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APPENDIX B TO FACILITY OPERATING LICENSE
INDIAN POINT UNIT 2 - ENVIRONMENTAL TECHNICAL
SPECIFICATION REQUIREMENTS FOR ONCE-THROUGH
COOLING - AMENDMENT #35 to DPR-26
dated November 16, 1977

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APPENDIX B

TO

FACILITY OPERATING LICENSE

FOR

CONSOLIDATED EDISON COMPANY
OF NEW YORK, INC.

INDIAN POINT NUCLEAR GENERATING
UNITS NUMBERS 1, 2 AND 3

DOCKET NUMBERS 50-3, 50-247, AND 50-286

ENVIRONMENTAL TECHNICAL SPECIFICATION
REQUIREMENTS

FOR ONCE-THROUGH COOLING

DEC 12 1975

Indian Point 1 - Amendment No. 17
Indian Point 2 - Amendment No. 35

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1.0 DEFINITIONS

The following terms are defined for uniform interpretation of the Environmental Technical Specifications for Indian Point Units Nos. 1, 2 and 3.

1.1 Limiting Conditions for Operation (LCO) - are quantitative limits on plant parameter operations and discharges which are controlled to assure they will not result in unacceptable environmental impacts.

1.2 Nonroutine Reportable Environmental Occurrence

Nonroutine reportable environmental occurrence is the occurrence of any plant condition that in accordance with Section 5.6.2, Nonroutine Reports.

1.2.1 Results in noncompliance with, and is in violation of, an environmental technical specification, or

1.2.2 Causes any uncontrolled or unplanned releases of chemical, radioactive, and thermal or other discharges from the site in excess of applicable Federal and State regulations.

1.3 Emergency Conditions

1.3.1 National Power Emergency - is any event causing authorized Federal officials to require the licensee to supply power within or without its distribution area.

1.3.2 Regional Emergency - is any of the following occurrences within the State of New York:

1.3.2.1 A catastrophic natural disaster such as flood, tornado, hurricane, etc.

1.3.2.2 Other emergencies declared by municipal, county, State or Federal officials requiring an uninterrupted source of power.

1.3.3 Reactor Emergency - shall mean an unanticipated equipment malfunction or other event necessitating prompt remedial action to avoid endangering the public health and welfare.

1.3.4 An Emergency Need for Power - shall mean a condition which results in a projected voltage reduction in the licensee's service system unless additional power can be obtained.

1.4 Temperature Considerations

1.4.1 Circulating Water System (CWS) - includes the intake openings and structure for all Units, the condenser cooling water systems, the discharge canal, and the discharge ports and structure.

1.4.2 Intake Water Temperature - refers to the individual water temperatures measured in the intake structure forebays in the inlet to the circulating water system for each Unit.

1.4.3 Discharge Canal Water Temperature - refers to the water temperature measured in the discharge canal, at or near the confluence of the discharge canal with the Hudson River.

1.4.4 ΔT_c Across Circulating Water System (CWS) - refers to the temperature difference between the average intake water temperature and the measured discharge canal water temperature.

1.4.5 Ambient River Water Temperature - refers to the Hudson River water temperature before the addition of heat of artificial origin.

1.4.6 Site River Water Temperature - refers to the Hudson River water temperature in the vicinity of the Indian Point site without the addition of thermal discharges from the Indian Point site.

1.4.7 Thermal Discharge - is one which results from the addition of heat to the receiving body of water from other than natural sources of heat.

1.4.8 Mixing Zone - refers to the volume of water heated by thermal discharges from the Indian Point Station mixed with the ambient river water volume to reduce temperatures to the limits established in Sections 2.1 and 4.1.1a.

1.4.9 Deicing - refers to recirculating a portion of the condenser discharge water back to the intake structure through the deicing loop to melt surface and frazil ice.

1.5 Velocity

1.5.1 Intake Velocity - is the water velocity expressed in feet per second (fps) of cooling water withdrawn through the intake opening structure which includes the outer fixed (meshed) screens located at the forebay opening for Units Nos. 1 and 2, trash racks, traveling screens (outermost screens for Unit No. 3), and stop log guides. The intake velocity through the screens is not measured directly but its value over the surface area of the screens is calculated by knowing the volumetric flow rate, i.e.,

$$V_i = \frac{Q_c}{A_s \times R_f} \qquad (1\text{-}1)$$

where: V_i = calculated intake velocity (fps) at outer fixed screens at Units Nos. 1 and 2 or the outer traveling screens at Unit No. 3.

Q_c = volumetric flow rate (cfs) obtained by the rated capacity of the circulating water pumps.

A_s = projected area (ft^2) of the opening of the frame of outer fixed screens at Units Nos. 1 and 2 or the area of the outer traveling screens at Unit No. 3 through which the cooling water flows.

R_f = fraction of projected area available for volumetric flow taking into account the size of the mesh screen and diameter of the screen wire, e.g., 0.080 in. diameter wire in 3/8 in. square mesh screen.

The intake velocity is constant with constant volumetric flow of the circulating pumps and constant projected area through which the water flows.

1.5.2 Approach Velocity - is the water velocity at a distance of 24 $\pm$ 2 inches away from the outer fixed screens at Units Nos. 1 and 2 and outer traveling screens at Unit No. 3 (which are located at the bay openings). The area average value of the approach velocity is estimated by knowing the volumetric flow rate, i.e.:

$$V_a = \frac{Q_c}{A_f} \qquad (1\text{-}2)$$

where:

V_a = area average approach velocity (fps)

Q_c = volumetric flow rate (cfs)

A_f = average area (ft^2) of cross section 24 $\pm$ 2 in. from intake forebay opening to river

1.5.3 Discharge Velocity - is the average velocity at the vena contracta of the water jets issuing from the discharge ports. The discharge velocity is not measured directly, but is calculated by measuring the difference in water level across the discharge structure.

$$V_{vc} = C \sqrt{2g\ h} \qquad (1\text{-}3)$$

where: V_{vc} = velocity (fps) at vena contracta

g = acceleration of gravity (ft/sec^2)

h = height (ft) of water in discharge canal above river level

C = velocity discharge coefficient (about 0.95) (Ref. 1.1-1)

1.6 Chlorine

1.6.1 Free Available Chlorine (Free Chlorine) - is that part of the chlorine injected into the condenser cooling water that remains as molecular chlorine, hypochlorous acid (HOCl), and hypochlorite ion or a combination thereof. (Ref. 1.1-2, 1.1-3).

1.6.2 Combined Available Chlorine (or Combined Chlorine) - is that part of the chlorine injected into the water that remains combined with ammonia or other nitrogeneous compounds. (Ref. 1.1-2, 1.1-3).

1.6.3 Residual Chlorine - is the amount of available chlorine present in water at any specified time subsequent to the addition of chlorine. (Ref. 1.1-2, 1.1-3).

1.6.4 Total Residual Chlorine - consists of the total amount of residual chlorine (the total free available and/or combined available chlorine) that remains, without regard to type. (Ref. 1.1-2, 1.1-3).

1.6.5 Chlorine Demand - is the difference between the dose and the residual chlorine after a particular period of contact, for one particular dose rate. The contact period is reported with the demand value (Ref. 1.1-3).

1.7 Fishery - shall include the yield of fish as well as the propagation of fish and other aquatic life.

1.8 Hudson River Estuary - is the tidal portion of the Hudson River from the Battery up to Troy Dam.

1.9 Entrainment - is the forced association with and exposure of nonmotile organisms to cooling water.

1.9.1 Pumped Entrainment - is the passage of organisms with the cooling water through the CWS.

1.9.2 Plume Entrainment - is the mixing of organisms present in the receiving water with those in the heated water from the discharge canal during dispersion of the heated water into the receiving water.

1.10 Impingement - is the contact and/or retention of organisms in the screening structures of the CWS (screening structure to include all types of mesh screens, trash racks and structural configurations which can impinge organisms).

1.11 Cold Shock - is exposure of organisms to rapid decrease in temperature or to temperatures below their lower critical temperature.

1.12 Heat Shock - is the exposure of organisms to rapid increase in temperature or to temperatures in excess of their upper critical temperatures for various periods of time which can result in lethal or sublethal effects on aquatic biota.

1.13 Zones of Passage - in river and estuary systems, is the continuous water routes including volume, area and quality necessary to allow passage of free swimming and drifting organisms with no significant effects produced on their populations.

1.14 Normal Plant Operation - with regard to environmental considerations, is the operation up to 3025 megawatts thermal (MWt) of Unit No. 3, 2758 MWt of Unit No. 2, and 615 MWt nuclear or 890 MWt fossil-nuclear of Unit No. 1 with the pumps at full flow such as to not exceed a maximum ΔT_c of 17F° across the CWS.

1.15 Reduced Flow Operation - is the operation of the CWS such that the amount of circulating water passing through the intake screens and the condensers, and discharged from the discharge canal is approximately 60% of the flow during the normal plant operation with all circulating water pumps in operation such as to not exceed a maximum ΔT_c of 28F° across the CWS for the same heat load as during normal plant operation.

1.16 Maximum Permissible Concentration (MPC) - is that concentration of a radionuclide according to 10 CFR Part 20, Appendix B, Table II in air (MPC_a) or water (MPC_w).

1.17 Standard Methods - refers to those methods as specified in 40 CFR Part 136.

1.18 The design of the shared liquid radioactive waste treatment system at the Indian Point Units Nos. 1, 2 and 3 precludes monitoring the actual release rates per reactor as specified in Specifications 2.4 b, 2.4.1.b, 2.4.1.c, 2.4.1.f and 2.4.1.h. The release rate per site shall be equal to the release rate per reactor times the number of reactors producing radioactive effluents at the site irrespective of the actual release rate from each reactor through the shared liquid radioactive waste treatment system.

References

1.1-1 Consolidated Edison Company of New York, Inc., "Indian Point Model No. 2 Cooling Studies," Alden Research Laboratories, May 1969. Appendix O, Supplement No. 1 to the Environmental Report for Indian Point Unit No. 2, Docket No. 50-247, September 9, 1971.

1.1-2 American Society for Testing and Materials "Annual Book of ASTM Standards, Part 23, Water: Atmospheric Analysis, D 1253-68".

1.1-3 U. S. Atomic Energy Commission, Final Environmental Statement, related to the operation of Indian Point Unit No. 2, Docket No. 50-247, September 1972, p. A-V-22.

2.0 LIMITING CONDITIONS FOR OPERATION

General: During a national power emergency, regional emergency, reactor emergency or an emergency need for power the limiting conditions for operation (LCO) provided in these Environmental Technical Specifications shall be inapplicable. During such emergencies, however, the LCO shall not be exceeded except as is necessitated by the emergency.

Applicability

Applies to the controlled release of thermal discharges, total residual chlorine and other chemical discharges, radioactive liquid, gaseous waste effluents and solid waste from the Indian Point Station.

Objective

To define the conditions for controlled release of nonradioactive and radioactive liquids and nonradioactive solids to the Hudson River and nonradioactive and radioactive gases to the atmosphere in order to assure compliance with applicable Federal and State regulations and to limit the stress to the aquatic ecosystem that might be caused by the discharge of excess concentrations or heat.

2.1 THERMAL

Applicability

Applies to the discharge of the heated water from the discharge structure.

3.0 MONITORING REQUIREMENTS

Applicability

Applies to routine sampling and analysis of the Station effluents and to an analytical evaluation of the data collected from the environmental monitoring survey.

Objective

To establish a sampling and analysis program which will assure that all effluents are kept within applicable Federal and State regulations.

3.1 THERMAL

Applicability

Applies to temperature measurements made in the intake forebays, and inside the discharge canal, and in a location outside the influence of the thermal discharge from Indian Point.

2.0 LIMITING CONDITIONS FOR OPERATION

Objective

To define the conditions for discharge of the heated water to assure compliance with applicable Federal and State regulations and to limit stresses to the aquatic ecosystem.

2.1.1 Maximum ΔT_c Across Circulating Water System (CWS)

Objective

To limit the maximum temperature rise across the CWS during full and reduced flow at all power levels.

Specification

2.1.1.1 The maximum temperature rise across the CWS shall not exceed the following temperature differentials, subject to the conditions of Section 2.1.2:

(a) 17F° when the CWS is operating at full flow and normal operation, or

(b) 28F° when the CWS is operating at reduced flow, or

3.0 MONITORING REQUIREMENTS

Objective

A. To establish that thermal releases will conform with applicable Federal and State regulations.

B. To assure that thermal protection conditions, including the temperature difference across the circulating water system, discharge temperature, and rate of temperature change, are maintained within the Environmental Technical Specifications.

3.1.1 Maximum ΔT_c Across Circulating Water System (CWS)

Objective

To monitor the intake and discharge temperatures at all power levels to assure that the allowable ΔT_c across the CWS is not exceeded.

Specification

3.1.1.1 The individual intake water temperatures along with the discharge canal water temperature shall both be continuously monitored and recorded. The intake water temperature shall be measured at a depth representative of the average intake temperature in a forebay of an intake for each Unit. The average temperature of the individual intake temperatures shall be calculated.

2.1.1.1 Specification (Cont'd)

(c) 31F° when the CWS is operating at reduced flow and one or more of the circulating water pumps is down for maintenance or pump outage, or

(d) 31F° when the CWS is operating at reduced flow and 10% of the normal condenser discharge is recirculated to the inlet for deicing purposes, or

(e) 38F° when the CWS is operating at reduced flow and 20% of the normal condenser discharge is recirculated to the inlet for deicing purposes.

(f) Item (a) above becomes 19F° when heater or preheater drains empty directly into condenser or during periods of high air inleakage into condenser.

(g) The limits specified in this Section may be exceeded if one or more of the circulating water pumps are down for maintenance or pump outage.

2.1.1.2 Whenever the temperature increment (ΔT_c) is above the specified limits in Section 2.1.1.1 for more than 6 hours, an investigation shall be undertaken to determine the cause for the temperature increase and corrective action shall be taken to reduce the ΔT_c to within the specified limits within 24 hours. These occurrences with corrective action shall be recorded and reported in accordance with Section 5.6.2.1.b.

3.1.1.2 The discharge canal water temperature shall be obtained by means of a probe located in the discharge canal before the confluence with the river, at a depth of 5.5 feet below mean low water (see Figure 2.1-1 for location of probes).

3.1.1.3 Methods of measurement shall include temperature sensors (RTDs) with an accuracy of $\pm$0.5°F and a sensitivity of 0.1°F. Temperature data from permanent RTDs shall be readout on a recorder in the control room. A three way switch shall be used to select the individual intake temperatures for recording purposes. The difference in output of the sensor at the discharge canal from the average of the individual intake temperatures, i.e., the ΔT_c across the CWS, shall be recorded on a daily basis and reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report. A strip chart record shall be kept for examination and the daily minimum, maximum and average values of the ΔT_c shall be reported.

3.1.1.4 Continuous temperature monitoring is required following changes in power level, during reduced flow and deicing operations until the ΔT_c across the CWS is stable within 5% of the expected value. Monitoring during all flow conditions shall be carried out by continuously measuring and recording information as to the heat load, the intake and discharge canal water temperatures, and the maximum ΔT_c across the CWS. The maximum surface temperature in the thermal plume and the extent of 4F° isotherm shall be monitored as described in Section 4.1.1.a to show compliance with the State thermal

Specifications (Cont'd)

2.1.1.3 The temperature rise across the CSW under all conditions shall be limited such that the thermal discharges comply with the NEW York State thermal criteria as presently in Section 4.1.1.a at all times.

Bases

The rise of intake water temperature across the condenser is a fixed value based upon initial condenser design, condenser cleanliness,

3.1.1.4 Specification (Cont'd)

criteria at all times. The flow rate through the CWS shall be logged each day and any changes recorded at the time of the change. The operating conditions measurements, flow rates, and results are to be reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

3.1.1.5 The continuous temperature recorder shall not be inoperative for a period exceeding 14 days. As an alternative during the monitoring or recording system downtime for calibration or repairs, manual temperature readings in the intake structure and in the discharge canal in the location 2 in Figure 2.1-1 shall be obtained and recorded once during each shift.

Temporary malfunction of temperature monitoring systems shall not be restrictive on plant operations, providing manual temperature measurements are taken.

3.1.1.6 There shall be an annual channel calibration of the sensor systems and a monthly channel functional test of the sensor systems.

3.1.1.7 Deviations from this monitoring program shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

Temperature monitoring sensors (RTDs) in the forebay of the intake and inside the discharge canal at the confluence with the Hudson River

Bases (Cont'd)

circulating water pump operation, and the plant's power level. During normal power operation, the ΔT_c across the CWS will be 15.3F° without the effects of recirculation of the thermal discharge to the intake and deicing operation. Recirculation will increase the temperature differential to 16.5F°. Operation of Unit No. 3 alone will increase the temperature rise across the CWS to 17F°.

During normal operation, a total condenser water flow of 840,000 gpm per Unit is obtained from the six circulating water pumps at either Unit No. 2 or Unit No. 3, and a total condenser water flow of 280,000 gpm is obtained at Unit No. 1 from its two circulating water pumps. Each circulating water pump has a capacity of 140,000 gpm. In addition to the above, Unit No. 1 has six service water pumps (two with capacities of 16,000 gpm each, and four with capacities of 1,500 gpm each) with a total flow of 38,000 gpm. Units Nos. 2 and 3 each have six service water pumps with a capacity of 5,000 gpm per pump, for a total flow of 30,000 gpm per Unit. The increase in temperature of the circulating water across each of the three condensers for Unit No. 2 or Unit No. 3, and one condenser for Unit No. 1 will be dependent on the pumping capacity of each of the circulating water pumps, the cleanliness of the condensers and the load carried. During normal operation the temperature differential across the CWS will be a maximum of 16.5F° with the full pumping capacity for all Units. In accordance with Specification 2.2.1.2, when

Bases (Cont'd)

will continuously monitor temperatures which will be recorded in the control room, and will provide a reliable method for determination of the temperature differential across the CWS.

Knowledge of the temperature rise across the CWS determines the rate at which the plants reject heat to the river. Temperature measurements and rate of changes in temperature are necessary to determine the range and relative fluctuations in temperatures of the thermal plume experienced by aquatic life in the intake and discharge areas. The heat rejection rate, as discussed in Section 2.1.3, along with the discharge canal temperature (see Section 2.1.2) at the confluence of the discharge canal with the river, is an important factor affecting the response of the river to the thermal discharge; that is, the maximum river surface temperature and the extent and intensity of the thermal plume. See Section 4.1.1.a for further details regarding the monitoring of the thermal plume.

Bases (Cont'd)

the intake water temperature is less than 40°F, the flow will be reduced from 100% flow to 60% flow for Units Nos. 1 and 2, thereby resulting in an increase in the temperature differential across the CWS. This flow reduction was required by the New York State Department of Environmental Conservation in an agreement made with Consolidated Edison on April 28, 1972, to rescind an Order by the State on February 29, 1972, to shut down the circulating water pumps after a fish kill occurred at the intake structure during testing of the pumps for Unit No. 2. The purpose of flow reduction is to reduce the volume of river water used and the intake velocity through the outer fixed screens to reduce fish impingement during wintertime. Flow at Unit No. 3 will also be reduced to minimize impingement effects when the intake river water temperature is less than 40°F as required in Specification 2.2.1.2. Flow may also be reduced when the intake water temperatures are greater than 40°F, provided the temperature conditions of the New York State thermal criteria as presented in Section 4.1.1.a are maintained.

Since the temperature differential increases with reduced flow, maintenance requiring pump shutdown should be avoided during the summertime (when the ambient water temperature can reach 79°F) in order to avoid excessive thermal stresses on aquatic biota.

During the winter, warmed water from the discharge canal can be recirculated to the intake forebay of Unit No. 3 for deicing purposes to melt

Bases (Cont'd)

During reduced flow when the intake water temperature is greater than 40°F, an increased temperature differential across the CWS will result in increasing the surface temperature of thermal discharges. Besides the thermal effects on biota as they pass through the condensers, organisms which are in the river water will also be exposed to the thermal plume, and during reduced pump capacities at the same heat load, they will be exposed to higher temperatures than otherwise. During periods when the ambient river water temperatures reaches about 79°F, many organisms will be living near their upper critical temperatures and probably above their thermal range of metabolic insensitivity. Thus to avoid changes in species composition or the biotic community, operation during reduced pump capacities, when the ΔT_c can be 28F°, will be limited by the maximum discharge canal water temperature of 98°F. Therefore operation with reduced flow is limited.

Bases (Cont'd)

surface and frazil ice by means of two 80,000 gpm pumps located adjacent to the discharge canal. A similar arrangement is provided for Unit No. 2. Deicing on Unit No. 1 is attained by means of direct recirculation of a portion of the heated water from the outlet water box of the Unit No. 1 condenser. Primary use of the deicing operation occurs in December, January and February with intermittent operation from November through April.

2.1.2 Maximum Discharge Temperature

Objective

To limit the maximum temperature of the CWS cooling water disharge through the discharge structure at the confluence with the river during normal operation and reduced flow in accordance with applicable Federal and State regulation.

