable to seek alternatives to its stock in trade: the construction of large-scale, multi-purpose dams and reservoirs to stimulate economic growth and to meet other, more traditional objectives.

TVA almost certainly will never again propose the building of a major dam.⁵¹¹ It has accomplished what it set out to do. It is out of the dam business except for Columbia, a relic of a bygone era in which dams were almost invariably viewed as synonymous with progress.

The Columbia Dam project, however, continues to haunt TVA. In refusing, for reasons unknown to the Committee, to rethink Columbia and to provide Congress with information necessary to reach an informed opinion on the project, TVA has forced the Committee to dust off and to analyze TVA's original, highly questionable project proposals and justifications of over a decade ago. The outdated studies, although still relied upon by TVA in its continued efforts on behalf of Columbia, cannot withstand even a modicum of scrutiny. TVA's use of stale and unsupportable data and assumptions has led the agency to resort to the artful and the disingenuous in its continued promotion of the Columbia dam and reservoir. Chairman Freeman's refusal, moreover, to provide the subcommittee with the benefit of his own views on Columbia portrays the agency as unwilling even to attempt to defend this project in public session. Nonetheless, it is as intent as it has always been on completing the dam as planned 13 years ago.

Based on the investigation of the Subcommittee on Environment, Energy, and Natural Resources and on its own review of the record, the Committee has determined that completion of the Columbia dam and reservoir is not in the public interest. That finding is based in part

⁵¹⁰ "A Conservationist Shakes the TVA," *supra*, p. 81.

⁵¹¹ Hearings, *supra*, pp. 179-180.

on TVA's own heretofore-undisclosed determination that the original project benefits can be obtained without the dam, without destroying 54 miles of river, without eliminating 13,000 acres of farmland and at a favorable benefit/cost ratio. Those project benefits under the no-dam alternative can be obtained for \$15 to \$25 million—compared to the \$78 million needed to complete the planned Columbia dam and reservoir.

A. THE COMMITTEE EVALUATION OF DAM BENEFITS

Overall, the Committee has determined the following about the claimed benefits of the Columbia dam project:

1. *Recreation.*—The \$140-million Columbia dam and reservoir is primarily a recreational project. As calculated by TVA, 60 percent of project benefits are to be derived from boating, water skiing, swimming, hunting and fishing on or near the 12,600-acre artificial lake and 236 miles of shoreline to be created by the dam. But the Committee has determined that:

(a) Creation of the reservoir would eliminate 54 miles of the free-flowing Duck River.

(b) There are at least seven recreational reservoirs within a short drive of the proposed Columbia reservoir.

(c) The 12,000-acre artificial lake will be reduced by two-thirds almost half of each year to provide flood storage capacity. That annual drawdown will expose 8,000 acres of useless mudflats.

(d) Recreational benefits can be obtained without the dam and reservoir by the planned development of the river corridor for improved fishing, hunting, hiking, camping, boating and canoeing. All of that can be achieved against the backdrop of considerable natural beauty, peace, and solitude.

2. *Increased Water Supply.*—As calculated by TVA, 19 percent of project benefits are for increased water supply to meet projected municipal and industrial demand.

The Committee has determined, however, that the operation of Normandy dam 111 miles upriver from Columbia can be modified—at no additional cost—to meet TVA's projected water needs for the areas for at least the next 50 years, as acknowledged by TVA.

3. *Enhanced Employment.*—As calculated by TVA, 17 percent of total project benefits are attributable to enhanced employment, or the creation of permanent new jobs for the subemployed.

The Committee has determined, however, that the enhanced employment benefit is based on the projected industrial growth that will accrue to the Columbia area because of the increased availability of water from Columbia dam. Normandy dam can be operated to meet Columbia's foreseeable water requirements. The enhanced employment benefits attributed to the Columbia dam can be met, therefore, by a change in the operation of Normandy dam.

4. *Flood Control.*—The final claimed project benefit, essentially flood control for two small areas in Columbia, comprises 1.4 percent of total claimed project benefits.

The Committee has determined, however, that the flood control benefit is for an area consisting mostly of substandard housing and run-

down or abandoned, small, commercial structures. Flood control objectives for the area can be met by a voluntary relocation and flood protection program. The cost of that option is many times less than providing those flood control benefits through construction of the Columbia dam and reservoir.

B. THE COMMITTEE EVALUATION OF ADVERSE PROJECT IMPACTS

The Committee finds that the adverse impacts of the planned Columbia dam and reservoir include the following:

1. The loss of 440 farms and the forced relocation of 1,500 persons.
2. The loss of 13,000 acres of farmland, with attendant economic losses to the Columbia area from the reduction in agricultural activity and the elimination of small businesses supporting the farming activity.
3. The loss of 54 free-flowing miles of the Duck River, a river considered for preservation as a wild and scenic river.
4. The loss of significant fish and wildlife values, including but not limited to:
 - (a) The loss of rich and diverse wildlife habitats through inundation, including that of the wood duck, which gave the river its name.
 - (b) The loss of cold water fish in the river and their replacement in the reservoir by less desirable, rough species.
 - (c) The destruction of the habitat of the Duck's remaining mussel fauna, including at least two identified endangered mussel species.
5. Possible nuisance algae growths in the proposed Columbia reservoir that could reduce the aesthetic and recreational value of the reservoir.
6. Potential downstream drinking water quality problems stemming both from the algae growth and excessive mineral accumulation in downstream flows.
7. Creation, through much of the year, of a local eyesore by exposing 8,000 acres of mudflats by drawing down the reservoir for flood control purposes.
8. The unnecessary expenditure of \$140 million in taxpayers' dollars.

C. TVA'S ADHERENCE TO FEDERAL LAW AND ITS RELATIONSHIP WITH OTHER AGENCIES

Since the inception of the Duck River project, TVA has been uncooperative with other federal agencies seeking to discharge their Congressionally mandated responsibilities concerning the development of the nation's water resources. In addition, TVA failed to comply in good faith with the requirements of the National Environmental Policy Act both in preparing its environmental impact statement and in taking environmental considerations into account in planning and promoting the Columbia dam project.

Specific instances of non-cooperation by TVA with other agencies include the following:

- (1) TVA's failure to honor its 1968 agreement with the Fish and

Wildlife Service to coordinate efforts to protect overall fish and wildlife and to mitigate the losses resulting from the project.

(2) TVA's decision to proceed with construction of the Columbia dam pending resolution of the endangered species problem over the objections of the Department of Interior in 1974 and again in 1976-1977.

(3) TVA's refusal to apply for a section 404 permit from the U.S. Army Corps of Engineers until November 1977 while discharging dredge and fill material into the Duck River and its continued discharge of such material into the river until March 1978 without a 404 permit.

(4) TVA's failure to provide technical and other information to the Environmental Protection Agency in the course of EPA's review of potential water quality problems associated with the project.

(5) TVA's submission of a "conservation plan" to Fish and Wildlife in 1979 to mitigate against the loss of endangered mussel species from the project when its own biologists had cautioned against the success of that proposal.

(6) TVA's submission of information to the Corps during the Corps' 404 public interest review that TVA knew to be inaccurate, incomplete and outdated.

(7) TVA's failure to prepare an Environmental Impact Statement genuinely assessing the likely costs and benefits of the dam projects as called for by Congress in the 1969 National Environmental Policy Act.

(8) TVA's failure to consult with the State of Virginia concerning the mussel conservation program which will require that State's cooperation to be successful.

(9) TVA's willful omission of critical, requested information on alternatives to the dam project in its 1979 report to the Office of Management and Budget.

(10) TVA officials' unwillingness to state their views on the Columbia Dam project when called upon to do so in a public hearing of a subcommittee of this Committee.

D. THE ROLE OF CHAIRMAN S. DAVID FREEMAN AND DIRECTOR RICHARD FREEMAN

Chairman Freeman and Director Freeman refused in testimony before the Environment, Energy, and Natural Resources Subcommittee to acknowledge any responsibility for or to offer an opinion on the Columbia project. They nonetheless were directly responsible for the final version of the 1979 Alternative Report to OMB that misrepresented key facts and omitted important TVA staff findings which would have favored a less costly, environmentally superior river development alternative. That riverine alternative, unlike the project as planned, has a favorable benefit/cost ratio, information that was withheld from OMB and the public by TVA.

The Committee recognizes that the origins of the Columbia Dam project preceded by many years the appointment of Chairman Freeman and Director Freeman to the TVA Board. Obviously the Freemans are not responsible for TVA's pre-1977 behavior with respect to

this project. The Committee finds, however, that it was incumbent upon Chairman Freeman and Director Freeman to have fully and objectively analyzed the Columbia project in the course of preparing the 1979 Alternatives Report to OMB. That failure was especially disturbing in view of Chairman Freeman's numerous, unsolicited commitments to personally evaluate the project and refer it to the board for final action.

The Committee's findings concerning the TVA board are limited to the Columbia project and should not be read to suggest any adverse criticisms of TVA or its board in other endeavors. The Committee is supportive, moreover, of Chairman Freeman's stated determination to transform TVA into a model utility and public agency.

E. THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY, THE FISH AND WILDLIFE SERVICE AND THE CORPS OF ENGINEERS

The subcommittee undertook its investigation of TVA's Columbia dam project in part to determine the effectiveness of other federal agencies in discharging their statutory responsibilities relative to that project. The Committee is not prepared to comment on the overall effectiveness of those agencies in dealing with water projects in general simply on the basis of their record on Columbia. The performance of the U.S. Fish and Wildlife Service and the Army Corps of Engineers in dealing with Columbia is suggestive, however, of a fundamental reluctance to assert themselves in overseeing federal water projects. Concerning the Columbia's project, the Committee has determined the following:

1. *EPA*.—The Committee finds that EPA adequately discharged its responsibilities pursuant to the Corps 404 review in opposing the issuance of a permit pending state resolution of water quality considerations.

2. *Fish and Wildlife Service*.—The Committee finds that the record of the Fish and Wildlife Service in dealing with Columbia has been one of weakness, timidity, and accommodation. Specifically, FWS:

(a) Failed to register an objection when TVA for over ten years ignored its agreement to consult with FWS on measures to prevent or mitigate fish and wildlife losses.

(b) Issued a 1979 biological opinion that accepted TVA's "conservation plan" to protect endangered species. Acceptance of that plan invited a Tellico-type situation in which TVA, upon the virtual completion of the project in 1986, will not be able to fill the reservoir and back up the river because of its failure to have successfully implemented its risky mussel transplant and conservation programs. In that event, Congress again, as in the Tellico Dam case, may be forced to choose between an essentially completed water project and the values underlying the Endangered Species Act. In so acting, FWS has succeeded in postponing and worsening a conflict that should have been resolved years ago.

3. *U.S. Army Corps of Engineers*.—The Committee is mindful that the Corps has yet to reach a final decision on whether the Columbia project is in the public interest, given EPA's refusal to accept the separate recommendations of the Corps' district engineer, Colonel Rob-

ert K. Tener, the division engineer, Major General Harry A. Griffith, and the director of civil works, Lt. General John Morris, that TVA be granted a 404 permit. Because of EPA's objections, the matter has been referred to Michael Blumenfeld, assistant secretary of the Army for civil works.

The Corps' failure to date to conduct a full, meaningful, public interest review of Columbia is rooted in Colonel Tener's and the Corps staff's failure to appreciate sufficiently the need for the Corps itself to aggressively determine the facts surrounding Columbia. The Corps should not be reluctant, as Colonel Tener has been in dealing with TVA, to require supporting documentation, to depose agency officials when necessary, and, most importantly, to recognize that the Corps has the ultimately responsibility in the context of a Section 404 review to determine whether a water project is in the public interest.

X.—COMMITTEE RECOMMENDATIONS

A. The Committee's principal recommendation is directed to the U.S. Army assistant secretary for civil works who is now charged with the determination of whether issuance of a 404 permit for the Columbia dam project is in the "public interest" under the terms of the Federal Water Pollution Control Act. In reaching that decision, the Committee recommends to the assistant secretary that he not rely exclusively on the record assembled to date by the Corps but that he supplement that record with this report, the documents obtained by the Subcommittee on Environment, Energy, and Natural Resources, and such other materials as he deems relevant. The Committee is not seeking to undermine the assistant secretary's authority to decide whether to issue a 404 permit for Columbia. To the contrary, the Committee intends to emphasize that he has the responsibility, under the Congressional mandate of the FWPCA, to make that decision for the Corps based on his own complete analysis of the factual record, unfettered by the desires of TVA if he deems those desires in conflict with the public interest.

Toward that end, the Committee considers it appropriate as part of its oversight effort, to bring to the assistant secretary's attention information relevant to his determination of whether the Columbia dam project is in the public interest.

B. The history of this project leads the Committee to a recommendation going well beyond the fate of this embattled dam project. For over 13 years, TVA has shown a dogged determination to complete this project whether or not the evidence about the dam's benefits supported that intention.

Toward that end, TVA has ignored a number of responsibilities entrusted to it by Congress. It ignored federal statutes calling for the good faith sharing of information with other federal agencies so that they might discharge their own statutory duties. In so doing, it fostered a debilitating atmosphere of mistrust among agencies inconsistent with the cooperation necessary for fair consideration of all of the interests and values associated with a major water project. TVA repeatedly showed a disregard for its fundamental responsibility to American taxpayers to spend their tax dollars wisely.

The final recommendation of the Committee is that TVA officials carefully and personally review the federal statutes governing TVA activities and defining their responsibilities as public officials, such as the National Environmental Policy Act and the Federal Water Pollution Control Act. Having done so, the Committee recommends that those officials follow those laws in good faith in making decisions on other projects, so that future Committee oversight of TVA actions will not necessitate reiteration of the findings and recommendations of this report.

The first section of the document is a list of names and titles, including the names of the authors and the titles of their works. The names are listed in a column on the left, and the titles are listed in a column on the right. The titles are written in a small, serif font, and are arranged in a list format. The names are written in a larger, bold font, and are arranged in a list format. The list is organized in a way that allows for easy comparison of the authors and their works. The list is a key component of the document, and it provides a clear and concise summary of the information being presented.

APPENDIXES

APPENDIX I.—WITNESSES WHO TESTIFIED BEFORE THE SUBCOMMITTEE ON ENVIRONMENT, ENERGY, AND NATURAL RESOURCES ON THE COLUMBIA DAM PROJECT

I. August 21, 1980:

1. U.S. Army Corps of Engineers:

Colonel George Robertson, Deputy Director of Civil Works, Office of the Chief of Engineers;
Colonel Robert K. Tener, Former District Engineer, Nashville District.

2. Environmental Protection Agency: Rebecca W. Hanmer, Regional Administrator—Region IV, Atlanta, Ga.

Accompanied by:

Charles Perry, EPA Regional Counsel; Mike McGhee, EPA Water Quality Standards Coordinator;

Howard Zeller, Deputy Enforcement Division Director;

Bradley Nicoisjsen, 404 Project Officer.

3. Fish and Wildlife Service, Department of the Interior: Lynn A. Greenwalt, Director.

II. September 24, 1980:

1. Fish and Wildlife Service, Department of the Interior; Lynn A. Greenwalt, Director;

Accompanied by: Ronald Lambertson, Associate Director, Federal Assistance, Fish and Wildlife Service.

2. Tennessee Valley Authority: John J. Jenkinson, Biologist.

III. September 25, 1980:

Tennessee Valley Authority:

S. David Freeman, Chairman; Richard M. Freeman,
Accompanied by: John L. Furgurson, Columbia Dam Project Manager, Tennessee Valley Authority.

APPENDIX II

To: Leon E. Ring, General Manager, E12B16 C-K.
From: John L. Furgurson, Columbia Project Manager, 448 EB-K.
Date: February 2, 1979.
Subject: Columbia Alternative Study—Draft Report, February 1, 1979.

Attached are three copies of the "Report on Preliminary Studies of Alternatives to Completion of Columbia Dam" for review by you and the Board.

The report identifies two alternatives to the Columbia Project as planned that would satisfy the essential water supply and flood control needs in the Columbia area and at the same time not jeopardize the habitat for certain endangered species. One alternative consists of modifications to Columbia Dam to maintain a reservoir at a lower level. The other encompasses removal of the earth portion of the dam, meeting future water supply needs in the Columbia area by changing the operation of Normandy Dam, and developing the river in some planned fashion. Both alternatives would include a downstream relocation program in the Duck River floodplain through the city of Columbia to obtain some of the project benefits associated with flood damage prevention. This relocation program is not supported by the benefits claimed.

Table 1 of the report, which compares benefits and costs of the various options, is incomplete. I received preliminary recreation benefit estimates from the Division of Forestry, Fisheries, and Wildlife Development Wednesday which they agree are obviously high, especially for the reservoir options. In October FF&WD reevaluated the Columbia recreation benefit in a similar manner to that used in the 1968 planning report and came up with an average annual benefit estimate of \$2.2 million. Their latest estimate is \$4.5 million and is based on the travel cost measure of willingness to pay methodology which was used in the Tellico alternatives study. I have been promised the final benefit estimates before the February 15 deadline. For your information. I have attached separate copies of Table 1 with the preliminary recreation benefits included.*

This report was prepared under the general guidance of the Division of Water Management by a task force consisting of representatives from the Offices of Engineering Design and Construction and Tributary Area Development; and Divisions of Agricultural Development; Environmental Planning; Forestry, Fisheries and Wildlife Development; Law; Navigation Development and Regional Studies; and Property and Services. This draft has been fully coordinated with these organizations. Claybourne Ross, Executive Secretary of the Up-

*Committee note.—The completed table 1 is reprinted in the body of the committee report in section V(B).

per Duck River Development Agency and Association also participated in the study during meetings of the task force in early December.

We are preparing printed exhibits to replace the hand-colored ones in this draft.

If you have any questions or would like further explanation, I would be glad to discuss the report with you.

JOHN L. FURGURSON.

REPORT ON PRELIMINARY STUDIES OF ALTERNATIVES TO COMPLETION OF COLUMBIA DAM

INTRODUCTION

This report summarizes a preliminary study by the TVA staff of alternatives to the completion of Columbia Dam and Reservoir now under construction on the upper Duck River in Maury and Marshall Counties, Tennessee (figures 1 and 2). (Columbia Dam and Reservoir, along with the completed Normandy Dam and Reservoir, make up TVA's Duck River Project.) The study investigated alternatives that would satisfy the essential water supply and flood control needs in the Columbia area and at the same time not jeopardize the habitat for certain endangered species. The primary objective aside from the endangered species constraints was to find alternatives that could provide water in ample quantity and of good quality, the lack of which is currently a limiting factor to industrial development particularly in Maury County. As a result of these investigations, TVA identified two alternatives to completing the dam as planned. The first consists of modification to the dam to maintain a reservoir at a lower level (figure 4). The second alternative encompasses removal of the earth portion of Columbia Dam, meeting future water supply needs from the existing Normandy Reservoir upstream, and developing the river in a planned fashion (figures 7a, b, c). Both alternatives would include a voluntary downstream relocation program in the Duck River floodplain through the city of Columbia to obtain some of the project benefits associated with flood damage prevention. This report is being prepared as requested by the Office of Management and Budget.

The Endangered Species Act of 1973, as amended, provides in part, that no Federal action be undertaken which would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat judged by the Department of the Interior to be critical. The small mussel, *Conradilla caelata*, sometimes called the birdwing pearly mussel has been listed as endangered. While critical habitat has not been specifically designated for this species, if and when such action is taken, the critical habitat is expected to include the area of Duck River downstream from Lillard Mill. The Lillard Mill population is located within the presently planned impoundment area (figure 2) and thus would be adversely affected because it depends on riverine habitat. The alternatives identified would avoid the adverse impact to this population. An analysis of potential impacts to this end and other endangered species is provided in more detail in Appendix A.

While the impact on endangered species has stimulated the search for alternatives, increased cost must also be considered. Columbia Dam

had a marginal benefit-cost ratio in 1968 when, at a cost of \$50 million, it was planned as one unit of the Duck River Project. The cost of the Columbia segment has now risen to \$140 million with \$44 million already obligated.

Under the low pool-downstream relocation alternative the cost to complete could be reduced to \$55 million and projected water supply needs would still be met for at least 50 years. It would also achieve the enhanced employment benefits associated with the project as planned and some of the recreation benefits. The downstream relocation component of the low pool alternative would capture an important part of the flood damage prevention benefit. Problems exist with this alternative, however, which will require complicated operations of the dam and reservoir to protect endangered species and the water quality of the releases. In addition, water supply storage could be reduced in later years by sediment accumulation and might have to be supplemented by additional withdrawals from Normandy Reservoir.

The no impoundment-downstream relocation alternative would cost from \$15 to \$25 million to implement. Studies show that Normandy Reservoir operations can be modified to meet water quality control objectives and projected water supply needs in the Columbia area for at least 50 years. Thus, together with the downstream relocation program, this alternative would meet the basic objectives of protecting the habitat of the endangered mussel and simultaneously satisfying the essential water supply and flood control needs in the Columbia area similar to the pool alternative. In addition the unimpounded river corridor could be developed in a variety of ways. For this report three levels of river development are presented.

The no impoundment-downstream relocation alternative has a favorable benefit-cost ratio using current methodology; whereas, the project as planned and the low pool-downstream relocation alternative do not. It also would have the least impact on the environment of any of the three options. Comparison of economic benefits and costs and of environmental impacts are shown in tables 1 and 2, respectively. Estimates of costs to complete are compared in table 3. Land requirements are compared in table 4.

HISTORY OF THE DUCK RIVER PROJECT

Early studies on development of the main stem of the Duck River, made as part of the general survey of the Tennessee River and its tributaries, were reported in House Document 328, 2d Session, 71st Congress (1930). In this document, six dam sites were identified on the Duck River from about mile 15 to mile 188. A brief study by TVA in 1951 considered sites at miles 147.7 and 191.3 as offering possibilities for development. However, the projects were not at that time found economically attractive.

In 1964 the leaders in Maury, Marshall, Bedford, and Coffee Counties (figure 1) organized the Upper Duck River Development Association to request assistance under TVA's tributary area development program. This program called for comprehensive unified resource development for the purpose of advancing economic growth through full use and development of all available resources. It focused on

smaller areas with the same comprehensive approach that TVA has utilized in the whole Tennessee Valley. The leaders also saw the need to develop an organization with broad legal powers which had official recognition in the governmental structure of the area. In response to that need, the Tennessee Legislature created the Tennessee Upper Duck River Development Agency in March 1965 and gave it broad responsibilities for formulating and carrying out plans and programs for improving the economy of the area. In 1966 the Tennessee State Planning Commission designated the four Upper Duck River counties as a planning region and created the Upper Duck Regional Planning Commission to assist in the development effort. Thus, three different organizations, each performing a separate but vital task, were created to plan, guide, and support an overall development effort in the Upper Duck River Valley. Effective coordination was and still is achieved through a deliberate overlapping of membership on the board of directors of the three organizations and through the use of a common staff.

An inventory of the area resources to identify its needs and opportunities was carried out through the Upper Duck River Development Association with TVA assistance. A report summarizing this effort was published in July 1965. This inventory served as a platform from which to survey the region's assets and liabilities, to chart a course of action, and to make decisions regarding desired actions. Based upon the inventory findings, an analysis was made of the economy and future growth patterns in the four-county area, and several important needs were identified to help solve existing and future physical, economic, and social problems. Included were (1) an improved physical and cultural environment, (2) additional high-wage industrial job opportunities, (3) adequate and dependable water supply and waste treatment facilities, and (4) improved educational and vocational training. The Duck River was the focus of this comprehensive development plan.

In 1966 the Upper Duck River Development Agency proposed the development of a water supply grid system to serve the four-county area. It included plans for interconnecting the area's five major cities—Columbia, Lewisburg, Shelbyville, Tullahoma, and Manchester—for greater economy, to aid industries requiring treated water, and to supply water to small communities and rural areas of the four counties. Federal grants, supplemented by municipal bonds, were obtained to construct the grid system which is now largely completed. Branch lines from the grid system will ultimately be constructed to serve virtually everyone in the four-county area. The Upper Duck River Development Association and Agency received national recognition for this major accomplishment. With the local organizations concentrating on the water grid system and other concerns, TVA was requested to investigate water resource development.

TVA first determined that multipurpose reservoir development on the main stem of the Duck River offered the best potential. A reconnaissance study in 1965 identified three dam sites on the Duck River which, if developed, could control the river and provide new opportunities for recreation and lakeshore development. These sites were the Columbia site at Duck River mile 136.7, the County Line site at mile

191.3, and the Normandy site at mile 248.6. Feasibility appraisals indicated that the Columbia and Normandy sites should be considered in more detail. The County Line site was less attractive because of apparent foundation problems and was eliminated from further consideration. Extremely tight scheduling of investigations on the Upper Duck River precluded a detailed overall appraisal of the water resource development as a system at that time. Therefore, on the basis of the information then available, it was decided to concentrate first on the planning studies for the Columbia site and then to focus attention on the Normandy site. A planning report issued in August 1967 recommended building a dam at Columbia. Further studies proved the feasibility of a dam and reservoir at the Normandy site. The two dam and reservoir projects were then presented as units of the Upper Duck River Project in a 1968 planning report. In that report the project was largely justified on the basis of enhanced employment (29 percent), recreation (25 percent), water supply (16 percent), flood control (7 percent), and water quality control (7 percent).

Streamflow regulation for water quality control was included in the Duck River Project in accordance with the requirements of Public Law 87-88 which required Federal agencies in planning and development of water resource projects to study the need to include water control storage. The results of TVA's studies concerning the need for streamflow regulation in the Duck River for water quality control were reviewed and concurred in by the proper reviewing agencies in 1967, 1968, and 1969. (At the time of original planning, consultation was with the Department of Health, Education, and Welfare; but it has since shifted to the Department of Interior and then to the Environmental Protection Agency.) The TVA water quality studies were summarized in an October 1969 report entitled "The Potential Impact on Water Quality of the Duck River Project." The final State of Tennessee Duck River Basin Plan based on the water quality control streamflow to be provided by the planned project was adopted by the Tennessee Water Quality Board in October 1974, approved by EPA Region IV, and distributed by the State in May 1975 (see Appendix B).

The project construction cost was estimated at \$73.5 million of which \$50 million was for the Columbia Dam and Reservoir. The benefit-cost ratio for the two-unit project was estimated at 1.2 to 1. For the Columbia unit the benefit-cost ratio was 1 to 1. The engineering studies and economic analysis for the planned project were summarized in TVA planning report No. 65-100-1 entitled "The Duck River Project—Normandy and Columbia Reservoirs," issued in September 1968. The planning report was supplemented in October 1969 at the request of the Office of Management and Budget. The first appropriation came in December 1969.

Following the enactment of the National Environmental Policy Act of 1969, TVA prepared a draft environmental impact statement (EIS) which was published in June 1971. A public hearing on the project was held in August and a final EIS published in April 1972. The Environmental Defense Fund, Inc., filed suit in July 1972 challenging the adequacy of the final EIS. The case was tried in United States District Court in 1974, and the Court found the final EIS was

deficient. A supplement to the final EIS was issued in June 1974 and court approval followed. Construction of Normandy Dam began in June 1972 and was completed in 1976 at a cost of \$37.4 million. Construction at Columbia Dam was begun in August 1973, and completion is now projected for 1985. Estimated construction cost now run \$140 million. Construction of the Columbia Dam and Reservoir is about 30 percent complete (\$44 million obligations through fiscal year 1978) however, certain activities have been curtailed pending approval of TVA's application to the Nashville District of the Corps of Engineers for a permit to place fill material below normal high water. Concurrent with the application to the Corps of Engineers, the Tennessee Division of Water Control was requested to review the application and to issue a certification in accordance with the requirement of the Federal Water Pollution Control Act (FWPCA). The State has issued a letter of intent to certify.

