

In the Matter of
TENNESSEE VALLEY AUTHORITY
(Yellow Creek Nuclear Plant, Units 1 and 2)

NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD
LBP-78-7
Docket Nos. STN 50-566, STN 50-567
February 3, 1978

****1 *215** John M. Frysiak, Chairman; Lester Kornblith; Oscar H. Paris

***216 Appearances**

James F. Burger, Esq., W. Walter LaRoche, Esq., and Alvin Gutterman, Esq., for the Applicant.

Aubrey Godwin, Director, Division of Radiological Health, for the State of Alabama Department of Public Health.

Eddie Fuente, Esq., Division of Radiological Health, for the State of Mississippi State Board of Health.

Edward Ketchen, Esq., and Robert Mitchell, Esq., for the U.S. Nuclear Regulatory Commission.

The Licensing Board issues a partial initial decision, making findings of fact and conclusions of law and authorizing the issuance of a limited work authorization pursuant to [10 CFR § 50.10\(e\)](#), subject to certain terms and conditions.

FWPCA: EPA AUTHORITY

Although the staff unquestionably has authority to impose certain monitoring requirements, the authority does not extend to matters within the jurisdiction of the EPA (which has authority over effluent limitations pursuant to the Federal Water Pollution Control Act Amendments of 1972 (FWPCA)).

NEPA: COST-BENEFIT BALANCE

The staff must consider adverse effects on the aquatic environment in its NEPA cost-benefit balance, although it cannot require monitoring which is otherwise within the jurisdiction of the EPA Administrator.

TECHNICAL ISSUES DISCUSSED: Table S-3, radon-222; cooling water intake system; seismology.

PARTIAL INITIAL DECISION

(Limited Work Authorization)

***217 I. INTRODUCTION**

1. This is a proceeding on the application of the Tennessee Valley Authority ('TVA or Applicant') for construction permits for the proposed Yellow Creek Nuclear Plant, Units 1 and 2 (the 'facility'). This Partial Initial Decision examines Applicant's request for authorization to perform certain limited work activities, pursuant to [10 CFR § 50.10\(e\)](#).¹ A subsequent partial initial decision addressing the remaining radiological health and safety aspects of the construction permit application will be issued by this Board after the conclusion of public hearings on those issues.

2. The facility will consist of two pressurized water reactors, each with a rated core power level of 3,800 megawatts thermal and a net electrical output of 1,300 megawatts electrical.² The Yellow Creek site is located in northeast Mississippi in Tishomingo County about 9 miles north of the town *218 of Iuka.³ The 1,160-acre site is on a peninsula between the Yellow Creek embayment and the Pickwick Lake.⁴

3. The Commission published a 'Notice of Hearing on Application for Construction Permits' on February 10, 1977 ([42 Fed. Reg. 8441](#)). As a result of this notice, no petitions to intervene were filed, but a number of persons requested permission to make limited appearances pursuant to 10 CFR § 2.715(a). Both the Applicant (Tr. 303-309) and the Staff (Tr. 607-616) responded on the record to the statements or questions or both of the limited appearance

participants. Although the Staff or the Applicant may elect to respond more specifically in writing to some questions (e.g., limited appearance statements concerning uranium fuel cycle comments of Dr. Jordan, see Tr. 41), we believe the FES, the Safety Evaluation Report, the ER, the PSAR, and the record in this case provide appropriate responses to any general questions, any generic questions and statements, or any specific site-related questions presented by the limited appearance participants. Accordingly, further consideration of the limited appearance statements in this Partial Initial Decision is unnecessary. These were received at the hearing sessions held December 13–15 and at the special session held for limited appearances on December 27, 1977.

****2** 4. The record of the hearing includes the testimony of witnesses for the Applicant and the Staff as well as the exhibits offered by the parties and received in evidence.⁵ At the hearing a manuscript entitled 'Methods for Calculating Survival Rate, Biomass Production, Growth Rate, and Assessing Entrainment of Lacustrine Ichthyoplankton,' by P.A. Hackney (1977), was marked for identification as Applicant's Exhibit #6 without objection, but its receipt into evidence was held up pending delivery of copies to parties and the Board. The requisite copies have been supplied, and Applicant's Exhibit #6 is now received into evidence.

5. The parties to this proceeding are the Applicant, the NRC Staff, and the States of Mississippi, Alabama, and Tennessee.⁶

6. By motion dated January 25, 1978, Applicant moves the Board to reopen the record in this proceeding pursuant to 10 CFR § 2.718(j) to receive into evidence the affidavit of one Thomas E. Spink, dated January 25, 1978, together with Attachment A, on the ground that the information contained therein may have a bearing on site suitability issues. Staff does not ***219** object to the motion.⁷ The Board finds the information relevant and grants Applicant's motion to reopen the record for the limited purpose of receiving into evidence the affidavit of Thomas E. Spink, dated January 25, 1978, together with Attachment A. Said affidavit is marked Applicant's Exhibit #8 and is received into evidence. Applicant is authorized to supply and distribute the requisite number of copies of the exhibit.

II. ENVIRONMENTAL MATTERS

A. Compliance with 10 CFR Part 51 and the National Environmental Policy Act

7. This Board is responsible for determining whether the requirements of the National Environmental Policy Act of 1969 (NEPA) §§ 102(2)(A), (C), and (D) and of 10 CFR Part 51 have been met in this proceeding. We must weigh the environmental, economic, technical, and other benefits against environmental and other costs, and considering available alternatives determine the appropriate action to be taken. We must, in addition, determine whether the NEPA review conducted by the NRC Staff has been adequate. Finally, we must decide those matters in controversy between the parties within the scope of NEPA and 10 CFR Part 51.

8. In accordance with 10 CFR Part 51 the Applicant has submitted an Environmental Report (ER) (Applicant's Exhibit #1) with its application. The NRC Staff circulated its Draft Environmental Statement (DES) in June 1977 and published its Final Environmental Statement (FES) (Staff's Exhibit #1) in November 1977. Our decision is based upon these documents and other evidence relating thereto which is before us.

9. The FES describes the proposed site, the major plant systems, and the environmental impacts of site preparation, plant construction, and plant operation. It contains the Staff's cost-benefit analysis, which considers the environmental effects of the proposed facility and alternatives for avoiding or reducing adverse effects. On the basis of its review, Staff concluded that the action called for under NEPA and 10 CFR Part 51 is issuance of construction permits, subject to certain conditions for protection of the environment. FES at ii.

***220 (1) Impacts of Construction**

(a) Land

****3** 10. Present land use on the site, primarily forest production and limited agriculture, will terminate. FES § 4.1. Less than 500 acres of the 1,160-acre site will be altered by construction activities. FES § 4.1; ER § 4.3.1.1. Upon

conclusion of construction, approximately 200 acres will be permanently committed to plant facilities and access roads. FES § 4.1. The remainder will be revegetated by seeding and planting. *Ibid.* The total acreage to be committed to the facility and disturbed during its construction is very small compared to the total land available for forest production and agriculture in the area (Alcorn, Tishomingo, and Hardin Counties). ER § 2.1.4. We conclude that the impact of this facility on forest and land resources will be insignificant.

11. Dust, smoke, and noise will be generated during construction. FES § 4.3.1.3; ER § 4.1.3.1. Appropriate measures will be taken by the Applicant to mitigate the impact of these factors. ER § 4.1.3.1. We find these measures to be adequate and the impact acceptably minor.

12. Terrestrial fauna on the site will be adversely impacted by the noise and dust created by construction activities, as well as by habitat destruction and alteration. FES § 4.3.1; ER § 4.1.1.2. Much of this disturbance will be temporary, associated with construction; some habitat will be permanently lost, of course. Staff estimated that wildlife losses on Yellow Creek peninsula due to construction may amount to 30% of the present populations. FES § 4.3.1. We note, however, that the site occupies much less than 1/3 of the peninsula, and less than 1/2 of the site will be disturbed during construction. We consider Staff's estimate to be extremely conservative. We believe that the impact on terrestrial fauna, including wildlife, will be acceptably minor.

(b) Water

13. The principal impact from construction on aquatic systems will be increased turbidity and siltation caused by grading and filling, excavation, dredging, and construction of the barge slip and the intake and discharge structures. FES § 4.3.2.1. To minimize the impact of these activities, the Applicant will implement an erosion and sedimentation control program, to include minimizing slope angle and the use of berms, diversion dikes, check dams, stormwater collection, settling ponds, mulches, gravel, sediment basins, fiber mats, grasses, special drains, and netting, as needed. *Ibid.* Point source discharges will comply with requirements of the National *221 Pollutant Discharge Elimination System (NPDES) discharge permit to be issued by the Environmental Protection Agency (EPA). ER § 4.1.2, Appendix A; FES § 4.2.1, Appendix C. This permit will require the Applicant to submit to EPA for review and approval a detailed study plan for monitoring aquatic impact upon commencement of construction, as generally outlined in Section 6.2 of the ER. The planned mitigation measures and monitoring program will adequately serve to minimize the impact of construction on aquatic systems.

**4 14. In addition to the short-term increases in turbidity and siltation already mentioned, there will be a long-term loss of small areas of aquatic habitat. This loss will involve Slick Rock Branch, Tacket Branch, Bullard Branch, and portions of Slick Rock Cove. FES § 4.3.2; ER § 4.1.2. Staff estimates that construction will result in a standing-fish-stock loss of about 0.1% and a spawning-habitat loss of about 1% for the Yellow Creek embayment. FES § 4.3.2.1. We consider these losses to constitute a minor impact.

(c) Archeological Sites

15. An archeological survey conducted by the Applicant at the plant site identified numerous archeological sites. FES § 2.9.2. A data-recovery and mitigation plan was submitted by TVA to the Advisory Council on Historic Preservation, which subsequently concurred with TVA's proposal. *Ibid.* Staff reports that the function and distribution of these sites is unique; because of their location and importance it recommends that an archeologist must be present when the initial earth-moving activities take place, so that buried sites and sites not located previously can be identified and action taken to collect data. FES § 4.4.7. We concur with Staff's conclusion.

