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ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 3 TO FACILITY OPERATING LICENSE NO. DPR-51

CHANGE NO. 1 TO TECHNICAL SPECIFICATIONS

ARKANSAS POWER AND LIGHT COMPANY

ARKANSAS NUCLEAR ONE, UNIT 1

DOCKET NO. 50-313

Revise Appendix B as follows:

Changes effective immediately:

Remove pages i, 2-10, 2-17, 2-18, 2-19, 4-8, 4-13, 4-15, 4-18, 4-28 and 4-29; and insert the attached revised pages. Add pages 6-3, 6-4, 6-5 and 6-6. The changed areas on the revised pages are shown by marginal lines.

Changes effective June 1, 1975:

On June 1, 1975, remove pages 2-1, 2-2, 2-3 and 2-4 and insert the attached revised pages. The changes areas on the revised pages are shown by marginal lines.

Changes effective on October 1, 1975:

On October 1, 1975, remove pages 4-11 and 4-12 and insert the attached revised pages. The changed areas on the revised pages are shown by marginal lines.

Effective January 19, 1975, activities under the U. S. Atomic Energy Commission regulatory program were assumed by the U. S. Nuclear Regulatory Commission in accordance with the Energy Reorganization Act of 1974. Any references to the Atomic Energy Commission (AEC) contained herein should be interpreted as Nuclear Regulatory Commission (NRC).

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2.0 LIMITING CONDITIONS FOR OPERATION

2.1 Thermal

2.1.1 Maximum ΔT Across Condenser

Objective

To limit thermal stress to the aquatic ecosystem by limiting the maximum ΔT across the condenser during operation.

Specification:

a. The maximum differential temperature across the condenser shall not exceed 15°F during normal operation with all four circulating water pumps in operation.

b. If one or two circulating water pumps are out of service at any given time the maximum condenser ΔT shall not exceed 30°F; and Specification 2.1.2 of this Appendix shall be met.

Monitoring Requirement

The temperature differential across the condenser shall be monitored every hour utilizing the computer output of the condenser inlet and the circulating water discharge flume temperature measurements. The range of these measurements shall be 0-150°F and their accuracy shall be ±0.5%. | 3

If the plant computer is inoperable, the condenser ΔT shall be monitored at least once each shift when the plant is operating at steady state power levels. The condenser ΔT shall be measured within two (2) hours after a change in power level has been stabilized and at least once each shift thereafter. The condenser ΔT shall be determined using measurements at the condenser inlet and in the discharge canal. | 1,3

Bases

Maximum ΔT's of 15°F with 4 circulating water pumps operating (~1700 cfs flow) and 30°F with 2 circulating water pumps operating will insure that the limits of the applicable water quality criteria will not be exceeded. The difference in temperature readings of the RTD's at the inlet of the condensers and at the circulating water discharge flume provides the ΔT across the condensers. | 3

Specification 2.1.1.b allows maintenance to be performed on circulating water pumps when the Dardanelle Reservoir ambient temperature is such that Specification 2.1.2 will not be exceeded. Hydraulic model studies have shown that a 30°F ΔT at 850 cfs circulating waterflow will not result in adverse changes in the Dardanelle Reservoir isotherms when

compared to the isotherms resulting from a 15°F ΔT at 1700 cfs except on the surface of the discharge embayment.

2.1.2 Maximum Discharge Temperature

Objective

To limit thermal stress to the aquatic ecosystem by limiting the plant's maximum discharge water temperature.

Specification

The condenser discharge water temperature shall not exceed 105°F for more than two consecutive hours. If the water temperature exceeds 105°F for two hours an investigation of the situation will be undertaken and corrective action shall be taken to maintain the discharge water temperature at 105°F or less. One such corrective action would be a reduction in the plant power level unless there is an emergency need for the lost power. This emergency need would exist when a reduction in power would mean cutting off firm customers. If monitoring (see below) indicates that the temperature at the mouth of the discharge embayment is $\leq$ 105°F, the plant load will not be reduced.