Specification

2.1.2.1 During June through September, the discharge canal water shall not exceed 98°F during normal plant operation or reduced flow operation of all three Units, with all circulating and service water pumps at the appropriate flow rate for that type of operation. The maximum discharge temperature during full and reduced flow shall be limited such that the thermal discharges shall be maintained in accordance with the New York State thermal criteria.

Bases (Cont'd)

All temperature measurements shall be reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report, including operating conditions and temperature measurements during reduced flow.

3.1.2 Maximum Discharge Temperature

Objective

To monitor the circulating water discharge temperature to assure that the allowable discharge temperature is not exceeded.

Specification

3.1.2.1 A mid-depth temperature sensor as described in Specification 3.1.1.2 shall continuously measure and record the temperatures in the discharge canal.

Specification (Cont'd)

2.1.2.2 If this temperature is exceeded for two (2) hours, corrective action shall be taken to restore compliance with specifications unless there exists an emergency need for power.

2.1.2.3 When the discharge canal head differential is less than 1.5 feet for more than two (2) hours, the maximum temperature in the discharge canal shall not exceed 90°F. See Specification 2.2.2.2.

2.1.2.4 Deviation from the specifications for more than 24 hours shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

The analysis is based on the assumption that the maximum ambient temperature is 79°F and the maximum effect of recirculation on the intake temperature, from the tidal influence of the estuary, is a temperature differential

Specification (Cont'd)

3.1.2.2 Temperatures in the discharge canal will be transmitted to the same control room as that of the intake and daily maximum, minimum and average temperatures reported in accordance with Section 5.6.1.1 Annual Environmental Operating Report.

3.1.2.3 The temperature measurements shall be visually displayed for monitoring purposes and recorded. Based on results in Section 4.1.1.a for the monitoring of the thermal plume, a correlation between the maximum temperature in the discharge canal and the maximum surface temperature of the thermal plume shall be developed for specific hydraulic conditions and plant operating conditions and reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

3.1.2.4 When the above monitoring system is not operative, an alternative backup system as presented in Section 3.1.1.5 shall be used.

3.1.2.5 Deviations from the monitoring program shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

The placement of the temperature monitoring instrument in the discharge canal will give the temperature of the discharge water immediately before mixing with the receiving

Bases (Cont'd)

of less than 1.2F°. An upper limit of 98°F of the discharge water at the discharge port is thereby being set.

The thermal discharges shall also be maintained at all times to adequately protect aquatic biota against exposure to excess temperatures and to comply with the New York State thermal criteria presented in Section 4.1.1.a.

2.1.3 Maximum Heat Rejection Rate (Btu/hr)

Objective

To limit the maximum heat discharged with the heated coolant water into the Hudson River.

Specification

2.1.3.1 The maximum heat rejected into the river with the discharged heated coolant water shall not exceed the sum of 16.3×10^9 Btu/hr.

The heat rejection rates for the plants in operation shall be calculated in the equation

$$H = \rho\ Q_c\ C_p\ \Delta T_c \qquad (2\text{-}1)$$

where:

H = heat rejection rate for the plants in operation in Btu/hr

Bases (Cont'd)

water. The placement of this temperature sensor at a 5.5 foot depth in the discharge canal will provide for temperature measurements representative of the discharge water before mixing with the receiving water.

3.1.3 Maximum Heat Rejection Rate (Btu/hr)

Objective

To calculate the maximum heat rejection rate.

Specification

3.1.3.1 Monitoring and recording requirements include those for the monitoring of the ΔT_c across the CWS and the flow Q_c through the CWS specified in Section 3.1.1.4. Except during thermal plume measurements, the heat output in Btu/hr for all Units in operation shall be averaged daily and reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report. During plume measurements, the maximum, minimum and average heat output shall be determined and reported on a daily basis in accordance with Section 5.6.1.2, Special Environmental Operating Reports.

2.1.3.1 Specification (Cont'd)

Q_c = CWS flow in cu. ft/hr obtained by the rated capacity of the circulating water pumps as described in Section 2.1.1.

ΔT_c = temperature differential (F°) across the CWS as discussed in Section 2.1.1.

ρ = water density, lbs/cu. ft

C_p = specific heat of the water, Btu/lb/F°

All thermal discharges shall occur through the subsurface ports of the outfall structure.

Bases

The maximum heat rejected is a fixed value based on the reactor core design, the primary and secondary coolant heat transfer system, and the spent steam temperature and volume as the steam reaches the condenser tubes. The maximum heat output for each plant is as follows: Unit No. 1, 2.0×10^9 Btu/hr; Unit No. 2, 6.5×10^9 Btu/hr; and Unit No. 3, 7.1×10^9 Btu/hr. Deviations of approximately 5% from these numbers can be expected due to occasional high turbine back pressure. With fluctuations in power output of the plants, the heat rejected to the river will fluctuate. By measuring the ΔT_c across the CWS and the flow rates of the circulating water pumps, the heat rejected to the river may be determined.

Specification (Cont'd)

3.1.3.3 Deviations from this monitoring program shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

Calculation of the heat rejection rate to the river will be made for use in evaluating the temperature of the thermal plume (Section 4.1.1.a)

2.1.4 Rate of Temperature Change of Circulating Water System (CWS)

Objective

To limit the rate of temperature change of the circulating cooling water during normal plant operation at full flow or reduced flow by limiting the temperature change of the primary operating cycle.

Specification

2.1.4.1 The rate of temperature change in the discharge canal water during normal plant operation shall not exceed 15F° per hour during normal power increase, and 7F° per hour during normal power reductions.

2.1.4.2 If these rates are exceeded, plant operations shall be modified to restore compliance with the specifications and to avoid heat or cold shock to aquatic life.

3.1.4 Rate of Temperature Change of Circulating Water System (CWS)

Objective

To control the rate of temperature change of the condenser cooling discharge water by regulating the rate of load change thereby assurring that the allowable rates of change are not exceeded for protection of biota.

Specification

3.1.4.1 Intake and discharge canal water temperatures shall be monitored continuously under Section 3.1.1. The ΔT_c described in Section 3.1.1 shall be differentiated to provide the rate of change of temperature. This information shall be recorded during all flow conditions. The time of the day and dates when the temperature changes are greater than the limits specified in Section 2.1.4 shall be recorded and reported in accordance with Section 5.6.2.1.a

3.1.4.2 Observations shall be made to determine whether fish are undergoing thermal stresses from rate of temperature change and the results promptly reported in accordance with Section 5.6.2.1.a.

Specification (Cont'd)

2.1.4.3 This limitation may be exceeded for brief periods as necessary to maintain protection of critical plant equipment and systems and for certain safeguard operations which cannot be limited or regulated by plant operation. These safeguard operations include automatic plant trips and manual plant trips initiated by licensed personnel in emergencies or other situations requiring such actions in compliance with safety related technical specifications.

2.1.4.4 Deviations from the specifications shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

The limiting condition is established to minimize shock to aquatic species of this region. An increase of 15F° per hour of the discharge canal temperature should not cause detrimental effects to fish since they are motile and capable of leaving the area. A decrease of 7F° per hour should aid in avoiding potential detrimental effects to fish as the discharge velocity will provide rapid mixing with the surrounding river water. The discharge velocity (10 fps) will discourage most fish from spending time in the region of maximum temperature.

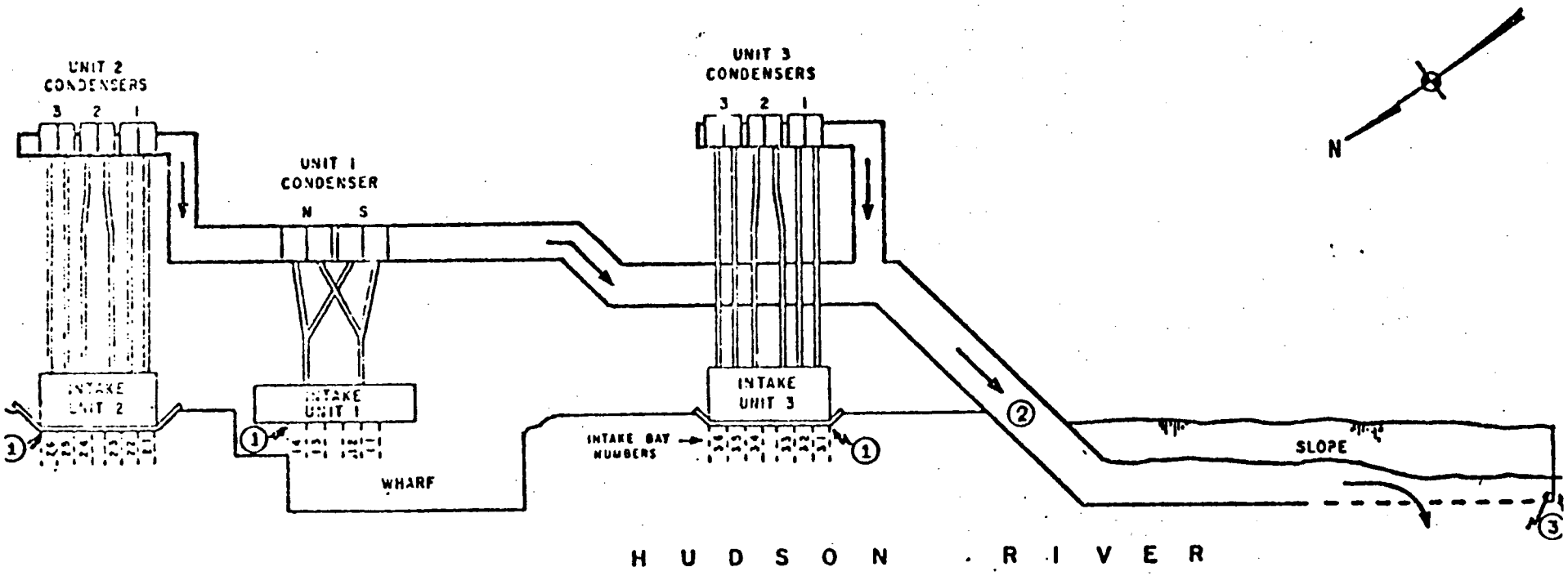
Bases

Monitoring of the temperature change across the condensers will ensure representative temperature measurements before dilution of the circulating water with ambient river water. A linear correlation of the rate of temperature change in the discharge canal and the mixing zone boundary is assumed. Any lethal and sublethal effects on fish from sudden temperature changes shall be observed and promptly reported in accordance with Section 5.6.2.1.a.

Figure 2.1-1 DISCHARGE CANAL THREE UNIT OPERATION

CIRCULATING WATER SYSTEM

SCHEMATIC



INTAKE WATER TEMPERATURE MONITORING - 1
DISCHARGE WATER TEMPERATURE MONITORING - 2
DISCHARGE CANAL DIFFERENTIAL LEVEL MONITORING - 3

2.2 HYDRAULICS OF CIRCULATING WATER SYSTEM (CWS)

Applicability

Applies to the mode of operation of the circulating water system (CWS).

Objective

To define the limiting conditions for operation of the CWS.

2.2.1 Approach and Intake Velocities

Objective

To limit the approach and intake velocity of the condenser cooling water so as to limit the impingement of organisms on the screens and racks of the intake structure.

Specification

2.2.1.1 The withdrawal of cooling water from the Hudson River shall be maintained so that the maximum value of area average approach velocity taken 24 ± 2 inches in front of the intake structure shall not exceed one foot per second (1 fps) and the maximum value of intake velocity through the outermost screens of any Unit shall not exceed 2.25 fps. This specification shall not apply to Unit 1 during the submerged Weir Feasibility Study.

3.2 HYDRAULICS OF CIRCULATING WATER SYSTEM (CWS)

Applicability

Applies to the recording and measurement of the operating characteristics of the intake and discharge system.

Objective

To monitor and record the limiting conditions for operation of the CWS.

3.2.1 Approach and Intake Velocities

Objective

To monitor and record the approach and intake velocities through the intake system.

Specification

3.2.1.1 The approach and the intake velocities shall be calculated for the intake system according To Equations 1-1 and 1-2 in Section 1.5. This specification shall not apply to Unit 1 during the submerged Weir Feasibility Study.

Specification (Cont'd)

2.2.1.2 When the average intake water temperature is less than 40°F, the area average approach and the intake velocity shall be reduced to approximately 60% of the maximum full flow conditions as per New York State Department of Environmental Conservation requirements. The adjustment in the two types of velocities shall be made within one week after the average intake water temperature reaches 40°F.

2.2.1.3 Deviations from these specifications shall be reported in accordance with Section 5.6.2.1.b.

Bases

The withdrawal of cooling water from the Hudson River through the outer protective screens will cause damage to aquatic biota by impingement on these screens. Excessive fish collections have been experienced at the Indian Point Unit No. 1 intake screens and at Unit No. 2 during testing of the circulating water pumps. Information indicated that by maintaining the approach

Specification (Cont'd)

3.2.1.2 The calculated values shall be confirmed by intake flow measurements in Section 4.1.2a(5). Any changes in the flow rate of circulating water pumps and the CWS shall be recorded, including the date and time of day. Prior to making changes in the flow rate, the individual intake river water temperatures for the appropriate Unit shall also be measured and recorded. These temperatures and adjustments in the flow rate shall be described and reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

Bases

At present the approach and intake velocities through the outermost screens are being calculated and recorded depending on the flow rate through each intake system. When the outer fixed screens on Units Nos. 1 or 2 are pulled up one or more times a day for washing off impinged fish or debris, the traveling screens

Bases (Cont'd)

velocity at one (1) foot per second (fps) and intake velocity to 2.25 fps or less this problem should be reduced.

By design, the velocity approaching the outer screens of the intake structure is less than 1 fps. When the average intake temperatures are less than 40°F, flow reduction will be accomplished as per New York State Department of Environmental Conservation requirements. The method for reducing flow depends on the Unit. A week is required to convert the outlet of the condensers so as to result in 60% flow of the cooling water. These loops permit approximately 40% of the pump flow to be returned back to the intake bay. Thus, the approach velocity of the river water transversing the outermost screens will be reduced to approximately 0.5 fps.

Bases (Cont'd)

collect what is transported past the trash racks to the screens by the water flow of the circulating water pumps. Unit No. 3 has traveling screens flush with the river. Occurrences of the screen washings and the number of fish collected are recorded and the fish count, type and size, are reported on a monthly basis to the Region I Office of Inspection and Enforcement (cc to Office of Nuclear Reactor Regulation) in accordance with Section 4.1.2a(3) and Section 5.6.1.2, Special Reports.

By monitoring and reporting the velocities through the intake system, a correlation with any fish impingement can be attempted. A better understanding of the problems of fish impingement will be obtained by calculating and measuring the dynamic characteristics of the intake system. However, any approach or intake velocities that caused or contributed to a significant impingement problem would be environmentally unacceptable.

2.2.2 Discharge Velocity

Objective

To limit the minimum discharge velocity of the cooling water through the discharge structure so that effective dilution with the receiving water of the Hudson River will be achieved.

Specification

2.2.2.1 The discharge velocity, as defined in Section 1.5.3, shall be measured from the head differential across the discharge structure (see Fig. 2.1-1). Unless a lower head differential is permissible in accordance with the following paragraph, the minimum head differential across the outfall structure shall be maintained at 1.5 feet to 1.7 feet to assure a minimum discharge velocity, as defined in Equation 1-3 in Section 1.5.3, of 10 fps. The adjustable ports in the outfall structure shall be adjusted such that the discharge velocity, during operation, is maintained at a minimum of 10 fps in accordance with the analysis of thermal discharge models (mathematical and hydraulic). Adjustment in the ports shall be made mechanically within four (4) hours of any change in the flow rate of the circulating water pumps.

3.2.2 Discharge Velocity

Objective

To monitor and measure so that a minimum discharge velocity of 10 fps shall be maintained as required through each port in the discharge structure.

Specification

3.2.2.1 The water level differential of the water in the discharge canal as against that in the Hudson River shall be measured and logged over the tidal cycle on a daily basis in order to provide information required to calculate the actual discharge velocity.

Specification (Cont'd)

2.2.2.2 At or below 50% of the sum of the rated power levels of the three Units, a discharge velocity through the discharge ports shall be maintained such that the thermal discharges shall satisfy the New York State thermal criteria. When the discharge canal head differential is less than 1.5 feet, the temperature in the discharge canal shall not exceed 90°F.

2.2.2.3 If the head differential is not maintained at the required level beyond 24 hours, such deviation shall be promptly reported in accordance with Section 5.6.2.1.a.

Specification (Cont'd)

3.2.2.2 The relationship between discharge velocity, open port area, and canal head above river level shall be confirmed by actual measurement and reported in accordance with Section 5.6.1.1.

3.2.2.3 The relationship between power level, heat rejection rate, plant flow rate, discharge velocity, and characteristics of the thermal discharge, including dilution of the discharge jet with the receiving river water, shall be investigated to determine the optimum operating mode of the CWS for specific plant operating conditions. Results of all adjustments to the gates of each of the port holes of the discharge structure and optimum mode of operation of the CWS through the intake-discharge structure, including the above mentioned relationship shall be recorded and reported in accordance with Section 5.6.1.1. Results of the discharge velocity measurements shall also be recorded and reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

3.2.2.4 Deviations from these specifications beyond 24 hours shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

The capability of a jet discharge to mix with the ambient receiving water is a strong function of the jet discharge velocity. The analysis of the thermal hydrological models has been performed based on the commitment that a minimum discharge velocity of 10 fps shall be maintained.

The modified multiport discharge structure uses adjustable gates that will provide a discharge velocity of 10 fps under various flow rates. Such operation shall be conducted to give assurance that, at all power levels, the applicable New York State thermal criteria shall be met. The discharge velocity is obtained through the use of Equation 1-3 in Section 1.5.3. For a discharge velocity at the vena contracta of a minimum of 10 fps, the difference in height across the discharge structure will be maintained at 1.5 to 1.7 feet.

Each gate can now be adjusted mechanically rather than manually, thereby allowing for faster gate adjustments. When the sum of the rated power levels of the three units is at or less than 50% power, the gates can be adjusted to allow a lower discharge velocity than 10 fps, provided that the State thermal criteria can be met.

Bases

In order to assure the proper mixing of the heated coolant water with the receiving water of the Hudson River, the proper discharge velocity has to be maintained. By actual measuring and recording the flows and water level differential, the licensee will be certain that proper dispersion of the thermal plume will occur in accordance with the mathematical and hydraulic models developed for Units Nos. 1, 2, and 3. Confirmatory measurements of the discharge velocity through the individual port holes will assure that adequate mixing of the thermal discharge with the receiving river water will occur so as to protect the aquatic biota from thermal stresses.

The optimum relationship between the plant operating characteristics and the operating mode of the intake-discharge structure will be needed to assure adequate mixing of the thermal discharge with the river water.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3 CHEMICAL

Applicability

Applies to the limits of release of non-radioactive liquids, gases and solids from the site.

Objective

To limit the release of non-radioactive liquids and solids to the river and gases to the atmosphere to assure compliance with applicable Federal and State regulations and to ensure the releases are neutralized and/or treated, and controlled, prior to dilution so as not to affect adversely public health or the natural environment and to minimize degradation of the quality of the receiving medium.

Specification

All Station liquid chemical discharges shall be diluted by the circulating cooling water effluent of a minimum of 100,000 gpm during release.

3.0 MONITORING REQUIREMENTS

3.3 CHEMICAL

Applicability

Applies to monitoring the total amount, rate of release and the concentration of non-radioactive chemicals in liquid, gaseous solid waste discharges.

Objective

To monitor the amount, rate of discharge, frequency of discharge, and concentration of chemicals released from the site.

Specification

A sampling schedule shall be established which will assure that liquid and gaseous effluent releases are kept within applicable Federal and State regulations and that the natural ecosystem and public health and welfare are protected.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3.1 Chlorination of the Circulating System (CWS)

Applicability

Applies to the release of residual chlorine from Indian Point Units Nos. 1, 2 and 3.

Objective

To limit the amount and concentration of residual chlorine discharged to the Hudson River from Indian Point Units Nos. 1, 2 and 3.

Specification

2.3.1.1 Should the CWS be chlorinated, the maximum frequency of chlorination for the condensers of each Unit shall be limited to three (3) times per week. The duration of any one chlorination period shall not exceed one hour with a maximum of two (2) chlorinations per twenty-four hour period. The total time for chlorination of three Units shall not exceed nine (9) hours per week. Chlorination shall take place during daylight hours.

2.3.1.2 No discharge of total residual chlorine is allowed from the condenser cooling system at one Unit while the condenser cooling system at another Unit is being chlorinated.

3.0 MONITORING REQUIREMENTS

3.3.1 Chlorination of the Circulating Water System (CWS)

Applicability

Applies to monitoring of the amount and concentration of the total residual chlorine in the discharge water.

Objective

To monitor the amount and concentration of total residual chlorine in the discharge water and timing and duration of chlorination treatment.

Specification

3.3.1.1 During periods of chlorination, samples of circulating water shall be taken to measure total residual chlorine at both the condenser outlet water box and at the confluence of the discharge canal with the Hudson River. The samples for measurement at the condenser water box are taken 5 minutes before and 5 minutes after the start of chlorination, and at approximately 10 minute intervals while chlorination is taking place.