(d) Transmission Lines

16. Transmission lines will require an additional commitment of about 2,266 acres. ER §§ 4.2, 4.3.1. Where they cross forested land, forest habitat will be replaced by low vegetation and edge habitat. Staff Exhibit #2 at i. The lines will also cross numerous streams. FES § 4.3.2.2. Staff has identified certain precautions which should be required to keep environmental effects of transmission lines to a minimum practical level. FES § 4.5.2.1. We find that with Staff's recommended requirements the impact of transmission line construction will be at an acceptable level.

***222 (e) Socioeconomic Impacts**

17. Both Applicant and Staff have analyzed the potential socioeconomic impacts that will result from plant construction. FES § 4.4; ER § 4.4. During the peak construction period, 30% of the construction force or about 780 workers will move into the area. About 60% of these will bring their families with an average of one school-age child per family (470 children). FES § 4.4.1.2; ER at 4–1, 4.4–3. The maximum immigrating population at any one time is expected to be about 1,720 individuals. FES § 4.4.1.2. This population increase will affect housing patterns and housing availability and will place additional demand on social organizations and municipal services. FES § 4.4.2. The Applicant has proposed a program, summarized in the FES § 4.5.1.4 and the ER § 4.4.3, which is designed to mitigate these effects. We find the analyses of socioeconomic impacts to be adequate and that the measures proposed to mitigate them are appropriate.

(2) Impacts of Operation

(a) Land

18. The operation of the plant will remove the site from timber and agricultural production, as mentioned *supra*. It will also preclude the use of the site, its shoreline on Yellow Creek embayment, and Goat Island for recreation. FES §§ 5.1, 11.4.4.6. A replacement of the camping facilities on Goat Island will be provided on the mainland west of Goat Island. FES § 11.4.4.6. That portion of the Yellow Creek embayment which falls in the exclusion area will continue to be accessible for fishing and boating. Tr. 523, ‘Site Suitability Report’ (SSR) at 2. We found *supra* that the commitment of land to the plant site would not constitute a significant impact. We find likewise with regard to the impact on recreation.

(b) Water

****5** 19. Cooling water for the plant’s heat-dissipation system will be drawn from the Yellow Creek embayment of Pickwick Lake. FES § 5.2.1. Maximum makeup water requirements will be approximately 146.6 ft³/s, of which about 65.5 ft³/s will be returned to Pickwick Lake as blowdown, and the remainder will be lost to the atmosphere as vapor or drift. Staff Exhibit #2 at i; ER §§ 3.4.3.3, 3.4.4.3. This consumptive use of water is greater than the monthly average minimum flow of Yellow Creek during fall and summer, but it is only about 1% of the minimum daily average flow of the Tennessee River downstream at Pickwick Landing Dam. FES § 5.2.1. Water ***223** availability in Pickwick Lake is the controlling factor, because it regulates pool level in Yellow Creek embayment. *Ibid*. Thus the operation of the plant will have an insignificant impact on water availability.

20. The water discharged from the plant to Pickwick Lake will affect about 2% of the river cross section at discharge location. FES § 5.5.2.2. Because the discharge is released offshore in the channel, it will have little or no impact on inshore spawning areas. *Ibid*. Staff believes that under worst-case temperature difference between blowdown and river, fish larvae passing through the mixing zone could experience thermal stress; the small cross section of the plume relative to the total river, however, and the short residence time of the larvae in the plume will result in no unacceptable mortality of fish larvae. *Ibid*. When ambient temperature is 30°C and blowdown water is > 30°C, the discharge would exceed the State of Mississippi’s maximum temperature standard. FES § 5.3.2.4. TVA has requested and tentatively received from the Regional Administrator of EPA less stringent alternative limitations for the Yellow Creek plant. *Ibid*. Chemicals included in the discharge will not result in a measurable change in the water quality of Pickwick Lake. FES § 5.5.2.2. Staff expects that plant chemical discharges will not exceed the water quality standards of the States of Mississippi, Alabama, and Tennessee. FES § 5.3.3.2. We conclude from the evidence that the impact of the water discharged into Pickwick Lake by the plant will be acceptably minor.

(c) Cooling Towers

21. Initially Applicant considered using mechanical-draft cooling towers but now intends to use natural-draft cooling towers to discharge most of the plant’s waste heat. Staff FES § 9.3.1.2. Utilizing information presented to it in early October, Staff expanded its evaluation of this mode of heat dissipation. *Ibid*; *see also* Supplemental Testimony of

the NRC Staff Relating to Natural-Draft Cooling Towers and Other Changes Included in Revision 3 to the Yellow Creek Nuclear Plant, Units 1 and 2, ER following Tr. 360 (herein 'Staff Supp. Test.').

22. Two 550-foot natural-draft cooling towers (NDCT) will be used. Staff Supp. Test. at 6. Operation of the cooling towers will cause the formation of a visible cloudlike plume, which will contain soluble chemicals that are present in the circulating water. Tower operation will cause large amounts of heat and water vapor to be added to the atmosphere over a small area, as a result of which local atmospheric changes may occur. *Id.* at 7. The most significant of these changes will be a minor reduction of sunshine reaching the small, shifting area shaded by the plume. *Id.* at 8. Ground-level fogging and icing created downwind of the NDCT would be *224 confined to the site. *Ibid.* Experience with operating NDCT's indicates that the drift deposition of the cooling water and the solids in the plume are too low to be measured or to create environmental impacts. *Id.* at 9. It is anticipated that the primary adverse impact of the NDCT's will be the visibility of the plume for several miles around the facility, including areas in and around Pickwick Lake and the Yellow Creek embayment. The towers themselves will be visible from many areas in and around the lake and embayment. *Id.* at 10. Staff, while acknowledging that it is difficult to predict the impact of the visibility of the cooling towers and their plumes, does not believe that the recreational use of the area will be significantly affected by the towers. FES § 9.1.3.2. We conclude that the ecological impact of the NDCT's will be minor and the visual impact will depend primarily on the eyes of the beholder. Overall we do not find the proposed towers environmentally unacceptable.

(d) Radiological Impact on Man

**6 23. Both Applicant and Staff have evaluated the radiation doses to man at and beyond the site boundary, using conservative assumptions on dilution of effluent gases, dilution of radionuclides in liquid discharge, and use by man of the area surrounding the plant. FES § 5.4; ER § 5.2. Individual doses are presented in Tables 5.9, 5.12, and 5.14 of the Staff's FES, and population dose commitments are presented in Table 5.10. The calculated doses from liquid effluents are 0.51 millirem per year to the total body and 0.68 millirem per year to any organ. FES Table 5.14. The calculated doses from noble gas effluents are estimated to be 0.21 millirem per year to the total body and 0.62 millirem per year to the skin. The dose to any organ from radiiodine and from particulates is estimated to be 1.4 millirem per year. *Ibid.* These annual individual doses resulting from plant operation are a small fraction of the dose limits specified in 10 CFR Part 20 and 10 CFR § 50.34 as defined in Appendix I to 10 CFR Part 50. The estimated population doses resulting from operation of the plant are also small fractions of the annual dose received from natural background radioactivity. FES § 5.4.1.6. Consequently Applicant and Staff concluded that there will be no measurable radiological impact upon man from the routine operation of the Yellow Creek plant. FES §§ 3.5, 5.4.1.6. We concur.⁸

24. Applicant and Staff have analyzed the environmental effects of postulated accidents, using best estimates of probabilities and realistic *225 assumptions with regard to fission product release and transport. FES Ch. 7; ER Ch. 7. The radiological effects on the environment were assessed by Staff using the guidance issued as a proposed amendment to 10 CFR Part 50, Appendix D, dated December 1, 1971 (36 Fed. Reg. 22851). FES Ch. 7. The results of this analysis show that environmental risks due to postulated accidents are exceedingly small.

(3) Need for Power

25. The TVA system is a winter-peaking system serving a population of about 6.7 million people. It is primarily a wholesaler serving 110 municipal systems, 50 cooperatives, a number of large directly served industries, and several directly served Federal agencies. FES at 8-1. It plans to put the first Yellow Creek unit in commercial service in March 1985 and the second in March 1986. ER, Introduction at II. Unit 1 will thus be available to serve the fiscal 1986 peakload. To support the need for this schedule, TVA has performed a detailed year-by-year forecast of its peakload and energy requirements, ER, § 1.1. The Staff has carefully evaluated these forecasts, FES at 8-2-8-18, and has independently assessed the Applicant's need for power. FES at 8-21-8-24. The Staff has concluded that TVA's projections are reasonable and that the Applicant has appropriately planned its system capacity expansion program to meet its projected needs. FES at 8-23.

26. TVA estimates that the peakload in 1986 will be 36,000 MW compared to a 1973 (pre-embargo) peakload of

18,888 MW and a 1977 peak of 21,803 MW. The average growth rates for 1973–1986 and 1977–1986 are 5.1% and 5.7%, respectively. ER at Table 1.1. A more meaningful parameter, however, is the growth rate obtained by subtracting from the actual peakloads the ERDA load (which is predetermined) and normalizing the non-ERDA peaks to a nominal minimum temperature. The 1973, 1977, and 1986 peaks are then 17,421, 19,476, and 31,515 MW, respectively, and the average annual projected growth rates for 1973–1986 and 1977–1986 are 4.7% and 5.7%, respectively. FES at Table 8.4. The historical values of the adjusted peakload growths are 6.3% for the period 1965–1973 and 6.1% from 1965 through 1977. *Ibid.*

****7 27.** Looking similarly at energy requirements (exclusive of the Federal component), we find average annual historic growth rates of 7.3% for the 1965–1973 period and 5.7% for 1965–1977. The projected rates are 4.8% for 1973–1986 and 5.8% for 1977–1986. FES at Table 8.1. Thus, projected growth rates for both energy and peak demand are somewhat lower than historic rates. These reductions are due in part to the effects of conservation, which both Staff and Applicant have considered in their projections.