Monitoring Requirements

Condenser discharge water temperature shall be monitored every hour utilizing the average of the computer output of the circulating water discharge flume RTD readings. The RTD's have a 0-150°F range and an accuracy of $\pm$0.5%.

If the plant computer is inoperable, the condenser discharge temperature shall be measured at least once each shift. If the condenser inlet temperature exceeds 85°F with all four circulating water pumps running or 70°F with less than four circulating water pumps running, the circulating water discharge flume temperature shall be monitored every two (2) hours.

If the circulating water discharge flume temperature exceeds 105°F, plant personnel will be dispatched to the mouth of the discharge embayment to monitor the exit temperature from the embayment. Monitoring of the embayment will continue every two hours as long as the condenser outlet temperature remains at 105°F.

Bases

The 105°F maximum discharge water temperature limit is set to assure that the Dardanelle Reservoir temperature does not exceed 95°F as

established by the applicable water quality criteria. The use of the circulating water discharge flume RTD's provides the circulating water discharge temperature prior to mixing with the Dardanelle Reservoir water.

No credit was taken in the analyses and models of the circulating water system for heat exchange within the discharge embayment even though it is expected that the water temperature will be reduced in the embayment. Thus, the average temperature should be <105°F even when the temperature at the circulating water discharge flume is greater.

2.1.3 Maximum BTU/hr

Not applicable.

2.1.4 Rate of Change of Discharge Temperature

Objective

To avoid thermal stress to the aquatic ecosystem due to sudden changes in water temperature.

Specification

In the event of a planned shutdown during the period November through April, the reactor power level shall be reduced to 0% at a rate such that the decrease in the circulating water discharge flume temperature shall be ≤5°F/hr in order to avoid any adverse thermal impact on the aquatic environment in the discharge embayment. As the reduction in power level is made, the number of operaitng circulating water pumps will be reduced so as to limit the rate of decrease of the water temperature in the discharge embayment.

This limitation may be exceeded for brief periods as necessary to protect plant equipment and for certain safeguard operations which cannot be limited or negated by plant operation. These safeguard operations include automatic plant trips and compliance with safety-related technical specifications.

If after a few planned shutdowns at the specified rate, there are no detectable adverse effects on the discharge embayment environment, then future planned shutdowns may be conducted at slightly higher rates. The required monitoring shall be

conducted until it is established that there is no adverse environmental impact associated with plant shutdowns conducted at the higher rate. If there is adverse environmental impact detected, then future planned shutdowns will be conducted at slightly slower rates until a shutdown rate where there is no detectable adverse environmental impact is determined.

Monitoring Requirement

Circulating water discharge flume temperature will be monitored every hour during the power reduction utilizing the average of the computer output of the circulating water discharge flume RTD readings. The RTD's have a 0-150°F range and an accuracy of ±0.5%.

If the plant computer is inoperable, the circulating water discharge flume temperature shall be monitored at least once per hour during the power reduction utilizing the condenser temperature recorder which has a 0-150°F range and a ±0.5% accuracy.

The aquatic environment of the discharge embayment will be watched during and immediately after planned shutdowns in order to detect any adverse environmental impacts on the embayment, which might occur. A record of the observations made, rate of temperature change, and appropriate data shall be maintained.

Bases

There has been no incidence of adverse environmental impact associated with any operating AP&L power plant. There is also a lack of data or evidence which would support a limiting rate of change of temperature for the specific species that might inhabit the discharge embayment. In view of this, a conservative rate of change, ≤5°/hr, is specified. It is also conservative because the actual rate of change of the discharge embayment will be slower than the rate of change of the circulating water system. A reduction in circulating water flow will further decrease the rate of change of temperature in the discharge embayment.

2.1.5 Heat Treatment of Circulating Water System

Not Applicable.

2.1.6 Deicing Operations

Not Applicable.

b. Averaged over a yearly interval, the release rate of I-131 and other particulate radioisotopes with half lives longer than eight days discharged from the plant should result in a dose in the unrestricted area of less than 15 mrem to the thyroid of a child through the grass-cow-milk chain.

