

Unlike the report TVA prepared for OMB in 1979² that dealt with alternatives, this study concentrates on the economics of spending additional funds necessary to complete the Columbia Dam and Reservoir. Only remaining costs and remaining benefits are pertinent to such a determination. Recoverable costs (such as acquired land that can be resold) are included in the benefit-cost analysis as "recoverable cost foregone."

Congress originally funded the Duck River project in 1969 based on a TVA study showing a total estimated cost of \$73.5 million and a benefit-cost ratio of 1.3 to 1 for the two dam system. Columbia Dam and Reservoir alone was estimated to cost \$50 million with a benefit-cost ratio of 1 to 1. Construction of Normandy Dam and Reservoir began in 1972 and was completed in 1976 at a cost of \$37.4 million. Construction at Columbia began in 1973, continued somewhat sporadically after 1978, and was halted in September 1983. The project is now 45 percent complete with over \$80 million expended or obligated to date. The total cost of Columbia Dam and Reservoir is now estimated at \$239 million assuming completion by 1992.

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The cost remaining from this date necessary to complete Columbia Dam and Reservoir is estimated at \$159 million. This estimate includes an inflation factor of 6 percent per year (based on TVA's experience in recent years) and is based on a six year period of construction, 1987 through 1992. Assuming resumption of construction in 1987 is very optimistic in

²Report to OMB on Columbia Dam Alternatives, April 1979

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light of the status of the mussel conservation program. Remaining construction activities are described beginning on page 12 and summarized in Table 1. Other public and private costs are estimated at \$10 million.

For economic analysis purposes, remaining costs and remaining benefits are compared at 1985 price levels in this report. The estimated remaining cost converted to 1985 price levels is \$123.4 million. Costs and benefits are converted to equivalent average annual values over a 50-year economic life at discount rates of 4-7/8 and 8-5/8 percent. The lower rate was that used in the 1969 analysis and the higher rate is that currently specified (as of October 1, 1985) for use on Federal water and related land resources projects. Annual costs, including interest and amortization charges for capital over the 50-year project economic life; interest during construction; annualized operation, maintenance, and replacements; recoverable cost foregone; and salvage value are estimated at \$8.700 million at 4-7/8 percent discount rate and \$14.880 million at 8-5/8 percent discount rate.

The major activities remaining to complete the project include purchase of some 14,600 acres of land and relocation of about 30 families; completion of the dam; relocation of 22 miles of roads in the reservoir area including replacement of two interstate highway bridges crossing the Duck River; utility relocations including three major gas lines of Texas Eastern Transmission Corporation; relocation of approximately 300 graves from sixteen cemeteries; reservoir clearing and structure removal; construction of recreation, wildlife and other public use facilities around the reservoir; archaeological, historical, and cultural investigations; water quality

studies; and habitat improvements and transplant monitoring connected with the mussel conservation program. as required under ESA.

Benefits evaluated in 1969 included flood control, water supply, water quality (Normandy only), recreation, fish and wildlife, shoreline development (land enhancement), transportation savings, redevelopment, and enhanced employment. No new economic analyses have been developed in the intervening years; but, the 1969 analysis has been updated on several occasions to reflect increased costs.

All the benefit categories included in the 1969 evaluation, with the exception of enhanced employment, were considered in this study. Enhanced employment benefits are not applicable under the Guidelines. Benefits evaluated include system, urban and agricultural flood control; water supply; recreation (including fishing and hunting)³; and land enhancement. Transportation savings benefits were mainly associated with highway relocations on Highway 50 and Iron Bridge-Sowell Mill Pike which have been completed and are presently realized. Redevelopment benefits were not evaluated because unemployment in the project area is not high enough or persistent enough to qualify under the Guidelines. The total annual benefits for all purposes are estimated to be \$6.290 million at 4-7/8 percent discount rate and \$6.150 million at 8-5/8 percent discount rate. These benefits are described beginning on page 20 of the report.