The Duck River Project (Columbia and Normandy Dams and Reservoirs) has had the overwhelming support of the local citizens of the area. Indicative of their support, literally hundreds have appeared and testified at public hearings on the Duck River Project. For example, in April 1978 over 260 local citizens went to Washington at their own expense to appear before House and Senate Subcommittees on Public Works Appropriations. As further evidence of their support, the city and county governments, chambers of commerce, civic clubs and other organizations have passed numerous resolutions in support of the project. However, probably the greatest indication of support by the people is their willingness to underwrite the water supply portion of the construction of the project to the extent of \$16.2 million. This amount is being accumulated by a five cent per thousand gallon surcharge for water use through the five municipal systems beginning in January 1972. The project also enjoys the overwhelming support of local, State and Federal elected officials.

Normandy Dam and Reservoir serves mainly Coffee and Bedford Counties. Since closure in January 1976 the dam has been operated to reduce a number of downstream floods on agricultural land and at Shelbyville, Tennessee, and to supplement low flows as necessary to satisfy Shelbyville's needs for water supply and water quality control. Tullahoma and Manchester are also making plans to supply future water supply needs of Coffee County from an intake pumping plant constructed on Normandy Reservoir. In addition, Normandy operation fulfills water quality control requirements for waste assimilation at Columbia, Tennessee, and provides some additional flow for water supply. Normandy Reservoir has completed its third summer of operation and recreation activity is increasing annually.

Original plans for Columbia Dam called for a multipurpose reservoir to serve Maury and Marshall Counties with a summer pool at elevation 630 and a winter drawdown to elevation 603. The drawdown would allow sufficient flood detention capacity in the reservoir area to reduce the flood of record at the city of Columbia to essentially a nondamaging stage. The reservoir would also serve as an ample source of water supply for Maury County including the industrial complex downstream from the city. Water released from Normandy Reservoir for water quality control requirements, together

with additional water from storage in Columbia Reservoir, would be released as required to meet future water quality control and water supply needs in Maury County. Columbia Reservoir, with four times the surface area of Normandy Reservoir during the summer months, would be expected to attract a diversity of recreational activity.

LEGAL CONSIDERATIONS

There are several major Federal laws or policies which could affect the completion of the Columbia Dam portion of the Duck River project. These are the Endangered Species Act of 1973; the National Environmental Policy Act of 1969; the Historic Preservation Act of 1966 and the related Executive Order No. 11593; Executive Order No. 11988, "Floodplain Management," which discourages unwise use and development of floodplains; Executive Order No. 11990, "Protection of Wetlands," which discourages new development in wetlands; the Water Resource Planning Act of 1965; the Federal Water Pollution Act; and the President's National Water Policy. As discussed below, the effect of many of these requirements will be different depending on whether the project is completed as presently designed or under an alternative design.

Endangered Species Act of 1973.—This act prohibits any Federal agency from undertaking any activity which would jeopardize the continued existence of any endangered or threatened species or which would destroy or adversely modify such species' critical habitat. If it becomes apparent that a proposed Federal project may have such an adverse effect, the involved Federal agency is required to consult with the Department of the Interior to assure that the final action to be taken complies with the purposes of the act. Seven species of endangered mussels have been listed as occurring in the Duck River. Although TVA's biologists disagree with the Fish and Wildlife Services biological opinion regarding how many species would actually be jeopardized by completion of the project, it is now clear that impoundment of the reservoir as planned would destroy a significant colony of one endangered species of mussel (*Conradilla caelata*) near Lillard's Mill.

This impact under present law prohibits TVA from impounding the reservoir as presently designed without obtaining an exemption under the recent Endangered Species Act amendments of 1978 or administrative change with respect to the listing as endangered. In addition, the Department of the Interior has proposed to list six species of snails as threatened or endangered, several of which inhabit the area of Columbia Reservoir.

An exemption for Columbia would have to follow a 3-tier review process, beginning with consultation with the Secretary of the Interior and progressing through a 3-member review board and the 7-member Endangered Species Committee. The exemption process for Columbia could be commenced by either TVA or the Governor of Tennessee, and it might take approximately 18 months to complete. An exemption could be granted only if the committee found that:

- (1) there are no reasonable and prudent alternatives to dam completion;

(2) the benefits of such action clearly outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat; and

(3) such action is in the public interest.

(4) the action has regional or national significance.

National Environmental Policy Act of 1969.—TVA filed a final environmental impact statement for the originally proposed Duck River Project in 1972. It was supplemented in 1974. Completion and impoundment and operation of the reservoir as presently designed would not require additional NEPA review. In the event the scope of the project or substantial design or operating changes were made in the reservoir resulting in significantly different environmental impacts, a supplemental environmental evaluation would be required to document such changes.

National Historic Preservation Act of 1966 and Related Executive Order No. 11593.—The Secretary of the Interior maintains a National Register of Historic Places (Register), and Federal agencies must consider the impacts of their projects upon such values and must consult with the Advisory Council on Historic Preservation on properties included in the Register or eligible therefor. TVA has not yet completed this process for the present project, but the final steps leading to compliance are underway at this time. TVA will be preparing a memorandum of agreement (MOA) pursuant to section 106 of the National Historic Preservation Act to be entered into by TVA, the State of Tennessee Historic Preservation Officer and the Advisory Council on Historic Preservation. This MOA should be broad enough to cover all project alternatives.

Executive Order No. 11988, "Floodplain Management."—This order was issued May 24, 1977, and generally directs all Federal agencies to avoid taking action within the floodplain unless it is the only practicable alternative. If the floodplain cannot be avoided, agencies are instructed to adjust to the floodplain by reducing the risk of flood loss; minimizing the impact of floods on human safety, health, and welfare; and restoring and preserving the natural and beneficial floodplain values. TVA will implement the policies of the order and the procedures which it is developing [43 Fed. Reg. 24,228 (1978)] in TVA's continuing consideration of alternatives.

Executive Order No. 11990, "Protection of Wetlands."—This Order was issued May 24, 1977, and generally directs all Federal agencies to avoid supporting new development in wetland areas wherever practicable alternatives exist. If wetlands cannot be avoided, agencies are instructed to take all practicable measures to minimize harm to wetlands that may result. TVA will implement the policies of the order and procedures it is developing (43 Fed. Reg. 24,228 (1978)) in its continuing consideration of alternatives.

Water Resources Planning Act of 1965.—Any alternatives that are examined for completion of the Duck River Project, including completing the dam under an alternative design, would be evaluated using the Water Resources Council's Principles and Standards. This would be done in the context of the planning and the overall review of the proposal.

Federal Water Pollution Control Act (FWPCA).—To the extent

applicable to TVA-built structures in the Tennessee River System, section 404 of this act requires that discharges of dredged or fill material into waters of the United States be permitted by the Secretary of the Army, acting through the Corps of Engineers. The placement of soil, sand, rock, rubble, or similar materials in the waters of the Duck River to stabilize channel banks, emplace structures, divert flows, or for other purposes constitutes a discharge subject to the requirements of section 404, and to the standards for evaluating such discharges, as specified in the section 404(b) guidelines of the U.S. Environmental Protection Agency. Certain features that might be considered for improvement of endangered species habitat would also require a 404 permit if they involved these types of materials discharges. If an alternative other than the project as planned is selected, TVA will apply for section 404 permit or permits required in conjunction with construction of further development features of the project. Corps of Engineers NEPA procedures require a review of the impacts from the whole project, not just the aspects of the project for which a permit is sought. The Corps can rely wholly or partially on an adequate EIS prepared by another Federal agency. Nevertheless, its permitting procedures can involve lengthy public comment periods, public hearings, and environmental evaluations, all of which can protract the proceedings considerably. At present National Pollutant Discharge Elimination System (NPDES) permits are not required for reservoir discharges other than minor miscellaneous discharges; however, it is possible that such permits might be required prior to impoundment of the project. In connection with the obtaining of a 404 or NPDES permit, TVA must also receive from the State of Tennessee certification under Section 401 that the completion of the activities sought to be permitted will not violate Tennessee water quality standards.

President's Water Policy.—The President's water policy message, delivered to the Congress on June 6, 1978, is an important directive to reform existing water resources development practices. On July 12, 1978, the President signed a series of documents outlining action to be taken by Federal agencies in implementing his initiatives. In the area of water conservation, the President directed all Federal agencies to incorporate water conservation requirements in all applicable programs. Water conservation practiced by the municipal and industrial users in the upper Duck River area could reduce the long-term average demand and thereby conserve related resources. TVA will promote water conservation as an integral part of the Duck River Project.

Land Acquisition.—Under the Tennessee Valley Authority Act of 1933 as amended, TVA has already purchased several thousand acres near Columbia for the Columbia Dam segment of the Duck River project. If TVA decided to return any of this land to the public, section 31 of the TVA Act requires TVA to sell such surplus property at public auction. Thus prior owners could not be assured that they would be able to repurchase any specific property.

DEVELOPMENT OF ALTERNATIVES

The basic reason for investigating alternatives to the Columbia Dam and Reservoir is the potential harmful impact of impoundment on the habitat of the endangered mussel species, *Conradilla caelata*. Known

habitat for *C. caelata* is the reach of the Duck River just downstream from Lillard Mill Dam (figure 2) at Duck River mile 179. In addition any alternative would be expected to satisfy essential water supply and flood control needs of the Columbia area.

An alternative to consider is the operation of the project at a lower pool level (figure 4) that would not impound the habitat of the endangered mussel. The low pool could provide water supply storage and a water base for recreation, wildlife management and other developments similar to the project as planned. The dam could not, however, be operated for flood control; but a downstream relocation program could partially compensate for this.

Another alternative would be to not impound water. It involves removal of the earth portion of Columbia Dam and increasing low flow releases from Normandy Reservoir to meet water quality control objectives and projected water supply requirements in the Columbia area for at least the next 50 years. The Duck River corridor in the Columbia Reservoir area could then be developed in a planned manner. Development could vary from a full range of developmental opportunities to minimal recreation facilities (figures 7 a, b, c). The downstream relocation program would also be included in this alternative.

In summary the following options have been identified for analysis in this report:

1. Dam and reservoir development as originally planned with minor modifications.
2. Low pool with downstream relocation program.
3. No impoundment, Normandy operational change, and a varying degree of river development and downstream relocation program.

Further detailed studies would be required if either alternative to the original development is selected. This is especially true in selecting land uses for river development and in determining the best downstream relocation plan.

PROJECT AS PLANNED

Description

If the Columbia unit of the Duck River Project were to be completed as originally planned, the dam would create a 12,600-acre multiple-purpose impoundment at normal maximum pool, elevation 630, which would extend some 54 miles up the Duck River in Maury and Marshall Counties (figure 2). The reservoir would be drawn down after October 15 each year in order to provide winter flood detention capacity. This drawdown would also effectively control potential excessive growth of aquatic weeds. Except during flood conditions, the reservoir level would then be at elevation 603 until February 1, after which time the pool level would be raised gradually along a guide curve with the objective of reaching and maintaining recreational pool levels within about 5 feet of normal maximum pool throughout the summer months.

An estimated 27,500 acres of land would be acquired for the reservoir area. The project would affect about 45 miles of highways, most of which are secondary. It would also require the rebuilding at a higher elevation two bridges of Interstate 65 that span the Duck River and about 3 miles of the interstate.

The dam as originally designed includes a concrete gravity nonoverflow section on each side of a 5-bay concrete spillway, and a main embankment of rolled earthfill. The top of dam would be at elevation 648. Discharge facilities would include 4 large spillway gates with crest at elevation 594; a large water quality spillway gate with crest at elevation 615; an intermediate level sluice at elevation 613; and two regulating sleeve valves at elevation 584 (figure 3). These features were incorporated in the dam to provide operating flexibility to protect downstream water quality and to provide temperature regimes to enhance the downstream warm water fishery. To further improve operations it is now proposed to replace the intermediate level sluice with an additional high-capacity regulating sleeve valve. A multiple-level gating structure would then be added to the face of the dam enclosing the three regulating sleeve valves. Several gated openings would be provided between elevations 570 and 610. With these gate openings at various levels, withdrawals could be selected from a reservoir stratum having good water quality.

Construction of the dam and reservoir as originally planned is approximately 30 percent complete. Obligations through September 30, 1978, totaled about \$44 million. The remaining costs are estimated at \$96 million with construction scheduled for completion in June 1985. This includes the cost for the modifications to the discharge facilities. Concrete placement for the concrete dam and spillway is complete except in two spillway bays which were left for third-stage diversion (figure 3). The gates are scheduled for delivery early in calendar year 1979. Earth excavation for the earth dam and embankment is nearly complete while earthfill placement is about 60 percent complete. The remaining earthfill placement must await third-stage diversion. Land acquisition has advanced to approximately 50 percent complete with some 11,100 acres acquired as of September 30, 1978. Six road projects have been completed and a number of others are under various stages of construction. Some 450 acres have been cleared in the reservoir, mostly for third-stage diversion and below the elevation 600 contour.

Benefits

The project as planned would provide flood control benefits to urban and agriculture land downstream from the dam; would improve the quality and quantity of water available for municipal and industrial use in Maury County; would create recreational opportunities, including fishing and hunting in and around the reservoir; would provide a setting for shoreland development; and provide higher wage employment for the subemployed in the area. (A river development plan outside the impoundment area is discussed in Appendix C.)

Flood Damage Prevention.—The flood detention capacity in Columbia Reservoir would reduce flooding at the city of Columbia, immediately downstream, and to a much lesser degree at Centerville. The flood of record at Columbia would be reduced to essentially nondamaging stages thereby enhancing the value of about 1,200 acres in the city because of the reduced flood risk. The dam would also reduce flood damages to some 3,700 acres of agricultural lands downstream from the dam in Maury County. The project would also increase the effectiveness of TVA flood control operations at Kentucky Dam; but the incremental benefit is not significant.

Water Supply.—The Duck River project would improve streamflow in the Columbia area to the benefit of municipal and industrial water users. Low flows in the Duck River at Columbia have historically been a reoccurring problem. In these situations, the streamflow has been insufficient to meet either water supply requirements or water quality control needs for assimilation of treated waste discharges to protect downstream water quality. It should be emphasized that these two water uses are not mutually exclusive, in that providing adequate streamflows to assimilate treated waste discharges are of no value if adequate streamflows are not also available to meet the corresponding water supply requirements associated with the waste discharge. Planned releases from Columbia Reservoir would provide 155 cubic feet per second of water for purposes of water quality control concurrent with provisions for water supply releases of up to an addition 150 cubic feet per second. Releases presently being made from Normandy Dam for water quality control and water supply needs at Shelbyville are already serving the water quality control requirements at Columbia. These releases, together with water stored in Columbia Reservoir for water supply purposes, would be released from Columbia Reservoir at an initial total rate of about 215 cubic feet per second and gradually increased over the life of the project as required, to meet increased water supply requirements, to a projected ultimate total release of 305 cubic feet per second by the year 2075. These releases, together with improved organic waste treatment in the Columbia-Mount Pleasant area expected by 1979, should eliminate low dissolved oxygen in the Duck River downstream from the city of Columbia. Columbia Reservoir would also reduce turbidity and concentrations of suspended solids and coliform bacteria downstream, thus reducing water treatment costs (see Appendix B).

Enhanced Employment.—Past growth in the economy of Maury and Marshall Counties has been below its potential. Indeed while the area has good industrial possibilities the growth rate in manufacturing recently has declined. Maury County in particular has attracted large, heavy metalworking and chemical industries, which are intensive users of process water. All indications point to expansion of existing industry and attraction of new industry at the industrial complex downstream from the city if a dependable water supply is made available. Smaller, dispersed light industrial parks would also be expected along the water grid system in the two counties with the assured water supply. New industrial and services employment opportunities could provide an addition of some 1,000 jobs within 25 years. This creation of more jobs is a significant and lasting benefit to the area from more productive use of subemployed labor.

Aquatic Ecology.—Impoundment of Columbia Reservoir would increase the biological productivity of the water body. A combination of related factors including (1) the impeding of the Duck River flow with a resultant increase in retention time; (2) the removal of some suspended solids initially, at least, permitting light to penetrate to greater depths; and (3) the inflow of nutrients within the epilimnion (from both local surface water runoff and inflow of the Duck River), would stimulate the production of phytoplankton. This would support a larger biomass of consumer organisms (e.g., zooplankton, planktiv-

orus fish and larval fish). Enriched reservoirs of this nature are extremely valuable because of their ability to provide excellent fishing and serve as general purpose recreational areas. The project as planned would create 3,900 acres of potential habitat for rooted aquatic plants (macrophytes). Within this acreage there would exist a broad spectrum of ecological niches that might support a diverse flora. These plants would serve as nursery areas for fish and invertebrates in addition to providing summertime habitat and a food source for waterfowl (Appendix B).

Land Enhancement.—The reservoir would enhance the value of adjacent lands much of which would be ideally suited for vacation-type and permanent homes. It would also provide a moderate sized, scenic reservoir with opportunities for substantial public, private, and quasi-public recreation development (figure 2). Several large tracts on the lower portion of the reservoir would have good land-to-water relationships, moderate to gently sloping topography, and easy accessibility.

Planned highway improvements to I-65, which will improve access to the middle reach of Columbia Reservoir, will result in the enhancement of private property in that area. Figure 2 reflects a large area which is being promoted as a planned unit development by the private sector. As presently envisioned, the area would be developed for vacation homes, minifarms, and other related recreation facilities which are marketable in the Maury County-Nashville area. The project as planned would also influence existing development patterns in the Columbia area by attracting future private development toward the lower reaches of the reservoir. Development is anticipated in the Iron Bridge and Fountain Creek areas.

Recreation.—The impoundment would have wide and deep expanses of water with numerous coves and islands. Between the Interstate 65 crossing and the vicinity of Henry Horton State Park, the characteristics of a winding river would still persist. In order to meet the needs for recreation use of the reservoir and to assure adequate public access to the lake, provisions would be made for boating access and pertinent support facilities at strategic locations around the shoreline. These include two parks, three commercial recreation areas, two group camps, and additional boat access and day-use facilities. Access to the narrow, winding upper reaches of the reservoir would be provided by a series of public boat ramps (figure 2). The reservoir would offer attractive boat and bank fishing opportunities. In addition, a warm-water fishery could be developed downstream from the dam as a result of the improved temperature regimes.

Wildlife.—The major wildlife enhancement planned for the reservoir would be the development of a state wildlife management area at Sowell-Tugas Bend (figure 2). The Tennessee Wildlife Resource Agency (TWRA) expects this to fill a void in public wildlife use opportunities in lower middle Tennessee. The benefits ascribed to this management area would complete TVA's mitigation of the impacts to fish and wildlife from the entire Duck River Project. TWRA has begun an intensive giant Canada goose release program, expecting Columbia Reservoir to furnish considerable nesting habitat, foods, resting sites, and sanctuary for these nonmigrating waterfowl.

Historic.—TVA proposes to develop a historic community of structures which are representative of the settlement and growth of this

area through the 19th century. This proposal is outlined in Appendix D. TVA also plans to create an inventory of logs and related construction materials from among the more than 50 non-Register-eligible log structures that have been acquired as a part of this project. These include houses, sheds, cribs, and barns. Such materials are in the short supply for historic restorative projects and would form a vital supply for public and quasi-public projects throughout the Tennessee Valley. Facilities to store and secure this inventory would be a necessity. If significant archaeological sites are found, some of them might also contribute to the interpretation of the history of the area.

Adverse or Irreversible Impacts

Endangered Species.—Impoundment of the Duck River would eliminate riverine habitats to at least Duck River mile 191. Similarly the lower reaches of the tributary streams would be inundated. Most organisms which depend on the riverine habitat would be lost from the system. This would include most of the mussels and snails within the impoundment. There is no evidence to suggest that *Conradilla caelata* (endangered), found alive immediately downstream from Lillard Mill Dam (figure 2), would survive impoundment. The snails, *Lithasia geniculata geniculata*, *Lithasia armigra duttoniana*, and *Leptoxis praerosa* would be expected to be eliminated in the area. A complete discussion of endangered species constraints is included in Appendix A.

Aquatic Ecology.—Compositional shifts within the phytoplankton community may at times involve excessive numbers of nuisance algal taxa including blooms of blue-green algal cells such as *Anabena*, *Aphanizomenon*, and *Microcystis*. These are capable of producing obnoxious tastes and odors and have been reported to cause toxicity to both agricultural and public water supplies. Other phytoplankton cells such as *Synedra* may be produced in sufficient numbers to cause filter clogging problems in municipal water treatment facilities. It is not possible to completely predict the trophic status of Columbia Reservoir due mainly to the lack of a sufficient understanding of all factors involved (Appendix B).

A number of undesirable and weedy species of aquatic plants may colonize some of the 3,900 acres that would be available for rooted aquatic plants (macrophyte growth). Excessive growths of weedy species would enhance mosquito production, reduce recreational potential, and create problems relating to water quality. Impoundment would destroy riverine and existing wetland habitats in addition to eliminating beds of a submersed plant (a river weed—*Podostemon*), which supports a large and diverse aquatic insect community (Appendix B).

Water Quality.—Potential adverse effects related to water supply use include elevated concentrations of iron and manganese, as well as taste and odor problems during blooms of nuisance species of algae. With the provision incorporated in the dam to ensure that all releases are high in dissolved oxygen, the reduced forms of iron occurring in the release should be reoxidized to insoluble forms that can be readily removed by conventional water treatment processes. However, soluble manganese is not as easily oxidized and some increase in concentra-

tions of soluble manganese can be expected downstream of the reservoir. This condition could be most evident during the initial few years of lake aging. Additional treatment can be provided at Columbia at modest cost to remove soluble manganese to acceptable levels. By utilizing the options of withdrawing water from various levels in Columbia Reservoir, taste and odor problems downstream from Columbia Dam can be minimized (Appendix B).

Completion of Columbia Dam may result in increased wastewater treatment costs at Lewisburg, Tennessee (figure 2). At present, Lewisburg discharges treated waste to Big Rock Creek above the embayment area which would be formed by Columbia Reservoir. The city is in the planning stage for improving its wastewater treatment plant including consideration of alternative discharge locations, one of which is piping its waste to Columbia Reservoir. If Lewisburg continues to discharge to Big Rock Creek after Columbia Reservoir is impounded, there may be a problem with nutrient enrichment of the Big Rock Creek embayment. Should this occur, nutrient removal could be required at the Lewisburg wastewater treatment facility resulting in increased treatment costs to the city.

Historical and Cultural Sites.—While the formal cultural review of the project area has not been completed, impacts on historic resources from this alternative would include inundation of four sites currently judged eligible for the National Register of Historic Places. One, the Rieves log house, represents the earliest settlement of this region (circa 1807). Two other houses judged eligible are located at the edge of the maximum shoreline contour on an island. There are at least another 12 structures on TVA-acquired lands that, while not judged eligible for the Register, are of some architectural interest. These might be affected indirectly or directly depending on the decisions regarding land use adjacent to the reservoir. The surroundings of the Pleasant Mount Presbyterian Church, the only site in the project area currently listed on the National Register, would be altered by the removal of houses below it and the replacing of this rural residential setting with waters of a reservoir. Replacement of road access and graves relocations at the church may be necessary as mitigation.

The area to be impounded contains a number of archaeological sites. These archaeological properties were surveyed in 1973 and some 300 prehistoric occupation sites have been identified. After National Register eligibility status has been determined, TVA would proceed to mitigate any impact on eligible properties. The work would follow, in general, a research design submitted by the University of Tennessee and accepted by TVA. Recovery of representative materials would be carried out before impoundment.

Recreation.—Fifty-four miles of stream now receiving some use for canoeing, floating, fishing, and other river-oriented recreation activities would be impounded. The slow moving, winding character of the river which gives it a quiet, pastoral quality suitable for novice and family canoeists and floaters would be lost.

The reservoir would be drawn down 27 feet each year exposing some previously inundated portions of the shoreline during the winter months when water-oriented recreation activity would be limited. The

greatest impact of the drawdown would involve the appearance of some 8,000 acres of reservoir land exposed.

Agriculture.—Some 27,500 acres of land would be lost to private ownership. This land has been used primarily for agricultural production including farm woodland. Major crops in the area are corn, soybeans, wheat, tobacco, and hay. About four-fifths of the 1969 sales of \$1.0 million was livestock or livestock products including milk, beef and hogs. The 1969 sales would have amounted to an estimated \$2.0 million at 1977 prices.

There are 4,200 acres of prime farmland¹ that would be inundated (36 percent of the land area excluding the river) and another 3,000 to 3,500 acres (23 percent) in the land around the reservoir. In addition, there are over 2,000 acres of land of state-wide importance, soils that would be inundated and almost 3,000 acres (20 percent of the land) around the planned reservoir. Additional acres classified as "other" are not suitable for crops but some of these acres are productive for pasture. No unique farmland has been delineated in the reservoir area.

Completing the project as planned would divert this land from agriculture to other uses with a resulting decline in farm income and the associated loss of business by firms supplying farmers and those purchasing and processing farm products. The gross value of this decline in farm-related business activity is estimated to be \$5.0 million annually in terms of 1977 prices.

LOW POOL-DOWNSTREAM RELOCATION ALTERNATIVE

Description

This alternative proposes that Columbia Dam be completed and operated at a low pool that would not impound the reach of the Duck River just downstream from Lillard Mill Dam (mile 179) known to be the habitat for the endangered mussels. In addition the alternative includes a downstream relocation program in the Duck River floodplain through the city of Columbia.

The low pool would normally impound water to elevation 600 extending some 36 miles up the Duck River to about 173 (figure 4). It would provide the storage requirements necessary to assure the Columbia area of a water supply for at least 50 years in the future. The low pool would have no detention capacity for flood control. In its place this study proposes that TVA support a downstream relocation program that would enable residents and businesses in the most vulnerable areas along the Duck River floodplain in the city of Columbia to relocate to flood-free locations. This program would only partially replace the local flood control benefits of the project as planned; but it would benefit those most directly impacted by the frequent flooding of the Duck River.

¹ Prime farmland is land best suited for producing food, feed, forage, fiber, and seed crops. It has the soil quality, growing seasons and moisture supply needed to produce high yields of crops economically when treated and managed according to modern farming methods. It does not have a serious erosion hazard.

Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.

Additional of Statewide Importance is, in addition to prime and unique farmlands, significant for the production of crops as determined by the appropriate state agencies.

The low pool alternative assumes that Columbia Dam would be completed essentially as described in the section on Project as Planned, with the exception of the two spillway bays which have been left down for diversion purposes. Spillway crests in these two bays would be constructed to elevation 585 for one and elevation 600 for the other instead of elevation 594 as now designed (figure 3). This modification would increase flexibility for water quality control and flood operations and would still allow impounding at a higher elevation in the future should that option prove to be desirable.

The low pool would be operated at normal maximum elevation 600 during most of the year. It would fluctuate between elevations 600 and 605 as required to handle moderate flows that might be expected during those months. An occasional rise to around elevation 610 at the dam might be required during moderate to high flows. This would be especially true should potential nuisance level eutropic conditions occur in the reservoir that would require making downstream releases delicate. The longer the reservoir would have to be held at the higher elevation the greater the chances of predator fish preying upon the smaller host fish in the Lillard Mill area. Conversely, if flows should become so great that downstream releases would have to be made by opening spillway gates, downstream water users could be adversely impacted. The success of this operation would depend on intensive water quality monitoring.

