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ENVIRONMENTAL TECHNICAL SPECIFICATIONS

AND BASES

APPENDIX B

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## 2.0 ENVIRONMENTAL PROTECTION CONDITION

### 2.2.2 Suspended and Dissolved Solids

Objective: To limit the total amount of solids discharged to the lake.

Specification: The pH of the solution released from the neutralizing tank shall be within the range of 6 to 8 before dilution in the circulating water system.

For normal operation, the average incremental increase in the concentration of total solids in the circulating water resulting from the neutralizing tank discharge shall not exceed 2.0 mg/l when calculated during periods of each discharge.

The total annual release from the neutralizing tank shall not exceed 125 tons of total solids.

Bases: The demineralizer system consists of twin cation, anion, and mixed bed units used to ensure that the product water is high quality water capable of meeting stringent Nuclear Steam Supply System specifications.

During normal operation, it is expected that approximately 22,000 gallons of neutralized waste will be discharged from the primary cation and anion regeneration process once every two days while 3600 gallons of neutralized waste from the mixed bed regenerations will be discharged twice a month. It is possible, however, that on any given day, the chemical discharges from the neutralizing tank may contain wastes from both the primary cation and anion units and mixed bed units.

## 3.0 MONITORING REQUIREMENTS

### 3.2.2 Suspended and Dissolved Solids

Objective: To monitor the total amount of solids discharged to the lake.

Specification: The pH of the discharged solution shall be taken from an "in line" pH monitor and the range recorded in the discharge log book. Should the "in line" pH monitor fail, representative samples shall be taken every 20 minutes during the release for pH determination.

Prior to release of waste from the neutralizing tank, a representative sample shall be analyzed for suspended, dissolved and total solids. The total amount in gallons released and the time required for discharge shall be recorded.

Bases: Analysis of a representative sample from the waste neutralizing tank, before dilution with the circulating water system, by Standard Methods or its equivalent will ensure that each batch discharged from the neutralizing tank is documented. Monitoring the pH of the waste stream will ensure that the wastes are neutralized before release.

## 2.0 ENVIRONMENTAL PROTECTION CONDITION

### 2.2.3 Treatment Chemicals

Objective: To identify and quantify all treatment chemicals and to limit the quantity of phosphate discharged to the lake.

Specification: The average incremental concentration of phosphate, after dilution in the circulating water, shall not exceed 0.025 mg/l when calculated during periods of discharge.

The annual addition of phosphate (PO<sub>4</sub>) to Lake Michigan shall not exceed 750 pounds.

The total amounts of all raw chemicals added or used in the plant, identified below, shall be reported annually at the end of the calendar year in the Semi-Annual Operating Report.

1. Primary System
  - a. Boric acid
2. Secondary treatment chemicals
  - a. Phosphates
  - b. Morpholine
  - c. Hydrazine
3. Pre-treatment system chemicals
  - a. Alum
  - b. Lime
  - c. Polyelectrolyte
  - d. Hypochlorite
  - e. Sodium Sulfite
4. Demineralizer System
  - a. Caustic Soda
  - b. Sulphuric acid

## 3.0 MONITORING REQUIREMENTS

### 3.2.3 Treatment Chemicals

Objective: To monitor the quantity of phosphate (PO<sub>4</sub>) discharged to the circulating water and the total amount of treatment chemicals.

Specification: Steam generator water (blowdown) samples shall be analyzed three times per week for phosphates (PO<sub>4</sub>) and the average incremental concentration of phosphate after dilution in the circulating water shall be calculated and recorded.

A record shall be kept of all raw treatment chemicals used in plant unit operations.

Bases: The chemicals used in the different processes within the plant are required to provide safe and efficient operation of the various unit operations. All chemicals are added to these systems on an "as needed" basis.

5. Potable Water Softeners
  - a. Salt
6. Condenser
  - a. Hypochlorite

## 2.0 ENVIRONMENTAL PROTECTION CONDITION

Bases: Boric acid is used as chemical shim during plant operation in order to control reactivity within the primary cycle.