28. Taking into account TVA's firm net purchase of 1,100 MW in 1986, ***226** the peakload responsibility that year will be 34,900 MW. In 1987 and 1988 this is expected to increase to 37,650 MW and 39,400 MW, respectively. Assuming the timely availability of both Yellow Creek units and all units scheduled to be completed earlier, the capacity available will be 43,155 in 1986, 21.6% in 1987, and 16.0% in 1988. If the Yellow Creek units are each delayed 1 year the respective reserve margins will be 20.0%, 18.1%, and 12.7%. If they are delayed by 2 years, the figures will be 20.0%, 14.6%, and 12.7%. FES at Table 8.16. Four nuclear units other than Yellow Creek are scheduled to be put into commercial service during the 2 years immediately prior to the 1986 winter peak. ER at Table 1.1–27. Delay of any of these will further reduce the reserve margin (by about 3.4% per unit delayed). In view of the FPC suggested reserve margin of 15–25%, FES at 8–23, the capacity expansion plans of the Applicant appear to be reasonable. The Board finds that the power to be generated will be needed by TVA at the dates scheduled for plant completion or shortly thereafter.

(4) Alternatives to the Proposed Plant

29. The Applicant and Staff independently evaluated a number of alternatives to the proposed nuclear generating station. These included both alternatives that would not require construction of additional generating capacity, such as purchased power and energy conservation, and alternative methods of generating the necessary power. Purchased power would be a viable alternative only if utilities of another region consistently maintained capacity in excess of needs. This cannot be reliably predicted and, therefore, is not a viable alternative. Other energy sources evaluated included solar, geothermal, hydro, and fossil fuel power sources. The analysis indicates that the only viable alternatives for the needed baseload capacity addition are fossil fuel (in particular coal) and nuclear power. FES at 8–13–8–18, 9–1, 9–2; ER at 9.1–1–9.2–17. Both parties prepared detailed comparisons of these two alternatives, considering both economic and environmental factors. ER at 9.2–7, 9.2–8; FES at 9–2–9–6. The Applicant concluded that the cost advantage of a nuclear plant was 8.0 mills/kWh for high sulfur coal and 8.5 mills/kWh for low sulfur coal, based on a 70% capacity factor. ER at Table 9.2–1. The Staff's analysis was made only for the high sulfur case and indicated a nuclear advantage of 10.0 mills/kWh for the 70% capacity factor case. The cost advantage for the nuclear plant, the Staff found, would be 9.6 mills/kWh and 9.2 mills/kWh for operation of both plants at 60% and 50% capacity factors, respectively. FES at Table 9.1. At 70% capacity factor, each mill per kilowatt-hour difference is equivalent to about \$16,000,000 per year.

****8 *227 30.** With respect to the environmental comparison, the Applicant considered air pollution, thermal pollution, radioactive effluents, fuel transportation, waste disposal, land use, noise, and aesthetics. It concluded that the environmental impact of a nuclear plant would be less than that of a coal-fired plant. ER at 9.2–8–9.2–17, Table 9.2–6. The Staff's analysis focussed primarily on health effects, limiting the comparison of other factors to a single table, Table 9.9, in the FES. With respect to the health effects, the FES shows and the Staff concludes, that the nuclear fuel cycle is considerably less harmful to man than the coal fuel cycle. FES at 9–16. The Staff goes on to note that although there are substantial uncertainties in both estimates, the impact of transportation of coal is well known and alone is greater than the Staff's conservative estimate of the effects of the entire uranium fuel cycle. The Staff further emphasizes that the increased risk of health effects for either fuel cycle represents a very small incremental risk to the average public individual. *Id.* at 9–17.

31. Prior to offering the FES into evidence, the Staff counsel asked the Staff Environmental Project Manager whether he adopted the FES as being true and correct and received an affirmative answer. Tr. 317. However, before moving it into evidence, Staff counsel called to the attention of the Board previous correspondence relating to the accuracy of Table S-3 of 10 CFR § 51.20 (also presented as Table 5.15 of the FES), Tr. 322, and stated that the matter discussed in that correspondence might, after completion of the Staff's evaluation of it, be significant in this proceeding. Tr. 323. This evaluation was expected to be available 'within a couple of weeks,' *ibid.*, and he requested that the record be kept open for its receipt. The Board subsequently asked the Staff witness for particularization of the sections of the FES with respect to which he had reservations. He identified two paragraphs in Section 5.7, one entry in Table 9.10-A, and one paragraph in Section 9.1.2.3. Tr. 353-355. During cross-examination by Applicant's counsel, the witness stated that if the value of 74.5 curies for radon-222 effluent in FES Table 5.15 (and 10 CFR § 51.2 Table S-3) were correct and if review of that number did not show something else to be in error in Table S-3, he could adopt the FES without reservation. Tr. 370-374. No further evidence on this matter was offered before the record was closed on December 27.

32. The Board has reviewed this question and has determined that it is bound by 10 CFR § 51.20 and Table S-3 therein.⁹ The Staff witness has testified that if Table S-3 is correct, the FES is true and correct in its entirety. On this basis, the Board finds that the environmental impact of the *228 nuclear plant, including health effects, is less than the environmental impact of the coal-fired plant and that, considering both economic and environmental effects, the nuclear plant is the more desirable alternative.¹⁰

(5) Alternate Plant Systems

**9 33. In order to minimize the environmental impact of Yellow Creek, both Staff and Applicant have evaluated alternatives to various plant systems, considering economic costs and operational aspects as well as environmental impacts. Several methods of waste heat dissipation were considered. The Applicant concluded that no alternative system had a clear environmental advantage and that the natural-draft cooling towers should be selected on an economic basis. ER at 10.1-1. The Staff concluded that mechanical-draft towers and fan-assisted natural-draft towers were viable alternatives but that the selected natural-draft towers were a reasonable choice. FES at 9-27. The Board agrees.

34. Various other alternate plant systems, such as makeup water system waste disposal, biocide treatment, sanitary waste treatment, radioactive waste treatment, nonradioactive solid waste treatment, access facilities, and transmission line routes were considered. None of these evaluations reflected economic or environmental advantages that would warrant their selection instead of the systems proposed. FES at 9-28-9-30; ER at §§ 10.2-10.13. The Board agrees with this conclusion.

(6) Alternate Plant Sites

35. TVA, as a part of its ongoing power program effort, maintains a siting program organized along two functional lines: inventory siting and project siting. The inventory siting process involves long-term planning to identify, investigate, and acquire inventory sites believed suitable for future power facilities. The project siting process is directed towards the identification and investigation of sites believed suitable for specific authorized projects. FES at 9-17; ER at 9.2-17-9.2-19. The size of the TVA service area and the large attendant investments in the transmission system make the geographic relation of generation to load an important siting consideration in determining initially the area in which a new facility is to be located. A balance of engineering, economic, and environmental factors is taken into consideration in determining preferred sites within the desired area for a *229 particular facility. Further screening includes an examination of factors such as access, flooding conditions, topography, seismology, and availability of cooling water. *Ibid.* The Staff found and the Board concurs that this is a reasonable approach for preliminary site screening.

36. TVA has divided its system into five areas in order to facilitate studies of energy-load growth and general power flows in the system. TVA studies indicate that a significant deficit of generation will exist in the western portions (areas 1 and 5) of the TVA system unless increased generating capabilities are available in the mid-1980's. FES at

9–17; ER at 9.2–19–9.2–24.

37. TVA identified 15 candidate sites in the two affected areas suitable for power plant siting based on their general characteristics. FES at 9–19; ER at Appendix E. Four of these sites were selected for further studies. Of these four, Saltillo and Yellow Creek were added to TVA’s site inventory, based primarily on lower foundation costs and sizes of the sites. *Ibid.* The Staff, in its examination, concluded that the Saltillo site does not offer advantages over the proposed Yellow Creek site and accordingly the choice of Yellow Creek by TVA was considered to be reasonable. FES at 9–21. The Board concurs with the Staff’s assessment. None of the identified sites are ‘obviously superior’ to the proposed Yellow Creek site.

B. Compliance with the Federal Water Pollution Control Act Amendments of 1972

****10** 38. As required by Section 402 of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA), [33 U.S.C. § 1251](#), *et seq.*, the Applicant must receive a final NPDES permit for the Yellow Creek project from the EPA. In accordance with the Second Memorandum of Understanding between the NRC and EPA with regard to implementation of certain responsibilities (40 *Fed. Reg.* 60117, 60120), the Staff has appended a copy of the proposed NPDES permit and of the public notice to be issued by EPA as Appendix C to the FES.¹¹

39. The Staff seeks to impose on the Applicant several conditions which the Applicant asserts are prohibited by § 511(c)(2) of the FWPCA, which states:

(2) Nothing in the National Environmental Policy Act of 1969 [83 Stat. 852] shall be deemed to—

(A) authorize any Federal agency authorized to license or permit the conduct of any activity which may result in the discharge of a pollutant ***230** into the navigable waters to review any effluent limitation or other requirement established pursuant to this Act or the adequacy of any certification under section 401 of this Act; or

(B) authorize any such agency to impose, as a condition precedent to the issuance of any license or permit, any effluent limitation other than any such limitation established pursuant to this Act.

The principal matters involved are (1) right of approval of TVA’s construction monitoring program, (2) right of approval of changes to the portions of the preoperational monitoring program dealing with the aquatic environment, and (3) right to require that TVA install an impact-mitigating device on the intake screen if necessary.

40. Staff argues that while the EPA has primary jurisdiction over effluent limitations pursuant to the FWPCA, the NRC is required by NEPA to exercise overall environmental responsibility in approving the site and the proposed facility in issuing a limited work authorization and construction permit. Staff Proposed Findings at 17–18. The Staff argues further that the NRC must consider the environmental impacts of the intake system (and monitoring requirements) approved by EPA and factor these into its cost-benefit balancing under NEPA. NRC Staff’s Brief in Support of the Commission’s Authority to Impose Monitoring Conditions Pursuant to NEPA (hereinafter ‘Staff’s Brief’) at 2–3. Applicant, while agreeing with Staff on the basic jurisdictional split and on the need for the NRC to take these matters into account in its cost-benefit balancing, argues the above-cited section of FWPCA clearly prohibits the conditions in contention, basing its interpretation of ‘other requirements’ on § 402(a)(2) of FWPCA which specifies that ‘The Administrator shall prescribe conditions for such [NPDES] permits to assure compliance with Paragraph (1) of this subsection, including conditions on data and information collecting, reporting, and such other requirements as he deems appropriate.’ Clearly, Applicant argues, monitoring requirements fall within the Administrator’s jurisdiction and authority. Applicant’s Brief in Support of Its Proposed Findings of Fact and Conclusions of Law at 9–10.