During a minimum six weeks period in January and February the reservoir would be drawn down to elevation 590 to control the potential growth of excessive quantities of aquatic weeds. This drawdown would dewater the colonized areas allowing the weeds to dry up and die. During these winter months nuisance level eutrophic conditions would not be a problem so all discharge facilities could be operated to handle the larger flood flows that have historically occurred during those months. Even so, the reservoir might be expected to rise from the elevation 590 drawdown to elevation 608 at the dam during a flood of ten-year frequency and to about elevation 613 at the dam during a 100-year frequency. In the Lillard Mill Dam vicinity these elevations would be 641 and 645, respectively, the same as under existing conditions. At the Interstate 65 crossing of the Duck River (mile 151.5) the flood of 100-year frequency would pass at elevation 617, about one foot below low steel on the existing bridges. These infrequent rises during flooding would last for a few days. Although there is concern about predator fish from the reservoir preying upon the smaller host fish at times when the reservoir would be above elevation 600, the high stream velocities during flooding would tend to restrict the upstream migration of these fish.

Sediment accumulation could also be a problem in operating the low pool. Estimates, based on observed data, show that sediment could be expected to fill the low pool to normal maximum elevation 600 in about 100 years. There has been a downward trend in sediment loads over the past 45 years as erosion control measures and improved agricultural practices have been put into more general use. To the extent that this trend continues into the future, the 100-year estimated time for accumulation of sediment would be increased. Even at the present rate, the low pool could be expected to meet projected water supply needs

in the Columbia area for at least the next 50 years. Further assurance in meeting the future water supply needs would be provided by raising the winter level of Normandy Reservoir to provide additional supplementary storage should it be required. The combined storage in Columbia low pool and Normandy Reservoir would assure meeting the water quality control objective and projected water supply requirements in the Columbia area for many years beyond 50 years.

The present flood control operation at Normandy is based on the combined flood detention capacity in Normandy and Columbia Reservoirs to add to the effectiveness of the TVA water control system. With the absence of the Columbia capacity this system operation would not be possible and the flood detention capacity at Normandy could be reduced and still allow the flood reduction on agricultural land and at Shelbyville similar to the present operation. The specific modifications in the Normandy operation would include raising the winter level from the present 859 elevation on January 1 to elevation 866.5. The guide curve would also be further modified to allow filling of the reservoir to its normal maximum level, elevation 875, by the first of May instead of May 15 (figure 5). The modification would have no significant adverse effects on the Normandy operation.

An estimated 18,500 acres of land would be included in the purchase boundary for this alternative (table 4). Included in this land are areas which would be developed for recreation, wildlife management, and agriculture demonstration (figure 4). This land includes all of the approximately 11,100 acres already acquired for the project as of September 30, 1978, and an additional 7,400 acres that would have to be purchased. If this alternative is selected further consideration should be given to the land uses identified in this preliminary study and in determining if any of the land should be returned to the private sector.

The low pool alternative would affect some 25 miles of highways, most of which are secondary. Some of these roads have been or are being constructed at this time. The two bridges of Interstate 65 spanning the Duck River would not have to be rebuilt as they would with the project as planned.

The voluntary downstream relocation program, proposed as a part of this alternative, would be carried out by the city of Columbia with financial and technical assistance from TVA. As now envisioned it would include the relocation of 26 residences and businesses from the floodplain in the Riverside community, protection of the school in the same area, and relocation of some 17 structures in the Helms Branch area east of the main business district (figure 4). This program would partially compensate for the loss of flood detention capacity that was included in the planned project. The cleared areas could be utilized for park, recreational, or other uses compatible with the flood hazard and the city of Columbia floodplain regulations.

Further studies are required especially in the Helms Branch area where constructing a levee and pumping station should be considered as an alternative to relocation.

Benefits

The low pool—downstream relocation alternative would provide similar types of benefits to those provided by the project as planned.

These benefits are described in the following paragraphs. (A river development plan outside the impoundment area is discussed in Appendix C.)

Flood Damage Prevention.—The downstream removal program would provide an opportunity for residents and occupants of the flood hazard area of the city of Columbia to locate to flood-free locations, thereby reducing the perpetual threat from destructive flooding.

Water Supply and Enhancement Employment.—The project would improve the streamflow situation in the Columbia area in much the same way as the original project. The low pool alternative would pass the 160 plus cubic feet per second flow now being maintained at Shelbyville by operation of Normandy Dam for water quality control and water supply. Up to an additional 100 cubic feet per second would be released from storage in the low pool as may be required for water supply. The initial combined release would be a minimum of 215 cubic feet per second and could be increased to a maximum of at least 250 cfs as required. This dependable streamflow would improve the water supply situation for present industry and encourage expansion, would cover the future requirements for the water grid system in Maury and Marshall Counties, and should attract new industry to the area. The new industrial and service employment opportunities could provide an addition of some 1,000 jobs within 25 years, the same as the planned project.

Biological.—The low pool would result in increased biological productivity of the water body similar to the project as planned.

Land Enhancement.—Land enhancement associated with the low pool would be less than that anticipated for the project as planned due to the reduced size of the reservoir and removal of the need for improvements to Interstate 65.

Recreation.—At elevation 600 the surface area of the low pool would cover some 3,700 acres. In comparison with Columbia Reservoir as planned, this pool would be about one-fourth the size, would be some 18 miles shorter in length and have considerably less shoreline. It would lack much of the wide and deep expanse of the high pool and would have the characteristics of a winding river over most of its length as compared to the upper reaches of the high pool. Based on an analysis of land-to-water relationships, lake configuration, and potential of other lakes in the vicinity, the recreation potential of this project would be limited. However, the presence of a relatively more stable pool would be a positive attribute that would help to offset some of these limitations. Recreation activities along the lower ten miles having a lake setting would be supported by a moderate size public recreation area including a marina. A public park would also be envisioned and six boat launching ramps would be sited at various locations to provide an even distribution of the lake access opportunities. A demonstration regional recreation/environmental education center (figure 6) would be located at Cheek Bend (mile 155) with an associated educational outpost at Lillard Mill. Additional access sites would also be located upstream from Lillard Mill Dam and in the vicinity of Henry Horton State Park. This would provide easy access to some 12 miles of stream for river recreation (figure 4). This low pool with its reduced surface acreage would of course offer reduced

opportunities for boat and bank fishing. Artificial fish attractors would be installed to replace cover removed from the reservoir and one fishing pier and shoreline fishing facility would be developed. The ability to develop the downstream warm water fishery as planned for the original project would be questionable.

Wildlife.—A viable wildlife management program would be developed in the Fountain Creek arm of the reservoir and in the Cheek Bend area on some 6,000 acres of land already largely in TVA ownership (figure 4). Agricultural land would be farmed under arrangements with local farmers and the Tennessee Wildlife Resources Agency. Management options, especially hunting, might be limited by the anticipated Columbia urban expansion along State Route 50, particularly in the Fountain Creek area. Management in the Cheek Bend area would complement public recreation development plans for that area. The wildlife management program would be expected to complete TVA's mitigation of impacts to fish and wildlife from the entire Duck River Project.

Historical.—The proposal to remove and relocate a representative sampling of houses depicting the early growth pattern of this region applies to this alternative. (See Appendix D.) Logs and related material from the 50 or more non-Register eligible log buildings which have been acquired by TVA could still be collected and stored. These materials would be intended for future public or quasi-public agency use.

Archaeological.—Since the low pool would cover only one-fourth of the land impounded by the project as planned the number of archaeological sites inundated would be reduced. Any land to be sold or transferred would be handled according to established procedures concerning the protection of archaeological resources. If significant archaeological sites are found some of them might also contribute to the interpretation of the history of the area.

Adverse or Irreversible Impacts

Endangered Species.—Although there would be no direct impact on the mussel population of *C. caelata*, there exists the possibility of an indirect impact since at a critical stage in their life cycle mussel larvae are an obligate parasite on host fish. That is, the young mussels attach themselves to the gills of the host fish in order to grow. Although the fish host necessary for completing the life cycle of *C. caelata* is not known with certainty, there is a possibility that the impoundment could affect this fish and *C. caelata* indirectly.

Snails which depend on a riverine environment would be eliminated in impoundment areas where there is no significant flow. This includes *Lithasia geniculata*, *geniculata*, *Lithasia armigera duttoniana*, and *Leptoxis praerosa*. A complex discussion of endangered species constraints is included in Appendix A.

Aquatic Ecology.—The potential for adverse impacts associated with nuisance-level phytoplankton production in the low pool would be greater than that described for the project as planned. The potential for adverse impacts for rooted aquatic plants (macrophytes) would be greater than those mentioned for the planned project but the acres available for colonization would be less than half (Appendix B).

Water Quality.—It is not possible to predict with certainty the

frequency of adverse eutrophic conditions in the low pool; however, operating flexibility would be provided to minimize the chances of tastes and odors associated with blue-green algal blooms in the reservoir, occurring in the releases and adversely impacting downstream water supplies. The reduced volume of water available in the hypolimnion decreases the ability for operation during extended periods of algal related problems in the epilimnion. However, these extended periods should be rare. The use of selective withdrawal of water from the lower level of the pool may adversely impact the ability to develop the warmwater fishery downstream of the dam as included in the project as planned. Releases through the regulating sleeve valves would effectively result in oxidation of the soluble forms of iron and partial oxidation of the soluble manganese concentrations. (See Appendix B.)

Historical and Cultural Sites.—While the review of cultural properties has not yet been completed with the State and the Advisory Council on Historic Preservation, only one house currently judged eligible for inclusion in the National Register, the Rieves House, would be affected by the low pool. An undetermined number of archaeological sites would be inundated. Mitigation of impact would be undertaken in accordance with established procedures if there are sites among these which are judged eligible for addition to the National Register of Historic Places.

Recreation.—Thirty-six miles of stream now receiving some use for canoeing, floating, fishing, and other river-oriented recreation activities in the Columbia area would be impounded and lost for canoeing and floating. Sediment accumulation in the reservoir might adversely affect some recreation activities, especially in later years. The ten foot drawdown would expose some 1,400 acres of previously inundated portions of the shoreline during the winter months when water-oriented recreation would be limited. This impact would largely involve the appearance of the reservoir.

Agriculture.—The low pool alternative would remove some 18,500 acres of land from private ownership. Thus, the amount of agricultural land needed would be materially reduced when compared with the project as planned. The amount of prime farmland² to be inundated would be only a third as much (1,400 acres). Also there are about 600 acres of farmland of state importance in the area to be inundated and other acres that could be used productively for pasture. For the land in the purchase area around the reservoir, roughly 36 percent is prime farmland, 19 percent is additional farmland of statewide importance and some land could be used productively for pasture.

The estimated farm sales for the low pool project area is 50 percent of that for the project as planned (\$1 million in 1977 dollars). The gross value of the decline in farm related business activity in 1977 dollars is estimated to be \$2.5 million.

NO IMPOUNDMENT—DOWNSTREAM RELOCATION ALTERNATIVE

This alternative is in three separate parts. First, the earth portion of Columbia Dam would be removed and no water would be impounded. In addition the operation of Normandy Reservoir would

² See footnote 1 on p. 127.

then be modified so that releases from Normandy Dam could be increased to maintain the combined water quality control objective and projected water supply needs in the Columbia area for at least the next 50 years. Second, the 54 mile reach of the Duck River from the dam site to mile 191, above Henry Horton State Park, would be developed in a planned manner. Three levels of river related development are proposed for this reach, varying all the way from full recreation, cultural resources development, and a wildlife management program with agricultural production and demonstration to providing a few access points for river recreation. (figures 7a, 7b, and 7c) Any land purchased in the area which could not be utilized under the level of development implemented would be returned to the private sector. Third, the downstream relocation program described under the Low Pool—Downstream Relocation Alternative would be utilized.

The first two actions are summarized in the following sections. The third, downstream relocation, was previously described.

1. Dam Removal—Normandy Operational Change

Description

That portion of the earth fill at Columbia Dam already in place would be removed to reduce floodplain impacts and hazards. Studies show that the concrete spillway and nonoverflow section could be left in place without adversely affecting flood conditions in the area. (Removal of this concrete would increase the costs by about \$1.7 million.) This alternative assumes that the concrete portion would be left in place and isolated by fencing, leaving to a later time the final decision on its removal.

The winter flood control operation of Normandy Reservoir would be modified to meet water quality control objectives and projected water supply needs in the Columbia area. The existing flood control operation at Normandy is based on the combined flood detention capacity in Normandy and Columbia Reservoirs which would add to the effectiveness of the TVA flood control system. With the absence of the Columbia capacity this system operation would not be possible and the flood detention capacity at Normandy could be reduced and still allow for flood reduction on agricultural land and at Shelbyville similar to the present operation. The specific modifications in the Normandy operation would include raising the winter level from the present 859 elevation on January 1 to elevation 866.5. The guide curve would also be further modified to allow filling of the reservoir to its normal maximum level, elevation 875, by the first of May instead of May 15 (figure 5). The modification in operation would not adversely impact reservoir levels at Normandy or the temperature regime for the cold water fishery downstream from the dam.

Benefits

Water Supply and Enhanced Employment.—With the modifications in Normandy Reservoir operation there would be sufficient storage in Normandy Reservoir to maintain streamflow of up to 250 cfs at Columbia for water quality control and water supply purposes. This level of streamflow would be sufficient to provide 155 cfs at Columbia for water quality control and up to 100 cfs for water supply which would satisfy the water supply needs for at least the next 50

years. The water supply benefit and associated enhanced employment benefit would be the same as for Project As Planned and the Low Pool—Downstream Relocation Alternative.

Adverse and Irreversible Impacts

Some temporary increased turbidity and concentration of suspended solids may be expected in the river during the removal of the earth portion of the dam. No significant adverse impacts would be associated with the operational change at Normandy.

2. River Development

The following subsections address the three levels of river development in the 54 mile reach under study and describe the benefits and adverse impacts associated with them. If this alternative is selected, further consideration should be given to the development identified in this study and in determining what, if any, land should be returned to the private sector. (Appendix C discusses additional Duck River development opportunities outside the scope of this study.)

Maximum Development Level (figure 7a)

Components and Benefits.—The following represent the scope of activities proposed for this level of development.

A. A minimum 50-foot "greenbelt" easement on either side of the stream from the dam site (mile 136.9) to Henry Horton State Park would be maintained for bank stabilization, erosion control, flood plain management and enhancement of wildlife. The "greenbelt" easement will also maintain the pastoral beauty of the river. The easement would be obtained at the rate of 12 acres per river mile.

B. Eight river access sites each consisting of a parking lot, boat/canoe launching ramp, and bank fishing facilities comprising an average of two acres each, would be developed for boating, fishing and consumptive-non-consumptive wildlife uses.

C. A total of 12 informal, primitive camping areas (accessible by river only) would be developed. Each site would average two acres in size. Adirondack-type shelters would be constructed.

D. A main hiking trail approximately 54 miles in length, paralleling the river within the "greenbelt" and linking significant natural history features would be constructed. This trail would facilitate other river oriented recreation use.

E. Sites containing significant natural, historical, cultural, and/or archaeological resources which have been identified, would be proposed for management and development for interpretive and environmental education use. These areas will be joined by an interlocking system of additional hiking trails.

F. A demonstration regional recreation/environmental education center (figure 6) would be built at Cheek Bend (mile 155) with an associated educational outpost constructed at Lillard Mill (mile 179). Approximately 100 acres of additional land should be purchased to eliminate inholdings in the Cheek Bend area and to acquire land at Lillard Mill.

G. Improvements would be undertaken at suitable sites throughout this stretch of the river to provide improved fishery habitat and improved conditions for water based recreation.

H. Catchable size fish such as channel cat would be stocked on a put and take basis to accommodate increased fishing demand.

I. The central theme for the Columbia unit of the Duck River Project would shift from reservoir oriented recreation-wildlife management to a riverine system. If this occurred, the lands already acquired from the dam site upstream to and including the Fountain Creek area and the Cheek Bend area upstream from the interstate lend themselves well for development as a National demonstration of wildlife life management-agriculture-outdoor recreation. Wildlife enhancement would be instituted on some 9,600 acres acquired to date and an additional 3,200 acres within the original purchase boundary which have not yet been purchased. The additional acreage would eliminate inholdings. Agricultural land would be farmed under arrangements with local farmers and the Tennessee Wildlife Resources Agency. Land could be leased for crop production, livestock or dairy farming. Dairy and livestock units will involve a long term lease designed to facilitate private capital development, demonstrate improved management and farming systems for the area, and to insure that appropriate practices are utilized to prevent soil loss. Technical assistance will be provided and operators will agree to set goals, keep adequate farm records, and make investments similar to participants in the TVA Land Grant University Rapid Adjustment Program. Sharecropping, an arrangement where by certain percentage of crops grown are left for wildlife use, may also be utilized. Consequently, agricultural lands, particularly prime lands, would be kept productive.

J. Additional wildlife management practices such as constructing nesting structures would be utilized along the river greenbelt corridor.

K. TVA could relocate and restore certain houses already owned by TVA in an appropriate setting near Milltown (Lillard Mill). These houses are examples of the progress of this area as portrayed through architectural style from earliest settlement through the pioneer period. They would form a record of the history within the watershed, and also of the westward movement in Tennessee. A plan, for this and other elements concerning cultural resources is set forth in Appendix D.

L. Some 1,500 acres of land purchased to date would be returned to the private sector.

Adverse or Irreversible Impacts.—The following represents the range of impacts which can be expected for this level of development.

A. Short-term impacts to recreation areas during the construction of facilities in the nature of siltation and habitat disturbance will occur.

B. Some 13,200 acres will be lost to private ownership (table 4). This impact, however, will be offset by the managed recreational, wildlife and agricultural areas under this option.

C. Increased fishing pressure could deplete certain native game species. This impact may be mitigated if stocking of catchable size fish proves feasible. Similarly competition and predation by stocked fish may adversely affect native species. This effect may be offset by the improvement of fishery habitat.

D. Uncontrolled access and river use at Lillard Mill could disturb the endangered mussel habitat, including the increased opportunity for illegal collection. These impacts should be avoided by controlling ac-

cess and area development planning. TVA is studying ways to avoid such adverse effects.

E. Increased public use of the natural resource must be expected. Facility and access planning will help to lessen impacts from public use.

Medium Development Level (figure 7b)

Components and Benefits.—The following represent the scope of activities proposed for this level of development.

A. A minimum 50-foot "greenbelt" easement on either side of the stream from the Interstate 65 crossing of the Duck River (mile 151) to Lillard Mill Dam (mile 179). This easement would be maintained for bank stabilization, erosion control, and floodplain management.

B. Four river access sites each consisting of a parking lot, boat/canoe launching ramp, and bank fishing facilities comprising an average of two acres each, would be developed on the 30-mile stretch. Additional sites downstream from I-65 will be developed for boat access only.

C. A total of seven informal, primitive camping areas (accessible by river only) would be utilized.

D. A hiking trail of 30 miles in length would be developed in conjunction with the greenbelt.

E. The demonstration regional recreation/environmental education center (figure 6) at Cheek Bend (mile 155) would be constructed as previously described.

F. Wildlife enhancement would be instituted on some 7,000 acres purchased to date and on some 2,000 acres within the original purchase boundary which have not yet been purchased. Development would be similar to that described under the maximum level except that the Cheek Bend area would not be utilized.

G. Wildlife management practices would be utilized along the river greenbelt corridor.

H. The historic resources program would be the same as described in Appendix D.

I. Improvements would be undertaken at suitable sites to provide improved fishery habitat and improved conditions for water based recreation.

J. Some 4,000 acres of land already purchased would be returned to the private sector.

Adverse or Irreversible Impacts.—The following represent the range of impacts which can be anticipated for this level of development.

A. Short-term impacts will be as previously described.

B. About 9,400 acres will be lost to private ownership (table 4).

C. Increased fishing pressure would not be expected to be a serious problem at this level of development.

D. Adverse impacts could occur at Lillard Mill access as previously described.

E. Decreased public use would be expected under this option, requiring less extensive planning to avoid undue stress.

Minimum Development Level (figure 7c)

Components and Benefits.—The following represent the scope of activities proposed for this level of development.

A. Eight river access sites each consisting of a parking lot and boat/canoe launching ramp, and comprising an average of two acres each, would be developed.

B. A total of four informal, primitive camping areas (accessible by river only) would be developed.

C. Wildlife enhancement would be instituted on some 5,000 acres of land largely in TVA ownership in the Fountain Creek area for development in the manner previously described.

D. The historic resources program would consist of the following:

1. Measure, draw, and photograph structures judged to be representative of the historic and architectural growth of the area.

2. Construct a scale model of these structures for display and interpretation in the area.

3. Collect and store log materials from other acquired structures for use in restoration and preservation projects.

4. Take appropriate mitigative action on archaeological sites impacted.

E. Some 6,600 acres of land already purchased would be returned to the private sector (table 4).

Adverse or Irreversible Impacts.—The following represent the range of impacts which can be anticipated.

A. Short-term impacts will be as previously described.

B. About 5,100 acres will be lost to private ownership.

C. Adverse impacts could occur at Lillard Mill access as previously described.

D. Decreased public use would be expected.

COMPARISON OF ALTERNATIVES

Table 1 displays the economic analysis for the various options. Benefits and costs are expressed in 1978 price levels. They were converted to an equivalent average annual value over a 50-year economic life at a discount rate of $6\frac{7}{8}$ percent, which is the most recent rate specified for use in Federal water and related land resources projects. Since this is a partially completed project, only those factors which are still variables are included in the analysis. Benefits which have been achieved and costs which have been incurred (sunk) are fixed and are not pertinent to any decision to proceed, stop, or modify. Consequently, the costs shown are remaining costs and the benefits shown are remaining benefits. The analysis included both those TVA and non-TVA costs which would be required to achieve the projected benefits. Some or all of the land which has been purchased thus far would be retained for each alternative, except the liquidation alternative. This land, in each case, could be sold if the project were liquidated. Thus, its value is a variable and is included in the economic analysis as recoverable costs foregone.

The downstream removal program is not supported by the flood control benefit.

An additional option shown on table 1 involves liquidating the project by removing the earthen dam, completing any necessary highway relocation and restoration work that may be required and selling all

of the land purchased to date. It would achieve the water supply and enhanced employment benefits through the reservoir operational change at Normandy.

Significant environmental impacts mentioned in the text under the section describing the various options are summarized in table 2.

Capital costs remaining to complete the project under the various options are compared in table 3. Total costs are shown in 1978 dollars and actual construction dollars based on the completion dates shown. The degree of accuracy of the cost estimates varies greatly, depending on what is known about the work involved. The costs for the project as planned have the highest degree of accuracy while the costs for land and facilities associated with river development have the lowest.

TABLE 1.—ECONOMIC ANALYSIS

[In millions of dollars]

Item	Project as planned	No impoundment, downstream removal				¹ Liquidation
		Low pool downstream removal	Maximum river development	Medium river development	Minimum river development	
Capital costs:						
TVA.....	\$72.0	\$46.0	\$21.0	\$19.0	\$12.0	\$4.0
Non-TVA.....	6.0	.703	.004	.003	.001	-----
Total, capital costs.....	78.0	46.703	21.004	19.003	12.001	4.0
Annual costs:						
Interest and amortization ²	6.739	3.616	1.512	1.370	.870	.285
Operation and maintenance, replacements:						
TVA.....	.156	.400	.350	.325	.075	-----
Non-TVA.....	.200	.040	.040	.035	.025	-----
Recoverable costs foregone.....	.307	.307	.245	.181	.072	-----
Total, annual costs.....	7.402	4.363	2.147	1.911	1.042	.285
Annual benefits:						
Flood control.....	.100	.012	.029	.029	.029	-----
Water supply.....	1.326	1.326	1.326	1.326	1.326	1.326
Recreation.....	-----	-----	-----	-----	-----	-----
Agriculture.....	-----	.076	.152	.152	.076	-----
Enhanced employment.....	1.170	1.170	1.170	1.170	1.170	1.170
Total, annual benefits.....	-----	-----	-----	-----	-----	-----
Net, annual benefits.....	-----	-----	-----	-----	-----	-----

¹ This assumes modification in Normandy operation.

² Interest equals 6½ percent, economic life equals 50 years, 1978 price levels.

TABLE 2.—ENVIRONMENTAL CONSIDERATIONS

Item	Reservoir as planned	Low pool	No impoundment river development
1. Endangered and threatened species:			
Endangered—Federal <i>conradilla caelata</i> .	Last significant population in Duck River (Lillard's Mill) will be destroyed.	Last significant population in Duck River (Lillard's Mill) may be indirectly affected.	May be indirectly affected by historic development at Milltown.
Proposed endangered—Federal <i>lithasia io geniculata lithasia io armigera duttoniana leptoxis (anculosa) praerosa</i> .	54 miles of riverine habitat would be destroyed.	36 miles of riverine habitat would be destroyed.	Potential disturbance habitat due to increased public use.
Threatened—State <i>aquali</i> .	54 miles of river, and 32 miles of tributary habitat would be destroyed.	36 miles of river, and 14 miles of tributary habitat would be destroyed.	No anticipated change in population levels.

TABLE 2.—ENVIRONMENTAL CONSIDERATIONS—Continued

Item	Reservoir as planned	Low pool	No impoundment river development
2. Aquatic ecology:			
Phytoplankton.....	Potential nuisance-level production.	Potential nuisance-level production to a greater degree than for planned project.	No elevation of phytoplankton production.
Aquatic plants.....	Potential excessive growth of undesirable species on some 3,900 acres.	Potential excessive growth of undesirable species on some 1,400 acres to a greater degree than for the planned project.	No increase in aquatic plant growth.
3. Water quality downstream:			
Iron and manganese.....	Potential elevated concentrations.	Potential elevated concentrations.	No significant change in concentrations which have occurred in the past.
Blue-green algal blooms.....	Potential taste and odor problems.	Potential taste and odor problems to a greater degree than for planned reservoir.	No change in taste and odor problems.
4. Historical and cultural:			
Historical sites.....	Inundates four historic sites judged eligible for the National Register. Two other eligible sites at edge of maximum pool.	One historic site judged eligible for the National Register would be affected.	Historic sites would be preserved but potential impact from increased public use in the area.
Archaeological.....	Permanent inundation of an as yet undetermined number of archaeological sites on 4,300 acres. Temporary inundation annually of an as yet undetermined number of archaeological sites on an additional 8,300 acres.	Permanent inundation of an as yet undetermined number of archaeological sites on 2,300 acres. Temporary inundation annually of an as yet undetermined number of archaeological sites on an additional 1,400 acres.	Potential impact from increased public use in the area.
5. Recreation:			
River.....	54 miles of Duck River now receiving some use for canoeing, floating, fishing, and other river-oriented recreation would be impounded. Downstream warm water fishery would be created.	36 miles of Duck River now receiving some use for canoeing, floating, fishing, and other river-oriented recreation would be impounded. Downstream warm water fishery questionable.	Duck River would be preserved for canoeing, floating, fishing, and other river-oriented recreation. Potential impact on natural resource from increased public use.
Lake.....	Creates a 12,600-acre lake during the summer recreation months. The winter drawdown during January would expose some 8,300 acres of previously inundated portions of the shoreline.	Creates a 3,700-acre lake during the summer recreation months. The winter drawdown during January would expose some 1,400 acres of previously inundated portions of the shoreline.	No permanent impoundment.
6. Agriculture.....	Some 27,500 acres of land would be lost to private ownership. Some 4,200 acres of prime farmland and 2,000 acres of statewide importance would be inundated. An additional 6,000 acres of land in these two categories lie around the reservoir within the purchase boundary.	Some 18,500 acres of land would be lost to private ownership. Some 1,400 acres of prime farmland and 600 acres of statewide importance would be inundated. An additional 8,000 acres of land in these two categories lie around the reservoir within the purchase boundary.	Land required for river development would be lost to private ownership as follows: Maximum development—13,200 acres; medium development—9,400 acres; minimum development—5,000 acres.