2.4.1 Liquid Discharge

Specification

1. The rate of release of radioactive materials in liquid waste from the plant shall be controlled such that the instantaneous concentrations of radioactivity in liquid waste, upon release from the Restricted Area, do not exceed the values listed in 10 CFR 20, Appendix B, Table II, Column 2.

2. If the release of radioactive materials in liquid effluents, excluding tritium and dissolved gases, when averaged over a calendar quarter, exceeds 2.5 curies, the Licensee shall: 3

   a. Make an investigation to identify the causes for such release rates;

   b. Define and initiate a program of action to reduce such release rates to the design levels; and,

   c. Notify the Director, Directorate of Licensing within 30 days, identifying the causes and describing the proposed program of action to reduce such release rates.

3. The release rate of radioactive liquid effluents, excluding tritium and dissolved gases, shall not exceed 10 curies during any calendar quarter.

4. During release of liquid radioactive waste, the following conditions shall be met:

   a. At least two (2) condenser circulating water pumps shall be in operation to provide a minimum dilution flow of approximately 383,000 gpm in the discharge canal for the liquid waste effluent;

   b. The effluent control monitor shall be set to alarm and automatically close the waste discharge valve such that the requirements of Specification 2.4.1 are met; and,

TABLE 2-2

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab[3]
1. Filtered Waste Monitor Tank, Treated Waste Monitor Tank, and Laundry Drain Tank	a. Gamma isotopic analysis	a. Prior to release of each batch	a. Gamma Nuclides 5×10^{-7} µCi/ml[4]
	b. Radiochemical Analysis Sr 89, 90	b. Sr-89 Monthly Sr-90 Quarterly	b. 5×10^{-8} µCi/ml
	c. Dissolved Noble Gases	c. Monthly	c. Dissolved Gases 10^{-5} µCi/ml
	d. Tritium	d. Monthly Proportional Composite[2]	d. 10^{-5} µCi/ml
	e. Gross Alpha Activity	e. Monthly Proportional composite	e. 10^{-7} µCi/ml
	f. Ba-La-140, I-131	f. Weekly Proportional Composite[2]	f. 10^{-6} µCi/ml
2. Primary Coolant	a. I-131, I-133	a. Weekly	a. 10^{-6} µCi/ml
3. Waste Gas Decay Tank	a. Gamma Isotopic Analysis	a. Prior to release of each batch	a. 10^{-4} µCi/cc
	b. Deleted	b. Deleted	b. Deleted
	c. Tritium	c. Prior to release of each batch	c. 10^{-6} µCi/cc
4. Unit Vent Sampling	a. I-131[1]	a. Weekly	a. 10^{-12} µCi/cc
	b. I-133, I-135	b. Monthly	b. 10^{-10} µCi/cc

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TABLE 2-2 (Cont'd)

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab(3)	
4. Unit Vent Sampling (Cont'd)	b. Particulates(3)			
	1) Deleted	1) Deleted	1) Deleted	3
	2) Gross Alpha Activity	2) Quarterly on Weekly Sample	2) 10^{-11} µCi/cc	
	3) Gamma Isotopic Analysis	3) Biweekly Composite	3) 10^{-11} µCi/cc	3
	4) Radiochemical Analysis Sr 89, 90	4) Quarterly Composite Sr-89 Monthly	4) 10^{-11} µCi/cc	3
	5) Ba-La-140, I-131	5) Weekly	5) 10^{-10} µCi/cc	
	c. Gases			
	1) Gross γ Activity	1) Monthly(5)	1) 10^{-4} µCi/cc	3
	2) Tritium	2) Monthly	2) 10^{-6} µCi/c	
5. Reactor Building Purge	a. Gamma Isotopic Analysis	a. Each Purge	a. 10^{-4} µCi/cc	
	b. Deleted	b. Deleted	b. Deleted	3
	c. Tritium	c. Each Purge	c. 10^{-6} µCi/cc	
6. Condenser Vacuum Pump (Air Ejector)	a. Gamma Isotopic Analysis	a. Monthly	a. 10^{-4} µCi/cc	3
	b. Tritium	b. Monthly	b. 10^{-6} µCi/cc	

TABLE 2-2 (Cont'd)

MINIMUM SAMPLING FREQUENCY

(1) When activity level exceeds 10 percent of the limits of Specification 2.4.2.3, the sampling frequency shall be increased to a minimum of once each day. When the gross activity release rate exceeds one percent of maximum release rate and the average gross activity release rate increases by 50 percent over the previous day, an analysis shall be performed for iodines and particulates.