****11** 41. The Board agrees that such matters are within the authority of the Administrator and that he has exercised that authority by imposing, with respect to the three matters identified above, the conditions set forth in Sections G and H of Part III of the NPDES permit. FES at p. C–17. We also agree with TVA’s interpretation that these conditions are ‘other requirements’ as that term is used in § 511(c)(2) cited above. This is also consistent with the Commission’s definition of ‘other requirements’ set forth in the Second Memorandum of Understanding, Appendix

A, paragraph 2.a. Appendix A goes on to say, in paragraph 3, that:

*231 Except as provided in Paragraph 6 [not relevant here], if and to the extent that there are applicable limitations or other requirements promulgated or imposed pursuant to the FWPCA, different limitations or requirements will not be imposed by the NRC as a condition to any permit or license . . .

42. The Staff's argument that it must consider these matters in its cost-benefit balancing is, of course, beyond dispute. The Staff, however, extends its requirements to include its 'authority under NEPA to monitor the actual effects of a licensee's construction and operation under a Commission construction permit or operating license, even after the favorable cost-benefit balance is struck.' Staff's Brief at 4. The citations by the Staff to the Commission's rules set forth to support this assertion do not do so. Although the Staff unquestionably has authority to impose certain monitoring requirements (and we do not attempt to define the full scope of that authority here), the authority does not extend to matters within the jurisdiction of the Administrator of EPA. The intent of Congress that the FWPCA would, in limited respects, supersede NEPA is clear in the opening phrase of § 511(c)(2) as well as in the legislative history of the Act. The determination by Congress to avoid dual regulation and to lodge the responsibility and authority where the expertise rests is further set forth in § 101(f) of FWPCA, where it is stated that:

It is the national policy that to the maximum extent possible the procedures utilized for implementing this Act shall encourage the drastic minimization of paperwork and interagency decision procedures, and make the best use of available manpower and funds, so as to prevent needless duplication and unnecessary delays at all levels of government.

43. Based on these considerations, we have modified some of the conditions sought by the Staff. Principally, these are inherent in proposed Condition 7.b, FES at ii, which states that '[i]n addition to the preoperational monitoring program set forth in Section 6 of the Environmental Report, with amendments, the Staff recomme[n]dations (sic) in Section 6 of this document shall be followed.' This condition will be limited to those recommendations not within the jurisdiction of EPA, as we understand it. Lest our position be misunderstood, we want to emphasize that the effects that the Staff wants to have monitored and the alteration that might be necessary to the intake structure are important. Monitoring must take place and future action may be necessary. The EPA, however, has made provisions for this in the NPDES. If the Staff feels that these conditions are not adequate, the route to improvement is through EPA. The Staff states relations between it and EPA are working smoothly. Staff's Brief at 2. We urge the Staff to maintain this close relationship and to exploit it when necessary.

***232 (1) Construction**

**12 44. In spite of measures taken to mitigate impacts on aquatic systems (see paragraph 13, *supra*) construction activities will have a major *short-term* effect on Slick Rock Branch, Yellow Creek embayment, and Pickwick Lake as a result of dredging and erosion. FES § 4.3.2.1. The more important impacts will involve loss of habitat, reduction of primary productivity (as a result of increased turbidity), mortality of periphyton and macrophytes (as a result of reduction of dissolved oxygen), disruption of benthic communities, and disruption of fish migrations and spawning activities. *Ibid.* These impacts will be temporary, however, and the disturbed areas should recover following cessation of construction activities. Further, the temporary losses from aquatic populations because of construction activities will be insignificant considering the total populations in the embayment and entire lake.

45. The Staff has summarized commitments made by the Applicant to mitigate adverse effects of construction on water quality and aquatic systems. FES §§ 4.5.1.2, 4.5.1.3. These commitments have been included as conditions which Staff recommends for the limited work authorization and construction permit. FES at ii. We adopt this recommendation as a condition of our authorization.

46. The release of toxic substances associated with resuspension of sediments during in-stream excavation for the intake and discharge structures could result in adverse impacts on water quality and aquatic biota. FES § 4.3.2.1. Because of the comparatively small amount of in-stream excavation that will be necessary for installation of the

intake and discharge system, no long-term irreparable damage to the aquatic systems of the Yellow Creek embayment is anticipated. Depending on sediment contamination, however, short-term impacts could result from resuspension of mercury or other toxic substances. FES § 4.3.2.1. The Staff and the EPA, as part of their independent statutory responsibilities to conduct a NEPA analysis, elected to require the Applicant to perform sediment and elutriate tests (with special attention to mercury) on riverbed deposits at the Yellow Creek site according to promulgated guidelines. The Staff indicated that based on the results of these tests, special conditions for the control of disturbed sediments may be necessary. *Ibid.* The Staff's construction permit condition is contained in FES § 4.5.2.2. Staff now says that the Applicant submitted adequate sediment analysis and elutriate test results on riverbed deposits in Revision 3 to the ER. The tests show that resuspension of mercury will not cause a significant impact. Tr. 332. Staff concludes that the condition called for in FES § 4.5.2.2, Item 1, is no longer necessary and should not be made a condition of the permit. *Ibid.* We concur.

***233 (2) Intake Structure**

(a) Intake System

47. The proposed intake system will be located in Yellow Creek embayment in the vicinity of Slick Rock Branch. ER § 3.4.3.2. The pump station will be placed behind a dike in Slick Rock Branch inlet, and the intake will consist of six pipes which penetrate the dike and open above the bottom about 500 feet from the dike, near the center of the embayment. *Ibid.* The pipes have a diameter of 7.5 feet, and their tops will be 12 to 18 feet below the surface, depending on reservoir elevation. *Ibid.* Vertical traveling screens and a trash rack will be installed on the openings at the pump station, but no screens are proposed for the intake pipes. *Ibid.* The potential impact of the intake on fish populations was the subject of much discussion during the evidentiary hearing and is the basis for controversy between Applicant and Staff. We now consider that issue and decide the controversy, pursuant to our responsibility and authority under NEPA.

(b) Alternatives

****13** 48. Alternatives to the selected intake Design D included four additional plans for Yellow Creek embayment and three for Pickwick Lake, ER § 10.2; FES § 9.3.2. The three schemes for placement of the intake on the lake side of the peninsula were rejected because of design, cost, and esthetic considerations, and because of the severe impact on the terrestrial environment that would be associated with placing the intake in Pickwick Lake. *Ibid.* Of the five plans for placing the intake on Yellow Creek embayment, Staff considered two schemes to be environmentally unacceptable because of the high fish mortality they would cause, one to be environmentally less desirable than Design D because it would destroy more cove habitat, and one less desirable because of expense. FES § 9.3.2. Thus they concluded that proposed Design D was the preferred alternative, but they recommended that the design not preclude the future installation of an impingement or entrainment mitigation device. *Ibid.*

(c) Design of Intake

49. Prior to reviewing Revision 3 of the ER (dated December 1, 1977), Staff was under the impression that the ends of the intake pipes were to turn downward so that the openings were parallel to and close to the bottom. Tr. 395–6. The EPA was reported to have shared Staff's belief. *Ibid.*, Tr. 407, 603. Staff was under the further impression that there was a thermal ***234** stratification in the embayment which would cause fish population density to be low in the zone where the pipes opened. Tr. 395–6, 467–9. On the basis of this understanding Staff recommended selection of intake Design D (just described) over several alternatives, with the added recommendation that the design not preclude the future installation of an impingement mitigation device. FES § 9.3.2; Tr. 405–7.

50. As a result of reviewing Revision 3 of the ER and consulting further with EPA, Staff became aware that the Applicant's proposal in fact called for the openings of the intake pipes to be vertical, perpendicular to the bottom. Tr. 395–6, 407.¹² Also, Staff learned that there is no thermal stratification in Yellow Creek embayment. Tr. 396, 435–36. As a consequence of these discoveries, one of the Staff witnesses, Mr. Stupka, testified initially that the proposed intake Design D was 'unacceptable on environmental grounds.' Tr. 393. Later, however, he modified that testimony by saying, 'And I consider that there will be an unacceptable—pardon me—a needless adverse

environmental impact as a result of placing the pipe in the position that they have, the intake structures.’ Tr. 442. Dr. Sharma, Project Leader for the Staff’s team of consulting witnesses, testified that he believed the offshore location of the pipes was the preferred location because it was a region of relatively low density of fish larvae. Tr. 443. He also testified that the panel felt that the new understanding with regard to the intake ‘in no way shifts the cost-benefit balance of the plant.’ Tr. 446. Staff witness Mr. Scaletti, Environmental Project Manager for the U.S. NRC, likewise testified that the panel’s position was that the cost-benefit balance in the FES was valid in spite of the new understanding with regard to the intake. Tr. 420.

****14** 51. In view of the foregoing we find that the location of the intake system is acceptable on environmental grounds. In addition, we find that the design of the intake pipes is adequate on environmental grounds insofar as regards the fact that the ends of the pipes will be vertical rather than horizontal to the bottom. We turn now to consider Staff’s recommendations that the design not preclude the future installation of a device to mitigate entrainment and that Applicant monitor entrainment after the plant goes into operation.¹³

(d) Fish Mortality

52. Yellow Creek embayment is a productive nursery for fishes. FES ***235** § 5.5.2.1. The relative abundance of juvenile clupeids, catostomids, ictalurids, and sciaenids are much greater in the embayment than in Pickwick Lake. ER Appendix F7. Because of the shallow depth of Yellow Creek embayment, there is no hypolimnion; as a consequence there will be considerable numbers of larvae present near the bottom in the vicinity of the intake, although not as many as there would be near the shoreline. Tr. 230. Applicant has used two methods to estimate the extent of fish larval mortality that will result from entrainment. ER § 5.1.3.1. Estimate 1 assumes that fish larvae are distributed homogeneously in the waters of the embayment, while Estimate 2 is based on sample data taken in the area where the intake is to be located. *Ibid.*, Tr. 203–10, 221–30.¹⁴ Estimate 1 predicted an annual mortality of 14.47 percent for *Pomoxis* sp. (crappie) and 19.54 percent for *Morone* sp., with other species expected to suffer similar mortality. ER § 5.1.3.1.1. Estimate 2 predicted an annual mortality of 7.18 percent for *Pomoxis* and 9.97 percent for *Morone*, with similar mortality expected for other species. *Ibid.* Applicant contends that Estimate 2 is more realistic, because the assumption that larvae are distributed homogeneously required by Estimate 1 is unrealistic. *Ibid.*, Tr. 210. Applicant concludes that entrainment of this scale could result in reductions of adult standing stock in Yellow Creek embayment during the operating life of the plant. ER at 5.1–11. Applicant and Staff agree, however, that such reductions of fish populations in Yellow Creek embayment will have a negligible effect on fish populations in Pickwick Lake as a whole. *Ibid.*, FES § 5.5.2.1. This conclusion is based on the *assumption* that other embayments in Pickwick Reservoir are also important nursery areas. Tr. 239–40.¹⁵