TABLE 3.—ESTIMATE OF COST TO COMPLETE

[In thousands of dollars]

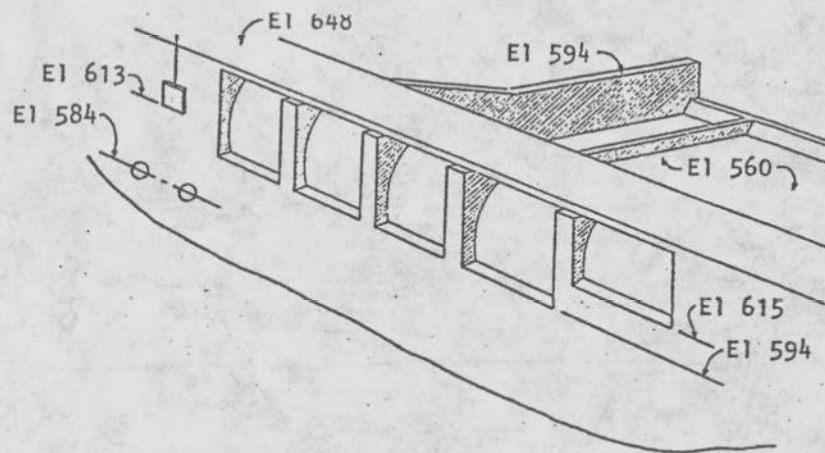
Item	Project as planned	Low pool downstream removal	No impoundment, downstream removal		
			Maximum river development	Medium river development	Minimum river development
Land and land rights:					
Land purchase and acquisition expense.....	\$20,000	\$9,150	\$4,000	\$2,750	\$65-
Land sales less sales expense.....			-625	-1,640	-2,97-
Net total land and land rights.....	20,000	9,150	3,375	1,110	-2,32-
Relocations and protections:					
Highways and bridges.....	19,733	8,547	7,313	7,313	7,31-
Railroads.....	38				
Other structures.....	5,564	3,137	570	570	57-
Total relocations and protections.....	25,335	11,684	7,883	7,883	7,88-
General yard improvements.....	637	637			
Reservoir.....	3,972	2,981			
Concrete dam and spillway.....	2,682	2,682			
Earth main dam.....	1,551	1,551			
Sluiceways.....	1,010	1,010			
Access roads for permanent use.....	397	397			
Vector control facilities.....	416	380			
Recreation facilities and cultural.....	1,727	3,079	2,152	2,060	6-
Radio gaging and control facilities.....	5	5			
Removal and restoration:					
Riverbank and main dam riprap.....			50	50	5-
Earth main dam and diversion dike.....			750	750	75-
Construction plant.....			80	80	8-
Revegetate clearer reservoir.....			110	110	11-
Erect security fence.....			30	30	30
Conclude miscellaneous contracts.....			970	970	970
Total removals and restorations.....			1,990	1,990	1,990
Construction plant, equipment, and inventories.....	-664	-664	-664	-664	-664
Construction supervision and services.....	9,138	5,993	2,972	2,947	2,424
General engineering and design.....	1,417	594	594	594	594
Administrative and general expense.....	4,616	3,019	1,481	1,467	1,208
Project contingency.....	6,565	4,306	2,021	2,417	1,625
Total expenditures (1978 dollars).....	78,804	46,804	21,804	19,804	12,804
Change in commitments.....	-6,804	-6,804	-6,804	-6,804	-6,804
Total obligations (1978 dollars).....	72,000	40,000	15,000	13,000	6,000
Escalation.....	24,000	8,000	3,000	3,000	2,000
Total obligation (based on construction schedule).....	96,000	48,000	18,000	16,000	8,000
Downstream removals.....		6,000	6,000	6,000	6,000
Downstream removals (based on construction schedule).....		7,000	7,000	7,000	7,000
Total cost to complete (1978 dollars).....	72,000	46,000	21,000	19,000	12,000
Total cost to complete (based on construction schedule).....	96,000	55,000	25,000	23,000	15,000
Construction start.....	(¹)	(¹)	(¹)	(¹)	(¹)
Construction complete.....	(²)	(²)	(²)	(²)	(²)

¹ October 1, 1978.² June 1985.³ June 1981.

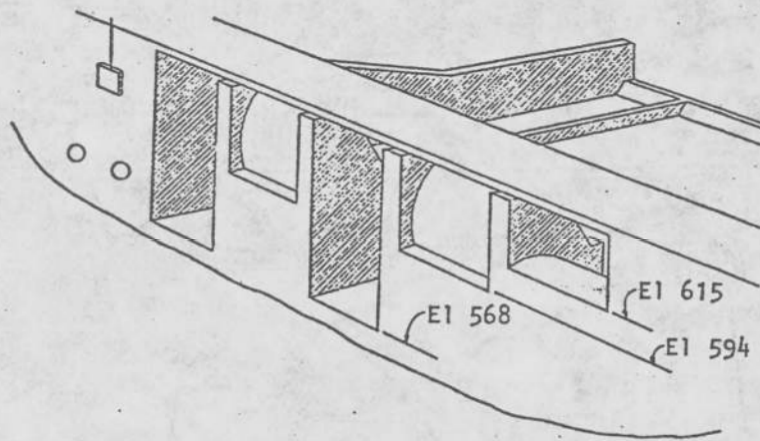
TABLE 4.—LAND REQUIREMENTS

	Acres—(approximate)			
	Required	Acquired land ¹ to be retained	Additional to be acquired	Excess to be sold
Reservoir as planned.....	27,500	11,100	16,400	
Low pool.....	18,500	11,100	7,400	
No impoundment-river development:				
Maximum.....	13,200	9,600	3,600	1,500
Medium.....	9,400	7,100	2,300	4,000
Minimum.....	5,100	4,500	600	6,600

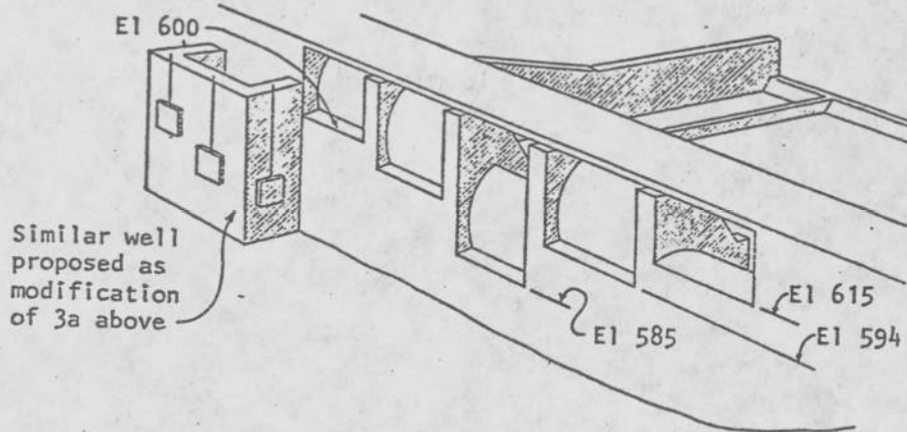
¹ The study is based on 11,100 acres of land acquired through Sept. 30, 1978. Since that date some 1,000 additional acres have been acquired.



3a - Spillway as planned



3b - Spillway as presently constructed



3c - Spillway for low pool alternative

FIGURE 3 - COLUMBIA SPILLWAY

APPENDIX A

ENDANGERED SPECIES

Seven species of endangered mussels have been listed as occurring in the Duck River. The present status of these species in the Duck River based on intensive surveys by TVA and other sources is as follows:

1. *Epioblasma* (= *Dysnomia*) *turgidula*—presumed extinct by Stansbery in 1971.

2. *Epioblasma* (= *Dysnomia*) *florentina florenina*—presumed extinct by Stansbery in 1971.¹

3. *Epioblasma* (= *Dysnomia*) *Walkeri*—was last collected (alive) in 1964 at DRM 187.0 (Ohio State University Museum specimen).¹

4. *Quadrula intermedia*—was last collected (dead) at DRM 179.5 by Yokley in 1973.

5. *Toxolasma* (= *Carunculina*) *cylindrella*—was last collected (above the Normandy Dam site) in 1965 (Ohio State University Museum specimen).

6. *Plethobasus cooperianus*—listing has been based upon specimens collected alive at DRM 134.0 by Isom and Yokley in 1965. No specimens have since been found.

7. *Conradilla caelata*—has been found alive in the Duck River and is relatively abundant immediately downstream from Lillard's Mill Dam where it occurs with 18 other species of mussels. This bed extends approximately 0.8 mile downstream from the mill dam (DRM 179.4–178.6). Two freshly dead specimens of *C. caelata* were recently collected (October 1978) at Creek Island (DRM 178.2). Earlier surveys of the Duck River by Ortmann (1924), Isom and Yokley (1968), and van der Schalie (1973) reported *C. caelata* to be more widely distributed in the Duck River. However, recent surveys by TVA (1976 and 1978) have failed to document live *C. caelata* specimens at any other Duck River location except downstream from the old dam in the town of Columbia where it was transplanted in 1975 by Yokley. At this site, of the 49 specimens that had been introduced, 18 were observed in 1976 and one was found in 1978. *C. caelata* was transplanted downstream from the Shelbyville Dam in 1974, but all efforts to find these specimens since then have failed. A similar transplant had also been made to Little Cypress Creek in northern Alabama, however, no specimens of this species were found at the transplant site in a November 1978 survey. Outside the Duck River known populations of *C. caelata* occur in the Powell River and two specimens have been found in the Clinch River.

Additionally, six species of snails listed as occurring in the Duck River have been proposed for threatened and/or endangered status by the Department of the Interior. Intensive surveys by TVA in 1972, 1977 and 1978 have documented the following distribution information for these snail species:

¹In October 1978 a specimen tentatively identified as belonging to the *E. walkeri-florentina* complex was collected alive from downstream of Lillard's Mill Dam, photographed, and returned to the river. Verification of this identification has not been possible due to a photographic malfunction and inability to retrieve the specimen.

1. *Lithasia (Io) geniculata geniculata*—documented in the Duck River system (including the Buffalo River) and intermittently in the Tennessee River from TRM 8.2–203.9.

2. *Lithasia (Io) armigera duttoniana*—documented in the Duck River. Not known to occur outside the Duck River system.

3. *Leptoaxis (Anculosa) praerosa*—documented in the Duck River. Other documented locations include the Buffalo, Elk, Little Tennessee, and Nolichucky Rivers, Big Nance Creek, Cedar Creek, and intermittently in the Tennessee River from TRM 4.5–203.9.

4. *Lithasia (Io) salebrosa*—not documented in the Duck River. Present at various sites in the Tennessee River from TRM 5.3–258.0.

5. *Lithasia (Io) geniculata pinguis*—not documented in the Duck River or in the lower Tennessee River.

6. *Lithasia (Io) armigera jayana*—tentatively reported from five sites in the Duck River (DRM 131.0, 160.0, 187.0, 239.8, 245.0) based upon a few specimens collected in October 1978. These identifications will be verified by specialists.

Of these snail species only *Lithasia (Io) geniculata geniculata*, *Lithasia (Io) armigera duttoniana*, *Leptoaxis (Anculosa) praerosa*, and possibly *Lithasia (Io) armigera jayana* occur within the Columbia area. These species also occur both above and below the Columbia area in the Duck River.

The State of Tennessee (TWRA) has two species of fish listed on their State list as threatened, *Percina macrocephala* (longhead darter) and *Etheostoma aquali* (coppercheek darter). The coppercheek darter has been found by TVA throughout the project area. The longhead darter has not been found within the project area, but may exist there.

Two species of plants known to occur in Maury and Marshall Counties have been proposed for the Federal list of [threatened and/or] endangered plants. They are *Leavenworthia exigua lutea*, and *Lesquerella densipila*. Although only limited field surveys have been completed, neither of these are known to occur within the Columbia Project area.

APPENDIX B

WATER QUALITY RELATED CONSIDERATIONS

BACKGROUND

Low stream flows in the Duck River at Columbia, Tennessee, have historically been a reoccurring problem. In these situations, the streamflow has been insufficient to meet either the water supply requirements or the streamflow requirements to assimilate the treated organic waste discharges to protect downstream water quality. These two water uses are not mutually exclusive, for example, provisions to provide for water supply needs would be of little or no value if there were inadequate streamflows available to assimilate the resulting waste discharges with reasonable levels of waste treatment. Likewise, provisions to provide adequate streamflows to assimilate treated waste discharges are of no value if adequate streamflows are not available to meet the corresponding water supply requirements associated with the waste

discharge. Consequently, there must be a balance between the streamflow provided by any project alternative to ensure that adequate flows are provided to achieve both of these purposes simultaneously.

The simultaneous satisfaction of both the water quality control and the water supply needs at Columbia, Tennessee, was one of the primary objectives at the Duck River project as initially planned. The achievement of both of these needs is also a primary objective of the low pool and no impoundment alternatives.

EXISTING CONDITIONS

Water Quality

In general, water quality in the vicinity of Columbia, Tennessee, is good and is suitable for all uses. Soluble iron and manganese concentrations are low, and no undesirable effects have been reported at the Columbia, Tennessee, water treatment plant. Minor water quality problems associated with nonpoint source pollution have been identified within the Columbia area, primarily resulting from the extensive agricultural activity occurring in the Duck River Basin upstream of Columbia, Tennessee. These problems occur during periods of rainfall and are mainly related to increased concentrations of coliform bacteria, turbidity, and suspended solids.

The organic wasteload discharged to the Duck River in the Columbia, Tennessee, area has been documented to depress dissolved oxygen concentrations below an acceptable level (5 mg/l) during periods of low flow. With the closure of Normandy Dam in January 1976 minimum flow at Columbia, Tennessee, was increased and the low dissolved oxygen conditions have improved. Improved waste treatment planned in the Columbia-Mount Pleasant area should result in the elimination of the occurrence of low dissolved oxygen in the Duck River downstream of Columbia, Tennessee, provided streamflows of at least 155 cfs as maintained at DRM 132.8.

Aquatic Ecology (Nonfish)

Phytoplankton.—The phytoplankton community in the Duck River reflects changes brought about by the presence of Normandy Reservoir and several small mill dams. The phytoplankton standing crop is greater than for comparable nonimpounded rivers and is typified by a diverse algal assemblage. Because of the impoundments upstream of the Columbia Project area the species composition is more representative of a phytoplankton rather than a potamoplankton (i.e., planktonic organisms living and reproducing in impounded waters rather than in flowing waters) community.

The geologic formations of the Duck River Basin are rich in phosphorus and therefore can be expected to supply a constant amount of nutrient material into impoundments on the Duck River. In addition, discharges from Normandy Dam will consist of one or both of the following: (1) waters from the epilimnion which have the potential of being rich in phytoplankton and (2) hypolimnetic waters which may be rich in nutrients. Any one or combination of these discharges, when combined with tributary drainage into Columbia Reservoir, will most likely increase the probability of Columbia Reservoir being highly eutrophic.

Aquatic Macroinvertebrates.—The aquatic macroinvertebrate community of the Duck River represents a diverse well-balanced fauna. However, one notable exception has become evident through the mussel surveys conducted in recent years, especially 1976. The data indicate that the only remaining "mussel bed" within the project area occurs downstream of Lillard's Mill Dam (DRM179.0). *Conradilla caelata* Conrad occurs within this bed. The other two extant populations of *C. caelata* occur in the Powell and Clinch Rivers in Virginia and Tennessee. In 1974 Paul Yokley, working under TVA contract, transplanted three populations of *C. caelata* outside the project area, all of which have essentially failed. (One live specimen was collected below Columbia City Dam in 1978.)

Three snail species which appear on the Department of Interior's proposed list of threatened or endangered species have been confirmed in the project area. However, each of these species occur outside the project area where they will not be affected.

The Duck River, the tributary streams which would be impacted by the impoundment alternatives support a diverse well-balanced macroinvertebrate fauna.

Aquatic Macrophytes.—The Duck River from DRM 146 to DRM 172.1 consists of an alternating series of pools and riffles. Submerged species such as *Heteranthera dubia* (Jacquin) MacM., *Potamogeton nodosus* Poiret, and *Podostemon ceratophyllum* Michx. inhabit most riffles with *Justicia americana* being the dominant emergent species in both riffle areas and pools. Occasional colonies of duckweed (*Lemna*, *Spirodela*, *Wolffia*) cover the surface in a few sloughs adjacent to the main river channel.

The low gravel bars associated with the riffle areas are dominated by such woody taxa as *Salix nigra* Marsh., *S. caroliniana* Michx., *Platanus occidentalis* L., and *Acer saccharinum* L. with an occasional *Cephalanthus occidentalis* L. The herbaceous vegetation on these bars is rather sparse due to frequent inundation associated with fluctuations in water level following periods of rainfall. Also present along the mainstream are islands which are several feet above the summer water level of the Duck River. These islands are similar in composition to the flood plain forests adjacent to the river and are dominated by *Acer saccharinum*, *A. negundo* L., and *Fraxinus pennsylvanica* Marsh. with the herbaceous understory consisting primarily of several species of *Polygonum*, *Boehmeria cylindrica* (L.) Swartz, *Pilea pumila* (L.) Gray, *Impatiens capensis* Meerb., and *Verbesina alternifolia* (L.) Kearney. Original riparian vegetation is typically restricted to narrow bands along the river bank.

Areas which could be classified as wetlands are primarily confined to the adjacent flood plain of the Duck River and tributary streams. A few remnants of bottomland hardwood forests dominated by *Acer saccharinum*, *A. negundo*, *Fraxinus pennsylvanica*, and *Platanus occidentalis* remain, but most have been destroyed by drainage and clearing associated with agricultural practices and reservoir preparation.

No aquatic or wetland species were observed that are on the Tennessee rare plant list (Committee for Tennessee Rare Plants, 1979) or the Federal list of endangered and threatened plant species.

Wastewater Treatment (Organic Wastes)

In the Columbia-Mount Pleasant area there are 12 wastewater discharges. Two of these are municipal waste discharges from the cities of Columbia and Mount Pleasant. The remainder are industrial process, cooling, and sanitary waste discharges. Only two of the industrial discharges contain carbonaceous oxygen demanding materials. The other wastes contain mainly inorganic solids associated with phosphate mining or processing. Several of the phosphate industries have essentially complete wastewater recirculation systems and seldom, if ever, discharge to a stream. These inorganic discharges do not affect the assimilative capacity of the Duck River for oxygen demanding materials and because of this are not considered in determining streamflows required for water quality control needs at Columbia, Tennessee. The discharge of organic materials would not impact the acceptability of the stream water quality for water supply withdrawals for these industries, provided the withdrawals were located downstream from the point of organic discharges. Similarly, industrial water supply withdrawals would not impact the assimilative capacity of the river for organic wastes provided the withdrawals were made downstream from the point of discharge of the organic wastes.

Municipal Wastewater Treatment.—Columbia, Tennessee, has just completed construction of a 7-million gallon per day wastewater treatment facility, when placed into operation, the plant should achieve an 85 percent reduction of organic wasteload. The facility is a secondary type (best practicable) which has the capability of reducing ammonia nitrogen of the effluent to 5 mg/l. The discharge will be at DRM 127.9.

Until the new plant becomes operational, the city is using the old secondary plant which has a design capacity of 2.5 mgd and discharges at DRM 132.2.

Mount Pleasant, Tennessee, operates a secondary type waste treatment plant with a design capacity of 350,000 gallons per day. The effluent point for this plant is Sugar Creek mile 0.9, a tributary stream of the Duck River. The plant present is overloaded and achieves only a 68 percent BOD removal. A new 710,000 gal/day tertiary treatment plant is under construction with planned completion in 1979. This facility is designed to accomplish a 95 percent reduction in organic wasteload. The new facility will discharge to Sugar Fork, a small tributary stream of the Duck River, thus the need for a high degree of treatment.

Industrial Wastewater Treatment.—The two industries having carbonaceous BOD discharges are E. I. Dupont and Union Carbide with waste discharges at DRM 129.9 and DRM 129.3, respectively. The Union Carbide treatment facility achieves over 90 percent BOD removal. However, the Tennessee Division of Water Quality Control has reported that treatment provided by E. I. Dupont waste treatment plant is inadequate to protect water quality in the Duck River. Corrective actions are being taken by the company to improve this deficiency.

WATER QUALITY CONTROL

The water quality control streamflow provisions incorporated into the original project plan were based on providing sufficient stream-

flow to increase the stream assimilative capacity for organic wastes in the critical reaches of the Duck River so that dischargers would not have to go beyond secondary treatment. It should be emphasized that providing these streamflows did not relieve the various dischargers of their responsibilities for providing the minimum level of treatment required. Within the nomenclature of the current regulations, this increased streamflow is necessary to allow the critical stream segments to be designated as "effluent limited segments" rather than "water quality limited segments."

The original streamflow requirements were established based on organic assimilative capacity determinations of the critical reaches and the organic load of the secondary effluents developed from population and employment projection in the project area. The reevaluation of the water quality control needs in this report incorporates two basic changes in the determination of water quality streamflow requirements at Columbia, Tennessee. First, the current economic projections are not as optimistic as the "Series C" projections used in the initial planning studies. The consequence of this change was to reduce the projected waste loads. Secondly, the minimum dissolved oxygen criterion used in the reevaluation was 5 mg/l. (During the original planning, the State of Tennessee dissolved oxygen criterion was 3 mg/l; however, TVA used 4 mg/l in its evaluations. Subsequent to completion of the initial planning study, the state minimum dissolved oxygen criterion was revised to 5 mg/l.) The effect of increasing the dissolved oxygen criterion was to reduce the organic load which a stream could satisfactorily assimilate at a specific level of streamflow. The net effect of incorporating these two "offsetting" changes is that the level of streamflow required for water quality control is for all practical purposes the same as the requirements provided in original planning studies.

EUTROPHICATION

Eutrophication refers to natural or artificial additions of nutrients to bodies of water and to the effects of added nutrients. Eutrophication of lakes is a natural process that can be greatly accelerated by man. The abundance and species composition of plankton, bacterial, benthic, and fish populations change as eutrophication progresses, and changes of this nature may be used as an indicator of eutrophication as well as the rate of eutrophication. When these changes result in dense populations of planktonic algae dominated by a few species of bluegreen algae, then the eutrophication process is undesirable. The increase in undesirable aquatic organisms can preclude recreational use, cause aesthetically unpleasing situations, and result in adverse water quality conditions which can further impair various water uses.

TVA has been aware of the potential problem of eutrophication in the streams and reservoirs of the Tennessee Valley. Although the specific triggering mechanisms for nuisance-level biological responses in a given water body are not fully understood, the potential for the occurrence of such responses have been traditionally associated with high concentrations of the primary nutrients, nitrogen, and/or phos-

phorus. However, there are other substances other than nitrogen and phosphorus that have been documented as contributing to the eutrophication process (i.e., carbon, vitamins, growth hormones, amino acids, trace elements, etc.). There is little agreement among the experts as to which of the primary nutrients (nitrogen or phosphorus) and what concentrations is the threshold level that if exceeded will result in nuisance-level algal growths. This is also true for the other substances and conforms to Liebig's Law of the Minimum which states:

To occur and thrive in a given situation, an organism must have essential materials which are necessary for growth and reproduction. These basic requirements vary with the species and with the situation. The essential material available in amounts most closely approaching the critical minimum needed will tend to be the limitation one. (Odum, 1964)

With respect to eutrophication of reservoirs, physical properties (e.g., hydraulic flow-through pattern depth of light penetration, depth, shape, geographical location, etc.) should be considered as essential materials in Liebig's Law of the Minimum. Nuisance levels of aquatic organisms do not always result from an abundance of chemical nutrients, because some physical factor(s) may be restricting such growth.

TVA has observed nitrogen and phosphorus levels in most of its reservoirs well above the threshold concentrations reported to have caused nuisance-level growths in natural lakes. However, few such growths have been encountered in the TVA system. This lack of such growths is attributed to the difference in the physical and hydraulic flow-through characteristics of man-made reservoirs, such as those in the TVA system when compared with natural lakes.

All of TVA's reservoirs could be considered as biologically productive in terms of the total plankton standing crop. The presence of a large plankton standing crop is important to the maintenance of a healthy fishery resource, since these organisms are the primary links in the food chain. If standing crop were used as the criteria for classifying a lake as a eutrophic then all TVA reservoirs would be considered eutrophic. The "key" to water quality problems associated with eutrophication is not the occurrence of large standing crops, but rather is related to the composition of the standing crop. Water quality problems would not be encountered unless the dominant algal taxa were the nuisance forms of blue-green algae which as mentioned earlier are indicative of undesirable eutrophication. Dominance of these blue-green algal species has not occurred, with the exception of Cherokee Reservoir, in the TVA reservoirs although sporadic blooms have and are expected to periodically occur in these reservoirs.

The phosphorus concentrations of the Duck River upstream from the City of Columbia are elevated in comparison to most streams in the Tennessee Valley. The primary sources of these elevated phosphorus concentrations are surface water runoff from agricultural lands and surface runoff and groundwater from the phosphorus rich geologic conditions of the Duck River Basin. Because of the physical characteristics of the Columbia project as initially planned (detention time

measured in months and an annual reservoir drawdown of 27 feet at Columbia), it is expected that the reservoir would respond similar to TVA's headwater reservoirs. The potential for nutrient recycling resulting from mixing of the bottom and surface water and the resolubilization of deposited nutrients from the reservoir bottom would be minimized due to the planned reservoir drawdown. The season when the recycling potential could occur corresponds with (1) the period of minimum reservoir volume, (2) the period of lowest water temperatures which would tend to limit biological production, and (3) the period when homogeneous dissolved oxygen concentrations would occur in the reservoirs.

TVA recognized the potential for eutrophication and related water quality problems when the project was designed and incorporated features in the dam which could preclude or minimize problems downstream of the reservoir. Although the operation was planned to release primarily warmer surface waters so the downstream warm water fishery could be enhanced, the dam has outlets at several different levels so that water could be selected from a stratum having good water quality. The low level outlets are equipped with a regulating sleeve valve which would reerate releases during periods when water at that level would be low in dissolved oxygen. The installation of an additional high capacity regulating sleeve valve and a multiple level gating structure for the valves will greatly increase the operating flexibility. In addition, the planned annual drawdown of 27 feet would effectively control extensive colonization by rooted aquatic plants. Minor fluctuations in water level during the summer season may be required to prevent mosquito problems. With the expanded operating flexibility built into the Columbia Dam the potential problems associated with the occurrence of nuisance-level blue-green algae blooms in the reservoir could be avoided in the releases.

It is anticipated that Columbia Reservoir, like other storage reservoirs in the TVA system, will undergo strong thermal stratification during the period between early spring (May) and late fall (November). During this period, the dissolved oxygen in the hypolimnion will become depleted. Provisions have been built into the structure to provide the operating flexibility to ensure that the releases are well oxygenated. All release points from the hypolimnion have been equipped with regulating sleeve valves which are efficient aeration (reoxygenation) devices. Studies have shown that the reoxygenation efficiencies of these valves will satisfy 85 percent of the oxygen deficits of the water entering the valve. Thus, under even the worst case conditions (assuming inflow DO was zero) the dissolved oxygen concentration of the releases through the valves would be at least 85 percent of the saturation value.

Within the reservoir the dissolved oxygen concentration as measured at the five foot level would reflect high dissolved oxygen concentration since water at this depth is within the epilimnion of the reservoir. Thus there should be no problems associated with meeting the 5 mg/l dissolved oxygen standard in the releases from the reservoir or at the applicable measuring point within the reservoir.

The occurrence of the low DO concentrations in the hypolimnion is a natural phenomenon and would not adversely impact the water

quality of the reservoir or the ability to maintain a warm water fishery in the reservoir. However, these low DO could have an adverse impact on the fisheries resource if species of fish having thermal preferences associated with the cooler hypolimnetic waters are introduced into the reservoir. The introduction of such species to Columbia Reservoir would not reflect sound fisheries management and would be discouraged.