Phosphate, hydrazine, and morpholine are used to chemically treat the secondary system. Of these chemicals, only morpholine and phosphates are expected to enter the circulating water via the blowdown, since hydrazine breaks up into a gas at high temperatures. Morpholine is used to increase condensate pH, while phosphates are used to aid in fluidizing scale and sludge forming contaminants. The chemicals added to the pre-treatment system are alum to coagulate the turbidity in the water, lime to presoften the water, polyelectrolyte to aid in the development of the floc, hypochlorite solution to kill bacteria and sterilize the water and sodium sulfite to reduce any free chlorine before entering the demineralizers.

Caustic soda and sulphuric acid are used in the demineralizer system regeneration process while salt is used to regenerate the water softener.

## 3.0 MONITORING REQUIREMENTS

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## 4.0 ENVIRONMENTAL SURVEILLANCE AND SPECIAL STUDIES

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### 4.1 Biological

#### 4.1.1 Aquatic

- a. General Ecological Survey to evaluate the contribution of the plant discharges on the biotic stresses in the lake and including possible long term effects.

Objective: The specific aims of the general survey are as follows:

1. Identify certain physical characteristics such as water temperature, local lake currents, and bottom contours in the immediate plant influence.
2. Investigate benthic macroinvertebrates, zooplankton, phytoplankton, and periphyton populations and their distribution within the area of the thermal plume and intake.
3. Characterize the distribution of fish at different seasons in the vicinity of the intake and discharge.
4. Determine whether the warm water discharge or intake of cooling water is having an adverse impact on the life history of fish in the vicinity of the plant.
5. Determine changes in the bacteriological and chemical makeup of the Lake Michigan waters in the vicinity of the plant.
6. Determine a numerical predictive model for the thermal plume and measure the shape and extent of the thermal plume during plant operation.

Specification:

1. A general ecological survey shall be undertaken for two years after the plant becomes operational.
  - a. Data collected during the two years of the program shall be reviewed and evaluated by the licensee and the AEC to determine whether the program should be modified or discontinued.
  - b. The program may be modified as necessary to accommodate changes occurring during the survey. These changes shall be reported in the Semi-Annual Operating Report.
  - c. A summary of the progress and results of these studies shall be included in the Semi-Annual Operating Report.
  - d. The frequency of the field sampling program shall be in accordance with Table ES 4.1.1-1.
  - e. Sampling locations and the parameters sampled shall be established in accordance with Figure ES 4.1.1-1.
2. Water Column Profile Locations
  - a. Seventeen profile sampling locations shall be established in accordance with Figure ES 4.1.1-1. Five

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#### 4.0 ENVIRONMENTAL SURVEILLANCE AND SPECIAL STUDIES

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locations shall be established offshore at the 10 foot depth contour, five along the 20 foot depth contour and five along the 30 foot depth contour. One station shall be established at the mouth of the discharge and another at the 40 foot depth contour.

b. Temperature and dissolved oxygen shall be measured immediately below the lake surface and at each meter of depth at all locations.

#### 3. Bottom Contours

a. Bottom contours in the vicinity of the discharge shall be mapped twice during the first year of operation and once during the second year.

#### 4. Water Quality and Bacteriology

a. Duplicate samples shall be collected from three locations along each of the 10 and 20 foot depth contours and from a single location at the 40 foot contour.

b. Samples along the 10 foot contour shall be from mid-depth; samples along the 20 foot contour shall be from 1 meter below the surface and from one meter above the bottom; and samples at the 40 foot contour shall be from the top, mid-point and bottom of the water column.

c. A profile of the temperature and dissolved oxygen shall be measured at each of these lake sampling locations.

d. The chemical, physical, and bacteriological characteristics measured shall be as follows:

Alkalinity, Total  
Ammonia  
Arsenic  
Bacteria, Standard Plate Count  
Bacteria, Total Coliform  
Bacteria, Fecal Coliform  
Bacteria, Fecal Streptococci  
Bio-Chemical Oxygen Demand (5-Day)  
Boron  
Cadmium  
Chemical Oxygen Demand  
Chloride  
Chromium, Total  
Color, True  
Conductance, Specific  
Copper

Manganese  
Mercury  
Nickel  
Nitrate  
Nitrite  
Organic Carbon, Total  
Organic Nitrogen, Total  
Orthophosphate Soluble  
Oxygen Dissolved  
pH  
Phosphorus, Total  
Potassium  
Silica  
Sodium  
Solids, Total Dissolved  
Sulfate

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#### 4.0 ENVIRONMENTAL SURVEILLANCE AND SPECIAL STUDIES

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Fluoride  
Hardness, Total  
Iron  
Lead

Temperature Profiles  
Turbidity  
Zinc

5. Lake Currents - Lake currents in the vicinity of the thermal plume shall be measured.
6. Phytoplankton
  - a. Duplicate water samples for phytoplankton analysis shall be collected at seven stations at a depth of one meter below the lake surface.
  - b. A species checklist and enumeration shall be compiled for each sample.
7. Zooplankton
  - a. Zooplankton samples shall be collected from five locations.
  - b. Two replicate samples shall be taken at each location and depth.
  - c. Organisms shall be identified to the lowest positive taxonomic level and enumerated.
  - d. Populations shall be analyzed to determine the difference between locations.
8. Periphyton
  - a. Periphyton samples shall be collected from naturally occurring rock substrates at each of the three sampling locations.
  - b. The color, species composition, and abundance of the attached algae and the type of substrate upon which it grows shall be noted.
  - c. A species checklist, including the relative abundance of each species, shall be prepared for each sample to determine differences and similarities among locations.
9. Benthos
  - a. Benthos samples shall be taken at eight locations.
  - b. Organisms shall be identified to the lowest positive taxonomic level and enumerated in abundance per square meter.
10. Fish
  - a. Gill nets shall be used to sample fish populations at three locations.
  - b. Minnow seining shall be conducted at three locations.
  - c. Fish eggs and larvae shall be sampled and identified at six locations during the spawning season for local species.
  - d. All fish shall be identified and measured, those fish larger than 10 inches shall also be weighed and checked for parasite markings and disease.

#### 4.0 ENVIRONMENTAL SURVEILLANCE AND SPECIAL STUDIES

- e. Scale samples shall be taken for age and growth analysis for selected species.
- f. Stomach samples shall be taken from selected species for food habit determination.

Bases: The general ecological survey of the aquatic environment in the vicinity of the Kewaunee Plant will provide the necessary information to compare three years of pre-operational study with data taken during the two years of operational study.

Bottom contours of the discharge area will help to analyze the effect that the circulating water velocity has upon the bottom.

Past experience with continuous recording current meters has indicated poor reliability of these meters in the field; however, use of a combination of both continuous recording meters and drogues will aid in evaluating thermal plume patterns.

By using a benthic pump and a diver to collect benthos samples, a very reliable sample is obtainable which will allow better determination of the thermal influence of the plume upon benthic organisms.

The setting of gill nets with one 300 foot panel of 2½ inch stretched mesh, one 300 foot panel of 3½ inch stretched mesh, one 300 foot panel of 5½ inch stretched mesh and one 50 foot panel of 1½ inch stretched mesh for a twelve hour period will allow a representative sampling of fish, which will aid in the determination of fish density before and after plant operation.

Water Column Profile data will be examined to determine the degree of similarity in the water masses which make up the study area. Seasonal differences will be noted.

Water quality data will be determined and compared to state and federal standards and data collected from other areas of the lake.

Bacteriological data, along with BOD results, will aid to determine the presence of domestic and/or agriculture wastes near the site.

Phytoplankton data will assist in determining the water quality and nutrient levels to support algae growth near the site. Abundance of specific species will present a basis for comparing the study area to other regions where similar surveys are being conducted.