53. Nevertheless, Staff is concerned that the importance of the embayment as a nursery may result in a much higher annual mortality than anticipated. FES. § 5.5.2.1. Staff witness Mr. Stupka considers the data used by the Applicant in calculating Estimate 2 to be insufficient to determine relative abundances of larvae in different parts of the embayment. Tr. 427. Consequently, he prefers Estimate 1 because it is more conservative than Estimate 2. Tr. 426–7. He estimated that entrainment could reduce the reservoir-wide larval stock of species which selectively breed in Yellow Creek embayment, specifically *Pomoxis* and *Morone*, by 4 to 5 percent. Tr. 429–30. Applicant witness Dr. Hackney admitted that TVA’s biologists had little confidence in the sampling methods used in 1974 and 1975 for estimating the distribution and abundance of fish larvae. Tr. 557. Applicant witness Mr. Gwinner testified that the methods used in those years gave no ***236** information about vertical distribution of larvae, and Dr. Hackney said that the nets used at that time were missing smaller fish. Tr. 560–61. In 1976 sampling equipment and method were changed. Tr. 557–8, 562–3. The density estimates based on the 1976 data gave mortality estimates (see paragraph 51, *supra*) which are greater than the 5 to 18 percent estimated on the basis of 1974–1975 data. Tr. 558.¹⁶ Finally, Mr. Stupka testified that 1 year’s sampling is insufficient to arrive at conclusions about larval densities, because of year-to-year fluctuations in population numbers. Tr. 433–4, 508–9.

****15** 54. The evidence before us indicates that the potential impact of the intake on fish populations in Yellow Creek embayment, and perhaps on Pickwick Lake as a whole, is a matter for concern. Applicant’s mortality estimates, based as they are on data taken during a single year and on questionable assumptions, must be accepted with a sense of uncertainty. We believe that Staff’s reservations are well founded, and we would concur with their recommendations for conditions relating to the intake had we not found that such conditions are within the

jurisdiction of the EPA, not the NRC. In the absence of the authority to impose conditions with regard to the intake, we again urge Staff to work with the EPA on this matter.

55. In conclusion, while we have found the matter of fish mortality to be of concern, we do not find it of sufficient importance to tilt the cost-benefit balance. It is, after all, a matter whose importance may be proved or disproved by experience. And even if it proves to be important, means will be available for mitigating the impact of the plant's operation on fish populations.

C. Cost-Benefit Analysis

56. The Board has weighed the environmental, economic, technical, and other benefits of construction of the proposed plant against environmental and other costs based upon the evidence of record. The principal environmental impacts resulting from the construction and operation of the facility can be summarized as follows:

(1) Land Use

a. Less than 500 acres of the site will be altered by clearing for construction of plant facilities and rail and road routes. During construction this area of the site will be disturbed, and noise and *237 dust will be created. Additionally, the disturbed area will be subject to some soil erosion and unavoidable soil loss (FES, p. i as corrected by Staff Exhibit 2).

b. About 200 acres of the 1,160-acre site will be permanently occupied by station structures and will be unavailable for alternate uses (FES, p. i).

c. Transmission lines will require about 2,266 acres of additional land for new rights-of-way (FES, p. i).

d. The natural-draft cooling towers will be visible to the surrounding area.

(2) Water

a. Construction activities will have a short-term impact on Yellow Creek embayment and Pickwick Lake by increasing turbidity and siltation. In addition there will be some destruction of littoral and benthic habitat.

b. During operation of the plant a maximum of 146.5 ft³/s of makeup water will be withdrawn from the Yellow Creek embayment of which 65.5 ft³/s will be returned to the Pickwick Lake via a pipeline with the dissolved solids concentration increased by a factor of about 2 (FES, p. 1).

(3) Air

Vapor plumes will be visible from the cooling towers. The plumes will reduce the sunlight reaching the ground in the area which they shade. Additionally, possible cloud formation and precipitation may occur under certain conditions (Staff Cooling Tower Testimony at 7).

(4) Biotic Effects (FES, Table 10.9)

a. Terrestrial

**16 (i) Wildlife will be displaced from the site by construction activities.

b. Aquatic

(i) A small amount of benthic and fish habitat will be permanently lost by intake discharge installation.

***238** (ii) Between 7 percent and 20 percent of the larval fish from the Yellow Creek embayment may suffer mortality by entrainment in the intake.

(iii) The discharge plume will elevate temperatures in a small cross section of Pickwick Lake.

(5) Community Impacts

Hunting, fishing, and other recreational activities on the site will cease. Traffic on local roads will increase substantially due to construction and commuting activities. Influx of workers' families (780 work immigrants) could cause some housing and school problems, although most of the work force is expected to commute from the surrounding areas (FES, p. i).

(6) Radiological Effects

There will be releases of gases and liquid effluents containing small amounts of radioactive materials. The dose estimated to be received by the population within a 50-mile radius of the plant would be less than 8 man-rems per year (FES, p. i).

57. The principal benefit from construction and operation of the plant is an ample supply of electricity to meet the region's needs and allow continued improvement of the quality of life in the region. Indirect benefits include increased regional gross product, recreational benefits, increased employment and employment potential, and educational benefits derived from visits to the plant. These quantifiable benefits are tabulated in TVA's ER, Chapter 8 (*see also* Staff FES, Chapter 10).

58. The Board finds, considering the above, that the benefits to society from licensing the Yellow Creek plant outweigh the costs, and these benefits will be maximized by construction which will allow operation on the projected dates.

III. SITE SUITABILITY

A. Introduction

59. The Board has reviewed the proposed site pursuant to [10 CFR § 50.10\(e\)\(2\) \(1977\)](#) to determine whether, based upon the available information and review to date, there is reasonable assurance that the proposed site is a suitable location for nuclear power reactors of the size and type proposed ***239** by the Applicant from the standpoint of radiological health and safety considerations under the Atomic Energy Act and rules and regulations promulgated by the Commission pursuant thereto. The Board's review has been guided by the reactor site criteria given in the Commission's regulations on site suitability as related to radiological health and safety (10 CFR Part 100). The factors considered are the population density and land use characteristics of the site environs; the potential influence of nearby industrial, military, and transport facilities; and the physical characteristics of the site, including its meteorological, hydrological, and seismological characteristics.

60. Both Staff and Applicant presented testimony on these subjects. The Staff testimony consisted of the Site Suitability Report.¹⁷ The Applicant's basic testimony consisted of a document entitled 'Tennessee Valley Authority Proposed Yellow Creek Nuclear Plant Site Suitability Testimony' (following Tr. 289) (hereinafter 'Site Testimony').

****17** 61. The Yellow Creek site containing approximately 1,160 acres is located in Tishomingo County, Mississippi.

The site is located on the right bank of the Yellow Creek embayment at Yellow Creek Mile 6 and is approximately 17 miles east of Corinth, Mississippi. It is on the western slope of a 2-mile-wide peninsula between Yellow Creek and the Tennessee River near Mile 217. The facility will consist of two identical pressurized water reactors to be supplied by Combustion Engineering, Incorporated. These nuclear steam supply systems (NSSS) are of a size, type, and design similar to the CE system 80 design described in CESSAR for which NRC has issued a Preliminary Design Approval. The NRC has reviewed and approved for construction other nuclear power plants which have referenced the CESSAR design. Each Yellow Creek unit will have an NSSS which will operate at a rated thermal core output of 3,800 megawatts and a turbine generator net electrical output of 1,339 megawatts. The design thermal core output is 4,100 megawatts. Site Testimony at 1–2; SSR at 1.

B. Exclusion Area, Low Population Zone, and Population Center Distance

62. The exclusion area will have a minimum exclusion distance of 695 meters from the edge of the Unit 2 containment structure to the closest site boundary. The Applicant owns all the land, including mineral rights, within *240 the exclusion area. A portion of the Yellow Creek embayment is located within the exclusion area and is accessible for fishing and pleasure boating. The Applicant will make appropriate arrangements to control the movement of people in this area as part of its radiological emergency plan. There is reasonable assurance that the Applicant has the authority to determine all activities within the exclusion area, SSR at 2, and can develop an adequate radiological emergency plan. *Id.* at 7. This plan, to be developed in coordination with Mississippi, Tennessee, and Alabama, will also provide for the timely evacuation of the areas in the event of a radiological emergency. Site Testimony at 2–3.

63. An estimated 6,125 people live within 10 miles of the Yellow Creek site. More than 84 percent of this population reside between 5 and 10 miles from the site. Three small towns (Iuka, Burnsville, and Waterloo) are located between 5 and 10 miles from the site. Iuka, the largest, had about 35 percent of its 1970 population of 2,389 persons located within the 10-mile radius to the south. The remainder of the area within 10 miles of the site is sparsely populated. Site Testimony at 4; SSR at 2. Population growth in this area is expected to be small. *Ibid.*

64. The 1970 population estimate for the area within a 50-mile radius of the site is about 350,000. This population is projected by the Staff to grow at a rate of 7% per decade. SSR at 7. By the year 2020 it will still be substantially less than 500 per square mile at all distances out to 50 miles. SSR at 6.

65. The Applicant has specified a low population zone 3 miles in radius. The 1970 population in the low population zone was 475 persons. The Applicant estimates a summer increase of 5,250 persons in the 3-mile low population zone radius of the plant because of water sport recreation on the Tennessee River, including the Pickwick Reservoir and the Yellow Creek embayment. The Staff has concluded that there is reasonable assurance that the definition of the low population zone in 10 CFR Part 100 can be satisfied. Based on the available evidence in their review of the population distribution, road network, and land use factors within the low population zone, it has not identified any factors which would preclude the development of acceptable emergency measures to protect the public within the low population zone. SSR at 7.