The low pool alternative will affect the water quality of the dam releases as a result of the expected eutrophic condition of the Columbia Reservoir unless modifications are incorporated into the existing structure which would permit selective withdrawal and reservoir draw-down capabilities.

Structural modifications required would be the installation of an additional large capacity regulating sleeve valve and an upstream multilevel gating structure to provide greater flexibility for selective withdrawal of water from the impoundment. To achieve the needed flexibility, multilevel gate openings for discharges through the regulating sleeve valves would have to be provided between elevations 570 and 600.

Annual reservoir drawdown of 10 feet (with capabilities of increases to 15 feet) during a minimum of a 6-week period between October 1 and March 1 would be required to control the development of excessive quantities of aquatic weeds.

Minor fluctuations in pool elevation of about one foot on a 7-day cycle may be required during the period from May 15 to September 30 for the control of mosquito production.

The structural modifications and operating constraints identified above would provide sufficient operating flexibility to (1) preclude or mitigate to acceptable levels the downstream impact of the reservoir releases on downstream water users in the event a blue-green algal bloom did occur in the reservoir, (2) preclude or control the development of weedy aquatic macrophytes in the reservoir, and (3) control mosquito production in the reservoir. With respect to the impoundment itself it is not feasible (based on the state of the art) to predict with any certainty the occurrence or lack of adverse plankton production (blue-green algae) in the pool. Actual monitoring would be required to document the lack of or presence of such conditions.

Any subsequent mitigative actions needed would have to be based on the monitoring results.

The ability to adjust operations to operate around the occurrence of blue-green algal blooms if structural operating flexibility is provided has been demonstrated at Normandy Reservoir. An extensive blue-green algae bloom did occur in Normandy Reservoir in May 1977 during a period of surface water releases from the reservoir. However, upon notification of resulting taste and odor problems at the downstream water supplies, the releases were switched to lower level outlets and the downstream problems were corrected. This change in operation isolated the bloom in the reservoir until natural die-away occurred.

Although the water depths at Columbia would be much less for the low pool alternative, strong thermal stratification would still be expected to occur in the reservoir. Provisions have been incorporated in

the dam structure to ensure selective withdrawal capabilities, with all releases from below the surface elevation being passed through regulating sleeve valves. The incorporation of this operating flexibility will ensure that (1) all releases have high concentrations of dissolved oxygen, and (2) potential taste and odor problems associated with blue-green algal blooms in the epilimnion of the pool could be avoided in the releases for brief periods of time.

There would be no problems with meeting the minimum dissolved oxygen standard of 5 mg/l in the releases or in the reservoir at the point where the standard is applicable (5 foot depth). However, low dissolved oxygen concentration would be expected to occur in the hypolimnion of the reservoir. As with the project as planned alternative, these low dissolved oxygen concentrations in the reservoir are not of environmental significance provided the introduction of fish species having thermal preference for the hypolimnetic waters does not occur. The volume of the hypolimnetic waters having low dissolved oxygen concentration would be much less than for the project as planned alternative.

APPENDIX C

REGIONAL RIVER DEVELOPMENT

A concept plan has been developed to enhance the recreation, wildlife and fishery opportunities for the Duck River between Columbia Dam at river mile 137 and Normandy Dam upstream at mile 248. This river development plan would include all of the 111 mile reach under the no impoundment alternative or, if either impoundment option is implemented, the reach upstream from the impoundment. The major theme would be to promote the river in the four county Duck River Project area for intensive public river based recreation opportunities. Adjacent lands, where suitable, will be used for wildlife development. Facilities would also be developed which complement the river and add to the visitors enjoyment of the rich natural history to be found in the region. Three levels of development were investigated varying from a full range of opportunities in recreation, fishing and wildlife development down to minimal recreational facilities.

The river development proposed for the reach from Columbia Dam to mile 191 has been included in the main body of the report as an integral part of the no impoundment alternative. This appendix outlines potential development of the remaining 57 miles of the Duck River from mile 191 upstream to Normandy Dam which is beyond the scope of the alternatives study. However, this portion of the Duck River could be developed in conjunction with the project as originally planned or with either alternatives to bring additional benefits to the region.

The three levels of development for the 57 mile reach are outlined in the following section.

MAXIMUM DEVELOPMENT LEVEL

A. A minimum 50-foot "greenbelt" easement of either side of the stream would be maintained for bank stabilization, erosion control,

and flood plain management and enhancement for wildlife. The greenbelt would also help in maintaining the pastoral beauty of the river.

B. Ten river access sites each consisting of a parking lot, boat/canoe launching ramp, and bank fishing facilities comprising an average of two acres each, would be developed for boating, fishing and consumptive-non-consumptive wildlife uses.

C. A total of 18 informal, primitive camping areas (accessible by river only) would be developed. Each site would average two acres in size. Adirondack-type shelters would be constructed.

D. A main hiking trail approximately 57 miles in length would be constructed. This trail would parallel the river, within the greenbelt link significant natural history features and facilitate other river oriented recreation.

E. Sites containing significant natural, historical, cultural and/or archaeological resources which have been identified, would be proposed for management and development for interpretive and environmental education use.

F. Improvements would be undertaken at suitable sites throughout this stretch of the river to provide improved fishery habitat and improved conditions for water-based recreation.

G. Opportunities for fish stocking would be examined along the lines of the no impoundment alternative.

H. Wildlife management would be practiced selectively and to complement other recreation development.

MEDIUM DEVELOPMENT LEVEL

A. A minimum 50-foot "greenbelt" easement on either side of the stream would be maintained for bank stabilization, erosion control, and flood plain management and enhancement for wildlife on the 27 mile stretch from Shelbyville to Normandy Dam. The greenbelt would also help in maintaining the pastoral beauty of the river.

B. Seven river access sites each consisting of a parking lot, boat/canoe launching ramp, and river bank fishing facilities comprising an average of two acres each, would be developed. Three sites will be developed for boating access only.

C. A total of eight informal, primitive camping areas (accessible by river only) would be developed.

D. A hiking trail approximately 27 miles in length would be constructed. This trail would parallel the river within the greenbelt and link significant natural history features.

E. Wildlife management, historical and cultural opportunities would be as described.

F. Improvements would be undertaken at some suitable sites throughout this stretch of the river to provide improved fishery habitat and improved conditions for water-based recreation.

MINIMUM DEVELOPMENT LEVEL

A. Ten river access sites each consisting of a parking lot and boat/canoe launching ramp, and comprising an average of two acres each, would be developed.

B. A total of three informal, primitive camping areas (accessible by river only) would be developed.

APPENDIX D

DEVELOPMENT PLAN FOR HISTORICAL RESOURCES

A complete survey of the area involved in the project as planned has been made, and the structures with historical significance have been identified. Most of these structures have already been acquired in activity to date. The use and disposition of these structures can be considered in each alternative plan.

The basics of the proposed development plan for historical resources are applicable to all project alternatives. Because of land acquisition already completed, TVA has acquired most of the structures which would allow the development plan to be implemented with a minimum of further acquisition. Among the structures acquired are good examples of the historical growth and development not only of this watershed area, but of the entire westward movement in Tennessee.

The proposed development plan for historical resources is to relocate in an appropriate setting and restore the structures identified below to show the development of architecture, habitation, and economic growth in this area. This portrayal will be an authentic, vivid picture of the lifestyle in this area from earliest settlement to the end of the pioneer period. What is true of this area, with minor variations, will also be true of the westward movement in Tennessee.

The structures fall into two generations with several varieties of style in each. The examples listed below are recommended for relocation and restoration. The first generation of structural styles is as follows:

1. Single crib log houses
 - (a) Rectangle—Rieves Log House (COLR-801)
 - (b) Square—Box House (COLR-1611)
 - (c) Square with frame—Davidson House (COLR-1319)
2. Single crib log houses with additions—Derryberry Log House (COLR-1705) with breezeway and kitchen and the addition of a single room.
3. Double crib log houses with breezeway.
 - (a) Lovett Log House (COLR-334)
 - (b) Tyree House (COLR-1903) is a frame house built on this log pattern.

The second generation of structural styles is as follows:

1. Central hall Classical "I" block house.
 - (a) One-story type—Cheek House (COLR-1511)
 - (b) Two-story type—Harris House (COLR-511)
2. Central hall Gothic "I" house—Hight House (COLR-1211).

The recommended area for relocating, restoring, and exhibiting these structures is the vicinity of Milltown and Lillard Mill. This vicinity is recommended because it allows some additional complementary development that increases the benefits of this plan. Specifically, the community of Milltown should be the subject of preservation and restoration activity based on the furniture industry that was once located here. Also, the now-abandoned Leonard House (COLR-3501),

which TVA will not acquire, could be restored in place and exhibited as a good example of the manor house design. Also the community of Caney Springs, a potential historic district, is just three miles north of this vicinity, and the proximity would be beneficial to both communities.

Visitation to such a developed area should grow gradually over a five-year period to an annual level of 100,000 people. With some promotion and coordination with visitor facilities in the Nashville area, the potential visitation could be greatly increased to a level of 250,000 visits annually.

In addition to the relocation and restoration of the nine structures identified above, TVA has acquired a number of other structures which are significant enough that they need to be measured, drawn, and photographed before being removed. These structures are listed below:

1. Briarwood (COLR-210)
2. York House (COLR-1708)
3. Hardison House (COLR-1706)
4. Vaughn House (COLR-333)
5. Billington House (COLR-2906)

The lime kiln on COLR-901 and the foundation of Fountain Heights Mill on COLR-6-121 need to be measured, drawn, and photographed. Disposition of the lime kiln will depend on the project alternative selected.

A number of log structures having no historical significance have already been acquired in the project area. These structures need to be taken down and the useable logs brought to a central storage point for future use as log material.

Archeological sites on lands already acquired are still being evaluated for significance. Other lands that will be acquired will be reviewed and evaluated. Significant sites may be nominated to the National Register. In any event a mitigation plan for the area will be coordinated with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation (ACHP). A selection of significant archaeological sites will be identified, made accessible to the public, and properly protected and interpreted as part of this plan.

APPENDIX III

HOUSE OF REPRESENTATIVES,
ENVIRONMENT, ENERGY, AND NATURAL
RESOURCES SUBCOMMITTEE OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C., October 14, 1980.

Mr. MAURICE B. ROWE,
*Secretary of Commerce and Resources, 9th Street Office Building,
Richmond, Va.*

DEAR MR. ROWE: As part of its oversight function, the Subcommittee is conducting an investigation into the Columbia Dam, a \$150-million project being constructed by the Tennessee Valley Authority on the Duck River in Tennessee.

In hearings held in late September, representatives of both the U.S. Fish and Wildlife Service and TVA stated to the Subcommittee that the key to the success of a conservation plan for two endangered mussel species to be inundated by the dam was the revitalization of the Powell and Clinch rivers as habitats for those species. The species then would be transplanted into those habitats. Those two agencies have established a coordinating committee, of which the State of Virginia is a member, to oversee the conservation effort.

The Subcommittee is very concerned about the viability of this conservation plan, upon which the entire construction schedule of the Columbia Dam is based. As the position of the State of Virginia is very important to the Subcommittee's evaluation of the plan and its review of the role of the agencies which agreed to it, we have enclosed a list of questions which we request you answer for our record.

We would request that answers to these questions be received in our office within thirty (30) days of your receipt of this letter. If you have any questions, please contact Edith Holleman, Subcommittee staff counsel, at (207) 225-6427.

Sincerely,

TOBY MOFFETT, *Chairman.*

1. Describe the role of the State of Virginia as a member of the Columbia Dam Coordinating Committee for the Conservation of Endangered Species.

2. Is the Virginia Game Commission the state agency primarily responsible for maintaining the state's water quality? If not, which agency is?

3. What is the position of the State of Virginia on the biological viability of the conservation plan as proposed by the Tennessee Valley Authority for the two endangered mussel species that would be inundated by the closing of the Columbia Dam?

4. Would some improvement in water quality be necessary for successful transportation to take place in the Powell or the Clinch rivers?

5. Has the State of Virginia or its representative on the coordinating committee made any pledge to clean up the waters of the Powell, Clinch and other Virginia rivers if any (or all) of them are chosen as transplant sites for the two endangered mussel species?

6. Is the State of Virginia committed to providing a viable habitat in any of the above rivers by the fall of 1983, the time at which the first transplants are scheduled?

7. In your view, is the permission of the State of Virginia necessary before transplantations into its waters can be made?

8. Is there any reason why Virginia would not fully cooperate with TVA's conservation plan? Please elaborate.

9. List the agencies that would be involved in a decision to allow the transplant of endangered species into Virginia rivers.

10. Describe the process by which a decision of such transplants would be made by those agencies and the interests which each agency was created to protect.

11. Has the Virginia Game Commission consulted with the agency responsible for water quality concerning the proposed transplantation program? Has it been requested to do so by the coordinating committee?

12. Has the game commission consulted with any of the above state agencies concerning the Columbia Dam project? If so, describe the status of the consultations?

13. Describe any related or unrelated clean-up efforts underway on the Clinch and Powell rivers, whether by the State of Virginia, regional or local planning agencies, or agencies of the federal government, such as the Environmental Protection Agency or the Office of Surface Mining.

14. What will be the status of these efforts by the fall of 1983?

COMMONWEALTH OF VIRGINIA,
OFFICE OF THE GOVERNOR,
Richmond, November 14, 1980.

HON. TOBY MOFFETT,
*Chairman, House Subcommittee on Environment, Energy, and
Natural Resources, U.S. House of Representatives, Rayburn
House Office Building, Washington, D.C.*

DEAR MR. CHAIRMAN: Thank you for your letter of October 14, requesting the position of the Commonwealth of Virginia on the conservation plan for endangered species (mussels) in the Duck River in Tennessee. Your letter stated that the plan contemplates relocation of these species to the Clinch and Powell Rivers, which flow from Virginia to Tennessee, so that the Tennessee Valley Authority can finish work on its Columbia Dam.

We have discussed this matter with appropriate State agencies and have reviewed the list of questions you sent. I would like to address Question Number 8 in this letter, as it seems essential to the whole issue. The other questions are addressed in an attachment.

It appears to us that the proposed relocation of endangered species to waters for which Virginia is responsible poses two basic problems requiring resolution before any action is taken. First, relocation of an endangered species to a new habitat is a biologically risky endeavor,

since the new habitat might not be hospitable to the mussels for reasons of water pollution or unfriendly interaction with the inhabitant species of the Powell and Clinch Rivers. In any case, there is some natural difference between the ecologies of these two sets of rivers that has resulted in the species in question naturally occurring in one and not the other. Conversely, relocated mussels might in some way harm the new environment or inhabitants thereof. Credible scientific study of these questions would take years, since mussels have life spans as long as thirty years. Relocation of the endangered mussel species to a strange and possibly detrimental environment does not seem to be a sound method for preservation of a species whose existence is threatened.

The second basic problem raised by the proposed relocation is that a valid obstacle to development of the Duck River in Tennessee would be artificially transferred to Virginia, giving Virginia the responsibility of preventing incompatible development in an area which might otherwise be more suitable for development than Tennessee. The presence of the endangered mussels, assuming they survive relocation, would restrict our choices in future development in the region of these two rivers.

We support reasonable efforts to preserve endangered species in principle and in practice. But shifting the responsibility for protecting the mussels at issue would impose potentially onerous burdens upon Virginia's citizens by artificially creating an obstacle to development where no such obstacle now exists, while in no way guaranteeing the mussels' chances for survival in the long run.

Thank you for your inquiry. Specific answers to the other questions are attached.

Sincerely,

MAURICE B. ROWE.

Attachment.

ANSWERS TO SPECIFIC QUESTIONS PROPOSED MUSSEL RELOCATION PLAN

1. Virginia's role in the Columbia Dam Coordinating Committee is limited to staff activity by the Commission of Game and Inland Fisheries. The Commission has joined in discussions concerning the technical feasibility of proposed investigations into the relocation matter. No policy commitment with respect to the desirability of a transplant has been offered.

2. The State Water Control Board is responsible for water pollution and abatement, water resources planning, flood control, and regulation of water impoundments.

3. The Commission of Game and Inland Fisheries staff does not believe that sound conclusions on the biological viability of mussel relocation can be drawn in the time proposed for investigations.

4. The successful relocation of mussels from the Duck River to the Powell and Clinch Rivers would probably require improvements in water quality of these rivers, as they receive some acid mine drainage.

5. Virginia is committed to protect and restore all State waters to such condition as will nurture all species of aquatic life which might

reasonably be expected to inhabit them. This would not include transplants. No other commitment exists.

6. No specific commitment has been made. See the answers to questions 4 and 5, above. The fall of 1983 is probably too soon to expect to find out what habitat improvements would be indicated, let alone to achieve such improvements.

7. We know of no state laws requiring Virginia's permission for transplanting of endangered species into its waters. The Endangered Species Act of 1973 does not address this issue.

8. Answered in body of attached letter to Congressman Moffett.

9. Assuming that Virginia has or obtains a legal basis for allowing or disallowing transplants of endangered species, the Governor's Office (or General Assembly) should make the determination after consulting with the State Water Control Board, the Commission of Game and Inland Fisheries, the Department of Health, the Division of Mined Land Reclamation, the Council on the Environment, the Ohio River Valley Sanitation Commission, and the Lenowisco and Cumberland Plateau Planning District Commissions.

10. The decision process on a relocation might take the form of a task force recommendation to the Governor, or to the Secretary of Commerce and Resources. The agencies listed in Question 9's answer have agency interests as follows:

State Water Control Board—see the answer to Question 2, above.

Commission of Game and Inland Fisheries—sport fish and game protection and management.

Department of Health—human health protection.

Division of Mined Land Reclamation—surface mining reclamation and control.

Council on the Environment—coordination and executive advisory functions with respect to environmental matters.

Ohio River Valley Water Sanitation Commission—water quality in the Ohio River Valley.

Planning District Commissions—general planning and local coordination functions for western areas of state, as follows:

Lenowisco—counties of Lee, Scott, and Wise.

Cumberland Plateau—counties of Buchanan, Dickenson, Russell and Tazewell.

11. No consultation between the Game Commission and other agencies has been sought concerning the transfer. There have been informal discussions with the State Water Control Board.

12. Columbia Dam project consultations between the Game Commission and the State Water Control Board have been informal.

13. The State Water Control Board is involved in clean-up efforts in the Powell and Clinch Rivers through its implementation of the NPDES program under Public Law 92-500 (the Clean Water Act). The Powell and Clinch Rivers have some water quality problems, stemming primarily from coal mining and related activity.

14. The State will continue its efforts to abate mine pollution, and water quality should improve between now and the fall of 1983.

STATE WATER CONTROL BOARD,
Richmond, Va., November 7, 1980.

Subject: See attached letter.

To: J. B. Jackson.

From: R. E. Bowles.

Copies: T. M. Felvey and R. V. Davis.

First we would like to state that you have very adequately addressed the problem as it would impact the Commonwealth in your memorandum of October 30, 1980. We can add nothing to this excellent discussion other than to recommend its use in any reply to the proposed transfer.

I am attaching some comments we have made to the questions you requested us to address.

2. The Virginia State Water Control Board is the agency established pursuant to the Virginia Code for the purpose of water pollution prevention and abatement, water resources planning, flood control and regulation of water impoundments.

4. Yes, some improvement in water quality would probably be necessary for the successful transplantation of mussels from the Duck River into the Clinch or Powell Rivers. These Rivers currently support populations of endemic endangered mussels. Coal mining and industrial and municipal pollution are threatening their survival. The most serious water quality problem on the Powell River is from aggravated acid mine drainage. This originates in abandoned mines in localized areas. There is currently no way the State can legally enter into abating these problems. The Surface Mine Control and Reclamation Act may allow the State Division of Mined Land Reclamation to solve these problems several years down the road. This will take time because there are many sites to address and they cannot be handled all at the same time. There is also a considerable amount of sedimentation involved in coal mine pollution resulting from storm runoff from refuse piles, spoil areas and road cuts. The Clinch River is primarily affected by sedimentation with acid mine drainage of secondary importance in terms of overall contribution to water pollution. In general, the mining pollution problems are greater in the Powell basin than the Clinch. The increase in coal mining activities over the next several years will further jeopardize these endangered species. There is some question now as to whether the coal mine sedimentation or some other pollution problem may be affecting the feeding and reproduction of the endemic mussel species. A 1979 survey of endangered mussel populations on the Powell River conducted by TVA showed the absence of young individuals of many of these species. These problems would undoubtedly affect the success of the introduction of a new species.

8. There seem to be two basic problems for the Commonwealth of Virginia in this issue. The first is the biological problem of relocating an organism from one stream to another. We must assume that the water quality of the Duck River is suited to the needs of the mussels in question, but how can we assume the same of the waters of the Clinch or Powell Rivers? We, in Virginia, will readily admit that there are water pollution problems on these two rivers. Can we jeopardize the survival of a species without first being certain that the new habitat will provide for its continued growth and reproduction? Would the

introduction of new species threaten the survival of endemic mussels through competition or some other interactive factors? These questions should be answered by credible scientific study before the biological problems of the transplant could be solved.

The second problem posed by this action would be related to the uses Virginia may make of the Powell or Clinch Rivers after the mussels are established. Would we be able to develop the areas to the same extent as we could now or would the presence of these species restrict our options? This is a rather heavy responsibility which the State of Tennessee is willing to give us and we cannot accept it lightly. Any effort to protect and preserve endangered species is commendable and is worthy of consideration; however, alternatives to locating the species and alternative uses of the Rivers in question must be considered.

9. There are a number of state and local agencies which should be consulted in this matter including: State Water Control Board, Commission of Game and Inland Fisheries, Division of Mined Land Reclamation, Department of Health, Ohio River Valley Water Sanitation Commission, Cumberland Plateau Planning District Commission, Lenowisco Planning District Commission and others designated by the Council on the Environment.

10. It may be advisable to create a task force of state and local agencies to allow for open discussion of the transplant plan and formulation of a coordinated state response to the congressional inquiry. All of the agencies listed in number 9 above are concerned with the maintenance or utilization of the area's water resources.

11. The Game Commission has discussed the proposed transfer with the Water Control Board.

12. The Water Control Board has discussed the problems associated with the proposed transfer with the Game Commission.

13. The State Water Control Board is active in water pollution abatement in the Clinch and Powell Rivers through the implementation of the NPDES program authorized under Public Law 92-500. There are many water pollution problems in these two Rivers and 70-90 percent of them are related to coal mining and its related activities. This is a gradual process of locating and permitting mines and bringing mine effluents into compliance with the law. We anticipate turning over the NPDES program as it relates to mining activities to the Virginia Division of Mined Land Reclamation in the next 1 to 2 years. This transfer of responsibility is contingent upon DMLR's being approved by the Federal Office of Surface Mining to implement the programs of the Surface Mining Control and Reclamation Act. Their system of implementation must be approved by OSM by January 3, 1981. This act is aimed specifically at mining and should give the State much more power to abate mine pollution than is presently available in the NPDES program. The transfer of NPDES responsibility would eliminate duplication of effort in mine problems. The State also would have up to 80 people involved in the program at DMLR compared to the 8 presently handling mining permits at the Water Control Board. All this should improve the permit issuance rate and compliance enforcement. This is, however, a new area for DMLR. They have very little water quality or pollution engineering

experience because their mandate up to this time has been primarily in the area of terrestrial reclamation. We anticipate some lag-time involved in their gaining the needed experience and gearing up to handle the program.

14. While we feel that we are constantly making progress toward improving the water quality of the Clinch and Powell Rivers, there will probably not be a dramatic improvement between now and the fall of 1983. The Federal Strip Mine Control and Reclamation Act will be a great tool in solving the mine related water quality problems in these two Rivers but this change will not occur overnight. The state and federal agencies involved in the NPDES and SMCRA permit programs will be working hard between now and 1983 and probably for some years beyond that to make the Clinch and Powell Rivers suitable habitats for aquatic organisms, be they common or endangered, endemic or transplanted.

COMMONWEALTH OF VIRGINIA,
COMMISSION OF GAME AND INLAND FISHERIES,
Richmond, November 6, 1980.

MEMORANDUM

To: J. B. Jackson, Administrator, Council on the Environment.

From: Jim McInter.

Subject: Conservation Plan for Species Affected by TVA Columbia Dam—Powell and Clinch Rivers.

In response to your memorandum of October 30, same subject, I submit below our comments on the questions posed by the referenced questionnaire:

1. The Virginia Commission of Game and Inland Fisheries staff has participated in discussions of the technical (biological) feasibility of proposed *investigations* aimed to determine whether certain endangered mussel species might be transplanted successfully from the Columbia Dam site to Virginia waters. No policy commitment with respect to the *desirability* of such transplants has been offered.

2. No. State Water Control Board.

3. The Virginia Commission of Game and Inland Fisheries staff does not believe that sound conclusions on the biological viability of the plan can be expected in the time frame proposed for the investigations.

4. This is an unknown. Until it is known why the species do not exist now in the Powell or Clinch rivers, no conclusions can be drawn as to what habitat improvements, if any, might enhance the probability of successful transplants.

5. Not to the knowledge of the Commission of Game and Inland Fisheries.

6. Not to our knowledge. See 4, above. 1983 probably is too soon to expect to find out what habitat improvements would be indicated, let alone achieving such improvements.

7. Unfortunately, perhaps, we know of no State statute that would require such permission. Maybe we need one.

8. There might well be.

9. Assuming that Virginia has, or will have, legal basis for allowing or disallowing such transplants, the Governor's Office (or the General Assembly by statute) should determine the answer to this question.

10. This question ought to be answered by the Council on the Environment, or the Secretary of Commerce and Resources.

11. No. And no.

12. Only informally, with staff members of SWCB and COE.

13. SWCB probably can give the most definitive answer to this question.

14. Same comment as 13, above. (The year undoubtedly should be 1983 rather than 1973.)

APPENDIX IV

DEPARTMENT OF THE ARMY,
NASHVILLE DISTRICT, CORPS OF ENGINEERS,
Nashville, Tenn.

Subject: Proposed Fill Activities for Columbia Dam Project at Miles 136.6, 136.9, and 156.1, Duck River.

This report is submitted in accordance with 33 CFR 325.8(b), concerning an application by the Tennessee Valley Authority for a Department of the Army Permit for the subject activity. The application with plans was submitted to this office on 1 November 1977 (enclosure 1).

1. Applicant

Tennessee Valley Authority, Knoxville, Tennessee 37902.

2. Location of Proposed Work

Miles 136.6, 136.9, and 156.1, Duck River (Enclosure 2, Exhibit A).

3. Character and Purpose of Proposed Work

The proposed work consists of the following activities necessary for the completion of the Columbia Dam Project:

a. Placement of approximately 1200 cubic yards of material below ordinary high water elevation 570.0 for construction of approach fills for a proposed single-span bridge at Mile 136.6, Duck River. The fill could consist primarily of filter material and riprap and be used for slope protection. Rock filled revetments would be placed at the toe of each slope to provide support for this material and prevent sliding of the material onto the river bed. The purpose of this proposed bridge construction would be to replace an existing substandard bridge at the same location on an unnumbered county road called "Iron Bridge Road" (see Enclosure 2, Exhibits B, C, and D).

b. Placement of an estimated 117,000 cubic yards of impervious rolled fill material below ordinary high water elevation 570.0 for construction of Columbia Dam at Mile 136.9, Duck River. This material is presently in place, thus eliminating a 300'x500' section of stream at this location. The flow of the stream has been directed through a diversion channel measuring approximately 270'x2000' located east of the fill already in place. The spillway diversion channel has been completed. The excavation of this channel was performed in the dry with an earthen plug at the lower end of the channel. Approximately 6,000 cubic yards of filter material and 12,000 cubic yards of riprap have been placed on the slopes of the 270'x2000' diversion channel. Waste material resulting from the excavation of this channel was used to fill the old stream bed immediately downstream from the earth portion of the dam. Prior to completion of the project, the existing diversion channel would be closed and the flow of the

river would be directed through the concrete spillway portion of the dam into the permanent spillway channel. Approximately 30,000 cubic yards of impervious rolled fill material would be placed in the old diversion channel below ordinary high water and the earth-filled section of the dam completed. In addition, an estimated 50,000 cubic yards of fill material would be placed in the old river channel downstream from the damsite to prevent erosion of the dam's downstream toe from tailwater wave wash (see Enclosure 2, Exhibits E and F).

c. Placement of approximately 60,000 cubic yards of fill material below ordinary high water elevation 600.0 for construction of approach fills for a proposed 3-span bridge at Mile 156.1, Duck River. The fill would consist primarily of unclassified material. Riprap would be placed on the exposed slopes of the approach fills for slope protection. The purpose of this proposed bridge construction would be to replace an existing bridge located approximately 1600 feet upstream on an unnumbered county road called "Sowell Mill Pike" (see Enclosure 2, Exhibit G, H, I, J, and K).