3.3.1.2 Samples shall be taken at once (1) meter depth and three (3) meter depth at the discharge point of confluence with the Hudson River at the frequency in Specification 3.3.1.1 to assure that representative samples of chlorinated water being discharged into the Hudson River are being collected and analyzed.

2.0 LIMITING CONDITIONS FOR OPERATION		3.0 MONITORING REQUIREMENTS	
2.3.1	Specification (Continued)	3.3.1	Specification (Continued)
2.3.1.3	Routine chlorination shall be suspended when the intake water temperature is less than 45°F.	3.3.1.3	Total residual chlorine shall be measured using a method approved by ASTM or Standard Methods. Concentrations in samples for total residual chlorine shall be measured with an accuracy of ± 0.1 ppm of the limit of 0.5 ppm and with a precision of ± 0.05 ppm.
2.3.1.4	Chlorination treatment shall be controlled such that the maximum concentrations of the total residual chlorine in the cooling water discharged at the confluence of the discharge canal with the Hudson River shall not exceed 0.5 ppm nor an average of 0.2 ppm during a maximum of 2 one-hour periods a day. All practicable measures to reduce the releases to lower concentration levels shall be taken.	3.3.1.4	Chlorine demand shall be taken at the plant intake by collecting samples within two hours prior to chlorination.
2.3.1.5	The dates, times and duration of chlorination, the amount, and concentration measured shall be logged.	3.3.1.5	During and after chlorination treatment of the condensers, the chlorine discharge shall be visually inspected for evidence of any detrimental effects on aquatic life, such as dead fish or fish in distress. Such evidence shall be noted and a record of such evidence shall be maintained with the records of the amount, time and dates of chlorination.

2.3.1 Specification (Continued)

2.3.1.6 The chlorine demand shall be determined at the rate of once per week within two hours prior to chlorination.

2.3.1.7 If levels exceeding that in Specification 2.3.1.4 are exceeded, corrective action shall consist of reducing the chlorine injection rate.

Bases

Of special concern ecologically is the potential damage to the river organisms from exposure to residual chlorine, including chloramines formed by reaction between chlorine or hypochlorite ions and nitrogeneous compounds, during and after the periodic chlorination of the circulating water system. Chlorination treatment involves the use of approximately a 15% sodium hypochlorite solution (390 lb/day average) at rate of 5 gpm for dosing at any

3.3.1 Specification (Continued)

3.3.1.6 During the first year of operation of Unit No. 3 details of the chlorine monitoring program shall be reported in the Annual Environmental Operating Report.

Bases

The samples of residual chlorine (free and combined) are taken during the chlorination treatment so as to obtain representative sampling of the chlorinated discharges. The samples will be analyzed by an appropriate method of analysis which will ensure accurate results and will allow for complete documentation of residual chlorine (free and combined) in the circulating water system and receiving waters.

2.3.1 Bases (Continued)

one time the condenser inlet water boxes. The chlorine dose is fed into one-half of each of the three condensers at Unit No. 2 (or No. 3) at the same time so as to produce a maximum chlorine concentration at the outlet box of less than 1.0 ppm of total residual chlorine. Dilution with the unchlorinated portion should reduce the maximum total residual chlorine level to less than 0.5 ppm. The magnitude of the residual chlorine concentration at the point of discharge into the river depends on the rate of decomposition and on the retention time in the discharge canal. Every precaution shall be taken not to exceed 0.5 ppm at the discharge point into the river and all practicable measures taken to reduce the level to lower concentration at the point of discharge into the river. Efforts will be made to minimize the impact of chlorine, by such means as timing of chlorination so as not to coincide with rapid shutdowns or release of nitrogeneous materials, and chlorinating during the daytime. The discharge jets (from the discharge ports) containing chlorine rise to the upper layers of the river, whereas during the day important organisms (such as zooplankton, Gammarus and Neomysis, and fish eggs and larvae) are prevalent in the lower layer.

The chlorine demand of the river is estimated to be about 1.0 ppm and chlorine breakdown by chemical reaction aids in reducing the concentration released to the Hudson River. The resulting tests carried out by the licensee on existing discharges from Unit No. 1 have shown that the chlorination program and discharge limits have not caused significant damage to the ecosystem of the Hudson River.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3.2 Corrosion Inhibitors

Objective

To limit the concentration and amount of chromate or other corrosion inhibitors discharged to the river.

Specification

2.3.2.1 The average incremental increase in the concentration of chromium (as CrO_4 and total chromium) or Drewgard 100 in the circulating cooling water resulting from equipment leakage shall not exceed 0.05 ppm, and 2.5 ppm respectively.

2.3.2.2 Annual release of chromium shall not exceed 100 lbs per year and that for Drewgard 100 shall not exceed 48,000 lbs. per year.

Bases

Leakage of corrosion inhibitors from auxiliary systems may result in release of chromate ions and total chromium or Drewgard 100 in the liquid discharges. Limiting the concentrations to small amounts will assure that aquatic biota will be protected since many species can reconcentrate chromate ions once absorbed into the body tissues.

3.0 MONITORING REQUIREMENTS

3.3.2 Corrosion Inhibitors

Objective

To monitor the concentration and amount of chromate or other chemicals used as a corrosion inhibitor.

Specification

3.3.2.1 Samples of the circulating water shall be taken at 1 meter and 3 meter depth in the discharge canal and analyzed for the hexavalent and total chromium using an ASTM or Standard Method of Analysis. Determination of Drewgard 100 in the discharge canal shall be determined by calculation of usage.

3.3.2.2 Drewgard 100 shall be segregated and treated for zinc or other heavy metal removal before discharge.

3.3.2.3 Any accidental releases from equipment malfunction shall also be noted and reported within 30 days in accordance with Section 5.6.2.1.b.

Bases

Sampling, analysis and determinations of the incremental amount of chromium and Drewgard 100 present in the discharge canal will indicate the amount and concentrations of releases to the river to assure compliance with applicable regulations. Any heavy metals present in Drewgard 100 will be required to be removed before any discharge will be permitted because of high toxicity of heavy metals to aquatic biota. Monitoring releases in the discharge canal will provide assurance of protecting the aquatic biota.

2.3.3 Other Chemicals Which Affect Water Quality

Applicability

Applies to the controlled release of process chemicals used for treating the reactor primary and secondary coolant system and for maintenance and cleaning of equipment.

Objective

A. Liquid Releases

To identify and quantify all treatment chemicals used and to limit the concentrations and amounts of chemicals released into the discharge canal prior to entry into the river at the confluence to less than the values listed in Tables 2.3-1 and 2.3-2, respectively.

To identify and limit the release of miscellaneous substances which in concentrations or combinations are toxic or which produce unreasonable physiological responses in humans, fish and other biotic life and plants; or which cause objectionable color, odor, taste or turbidity; or floating debris, oil, scum, and other matter; or materials that will settle to form objectionable deposits.

B. Gaseous Effluents

To limit the release of gaseous pollutants in accordance with air quality regulations.

3.3.3 Other Chemicals Which Affect Water Quality

Applicability

Applies to routine measurements and recording of chemical or other discharges.

Objective

To monitor all chemical discharges of liquids, gases and solids from the site.

2.3.3 Other Chemicals Which Affect Water Quality

Objective (Continued)

C. Solid Effluents

To dispose of solid wastes collected in the intake forebay in accordance with applicable regulations.

Specification

2.3.3.1 Liquid Releases

The release of the chemical discharges shall not exceed the concentration levels in the discharge canal listed in Table 2.3-1 or the amount listed in Table 2.3-2 prior to entry into the river (i.e., at the confluence).

They can be discharged in the following manner:

- released continuously
- released batchwise
- released only in the event of evaporator breakdown
- released on assumption of system leakage

The conditions under which the chemicals may be released, the maximum sustained release, and the concentration under the most adverse condition shall be maintained as listed in Table 2.3-2.

All the chemical discharges, whether released continuously or intermittently, shall not exceed the concentration levels shown in Table 2.3-1 in accordance with applicable regulations.

3.3.3 Other Chemicals Which Affect Water Quality

Specification

3.3.3.1 Liquid Releases

The monitoring of liquid effluents shall be conducted in accordance with Table 2.3-1. Sampling and analysis of all discharges shall be conducted using ASTM or other approved standard methods. Duplicate samples shall be taken at one (1) meter and three (3) meter depths at the intake and discharge canal. The source of discharge should be sampled where possible, if such sampling will provide a more accurate assessment of plant discharges. During unplanned accidental releases, samples shall be taken hourly during the event. The location of sampling and resulting analysis of samples shall be reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report. Records shall be kept of the concentrations measured, amounts used, and the rate of discharge on a daily and yearly basis. Records shall be kept on the sampling techniques and analytical procedures used. All analytical equipment shall be periodically calibrated. A backup method shall be made available in the event that the analytical instrument used is not functioning.

Samples of the steam generator or boiler blowdown shall be analyzed for phosphate (PO_4) and hydrazine and cyclohexylamine on a weekly basis when used.

2.3.3 Chemicals Which Affect Water Quality

Specification (Continued)

The water quality of the cooling water discharge shall be maintained such that the discharge of the condenser cooling water shall not cause the dissolved oxygen (D.O.) levels at any point in the receiving water to fall below 5 ppm. When the site river water concentration of D.O. is below 5.5 ppm, the maximum decrease in concentration of D.O. at the confluence of the discharge canal with the river shall not be more than 0.5 ppm. When the D.O. is 5.5 ppm or above, the concentration of D.O. at the confluence of the discharge canal with the river shall not be less than 5.0 ppm.

Discharges, whether released batchwise or continuously, containing heavy metals shall be sufficiently diluted such as to result in an undetectable concentration. See Section 2.3.2 on the limits of discharge of chromium and other heavy metal corrosion inhibitors.

Discharges shall not contain concentrations of oil and grease that would produce a visible sheen in the receiving waters nor shall oil be discharged in any quantities that are harmful as defined pursuant to 40 CFR 110.

3.3.3 Chemicals Which Affect Water Quality

Specification (Continued)

Analysis for boron shall be conducted on a daily basis in the event of evaporator breakdown.

All pH measurements shall be continuously taken during discharges of regenerant wastes and periodically during releases on a batch basis such as in the event of evaporator breakdown. Such events shall be reported in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

Monitoring for dissolved oxygen shall be measured at an intake forebay and the discharge canal on a weekly basis to assure the discharges shall contain concentrations of no less than 5.0 ppm in accordance with applicable State classification of the Hudson River estuary.

Visual inspection shall be made for oil and if oil is present in discharges, amounts released shall be estimated and any detectable effects on biota shall be reported within 30 days in accordance with Section 5.6.2.1.b.

2.3.3 Other Chemicals Which Affect Water Quality Specifications (Continued)

All industrial wastes, sludge deposits, sanitary sewage or discharges containing toxic contaminents or impurities, deleterious substances, or refuse shall be effectively treated and the amounts and concentration levels released shall be limited in accordance with the water quality classification (Class "SB") established by New York State for the Hudson River estuary. No taste- or odor-producing substances in amounts that will interfere with use for primary and secondary contact, recreational use, or will transmit any undesirable taste or odor to edible aquatic life shall be released. The discharges shall not contain any visible foam or floating solids.

2.3.3.2 Gaseous Effluents

The release of gaseous pollutants in combustion products from Unit No. 1 superheater, the site's plant package boilers and any diesel-powered units (such as auxiliary generators) shall be limited through the use of low sulfur fuel oil in accordance with applicable Federal, State and local regulations. Any other gaseous emission containing waste gases and particulate matter from existing and future waste treatment facilities associated with the discharge shall be limited to permissible levels in Federal and State air quality standards.

3.3.3 Other Chemicals Which Affect Water Quality Specification (Continued)

3.3.3.2 Gaseous Effluents

Records shall be kept of the amount and composition (batch basis) of fossil fuels utilized at Indian Point.

2.3.3 Other Chemicals Which Affect Water Quality

Specification (Continued)

2.3.3.3 Solid Effluents

Solid waste collected from the intake screens and trash racks shall be dispersed in such a manner as to prevent its entry into navigable waters, except that which may return with the impinged fish.

2.3.2.3 Deviations after 24 hours from the limits given in Tables 2.3-1 and 2.3-2, including reduction in D.O. below 5.0 ppm, shall be promptly reported in accordance with Section 5.6.2.1.a.

Bases

Chemical releases from Units No. 1, 2 and 3 are subject to the same dilution in the circulating water system discharge prior to release into the river as the radioactive effluents. The resulting concentrations during any prior operation of Units Nos. 1 and 2 have not exceeded the limits established under these specifications. No adverse effects have been observed from these discharges and therefore added assurance is gained that future operations under a similar program will also produce no adverse effects to the Hudson River.

3.3.3 Other Chemicals Which Affect Water Quality

Specification (Continued)

3.3.3.3 Solid Effluents

Reports shall be kept on the sources of solid wastes, sludges, debris, approximate volumes disposed, the methods used for removal and transportation, and the location of the disposed materials. Data on the number, species, and weight of fish collected at the screens on a daily basis shall be reported in a monthly report to the Nuclear Regulatory Commission as well as to the New York State Department of Environmental Conservation in accordance with Section 4.1.2a(3) and Section 5.6.1.2, Special Environmental Operating Report.

Bases

The liquid effluent monitoring program is designed to demonstrate that the plants are being operated in accordance with Environmental Technical Specifications with respect to chemical discharges, water quality, changes in dissolved oxygen and other parameters.

Samples taken and analyzed shall determine whether the chemical specifications have been met and the releases meet applicable regulations. Administrative controls will

2.3.3 Other Chemicals Which Affect Water Quality

Bases (Continued)

The New York State Department of Environmental Conservation has established water quality standards depending upon water use. Applicable criteria classified the Hudson River at Indian Point as "Class SB" (6NYSCRR 701.5).

All discharges are subject to regulation by the Federal, State and local governments. The licensee has applied for appropriate permits from these agencies to regulate discharges. The licensee has proposed to meet certain discharge limits with respect to concentrations of various chemicals at the discharge into the river which the licensee believes satisfy the State water quality standards. The basis for the limits listed in Table 2.3-1 was obtained in part from bioassay work performed by consultants for the licensee. The concentration limits were developed from the evaluation of the toxic potential of the enumerated chemicals, utilizing values from the literature along with the toxicity bioassays (References 2.3-1, 2.3-2).

Oil and grease spills in the facility are cleaned up, drummed, and carted to the local dump (Croton) by a commercial carting service. Should any oil or grease inadvertently enter any drain, their discharge to the river will be prevented through the use of an oil slick boom placed across the discharge canal.

3.3.3 Other Chemicals Which Affect Water Quality

Bases (Continued)

be such that all releases shall meet applicable regulations. The liquid effluent monitoring program also provides a means of ensuring that the administrative controls effectively meet these regulations.

Dissolved oxygen concentrations of the circulating water system will be measured to note any changes from continued operation of Unit No. 3. Any large reduction in dissolved oxygen may be harmful to certain aquatic life during periods when there are low D.O. levels. The concentration level of 5.0 ppm has been established by the New York State Department of Environmental Conservation for the protection of aquatic life.

In addition to the liquid effluent monitoring schedule detailed in Table 2.3-1, the licensee has embarked on an extensive chemical monitoring survey in the environs of Indian Point (see Section 4.1.2a(4). Special Studies), the objective of which is to determine the significance of the effects of liquid effluents on the biota.

An impingement study to count the number of fish collected at the intake structure as presented in Section 4.1.2a will serve to evaluate ecological effects of fish killed. See Section 4.1.2a regarding details of the impingement surveillance study being done by the licensee.

2.3.3 Other Chemicals Which Affect Water Quality

Bases (Continued)

Consolidated Edison Company is currently using fuel oil with a sulfur content of about 0.30 percent by weight, thus meeting the appropriate New York State regulations (Reference 2.3-3). In addition, the annual average concentrations for the emissions of NO_x and particulates from the site package boilers and superheaters are currently in compliance with the Federal Air Quality Standards that have to be achieved by 1975 (References 2.3-2 and 2.3-4).

Experience with Units Nos. 1 and 2 indicates that fish can be expected to be impinged on the traveling screens of Unit No. 3. When the fixed screens are raised on Unit No. 2 (about once a day), logs and other large waste material (e.g., plastic bags and large shrubbery) that were on the outermost screens are caught by the trash bar racks. Small debris and impinged fish are caught on the traveling screens. When these racks and traveling screens are cleaned, the debris on them is taken off and carried away. These solid wastes are carried away by a commercial service to the Croton dump. The specification to carry away this solid waste rather than throw it back into the river (from whence it came) is consistent with the licensee's commitment to protect the environment.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3.4 Hydrogen Ion

Objective

To limit the pH range of the circulating water discharge between 6 and 9 so that the water can be compatible with aquatic life.

Specification

2.3.4.1 The discharges of acids or bases shall be controlled such that hydrogen ion concentration of the discharges diluted in the circulating cooling water shall be maintained between 6 and 9 pH units.

2.3.4.2 All acidic or basic regenerant releases shall be neutralized prior to discharge. No bulk amounts of acids or bases shall be instantaneously discharged.

2.3.4.3 If as a result of plant operations, the limits specified in 2.3.4.1 are exceeded, then plant operations shall be modified to restore the pH in the discharge to within the specifications.

3.0 MONITORING REQUIREMENTS

3.3.4 Hydrogen Ion

Objective

To measure the hydrogen ion concentration of discharges.

Specification

3.3.4.1 The pH of the discharge from the Neutralization Facility shall be measured during discharge of regenerant wastes, as indicated in Table 2.3-1. and that of other releases such as in the event of evaporator breakdown or from steam generator blowdown.

3.3.4.2 The sensor calibration shall be checked using weekly grab samples.

3.3.4.3 If the sensor systems are inoperative, grab samples shall be taken during periods of discharge.

3.3.4.4 Minimum and maximum values shall be reported weekly in accordance with Section 5.6.1.1, Annual Environmental Operating Report.

2.3.4 Hydrogen Ion

Bases (Continued)

The limiting condition is established to minimize the effect of acids or bases on the natural aquatic ecosystems. By restricting the amounts of acids and bases released to the environment and controlling the pH levels and changes in pH levels, the biota will be protected.

3.3.4 Hydrogen Ion

Bases (Continued)

A neutralization facility has been built to neutralize all acidic and basic regenerant wastes prior to discharge through the canal. Monitoring the pH of the discharge from the neutralizing facility will assure that no sudden changes or excesses in acidity or basicity will occur to result in damage to aquatic life. Monitoring the pH of other discharges made on a batch basis as in the event of evaporator breakdown or made because of the all volatile treatment of the secondary coolant at Unit No. 2 will assure controls on acidity or basicity for protection of biota by requiring the licensee to take corrective action in accordance with Section 5.6.2.1.a.

REFERENCES

2.3-1 Testimony of Gerald J. Lauer, Ph.D., New York University, "Effects of Chemical Discharges from Indian Point Units 1 and 2 on Biota and on River Chemistry," Docket No. 50-247, April 5, 1972.

2.3-2 "Final Environmental Statement, Indian Point Unit No. 2," United States Atomic Energy Commission, Directorate of Licensing, Docket No. 50-247, September 1972.

2.3-3 New York State Department of Environmental Conservation Regulations, Title 6, Chapter III, Air Resources, Subchapter A, Prevention and Control of Air Contamination and Pollution, Part 225, Fuel Composition and Use - New York City Metropolitan Area.

2.3-4 Consolidated Edison of New York, Inc., Supplement No. 3 to the Environmental Report for Indian Point Unit No. 2, Benefit-Cost Analysis, February 1972.

TABLE 2.3- (Sheet 1 of 3)

LIQUID EFFLUENT MONITORING SURVEY

Parameter Analyzed for	Max. Conc. (ppm)	Collection and Analyses Frequency	Uses of Chemical
Phosphate (Orthophosphate)*	1.5	WK	Used for maintaining the chemistry in the secondary system
Hydrazine*	0.1	WK	Used for oxygen scavenger of secondary system
Cyclohexylamine*	0.1	WK	Used to adjust pH of feedwater to steam generator
pH - (units)	6.0 - 9.0	DD	
Lithium Hydroxide	0.01	D	Used to adjust pH of primary coolant
Boron	1.0	D	Used as chemical shim in primary coolant
Chromium (total)	0.05	WK	Used as corrosion inhibitor
Residual Chlorine (free and combined)	0.5	D	Used as a biocide to treat condenser and auxiliary cooling water systems
Chlorine Demand	(Not Applicable)	WK	
Sodium Hydroxide	(Not Applicable)	DD	Used as a chemical regenerant
Specific Conductance (Salinity)	(Not Applicable)	WK	
Soda Ash	(Not Applicable)	D	Used to wash Unit No. 1 flue gas passages
Sulfuric Acid	(Not Applicable)	DD	Used as a chemical regenerant

*It is not intended to use these chemicals constantly. These chemicals will be analyzed when used.