**18 66. The nearest population center, as defined in 10 CFR Part 100, of 25,000 persons or more is Florence-Muscle Shoals—Sheffield-Tuscumbia, Alabama, complex, located approximately 35 miles east of the site. This population center had a 1970 population of 62,881. A population center containing more than 25,000 residents is not expected to develop closer to the site. There is little likelihood that the city of Corinth, Mississippi, located about 15 miles west of the site, will have a population in excess of 25,000 persons during the lifetime of the facility, and therefore Corinth *241 would not become a new population center. Site Testimony at 5; SSR at 7.

67. The Staff concluded, SSR at 7, and we agree, that the exclusion area, low population zone, and population center distance meet the siting guidelines of 10 CFR Part 100 and are acceptable on the basis of the exclusion area and low population zone distances, the specified population center distance, and the estimated potential radiological consequences of design basis accidents.

C. Nearby Industrial, Transportation, and Military Facilities

68. No industrial plants are located within 5 miles of the site. It is anticipated that some industrial plants will be located across the Yellow Creek embayment near the Yellow Creek Port which is 1.8 miles northwest of the site. However, there are no firm plans for plant locations in this area at the present time. Site Testimony at 5. No known military facilities are located within 10 miles of the site. *Id.* at 7; SSR at 7.

69. The nearest major land transportation route is Mississippi Highway 25 located about 2 miles west of the site. The plant access road is also utilized by the few residents of the Yellow Creek peninsula who live north of the plant. The nearest major railroad is the Southern Railroad located 9.5 miles south. The Corinth and Counce Railroad is 7 miles to the northwest. The spur track from the Corinth and Counce Railroad serves Yellow Creek Port and lies approximately 1.6 miles to the northwest. SSR at 7; Site Testimony at 5–6. The nearest natural gas transmission line is a 6-inch pipeline 7.5 miles northwest of the site. It poses no potential hazard to the site. SSR at 7; Site Testimony at 6.

70. The main channel of the Tennessee River is located 2 miles east of the proposed site and is a major barge route. This traffic will pose no threat to the safe operation of the proposed nuclear plant on this site because of the separation distances involved. SSR at 7; Site Testimony at 6.

71. The Yellow Creek embayment is not now available to commercial barge traffic south of the Yellow Creek Port in the vicinity of the Yellow Creek facility. However, the embayment will have an estimated yearly shipment of 24 million tons of material past the site when the Tennessee-Tombigbee Waterway is completed in 1983, approximately 0.8 miles west of the site. The commodities and the expected frequency of shipments described will not pose a significant projected hazard by commercial barge shipments past the site in the Yellow Creek embayment. The water intake structure is not safety-related and need not be protected against a barge impact although it is located in the Yellow Creek embayment in the general vicinity of the Tennessee-Tombigbee Waterway. The probability of a significant hazard to the plant due to an accident caused by barge shipments *242 past the plant site is sufficiently low such that no further consideration is required. SSR at 9; Site Testimony at 6.

**19 72. There are no existing or planned airports within 10 miles of the site. The proposed site will be located near two Federal airways and in the vicinity of a military jet training area. There are no hazards with respect to these airways due to aircraft impacts since the air crash probability analysis indicates that the probability of impact is less than 10^{-7} per year. The Columbus Four Intensive Student Jet Training area is located over the site. However, probability of a crash at the site of the proposed nuclear plant due to jet operations in this area due to jet training is less than 10^{-7} per year and is sufficiently low that an aircraft crash need not be postulated for design purposes. SSR at 9; Site Testimony at 6.

73. The Staff has found that no special design considerations are required for the proposed plant with regard to potential accidents which may occur as a result of nearby industrial, military, or transportation facilities and that in this regard the proposed site is suitable. SSR at 9. We agree.¹⁸

D. Meteorology

74. The Applicant has provided meteorological information to support the suitability of the site. PSAR § 2.3. The Staff has found that meteorological data obtained provide an adequate meteorological description of the site and the site vicinity for the purposes of assessing postaccident and continuous release atmospheric diffusion conditions and has concluded that the proposed site is suitable for the proposed nuclear plant with regard to the meteorological assessment. SSR at 10–13. The Board concurs with this conclusion.

E. Hydrology

75. Plant grade will be at elevation 520 feet or 74 feet above the peak flood elevation. Flood levels from postulated seismically induced dam failures or other cause will not be as high as the probable maximum flood level. Site Testimony at 10; SSR at 13–15. The Applicant will design the site drainage systems, including the roofs of all safety-related buildings, to accommodate the local probable maximum precipitation. The design basis precipitation

proposed by the Applicant is acceptable to the Staff. Site Testimony at 10; SSR at 15. The Staff has found that the facility satisfies the flooding criteria of Regulatory Guides 1.59 and 1.102. SSR at 15, 16.

***243** 76. Low reservoir water levels are not expected to be a problem with operation of this facility. Emergency cooling water will be furnished by the two spray ponds (the ultimate heat sink) that are not dependent upon Pickwick Reservoir water for their safety functions. Stored water at prescribed minimum pool elevational levels at dams upstream of the site are available and could provide more than 1,000 cubic feet per second after more than 2 years of no rainfall. Plant operation will not be significantly affected by low river flow since normal consumptive water use with both units at full power is 64 feet per second. SSR at 16; Site Testimony at 9–10.

77. Location of the intake pipes in the Yellow Creek embayment poses no problem with respect to either normal operation or emergency operation. The normal full pool elevation is 414 mean sea level and the minimum, since the Pickwick Dam was closed, is over 407 feet mean sea level. The top of the intake pipes will be between 392 and 406 feet mean sea level. Site Testimony at 9; SSR at 16.

****20** 78. The Staff has evaluated the effect of spills of radioactive liquids on surface waters and has concluded that the radionuclide concentrations at the nearest recipient would be a small fraction of the regulatory limits. SSR at 17–18. There are no ground water users down-gradient from the site. SSR at 17. The design basis ground water level for static and dynamic analysis of 519 feet mean sea level, which is 1 foot below plant grade, is acceptable to the Staff. SSR at 17.

79. We find that the flood analysis for the site satisfies the appropriate regulatory criteria, that acceptable normal and emergency cooling methods can be designed, that the proposed ground water level is acceptable, and that postulated liquid spills will not result in an unacceptable radioactivity hazard. Accordingly, we conclude that the proposed site is hydrologically suitable.

F. Geology

80. Physiographically, the site is located at the irregular eastern margin of the Eastern Gulf Coast Plain section of the Coastal Plain physiographic province near the western edge of the Highland Rim section of the Interior Low Plateaus province. The Yellow Creek site lies within or is immediately adjacent to a flexure zone apparently undeformed since pre-Tertiary time. Faulting, no younger than Tertiary, perhaps older, is known within 25 miles of the site. SSR at 18–20.

81. The uppermost, well consolidated bedrock at the plant site, as well as within the site vicinity (5-mile radius), consists predominantly of the lower portion of the Mississippian Ft. Payne formation. Elsewhere within the site vicinity Paleozoic units, the Chattanooga Shale, and the Devonian ***244** Ross formation (both stratigraphically underlying the lower Ft. Payne) are well exposed at lake level. The lower Ft. Payne is a competent slightly calcareous siltstone (very silty limestone) devoid of cavities and not subject to active solutioning, about 100 to 120 feet thick. This competent unit will serve as foundation for most of the seismic Category I structures including the reactor, fuel, control, and steam valve vault buildings. Other safety-related structures will be established on either granular backfill or in situ soil. The upper weathered, clayey-cherty facies of the Ft. Payne is approximately 40 feet thick at the plant site. SSR at 22.

82. Several anomalous subsurface conditions were found at locations within the site vicinity. Detailed investigations by the Applicant led it to conclude that these were not of tectonic origin. The Staff concluded that the anomalies described present no hazard to the proposed nuclear facilities, based upon intensive subsurface exploration, detailed surface mapping, and other information which shows that the features, even if they were of fault origin, are quite old (at least prior to the close of the Cretaceous) and noncapable within the meaning of Appendix A to 10 CFR Part 100. SSR at 23–25.

83. A subsurface investigation of a suspected fault was conducted near Savannah, Tennessee. Insufficient direct evidence exists to determine, within reasonable limits, the age of movement of the fault identified by the Applicant's subsurface investigation. Unfaulted organic sediments overlying the fault projection are approximately 20,000 years

old. SSR at 27. Based upon available evidence, however, it appears to the Staff that the fault presents no hazard to the proposed Yellow Creek Plant because of the following:

****21** 1. Remoteness (16 miles) of the fault from the proposed site.

2. The trend and location of the subsurface fault does not seem to be related to the north-south Tennessee River topographic scarp.

3. Rock core taken from the fault zone is well healed, indicating considerable age.

4. Geological mapping in this area shows no faulting. Additionally, it appears that subsurface investigations in the uplands east of the scarp, north and south of the Williams Road Walker Branch area, could demonstrate the continuity of the Cretaceous Paleozoic contact along a north-south section.

5. Geologic mapping to the south of Pickwick Landing Dam, in particular that within 5 miles of the proposed site, indicates no faulting. SSR at 28–29.

***245** 84. Based upon the available evidence, we conclude that there is no geologic structure in the vicinity of the proposed site that could cause surface displacement or tend to localize earthquakes at the site. Faults present in the site area are no younger than late Tertiary, and as such are not capable faults within the meaning of 10 CFR Part 100, Appendix A. Therefore, we conclude that in regard to the geologic aspects, the proposed site is suitable for the nuclear power plant of the type and size proposed within the meaning of 10 CFR Part 100, Appendix A.

G. Seismology

85. The Yellow Creek site is located at the boundary between the Central Stable region tectonic province and the Gulf Coastal Plain tectonic province. It is in an area of relatively low seismicity based on the historical record. The nearest historical earthquake activity reported in the vicinity of the site had a Modified Mercalli (MM) intensity of III–IV and occurred 10 miles north of the site near Savannah, Tennessee, in 1895. The largest historical earthquake within approximately 100 miles of the Yellow Creek site had a Modified Mercalli intensity of VIII and occurred near Memphis in 1843, closer to the New Madrid area where numerous earthquakes have been reported in historical records. SSR at 28–29.