Columbia Dam is a part of TVA's Duck River Project which includes two dams and reservoirs (Normandy and Columbia). Normandy Dam, located at Mile 248.6, Duck River, is presently complete and operational. This application involves only that work necessary for the completion of Columbia Dam.

4. *Applicable Statutory Authorities Conferring Corps of Engineers Regulatory Authority*

Section 404 of the Clean Water Act (33 USC 1344).

5. *Other Federal, State, and Local Authorizations Obtained, Required, or Pending*

By letter dated 6 December 1979, the Tennessee Department of Public Health, Division of Water Quality Control, issued water quality certification as required by Section 401 of the Clean Water Act (Enclosure 3). This certification was appealed (Enclosure 3a) by the Environmental Defense Fund, Tennessee Scenic Rivers Association, and the Tennessee Citizens for Wilderness Planning. In a 2 May 1980 hearing conducted by the Tennessee Water Quality Control Board, the Board decided to hold a *de novo* hearing to review the 6 December 1979 certification. Presently a date has not been set for the hearing.

6. *Date of Public Notice, Summary of Comments, Objections, and Public Hearing*

a. Public Notice ORNOP-F 78-48 was issued on 9 March 1978 announcing the proposed work and sent to all parties deemed likely to be interested. A copy of the public notice and distribution list is attached as Enclosure 2.

b. Letters commenting on the proposed project were received in response to the public notice from the US Department of the Interior, Fish and Wildlife Service (FWS), the US Environmental Protection Agency (EPA), the Tennessee Historical Commission, the Tennessee Wildlife Resources Agency, and the Tennessee State Planning Office. A summary of the views of these agencies will be discussed in more detail in paragraph 7 below.

c. Approximately 264 comments were received in response to the public notice from the general public objecting to the proposal. Many of these comments also requested that a public hearing be held. A majority of these comments dealt with the following major issues:

- (1) Minimal benefits claimed for navigation, electric power generation, use of marginal lands, and reforestation.
- (2) Minimal flood control benefits claimed for municipalities and agricultural lands.
- (3) Questionable shoreline development based primarily on extreme drawdown of reservoir pool for flood storage capacity.
- (4) Potential water quality problems resulting from expected eutrophication within the impoundment.
- (5) The need for increased water supply could be met under existing conditions by controlled releases from Normandy Dam.
- (6) Loss of existing fish and wildlife habitat resulting from impoundment.
- (7) Increased transportation costs resulting from relocation of roads and bridges within the impounded area.
- (8) Speculative industrial development based on increased water supply resulting from the impoundment.
- (9) Lack of need for increased flat water recreation versus increasing need for riverine recreation opportunities.
- (10) Loss of productive agricultural lands.
- (11) Questionable benefit-cost ratio for the Columbia Dam Project.
- (12) Cost overrun resulting from project delays and inflation.
- (13) Displacement of residents in the project area.
- (14) Concern with regard to amount of land acquisition and price per acre paid.
- (15) Alleged violations of applicable laws, regulations, and executive orders.
- (16) Lack of consideration for feasible alternatives which would provide the same benefits.

d. Approximately 30 comments were received in response to the public notice from the general public favoring the proposal. A majority of these comments dealt with the following major issues:

- (1) Increased water supply provided to the City of Columbia, Tennessee.
- (2) Increased flat water recreation opportunity resulting from impoundment.
- (3) Flood control benefits to the City of Columbia and agricultural lands.
- (4) Potential industrial development resulting from impoundment.
- (5) Economic benefits to the surrounding community.

e. In response to the request for a public hearing, Public Notice ORNOP-F 79-294 (Enclosure 4) was issued on 26 October 1979 announcing the public hearing. The hearing was held at Columbia State Community College in Columbia, Tennessee, on 27 November 1979. A copy of the transcript of the public hearing is attached as Enclosure 5. Subsequent to public notice announcing the public hearing, approximately 1371 letters opposing the project and 2411 letters favoring the project were received. The nature of these comments dealt primarily with the same issues enumerated in paragraphs 6(c) and 6(d) above.

7. Views of Federal, State and Local Authorities

a. The following is a summary of comments received from the EPA:

(1) By letter dated 20 March 1978 (Enclosure 6), EPA responded to Public Notice ORNOP-F 78-48, requesting that the permit be held in abeyance pending receipt of a comprehensive biological study designed to evaluate the effect of the project on endangered species as well as critical habitat.

(2) By letter dated 6 November 1979 (Enclosure 7), EPA concurred with the biological opinion issued by FWS to TVA on 28 September 1979. EPA also recommended that a formal commitment be obtained from TVA agreeing to the recommendations contained in the biological opinion prior to issuance of a 404 permit.

(3) By letter dated 19 December 1979 (Enclosure 8), EPA reiterated its request for a formal commitment by TVA to implement the conservation plan contained in the 28 September 1979 biological opinion.

(4) Based on a review of additional information furnished by TVA and further discussions with FWS, EPA indicated in a letter dated 22 January 1980 (Enclosure 9), that it would not object to issuance of the 404 permit provided the permit was conditioned to not allow impoundment above elevation 571.0 until TVA had successfully implemented the conservation program to the satisfaction of FWS.

(5) Based on the potential for water quality problems within the Columbia Dam Reservoir, by letter dated 13 February 1980 (Enclosure 10), EPA requested that a decision on the 404 permit be held in abeyance pending a review of the proceedings and additional data presented at an appeal hearing before the Tennessee Water Quality Control Board concerning the issuance of the 401 certification by the Tennessee Department of Public Health, Division of Water Quality Control.

b. The following is a summary of comments received from the FWS:

(1) By letter dated 2 May 1978 (Enclosure 11), FWS requested a 45-day extension of the 9 March 1978 public notice comment period to submit input under the Fish and Wildlife Coordination Act (FWCA).

(2) By letter dated 26 May 1978 (Enclosure 12), FWS submitted a biological opinion that the proposed project would likely jeopardize the continued existence of the birdwing pearly mussel (*Conradilla caelata*) and the Cumberland monkey face pearly mussel (*Quadrula intermedia*).

(3) By letter dated 31 May 1978 (Enclosure 13), FWS submitted comments under the FWCA. The letter, in summary, stated that fish, wildlife, and recreational values would be adversely affected by the proposed project; the Duck River system and associated fish and wildlife resources are considerably more valuable to the public use and enjoyment than the proposed reservoir; and, recommended permit denial based on impacts on endangered species.

(4) By letter dated 16 October 1979 (Enclosure 14), FWS forwarded a copy of its 28 September 1979 biological opinion submitted to TVA. The opinion stated that the proposed project would not jeopardize the continued existence of the birdwing pearly mussel and

the Cumberland monkey face pearly mussel provided the Columbia Dam is constructed and operated in such a manner that the natural flow of the Duck River at Leftwich (approximately Duck River Mile 156) is not altered until an extensive endangered species conservation program to be undertaken by TVA is proven successful.

(5) By letter dated 29 January 1980 (Enclosure 15), FWS indicated that preparation of a revised biological opinion was underway, that the opinion would be forthcoming on or about 1 February 1980, and that the final comments under the FWCA would be forwarded approximately 15 days after the submission of the biological opinion.

(6) By letter dated 15 February 1980 (Enclosure 16), FWS submitted a biological opinion concerning the impacts of the proposed project on endangered species as specifically related to the Section 404 permit request. The biological opinion recommended that the Section 404 permit be conditioned to allow only that placement of fill material necessary to construct the dam structure to the point where it can be operated as a self-regulating dam, assuring that such construction will not create an impounded pool above elevation 571.0 or disrupt natural stream flows now experienced at Leftwich (approximately Duck River Mile 156). While operating the self-regulating structure, FWS requested that the issuance of a Department of the Army Permit to allow final completion of the dam project be held in abeyance until TVA has developed, carried out, and completed, with proven success, a conservation program for the two endangered mussels in accordance with the biological opinion issued to TVA, on 28 September 1979. FWS recognized the above as a reasonable and prudent alternative that would not violate Section 7(a) (2) of the Endangered Species Act (16 USC 1531 *et seq.*).

(7) By letter dated 19 February 1980 (Enclosure 17), the Honorable Robert Herbst, Assistant Secretary for Fish and Wildlife and Parks, U.S. Department of the Interior, notified the Honorable Michael Blumenfeld, Assistant Secretary of the Army, that FWS had recently completed consultation under Section 7 of the Endangered Species Act with the Nashville District Engineer for the Section 404 Permit application filed in conjunction with the construction of the Columbia Dam and Reservoir project. Secretary Herbst stated that the self-regulating dam is considered a reasonable and prudent alternative because it was confirmed by TVA representatives during endangered species discussions with FWS Consultation Team. Also, during those discussions, the FWS Consultation Team was given the impression by TVA that this alternative would receive further analysis. Accordingly, the biological opinion focused on this alternative since it was the only one which would avoid jeopardizing the species.

(8) By letter dated 3 April 1980 (Enclosure 18), FWS issued its final biological opinion. This opinion stated that the continued existence of endangered mussels would not be jeopardized providing no further work toward the completion of Columbia Dam be accomplished until the summer of 1983. If, at that time, conservation measures are shown by TVA to likely be successful based on specific criteria, filling could be undertaken but only to the extent necessary to create an impoundment not to exceed elevation 571.0. Filling to allow impoundment above elevation 571.0 could be accomplished only after conservation measures have been shown to be successful.

(9) By letter dated 2 June 1980 (Enclosure 18a), FWS submitted its final comments under the FWCA. It recommended that in view of the expected significant adverse impacts to fish and wildlife resources, the permit be denied unless five specific conditions be made a part of the permit to mitigate the impacts on fish and wildlife resources.

c. The following is a summary of comments and position statements prepared by members of the U.S. Congress :

(1) By letter dated 17 April 1978 (Enclosure 19), U.S. Senator Jim Sasser (Tennessee) indicated his support of TVA's Columbia Dam Project and that approval of the permit should be expedited.

(2) On 27 November 1979 at the U.S. Corps of Engineers' public hearing held to discuss the Columbia Dam Project, Mr. Rodger B. Kesley, on behalf of U.S. Senator Howard Baker (Tennessee) indicated the Senator's support for the project (Enclosure 5, page 7).

(3) By letter dated 7 April 1978 (Enclosure 20), U.S. Representative Robin Beard (Tennessee) indicated his support for the project and requested approval of the Department of the Army Permit be expedited.

(4) On 27 November 1979 at the Corps public hearing, Mr. John Maddox, on behalf of U.S. Representative Albert Gore, Jr. (Tennessee), expressed the Congressman's support for the timely completion of the Columbia Dam (Enclosure 5, page 6).

(5) By letter dated 16 January 1980 (Enclosure 21), U.S. Representative Robert W. Edgar (Pennsylvania) expressed his opposition to the construction of the proposed Columbia Dam because of the lack of project justification.

d. The following is a summary of the comments received from various agencies and officials of the State of Tennessee :

(1) By letter dated 17 April 1978 (Enclosure 22), the Tennessee Historic Commission (THC) indicated that sufficient information on archeological resources was not available to properly consider the impact of the project on these resources and that it would withhold further comment until an adequate archeological assessment was prepared. By letter dated 12 December 1979 (Enclosure 23), THC indicated that issuance of a permit would not affect National Register eligible properties if the permit were conditioned to require TVA compliance with 36 CFR 63 for a formal determination of eligibility for architectural, prehistoric archeological and historical properties.

(2) On 16 June 1978, the Tennessee Department of Public Health, Division of Water Quality Control issued to TVA a Notice of Intended Action to issue water quality certification as required by Section 401 of the Clean Water Act (Enclosure 24). By letter dated 1 February 1979 (Enclosure 25) to Mr. Frank M. Fly representing the Environmental Defense Fund, Inc., the Tennessee Department of Public Health granted a hearing before the Water Quality Control Board to consider the intent to issue the required 401 certification. The Notice of Intended Action was subsequently withdrawn rendering the appeal unnecessary. Following further evaluation, the Tennessee Department of Public Health, Division of Water Quality Control on 6 December 1979 (Enclosure 3) issued water quality certification. This certification was appealed by the Environmental Defense Fund, Tennessee Scenic Rivers Association and the Tennessee Citizens for Wilder-

ness Planning. In a 2 May 1980 hearing conducted by the Tennessee Water Quality Control Board, the Board decided to hold a *de novo* hearing to review the 6 December 1979 certification. Presently a date has not been set for the hearing.

(3) By letter dated 22 May 1978 (Enclosure 26), the Tennessee Wildlife Resources Agency (TWRA), in response to Public Notice 78-48, suggested that the permit should be denied at least until questions regarding which species of fish would be eliminated by the dam and which of those species are the host fish for the listed endangered mussels impacted by the project. TWRA also asked that other alternatives be considered. Further comments at the Corps' 27 November 1979 public hearing updated TWRA's position indicating that the permit should be conditioned to require the successful completion of the conservation program to protect the endangered mussel species and the development and installation of certain fish and wildlife mitigation measures agreed upon between TWRA and TVA (Enclosure 5, page 9).

(4) By letter dated 15 February 1980 (Enclosure 27), the Tennessee State Planning Office serving as the designated state clearinghouse, endorsed the issuance of the 404 permit subject to mitigation measures resulting from discussions between TVA and TWRA and the Tennessee Department of Conservation. By letter dated 12 May 1980 (Enclosure 28), Governor Lamar Alexander verified this comment as his official position.

(5) By letter dated 30 March 1978 (Enclosure 29), Mr. Joe L. Evins, serving as Special Advisor to then Governor Ray Blanton urged favorable action on the permit request.

(6) By joint Senate resolution No. 101, adopted April 4, 1979, and approved by Lamar Alexander, Governor of the State of Tennessee, on 10 April 1979, the Tennessee State Legislature urged the U.S. Congress to allocate funds for the expeditious completion of Columbia Dam (Enclosure 5).

(7) On 27 November 1979, at the Corps public hearing, Tennessee State Representative W. R. Lowe urged the expeditious completion of the project (Enclosure 5, page 39).

e. The following: is a summary of comments received from various local entities or officials:

(1) By letters dated 21 March 1978 and 13 November 1979 (Enclosures 30 and 31), Marshall County Judge Carlton Norris on behalf of the citizens of Marshall County requested that the 404 permit for the Columbia Dam project be issued.

(2) By letter dated 21 March 1978 (Enclosure 32), Mr. J. L. Moss, Jr., City Manager, City of Lewisburg, requested that the 404 permit be issued for the Columbia Dam project.

(3) By letter dated 21 March 1978 (Enclosure 33), Mr. Theron A. Bracey, Manager, Shelbyville Water, Power and Sewerage System, requested approval of the 404 permit.

(4) By letter dated 22 March 1978 (Enclosure 34), Judge John W. Ray, Chairman, Upper Duck River Development Agency, requested approval of the 404 permit for Columbia Dam.

(5) By letters dated 24 March 1978 and 13 November 1979 (Enclosures 35 and 36), Honorable J. A. Biggs, Mayor, City of Lewisburg, requested that the 404 permit for Columbia Dam be issued.

(6) By letter dated 27 March 1978 (Enclosure 37), Mr. J. P. Woodruff, Manager and Secretary, Board of Utilities, Columbia Power and Water Systems, requested issuance of the 404 permit for Columbia Dam.

(7) By letter dated 30 March 1978 (Enclosure 38), Mr. E. Ray Barley, Superintendent, Water and Sewer Department, City of Lewisburg, requested approval of the Columbia Dam project.

(8) By letter dated 30 March 1978 (Enclosure 39), Honorable Ben Andrews III, Mayor, Town of Spring Hill, Tennessee, requested approval of the Columbia Dam project based primarily on improved water supply.

(9) By letter dated 31 March 1978 (Enclosure 40), Mr. Claybourn Ross, Executive Secretary, Upper Duck River Development Agency, (a cosponsor of the Columbia Dam project) requested approval of the project. The letter was accompanied by a formal statement also dated 31 March 1978, (Enclosure 41) by the Upper Duck River Development Agency, which enumerated various factors as justification for completion of the Columbia Dam project. Numerous other letters were also received from the Upper Duck River Development Agency favoring completion of Columbia Dam and requesting issuance of the 404 permit.

(10) By letter dated 6 April 1978 (Enclosure 42), Mr. Barrett N. Jones, City Manager, City of Columbia, requested approval of the Columbia Dam project, based primarily on a commitment by the City to improve its sewage treatment facilities which has been predicated to a large extent upon completion of the Dam.

(11) By letter dated 5 November 1979 (Enclosure 43), Honorable William E. Frazier, Judge, General Sessions Court, Part I, for Maury County, requested issuance of the 404 permit for the completion of Columbia Dam.

(12) By letter dated 7 November 1979 (Enclosure 44), Nancy W. Thompson, County Clerk of Maury County, requested approval of the Columbia Dam Project, based primarily on flood control, water supply, and recreation benefits.

(13) By letter dated 8 November 1979 (Enclosure 45), Mr. Joe T. Kelley, Jr., President, Maury County Chamber of Commerce, on behalf of the Board of Directors of that organization, requested issuance of the 404 permit for Columbia Dam based primarily on flood control, recreation, water supply and water quality benefits.

(14) By letter dated 8 November 1979 (Enclosure 46), Honorable J. A. Morgan, Mayor, City of Columbia, endorsed the completion of the Columbia Dam and recommended issuance of the 404 permit on behalf of the City, its citizens, and the surrounding community.

(15) By letter dated 9 November 1979 (Enclosure 47), Mr. Harden Hill, Chairman, Maury County Water System, requested issuance of the 404 permit to TVA based primarily on water supply and flood control benefits.

(16) By letter dated 9 November 1979 (Enclosure 48), Mr. Barrett H. Jones, City Manager, City of Columbia, on behalf of the City administration of the City of Columbia, again strongly endorsed completion of the Columbia Dam.

(17) By letter dated 9 November 1979 (Enclosure 49), Honorable George S. Vibbert, Jr., Mayor, City of Tullahoma, recommended

completion of Columbia Dam based primarily on flood control, water supply, recreation, and economic benefits.

(18) By letter dated 9 November 1979 (Enclosure 50), Sue L. Houston, Executive Secretary, Marshall County Chamber of Commerce, on behalf of the membership of the Marshall County Chamber of Commerce, endorsed completion of the Columbia Dam based primarily on the economic, recreation, and water supply benefits.

(19) By letter dated 9 November 1979 (Enclosure 51), Mr. Joe Max Williams, Executive Director, South Central Tennessee Development District, recommended the completion of the Columbia Dam. Mr. Williams also indicated that counties of the region and the Cities of Manchester, Tullahoma, Shelbyville, Lewisburg, and Columbia, had indicated support for the Columbia Dam project based primarily on water supply, recreation, and economic benefits.

(20) By letter dated 12 November 1979 (Enclosure 52), Mr. Graham Baker, President, Columbia Jaycees, endorsed the expeditious completion of Columbia Dam based primarily on water supply, flood control and recreation benefits.

(21) By letter dated 10 November 1979 (Enclosure 53), Mr. Gilbert S. Steele, County Commissioner, Fifth District, Maury County, recommended completion of the Columbia Dam.

(22) By letter dated 13 November 1979 (Enclosure 54), Mr. Jim Keiran, Trustee of Maury County, recommended completion of Columbia Dam.

(23) By letter dated 13 November 1979 (Enclosure 55), Mr. Hershell White, Councilman, City of Columbia, recommended completion of Columbia Dam based primarily on flood control and water supply benefits.

(24) By letter dated 13 November 1979 (Enclosure 56), Mr. Andy Harden, Economic Development Specialist, South Central Tennessee Development District, recommended completion of Columbia Dam based primarily on economic, water supply, and recreation benefits.

(25) By letter dated 14 November 1979 (enclosure 57), Mr. Richard C. Phillips, Superintendent, Marshall County Board of Public Utilities, on behalf of that organization, urged completion of the Columbia Dam project based on water supply and recreation benefits.

(26) By letter dated 15 November 1979 (Enclosure 58), Honorable Taylor Rayburn, Maury County Judge, recommended completion of the Columbia Dam project, based on flood control, water supply, and economic benefits. Judge Rayburn also emphasized this project involves local funding totaling \$16 million.

(27) By letter dated 15 November 1979 (Enclosure 59), Mr. Ed Matheson, President, Manchester Area Chamber of Commerce, on behalf of that organization, recommended completion of Columbia Dam based primarily on flood control, water supply, recreation, and economic benefits.

(28) By letter dated 16 November 1979 (Enclosure 60), Mr. Gustave O. Prados, City Engineer, Spring Hill, Tennessee, recommended completion of Columbia Dam based primarily on flood control, recreation, and water supply benefits.

(29) By letter dated 18 November 1979 (Enclosure 61), Honorable Robert L. Jones, Judge, Division II, 11th Judicial Circuit of Ten-

nessee, recommended completion of Columbia Dam based primarily on recreation, economic, water supply, and wildlife resource enhancement benefits.

(30) By letter dated 27 November 1979 (Enclosure 62), Honorable William H. Boyd, Mayor, City of Mt. Pleasant, on behalf of the citizens of Mt. Pleasant and the Mt. Pleasant City Commission, recommended completion of Columbia Dam based primarily on flood control, recreation and water supply benefits.

8. Actions, Views, and Comments by the Applicant, Tennessee Valley Authority (TVA)

a. On 1 November 1977, TVA submitted an application (Enclosure 1) for a Department of the Army Permit for fill activities associated with the Columbia Dam project. Accompanying the application were copies of the final Environmental Impact Statement (EIS) Enclosure 63) and Supplement to the EIS (Enclosure 64), dated April 1972, and June 1974, respectively. In addition, TVA provided a copy of the transcript of its public hearing held at Columbia State Community College, Columbia, Tennessee, on 31 March 1977 (Enclosure 65).

b. Subsequent to issuance of Public Notice ORNOP-F 78-48 (Enclosure 2) an interagency meeting was held in the Nashville District Office on 25 April 1978 to discuss various aspects of the application. A transcript of the meeting is attached as Enclosure 66.

c. At the request of the Office of Management and Budget (OMB), TVA prepared a report on Columbia Dam alternatives dated April 1979 (Enclosure 67). Two alternatives were identified. They were: (1) low pool-downstream relocation alternative and (2) no-impoundment-downstream relocation alternative. Each alternative would require substantial changes in the project as planned. TVA concluded in the report that the alternatives would limit the benefits of the project and are not reasonable. The report recommends completion of the project as planned with implementation of a conservation plan to protect the endangered species of mussels located in the project impact area.

d. By letter dated 3 April 1979 (Enclosure 68) to the District Engineer, TVA addressed the comments and objections received in response to Public Notice ORNOP-F 78-48. The areas of concern to which TVA responded include: (1) the geology of the damsite; (2) use of impounded waters for the cooling system of a power plant; (3) alternative designs to provide commercial navigation and hydroelectric generation; (4) recreation benefits; (5) economic benefit/costs with respect to water supply; (6) water quality; (7) wildlife impacts; (8) forest and agricultural land losses; (9) historical and archeological impacts. TVA also indicated in this letter that it was continuing its consultation with FWS concerning mitigation measures which would resolve the endangered species issue. TVA would continue its efforts to obtain water quality certification from the State of Tennessee.

e. By letter dated 17 October 1979 (Enclosure 69), TVA provided a copy of the 28 September 1979 biological opinion issued by FWS to TVA.

f. By letter dated 26 November 1979 (Enclosure 70), TVA supplied information on water quality issues concerning the Columbia Dam

project which were previously provided to the Commissioner of the Tennessee Department of Public Health in connection with the State's certification proceedings.

g. By letter dated 21 December 1979 (Enclosure 71), TVA provided a response to issues raised at the Corps' 27 November 1979 public hearing.

h. By letter dated 4 January 1980 (Enclosure 72), TVA responded to EPA's request for assurance that TVA has committed sufficient resources to implement the conservation program detailed in the 28 September 1979 biological opinion. TVA provided a copy of the draft work plan being developed between TVA and FWS and invited EPA's comments and participation in the development and implementation of the program.

i. By letter dated 8 February 1980 (Enclosure 73), TVA urged the Corps not to delay a decision on the 404 permit because of the appeal by the Environmental Defense Fund of the Section 401 certification (Enclosure 3a).

j. In a letter dated 7 March 1980 (Enclosure 74) to the Environmental Defense Fund, TVA indicated that the use of the Columbia Dam as a self-regulating dam with impoundment not to exceed elevation 571.0 is not a permanent alternative to the project as now planned with conservation. TVA stated that it could operate the dam as a self-regulating dam only as long as necessary to complete the proposed conservation program.