TABLE 2.3 (Sheet 2 of 3)

Parameter Analyzed for	Max. Conc. (ppm)	Collection and Analyses Frequency	Uses of Chemical
Turbidity (Suspended Solids)	(Not Applicable)	WK	
Dissolved Oxygen	(Not Applicable)	WK	
Detergent	1.0	MO	Used for cleaning and laundry
Drewgard 100	2.5	MO	Used as corrosion inhibitor

Notes for Table 2.3-1:

1. WK (weekly), MO (monthly), D (during discharge), DD (continuously during discharge of regenerant wastes from neutralization facility). Samples will be taken hourly during accidental or unplanned discharges.

2. Samples for the analyses of all parameters except chlorine demand and residual chlorine will be taken at the plant intake and at the confluence of the discharge canal with the Hudson River.

3. Chlorine demand will be taken at the plant intake. Samples for residual chlorine measurement will be taken at both the condenser outlet water box and at the confluence of the discharge canal with the Hudson River. The latter measurements are performed at approximately ten minute intervals while chlorination is taking place.

4. No heavy metal discharges are planned or anticipated other than those listed on the above table.

5. All samples shall be taken and analyzed in accordance with approved standard methods.

   Approved standard methods are published by: (1) The American Society for Testing and Materials in the "Annual Book of ASTM Standards, Part 23, Water: Atmospheric Analysis," (2) Water Works Association and the Water Pollution Control Federation in the book "Standard Methods for the Examination for Water and Waste Water," and Section 1.17, and (3) "Methods for Chemical Analyses for Water and Wastes," Publication No. 16020, Environmental Protection Agency, 1971. In cases where: (a) the existing standards are not applicable; (b) conflicts exist between standards; (c) no standards exist; or (d) newer technology outdates existing standards, an evaluation will be made by Con Edison in light of the latest technology as to the applicable standard method to be used.

TABLE 2.3-1 (Sheet 3 of 3)

6. Lithium Hydroxide shall be determined by calculation of usage. See Table 2.3-2.

7. Boron discharge concentrations shall be determined by analysis of the individual tanks being discharged.

8. Drewgard 100 and detergent will be analyzed based on calculation of usage.

9. Sodium Hydroxide, Sulfuric Acid and Soda Ash shall be determined by pH measurements.

TABLE 2.3-2 ANTICIPATED RELEASES (Sheet 1 of 3)

CHEMICAL AND HOW RELEASED	MAXIMUM SUSTAINED RELEASE (lb/day)			CONCENTRATION WITH DILUTION FLOW OF 100,000 GPM* (ppm)
	Unit No. 1	Unit No. 2	Unit No. 3	
(A) Released Continuously				
Phosphate X	15	38	38	8.4×10^{-2}
Hydrazine	NA	1	1	8.3×10^{-3}
Cyclohexylamine	2.5	2.4	2.4	2.2×10^{-2}
Sodium Hydroxide	36	NA	NA	3.0×10^{-2}
(B) Released on the Assumption of System Leakage**				
Potassium Chromate (as Chromium)	NA	30	30	5.0×10^{-2}
Drewgard 100+++	NA	132	132	2.5×10^{0}
(C) Released on a Batch Basis				
Residual Chlorine	----------see text----------			
Detergent	3 (2 hr/day)	NA	NA	3.0×10^{-2}
Sodium Hydroxide	156 (1 hr, once a day)***	NA	NA	2.4×10^{0}
Sulfuric Acid	450 (1 hr, once a day)***	NA	NA	9.0×10^{0}

TABLE 2.3-2 ANTICIPATED RELEASES (Sheet 2 of 3)

CHEMICAL AND HOW RELEASED	MAXIMUM SUSTAINED RELEASE (lb/day)			CONCENTRATION WITH DILUTION FLOW OF 100,000 GPM* (ppm)
	Unit No. 1	Unit No. 2	Unit No. 3	
(C) Released on a Batch Basis (Continued)				
Soda Ash	1000 (2-4 times/year)	NA	NA	2.5×10^{0}
Hydrazine+	24 (once/year)	NA	NA	2.5×10^{-2}
Total Suspended Solids	1.5	NA	NA	
(D) Released on a Batch Basis, in Event of Evaporator Breakdown				
Lithium Hydroxide++	2.5	2.5	2.5	6.2×10^{-3}
Boric Acid++	600	600	600	1.5×10^{0}
Sodium Hydroxide	NA	12 (2 hrs. once every 4-7 days)	12 (2 hrs. once every 4-7 days)	2.4×10^{-1}

NA Not Applicable (Chemical is not discharged from Unit)

* Concentration calculated under most adverse condition, simultaneous release from Units Nos. 1, 2, and 3. Normal dilution flow is 2,058,000 gpm; hence with this flow concentrations would be 1/20 as much.

** Based on a continuous discharge of 25 gpm at 100 ppm and an evaporator breakdown.

*** This release results from regeneration of mixed bed ion exchangers. These chemicals are neutralized in the neutralization facility. Neutralized chemicals are not include in this table. The sulfuric acid used in the flash evaporator and spent in the process is also not included in this table.

TABLE 2.3-2 ANTICIPATED RELEASES (Sheet 3 of 3)

+ Chlorination will not take place at the same time hydrazine is released on a batch basis. Layup chemicals may be released on a batch basis, provided concentrations in Table 2.3-1 are not exceeded.

++ This release (in lbs/day) is based upon the direct release of maximum reactor coolant system concentrations at the maximum rate of the waste disposal system. The occurrence of this release is therefore very unlikely.

+++ Based on discharge of entire system in one hour at a maximum contration of 2000 ppm.

° Discharged during cleaning of the Unit No. 1 superheater and air preheater.

X In the event that all volatile treatment is used in the secondary coolant system, very little phosphate compounds will be discharged.

2.4 RADIOACTIVE DISCHARGES

Objective

To define the limits and conditions for the controlled releases of radioactive materials in liquid and gaseous effluents to the environs to ensure that these releases are as low as practicable. These releases should not result in radiation exposures in unrestricted areas greater than a few percent of natural background exposures. The concentrations of radioactive materials in effluents shall be within the limits specified in 10 CFR Part 20.

To ensure that the release of radioactive material above background to unrestricted areas be as low as practicable, the following design objectives apply:

For liquid wastes:

a. The annual dose above background to the total body or any organ of an individual from all reactors at a site should not exceed 5 mrem in an unrestricted area.

b. The annual total quantity of radioactive materials in liquid waste, excluding tritium and dissolved gases, discharged from each reactor should not exceed 5 Ci.

3.4 RADIOACTIVE DISCHARGES

Objective

To ensure that the releases of radioactive materials are as low as practicable and within allowable values.

Objective (Cont'd)

For gaseous wastes:

c. The annual total quantity of noble gases above background discharged from the plants should result in an air dose due to gamma radiation of less than 10 mrad, and an air dose to beta radiation of less than 20 mrad, at any location near ground level which could be occupied by individuals at or beyond the boundary of the site, and that no individual in an unrestricted area will receive an annual dose to the total body greater than 5 mrem or an annual skin dose greater than 15 mrem from this release quantity.

d. The annual total quantity of all radioiodines and radioactive material in particulate forms above background from all reactors at a site should not result in an annual dose to any organ of an individual in an unrestricted area from all pathways of exposure in excess of 15 mrem.

e. The annual total quantity of iodine-131 discharged from each reactor at a site should not exceed 1 Ci.

To estimate and control radioactive solid wastes in accordance with applicable regulations.

2.4.1 Specifications for Liquid Waste Effluents

a. The concentration of radioactive materials released in liquid wastes from all reactors at the site shall not exceed the values specified in 10 CFR Part 20, Appendix B, Table II, Column 2, for unrestricted areas.

b. The cumulative release of radioactive materials in liquid waste effluents, excluding tritium and dissolved gases, shall not exceed 10 Ci/reactor/calendar quarter.

c. The cumulative release of radioactive materials in liquid waste effluents, excluding tritium and dissolved gases, shall not exceed 20 Ci/reactor in any 12 consecutive months.

d. During releases of radioactive wastes, except as provided in Specification 3.4.1.h, the effluent control monitor shall be set to alarm and to initiate the automatic closure of each waste isolation valve prior to exceeding the limits specified in Specification 2.4.1.a above.

e. The operability of each automatic isolation valve in the liquid radwaste discharge lines shall be demonstrated quarterly.

f. The equipment installed in the liquid radioactive waste treatment system shall be maintained and shall be operated to process radioactive liquid wastes prior to their discharge when the projected cumulative release could exceed 1.25 Ci/reactor/calendar quarter, excluding tritium and dissolved gases.

g. The maximum radioactivity to be contained in any liquid radwaste tank

3.4.1 Specifications for Liquid Waste Sampling and Monitoring

a. Plant records shall be maintained of the radioactive concentration and volume before dilution of liquid waste intended for discharge and the average dilution flow and length of time over which each discharge occurred. Sample analysis results and other reports shall be submitted in accordance with Section 5.6.1.2 of these Specifications. Estimates of the sampling and analyses errors associated with each reported value shall be included.

b. Prior to release of each batch of liquid waste, a sample shall be taken from that batch and analyzed in accordance with Table 2.4-1 to demonstrate compliance with Specification 2.4-1 using the flow rate into which the waste is discharged during the period of discharge.

c. Sampling and analysis of liquid radioactive waste shall be performed in accordance with Table 2.4-1. Prior to taking samples from a monitoring tank, at least two tank volumes shall be recirculated. For Unit No. 1, a recirculation system shall be provided on the monitoring tanks by June 1, 1977. Prior to this date, Unit No. 1 representative samples will be taken from the tank drain tap after flushing the line with 5 times the sample line volume.

d. The radioactivity in liquid wastes shall be continuously monitored and recorded during release except as provided in Specification 3.4.1.h. Whenever these monitors are inoperable for a period not to exceed 72 hours, two independent samples of each tank

Specifications (Cont'd)

that can be discharged directly to the environs shall not exceed 10 Ci, excluding tritium and dissolved gases.

h. If the cumulative release of radioactive materials in liquid effluents, excluding tritium and dissolved gases, exceeds 2.5 Ci/reactor/calendar quarter, the licensee shall make an investigation to identify the causes for such release, define and initiate a program of action to reduce such release to the design objective levels listed in Section 2.4, and report these actions to the Commission within 30 days from the end of the quarter during which the release occurred.

Specifications (Cont'd)

to be discharged shall be analyzed and two plant personnel shall independently check valving prior to the discharge. If these monitors are inoperable for a period exceeding 72 hours, no releases from a liquid waste tank shall be made and any release in progress shall be terminated.

e. The flow rate of liquid radioactive waste effluents shall be continuously measured and recorded. For Unit No. 1 the tank level shall be checked and recorded at least once every two hours by plant personnel during release until the equipment specified in 3.4.1.h is installed.

f. All liquid effluent radiation monitors shall be calibrated at least quarterly by means of a radioactive source which has been calibrated to a National Bureau of Standards source. Each monitor shall also have a functional test monthly and an instrument check prior to making a release.

g. The radioactivity in the steam generator blowdown shall be continuously monitored and recorded. Whenever these monitors are inoperable, the blowdown flow shall be representatively sampled and analyzed at least once per watch or diverted to the waste management system and the direct release to the environment terminated.

h. Unit No. 1 shall be provided with a continuous liquid effluent monitor including a recorder in accordance with Specification 3.4.1.d, an alarm and automatic closure of each waste isolation valve in accordance with Specification 2.4.1.d, and a continuous flow measurement device including a recorder in accordance with Specification 3.4.1.e by June 1, 1977. Prior to this date, all Unit No. 1 liquid effluent releases shall be batch releases in accordance with

Bases

The release of radioactive materials in liquid waste effluent to unrestricted areas shall not exceed the concentration limits specified in 10 CFR Part 20 and should be as low as practicable in accordance with the requirements of 10 CFR Part 50.36a. These specifications provide reasonable assurance that the resulting annual dose to the total body or any organ of an individual in an unrestricted area will not exceed 5 mrem. At the same time, these Specifications permit the flexibility of operation, compatible with considerations of health and safety, to ensure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. It is expected that by using this operational flexibility under unusual operating conditions, and exerting every effort to keep levels of radioactive material in liquid wastes as low as practicable, the annual

Specifications (Cont'd)

Specification 3.4.1.b and any unplanned or uncontrolled offsite release of radioactive materials in liquid effluents in excess of 0.5 curies requires notification to the NRC in writing within 10 days, reporting the event, identifying the cause, and describing actions taken to prevent recurrence.

Bases

The sampling and monitoring requirements given under Specification 3.4.1 provide assurance that radioactive materials in liquid waste effluents are properly controlled and monitored in conformance with the requirements of Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50. These requirements provide the data for the licensee and the Commission to evaluate the performance of the plants relative to radioactive liquid wastes released to the environment. Reports on the quantities of radioactive materials released in liquid waste effluents are furnished to the Commission according to Section 5.6.1 of these Technical Specifications in conformance with Regulatory Guide 1.21. On the basis of such reports and any additional information, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

The points of release to the environment to be monitored in Section 3.4.1 include all the monitored release points as provided for in Table 2.4-3.

Bases: (Cont'd)

release will not exceed a small fraction of the concentration limits specified in 10 CFR Part 20.

The design objectives have been developed based on operating experience taking into account a combination of variables including defective fuel, primary system leakage, primary to secondary system leakage, steam generator blowdown and the performance of the various waste treatment systems, and are consistent with 10 CFR Part 50.36a.

Specification 2.4.1.a requires the licensee to limit the concentration of radioactive materials in liquid waste effluents released from the site to levels specified in 10 CFR Part 20, Appendix B, Table II, Column 2, for unrestricted areas. This Specification provides assurance that no member of the general public will be exposed to liquid-containing radioactive materials in excess of limits considered permissible under the Commission's Rules and Regulations.

Specifications 2.4.1.b and 2.4.1.c establish the upper limits for the release of radioactive materials in liquid effluents. The intent of these Specifications is to permit the licensee the flexibility of operation to ensure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the levels normally achievable when the plants and the liquid waste treatment systems are functioning as designed. Releases of up to these limits

Bases: (Cont'd)

will result in concentrations of radioactive material in liquid waste effluents at small percentages of the limits in 10 CFR Part 20.

Specifications 2.4.1.d and 2.4.1.e require that suitable equipment to control and monitor the releases of radioactive materials in liquid wastes is operating during any period these releases are taking place and are consistent with the requirements of 10 CFR Part 50, Appendix A, Design Criterion 64.

Specification 2.4.1.f requires that the licensee maintain and operate the equipment installed in the liquid waste systems to reduce the release of radioactive material in liquid effluents to as low as practicable consistent with the requirements of 10 CFR Part 50.36a. Normal use and maintenance of installed equipment in the liquid waste system provide reasonable assurance that the quantity released will not exceed the design objective. In order to keep releases of radioactive materials as low as practicable, the Specification requires operation of equipment whenever it appears that the projected cumulative discharge rate will exceed one-fourth of this design objective annual quantity during any calendar quarter.

Specification 2.4.1.g limits the amount of radioactivity that could be inadvertently released to the environment to an amount that will not exceed the Technical Specification limit.

Bases: (Cont'd)

In addition to limiting conditions for operation listed under Specifications 2.4.1.b and 2.4.1.c the reporting requirements of Specification 2.4.1.h delineate that the licensee shall identify the cause whenever the cumulative releases of radioactive materials in liquid waste effluent exceed one-half the design objective annual quantity during any calendar quarter and describe the proposed program of action to reduce such releases to design objective levels on a timely basis. The report must be filed with the Commission within 30 days following the calendar quarter in which the releases occurred.

2.4.2 Specifications for Gaseous Waste Effluents

The terms used in these Specifications are as follows:

subscripts v, refers to vent releases from Units Nos. 1, 2 and 3

s, refers to stack releases from Unit No. 1

i, refers to individual noble gas nuclide
(Refer to Table 2.4-5 for the noble gas nuclides considered)

numbers 1, 2, 3 refer to Units Nos. 1, 2 and 3, respectively.

Q_T = the total noble gas release rate (Ci/sec)

$= \sum_i Q_i$ = sum of the individual noble gas radionuclides determined to be present by isotopic analysis

3.4.2 Specifications for Gaseous Waste Sampling and Monitoring

a. Plant records shall be maintained and reports of the sampling and analysis results shall be submitted in accordance with Section 5.6.1 of these Specifications. Estimates of the sampling and analytical error associated with each reported value should be included.

b. Gaseous releases to the environment, except from the turbine building ventilation exhaust and as noted in Specification 3.4.2.c, shall be continuously monitored for gross radioactivity. The release rate in Specifications 2.4.2 shall be based on the measured flow rate or the determined flow rate of each operating vent or stack exhauster. A flow rate calibration of all

2.4.2 Specifications (Cont'd)

Q_{T_s} = sum of the Unit No. 1 stack releases (Ci/sec)

$Q_{T_v} = Q_{T_{v_1}} + Q_{T_{v_2}} + Q_{T_{v_3}}$ = sum of the vent releases from Unit No. 1, Unit No. 2 and Unit No. 3, three measurements (Ci/sec)

$\bar{K}$ = the average total body dose factor due to gamma emission (rem/yr per Ci/sec)

$\bar{L}$ = the average skin dose factor due to beta emissions (rem/yr per Ci/sec)

$\bar{M}$ = the average air dose factor due to beta emissions (rad/yr per Ci/sec)

$\bar{N}$ = the average air dose factor due to gamma emissions (rad/yr per Ci/sec)

The values of $\bar{K}$, $\bar{L}$, $\bar{M}$ and $\bar{N}$ are to be determined each time isotopic analysis is required as delineated in Specification 3.4.2. Determine the following using the results of the noble gas radionuclide analysis:

$$\bar{K} = (1/Q_T) \sum_i Q_i K_i$$

$$\bar{L} = (1/Q_T) \sum_i Q_i L_i$$

$$\bar{M} = (1/Q_T) \sum_i Q_i M_i$$

$$\bar{N} = (1/Q_T) \sum_i Q_i N_i$$

3.4.2 Specifications (Cont'd)

exhausters in all operating modes shall be performed each 6 months and the damper position and exhauster operating condition shall be checked and recorded each shift. Damper position and exhauster operating conditions need not be checked for a system equipped with an instrument which is generally regarded as a continuous flow measuring device. Whenever these monitors are inoperable, grab samples shall be taken and analyzed daily for gross radioactivity. If these monitors are inoperable for more than seven days, these releases shall be terminated.

c. During the release of gaseous wastes from the primary system waste gas holdup system, the gross activity monitor, the iodine collection device, and the particulate collection device shall be operating. The waste gas decay tank effluents shall be monitored and tested prior to any release of radioactive gas from a decay tank.

d. All waste gas monitors shall be calibrated at least quarterly by means of a known radioactive source which has been calibrated to a National Bureau of Standard's source. The calibration procedure for the waste gas decay tank effluent monitors shall consist of exposing the detector to a referenced calibration source in a controlled reproducible geometry. The source and geometry shall be referenced to the original monitor calibration which provides the calibration curves. Each

2.4.2 Specifications (Cont'd)

where the values of K_i, L_i, M_i and N_i are provided in Table 2.4-5, and are site dependent gamma and beta dose factors

Q = the measured release rate of the radioiodines and radioactive materials in particulate forms with half-lives greater than eight days (Ci/sec).

a. (1) The release rate limit of noble gases from the site shall be such that

$$2.0\ [Q_{Tv}\bar{K}_v + Q_{Ts}\bar{K}_s] \leq 1$$

and

$$0.33\ [Q_{Tv}(\bar{L}_v + 1.1\bar{N}_v) + Q_{Ts}(\bar{L}_s + 1.1\bar{N}_s)] \leq 1$$

(2) The release rate limit of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days, released to the environs as part of the gaseous wastes from the site shall be such that

$$2.9 \times 10^5\ Q_v + 6.2 \times 10^4\ Q_s \leq 1$$

b. (1) The average release rate of noble gases from the site during any calendar quarter shall be such that

$$13\ [Q_{Tv}\bar{N}_v + Q_{Ts}\bar{N}_s] \leq 1$$

and

$$6.3\ [Q_{Tv}\bar{M}_v + Q_{Ts}\bar{M}_s] \leq 1$$

(2) The average release rate of noble gases from the site during any 12 consecutive months shall be

3.4.2 Specifications (Cont'd)

monitor shall have a functional test at least monthly and instrument check at least daily.

e. Sampling and analysis of radioactive material in gaseous waste, particulate form, and radioiodine shall be performed in accordance with Table 2.4-2.

2.4.2 Specifications (Cont'd)

$$25\ [Q_{Tv}\bar{N}_v + Q_{Ts}\bar{N}_s] \leq 1$$

and

$$13\ [Q_{Tv}\bar{M}_v + Q_{Ts}\bar{M}_s] \leq 1$$

(3) The average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any calendar quarter shall be such that

$$13\ [2.9 \times 10^5\ Q_v + 6.2 \times 10^4\ Q_s] \leq 1$$

(4) The average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any period of 12 consecutive months shall be such that

$$25\ [2.9 \times 10^5\ Q_v + 6.2 \times 10^4\ Q_s] \leq 1$$

(5) The amount of iodine-131 released during any calendar quarter shall not exceed 2 Ci/reactor.