86. In determining the safe shutdown earthquake for the Yellow Creek site, the Staff considered earthquake activity in the Central Stable region tectonic province, in the Gulf Coastal Plain tectonic province, and that activity associated with structures in the New Madrid Faulted Belt. SSR at 29. The Anna, Ohio, earthquake of 1937 with a maximum intensity of VII–VIII (MM) is recognized as the largest earthquake which cannot be associated with a specific structure in the Central Stable region tectonic province. This intensity was assumed to occur at the site in establishing the safe shutdown earthquake. *Id.* at 30.

87. Within the Gulf Coastal Plain tectonic province, the largest earthquakes not considered to be associated with structures were evaluated. A typical maximum intensity VI (MM) earthquake was taken to be the largest earthquake associated with the Gulf Coastal Plain tectonic province, and this intensity was assumed to occur at the site in establishing the safe shutdown earthquake. *Ibid.*

****22** 88. The proximity of the New Madrid seismic zone is a more significant issue in establishing the seismic design basis for the Yellow Creek site. The 1811 and 1812 earthquakes in this zone, the largest in the recorded history of the eastern United States, had epicentral intensities in the range from X ***246** to XII (MM). SSR at 30. The Yellow Creek site is located 80 miles southeast¹⁹ of the New Madrid Faulted Belt. SSR at 31.

89. Data on the attenuation of intensity with distance for earthquakes in the central United States were considered in assessing the effects of a Modified Mercalli intensity XI–XII earthquake at a distance of 80 miles from the Yellow Creek site. SSR at 31. Although the intensity IX (MM) which would be felt at the site, corresponding to the occurrence of an earthquake of a maximum intensity XI–XII (MM) 80 miles from the Yellow Creek site, is higher

than that which would result from the postulated occurrence of lower intensities near the site, the acceleration level would not necessarily be as great for the former event. The Staff cited data showing that accelerations exceeding 0.2g are unlikely at epicentral distances greater than 60 miles. SSR at 32. A relationship has been developed that suggests that the acceleration expected at a distance of 80 miles from an earthquake of maximum intensity XI–XII (MM) would be less than about 0.2g. Furthermore, studies on attenuation and ground motion in the midcontinent indicate that much lower acceleration levels are appropriate. Finally, much of the damage produced by the New Madrid earthquakes may have been the result of soil failure. Soil failure studies indicate that long-duration ground motion with relatively low acceleration can produce such failure. Researchers have indicated that damage produced by earthquakes can be attributed to the level of ground velocity rather than acceleration. *Ibid.* We concur in the Staff's assessment that long-duration ground motion at low acceleration levels is a reasonable explanation for the phenomena observed at large distances from the New Madrid earthquakes. SSR at 32.

90. As stated above, the largest intensity at the site from postulated nearby earthquakes is VII–VIII (MM). The mean acceleration corresponding to a Modified Mercalli intensity of VII–VIII is 0.2g. SSR at 31.

91. Long-duration ground motion at low acceleration levels can produce response spectra in the lower frequency range which are not enveloped by the spectra of Regulatory Guide 1.60 scaled to the corresponding acceleration level. SSR at 32. The Applicant has altered its design response spectra to make them more conservative than the Regulatory Guide 1.60 spectra by adjusting the Regulatory Guide 1.60 spectra levels upwards for frequencies lower than 2.5 hertz. *Id.* at 33. The modified spectra enveloped the spectra from the real earthquake time histories except at a few isolated points in the low frequency range where they are exceeded by small amounts. Applicant proposes to use (1) a modified response spectrum scaled to 0.25g for design of structures supported on rock and (2) a modified response spectrum scaled *247 to 0.3g for design for structures supported on soil. For the safe shutdown earthquake the response spectra proposed by the Applicant are considered by the Staff to be adequate to represent the expected effects of an intensity VII–VIII (MM) earthquake postulated to occur near the site and an earthquake of maximum intensity XI–XIII (MM) postulated to occur 80 miles from the site. *Id.* at 32–33.

**23 92. Based on our analysis of the record, we make the following conclusions. The Yellow Creek site is situated in an area of relatively low seismicity. No tectonic structures that might localize earthquake activity in the site vicinity have been identified. The earthquakes to be considered in determining the safe shutdown earthquake for use in seismic design of the Yellow Creek plant are (1) an earthquake of maximum intensity VII–VIII (MM) occurring near the site, and (2) an earthquake of maximum intensity XI–XII (MM) occurring 80 miles from the site. The Regulatory Guide 1.60 response spectra, as modified by the Applicant and scaled to 0.25g for rock-supported structures and 0.3g for soil-supported structures, adequately represent the expected effects of the postulated earthquakes.

H. Foundations

93. The topography in the site area is the result of erosional processes which result in a marginally dissected plateau averaging 600 feet above sea level with ridges up to 700 feet above mean sea level. Alluvial surficial soil deposits are unconsolidated sands and clays. SSR at 33. These surficial soils and the underlying Eutaw formation will be almost completely removed due to plant grading at elevation 520. Major seismic Category I structures will be founded on bedrock, which is generally fresh and unweathered. Any weathered areas exposed in the bedrock during construction will be removed and treated with grout or dental concrete. SSR at 33–34. Based on the information presented in the Yellow Creek Preliminary Safety Analysis Report and the Corps of Engineers review of the site and foundation conditions, the Staff concludes that the geotechnical engineering aspects of the proposed site will be adequate to meet the requirements of 10 CFR Part 100. SSR at 35. In this regard, we find that the proposed site is suitable for the proposed nuclear facility.

94. On the basis of the considerations above and our review of the entire record, we find that the proposed Yellow Creek site is a suitable location for the two nuclear reactors and associated facilities of the type and size proposed from the standpoint of radiological health and safety considerations under the Atomic Energy Act of 1954, as amended, and the rules and regulations promulgated by the Nuclear Regulatory Commission in conformance with the Act.

***248 IV. LIMITED WORK AUTHORIZATION (LWA) ACTIVITIES**

95. The Applicant has, by letter dated February 4, 1977, requested authorization to perform certain site preparation and clearing activities permitted under 10 CFR § 50.10(e)(1). These activities are set forth in the LWA Testimony²⁰ at pages 1 through 4. Subsequently, by letter dated November 23, 1977,²¹ the Applicant amended the request to include certain additional activities permitted by 10 CFR § 50.10(e)(3). These activities, which are considered logical extensions of the activities requested earlier, include and are limited to drilling, grouting, placement of fill and dental concrete, or other foundation treatment of rock as described in PSAR § 2.5, 4.12 as required under all safety-related structures. LWA Testimony at 4. As a prerequisite for issuance of a Limited Work Authorization by the Director of Nuclear Reactor Regulation, the Board must make the findings required by 10 CFR § 51.52(b) and (c) (relating to environmental considerations) and must determine that, based upon the available information and review to date, there is a reasonable assurance and the proposed site is a suitable location for a nuclear power reactor of the general size and type proposed from the standpoint of radiological health and safety considerations. These findings we make in other parts of this decision. In addition, prior to the authorization of the additional work identified in the amended request, we must determine that there are no unresolvable safety issues relating to the additional activities that would constitute good cause for withholding authorization. We now address this determination.

****24** 96. Safety considerations relating to the additional activities (hereafter referred to as LWA-2 activities) were evaluated by the Staff in its safety review, and a summary of the results of that evaluation is set forth in the SER. The Staff concluded therein that, subject to favorable resolution of identified outstanding items, the issuance of the construction permit for the proposed facility would not be inimical to the common defense and security or to the health and safety of the public. None of the identified outstanding items relates to the requested LWA-2 activities. The pertinent sections of the SER are 2.5.3, 17.2, 17.4, and 17.5. Cox Testimony at 3, 4.

97. The first cited section deals with foundation engineering. The Applicant has also given evidence on this topic.²² The Staff testimony sets forth ***249** the soil conditions in the site area, and more specifically in the area to be excavated, the design of the foundations and considerations of slope stability. SER at 2-36-2-39. The Staff concludes that the Applicant's approach to foundation design is sufficiently conservative, that the foundation materials have been reasonably evaluated, and that they will provide adequate foundation support. *Id.* at 2-39. The Staff further concludes that the geotechnical engineering aspects of the proposed plant will meet the requirements of 10 CFR Part 100. *Id.* at 2-40. The Applicant's testimony addresses site foundation conditions, dental concrete, fill concrete, grouting, and associated quality assurance activities. Foundation Testimony at 1-4.

98. The cited subsections in Section 17 of the SER deal with the Staff evaluation of the Applicant's Quality Assurance Program. Appendix B to 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, establishes quality assurance requirements for the design, construction, and operation of nuclear power plant structures, systems, and components that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. The pertinent requirements of Appendix B apply to activities affecting the safety-related functions of those structures, systems, and components of a nuclear power plant. Cox Testimony at 2.

99. The Staff has completed its review of the quality assurance program for construction of the proposed Yellow Creek facility. The Staff concluded in § 17.2 of the SER that (1) the TVA quality assurance organization has sufficient independence and reports at a sufficiently high management level to accomplish the quality assurance objectives, and (2) the program, if adequately implemented, will conform to the requirements of Appendix B to 10 CFR Part 50 for the design and construction of the Yellow Creek Nuclear Plant, Units 1 and 2. Cox Testimony at 4. We concur.

100. The Office of Inspection and Enforcement (I&E) has conducted inspections to examine the implementation of the quality assurance program for the Yellow Creek Plant. Based on its inspections and assessment, I&E has concluded that the implementation of the Applicant's commitments in the quality assurance program for the Yellow Creek plant is consistent with the current status of the project. I&E will perform additional inspections to examine

the continued implementation of the QA program as it applies to LWA-2 activities, if authorized. Cox Testimony at 5.

****25** 101. Since the Yellow Creek quality assurance program and the implementation thereof are acceptable at this time and since I&E will perform additional inspections to provide assurance of continued acceptable implementation, there are no unresolved quality assurance matters that would constitute good cause for withholding the requested LWA-2 activities. *Ibid.* Further, we have examined the LWA-2 activities proposed by the Applicant ***250** and have found that there are no unresolved safety issues related to these activities which would constitute good cause for withholding of a Limited Work Authorization.