9. Views of the District Engineer Concerning the Probable Effect of the Proposed Work on

a. Recreation.—In the 1974 EIS supplement (Enclosure 64), TVA identified a demand for reservoir recreation boating, sailing, water skiing, beach swimming, and warm-water fishing) in the Duck River area using participation rates contained in the 1969 Tennessee State Comprehensive Outdoor Recreation Plan (SCORP) and 1970 Census Population projections and also stated that the proposed Duck River project (Normandy and Columbia Dams) would partially off-set the demand. A comparison of these early projections of recreation supply and demand with our recent projections based on the 1979 Tennessee SCORP has been made by the Nashville District in a document entitled "Recreation Analysis—Columbia Dam Study," Enclosure 75. This study generally revealed that there are presently nine major reservoirs within a 50-mile radius of Columbia which provide abundant flatwater recreation opportunities and exceed the region's demand for this type recreation activity. In addition, the study indicates that the demands for recreation opportunities provided by free-flowing streams are steadily increasing. The annual attendance for Columbia Reservoir estimated by TVA has been reviewed and appears to be accurate. However, TVA's estimates of costs for development of recreation facilities appear to be low. Also, an operating agency is not specifically identified. The addition of adequate annual costs for development of the recreation areas increases the total annual costs by an estimated \$664,000. This would effectively reduce the annual recreation benefits to about \$536,000. The Corps has estimated that if the stream were preserved in its present state with six to eight public access areas (no impoundment alternative with medium level development)

and some scenic acquisition, an annual use of 200,000 visitors would occur. The value of these benefits can be set at \$800,000 annually (150,000 x \$5 per visit and 50,000 x \$1.00 per visit). Annual costs to implement such a plan are estimated to be about \$150,000, resulting in a net benefit of \$650,000. Based on my review of this study, I have concluded that the recreation benefits to be gained from the Duck River as a free-flowing riverine system outweigh the projected recreation benefits which would be afforded by the proposed Columbia Reservoir.

b. Fish and Wildlife Values—

(1) General.—Approximately 12,600 acres of land including 1,600 acres of riparian and upland woodland habitat (the remainder being cropland) and a 54-mile river fishery would be displaced by the proposed reservoir. The Duck River supports a diverse, high quality aquatic community with a sport fishery characterized by cool-water species such as smallmouth bass in the upper reach and warm-water species such as largemouth bass in the lower reach. Riparian zones along the river in combination with upland and/or forest habitat and croplands provide some of the best small game habitat in southern middle Tennessee (Enclosure 13). In addition, waterfowl habitat provided in the riparian zones attracts a variety of ducks each winter (Enclosure 63). The Tennessee Wildlife Resources Agency (TWRA) considers the Duck River as providing highly valuable breeding habitat for wood ducks consistently ranking third behind the Holston and Red Rivers, state-wide, and second behind the Red River in Middle Tennessee. Figures compiled by TWRA indicate approximate concentrations of wood ducks being 10 birds per mile on the Duck River compared to 17.4 per mile on the Holston River, both being relatively high figures (personal communication with FWS). Considering the relative length of the Duck River and especially its length of unimpounded miles, the extent of the wood duck habitat provided by the river is substantial. The conversion of this river segment to a reservoir would result in an aquatic system with less species diversity. Population of cool-water species would be reduced dramatically while warm-water species would likely increase. Fish species more associated with still water such as largemouth bass, bluegill and undesirable rough fish would likely increase. Tributary streams would also become more conducive to supporting rough fish at the expense of other more desirable species. Additionally, an area which provides riparian duck habitat and highly diverse flora and fauna described above would be permanently displaced by a reservoir that would occasionally be used by ducks for resting. FWS has indicated that fish and wildlife resources associated with the river segment are considerably more valuable to the public use and enjoyment than the reservoir (Enclosure 13). Numerous reservoir projects exist within relatively small radius of the proposed reservoir site which have provided an abundance of reservoir-oriented fish and wildlife resources and have conversely decreased river-based fish and wildlife resources in the same area. Alternatives to the project considered by TVA would provide previously unavailable public access to the Duck River in the area proposed for impoundment (Enclosure 67). TVA has agreed with TWRA to provide certain mitigation which has resulted in TWRA's not objecting to the project as planned. Accordingly, TVA would (1) acquire approximately 2,000 acres of land

contiguous to the Sowell Bend-Tugas Bend area for development of a wildlife management area; (2) construct the necessary network of roads on the area to provide access; (3) construct fish rearing ponds totaling a minimum of six surface acres; (4) survey the area for potential small lake and pond construction for public fishing and Canada goose habitat; (5) clear hedgerows and timber from the area for the development of Canada Goose habitat as mutually agreed upon; (6) build a wildlife observation site; (7) enter into a lease agreement with TWRA which will allow areas not set aside for day use recreation or other specific State and Federal use to be available for hunting and associated recreational use; and (8) leave 2000 acres of standing timber for enhancement of fish and wildlife habitat (Enclosure 27). In a letter dated 2 June 1980 (Enclosure 18a), under authority of the Fish and Wildlife Coordination Act, the FWS recommended denial of the permit unless it is conditioned to require the following mitigation:

(a) That Habitat Evaluation Procedures be used (include FWS and TWRA in the process) to determine mitigation measures not being met by mitigation measures agreed to with the State TWRA. These measures, when determined, will be implemented by TVA as soon as possible to minimize fish and wildlife losses.

(b) That the Biological Opinion, dated February 15, 1980, and as clarified by Assistant Secretary Herbst's letter of April 3, 1980, be implemented in full.

(c) That the National Preservation Act of 1966 and Archeological and Historic Preservation Act of 1974, as described above, be adhered to.

(d) That stream fishery needs and recreational opportunity below the dam be studied; that a water release plan be developed to optimize the stream fishery and riverine recreational use below the dam; and riverine fishery and recreational developments be provided by TVA as needed.

(e) That the mitigation measures agreed to between TVA and TWRA be made conditions of the permit.

I have concluded that while there will be significant adverse impacts on fish and wildlife resources, these impacts would be mitigated to some extent by implementation of the Department of the Interior and TWRA recommendations.

(2) Endangered Species.—The 3 April 1980 biological opinion (Enclosure 18) rendered to the Nashville District by FWS stated that the continued existence of endangered mussels would not be jeopardized provided no further work toward the completion of Columbia Dam be accomplished until the summer of 1983. If, at that time, conservation measures are shown by TVA to likely be successful based on specific criteria, filling could be undertaken but only to the extent necessary to create an impoundment not to exceed elevation 571.0. Filling to allow impoundment above elevation 571.0 could be accomplished only after conservation measures have been shown to be successful. I believe this approach would provide adequate assurance that the proposed projects would not jeopardize the continued existence of the endangered species.

c. *Aesthetics*.—Aesthetics of the proposed project relate to the general public's view of a reservoir 54 miles in length versus its view of

an existing free-flowing river segment of equal length with a pastoral setting and the public's opportunity to gain access to and experience the amenities of each situation. Based on the applicant's discussion of river development schemes as alternatives to the project, as proposed (Enclosure 67), ample public access to the river and riparian lands for recreational purposes would be developed. The approximately 8000 acres of mud flats that would be exposed during the winter pool drawdown elevation 603.0 would likely be considered visually offensive by a majority of the people viewing the reservoir. However, this adverse visual effect would be partially offset by the fact that during late spring, summer, and early fall, when recreation demand is relatively high, Columbia Reservoir would exceed elevation 625.0 reaching normal pool elevation 630.0 during June and would expose a relatively small amount of bottom area (Enclosure 63). The group of people affected most adversely by the extreme exposure of bottom area would be those having year-round residence on reservoir front property and would be small in number compared to the general public that would use the reservoir during the peak recreation season. While both environmental settings have unique aesthetic qualities, in this case the one factor which seems to favor preservation of the natural riverine setting is the excessive mudflats which would be exposed due to the extreme drawdown of the proposed reservoir.

d. *Flood Plain Values.*—The objective of Executive Order 11988, Flood Plain Management, is to avoid to the extent possible the long and short-term adverse impacts associated with occupancy and modification of flood plains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The order requires Federal agencies to provide leadership and take action to (1) avoid the base floodplain (100-year) unless there is no practicable alternative, (2) reduce the hazard and risk of flood loss, (3) minimize impacts of floods on human safety, health and welfare, and (4) restore and preserve the natural and beneficial floodplain values. The proposed Columbia Dam and Reservoir would involve construction within the 100-year floodplain and would eliminate natural and beneficial floodplain values along 54 miles of the Duck River through permanent inundation and alter these benefits downstream due to reduced floodplain inundation. TVA's "Report on OMB on Columbia Dam Alternatives" (Enclosure 67) evaluates two alternatives to the Columbia Dam and Reservoir project as planned which include no impoundment-downstream relocation (flood prone structures) and low pool downstream relocation. The "no impoundment" alternative provides a practicable means for TVA to accomplish the four objectives mentioned above.

e. *General Environmental Concerns.*—The proposed dam and reservoir would have general adverse environmental impacts outside of those specifically discussed in sub-paragraphs 9(b), (c), (f), (j), (p), and (r) which relate to the proposed conversion of 54 miles of free-flowing river to a reservoir of equal length. These general impacts would result from increased human activity and land development on the proposed reservoir and around its periphery in an area which currently supports a predominately agricultural system. These impacts would include aesthetic degradation and wildlife habitat displacement related to residential and industrial development as well

as air pollution, increased noise levels, and water quality degradation related to these types of development and recreation use of the reservoir. Aesthetic degradation resulting from littering would also be an adverse impact which accompanies increased human activity.

f. *Wetlands*.—The objective of Executive Order 11990, Protection of Wetlands, is to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. The order requires Federal agencies to provide leadership and take action to minimize the destruction, loss or degradation, of wetlands in carrying out the agencies' responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources, planning, regulating, and licensing activities. Of the 12,600 acres to be impounded by the proposed reservoir, approximately 1,600 acres of riparian and upland woodlands interspersed among 11,000 acres of cropland would be eliminated. Large expanses of wetland habitat are not common throughout the floodplain of the Duck River at the site of the proposed reservoir primarily due to extensive agricultural activities over the years. However, approximately 400 acres of lower-lying riparian areas along the riverbanks and the banks of tributaries support vegetation (primarily bottomland hardwoods) which render them as wetlands under most all classification schemes including FWS's scheme (Enclosure 75a). Even though this type of wetland is a valuable resource that is being rapidly displaced by reservoir development throughout the middle Tennessee area, the values of the wetlands proposed for inundation for such things as wildlife habitat, bank stabilization, and filtration of receding flood waters are not unique. Among wetlands found along river and stream banks in the same area, although not unique, the Duck River and adjacent wetland areas of the proposed reservoir site are particularly attractive as breeding habitat for wood ducks. TVA's "Report to OMB on Columbia Dam Alternatives" evaluates two alternatives to the Columbia Dam and Reservoir Project as planned which include no impoundment-downstream relocation (flood prone structures) and low pool-downstream relocation. The "no impoundment" alternative provides a practicable means to avoid the destruction of the above-described wetlands.

g. *Flood Hazards*.—Prior to the impoundment of Normandy Reservoir, the Duck River was the largest tributary of the Tennessee River without reserved flood detention capacity. The Duck River can produce large floods causing significant damages to urban areas and agricultural lands along the stream. In addition, flood flows from the Duck River can add materially to flood crests on the lower Tennessee, Ohio, and Mississippi Rivers (Enclosure 76, page 43).

The proposed Columbia Dam site is located at Mile 136.9 on the Duck River immediately upstream from the City of Columbia, Tennessee. The total drainage area of the Duck River above (upstream) the dam site is 1,181 square miles of which 986 square miles are uncontrolled (below Normandy Dam). The 1,181 square mile drainage

area of the Duck River upstream from the Columbia Dam site comprises 16 percent of the total local drainage area between Pickwick and Kentucky Dams on the Tennessee River and 34 percent of the total Duck River drainage area (Enclosure 76, page 44).

Observations of river height at Columbia were begun in 1887 at the site of the old U.S. Highway 31 bridge (Mile 132.8) where the Columbia gaging station is located. There have been approximately (60) sixty floods that reached or exceeded bankfill stage of 32-feet (elevation 567.5) at Columbia in the $90 \pm$ years for which records are available. All but three of these occurred in the months December through April, with the greatest number in February and March. The flood of record at Columbia occurred in February 1948 when the river stage reached 51.75 on the gage (elevation 587.3) with a corresponding peak discharge of 61,100 cubic feet per second (cfs) (Enclosure 76, page 16).

The proposed Columbia Dam is designed to provide a maximum flood pool at elevation 635.0 (top of spillway gates) inundating 15,000 acres of land and impounding a reservoir volume of 363,000 acre-feet. The normal maximum summer pool would be elevation 630.0 inundating 12,600 acres with a reservoir volume of 294,000 acre-feet. The normal minimum winter pool would be elevation 603.0 inundating 4,300 acres at a reservoir volume of 80,000 acre-feet. Prior to 1 January of any given year, the reservoir would be drawn down 27 feet to minimum pool elevation 603.0 for flood control, thus providing a minimum controlled flood storage capacity (elevation 603 to 635) of 281,000 acre-feet during the primary flood season from December through April. Under normal conditions, the reservoir would not reach normal maximum pool elevation 630.0 until 15 May. The flood control reservation available on 1 January in the two reservoirs (Normandy and Columbia) would amount to 343,000 acre-feet, equivalent to about 5.4 inches of capacity on the total drainage area at the Columbia Damsite. The detention capacity in Columbia reservoir would reduce flooding at the City of Columbia, immediately downstream, and at Centerville, some 65 miles downstream from the site. It would reduce the 1948 flood of record through Columbia and future floods in the order of 300-year frequency to essentially non-damaging stages. The reduction at Columbia represents about 98 percent of the total potential at that city. At Centerville, the protection would be less (Enclosures 63 and 76).

The benefits resulting from the use of the flood detention capacity for the Duck River Project of which the Columbia Dam is a part have been considered in two parts: (1) those adding to the effectiveness of the TVA water control system, and (2) those accruing to the local areas downstream from the dams (Enclosure 63). The total value of the flood control benefits claimed for the Duck River Project (Normandy and Columbia) is approximately \$350,000 annually, which represents 7 percent of the total annual estimated project benefits of \$5 million (Enclosure 77). Of the \$350,000 annual flood control project benefits, approximately \$280,000 are directly attributable to Columbia Dam alone (Enclosures 63 and 76).

With regard to system flood control benefits, the Duck River Project would increase TVA system effectiveness by assisting in controlling lower Ohio and Mississippi River floods by increasing the amount of

capacity upstream from Kentucky Dam, reducing the amount of flooding along the Tennessee River downstream from Kentucky Dam, primarily at Calvert City, Kentucky, and increasing the operating efficiency of Kentucky Reservoir during large floods when low net heads on the spillway restrict pre-flood drawdown. Based on a fixed unit value per acre-foot of flood detention storage of the two reservoirs (Normandy and Columbia), the total annual flood control project benefits to the TVA system have been estimated to be approximately \$180,000 (Inclosure 76, page 43). Of this amount, approximately \$150,000 in flood control benefits to the TVA system are directly attributable to Columbia Dam alone (Enclosures 63 and 76).

The total local flood protection benefits claimed for the Duck River Project are approximately \$170,000 annually, which includes benefits in four major categories: (1) urban flood control benefits, (2) downstream land enhancement from flood protection, (3) reduced flood damages to roads and bridges, and (4) reduce flooding for agricultural lands. Of the \$170,000 local flood control benefits, approximately \$130,000 are directly attributable to Columbia Dam alone (Enclosure 76). The urban benefits claimed for Columbia Dam are based primarily on flood protection of 43 structures in the City of Columbia including protection from localized flooding in the Riverside, Valewood, and Helm Branch areas of the City. When considering alternatives to Columbia Dam, it is estimated that approximately \$7 million would be required to relocate the 43 structures. In addition, local flood protection could be provided to the critical urbanized areas of the City through a combination of structural/nonstructural remedies including proper floodplain management, relocations, flood proofing, channelization, levees, floodwalls or possibly a lesser impoundment at Columbia Dam. The flood protection benefits claimed for agricultural lands are based on reduced flooding of 3,700 acres of downstream prime farmlands. Under present conditions, these lands are not generally flooded during the crop-growing season as evidenced by their "prime farmland" classification (Enclosure 67). Also, the natural function of floodplain inundation is generally a productive one in that various organic nutrients are deposited during these flood conditions. Reduced flooding of these 3,700 acres would be accomplished by inundating 12,600 acres of equally valuable farmlands. The local flood protection benefits claimed for downstream lands are based on enhancement of approximately 1,200 acres of land that have a potential for industrial development assuming reduced flood heights (Enclosure 76). Disregarding the flood protection benefits claimed for land enhancement, the remaining local flood control benefits based on reduction of flood damage to existing flood plain structures and their contents account for 2 percent of the total estimated annual flood protection benefits for the Duck River project. Flood control is needed in the Duck River Valley especially at the City of Columbia which is subjected almost annually to floods causing significant property damages. (In the years for which records are available, no deaths have been directly attributable to floods in the City of Columbia.) In its consideration of alternatives for Columbia Dam, TVA has concluded that the no-impoundment alternative combined with local flood protection measures or the low-pool (lesser) impoundment alternative for Columbia Reservoir

can provide adequate flood control solutions for the City of Columbia and downstream areas (Enclosure 67).

h. *Land Use*.—The total acreage to be affected by completion of the Columbia Dam and subsequent impoundment of the reservoir would be 27,500 acres. Of this, approximately 34 percent (9,350 acres) is considered Class I and II agricultural lands, 17 percent (4,675 acres) is Class III land and, 11 percent (3,025 acres) is Class IV land. Class I and II lands are considered "Prime" farmlands (Enclosure 63). "Prime" farmlands are defined as lands suitable for any type of agricultural use, having high crop yields, experiencing minimal erosion, with adequate drainage, and little likelihood of flood damage during the crop season (Enclosure 67). The total lands to be impounded (12,600 acres) include 11,000 acres of Class I, II, and III croplands and approximately 1600 acres of riparian and upland woodlands (Enclosure 63).

Approximately 102,000 acres in Maury County (location of Columbia Dam) are classified as prime farmlands (Enclosure 78). Of this total, approximately 9.2 percent of these lands would be acquired for the Columbia Dam Project. In addition, essentially all the prime farmlands located between Miles 136.9 and 170.0 would be taken out of production. The loss of farmlands to the project would result in a drop of farm sales and farm dependent business by approximately \$4.4 million per year. This figure is based on a percentage of the total annual agricultural-related losses computed by TVA to be \$6.6 million per year for the entire Duck River Project. However, TVA predicts that economic gains from increased employment and tourism resulting from the project are expected to far exceed the maximum potential agricultural loss (Enclosure 64). TVA indicates that completion of the Columbia Dam would assist in meeting the requirements for an expanded urban and industrial base for the area. This projected demand would be met by utilizing the project lands as follows (Enclosure 67, Figure 2): Industrial development, recreation, wildlife management, urbanization, residential development, and planned unit development.

TVA would review the use of all proposed project lands and require approval for all structures and facilities in the reservoir area under the provisions of Section 26A of the TVA Act. In addition, Department of the Army Permits would be required pursuant to Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act for activities below ordinary high water of the reservoir area.

The completion of the Columbia Dam Project would introduce a system of highly complex and competing land uses into a simple agrarian system. In a 30 August 1976 Memorandum from the President's Council on Environmental Quality (Enclosure 79), Federal agencies were encouraged to make efforts to assure that such farmlands are not irreversibly converted to other uses unless other national interests override the importance of preservation or otherwise outweigh the environmental benefits derived from their protection. In addition, the Memorandum states that the preservation of farmland, in general, provides the benefits of open space, protection of scenery, wildlife habitat, and in some cases, recreation opportunities and con-

trols on urban sprawl. In keeping with this memorandum, my review of the continued use and viability of the farmlands to be affected by Columbia Reservoir has included not only threats from direct construction activities but also from urbanization and other changes in land use that might be induced by the impoundment. No objections were received in response to Corps' Public Notices from local, State, or Federal agencies having an interest in the preservation of prime and unique farmlands. However, based on my review and in light of the guidance continued in the above-mentioned Memorandum, I have determined that the irreversible loss of 11,000 acres of farmlands resulting from impoundment of Columbia Reservoir represents an overall negative environmental and economic impact when considering land use as a factor of my public interest review.

i. *Shoreline Erosion and Control.*—Riprap would be placed on the slopes of the earthen portion of the dam for erosion control. In addition, the permanent spillway channel would be lined with riprap to prevent bank scouring (Enclosure 2). At areas where the L&N Railroad would cross parts of the impoundment and where highway relocations are required, it will be necessary to protect the exposed banks with riprap (Enclosure 76, page 38). It is possible that erosion control measures would be required at various recreation and access sites within the proposed reservoir area. Extreme reservoir draw-down during the winter months would render the normal summer pool shoreline easily accessible for placement of erosion control devices when necessary.

TVA estimates that sediment could fill the proposed Columbia Reservoir to normal minimum pool elevation 603.0 in about 200 years and to normal maximum pool elevation 630.0 in about 400 years. The implementation of appropriate land conservation measures on agricultural lands in the upper reaches of the reservoir area would increase the estimated time for accumulation of sediment in the reservoir (Enclosure 63). Silt retention capability afforded by the dam and reservoir could contribute to improved water quality and scenic values downstream of the dam as a result of reduced sediment load. With regard to potential downstream bank erosion, there is some credence to the theory that tailwater discharges from dams contribute to increased streambank erosion. In the case of Columbia Dam, this is not expected to materialize due to controlled releases from the dam and the existence of the City of Columbia's water supply structure located at Mile 133.9, Duck River (3 miles downstream from the proposed Columbia Dam). Based on the above discussions, I believe that shoreline and streambank erosion that could normally be expected as a result of the operation of Columbia Reservoir would not be a significant problem and could be controlled by normal erosion control practices.

j. *Cultural Values.*—The National Register of Historic Places has been consulted to determine the presence of cultural resources in the project area. In addition, the Tennessee Historical Commission (THC) has submitted comments (Enclosure 23) in accordance with the National Historic Preservation Act (NHPA). There are no properties in the reservoir area listed as registered National historic landmarks or properties known to be under consideration for nomination to the Register. However, in accordance with the procedures of the

Advisory Council on Historic Preservation, TVA is presently identifying potential properties eligible for inclusion in the National Register. The THC has requested that in order to comply with NHPA guidelines to assure that issuance of a Department of the Army Permit will not affect National Register eligible properties, the following condition should be made a part of the permit, if issued:

TVA will request a formal determination of eligibility for architectural properties, prehistoric archaeological properties, and historic sites in accordance with 36 CFR 63 and that in the interim period no actions will be taken that will adversely affect potentially eligible properties.

TVA is considered the lead agency with regard to overall National Historic Preservation Act compliance, and compliance procedures including mitigation of adverse effects are the responsibilities of TVA rather than the Corps; i.e., TVA is responsible to (1) identify all historic, archaeological, architectural and cultural properties within the project area, (2) consult with the Keeper of the National Register to determine which of these properties are eligible for inclusion in the Register, (3) determine which National Register eligible properties will be adversely affected by the proposed project, and (4) negotiate with the Advisory Council on Historic Preservation and the State Historic Preservation Officer conditions which will either avoid, minimize, or mitigate adverse effects.

I am satisfied that any cultural resources eligible for inclusion in the National Register discovered within the project area would be properly mitigated by the above procedures.

k. *Navigation.*—The Duck River is considered a navigable water of the United States from its mouth to Mile 262.8 based on historical navigation by flatboats, steamboats, and floating forest products and present navigation by recreation craft. Present navigation on the Duck River in the vicinity of the proposed Columbia Dam Project presently consists of small recreation craft such as canoes, rafts, and small power boats. The Duck River is classified as a Class I float stream (Easy bends without difficulty, occasional small rapids with low regular waves, correct course easy to find, river speed less than hard back-paddling speed) as defined by the International Scale for Grading the Difficulty of River Cruising Routes and excellent for a relaxed family style of canoeing (Inclosure 63). TVA estimates that the 54-mile free-flowing section of the river proposed to be impounded by Columbia Dam presently receives approximately 6500 visits per year for canoeing and floating. With partial development of selected access points along the river, TVA projects the same section of the Duck River could potentially receive an estimated 31,000 visits per year for canoeing and floating. Controlled releases from Normandy would provide reliable flow suitable for boating and canoeing downstream (Enclosure 64). Completion of the dam and subsequent impoundment would result in a change of types of navigation from free-flowing recreation navigation to flat-water (reservoir) recreation navigation. Reservoir navigation would consist primarily of gasoline-powered water crafts, sailing crafts, canoes and rowboats. TVA estimates that by the year 2000, the Columbia Reservoir area would receive approximately 1,450,000 visits per year of which a part would participate in these various forms of navigation (Enclosure 64). Navigation would

be limited to those areas of the reservoir capable of providing necessary channel depths. The extent of this area would vary throughout the year with reservoir levels. Complete closure of Columbia Dam would result in a major obstruction to any type of navigation and require portage around the dam for continued navigation downstream. While the impoundment would eliminate the opportunity for free-flowing recreation navigation, it would enhance the ability of the stream to support a greater variety of recreation navigation as well as provide potential for limited commercial navigation.

l. *Energy Needs.*—The Columbia Dam Project will not provide any hydroelectric power generation. TVA determined that the cost of this addition to the project could not be economically justified (Enclosure 68).

Highway relocations associated with the Columbia Dam Project would improve the road network in the reservoir area, thus reducing energy consumption. TVA estimates that transportation savings resulting from completion of Columbia Dam would amount to approximately \$50,000 annually. These savings would be attributed to reduced operating costs for fuel, engine oil, tires, maintenance and depreciation due to mileage (Enclosure 63). The project would provide to the immediate 4-county area flat-water recreation facilities thus reducing travel to other existing reservoirs identified in Enclosure 75. In considering alternatives, TVA indicated that some highway relocations and improvements including the Sowell Mill Road bridge at Mile 156.1, Duck River, would be accomplished without full impoundment of the Columbia Reservoir as currently planned. In addition, the alternative considered would eliminate the need to raise the existing I-65 highway bridges necessary for full impoundment.

Energy consumption required for the completion, operation, and maintenance of the project as planned and related recreation activities appears to exceed projected energy savings of the project.

m. *Economics.*—TVA indicates that the Columbia Dam Project, as planned, would be a multi-purpose water control system which would contribute to area development by reducing flooding on urban and downstream agricultural lands, providing a more dependable supply of water of generally improved quality for municipal and industrial use, creating a broad range of new recreation and fish and wildlife opportunities, stimulating higher and better land use, and creating opportunities for more productive employment of the local labor force.

The largest single component of benefits TVA claims for the project is future/projected employment as area redevelopment benefits which represent approximately 30 percent of the total benefits of the project. Projected recreation benefits account for an additional 25 percent of the total benefits.

Construction activities for completion of the project site would have limited impact on local employment because of their relatively short duration (TVA's current estimated completion date is 1985). However, the completion of the project would increase long-term employment opportunities associated with subsequent operation and maintenance of the project. A more significant and enduring benefit to the labor force would be provided by the creation of more jobs in industry and related trades and services should such development occur (Enclosure 63).

The cities of Manchester, Tullahoma, Shelbyville, Lewisburg, and Columbia are actively participating in the construction of the Duck River Project by contributing toward the funding of the project in the amount of \$16.2 million over a 50-year period. These funds are being provided by levying a 5-cent per 1000 gallons surcharge on users serviced by the water grid system. TVA is presently meeting its commitment to these cities through controlled releases from Normandy Reservoir and has indicated that it can fulfill its existing water supply commitment to these cities under any of the alternatives previously considered by TVA (Enclosure 67).

Currently, construction of the Columbia Dam and Reservoir is about 30% complete (\$44 million expenditures or commitments through fiscal year 78). In this regard, the US Congress has continued to appropriate funds for the completion of the Duck River Project, of which Columbia Dam is a part, by its approval of TVA's annual budget requests. TVA estimates that to complete the project as planned with conservation would require an additional \$96 million. Costs to complete the alternatives discussed in Enclosure 67 vary from \$15 million for the No-Impoundment-Downstream Removal, Minimum River Development Alternative to \$55 million for the Low-Pool-Downstream Removal Alternative.

The benefit/cost ratio (BCR) for the Duck River Project of which Columbia Dam is a part, was computed by TVA as 1.3-1.0 for publication in its 1972 Environmental Impact Statement. In its Alternatives Report to OMB (Enclosure 67), TVA indicated that the BCR computed for the Columbia Dam Project was 1.0 to 1.0. TVA's BCR for the Duck River Project was reviewed by the US General Accounting Office in 1973, and the President's Executive Screening Committee in 1977, the latter of which computed a BCR of 0.8-1.0 (Enclosure 80). A current BCR specifically for the Columbia Dam Project based on present financial conditions is not available. However, using TVA's figures contained in its Alternatives Report (Enclosure 67), our computations indicate a BCR ranging from 0.7-0.8 to 1.0 for various levels of development for the No Impoundment Alternatives.

n. *Safety*.—Highway relocations associated with the proposed Columbia Dam Project would result in the improvement of grade and alignment of many of the existing routes thus making these roads safer to travel. Construction of modern bridges would also increase safety on these roads.