(2) A proportional sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged from the plant.

(3) The detectability limits for activity analysis are based on the technical feasibility and on the potential significance in the environment of the quantities released. For some nuclides, lower detection limits may be readily achievable and when nuclides are measured below the stated limits, they should also be reported.

(4) For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentration of such radionuclides using observed ratios with those radionuclides which are measurable.

(5) Analyses shall also be performed during reactor coolant degassing operatings when Waste Gas Decay Tanks are bypassed and waste gas from vacuum degassifier is being discharged to the station vent without holding for decay.

operational monitoring program described herein. The operational monitoring shall begin with the operation of Unit 1 and shall continue for five years after Unit 2 goes into operation. The effects of plant operation shall be determined by comparison of ecological parameters studied in the preoperational program.

Survey Plan

A map of the survey area showing sampling locations is presented in Figure 4-3. The type and frequency of field sampling shall be as presented in Table 4-3.

Specification

(a) Biological Surveys

1) Plankton

Plankton samples shall be obtained by use of the Wisconsin plankton net. These samples shall be analyzed for plankton (fauna, periphyton, filimentous algae) count and these counts will indicate numbers of organisms per liter of water sample as determined by the strip count method.

2) Benthic Organisms

The bottom organisms shall be obtained by the use of the Ekman dredge. The number of specimens of each group will be listed by sampling areas. Counts shall be made for the number of organisms per one-fourth square foot. Analysis of the plankton and benthic organisms will provide important information regarding the food chain.

3) Fish Survey

a) Gill Net Survey

A fish population and fish species count shall be taken with sizes noted, through the use of gill and trammel nets. A minimum of 16 net-nights' sampling will be accomplished each quarter. At each sampling point two (2) sets of 2 net-nights' sampling will be obtained within 30 days on a quarterly basis. Spines, scale samples, and length/weight frequencies shall be obtained for representatives of each species.

Frequencies of sampling were chosen to obtain a trend of aquatic life in the area. Most fish surveys are set up to be conducted in the summer because the fish are more plentiful at this time of year. It is felt that more frequent sampling of the organisms would produce repetitive data. However, less frequent sampling might yield erratic data from which no trend could be detected.

The data will be evaluated in relation to preoperational data obtained by AP&L, UALR, Ark. Tech., and various governmental agencies. By comparing preoperational data with postoperational data, changes in the environment can be detected. It is felt that in this way effects on the aquatic life by ANO can be monitored and controlled.

(2) Impingement of Organisms

Objective:

The objectives of the impingement study are to: (1) determine the species composition, and (2) quantify the numbers of fishes and other aquatic organisms which become impinged on the circulating water intake screens.

Specification:

Impinged organisms shall be sampled for three 24-hour periods per week. The total weight of the 24-hour sample shall be determined. All fishes and other organisms shall be identified by species. If the sample is greater than 100 lbs, two random subsamples of 50 lbs each shall be taken from each sampling period. All specimens in the two subsamples shall be identified to species and each series weighed and used to compute total weight per species for each 24-hour sample. All fish of a given species shall be used to compute modal length, maximum length, and modal weight. If greater than 100 fish are collected during a sampling period, a random subsample of at least 100 fish shall be used for the aforementioned measurements. Estimates of the total number of each species impinged per 24-hour sampling period shall be

computed. The number of circulating water pumps in operation during sampling shall be recorded.

All fish collected shall be disposed of in a land fill or by other alternative methods. The fish shall not be ground and returned to Lake Dardanelle.