102. During the evidentiary hearing the Board inquired into the extent of offsite work to be done under the LWA. Tr. 171-75, 180-88, 256-66, 268-69, 538-39. Although the Board has determined elsewhere in this decision that the environmental impacts of the offsite (as well as the onsite) activities are acceptable in the event that the plant is built, the Board considered that its inquiries were appropriate to assure that the offsite activities did not result, in the event that a construction permit might ultimately be denied, in significant undesirable and unnecessary environmental damage. In forming its decision on this matter, the Board attempted to balance the adverse environmental impacts if the construction permit is denied against the effects of deferring certain activities on the construction schedule and costs in the more likely event that the permit is eventually issued. Our concerns were somewhat alleviated by testimony that, if the construction permit was not delayed to an extent greater than now anticipated, in most cases the necessary preliminary work would automatically delay the start of clearing and earth-moving activities until after the anticipated construction permit issuance date. This is the case, for example, with respect to access roads, Tr. 259, and the plant railroad, Tr. 266. Some other activities, for example construction of the barge facility and associated channel dredging, would be started immediately and would have a serious schedule impact if deferred. Tr. 257-58. The only area in which the Board has remaining reservations is with respect to offsite transmission facilities. The Applicant's position on timing of clearing rights-of-way for these lines was ill defined. The witness at one point said that activity could be delayed 'up to a period of perhaps six months' and at another point stated '... we could perhaps delay for a few months.' Tr. 181. A portion of the proposed construction, that necessary for the line to be used to provide construction power to the site, must clearly be started as soon as possible to avoid undesirable impacts on the schedule. Tr. 180-81. Accordingly, we will require that the LWA be conditioned to prohibit offsite transmission line clearing or earth-moving except for the right-of-way to be occupied by the construction power line. A permanent transmission line is planned for all or part of the construction line right-of-way, and it is not intended by this condition to prohibit the preparation of the full width of the right-of-way for this line where it occupies the same right-of-way as the construction power line. Neither is it intended to prohibit, with respect to the balance of the permanent lines, such preliminary activities as design, surveying, and obtaining right-of-way.

***251 V. CONCLUSIONS OF LAW**

****26** 103. Based upon a review of the entire record in this proceeding and upon the foregoing findings and in accordance with [10 CFR § 50.10\(e\)](#) and 10 CFR Part 51 of the Commission's regulations, the Board has concluded as follows:

a. The environmental review performed by the Staff pursuant to the National Environmental Policy Act of 1969 has been adequate.

b. The requirements of Sections 102(2)(A), (C), and (E) of the National Environmental Policy Act of 1969 and 10 CFR Part 51 have been complied with in this proceeding.

c. Having given independent consideration of the final balance among conflicting factors set forth in the record of this proceeding with a view to determining the appropriate action to be taken, having weighed the environmental, economic, technical, and other benefits against environmental and other costs, and having considered available alternatives, in accordance with 10 CFR Part 51, the Board has determined that the appropriate action to be taken, after making all of the radiological and health and safety findings required by the Atomic Energy Act of 1954, as amended, and the notice of hearing in this proceeding, is the issuance of construction permits for the Yellow Creek Nuclear Plant. Units 1 and 2, subject to (i) conditions which may hereafter be determined to be warranted with

respect to radiological health and safety matters and (ii) the following conditions for the protection of the environment.

1. The Applicant shall take the necessary mitigating actions during construction and operation of the plant and associated transmission lines to avoid unnecessary adverse environmental impacts. These actions shall include those set forth in the FES at subsections 4.5.1.1, 4.5.1.2, 4.5.1.3, 4.5.1.4, 4.5.1.5, 4.5.2.1, items 2 and 3 of 4.5.2.2, 4.5.2.3 modified to read 'All waste from dredging shall be handled and disposed of in accordance with the Corps of Engineers § 404 permit,' 4.5.2.4, and 4.5.2.5.

2. The Applicant shall comply with all conditions of the NPDES permit.

3. In addition to the preoperational monitoring program described in Section 6 of the Environmental Report, with amendments, the Staff recommendations in Section 6 of the FES *252 document shall be followed except to the extent that they deal with aquatic impacts, which are within the exclusive jurisdiction of EPA and are included within the terms of the NPDES permit.

4. Clearing and earthmoving on offsite portions of the transmission line rights-of-way shall be limited to the right-of-way for the line to be used for construction power. This restriction will terminate upon issuance of the construction permit.

5. The Applicant shall establish a control program that shall include written procedures and instructions to control all construction activities as prescribed herein and shall provide for periodic management audits to determine the adequacy of implementation of environmental conditions. The Applicant shall maintain sufficient records to furnish evidence of compliance with all the environmental conditions herein.

**27 6. Before engaging in a construction activity not evaluated by the Commission, the Applicant will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than that evaluated in this Environmental Statement, the Applicant shall provide a written evaluation of such activities and obtain prior approval of the Director of Nuclear Reactor Regulation for the activities.

7. If unexpected harmful effects or evidence of irreversible damage are detected during plant construction, the Applicant shall provide to the Staff an acceptable analysis of the problem and a plan of action to eliminate or significantly reduce the harmful effects or damage.

VI. ORDER

Based upon the foregoing findings and conclusions and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations, IT IS ORDERED that this Partial Initial Decision shall constitute a portion of the ultimate initial decision to be issued upon the completion of the radiological health and safety phase of this proceeding.

IT IS FURTHER ORDERED, in accordance with Sections 2.760, 2.762, and 2.764 of the Commission's Rules of Practice, 10 CFR Part 2, that this Partial Initial Decision shall be effective immediately and shall constitute the final action of the Commission forty-five (45) days after the date of issuance *253 hereof, subject to any review pursuant to the Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within seven (7) days after service of this Partial Initial Decision. A brief in support of the exception shall be filed within fifteen (15) days thereafter, twenty (20) days in the case of the Staff. Within fifteen (15) days after the service of the brief of appellant, twenty (20) days in the case of the Staff, any other party may file a brief in support of, or in opposition to, the exceptions.

FOR THE ATOMIC SAFETY AND LICENSING BOARD John M. Frysiak, Chairman
Lester Kornblith, Jr.,
Member
Oscar H. Paris, Member

Dated at Bethesda, Maryland,

this 3rd day of February 1978.

[Attachments A and B have been omitted from this publication but are available in the NRC Public Document Room, 1717 H Street, N.W., Washington, D.C.]

Footnotes

- 1 The work items are set forth in 'Activities for Which the Tennessee Valley Authority has Requested a Limited Work Authorization' following Tr. 129.
- 2 Staff's Exhibit 3, 'Safety Evaluation Report (NUREG-0347), relating to construction of Yellow Creek Nuclear Plant, Units 1 and 2, December 1977, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation' (hereafter 'SER') received into evidence at Tr. 520 at p. 1-1.
- 3 Staff's Exhibit 1, 'Final Environmental Statement (NUREG-0365), Yellow Creek Nuclear Plant, Units 1 and 2, November 1977, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation' (hereafter 'FES'), received into evidence at Tr. 363.
- 4 SER at 1-1.
- 5 Exhibits are appended as Attachment A.
- 6 The States are participating in the proceeding as 'interested States' pursuant to 10 CFR § 2.715(c).
- 7 Immediately prior to issuance of this decision, the Staff's response was received stating *inter alia* that its review of the material was not complete. If the Staff finds design inadequacies at the conclusion of its review, these can be dealt with during the health and safety portion of the hearing.
- 8 At the time it introduced the FES into evidence the Staff excepted from its offer certain portions dealing with health effects of the nuclear fuel cycle. We discuss this in detail in paragraphs 31 and 32, *infra*.
- 9 See also [Metropolitan Edison Company, et al. \(Three Mile Island Nuclear Station, Unit No. 2\), ALAB-456, 7 NRC 63, 67 \(January 27, 1978\)](#).
- 10 While this decision was in the final stages of preparation, we received from the Staff supplemental proposed findings on this matter and supporting affidavits supplied for information. The fundamental conclusion of the proposed findings is incorporated herein. To the extent the detailed proposed findings are not adopted, they are not necessary to our decision.
- 11 We are advised by the Applicant that public notice of the proposed issuance was issued on December 1, 1977. Applicant's Proposed Findings at n. 7, p. 29.
- 12 The evidence shows that Staff's misunderstanding resulted from a misinterpretation of a sentence of p. 3.5-8 of the ER. Tr. 603-4. In fact, the Applicant never proposed that the ends of the intake pipes would turn downward. Tr. 600.
- 13 Although the FES refers to 'impingement,' our interpretation of the problem is that we are concerned primarily with 'entrainment' by the intake pipes. FES at ii, § 9.3.2; Tr. 488-89.
- 14 A homogeneous distribution means that larval density (number per unit volume) is similar throughout the embayment. Tr. 222.
- 15 In this connection it is appropriate to note that Yellow Creek embayment comprises 25 percent of the total embayment area of Pickwick Lake. Tr. 429.
- 16 The estimate of 5 to 18 percent was contained in the Acceptance Revision of the ER and also appears in the FES and in Staff's Proposed Findings.
- 17 The Safety Evaluation Report was also offered and accepted into evidence (Staff Exhibit 3). This report, usually not available at this stage of the proceeding, contains essentially all of the significant information in the SSR as well as additional information

relevant to the future phases of this proceeding and to the LWA activities discussed herein.

- 18 In reaching this finding, the Board has taken into account the affidavit and testimony of Thomas E. Spink, Applicant's Exhibit 8. *See* paragraph 6, *supra*.
- 19 The SER at 2–33, and SSR at 31, incorrectly indicate that the site is located to the southwest of the New Madrid Faulted Belt. The Staff's request that this typographic error be corrected is granted.
- 20 'Activities for Which the Tennessee Valley Authority Has Requested a Limited Work Authorization' following Tr. 129 (hereinafter 'LWA Testimony').
- 21 This letter appears in the record as 'Attachment A' to 'Supplemental Testimony of the NRC Staff on LWA–2 Activities' following Tr. 526 (hereinafter 'Cox Testimony'), and the list of activities therefrom is attached hereto as Attachment B.
- 22 TVA's Testimony Regarding Foundation Treatment Practices following Tr. 273 (hereinafter 'Foundation Testimony').

7 N.R.C. 215, 1978 WL 14189

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