Construction of the Columbia Dam as proposed would reduce downstream flooding thus making the area adjacent to the Duck River in the vicinity of Columbia, Tennessee, safer during the flood season. It would also reduce or help control flood heights as far downstream as the lower Tennessee, Ohio, and Mississippi Rivers. However, TVA has indicated in its Alternatives Report to OMB (Enclosure 67) that similar transportation and flood protection benefits could be provided by the No Impoundment, Downstream Relocation Alternative or the Low Pool, Downstream Relocation Alternative.

o. *Food Production*.—Of the total land to be acquired for the proposed Columbia Dam Project (27,500 acres), approximately 9350 acres are Class I and II agricultural lands, 4,675 acres are Class III lands, and 3,025 acres are Class IV lands. Class I and II lands are considered "Prime farmlands" which are defined as lands suitable for any

type of agricultural use, having high crop yields, experiencing minimal erosion, with adequate drainage, and little likelihood of flood damage during the crop season. Class III and IV lands are farmlands which are capable of producing high crop yields for specific crops. Of the total lands to be impounded by the reservoir (12,600 acres), approximately 11,000 acres are considered Class I, II, and III croplands (Enclosure 63). Most river bottom lands are considered productive farmlands, and the impoundment of Columbia Reservoir would eliminate a very large portion of these lands located within the project area. The permanent loss of those lands for food production purposes cannot be mitigated without adversely affecting other important resources. These lands comprise 9.2 percent of the productive farmlands in Maury County (Enclosure 78). The cumulative effect of such loss in productive lands would adversely impact the availability of agricultural lands nationwide. The national importance of these cumulative effects on farmlands related to land development including floodplain encroachment is evidenced in a 30 August 1976 Memorandum from the President's Council on Environmental Quality (Enclosure 79) which encourages Federal agencies to make efforts to assure that such farmlands are not irreversibly converted to other uses unless other national interest override the importance of preservation or otherwise outweigh the environmental benefits derived from their protection (see paragraph 9(h) of this report). Reduced flooding on the 3700 acres of prime farmlands downstream of the proposed dam would not necessarily increase food production on these lands due to the reduction of organic nutrients naturally deposited during periods of floodplain inundation. Therefore, it is my opinion that impoundment of Columbia Reservoir would result in an overall decrease of land available for food production in the immediate area.

p. *Conservation.*—The proposed project would be utilized for the storage of water to furnish a reliable source of water for present and future municipal and industrial requirements of Maury and Marshall Counties. Presently these areas are experiencing a depletion in ground water levels and the smaller streams in the counties experience extreme low flow during dry periods. As a result of project impoundment, ground water levels would rise in the vicinity of the reservoir; however, significant rises in the water table would occur at distances of less than one mile (Enclosure 63). The projected water supply needs for the Columbia area, however, could be met by modifications to the operation of Normandy Reservoir and the implementation of appropriate water conservation measures (Enclosure 67). This would reduce the commitment of resources required for the completion of Columbia Dam as presently planned.

The impoundment of the Columbia Reservoir would result in the loss of an estimated 11,000 acres of Class I, II, and III crop lands. These lands for the most part are considered "prime farmlands" (see para 9(o) of this report). In addition, an estimated 1600 acres of riparian and upland woodlands would be lost due to impoundment (Enclosure 63). The Tennessee Wildlife Resources Agency (TWRA) has requested that TVA leave standing timber in the reservoir area to provide fishery habitat. In addition, according to TWRA, proper man-

agement of TVA lands contiguous to the reservoir area would insure the protection and development of wildlife habitat lands (Enclosure 27). The impoundment area would serve as a catch basin for sediment entering the waterway as a result of upland erosion. This would reduce siltation deposits downstream of the reservoir, thus improving water quality and prevent reduction of stream capacity (Enclosure 63). However, this sediment entrapment would adversely affect water quality and biological productivity in the reservoir.

The Duck River supports a diverse, high quality aquatic community and riparian zones along the river in combination with open and forested upland habitat and croplands provide some of the best small game habitat in southern middle Tennessee. The impoundment of the Columbia Reservoir would result in an overall adverse impact to these fish and wildlife values (Enclosure 12). These losses, however, would be mitigated to some extent by implementation of the FWS and TWRA recommendations. In addition, the conservation program described in the FWS 3 April 1980 Biological Opinion (Enclosure 18) and agreed to by TVA, if successfully implemented, would insure the continued existence and potential enhancement of two endangered species of mussels within the project area. In a Department of the Interior document entitled "The Rivers Inventory of the Southeastern United States" dated October 1978 and revised in April 1980 (Enclosures 80a and 80b), two segments of the Duck River from Mile 8.0 to Mile 126.0 and Mile 132.0 to Mile 210.0 were listed for study and possible inclusion in the National Wild and Scenic River System. In the President's review of his administration's programs for the protection of the environment (Enclosure 81), he directed Federal agencies to, among other things, avoid or mitigate adverse effects on rivers identified in the National Inventory. Even though the lower section of the Duck River would not be directly affected by the proposed project, completion of the project as planned would preclude further consideration of 54 miles of the upper section as a wild and scenic river.

The project is not expected to have any effect on the geology or mineral resources of the area (Enclosure 63).

Improved highway transportation systems could reduce energy consumption by conserving gasoline; however, various recreation activities associated with the reservoir would increase the demand for energy resources. Implementation of either of the alternatives identified in TVA's "Report to OMB on Columbia Dam Alternatives" (Enclosure 67) would conserve important natural resources of the area.

q. *Water Supply.*—Columbia Dam as proposed would assure an adequate water supply for Marshall and Maury Counties and improve the present water supply situation both domestically and industrially. In addition, it would encourage expansion and development and attract new industry to the area which would provide economic stability by providing additional job opportunities. An improved water supply accounts for approximately 12.7 percent of the projected benefits from the Duck River Project of which Columbia Dam is a part. TVA has projected a 91 percent increase in the water supply demand over the next ten years for the Marshall and Maury County areas to be serviced by the Columbia Dam Project. In addition, the population increases

in the 4-county area have been at a rate of approximately 3 percent during the period 1970-77 (Enclosure 82).

The cities of Manchester, Tullahoma, Shelbyville, Lewisburg, and Columbia, are actively participating in the construction of the Duck River Project by contributing toward the funding of the project in the amount of \$16.2 million over a 50-year period. These funds are being provided by levying a 5 cents per 1000 gallons surcharge on users serviced by the 4-county water grid system.

TVA has indicated that controlled release from the existing Normandy Reservoir could furnish the necessary water supply demands of the water grid system without the Columbia Reservoir. However, local officials predict that the water grid system will require 3 times the amount of water projected by TVA (Enclosure 67). Normandy would also be able to fulfill water quality control requirements for waste assimilation for the City of Columbia. Williamson County has expressed an interest in obtaining its water supply from the Columbia water grid system. However, TVA has indicated that with the inclusion of Williamson County into the water grid system, Normandy would not be able to meet future water supply demands without affecting reservoir levels of Normandy. In addition, if industrial growth takes place at a greater pace than TVA has predicted, water supply from Normandy alone would not be adequate (Enclosure 67).

Implementation of various water conservation measures, i.e., recycling, discrete use, rationing, etc., would reduce the demand on water supply. In addition, improved treatment of wastewater, i.e., secondary and/or tertiary treatment, would further enhance the capability of the Duck River with controlled releases from Normandy Dam to receive and assimilate wastewater effluent discharges. Based on the projected population increase and industrial development in the 4-county area, it can be assumed that the water usage would increase by a proportionate amount. Therefore, I have concluded that future water supply demands for the Marshall and Maury County areas could be met through controlled releases from Normandy Reservoir without full impoundment of the Columbia Reservoir as planned. This conclusion is supported by the findings in TVA's "Report to OMB on Columbia Dam Alternatives."

r. *Water Quality.*—The Tennessee Department of Public Health, Division of Water Quality Control (TDWQC), certified on 6 December 1979 that construction of the proposed dam would not violate the State Water Quality Act or the Clean Water Act. Prior to certification, Mr. Stephen E. Anderson, a TDWQC staff member and Assistant Director for Enforcement and Planning, stated in his report dated 28 November 1978, that water quality standards were not technically appropriate to judge impacts on water quality within the proposed reservoir (Report entitled "Columbia Dam and Reservoir 401 Certification", (Enclosure 83). It was later revealed at a 2 May 1980 water quality certification appeal hearing that because of this technical deficiency, the effects of the proposed impoundment and downstream releases were not considered in the decision to issue the 6 December water quality certification (Enclosure 84). However, water quality effects within the proposed impoundment have been thoroughly considered by TDWQC. These impacts have been points

of debate between TDWQC staffs for approximately two years. Throughout the years, TVA has generally maintained its position that the reservoir would have no serious adverse water quality impacts as expressed in the EIS (Enclosure 63). This position is reflected by such statements as:

the levels of nutrient—particularly phosphorous—in the water proposed for an impoundment are well above the so-called “threshold levels” cited in the literature as those that, if exceeded, will result in obnoxious, algal blooms in natural lakes. In fact, nutrient levels considerably above the threshold levels occur in several reservoirs in the TVA system, but no blooms have resulted. (Enclosure 63.)

Mr. Anderson's report expressed serious concern over the probability of algal blooms and rapid eutrophication (nutrient overload) within the proposed reservoir in light of its receding water from an area with relatively high concentrations of phosphate, citing Normandy Lake and J. Percy Priest Lake as having phosphate-related eutrophication problems. In addition, the report stated that Tennessee Water Quality Standards for “dissolved oxygen” and “hard or mineral compounds” would probably be violated and that Columbia Reservoir would degrade waters of the Duck River. Although the potential for eutrophication is the main point of contention between TVA and TDWQC, the problem of how to contend with algal blooms, should they occur, presents another important point. TVA has stated in the final “Report to OMB on Columbia Dam Alternatives” (Enclosure 67), that even though it does not foresee the extreme conditions forecast by the State, provisions . . . have been incorporated into the project to provide operating flexibility to insure that the effects of any nuisance algal blooms which may occur in the reservoir may be isolated in the reservoir without impacting the quality of downstream releases. Should blooms occur, releases from the upper level of the reservoir would have to be discontinued making releases from lower levels necessary where high concentrations of iron and manganese are expected, thus subjecting these metals to domestic and industrial water intakes where treatment would be required. Although TDWQC concedes that Columbia Dam would have a unique capability for multi-level releases to control downstream water quality, it also concedes that the above-stated conditions coupled with a requirement to maintain a warm-water fishery, presents simultaneous mitigation requirements not previously met by any TVA systems. According to the TDWQC staff's assessment, the proposed reservoir and downstream releases would adversely affect water quality of the Duck River. A full evidentiary hearing to be conducted by the TDWQC Board will consider not only the impacts of the proposed dam construction on water quality but also the impacts of downstream releases from the dam and the impoundment and provide the most technically appropriate means available to allow accurate predictions of water quality impacts that would result from the proposed project.

10. Other Pertinent Remarks, Including

a. Extent of Need.—The citizens of Marshall and Maury Counties would directly benefit from completion of the Columbia Dam Project

in that it would provide benefits in the form of improved water supply, flood protection or prevention, flat-water recreation opportunities, incentives for domestic and industrial development, improved transportation routes, etc. However, these benefits would result in the relocation of businesses and residences, the loss of prime agricultural lands for food production, the elimination of riverine and upland wildlife habitat, potential water quality problems in the impoundment, and the expenditure of public funds on a project with benefits that could be provided by alternatives at significantly less costs.

The needs which have been identified by TVA are as follows: industrial and domestic development, recreation, water supply, water quality, and flood prevention. However, as indicated in this report, similar benefits can be provided through implementation of available alternatives discussed in TVA's "Report to OMB on Columbia Dam Alternatives." TVA has concluded that these alternatives are not reasonable since they are not economically justified. The only benefit which would not be provided by the alternatives is *flat-water* recreation. As previously discussed in this report, this need is being met by nine existing reservoirs (including Normandy Reservoir) within a 50-mile radius of Columbia, Tennessee.

There presently is an increasing public need for the development of additional energy sources such as hydroelectric power generation. Utilization of the proposed Columbia Reservoir for such power production was considered during its planning stages. However, TVA decided that the cost of providing hydroelectric generation capabilities would outweigh the benefits.

b. *Appropriate Alternatives.*—During the early planning stages of the Duck River Project of which Columbia Dam is a part, TVA considered several alternative ways of achieving the goals of the proposed action. The alternatives considered at that time included a no-action alternative, alternatives in lieu of a multipurpose project, alternative multipurpose reservoirs, and alternative reservoir levels for Columbia and Normandy Dams. TVA concluded that there would not be any significant environmental or economic advantages associated with either a combination of single-purpose projects or a different type of multipurpose development than the project as proposed (Enclosure 63).

In response to a request by the Office of Management and Budget (OMB), TVA prepared a *Report on Columbia Dam Alternatives* dated April 1979 (Enclosure 67). Alternatives considered in the report included:

Low Pool.—Downstream Relocation Alternative at cost of \$55 million

No-Impoundment.—Downstream Relocation Alternatives, With Maximum Development Level at a cost of \$25 million, With Medium Development Level at a cost of \$23 million, With Minimum Development Level at a cost of \$15 million

TVA has concluded that in light of the limited benefits, i.e., water supply, recreation, flood control, cultural, fish and wildlife, etc., of the alternatives to the project as planned, and the difficulty in operating the low pool reservoir, these are not reasonable alternatives. TVA has determined that the only reasonable alternative is the construction of Columbia Dam as planned, along with implementation of the

conservation program to assure the continued existence of the endangered mussel species.

Based on my review of TVA's "Report on Columbia Dam Alternatives," I have concluded that there are alternatives to the project as planned which would provide similar benefits without impoundment and at significantly reduced costs. TVA, however, has determined that these alternatives are not reasonable since they are not economically justified.

c. Probable Impacts Related to Cumulative Effects Created by Other Activities.—Prior to the completion of the Normandy Dam and Reservoir project, the Duck River along with the Buffalo, Harpeth, Red, and Roaring Rivers were the only free-flowing rivers in middle Tennessee that were unobstructed and uncontrolled by multi-purpose dams. The lower portion of the Duck River is inundated by the backwaters of Kentucky Reservoir and the above-mentioned waterways, except for the Buffalo River, are similarly inundated by other reservoirs. Considering the inundation of 17.7-miles of the lower Duck River, and the 16.5-mile portion impounded by Normandy Dam, the adverse cumulative effect of the proposed conversion of an additional 54 miles of free-flowing river to impounded waters would be significant involving approximately 21.0% of the Duck River's remaining 254.7 miles of free flow. (Small low-profile dams for local water supply, etc., do exist throughout the project area but are not considered as multi-purpose dams.) Additional consideration concerning cumulative effects of the proposed project involves the likelihood of future similar projects being proposed. With approximately 115 miles of free-flowing river downstream of the Columbia Dam site, and the town of Centerville located some 61 miles downstream, conditions appear conducive for proposals with similarly described purposes. Impacts of the proposed conversion of free-flowing river to impounded waters are considered adverse based on (1) the substantial number and even distribution of existing reservoir projects within a 50-mile radius of the proposed project site, and (2) the scarcity of and growing public demand for the inherent values of free-flowing rivers.

d. Position of the Congress of the United States.—The Duck River Project of which Columbia Dam is a part has not been specifically authorized by Congress. It was, however, authorized by the Board of Directors of the Tennessee Valley Authority under authority of the TVA Act of 1933. TVA submits to Congress its annual budget request which designates funds for specific projects such as the Duck River Project. In each year since 1969, Congress has continued to approve TVA's budget including funds specifically designated for the Duck River Project, thus allowing construction to proceed on Columbia Dam.

e. Extent and Permanence of Beneficial and/or Detrimental Effects.—If approved, the Columbia Dam Project, as planned, would result in the permanent conservation of 12,600 acres of productive farmlands and upland woodlands to an impounded reservoir area, 54 miles of riverine habitat to a flat-water reservoir, and an additional 14,900 acres of land under private ownership to public lands. It would provide long-term economic and social benefits to the surrounding area through an improved water supply system, flood protection, in-

creased domestic and industrial development, and increased flat-water recreation opportunities.

11. Enclosed are copies of TVA's 28 April 1972 Final Environmental Impact Statement and June 1974 Supplement for the Duck River project (Enclosures 63 and 64). I have reviewed these documents and have determined that they adequately address the environmental impacts of the project. Therefore, I recommend that the Corps adopt the EIS (and Supplement).

12. Section 404(b) Evaluation

The following is an evaluation of the proposed discharge of fill material necessary for the completion of Columbia Dam and the construction of upstream and downstream bridges. The evaluation is done in accordance with the Environmental Protection Agency's 404(b) Guidelines (40 CFR, 230), dated 5 September 1975, concerning the discharge of dredged or fill material below ordinary high water. The impacts related to displacement of open-water and bottom habitat for aquatic life and short-term increases in turbidity and downstream sedimentation as result of dam and bridge construction are relatively minor compared to those mentioned above.

Factors

Effects

- | | |
|-----------------------------|---|
| a. Project Description----- | The proposed discharge of fill material is described in paragraph 3 of this report. |
| b. Physical Effects: | |
| (1) Wetlands----- | Approximately 400 acres of wetlands classified as bottomland hardwoods under most classification schemes and lower bottomland hardwoods under FWS's classification system (Enclosure 75a) would be eliminated by the proposed reservoir. These wetlands serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing, and resting sites for aquatic and land species. Of particular value, the proposed reservoir site and the Duck River contain a large amount of breeding habitat for wood ducks and highly diverse populations of flora and fauna. Direct impacts on wetlands from the disposal of dredged and fill material are minor. |
| (2) Water Column----- | The water column within the river at the proposed reservoir site would be altered by conversion of free-flowing waters to impounded waters. These impounded waters would be characterized by increased ability to retain materials introduced by run-off from adjacent lands (i.e., solids, nutrients, etc.), and relatively high temperatures and relatively low dissolved oxygen levels in the thermally-stratified upper and lower levels respectively. The water column of the river downstream of the proposed dam site would basically retain its free-flowing characteristics. Water quality would be adversely affected by the above-mentioned changes primarily because of retained phosphates introduced to the impoundment (eutrophication) and downstream releases of trapped iron and manganese from the dam (see paragraph 9r). Adverse impacts from disposal activities will be temporary and primarily result from increased turbidity. |

*Factors**Effects*

b. Physical Effects—Continued

(3) Benthic Communities. Benthic organisms typically adapted to lotic environments would be replaced by those organisms preferring a lentic environment. The overall species diversity of the Duck River affected by Columbia Dam would decrease after impoundment. The mussel fauna is of special concern because some of its members are listed as endangered. (See discussion of mitigation for endangered mussels in paragraph 9b). Although some endemic mussels would adapt to a reservoir environment, overall mussel diversity would decrease as is expected for other forms of benthic life. The actual placement of dredged and fill material associated with the construction of Columbia Dam will result in temporary adverse effects on the benthic populations immediately downstream of the placement activities. These temporary impacts will be appreciably diminished further downstream. After the reservoir becomes fully operational, it is expected that the benthic communities immediately below the dam would be composed of fewer species than presently exist in the Duck River. However, these communities should recover at points further downstream.

c. Chemical Biological Interactive Effects.

The proposed fill material for dam construction would be obtained just upstream from the damsite from the right bank floodplain. The placement of the impervious rolled fill for completion of the dam would be accomplished in the "dry" subsequent to diversion of the river through the concrete portion of the dam. However, prior to this, the fill would be placed downstream of the dam to prevent backwater from coming in contact with the downstream slope of the dam. The slopes of all fill, including that proposed for construction of bridges would also be protected by a filter blanket topped with large aggregate riprap prior to reservoir impoundment. Therefore, since the proposed water/fill interfaces would be composed of rock which is substantially the same as the substrate at the disposal area and free of contaminants, the proposed placement of fill is excluded from the evaluation procedures of the chemical-biological interactive effects as specified in EPA Regulations, Title 40, Part 230, Section 230.4-1, Para. (b), (2) and (3) of the Federal Register, dated 5 September 1975, as the conditions of Paragraphs (b)(1)(i) and (b)(1)(iii)(b) and (c) exists as well as b)(1)(iii)a) described above.

d. Water Quality Standards---

A TDWOC Assistant Director's report (Enclosure 83) indicates that Tennessee Water Quality Standards are technically inappropriate to judge impacts on water quality within a reservoir. However, the report did evaluate all water quality standards and indicated that standards for "dissolved oxygen" and "hard or mineral compounds" would probably be violated. Subsequent to this report, TDWOC issued water quality certification (December 1979) for the proposed completion of the project. It was later revealed at a TDWOC Board hearing (2 May 1980) that the certification dealt with dam construction only and not the effects of the impoundment or downstream releases (see paragraph 9c).

*Factors**Effects*

e. Disposal Site Selection:

- (1) Need for activity----- The proposed placement of fill material would allow the completion of the Columbia Dam and Reservoir Project. According to TVA, the proposed multipurpose water control system provided by the proposed project and the previously completed Normandy Dam and Reservoir (collectively called the Duck River Project), would contribute to area development by reducing flooding on urban and agricultural lands; providing a more dependable supply of water of generally improved quality for municipal and industrial use; creating a broad range of new recreation and fish and wildlife opportunities; stimulating higher and better land use; and creating more productive employment of the local labor force. See discussion of the project purposes and other aspects of the project in paragraph 9 above.
- (2) Alternatives----- Alternatives to the project have been evaluated by TVA (Enclosure 67). The no impoundment alternative is practicable in that the Duck River as it exists with Normandy Dam water releases can provide the four-country area (Marshall, Coffee, Bedford, and Maury) with the basic benefits described in e(1) above and prevent the destruction of valuable natural resources as addressed in paragraph 9 above. No alternative disposal sites with significant environmental advantages have been identified.
3. *Objectives Considered in Determination of Discharge*
- a. Chemical, Physical, and Biological Integrity----- The proposed discharge would not significantly disrupt the chemical, physical, and biological integrity of the aquatic ecosystem below the discharge sites. Nevertheless, the secondary impacts of the discharge would result in adverse impacts to the natural system by converting a 54-mile section of the Duck River to impoundment. See discussion in subparagraphs 9b and 12b.
- b. Food Chain----- The diversity of species within the aquatic food chain would be reduced by conversion of a riverine system to an impoundment. See subparagraphs 9b and 12b(1).
- c. Movement of Fauna----- The proposed dam would eliminate or curtail spawning "runs" of various species of fish that inhabit the Duck River. In addition, the impoundment would render a 54-mile section of the river and portions of its tributaries as unsuitable for such "runs."
- d. Wetland Areas----- See b(1) above.
- e. Water Retention----- The proposed dam would impound a reservoir of 12,600 surface acres and 294,000 acre-feet at normal summer pool elevation. At normal winter pool elevation, the proposed impoundment would have 4,300 acres and 80,000 acre-feet. The impoundment at normal summer and winter pool elevations would be 54 and 46 miles long, respectively.
- f. Turbidity----- Turbidity of waters released from the proposed dam would likely be improved over existing conditions in that the reservoir's settling capabilities would reduce concentrations of solids released. Turbidity within the reservoir would likely increase algae induced turbidity typical of reservoirs (Enclosure 83). Turbidity resulting from the disposal activities would be temporary and have minimal impacts on the aquatic system.

<i>Factors</i>	<i>Effects</i>
g. Recreational, aesthetic, and economic values.	These values would be degraded by the Columbia Reservoir. The discharge of dredged and fill material would have minimum impacts on these values. See paragraph 9a, 9c, and 9m.
h. Water Quality-----	Water quality would be adversely affected by the Columbia Dam project. See paragraph 9r. Direct impacts from the fill activities would be minimal on water quality.
i. Endangered Species-----	The continued existence of endangered species would not be jeopardized. See subparagraph b (2).
<i>4. Water Use Impacts</i>	
a. Municipal Intakes-----	Additional quantities of water would be made available at the Columbia, Tennessee, municipal water intake, approximately 3 miles downstream of the dam site. Also, treatment requirements at this intake would be increased because of expected increases in iron and manganese that would be provided by discharges from the proposed reservoir. See paragraph 9r. The actual discharge of dredged and fill material would have minimal, if any, direct impact on municipal water treatment facilities.
b. Shellfish-----	The proposed reservoir would inundate highly valuable populations of two endangered mussel species and would jeopardize the continued existence of these species. However, through consultation, TVA has agreed with FWS to carry out a conservation program that if successful, would insure the continued existence of these species (see subparagraph b(2)). Habitat for other mullusks including snails dependent on lotic environments would for the most part be eliminated. Those species able to adapt to the environment provided by Columbia Reservoir would inhabit shallow water areas.
c. Fisheries-----	A 54-mile long riverine fishery would be adversely affected by the proposed project. However, a 12,600 acre lake fishery would develop. See paragraph 9b.
d. Wildlife-----	Wildlife resources provided along a 54-mile section of the Duck River would be adversely affected by the proposed project. See paragraph b.

404(b) *Conclusions.*—The proposed sites for the deposition of fill material for completion of the Columbia Dam and Reservoir Project and the completion of two related bridges, have been specified in accordance with the Section 404(b) (1) guidelines.

13. Conclusions:

a. The United States Congress has charged the Secretary of the Army, acting through the Chief of Engineers, to regulate the discharge of dredged or fill material into the waters of the United States. In this case, the Tennessee Valley Authority must obtain a Department of the Army Permit under Section 404 of the Clean Water Act for the placement of fill material in the Duck River prior to completion of the Columbia Dam. I am required to carefully weigh all those factors which are relevant to this activity, and to balance those benefits which reasonably may be expected to accrue from completion of the Columbia Dam, as proposed, against the reasonably foreseeable detriments of the proposed activity.

b. The benefits expected from completion of Columbia Dam which I find of most significance are:

(1) Economic benefits, including area redevelopment, industrial, and recreation benefits.

(2) Water supply for future needs in the total water grid system.

c. The reasonably foreseeable detriments which I find of most significance are:

(1) Loss of agricultural lands and food production.

(2) Loss of riverine environment (habitat, recreation values).

(3) Loss of approximately 400 acres of wetlands.

d. I have considered all factors relevant to the proposed completion of Columbia Dam. Other factors which I considered particularly important, but of somewhat lesser significance than those in b and c above, include flood damage prevention (limited benefits, available alternatives), shoreline values (limited benefits, partially detrimental), flatwater recreation, aesthetics, water quality (effects not fully determined by State and EPA), and other general environmental concerns.

e. In accordance with 33 CFR 320.4, determinations by other Federal agencies should be given great weight in their areas of responsibility. Accordingly, I attach great weight to the fact that, with respect to the significant, reasonably foreseeable detriments (c) (1), (2), (3) above), no Federal agency objected to issuance of the permit with appropriate conditions. Furthermore, local elected officials and the State Governor support the completion of Columbia Dam in spite of these foreseeable detriments, whose impact would be primarily of local and State concern.

f. The Congress has appropriated funds in each year from fiscal year 1969 through fiscal year 1980 for the Duck River project of which Columbia Dam is a part. While not *ipso facto* an affirmative determination of the public interest, the Congressional appropriation process should be given great weight as an assent to the economic value of the investment.

g. The Governor and the State Legislature have endorsed the completion of Columbia Dam. Pursuant to 33 CFR 320.4, in the absence of overriding national factors of the public interest (none of which I have identified), a permit will generally be issued following receipt of a favorable State determination.

14. Determination

I have determined that the benefits which reasonably may be expected to accrue from completion of the Columbia Dam outweigh the reasonably foreseeable detriments. I have considered the available alternatives and have determined that TVA's selected course of action, completion of the Columbia Dam project as presently planned, is the most appropriate alternative which would satisfy all project purposes. I, therefore, have determined that the proposed activity is in the public interest and that the Department of the Army Permit to place fill material in the Duck River for completion of the Columbia Dam should be issued with appropriate conditions.

15. Recommendation

Since I cannot take final action to issue this permit in the fact of the EPA request of 13 February 1980 that I hold issuance in abeyance,

I am forwarding this report to the Division Engineer, Ohio River Division. I recommend that the Division Engineer take action to issue the Department of the Army Permit.

ROBERT K. TENER,
Colonel, Corps of Engineers,
District Engineer.

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