Reporting Requirement:

Monthly results from this study shall be submitted to the NRC, Division of Reactor Licensing, no later than 10 days after the end of the reporting month. The reports shall contain the following information: the date of the sample, the species collected, the number or estimated number impinged in 24 hours for each species, the modal length (in mm) for each species, the maximum length (in mm) for each species, the modal weight (in g) for each species, and the number of pumps operating during each sample collection.

A summary of the impingement results shall be included in the report required by Specification 5.6.1.

(3) Entrainment of Ichthyoplankton

Objective:

The objective of the entrainment study is to determine the effects of operation of the Circulating Water System on the ichthyoplankton.

Specification:

A sampling program shall be implemented to determine estimated numbers of ichthyoplankton passing through the circulating water system. Intake samples shall be taken in the vicinity of the mouth of the intake canal in Illinois Bayou; discharge samples shall be taken from the discharge embayment in the vicinity of the discharge structure. Samples from the same water mass shall be obtained from the intake and discharge by coordinating their collection with circulating water passage time. Physicochemical parameters to be monitored at sampling shall include water temperature, dissolved oxygen and pH. Ichthyoplankton shall be sampled monthly during the months of April through September. Samples shall be taken over 24-hour periods at eight-hour intervals.

The samples shall be taken at surface, mid-depth and near bottom at both the intake and discharge by a high capacity pump sampler. As an alternative, a metered plankton net shall be fished at surface, mid-depth, and near bottom.

Specimens collected shall be identified to the lowest possible taxonomic level and densities shall be calculated. Immediate mortality shall be determined for intake and discharge samples based on the following criteria:

LIVE: Swimming vigorously, no apparent orientation problems, behavior normal.

STUNNED: Swimming erratically, struggling and swimming on side, some twitching but motile.

DEAD: No vital life signs, no body or opercular movements, no response to gentle probing.

Reporting Requirement:

Report levels shall be developed from the data collected at the conclusion of the first year of study. A summary of the entrainment study shall be included in the semi-annual environmental report.

Bases:

This study and subsequent analysis of the results will aid in determining the effect on the Ichthyoplankton of passage through the Circulating Water System.

(b) Terrestrial

Not applicable.

(c) Aerial

Not applicable.

4.2 Radiological Environmental Monitoring

Objective:

To provide information on the radiological effects of station operation on the environment.

Specification:

An environmental radiological monitoring program shall be carried out as defined in Tables 4-1 and 4-2 at locations defined in Figure 4-1 and Table 4-2.

4.2.1 Air Sampling

Continuous air sampling shall be performed at four locations onsite, two off-site within a ten-mile radius of the Plant, and one reference location. Locations have been selected near site boundaries and in existing populated areas for evaluation of possible exposure to airborne particulate and halide radioactivity resulting from station operation. The collection devices for iodine shall contain potassium iodide impregnated charcoal or equivalent, and shall be constructed and operated so as to retain quantitatively the iodine in the air passing through the device. Appropriate analyses of particulate filters and halide collection devices shall be performed on all samples in accordance with accepted techniques and nuclides of interest.

4.2.2 Direct Radiation

Ambient levels of direct external radiation shall be measured at the same locations as air particulate. Measurements shall be made by exposing thermoluminescent dosimeters for periods of three months and six months.

4.2.3 Precipitation Sampling

Precipitation sampling shall be carried out at four locations; two onsite, one within a ten-mile radius, and one reference location approximately twenty miles southwest of the plant. Analyses shall be performed as given in Table 4-1.

4.2.10 Milk Sampling

Samples of milk shall be collected within a 10-mile radius of the plant. The milk sampling program shall include:

(a) one (1) sample from the location of the offsite dairy farm or individual milk animal with the highest expected X/Q,

(b) one (1) sample from existing milking animals in each of three (3) areas where infant thyroid doses are calculated to be greater than 1 mrem per year. The infant thyroid dose shall be evaluated in the manner of Regulatory Guide 1.42.