³TVA has contracted with Midwest Research Institute (MRI) to estimate the potential recreation benefit using a regional model it previously developed for the Columbia and Tellico projects. Its estimate will be included in the final report. TVA has estimated the recreation benefit for this draft based on an update of the previous MRI estimate.

Following enactment of the National Environmental Policy Act of 1969, TVA prepared a draft environmental impact statement (EIS) that was published in June 1971. A public hearing on the project was held in August by TVA and a final EIS was published in April 1972⁶.

The Environmental Defense Fund, Inc., and others filed a lawsuit in July 1972 to halt the project on the grounds that the EIS was inadequate. The U.S. District Court held that the EIS, although sufficient in most areas, should have provided additional information about agricultural impacts, relocation of families, wildlife management, and river recreation. After a supplement to the final EIS was issued in June 1974⁷, the courts determined that the NEPA requirements had been met.

TVA and the Department of the Interior began consultations in mid-1976 under Section 7 of the Endangered Species Act after the U.S. Fish and Wildlife Service (FWS) listed a number of species of freshwater mussels designated as endangered, as occurring in the Duck River. TVA requested a Section 404 permit for Columbia Dam from the U.S. Corps of Engineers (USACE) in October 1977. USACE delayed action on the permit because of questions about water quality and endangered species. A public meeting was held in November 1979 by USACE. The rate of construction was curtailed in 1978 due to the lack of the USACE permit. OMB, through the deferral process, also restricted the funds that could be committed to the project although certain work was allowed to continue (certain road projects, biological studies, and cultural investigations).

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⁶Final Environmental Statement Duck River Project, April 28, 1972

⁷Supplement to Final Environmental Statement Duck River Project, June 1974

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TVA was asked by OMB to study alternatives which might provide essential project benefits and be consistent with applicable laws such as the

Endangered Species Act. The study, published in April 1979, concluded that

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no reasonable alternatives to completion existed. However, the alternative report outlined a conservation program to preserve the molluscan and other

fauna in the area that, if successful, would permit the project to be

finished as originally planned. The Department of the Interior accepted

False! It was a resp. B.O.
this approach to protecting the endangered species and issued a favorable biological opinion to TVA in September 1979 and to USACE in April 1980.

In October 1980 TVA halted all physical construction at Columbia until all legal impediments were removed. At that time the concrete portion of the dam was about 92 percent complete and the earth fill section was about 60 percent complete. No additional work has been done on the dam structure since then.

In the meantime, the State of Tennessee was studying the potential water quality effects and on December 6, 1979, the Tennessee Commissioner of Public Health certified to USACE that completion of Columbia Dam would not violate Tennessee water quality standards. The certification was appealed by the Environmental Defense Fund, Inc., and others to the State Water Quality Control Board. On April 6, 1981, the State board issued a decision which found that the construction and operation of Columbia Dam would not violate State water quality standards nor cause any water quality degradation. The decision was upheld in the Tennessee courts. On August 5, 1981, USACE issued the Section 404 permit. On the same date OMB released the \$15.8 million in deferred funds and construction on the project resumed shortly thereafter.

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Consistent with the Section 404 permit and the biological opinion, construction was limited to roads and bridges which would be useful even if the project was not completed. This work was finished in September 1983 when all construction was halted once again. TVA has, however, continued work on the mussel conservation program, cultural investigations, land use plans, and water quality studies, including a joint program with the Soil Conservation Service (SCS) demonstrating control of agricultural and other nonpoint sources of pollutants in the Duck River area.

Any further construction work will depend in part on the outcome of the mussel conservation program. This program was planned as a 2-tier effort, using an evaluation of program progress based on criteria set for each stage. The first tier required finding by the FWS of "likely success." Completion of the dam and the remainder of the major construction activity was to be delayed until the likely success of the conservation program was demonstrated to the satisfaction of FWS. The second tier required "proven success" to be demonstrated. Until such time as FWS is satisfied of the proven success, lake impoundment would be precluded.