(6) The amount of iodine-131 released during any period of 12 consecutive months shall not exceed 4 Ci/reactor.

c. Should any of the conditions of 2.4.3.c(1), (2) or (3) listed below exist, the licensee shall make an investigation to identify the causes of the release rates, define and initiate a program of action to reduce the release rates to design objective levels listed in Section 2.4 and report these actions

2.4.2 Specifications (Cont'd)

to the NRC within 30 days from the end of the quarter during which the releases occurred.

(1) If the average release rate of noble gases from the site during any calendar quarter is such that

$$50 \quad [Q_{Tv}\bar{N}_v + Q_{Ts}\bar{N}_s] \quad >1$$

or

$$25 \quad [Q_{Tv}\bar{M}_v + Q_{Ts}\bar{M}_s] \quad >1$$

(2) If the average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any calendar quarter is such that

$$50 \quad [2.9 \times 10^5 \, Q_v + 6.2 \times 10^4 \, Q_s] \quad >1$$

(3) If the amount of iodine-131 released during any calendar quarter is greater than 0.5 Ci/reactor.

d. During the release of gaseous wastes from the primary system waste gas holdup system the effluent monitors listed in Table 2.4-4 shall be operating and set to alarm and to initiate the automatically closure of the waste gas discharge valve prior to exceeding the limits specified in 2.4.2.a above. The operability of each automatic isolation valve shall be demonstrated quarterly.

e. The maximum activity to be contained in one waste gas storage tank shall not exceed 6000 curies (considered as Xe-133).

2.4.2 Specifications (Cont'd)

f. An unplanned or uncontrolled offsite release of radioactive materials in gaseous effluents in excess of 5 curies of noble gas or 0.02 curie of radioiodine in gaseous form requires notification to the NRC in writing within 10 days, reporting the event, identifying the cause, and describing actions taken to prevent recurrence.

Bases

The release of radioactive materials in gaseous wastes to unrestricted areas shall not exceed the concentration limits specified in 10 CFR Part 20, and in accordance with the requirements of 10 CFR Part 50.36a.

These Specifications provide reasonable assurance that the resulting annual air dose due to gamma radiation will not exceed 10 mrad, and an annual air dose due to beta radiation will not exceed 20 mrad from noble gases, that no individual in an unrestricted area will receive an annual dose to the total body greater than 5 mrem or an annual skin dose greater than 15 mrem from fission product noble gases, and that the annual dose to any organ of an individual from iodines and particulates will not exceed 15 mrem per site. At the same time these Specifications permit the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided with a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. It is

Bases

The sampling and monitoring requirements given under Specification 3.4.2 provide assurance that radioactive materials released in gaseous wastes are properly controlled and monitored in conformance with the requirements of Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50. These requirements provide the data for the licensee and the Commission to evaluate the performance of the plants relative to radioactive waste effluents released to the environment. Reports on the quantities of radioactive materials released in gaseous effluents are furnished to the Commission on the basis of Section 5.6.1 of these Technical Specifications and in conformance with Regulatory Guide 1.21. On the basis of such reports and any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

The points of release to the environment to be monitored in Section 3.4.2 include all the monitored release points as provided for in Table 2.4-4.

2.4.2 Bases (Cont'd)

expected that using this operational flexibility under unusual operating conditions, and by exerting every effort to keep levels of radioactive material in gaseous waste effluents as low as practicable, the annual releases will not exceed a small fraction of the concentration limits specified in 10 CFR Part 20.

The design objectives have been developed based on operating experience taking into account a combination of system variables including defective fuel, primary system leakage, primary to secondary system leakage, steam generator blowdown and the performance of the various waste treatment systems.

Specification 2.4.2.a(1) limits the release rate of noble gases from the site so that the corresponding annual gamma and beta dose rate above background to an individual in an unrestricted area will not exceed 500 mrem to the total body or 3000 mrem to the skin in compliance with the limits of 10 CFR Part 20.

For Specification 2.4.2.a(1), gamma and beta dose factors for the individual noble gas radionuclides have been calculated for the plant gaseous release points and are provided in Table 2.4-5. The expressions used to calculate these dose factors are based on dose models derived in Section 7 of Meteorology and Atomic Energy-1968 and model techniques provided in Draft Regulatory Guide 1.AA.

Bases (Cont'd)

Specification 3.4.2.b excludes monitoring the turbine building ventilation exhaust since this release is expected to be a negligible release point. Many PWR reactors do not have turbine building enclosures. To be consistent in this requirement for all PWR reactors, the monitoring of gaseous releases from turbine buildings is not required.

Bases (Cont'd)

Dose calculations have been made to determine the site boundary location with the highest anticipated dose rate from noble gases using onsite meteorological data and the dose expressions provided in Draft Regulatory Guide 1.AA. The dose expression considers the release point location, building wake effects, and the physical characteristics of the radionuclides.

The offsite locations with the highest anticipated annual dose from released noble gases are provided in Table 2.4-5.

The release rate Specifications for a radioiodine and radioactive material in particulate form with half-lives greater than eight days are dependent on existing radionuclide pathways to man. The pathways which were examined for these Specifications are: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, and (3) deposition onto grassy areas where milch animal graze with consumption of the milk by man. Methods for estimating doses to the thyroid via these pathways are described in Draft Regulatory Guide 1.AA. The offsite location with the highest anticipated thyroid dose rate from radioiodines and radioactive material in particulate form with half - lives greater than eight days was determined using onsite meteorological data and the expressions described in Draft Regulatory Guide 1.AA.

Bases (Cont'd)

Specification 2.4.2a(2) limits the release rate of radioiodines and radioactive material in particulate form with half-lives greater than eight days so that the corresponding annual thyroid dose via the most restrictive pathway is less than 1500 mrem.

For radioiodines and radioactive material in particulate form with half-lives greater than eight days, the most restrictive location is a dairy farm located 11,260 meters in the SSW direction (vent $X/Q = 2.4 \times 10^{-7}$ sec/m^3; stack $X/Q = 5.1 \times 10^{-8}$ sec/m^3).

Specification 2.4.2.b establishes upper offsite levels for the release of noble gases and radioiodines and radioactive material in particulate form with half-lives greater than eight days at twice the design objective annual quantity during any calendar quarter, or four times the design objective annual quantity during any period of 12 consecutive months. In addition to the limiting conditions for operation of Specifications 2.4.2.a and 2.4.2.b, the reporting requirements of 2.4.2.c provide that the cause shall be identified whenever the release of gaseous effluents exceeds one-half the design objective annual quantity during any calendar quarter and that the proposed program of action to reduce such release rates to the design objectives shall be described.

Specification 2.4.2.d requires that suitable equipment to monitor and control the radioactive gaseous releases are operating during any period these releases are taking place.

Bases (Cont'd)

Specification 2.4.2.e limits the maximum quantity of radioactive gas that can be contained in a waste gas storage tank. The calculation of this quantity should assume instantaneous ground release, a X/Q based 5 percent meteorology, the average gross energy is 0.19 MeV per disintegration (considering Xe-133 to be the principal emitter) and exposure occurring at the minimum site boundary radius using a semi-infinite cloud model. The calculated quantity will limit the offsite dose above background to 0.5 rem or less, consistent with Commission guidelines.

Specification 2.4.2.f provides for reporting release events which, while below the limits of 10 CFR Part 20, could result in releases higher than the design objectives.

2.4.3 Specifications for Solid Waste Handling and Disposal

a. Measurements shall be made to determine or estimate the total curie quantity and principle radionuclide composition of all radioactive solid waste shipped offsite.

b. Reports of the radioactive solid waste shipments, volumes, principle radionuclides, and total curie quantity, shall be submitted in accordance with Section 5.6.1.2.

Bases

The requirements for solid radioactive waste handling and disposal given under Specification 2.4.3 provide assurance that solid radioactive materials stored at the plant and shipped offsite are packaged in conformance with 10 CFR Part 20, 10 CFR Part 71, and 49 CFR Parts 170-178.

Table 2.4-1 (sheec 1 of 2)

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS

Liquid Source	Sampling Frequency	Type of Activity Analysis	Detectable Concentrations (μCi/ml)(3)
A. Monitor Tank Releases	Each Batch (2)	Principal Gamma Emitters (2)	5×10^{-7} (2)
	One Batch/Month	Dissolved Gases	10^{-5}
	Weekly Composite (1)	Ba-La-140, I-131	10^{-6}
	Monthly Composite (1)	H-3	10^{-5}
		Gross α	10^{-7}
	Quarterly Composite (2)	Sr-89, Sr-90	5×10^{-8}
B. Primary Coolant	Weekly (4)	I-131, I-133	10^{-6}
C. Steam Generator Blowdown	Weekly (5) (2)	Principal Gamma Emitters (2)	5×10^{-7} (2)
		Ba-La-140, I-131	10^{-6}
	One Sample/Month	Dissolved Gases	10^{-5}
	Monthly Composite (5)	H-3	10^{-5}
		Gross α	10^{-7}
	Quarterly Composite (5)	Sr-89, Sr-90	5×10^{-8}

(1) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged.

(2) For certain mixtures, 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 concentrations of such radionuclides using measured ratios with those radionuclides which are routinely identified and measured. Also, when operational or other limitations preclude specific gamma radionuclide analysis in batch releases, the provisions of Regulatory Guide 1.21, Revision (1), Appendix A, Section B,1,a, may be followed. Justification shall be documented for all batches for which specific gamma radionuclide analysis is not done. Refer to Regulatory Guide 1.21 Rev (1) June 1974, Section C.4 Gross Radioactive Measurements and Appendix A, Section B.

(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) The power level and cleanup or purification flow rate at the sample time shall also be reported.

(5) To be representative of the average quantities and concentrations of radioactive materials in liquid effluents, samples should be collected in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite should be throughly mixed in order for the composite sample to be representative of the average effluent release.

Table 2.4-2 (S t 1 of 2)

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS

Gaseous Source	Sampling Frequency	Type of Activity Analysis	Detectable Concentrations (μCi/ml)(1)
A. Waste Gas Decay Tank Releases	Each Tank	Principal Gamma Emitters	10^{-4} (3)
		H-3	10^{-6}
B. Containment Purge Releases	Each Purge	Principal Gamma Emitters	10^{-4} (2)
	(Not Including Pressure Relief Purges)	H-3	10^{-6}
C. Condenser Air Ejector	Monthly	Principal Gamma Emitters	10^{-4} (2) (3)
		H-3	10^{-6}
D. Environmental Release Points	Monthly (Gas Samples)	Principal Gamma Emitters	10^{-4} (2) (3)
	(Including Containment Pressure Relief Purges)	H-3	10^{-6}
	Weekly (Charcoal Sample)	I-131	10^{-12}
	Monthly (Charcoal Sample)	I-133, I-135	10^{-10}
	Weekly (Particulates)	Principal Gamma Emitters (at least for Ba-La-140, I-131)	10^{-11}
	Monthly Composite (4) (Particulates)	Gross α	10^{-11}
	Quarterly Composite (4) (Particulates)	Sr-89, Sr-90	10^{-11}

Table 2.4-2 (Sheet 2 of 2)

NOTES:

(1) The above detectability limits for activity analysis are based on 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.

(2) Analyses shall also be performed following each refueling, startup or similar operational occurrence which could alter the mixture of radionuclides.

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

(4) To be representative of the average quantities and concentrations of radioactive materials in particulate form released in gaseous effluents, samples should be collected in proportion to the rate of flow of the effluent stream.

Table 2.4-3

PWR-LIQUID WASTE SYSTEM
LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS

Process Stream or Release Point	Radiation Alarm	Auto Control to Isolation Valve	Continuous Monitor	Grab Sample Station	Gross Activity	I	Dissolved Gases	Alpha	H-3	Isotopic Analysis	Liquid High Level Alarm
Miscellaneous Waste Tank				X		X	X	X	X	X	X (b)
Detergent Waste Sample				X		X	X	X	X	X	X (b)
Primary Coolant System				X		X					
Liquid Radwaste Discharge Pipe	X	X(a)	X(a)		X						
Steam Generator Blowdown System**	X		X	X	X	X	X	X	X	X	
Outdoor Storage Tanks (potentially radioactive)				X	X					X	X (b)
Component Cooling Systems	X		X		X						
Turbine Building Sumps (Floor Drains)				X(c)	X (c)					X	

*In most PWR's the contents of the detergent waste collector tank are sampled, analyzed and then filtered prior to release through the liquid radwaste discharge pipe. The detergent waste system should be designed with either a split tank or two separate collection or sample (test) tanks to permit isolation of the tanks for mixing, sampling and analysis prior to release.

**In some PWR's processed liquid from the steam generator blowdown system is returned directly to the secondary system and the need for continuous monitoring at this release point is eliminated.

(a) Unit No. 1 after June 1, 1977

(b) All Units after June 1, 1977

(c) A composite sample shall be taken and analyzed daily whenever the secondary system gross activity exceeds 10^{-5} μCi/ml.

Table 2.4-4

PWR-GASEOUS WASTE SYSTEM
LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS

Process Stream or Release Point	Radiation Alarm	Auto Control to Isolation Valve	Continuous Monitor	Grab Sample Station	Measurement NG	Measurement I	Measurement Part	Measurement H-3	Measurement Alpha
Waste Gas Storage Tanks	X (b)	X (b)	X (b)	X	X	X	X	X	X
Condenser Air Ejector	X		X	X	X	X	X	X	X
Vent Header System*	X		X	X	X	X	X	X	X
Building Ventilation Systems									
Reactor Containment Building (whenever there is flow)	X	X	X	X	X	X	X	X	X
Auxiliary Building*	X		X	X	X	X	X	X	X
Fuel Handling & Storage Building*	X		X	X	X	X	X	X	X
Radwaste Building*	X		X	X	X	X	X	X	X
Steam Generator Blowdown Tank Vent or Condenser Vent**			X (a)	X	X	X	X	X	X
Waste Evaporator Condenser Vent***	X		X	X	X	X	X	X	X

*If any or all of the process streams or building ventilation systems are routed to a single release point, the need for a continuous monitor at the individual discharge point to the main exhaust duct is eliminated. One continuous monitor at the final release point is sufficient.

**In some PWR's the steam generator blowdown tank vent is routed to the main turbine condenser and the need for a continuous monitor at this release point is eliminated.

***For PWR's where the waste evaporator condenser is vented directly to the atmosphere.

(a) Units Nos. 1 and 3 by initial criticality of Unit No. 3 and Unit No. 2 by its refueling date. This equipment is a continuous sampler for radioiodine and particulate.

(b) Unit No. 1 by June 1, 1977.

TABLE 2.4-5 (Sheet 1 of 2)

GAMMA AND BETA DOSE FACTORS FOR
INDIAN POINT UNITS NOS. 1, 2 and 3

	$\chi/Q = 1.7 \times 10^{-5}$ sec/m^{-3} at 456 meters, SW				$\chi/Q = 3.5 \times 10^{-7}$ sec/m^{-3} at 3860 meters, N			
	Unit No. 1 Dose Factors for Vent				Unit No.1 Dose Factor for Stack			
Noble Gas Radionuclide	K_{iv} Total Body rem/yr / Ci/sec	L_{iv} Skin rem/yr / Ci/sec	M_{iv} Beta Air rad/yr / Ci/sec	N_{iv} Gamma Air rad/yr / Ci/sec	K_{is} Total Body rem/yr / Ci/sec	L_{is} Skin rem/yr / Ci/sec	M_{is} Beta Air rad/yr / Ci/sec	N_{is} Gamma Air rad/yr / Ci/sec
Kr-83m	6.3×10^{-4}	0	4.9	0.43	1.9×10^{-5}	0	0.1	0.0066
Kr-85m	5.8	25	34	6.1	0.32	0.52	0.71	0.33
Kr-85	0.068	23	34	0.072	0.0043	0.47	0.71	0.0045
Kr-87	18	170	170	19	0.91	3.4	3.6	0.96
Kr-88	45	40	51	47	2.5	0.81	1.0	2.7
Kr-89	9.3	170	185	9.8	0.07	3.5	3.7	0.074
Xe-131m	2.1	8.2	19	2.8	0.11	0.17	0.39	0.13
Xe-133m	1.7	17	25	2.4	0.081	0.35	0.52	0.11
Xe-133	2.0	5.3	19	2.5	0.095	0.11	0.37	0.11
Xe-135m	8.4	12	13	9.0	0.22	0.25	0.26	0.23
Xe-135	8.5	32	42	9.0	0.5	0.67	0.86	0.52
Xe-137	1.2	210	210	1.3	0.012	4.3	4.4	0.012
Xe-138	20	71	82	21	0.49	1.4	1.7	0.51

TABLE 2.4-5 (Sheet 2 of 2)

GAMMA AND BETA DOSE FACTORS FOR
INDIAN POINT, UNITS Nos. 1, 2 and 3

	$\chi/Q = 1.1 \times 10^{-5}$ sec/m^3 at 520 meters, SW				$\chi/Q = 2.6 \times 10^{-5}$ sec/m^3 at 330 meters, SW			
	Unit No. 2 Dose Factors for Vent				Unit No. 3 Dose Factors for Vent			
Noble Gas Radionuclide	K_{iv} Total Body rem/yr / Ci/sec	L_{iv} Skin rem/yr / Ci/sec	M_{iv} Beta Air rad/yr / Ci/sec	N_{iv} Gamma Air rad/yr / Ci/sec	K_{is} Total Body rem/yr / Ci/sec	L_{is} Skin rem/yr / Ci/sec	M_{is} Beta Air rad/yr / Ci/sec	N_{is} Gamma Air rad/yr / Ci/sec
Kr-83m	5.3×10^{-4}	0	3.2	0.35	0.001	0	7.6	0.79
Kr-85m	5.0	16	22	5.3	8.8	38	52	9.3
Kr-85	0.058	15	22	0.062	0.1	35	52	0.11
Kr-87	16	110	110	16	28	260	260	30
Kr-88	38	26	33	40	68	61	78	71
Kr-89	6.8	110	120	7.2	21	260	280	22
Xe-131m	1.8	5.3	12	2.4	3.3	13	28	4.3
Xe-133m	1.4	11	16	2.0	2.6	26	38	3.7
Xe-133	1.7	3.4	12	2.1	3.0	8	28	3.8
Xe-135m	6.9	7.9	8.2	7.3	14	19	19	15
Xe-135	7.3	21	27	7.7	13	50	64	14
Xe-137	0.93	140	140	0.98	2.6	330	330	2.8
Xe-138	16	46	53	17	34	110	130	36

4.1 NONRADIOLOGICAL ENVIRONMENTAL SURVEILLANCE

4.1.1.a Thermal Plume Mapping

Applicability

Applies to measurements of the thermal plume dispersed throughout the Hudson River as the thermal discharges are released from the Indian Point Station through the discharge structure into the Hudson River.

Objective

The objectives of the thermal plume mapping are:

(i) To determine compliance of the thermal discharge with the New York State thermal criteria, and

(ii) To provide data for comparison with the relationship between the thermal discharge to the river and the thermal response to the river as predicted by mathematical and physical models so as to improve and modify those models as analytical predictive tools for future thermal discharges under any anticipated conditions.

Specification

4.1.1.a.1 The thermal discharges from operation of Indian Point Units Nos. 1, 2, and 3 shall be limited so as to meet applicable criteria. Field surveys shall determine the compliance of plant thermal discharges to the New York State thermal criteria (6NYCRR 704.2 (b) (5)). These criteria are:

"(i) The water temperature at the surface of any estuary shall not be raised to more than 90°F at any point.

(ii) At least 50 percent of the cross sectional area and/or volume of the flow of the estuary including a minimum of one-third of the surface as measured from water edge to water edge at any stage of tide, shall not be raised to more than 4 Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin or a maximum of 83°F, whichever is less.

Specification (Continued)

(iii) From July through September, if the water temperature at the surface of any estuary before the addition of heat of artificial origin is more than 83°F, an increase in temperature not to exceed 1.5 Fahrenheit degrees at any point of the estuarine passageway as delineated above, may be permitted.

(iv) At least 50 percent of the cross sectional area and/or volume of the flow of the estuary including a minimum of one-third of the surface as measured from water edge to water edge at any stage of tide, shall not be lowered more than 4 Fahrenheit degrees from the temperature that existed immediately prior to such lowering."

4.1.1.a.2 Except during the months of December through March, temperature measurements of the thermal plume shall be taken on a monthly schedule for the first year of normal power operation. At critical times of the year and at the maximum surface temperature of the river, more frequent temperature measurements shall be made, particularly when operating at a reduced flow during the summertime. Surface temperature limitations shall be demonstrated by temperature measurements taken outside the outfall to assure Specification 4.1.1.a.1(i) is met. Assessment of the results of the first year operation shall determine the frequency of further measurements of this type. The program to determine the size, shape and location of isotherms shall extend for a three (3) year period of operation of Unit No. 3. Temperatures shall be measured at the surface and several depths, to permit the construction of tri-axial and cross-sectional isothermal plots of the thermal plume, and in sufficient frequency to reflect behavior of the plume during different phases of the tidal cycle. The measurements shall be presented concurrently with the intake and discharge canal water temperatures, heat load, circulating water flows, discharge velocity in accordance with Sections 2.1 and 2.2 and other conditions to define the intensity and extent of the Indian Point plume. The program and measurements shall allow for construction of isothermal maps in increments of 1F° down to a level of 2F° temperature excess above the site river temperature before the addition of heat of artificial origin.