(c) one (1) sample from milking animals at a control location (10-20 miles distant and in the least prevalent wind direction).

Samples shall be analyzed for Iodine-131, Strontium-89-90, and gamma emitting isotopes. The sampling frequency for locations nearer than three (3) miles shall be every two weeks during the season animals are on pasture and the locations nearer than 1.5 miles shall be sampled weekly during the season animals are on pasture. Each sample shall be analyzed for I-131 as in Table 4-1, and monthly composites shall be analyzed for radiostrontium and gamma emitters.

The analytical procedure used to determine the radioiodine concentration will have a sensitivity of 0.5 picocuries per liter, the overall error (one sigma confidence level) of the analysis will be within $\pm$ 25%. Results will be reported, with associated calculated error, as picocuries of I-131 per liter of milk at the time of sampling.

The area within ten (10) miles of the plant shall be surveyed semiannually for the locations of animals (cows, goats) producing milk for human consumption. The results of this survey shall be included in the Operating Report required by Specification 5.6.1. If it is learned from this survey that milk animals are present at a location which yields a calculated infant thyroid dose greater than from previously sampled animals, the new location shall be added to the milk sampling program as soon as practicable. The sampling location having the lowest calculated dose may then be dropped from the sampling program at the end of the grazing season during which the survey was conducted. Also, any location from which milk can no longer be obtained may be dropped from the program after notifying the NRC in writing that milk animals are no longer present at that location.

4.2.11 Vegetation Sampling

Grass and the leafy portions of other natural vegetation available at each of the air sampling stations shall be collected three times per year (spring, summer, and fall). Food crops and pasturage in the vicinity of the plant also shall be collected as available at harvest time. Appropriate analyses of all samples shall be performed in accordance with accepted techniques and nuclides of interest as given in Table 4-1.

4.2.12 Soil Sampling

Soil samples shall be collected semi-annually at the same locations as vegetation samples and analyzed for gross alpha and gross beta and gamma emitting isotopes as described in Table 4-1. The Fall sample also shall be analyzed for Strontium 89-90.

Bases:

One of the limiting conditions for operation of Arkansas Nuclear One is restricting environmental effects due to plant operation in unrestricted areas surrounding the plant site to within limits specified in AEC Regulations 10 CFR - Parts 20, 50, and 100. This Radiological Monitoring Program includes measurements made on the air, water, and land environments to insure that these limits are observed.