Should mention that "likely success" not achieved.

Not totally true.

The interagency Columbia Dam Coordinating Committee and FWS agreed to criteria for likely and proven success in 1982. TVA set out to demonstrate likely success by the fall of 1983. A significant step in the mussel conservation program was reached in November 1982 when 4,000 mussels were successfully transplanted from the Columbia impoundment area to four stream reaches in the Valley. Criteria for likely success of the transplants include (1) at least 50 percent survival, (2) approximately same sex and ratio, and (3) at least 10 percent of female mussels carrying larval mussels

at 3 of the 4 transplant sites. Initial surveys of the transplants were conducted in 1983. Evidence of reproductive success was far higher than the goal. Biologists found that 85-100 percent of the females had larvae in their gills. On the other hand, survival rates were low. Only at the site in North Fork Holston, where 70 percent survived, were the requirements achieved. The survival rate was 10 percent at the Buffalo River site, 20 percent on the Duck, and 40 percent on the Nolichucky. Surveys conducted in 1984 produced similar results. Surveys in spring 1985 showed much lower survival rates in the North Fork Holston and Nolichucky Rivers. Thus no sites met the survival criteria. The survey data were made available to the Coordinating Committee and FWS for their evaluation.

Another important element in the conservation program is mussel habitat improvement. TVA conducted surveys on 15 streams in the Valley for a number of years looking at substrate characteristics, water quality characteristics, plant communities, fish and insect communities, and the presence of mussels. The purpose was to determine habitats that are essential to the mussel survival and population growth. These studies were

I thought these are the results we could never get from TVA!
 summarized and the results forwarded to the Coordinating Committee and FWS for their evaluation in March 1984. Some additional information requested by FWS was also included.

In July 1984 FWS determined that the survival criteria for "likely success" were not met for the transplants and that criteria for other program aspects including mussel habitat improvement were also not achieved. TVA will continue to monitor the transplant sites at least through 1989 in an effort to prove that the transplanted populations are reproducing in their new

Is this true?

habitats. TVA has recommended that habitat improvements be limited to the Powell River where sediment runoff from coal mine lands could be a threat to another endangered mussel that is too scarce to transplant. In light of these considerations, TVA believes its actions have been commensurate with biologic and economic constraints facing it, congressional guidance and support, and the resource needs of the upper Duck River basin. The mollusk conservation program has as yet not demonstrated likely success under current criteria or on any other basis that is acceptable to the scientific community or the technical staffs of either agency. Consequently, resumption of construction at Columbia must now await "proven success."

The Columbia segment of the Duck River project is now about 45 percent complete. The concrete portion of the dam is about 92 percent complete and the earthfill section is about 60 percent complete. Almost 13,000 of the required 27,500 acres of land have been acquired. Approximately half of the some 45 miles of roads affected by the reservoir have been relocated. (The major relocation, replacing two Interstate Highway 65 bridges crossing the Duck River, has not been started.)

Through fiscal year 1984, some \$80 million had been obligated at Columbia. Total project cost is now estimated at approximately \$239 million based on a 1992 completion date. Remaining cost to complete the project is therefore around \$159 million. At the beginning of fiscal year 1986, TVA had about \$800,000 in funds available for Columbia. No additional funds were budgeted for fiscal year 1986.

alized land-use plan and, if pertinent, a reservoir or streamflow guide will help avoid or identify such conflicts. Use of the same employment and population projections by all analysts will also help avoid inconsistent assumptions which would be incompatible.

5. Adverse effects. When a proposed plan will displace activities such as existing instream recreation or fishing, the benefits foregone should be subtracted out to get a net benefit for the project for that purpose. Such a net benefit for reservoir recreation could conceivably be negative if a major float stream were inundated.

Shouldn't this also include the adverse effects to the environment, as in mussels?