4.1.1.a.3 Intensive field surveys, involving tri-axial thermal measurements of the thermal plume, as described below, shall be conducted during the first calendar year of normal operation (1976). To meet the objectives (i) and (ii) above, by February 1, 1976, the licensee shall submit to the NRC for review and approval, recommendations for the frequency and scope of such surveys based upon review and evaluation of intensive and monthly thermal surveys obtained from operation of Unit No. 2. In each case, the measurements of the extent and intensity of the plume shall allow for construction of isothermal maps with 1.0°F contour intervals except in the plane of discharge where contour intervals of 0.5°F shall be measured. To the extent possible surveys shall be made when the power plants have been operating at high power loads before each survey starts. These surveys shall be carried out in accordance with the the N.Y.S. Department of Conservation requirements for the intensive survey program.

Specification (continued)

During each monthly and the intensive field surveys, the following conditions shall be recorded as needed to assess the extent of the thermal plume:

(1) Plant conditions (condenser flow, intake temperature, discharge temperature, pressure head or discharge velocity).

(2) River hydrological conditions (ambient river temperature, fresh water flow, salinities, tidal stages)

(3) Meteorological conditions (wet and dry bulb temperatures, humidity, wind speed and direction, net radiation).

(4) Any other parameters needed to meet the objectives (i) and (ii) shall also be measured.

The survey may be conveniently divided into the following areas:

A. Near-Field Measurements

The near field is defined as the region within which effluent momentum is detectable as compared to natural dispersive processes and tidal momentum. For several discharge port configurations, thermal plume velocity, speed and direction, as well as temperatures shall be obtained. The results will be time dependent three-dimensional temperature and velocity profiles (over a tidal cycle and over a number of required cycles).

B. Far-Field Measurements

The far-field program shall include aerial temperature surveys along with tri-axial measurements through the detectable plume along with velocity measurements. The interaction between the near field and far field shall be considered. The results will be time dependent three-dimensional temperature and velocity profiles (over a tidal cycle and during a number of required cycles).

Specification (Continued)

C. Measurement of River Parameters

This aspect shall determine the salient river and atmosphere parameters, such as salinity, fresh water run-off, river velocities, heat exchange (or heat transfer) coefficient, thermal stratification factor, dispersion coefficient, and the local meteorology. Ambient river temperature shall be determined during the measurements with the three boats by means of a continuous temperature recorder placed far enough north of the Indian Point site to avoid influence of the site thermal discharges and those from other plants affecting the survey area.

D. Analysis

The near field measurements shall be compared to the results of the undistorted hydraulic model and the submerged discharge mathematical model. The far field measurements shall be compared to the distorted physical model and the far field mathematical model. The result of both the far field and near field shall be integrated to present the spatial and temporal temperature distribution in the river. Any modifications with justifications needed in either the physical models or the mathematical models shall then be incorporated.

4.1.1.a.4 Reporting Requirements

Specific details of the types of measurement, the schedule of measurements, the number and location of sampling stations to be used, the data taken in the above specifications and the temperature measurements taken shall be presented and reported in accordance with the requirements of Section 5.6.1.2, Semiannual and Special Environmental Operating Reports.

A progress report of the monthly surveys shall be submitted to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, as required by Section 5.6.1.2. Reports on the routine surveys submitted to the New York State Department of Environmental Conservation shall also be submitted at the same time to the Director of the Office of Nuclear Reactor Regulation (i.e., within 90 days of the completion of each of the routine surveys). A report on the intensive surveys shall be submitted to the Office of Nuclear Reactor Regulation within 12 months after completion of each intensive survey.

Reporting Requirements (Continued)

The final report shall include a complete evaluation of observed data with respective to predictive mathematical and hydraulic models regarding assumptions and parameters used in the models presented previously in the licensee's environmental report and supplements. Any modifications or adjustments made to previous assumptions and parameters used will be presented and justified. Revisions of temperature distributions as appropriate from data gathered shall be presented and justified. Incremental effects of thermal discharges from Indian Point Plants as distinct from those from the other plants on the river shall be determined and reported.

Basis

Consolidated Edison Company has initiated a program that entails an extensive thermal monitoring survey in the neighborhood of Indian Point. Thermal plume measurements will be made to: (1) determine the extent and intensity of the thermal plume as a function of time and compare with the applicable thermal criteria; (2) supplement previous studies and provide information to verify the mathematical and physical hydrothermal models; (3) compare the model analyses with the measured response of the river to the heat load from Indian Point, and enable the licensee to improve the models for predicting the intensity and extent of the thermal plume and demonstrate compliance with applicable criteria through the above specification, under anticipated average and severe conditions.

By using mathematical and hydraulic models, predictions of the intensity and extent of the thermal plume will be compared to the prototype thermal plumes. The program is divided into four task areas: (A) near-field measurements (B) far-field measurements, (C) measurement of river parameters, and (D) analysis of results.

The experimental design task will be formulated to include the necessary plant operating and discharge conditions, parameters to be measured, etc. The near-field measurements will require three-dimensional temperature and velocity patterns over several tidal cycles within several hundred feet of the outfall. Results will be compared to the Indian Point undistorted hydraulic model and to the submerged-discharge mathematical and hydraulic models in order to predict the results of the operation of three Units. Details of such models are described in References 4.1-1 through 4.1-7.

Basis (Continued)

Infrared overflights performed while Indian Point Unit No. 1 was operating in conjunction with the Lovett Plant have indicated that the critical tidal phase, with respect to the surface area and surface width limitations of the New York State thermal criteria, is in the slack period of low tide (Reference 4.1-1). Transects will be made within the Indian Point-Lovett region during the period to determine if the Indian Point facility is operating in compliance with applicable criteria by actual measurements in the river. Temperature measurements in the region of the near field plume during the months of July and August will demonstrate whether the Indian Point facility is operating within the maximum surface temperature limitations delineated by the New York State thermal criteria. To determine compliance with applicable thermal criteria, it will be necessary to determine the ambient temperature and the incremental effects of the Indian Point operations, and the incremental effects of thermal discharges of other plants that may have influence in the area of discharge from the Indian Point facilities. All compliance activities will relate to the ambient river temperature and not the site temperature as may be experienced at Indian Point. Thus, the ambient river temperature will be determined during the measurements with the boats by means of a continuous temperature recorder placed far enough north of the Indian Point site to avoid influence of the site. Care will be taken to have the power plants operating at high power loads and for sufficient length of time before each survey starts in order to have the river system as close to equilibrium with respect to the heat added as possible.

By determining the location and extent of the thermal plume, fish and other aquatic life can be protected from thermal blocks during migration of the fish up and down the river. By limiting the thermal discharges from the Indian Point Station, the discharges will not be injurious to fish or shellfish or the culture or propagation of a balanced indigenous population in the Hudson River.

References

4.1-1 Quirk, Lawler and Matusky Engineers, "Effect of Submerged Discharge of Indian Point Cooling Water on Hudson River Temperature Distribution," October 1969, Appendix M, Supplement No. 1 to Environmental Report, Indian Point Unit No. 2, Docket No. 50-247, September 9, 1971.

4.1-2 Ibid. "Supplemental Study of Effect of Submerged Discharge of Indian Point Cooling Water on Hudson River Temperature Distribution," May 1972, submitted as Appendix EE, Supplement No. 3 to Unit No.3 Environmental Report, Docket No. 50-286, October, 1972.

4.1-3 Testimony of John P. Lawler, Quirk, Lawler and Matusky Engineers, "The Effect of Indian Point Units 1 and 2 Cooling Water on the Hudson River Temperature Distribution," April 5, 1972, Docket No. 50-247.

4.1-4 Ibid, "The Thermal Effects of Indian Point Cooling Water on the Hudson River," February 5, 1973, Docket No. 50-247.

4.1-5 Alden Research Laboratories, "Indian Point Cooling Water Studies: Model No. 2, May 1967, Appendix O, Supplement No. 1 to the Environmental Report for Indian Point Unit No. 2, Docket No. 50-247, September 9, 1971.

4.1-6 U.S. Nuclear Regulatory Commission, Final Environmental Statement Related to the Operation of the Indian Point Nuclear Generating Plant, Unit No. 3, Docket No. 50-286, February 1975.

4.1-7 Consolidated Edison Company of New York, Inc, Environmental Report and Supplements for Indian Point Unit No. 3, Docket No. 50-286.

4.1.1b Meteorological Monitoring

Objective

The objective of meteorological monitoring is to adequately measure and document meteorological conditions at the site and to satisfy the requirements of the Emergency Plan for Indian Point.

Specification

4.1.1.b.1 The meteorological monitoring system shall be continued at Indian Point and shall satisfy the requirements of the Emergency Plan for Indian Point (FFDSAR for Indian Point No. 2, Vol. 6, Response to Question 12.5.). Wind speed, wind direction and temperature difference instrumentation shall be maintained at up to 100 feet AGL with at least one temperature sensor and wind sensor at the top of the tower. Important parameters (wind speed, wind direction, and ΔT) shall be available in the control room. Another set of sensors shall be located approximately 33 feet AGL. Both sets of instruments shall meet the recommendations for accuracy in Regulatory Guide 1.23, Onsite Meteorological Programs.

4.1.1.b.2 Reporting Requirements

Meteorological data shall be summarized and reported in a format consistent with the recommendations of Regulatory Guides 1.21 and 1.23. Quarterly data summaries shall be submitted to the Director of Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 as outlined in Section 5.6.1.2 Reporting Requirements. If the outage time of any of the meteorological instruments exceeds seven consecutive days, the total outage time and dates of outage, the cause of the outage and the instrument(s) involved shall be reported within 30 days of the initial time of the outage to the Office of Inspection and Enforcement and a copy to the Director of Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Any modifications to the meteorological monitoring program as described above shall have the written approval by the Director of Office of Nuclear Reactor Regulation, USNRC, prior to any modifications.

Bases

The collection of meteorological data at the plant site will provide information which may be used to develop atmospheric diffusion parameters to estimate potential radiation doses to the public resulting from actual routine or accidental releases of radioactive materials to the atmosphere. A meteorological data collection program as described above is necessary to meet the requirements of subparagraph 50.36a(a)(2) of 10 CFR Part 50, Appendix E to 10 CFR Part 50, and 10 CFR Part 51.

.1.2 Biotic

.1.2a Aquatic

.1.2a(1) General Ecological Survey

Applicability

Applies to measurements taken on aquatic biota in the Hudson River as they interact with plant operations of the once-through cooling system.

Objectives

The major objectives of the Indian Point General Ecological Survey and Special Studies program are to secure data needed to evaluate the effects of operation of the once-through cooling system of the Indian Point Units Nos. 1, 2, and 3 on the Hudson River ecosystem, and to devise means and methods for minimizing adverse effects. (See Reference 4.1-8.)

Specific objectives of the Indian Point General Ecological Survey and Special Studies program are to obtain data needed to:

(i) determine the biological significance of entrainment of certain species of ichthyoplankton and macrozooplankton in the coolant water passing through the CWS of Units Nos. 1, 2 and 3;

(ii) determine the population impact of fish impingement of certain fish species at the intakes of Indian Point Units Nos. 1, 2 and 3;

(iii) determine the biological significance on the Hudson River ecosystem of thermal and chemical additions from Indian Point Units Nos. 1, 2 and 3;

(iv) determine the biological significance on the Hudson River ecosystem of aquatic organisms passing through or being attracted to the thermal plume and/or into the effluent canal or intake;

(v) identify the species which can be used as key indicators and establish the biological sampling and analytical methods for laboratory and field studies to indicate as early as possible and as accurately as possible the magnitude of impact from once-through cooling on the aquatic ecosystem.

4.1.2a(1) Specification

A. General Ecological Survey Program

(i) Microzooplankton
For the period May through November, duplicate samples shall be collected every two weeks by compositing equal aliquots from each five (5) foot depth interval at station locations 1-7 (Fig. 4.1-1). Density in number of microzooplankton per liter shall be determined. Appropriate analyses of spatial and temporal variations in density shall be made.

(ii) Macrozooplankton
For the period May through November, duplicate samples shall be collected every two weeks with a one-half meter plankton net at stations 1-7 (Fig. 4.1-1). Three one-half meter nets shall be towed simultaneously; one just below the surface, one at mid-depth and one approximately two feet above the bottom. Duplicate samples shall be collected both during the day and at night. Organisms shall be identified by species to the extent practicable. Density in number per thousand m^3 for all macrozooplankton species combined and for each of the dominant species shall be determined. Appropriate analyses of spatial and temporal variations in density shall be made.

(iii) Fish

Adult and immature fish

Surface trawling shall be conducted biweekly from approximately July through November and bottom trawling shall be conducted biweekly from approximately April to November at the stations 1-7 (Fig. 4.1-1) and at other stations selected to adequately sample River Regions 1, 2 and 3 (Fig. 4.1-1). Beach seining shall be conducted from approximately April through November on a weekly schedule at stations 8-14 (Fig. 4.1-1) and biweekly at other stations selected to adequately sample River Regions 1, 2 and 3 (Fig. 4.1-1). The number of striped bass, white perch and tomcod shall be determined. Average length and weight for these three species shall be determined using statistically appropriate subsampling. Numbers by length classification shall be determined from statistically appropriate subsampling for all other species. Appropriate comprehensive analyses of the spatial and temporal distributions of dominant species shall be made.

4.1.2a(1) Specification (Continued)

Ichthyoplankton

Weekly sampling shall commence within three days after the mid-channel bottom temperature in the vicinity of Indian Point increases in the spring to 52°F (11°C). Sampling shall be continued on a weekly schedule through July. Sampling shall be conducted at stations 1-7 (Fig. 4.1-1) with three one-half meter plankton nets which are towed simultaneously: one just below the surface, one at mid-depth, and one approximately two feet above the bottom; duplicate samples shall be collected both during the day and at night. Additional ichthyoplankton samples shall be collected throughout River Regions 1, 2 and 3 by means of an epibenthic sled and Tucker trawl based on a stratified randomized sampling design.

Numbers per thousand m^3 shall be determined for white perch and Atlantic tom cod. Numbers of each life stage per thousand m^3 shall be determined for striped bass. Appropriate comprehensive analyses of the spatial and temporal variations in density of the various life stages of striped bass, relative to dominant environmental parameters, shall be made. Comparable analyses of other dominant ichthyoplankton, identified to species to the extent practicable, shall be made.

B. Administrative Controls on Schedule and Changes

The General Ecological Survey shall be conducted for the first two years of full power operation of Unit No. 3. The duration shall be extended one year for each year in which operation of Unit No. 3 is not achieved at at least 40% of rated power for 45 or more full days during the period from May 15 to July 31 in each calendar year.

The General Ecological and Special Studies programs shall not be terminated without prior review and approval by the Director of Office of Nuclear Reactor Regulation. Changes involving sampling locations, frequency and methodology, shall not be implemented without prior review and approval by the Director, Office of Nuclear Reactor Regulation. Any requested change submitted shall include a thorough documentation of the basis for the proposed change.

Reporting Requirements

The licensee shall submit special semiannual reports as outlined in Section 5.6.1.2 on reporting requirements for this program including any changes in the program.

4.1.2a(1) Bases

The overall program of the General Ecological Survey and Special Studies started in 1972 and has been conducted during operation of Units Nos. 1 and 2. Since Unit No. 3 did not start operation in 1975, the ecological studies in terms of collection of field data beyond 1975 is needed, particularly in view of the expected impacts from the added operation of once-through cooling of Unit No. 3 and the need to collect at least two years of field data in accordance with the Stipulation, dated January 15, 1974. See the Final Environmental Statement for Indian Point Unit No. 3.

The General Ecological Survey of the aquatic environment in the vicinity of the Indian Point facility will provide additional information necessary to compare preoperational data with operational data. In addition, the study program contains suitable control sampling locations to afford a second reference for comparison effects. The program as designed should differentiate between normal variability and Station-induced changes. Biological changes in the aquatic ecosystem that may result from Station operation (e.g., changes in organism distribution, abundance and species composition) should be detected by the monitoring program, and an evaluation of these changes with other concurrent studies will allow a determination of the Station impact.

4.1.2a(2) Entrainment of Organisms

Applicability

Applies to determining and reporting the types and quantities of organisms entrained in the water passing through the condenser cooling water system and evaluating the losses on the population.

Objective

The purposes of the entrainment study are: (i) to determine the types and quantities of macrozooplankton, and fish eggs and larvae which pass through the condenser cooling water system of Units Nos. 2 and 3; (ii) to determine the effect of passage on their survival; and (iii) to determine for certain fish species if losses observed from condenser passage will create adverse effects on the existing populations in the receiving water.

Specification

A. Entrainment Measurements

Sampling to determine the number and the mortality of macrozooplankton and ichthyoplankton passing through the CWS of Unit No. 3 shall be conducted for two spawning seasons following initiation of commer and operation of Unit No. 3. For comparative purposes, sampling shall be conducted at Unit No. 2 during the same time sampling is conducted at Unit No. 3 and shall coincide with striped bass ichthyoplankton sampling at stations 1-7 (Fig. 4.1-1). Collections shall be made with appropriate gear at one intake at Unit No. 3, at station D-1 (Figure 4.1-2), and a station in the common discharge canal (D-2) (Figure 4.1-2).

Macrozooplankton and ichthyoplankton samples shall be taken at the condenser water boxes at Unit No. 2 or 3 corresponding to the intake bay sampled when needed to distinguish between effects of temperature and chlorination. Sampling shall be conducted during the same time stations 1-7 (Figure 4.1-1) are sampled for ichthyoplankton. The entrainment sampling shall be of sufficient intensity so as to produce statistically reliable data. Macrozooplankton and ichthyoplankton shall be identified as to species to the extent practicable. Densities in numbers of organisms per thousand m^3 shall be determined. Comprehensive analyses of number and mortality of macrozooplankton and of striped bass, ichthyoplankton by life stage will be made. Comparisons of the density of the entrainable striped bass life stages passing through the CWS of Units Nos. 2 and 3 with the density of comparable life stages collected at stations 1-7 (Figure 4.1-1) shall be made.

4.1.2a(2) Specification (Continued)

Analyses shall consist of species composition, abundance, and counts of live, stunned and dead ichthyoplankton and macrozooplankton in all samples as soon as possible after collection. Additional analyses shall be done 24 hours later in representative samples.

Sampling shall also be conducted when the ΔT_c is greater than 16F° (see Section 2.1-1) to determine the entrainment effects at increased temperatures, provided operation at reduced flow occurs when striped bass eggs and larvae are present in the Hudson River.

B. Administrative Controls on Schedule and Changes

The entrainment sampling program shall be conducted for the first two years of full power operation of Unit No. 3. The duration shall be extended one year for each year in which operation is not achieved at at least 40% of rated power for 45 or more full days during the period from May 15 to July 31 in each calendar year.

Entrainment sampling programs shall not be terminated without prior review and approval by the Director of Office of Nuclear Reactor Regulation. Changes involving sampling locations, frequency, and methodology shall not be implemented without prior review and approval of the Director of Office of Nuclear Reactor Regulation. Any requested change submitted shall include a thorough documentation of the basis for the proposed change.

Reporting Requirements

Results of the entrainment study including any changes to the study shall be summarized and reported in accordance with Section 5.6.1.2, Special Environmental Operating Report.

Bases

The biological significance of macrozooplankton and ichthyoplankton being drawn or attracted into the intake canal is being quantitatively determined by measuring spatial and temporal distribution of planktonic organisms, applying these densities to the actual water mass subject to entrainment, comparing these entrainment values with observed densities of entrained organisms, and finally establishing the immediate and delayed effects of entrainment (passage) of non-screenable organisms through the condenser system of the plant. The entrainment studies will be used to determine the values for the cropping factor fc for different life stages of striped bass. Such information will be used in the striped bass young-of-the-year models to determine the magnitude of damage to the striped bass population from once-through cooling of Units Nos. 1, 2 and 3. Sampling in the river required to determine if losses from condenser passage adversely affect the existing striped bass population in the Hudson River is provided by Specification 4.1.2a(1) and (4). (References 4.1-10 and 4.1-11)

4.1.2a(3) Impingement of Organisms

Applicability

Applies to determining and reporting the number, length, weight and species of fish killed by impingement at the site's intake screens and evaluating impingement with respect to the impact on the Hudson River fish population.

Objective

The objectives of the impingement studies are to provide:

(i) estimates of the number, length, weight and types of species of fish killed by impingement on individual intake screens

(ii) a limit on the number of fish collected on the traveling screens

(iii) a study and evaluation of the causes of impingement

(iv) an evaluation of the effectiveness to reduce impingement by fish protection devices such as the air bubbler or other techniques

(v) a schedule for reporting of data on fish collected at the intake screens for all Units

(vi) an evaluation of the ecological significance of the effects of fish impingement on population density, size, abundance and diversity of the fisheries of the river.