ARKANSAS POWER & LIGHT CO.
ARKANSAS NUCLEAR ONE-UNIT 1

AQUATIC SAMPLING POINTS

FIG. NO
4-5

CHANGE 3

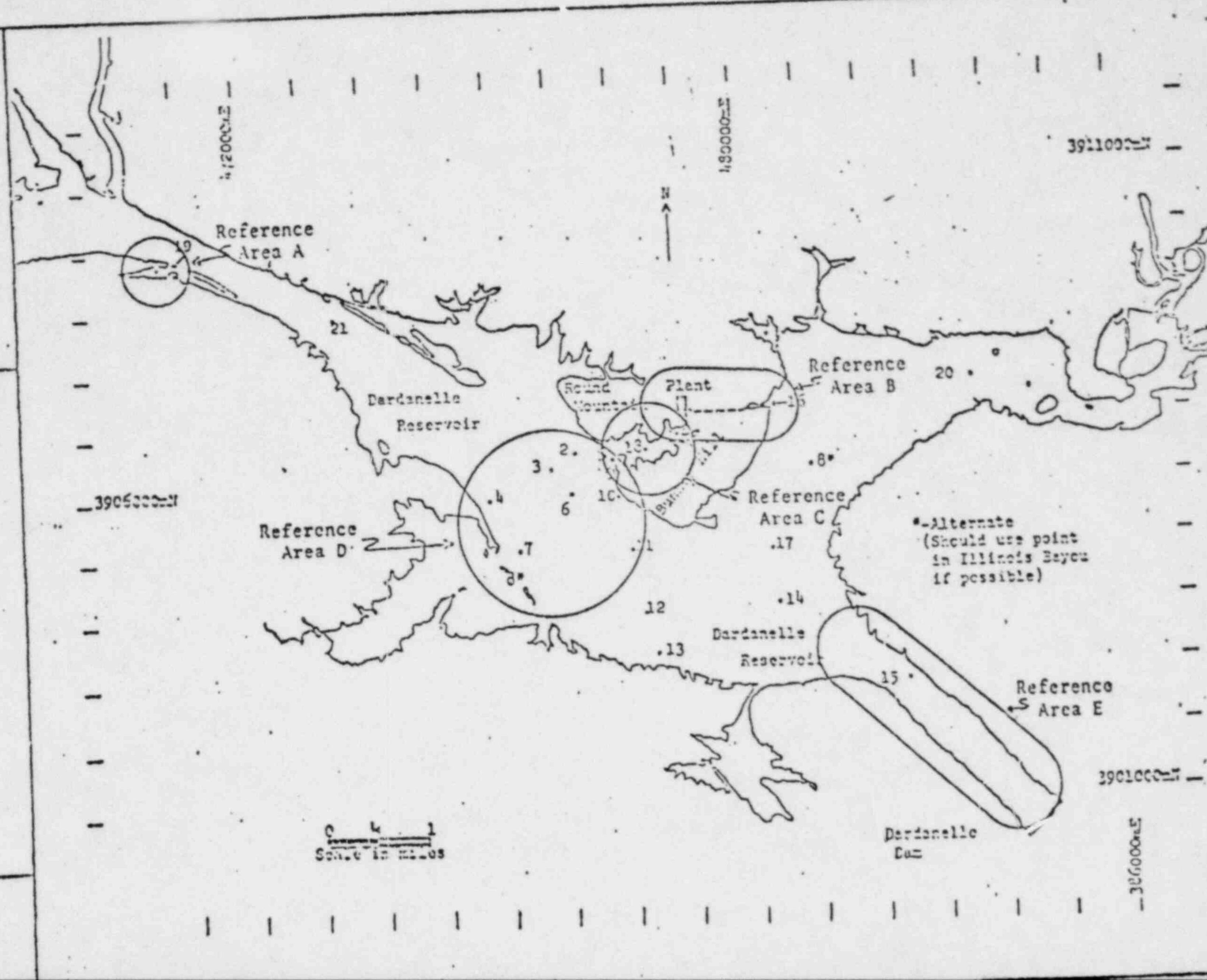

TABLE 4-2

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
16	295° - 6.0 miles	Piney Creek Area	1) Lake Water 2) Bottom Sediment 3) Aquatic Biota	1) Monthly 2) Semi-annually 3) Semi-annually	
17	Note 1		1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer, Fal
18	Note 1		1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer, Fal
19	99° - 5.0 miles	Akansas-Tech. Herd	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer, Fal

Note 1: These sample stations will be determined as per Specification 4.2.10 and will be reported in the Operating Report as per Specification 5.6.1.

TABLE 4-3

AQUATIC SAMPLING LOCATION AND FREQUENCIES

Sample Type	Sample Frequency	Sample Station #
Plankton	Quarterly - January, April July, October	1, 2, 3, 5, 10, 11, 14, 15, 16, 19, 21
Benthic Organisms	Quarterly - January, April July, October	1, 2, 3, 5, 10, 11, 14, 15, 16, 19, 21
Gill Net Survey	4 Consecutive days Quarterly - January, April July, October	Areas A, B, C, D
Trawling Survey	Every other week March, April, May, June	1, 3, 5, 9, 10, 11, 16, 19
Trap Net Survey	5 consecutive days Spring and Fall	Areas A, B, D
Cove Rotenone Survey	September	Areas A, C
Shoreline Seine Survey	Every other week March, April, May, June	1, 3, 5, 9, 10, 11, 16, 19
Fish Cage Survey (Mussels)	Semi-Annually	Areas A, B, D
Chemical	Monthly	3, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19
Physical	Monthly	3, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19

6.3 Diel Changes In Impingement Levels

Objective:

To provide information necessary for quantifying the extent of fluctuations in impingement levels within a 24-hour period.

Program Specification:

Beginning October 1 and continuing to April 1, 1976, subdivisions of a daily impingement sample (See Specification 4.1.2.a.(2)) into three eight hour subsamples shall be performed twice per month during regular impingement monitoring. The results of this study shall be analyzed to identify the extent of fluctuations in impingement levels within a 24-hour period. The data required by Specification 4.1.2.a.(2) shall be collected for each subdivision of the daily sample. 3

Reporting Requirements:

An interpretive report shall be submitted to NRC by May 1, 1976.

6.4 Absolute Population Density Estimate of Threadfin Shad

Objective:

To determine an estimate of the absolute population density of young-of-the-year threadfin shad in Dardanelle Reservoir in order to quantitatively assess the impact of impinging this species in large numbers.

Program Specification:

During 1975 an estimate of the absolute population density of young-of-the-year threadfin shad will be made in Dardanelle Reservoir. The estimates shall be based on a catch per volume sampling method. Before the sampling gear is selected, their efficiency in Dardanelle Reservoir will be determined in April-May and again in late June. An effort will be made to ensure that the correct volume and tow speed are measured during all tows. All horizontal midwater tows shall be taken during the night. Sampling shall be done weekly from April through July and bi-weekly from August through October. During April through July one set of gear shall be used to sample the smaller younger fish and during July through October another set of gear shall be used to catch the fish that have grown during the preceding months to a larger size. Both sets shall be used during July or until the catch rate for the first gear is basically zero. Samples of other ichthyoplankton shall be preserved for future analysis. Random sampling shall be done in 25 grids on lower Dardanelle Reservoir (downstream of Piney Bay) once per week or bi-weekly, depending on the time of year. Replicate (two) samples shall be taken at all grid stations.

This work shall be done by personnel capable of quality field work and capable of analyzing the data to the point of making the population density estimate.

Reporting Requirements:

The results of this program shall be reported to the NRC upon its completion.

Bases

This program constitutes a "state-of-the-art" effort to quantify the population density of threadfin shad in Dardanelle Reservoir. The program will attempt to determine the validity of concerns that have been raised over the large threadfin shad impingements that have been experienced at ANO-1.

6.5 Laboratory Study of Effects of Temperature and Temperature Change On the Swim-Speed and Mortality of Threadfin Shad

Objective:

To determine the effects of reduced temperature and rates of temperature reduction on the swim-speed and mortality of threadfin shad and in turn develop possible methods to reduce threadfin shad impingements.

Program Specification:

A laboratory study shall be conducted to document the effects of reduced temperature and rate of temperature reduction on the swim-speed capabilities and mortality of threadfin shad in Dardanelle Reservoir. One group of fish shall be used for the swim-speed determinations and another for the mortality determinations. Within the swim-speed group other groups shall be delineated, one for reduced temperature and another for rate of temperature reduction. The reduced temperature group shall be acclimated to various temperatures and tested for swim-speed with different fish being used for each acclimation temperature. The temperature reduction rate groups shall be acclimated to various temperatures and subjected to various rates of temperature drops, then tested for swim-speed or observed for mortality. No single fish shall be subjected to more than one set of conditions; i.e., used for more than one test. A control group shall be maintained and handled in the same manner as the other fish to differentiate natural morality, the effects of handling, etc.

Before the test is begun an effort shall be made to catch and maintain enough fish for the test. If this effort fails the study will be discontinued after consultation with NRC staff. If possible, all fish for the study shall be obtained from Dardanelle Reservoir.

This study shall be done by personnel competent in the field of aquatic biology laboratory work and capable of analyzing all data generated by the study.

Reporting Requirements:

The results of this study shall be reported to the NRC upon its completion.

Bases:

This study constitutes a "state-of-the-art" determination of temperature effects on threadfin shad in Dardanelle Reservoir. The results will contribute to the documentation of the fact that the large threadfin shad impingements experienced at ANO-1 are a result of natural causes.