Specification

A. Impingement Monitoring Program

(i) Daily collections shall be taken at each Unit by rotating and backwashing each traveling screen for at least 15 minutes. At Unit No. 1 or 2, collections shall be taken when the respective fixed screens are raised and backwashed (i.e. at least once per day). Fixed and traveling screen washings are required only when the corresponding circulating pumps are in operation, and prior to routinely taking a pump out of operation.

4.1.2a(3) Specification (Continued)

(ii) All fish will be collected from each traveling screen washing at Indian Point on a daily basis. Total numbers and weights of white perch, striped bass and Atlantic tomcod (during the spawning season) will be recorded for each unit daily. Sub-samples will be taken of all other species to establish a numbers-weight relationship. An estimate of total numbers shall be derived by recording total weight by species and converting to total numbers using the numbers-weight relationship. Fishes will be collected from each screen individually and an estimate made of the percentage (on a weight basis) of the total collected by screen. For those species selected for subsampling a representative range of sizes shall be sampled. The fixed screens shall be washed at least once per day. The traveling screens shall be run at the time the fixed screens are raised and back-washed. The estimated number and species of fish washed off the fixed screens which do not enter the forebay shall be estimated.

(iii) If the number of fish collected as determined in (ii) above exceeds 10,000 per day for seven consecutive days or 30,000 per day for three consecutive days or 40,000 in a single day, immediate corrective action shall be taken to reduce the number to below these levels. This limit shall apply to the total number of fish impinged at Unit Nos. 1, 2 and 3 together. (Fish impingement numbers are subject to the evaluation required under Reporting Requirements (d)(1) Page 4.1-18). The fish collected at Unit 1 shall not be included in the total station counts and shall not apply to the environmental protection conditions described in this paragraph when the submerged Weir Feasibility Study is being conducted.

(iv) The causes of fish impingement shall be evaluated, including the magnitude of the approach and intake velocity. During the first 180 days after issuance of license for operation of Unit No. 3, the water velocity profile across the outer (traveling) screens, as was required for Units Nos. 1 and 2, shall be determined. Velocity determinations shall be made at full flow and reduced flow and shall include measurements from at least two intake forebays.

Specification (Continued)

Measurement at each forebay shall be made as close as possible to the outer traveling screens at Units Nos. 1 and 2 and shall include at least four determinations over a tidal cycle (high and low tide shall be included). The results of the velocity profile study shall be submitted in accordance with the evaluation required under Reporting Requirements d(1) pg. 4.1-18 and shall include a detailed description of the study, methodology, and procedures used, results and conclusions reached as to the relationship between intake velocity and fish impingement.

(v) Except when out of service for maintenance, the air bubbler system for Units Nos. 1 and 2 shall be operated in front of the outer intake screens in accordance with the New York State Department of Environmental Conservation requirements. Operational experience of the air bubbler at Units Nos. 1 and 2 to prevent fish from being attracted to the intake screen and the effectiveness to reduce impingement by other fish protection devices shall be documented. Operating procedures shall be developed for air bubblers to obtain the optimum mode of performance for meeting the intended purposes of keeping fish away from the intake screens.

B. Administrative Controls of Schedule and Changes

The impingement monitoring shall be conducted throughout the period of once-through cooling of Unit No. 3.

Impingement monitoring programs shall not be terminated without prior review and approval by the Director of Office of Nuclear Reactor Regulation. Changes involving sampling locations, frequency, and methodology, shall not be implemented without prior review and approval of the Director of Office of Nuclear Reactor Regulation. Any requested change submitted shall include a thorough documentation of the basis for the proposed change.

Reporting Requirements

(a) If compliance with Specification (iii) requires a power reduction at the facility which results in an emergency need for power in the licensee's service system, the limits may be exceeded. Under these circumstances, the licensee shall inform the Region I Office of Inspection and Enforcement within 24 hours of the anticipated length of time and magnitude of the variation from the limits. Within 10 working days after the termination of the emergency power need, the licensee shall submit a report to the Director of Office of Nuclear Reactor Regulation documenting the evidence of an emergency need for power, the reasons for exceeding the limits, and the extent of the environmental impact.

Reporting Requirements (Continued)

(b) The licensee shall submit to the Region I Office of Inspection and Enforcement and a copy to the Director of Office of Nuclear Reactor Regulation by the 10th working day of the following month, a monthly report tabulating the daily records of fish collection at the Indian Point Facility. The report shall include the daily number, species breakdown, and total weights, and describe any corrective action taken to comply with Specification (iii) to keep the fish loss within the limits of the specification.

(c) Records of daily fish kills and reportable kills in Specifications (ii) and (iii) shall be kept and summarized in monthly reports for inspection and submitted in accordance with (b) above.

(d) By the end of the 6th month after spring recapture for the first full year class following the beginning of commercial operation of Unit No. 3, the licensee shall submit a report to the NRC describing the following:

(1) The ecological significance of the effects of fish impingement on population density, size, abundance, and diversity of the fisheries of the river as a function of plant operating variables. The evaluation program shall include a review of the parameters investigated in Sections 4.1.2a(1) and (4) and consideration of fish impingement experience at Units Nos. 1, 2 and 3 for the first 12 months following the beginning of operation of Unit No. 3. These shall include biological monitoring and population dynamics of selected fish movements and other ecological parameters. Environmental factors such as temperature, river flow, salinity and plant operational variables which influence the extent of fish impingement shall be evaluated.

(2) The effectiveness of the air bubblers at Units Nos. 1 and 2, reduced flow, and other operating procedures to reduce these impingement losses.

(3) The adequacy of this Specification 4.1.2a(3) and need for the implementation of any proposed design changes (e.g., common intake system).

Bases

Monitoring of impinged fish at the Indian Point Station will assure that the majority of fish killed will be identified and enumerated. The identification, counting and length-weight data obtained for all impinged fish of importance will assure documentation for expected fish losses resulting from normal three Unit operation. (References 4.1-12 and 4.1-13.)

Bases (Continued)

The limits on fish impingement (Specification (iii)) are established subject to revision based on the Station's operating experience and on the licensee's continuing efforts to reduce impingement and to evaluate the ecological significance of the losses.

The impingement losses of striped bass, white perch and other fish of importance will be compared with values obtained from previous fish kills at the Station since the mid-1960s. In addition, impingement data will aid in determining any effects of impingement on population levels, species abundance and diversity of the Hudson River fishery. Impingement of fish at maximum established rates in Specification (iii) for periods up to several days should not be considered to imply adverse effects on the fishery; rather it should be considered as indicative of a sufficient change from past experience to warrant corrective action to reduce the number impinged until further definitive information is available on the impact of impingement losses on the fishery. Results of intake flow reduction by the Station during the wintertime and operation of the air bubbler curtains shall be evaluated in terms of their feasibility to reduce impingement. Studies of the fishery will indicate whether fish losses currently being experienced at the Station are compatible with maintaining the existing species composition of the fishery and population numbers. Specific studies described in Section 4.1.2a(4) on the ecology of the existing fishery are continuing in order to evaluate (1) the significance of limits of impingement and (2) methods of further reducing the loss of fish at the plant. Thus, these studies will permit a more definite assessment of the biological significance of impingement losses at the intake screens.

Pending development of information from the General Ecological Survey (Section 4.1.2a(1)), and Special Studies (Section 4.1.2a(4)), this specification provides a mechanism for: (1) limiting the number of fish impinged at the Station, (2) providing the NRC's staff with a means of being kept currently advised of the number of fish being collected at the intake screens, and (3) determining what further methods can be developed to reduce impingement.

The limits provided in Specification (iii) will aid in the development of operating procedures and corrective actions to be taken to minimize the Station's impact on the fishery resources.

4.1.2a(4) Special Studies

Applicability

In conjunction with the General Ecological Survey (Section 4.1.2a(1)), a number of field and laboratory studies are being conducted to aid in determining the ecological impact of the Indian Point facility. Some of the studies have been completed during operation of Units Nos. 1 and 2. Certain studies are being extended to secure information for determining the effects of interim once-through cooling operation of Unit No. 3.

Objective

(i) To determine the major elements of the population dynamics of the striped bass (Morone saxatilis) and to evaluate the population effects of entrainment and impingement on striped bass by the use of mathematical models involving both spatial dependence (either 1- or 2- dimensional) and time dependence.

(ii) To determine the major elements of the population dynamics of white perch (Morone americanus) and to evaluate the population effects of entrainment and impingement on white perch.

(iii) To determine the efficiencies of the sampling equipment used to collect the ichthyoplankton life stages of striped bass.

(iv) To determine if a submerged weir will reduce the impingement of bottom oriented fish.

Specification

The following studies are being performed as described in Reference 4.1-8, and are following general procedures described in References 4.1-14, 4.1-15 and the additional references attached to the Bases.

A. Population dynamics of the striped bass and white perch which shall include:

(1) determination of relative and absolute population densities by: (See Section 4.1.2a (1)A(iii) for monitoring program)

4.1.2a(4) Specification (Continued)

(a) Catch per unit effort in the vicinity of Indian Point by use of trawls and seines at stations located in Regions 1, 2, and 3. (Figure 4.1-1).

(b) Mark-Recapture method using differential marking in different zones of the estuary to estimate the number of Age Group 0 and of Age Group I striped bass and white perch present in the areas of the Hudson River adjacent to Indian Point.

(c) Combined use of catch/effort and mark-recapture methods in order to calculate approximate values of absolute abundance of fish for previous years.

(d) Egg deposition and pelagic larvae population estimates of striped bass and larvae population estimates of white perch, based on data taken from stations covering at least River Regions 1, 2 and 3 (Figure 4.1-1).

(2) determination of natural survival and mortality rates for striped bass and white perch,

(3) determination of the relative concentrations of striped bass eggs and larvae susceptible to entrainment (f factors) for striped bass,

(4) determination of age composition and individual growth rates for the two populations,

(5) determination of sexual maturation as a function of age, body size, and sex for both populations,

(6) determination of population sex ratios for both populations,

(7) determination of food habits for both populations,

(8) determination of reproductive rates for both populations,

(9) determination of migratory habits of Age Group 0 fish, particularly as these habits relate to the susceptibility to longitudinal transport and their tendency to concentrate in the shoal areas for both populations,

Specification (Continued)

(10) determination of size frequency distribution for both populations.

B. Determination of the behavioral and physiological responses of selected nektonic and planktonic organisms to plant thermal discharges which shall include:

(1) Determination of the thermal preferences, avoidances, and upper and lower tolerance temperatures and the impact of thermal shock on different life stages of selected fish species.

(2) Determination of active respiration rates in the laboratory for selected fish species in order to evaluate the effects of thermal discharges on secondary production rates.

C. An evaluation of the relative efficiencies of the various ichthyoplankton gear types used to collect striped bass in the river, in the intake forebay, and in the discharge canal shall be made. Evaluation shall be made of the comparability of the estimates of densities as derived from sampling with each gear type. This evaluation shall be conducted by statistically appropriate sampling conducted during the time period striped bass eggs and larval stages are present. Sampling shall be conducted over a sufficiently long period of time to provide an assessment of changes in gear efficiencies as the striped bass larvae develop.

D. An evaluation of loss of impinged fish in the screen washing process in order to establish a correction factor to adjust daily counts of impinged fish. The method used to establish the correction factor sha be described in a report to be submitted no later than 90 days following the first 6 months of commercial operation of Unit No. 3.

E. A study of the effectiveness of a submerged weir in reducing impingement is to be performed as described in References 4.1-24 and 4.1-25. The NRC shall be notified within 24 hours of initiation of the test. The maximum duration of it shall be 180 days. The tasks (Task 1 and Task 2) in Reference 4.1-24 a do not apply and are replaced by the following:

Task - Monitor fish impingement at Unit No. 1 for twenty three-day periods (60 days total), alternating periods with and without partially blocked intakes. The flow rate through Unit No. 1 intake shall be maintained constant during the study. The study will be terminated prior to 180 days only if the data collected show that the blockage is not effective in reducing impingement, or if the total number of fish impinged on any one day exceeds 6,000. Fish impingement shall be monitored in accordance with Environmental Technical Specifications.

F. Administrative Controls on Changes

The Special Studies shall not be terminated without prior review and approval by the Director of Office of Nuclear Reactor Regulation. Changes in sampling locations, frequency and methodology, shall not be implemented without prior review and approval by the Director of Office of Nuclear Reactor Regulation. Any requested change submittal shall include a thorough documentation of the basis for the proposed change.

Reporting Requirements

Program reports of the data collected in field surveys and laboratory studies and the evaluation of the data with respect to this Specification shall be presented to the Director of Office of Nuclear Reactor Regulation within six months after completion of each annual study effort in accordance with Section

5.6.1.2. Any changes to the program shall also be described in these special reports. Estimates of fish lost during collections as determined in Specification (i) shall be used to establish a correction factor to adjust daily counts. The method used to establish the correction factor shall be described in a report to be submitted no later than 90 days following the first 6 months of operation of Unit No. 3.

Bases:

I. Population Dynamics

Fish population parameters change in predictable ways as a result of serious exploitation: population density and survival rates decrease; reduced recruitment causes a predictable decline in the relative abundance of certain age groups in subsequent years as reflected in age frequency distribution data; growth rate increases if food is limited; and sexual maturity may be attained at young ages. A data base exists from which each of these responses can be contrasted before and after operation of Indian Point Units Nos. 2 and 3. Table 4.1-1 indicates the various population estimates for different life stages of striped bass and white perch.

A. Population Density

Five different measures of fish population density are available:

Catch/Effort trawl data - relative abundance

Catch/Effort seine data - relative abundance

Mark-Recapture population estimates - absolute abundance

Egg deposition estimates - absolute abundance

Pelagic larvae estimates - absolute abundance

(1) Catch/Effort Data

The number of fish caught by a standardized amount of fishing effort using standardized collecting gears is an index of relative abundance of the fish population. Such an index is one of the longest established and most widely used types of data in the study and management of fish populations. Catch per unit of fishing effort - or catch/effort, the term used here - has been used to monitor changes in abundance from year to year and place to place in such widely differing situations as the great high seas fisheries of the world and local, hook and line, sport fisheries.

Bases (Continued)

(2) Mark-Recapture Population Estimate

Unlike the catch/effort data which are indices of relative abundance, the mark-recapture methods provide estimates of absolute numbers in the population, and date back to the the 19th century in fishery work (Reference 4.1-12). They have been applied to fish populations in almost every conceivable situation - small streams, large rivers, ponds, lakes, high seas. Similar methods are used to estimate the North American continental duck population and have been applied to insect and mammal populations. (Ref. 4.1-12, through 4.1-20.)

The developmental work of 1972 has proven that large numbers of young white perch and striped bass can be successfully marked and released in healthy condition in the Hudson estuary to provide a basis for estimates of population size. Separate population estimates can all be made for different age groups and size groups of fish, and for zones extending various distances from the Indian Point Station. A full scale mark-recapture program was conducted in 1973. The results of this program are available.

(3) Combined Use of Catch/Effort Data and Mark-Recapture Population Estimates

Catch/effort data are being collected in the same general localities and within the same time periods in which the mark-recapture data for population estimates are being collected. A relationship between these two types of population data can be developed where the two are collected in parallel, and this relationship can be applied to the catch/effort data of earlier years (1969, 1970, 1972) to calculate approximate values of absolute abundance of fish. In addition, the population, age, and length distribution of juveniles in the shoal and shore areas relative to the channel areas are being determined as part of the longitudinal transport survey of the striped bass.

(4) Egg Deposition and Pelagic Larvae Estimates

Additional estimates of the size of striped bass populations, completely independent of the mark-recapture work described above, are being made by estimating total egg deposition and abundance of the pelagic larvae and reconstructing (with the use of age structure, sex ratio, sexual maturation and fecundity data) the adult population size required for the spawning observed. While the promise of success of mark-recapture population estimates rising from work to date makes these estimates based on egg deposition less critical, they nevertheless constitute a valuable independent check on the mark-recapture work, and increase overall confidence in the assessment of fish population size. The estimate of striped bass eggs, and both striped bass and white perch larvae are being made using

Bases (Continued)

improved collecting gear and appropriate stratification of samples in time and space to provide population estimates applicable to the Indian Point region in particular, and the entire main spawning area of striped bass in the Hudson estuary.

B. Application of Population Data

Some important relationships among the different population data being collected for the Hudson Estuary fishes are:

(1) catch/effort data extended over 1969-1970, 1972-1975, and during interim operation of Unit No. 3 include the largest number of age groups of striped bass and white perch; and include comparative indices of relative abundance for other fish species. For maximum value, catch/effort data must be corrected for size and species selectivity by utilizing data collected during mark-recapture studies.

(2) catch/effort data for all years can be used to calculate approximate values for absolute size of fish populations by the use of conversion factors developed from those years in which catch/effort data were collected concurrently with mark-recapture population estimates.

(3) mark/recapture data provide direct estimates of absolute abundance of fish. These estimates will be available from the three study regions. The recapture on the water intake screens of the Indian Point Units Nos. 1, 2, and 3 of fish differentially marked in zones of increasing distance from the plant can provide a basis for estimating of the fraction of the fish population in each zone which is impinged.

(4) estimates of the numbers of eggs spawned in the Hudson by the striped bass population can provide a basis for calculation of the size of the parental stock. This reconstruction of population size can be used to verify the mark-recapture estimates.

(5) measurements of important environmental variables concurrently with fish population estimates may be used to account for the naturally occurring fluctuations in fish population size which tend to obscure the true effects of power plant operation.

Bases Continued

II. Mortality and Survival Rates

Collections of white perch and striped bass obtained from the standard trawl and seine stations are separated into size groups and a subsample of each size (if available) is randomly picked for age determination by scale analysis. Both species show clear annuli and can be aged quickly and reliably so that relative age structure can be determined.

Both data on relative abundance of successive age groups, as obtained from catch/effort study, and data on absolute abundance, as obtained from mark-recapture, egg deposition, and fish larvae estimates can be used as a basis for calculating mortality rate, and its complement, survival rate. Data on early life stages of striped bass can be used to determine the probability of natural survival to each successive life stage (i.e., egg through Juvenile II).

A. Calculations of Survival Rate

Taking the data from the entrainment studies discussed in Section 4.1.2a(2) together with the survival data based on population estimates, the following sequence of calculations with the confidence limit for each measurement is being carried out:

(1) the number of eggs spawned in the estuary;

(2) the size of the larval population;

(3) from the entrainment study, the density of eggs and larvae in the immediate vicinity of the power plant water intake;

(4) from (1), (2) and (3) the fraction of the population of eggs and larvae subjected to the influence of the water intake;

(5) from the entrainment study, the number of fish entrained and the number passing alive through the cooling system - hence, the survival rate for entrained fish; these data can be integrated with those from laboratory studies of the impact of the physical-chemical conditions of entrainment upon young fish;

Bases (Continued)

(6) from (1), (2), and (5) the fraction of the population killed during early life history stages by entrainment;

(7) from (1), (2), and estimates of juveniles (J_{II}, J_{III}), and Age Group I fish obtained from mark-recapture and catch/effort studies, the total mortality rates for each successive stage of the early life history: development of a survivorship curve can allow some useful interpolations, as for the J_I stage;

(8) from (6) and (7) by the use of standard actuarial calculations for survival under exposure to competing risks of death, the survival rate for each early life history stage in the absence of the operation of the power plant (note that Units Nos. 1, 2 and 3 effects can be treated separately here and all three can be differentiated from background natural mortality);

(9) from (7) and (8) the decrease in survival during the early life history due to operation of Indian Point Units Nos. 1, 2 and 3.

The calculations of the fraction of the year class affected by entrainment are sensitive to the natural fluctuations in year-class strength which complicate interpretation of population density changes. Entrainment affects a certain proportion of the fish population and is primarily a function of the fraction of the estuarine water withdrawn by the power plant cooling system. Appropriate allowance for non-random distribution of the fish and avoidance capability of the juveniles must be made, but again these phenomena are not believed to change because of year-class size.

The magnitude of natural mortality varies from year to year in the early life history stages, but is always quite high. The variations do influence the combined natural and power plant induced mortality, but the relationship can be predicted as in step (8) above for any observed or postulated natural mortality rate if the components of natural mortality are sufficiently quantified.

The spatial distribution of spawning and surviving young fish may vary, especially as a function of volume of freshwater discharge in the Hudson, and correlated physical and biological conditions.

Bases Continued

The spatial distribution of early stages of striped bass and white perch would influence the fraction of each year-class exposed to entrainment. By utilizing the population data discussed above in the models of the Hudson estuary striped bass population developed by Dr. John Lawler of QLM, (Reference 4.1-10), and by the NRC staff as presented in the Final Environmental Statement for Indian Point Unit No. 3, (Reference 4.1-11), the effects of any observed or postulated change in spatial distribution of spawning fish and early life stages of the progeny on the entrainment phenomenon can be readily predicted.

The simulation model is simply a device for assessing the outcome of joint operation of the many population phenomena described individually through the field studies. This comprehensive response of an integrated biological system to impact is complementary to assessments of the individual population phenomena empirically studied in the field.

B. Criteria for Assessing Impacts on Fish Populations

The following criteria for assessing the impact of Indian Point Units Nos. 1, 2 and 3 upon populations of striped bass and white perch are established. Each criterion is stated in terms of the symptoms of adverse impact.

(1) Decline in density of Juvenile II, Juvenile III, and Age Group I fish coincident with startup of Units Nos. 2 and 3 and not accounted for by changes in egg production of striped bass by parental stock or by environmental fluctuations.

(2) Large fraction of the population of eggs, larvae, or Juvenile I fish entrained and high mortality rate of entrained organisms.

(3) Substantial reduction in survival rate of striped bass from egg stage to Juvenile II, etc., accounted for by entrainment.

(4) Substantial percentage of stock from significant area of estuary impinged on intake screens.

(5) Lack of compensatory increase in survival rate among Juvenile II and Juvenile III fish following fulfillment of criterion (4).

Bases Continued

(6) Lack of compensatory increase in survival rate among Juvenile III to Age Group I fish following fulfillment of criterion (5).

(7) Increase in growth rate of fish. Note that increased growth rate is both a classical indicator of a substantial decrease in stock density (hence an indicator of adverse impact) and a compensatory response to reduction in density (hence an indicator of some capability of the fish stock to sustain itself in the face of increased mortality).

(8) Attainment of sexual maturity at an earlier average age. The note in (7) above identifying the criterion as an indicator of both adverse impact and compensatory capability of the population applies here as well.

(9) Continuing decline in population size or stabilization at an undesirably low level following a period of decline, as predicted by a simulation model of the striped bass population which integrated the empirical data from the ecological studies.

Acceptance or rejection of any of the above criterion must be based on an evaluation of the applicability of the criterion to the fish population being studied.

III. Biological Characteristics of Fish Populations

The biological characteristics of fish population being studied include racial composition, food habits, age composition, growth rate, and reproductive rate.

Identification of subpopulations and study of ecological relationships of major fish species was completed in 1973. These two studies provide additional information on the resident or migrating nature of the subpopulations (vital to estimates of population size) and their respective food habits. The report on this phase of work was completed by May 1, 1974.

The study of biological characteristics and health of fish populations can provide information as to the age and growth of fishes in the area, sexual maturation, sex ratio, and fecundity and may detect effects of once through cooling at Indian Point.

Bases Continued

Changes in age composition, growth rate, age at first sexual maturation, and fecundity are classical indicators of important changes in the mortality experience of fish stocks. The first two of these tend to have a historical character, often being detectable in the fish population for some time after their first occurrence. Additional comparative data on age composition and growth rates, predating 1969, are available from the New York University studies and from the New York Conservation Survey of 1936. All of these population parameters, when closely monitored, are useful in predicting population decline in advance of critical depletion. The first report of this phase of the work will be completed by October 1, 1975. The data are being collected and analyzed in such a way as to provide continuous monitoring of the fish populations with minimal lag time between field collecting and examination against previous population trends.

IV. Impact of Thermal and Chemical Effluents on Estuary

Measurements of the physical-chemical correlates of biological parameters have been made starting with April 1972 and will continue until January 1, 1976. It is essential that this information be gathered as supporting data relating to the condition, behavior and distribution of fish life. This information will be analyzed and factored into the final report issued from the study.

Thermal studies, attraction of fish to the discharge canal, infrared mapping of thermal plume, acute and chronic effects of temperature on survival and behavior of fish and benthic invertebrates have been investigated since April 1, 1972 and will continue until October 1, 1975. These studies are important to the success of the overall program but are not considered as critical in time as the population estimation part of the program. Studies of thermal preferences and the impact of thermal shocks on fish and invertebrates can be carried out simultaneously in the facilities available, and are planned for completion by 1975. They require a full year of effort due to seasonal changes in reactions to the organisms. The temperature avoidance study, which also required one year to complete, has been carried out in calendar year 1974. Active respiration rates have been determined to define chronic effects of temperature on key fish species.

The biological significance of thermal and chemical discharges from the plants can be determined by establishing the rate, quantity, and distribution of these discharges, and relating these to the densities and distributions of zooplankton and fishes, in the study area on a seasonal basis.

BASES Continued

The population dynamics, turnover rates, productivity, and species diversity of plankton organisms have been determined and will be used to evaluate the significance of plant operation on the ecosystem. Active respiration will also be used to evaluate the effect of predicted thermal discharges on secondary production rates of selected fish and benthos. These rates can be determined through laboratory experiments.

Biological behavior of organisms in the thermal plume will be correlated with the thermal plume measurements.

Plant production records provide data on the frequency of chlorination, concentrations and durations by season. Physical and chemical parameters are being measured in the intake bays and discharge canal and also at three transects (Figure 4.1-1): one from Verplanck southwest to Stony Point, one from Jones Point to Peekskill, and the third a V-shaped transect at Indian Point. The physical-chemical measurements (along with previous data) will define those physical and chemical properties of the estuary which have important influences on the biota (Table 4.1-2).

V. Gear Efficiency Studies

Striped bass ichthyoplankton sampling is conducted in a variety of locations, and specialized gear is necessary for sampling in each location. Absolute density estimates of the organisms in a unit volume of water can be made when the relative efficiency of the gear in collecting the organisms is known. Knowledge of gear efficiency allows for the comparison of data collected among the different locations.

VI Submerged Weir Feasibility Study

Bottom oriented fish such as *Morone americana* and *Microgadus tomcod* make up the bulk of impingement at Indian Point station. Although blockage of the bottom half of the screens will increase intake velocity which may increase impingement of pelagic species, the overall result may be of decreased impingement.

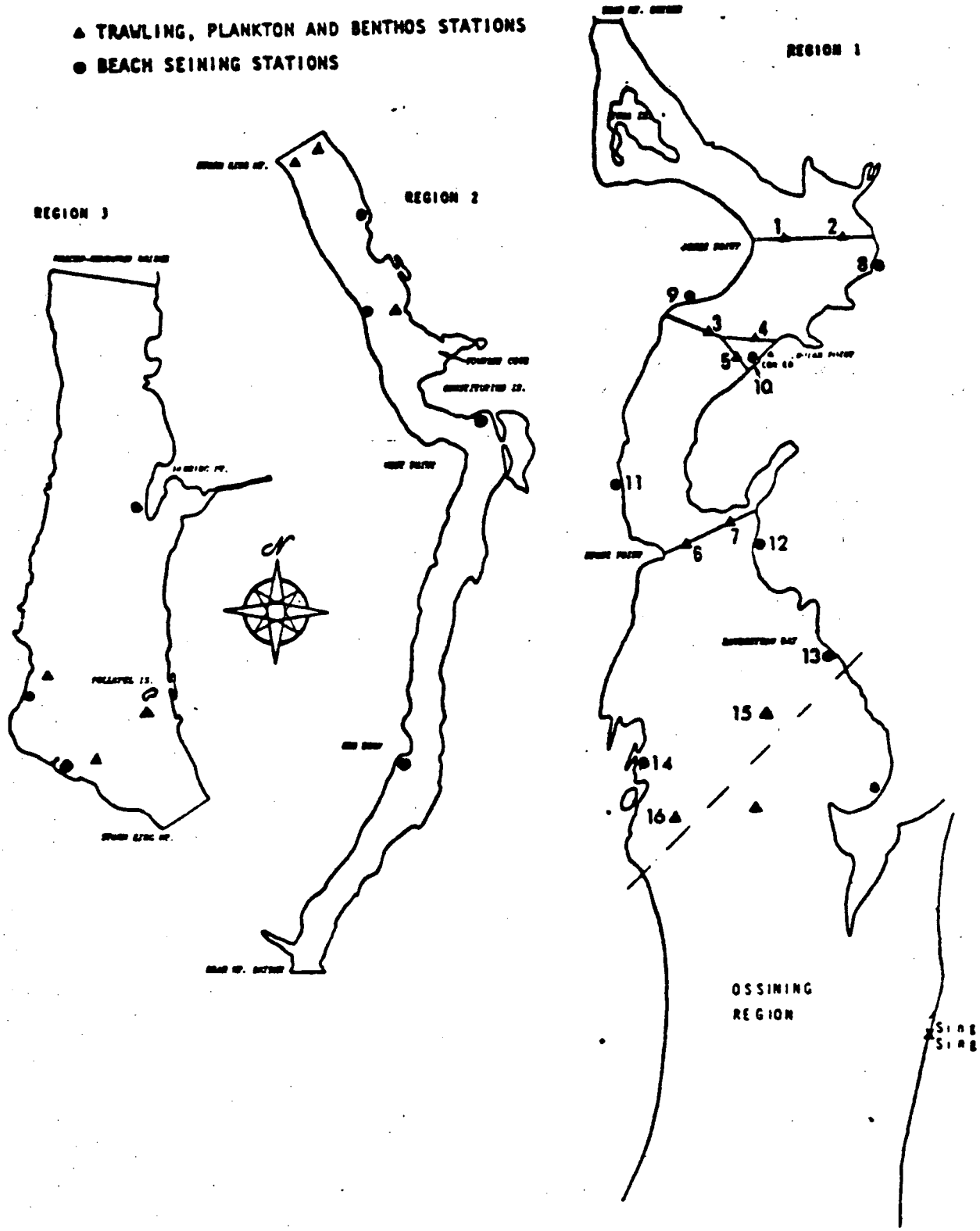


Figure 4.1-1 Indian Point Ecological Study Regions, Plankton stations are 1 through 7

Table 4.1-1 Population Data for Assessment of Impact of Indian Point Unit Nos. 2 and 3 Upon Population Density of Striped Bass and White Perch in Hudson Estuary

	Power Plant Impact			Data on Fish Populations											
							Age Group 0							Age Group	
Year	Unit #1	Unit #2	Unit #3	Eggs	Larvae	Juvenile I	Juvenile II		Juvenile III		Age Group I		II	III	IV
1969	Entrainment Impingement	None	None	-	-	-	1	1	1	1	1	1	1		1
1970	Entrainment Impingement	None	None	-	-	-	1	1	1	1	1	1	1		1
1971	Entrainment Impingement	None	None	-	-	-	-		-		-		-		
1972	Entrainment Impingement	None	None	-	-	-	1	1	1	1	1	1	1		1
1973	Entrainment Impingement	Impingement	None	1	1	-	1 1	1	1	1	1 1	1	1		1
1974	Entrainment Impingement	Entrainment Impingement	Impingement	2	2	-	2 2	2	2	2	2 2	2	2		2
1975	Entrainment* Impingement*	Entrainment* Impingement*	Entrainment* Impingement*	3	3	-	3 3	3	3	3	3 3	3	3		3

*This work will be continued into 1976 and 1977 since Unit No. 3 will not start operation until 1976.

Legend for Table 4.1-1

△1	Raytheon - Trawl Catch/Effort - Unit 1 Effect only
△1	Texas Instruments - Trawl Catch/Effort - Unit 1 effect only
△2	Texas Instruments - Trawl Catch/Effort - Unit 1 + Unit 2 effect
(1)	Raytheon - Seine Catch/Effort - Unit 1 effect only
(1)	Texas Instruments - Seine Catch/Effort - Unit 1 effect only
(2)	Texas Instruments - Seine Catch/Effort - Unit 1 + Unit 2 effect
(3)	Texas Instruments - Seine Catch/Effort - Unit 1 + Unit 2 + Unit 3 effect
[1]	Texas Instruments - Mark Recapture population estimate - Unit 1 effect only
[2]	Texas Instruments - Mark Recapture population estimate - Unit 1 + Unit 2 effects
[3]	Texas Instruments - Mark Recapture population estimate - Unit 1 + Unit 2 + Unit 3 effects
◇1	Texas Instruments - Population estimate eggs and larvae - Unit 1 effect only
◇2	Texas Instruments - Population estimate eggs and larvae - Unit 1 + 2 effects
◇3	Texas Instruments - Population estimate eggs and larvae - Unit 1 + 2 + 3 effects

Figure 4.1-3 Schematic of Indian Point Cooling Water System

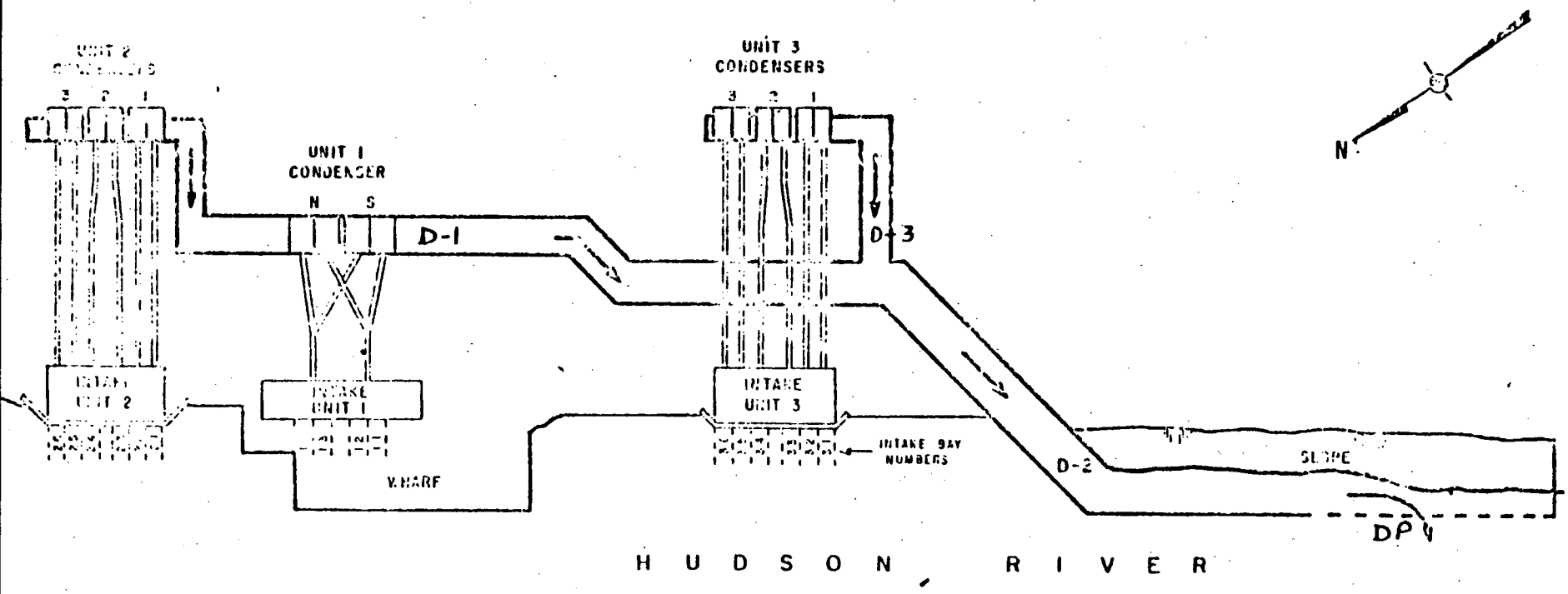


TABLE 4.1-2

WATER QUALITY MEASUREMENTS AT PLANT INTAKE AND DISCHARGE

AND AT THREE TRANSECTS IN THE RIVER

Parameter	Frequency
Temperature	Weekly
pH	Weekly
Conductivity (salinity)	Weekly
Turbidity	Weekly
Alkalinity*	Monthly
Bicarbonate*	Monthly
Ammonia*	Monthly
Orthophosphate*	Monthly
Nitrates*	Monthly
Carbon (inorganic and organic)*	Monthly
Chlorine demand*	Weekly
Free Chlorine*	Weekly
Residual Chlorine*	Weekly
Dissolved Oxygen	Weekly

* These parameters are measured at plant intake and discharge only.

REFERENCES

4.1-8 Testimony of Dr. James T. McFadden, Dean, School of Natural Resources, University of Michigan and Harry G. Woodbury, Executive Vice President, Consolidated Edison Company of New York, Inc., "Indian Point Studies to Determine the Environmental Effects of Once Through vs Closed Cycle Cooling at Indian Point Unit No. 2," February 5, 1973, Docket No. 50-247.

4.1-9 "Hudson River Ecological Study," First Semiannual Report, Prepared for Consolidated Edison Company by Texas Instruments, July 1972.

4.1-10 Testimony of John P. Lawler, Ph.D., Quirk, Lawler and Matusky Engineers, "The Effect of Entrainment and Impingement at Indian Point on the Population of the Hudson River Striped Bass," October 30, 1972, Docket No. 50-247.

4.1-11 U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Final Environmental Statement related to the operation of Indian Point Nuclear Generating Plant, Unit No. 3 (Vols. I and II) (Docket No. 50-286), February 1975.

4.1-12 Peterson, C. G. J., "The Yearly Immigration of Young Plaice into the Limfjord from the German Sea," Rept. Danish Biol. Stat., 6, p. 1-77 (1895).

4.1-13 Ricker, W. E. "Handbook on Computations for Biological Statistics of Fish Populations," Bull. Fish. Res. Bd. Can., No. 119, p. 300 (1958).

4.1-14 Delury, D. B., "On the Estimation of Biological Populations," Biometrics, 3, (4), p. 145-67 (1947).

4.1-15 Delury, D. B., "On the Planning of Experiments for the Estimation of Fish Populations," J. Fish. Res. Bd. Can., 8 (4), p. 281-307 (1951).

4.1-16 Delury, D. B., "The Estimation of Population Size by a Marking and Recapture Procedure," J. Fish Res. Bd. Can., 15, p. 19-25 (1958).

4.1-17 Chapman, D. G., "Inverse, Multiple and Segmential Sample Censuses," Biometrics, 8 (4), p. 286-306 (1952).

4.1-18 Chapman, D. G., "The Estimation of Bilogical Populations," Ann. Math. Statistics, 25, p. 1-15 (1954).

References (Cont'd)

4.1-19 Edmondson, W. T., "Reproductive Rates of Rotifers in Natural Populations," Nem. Inst. tal. Idrobio., 12, 21-77 (1960).

4.1-20 Warren, C. E., and Davis, G. E., "Laboratories Studies on the Feeding, Bioenergetics, and Growth of Fish," The Biological Basis of Freshwater Fish Production, p. 175, Shelby D. Gerkin (ed.), Blockwell, Oxford (1967).

4.1-21 Testimony of Gerald J. Lauer, Ph.D., New York University, "Effects of Indian Point Units 1 and 2 Operation on Hudson River Biota", October 30, 1972, Docket No. 50-247.

4.1-22 Testimony of R. A. Alevras, "The Estimation of Fish Impingement at Indian Point Units Nos. 1 and 2," February 5, 1973, Docket No. 50-247.

4.1-23 Consolidated Edison Company of New York, Inc., Environmental Report and Supplements for Indian Point Unit No. 3, Docket No. 50-286.

4.1-24 Attachment A of letter from LeBoeuf, Lamb, Leiby, & MacRae to B. Rusche dated February 24, 1976.

4.1-25 Letter from W. Cahill to G. Knighton dated May 18, 1976.

4.2 RADIOLOGICAL SURVEILLANCE

4.2.1 Radiological Environmental Monitoring Survey

Applicability

Applies to routine testing of the radioactivity in the plant environs and is applicable to the entire Indian Point site.

Objective

The overall objectives of the radiological environmental monitoring program are:

(1) to establish a sampling schedule for the entire Indian Point site which will recognize changes in radioactivity in the environs of the plants;

(2) to assure that the effluent releases are kept as low as practicable and within allowable limits in accordance with 10 CFR 50 and 10 CFR 20, respectively;

(3) to verify projected and anticipated radioactivity concentrations in the environment and related exposures from releases of radioactive materials from the Indian Point Units Nos. 1, 2 and 3.

Specifications

4.2.1.1 Environmental samples shall be collected and analyzed according to Table 4.2-1 at the locations shown in Figures 4.2-1a and b and presented in Table 4.2-2. Analytical techniques used shall be such that the minimum practical detectable concentrations presented in Table 4.2-3 are achieved.

4.2.1.2 During the seasons when animals producing milk for human consumption are on pasture, samples of fresh milk shall be obtained on a monthly* basis from farms including Strawtown Dairy, located 7 miles south

* Frequency shall be weekly when the calculated dose is greater than 15 mrem/yr and monthly when the calculated dose is greater than 1 mrem/yr but less than or equal to 15 mrem/yr.

4.2.1 Specifications (Continued)

southwest (the critical wind sector), and Guard Hill Farm, Bedford, located 10 miles east southeast, from the Indian Point site. Samples shall also be taken on a monthly schedule from milk processing dairies, including the Crowley Milk Company, Newburgh, which may use milk produced from cows pastured within the vicinity of the Indian Point site. The samples shall be analyzed for their radioiodine content, calculated as iodine-131. Analysis shall be carried out within eight (8) days (one iodine-131 half-life) of sampling. Suitable analytical procedures shall be used to determine the radioiodine concentration to a sensitivity of 0.5 picocuries per liter (pCi/l) of milk at the time of sampling. For activity levels at or above 0.5 pCi/l, the overall error (one sigma confidence level) of the analyses will be within ±25%. Results shall be reported, with associated calculated error, as picocuries of iodine-131 per liter of milk at the time of sampling. If milk is unavailable for reasons beyond the control of the licensee, samples of pasture grass shall be obtained from the location where the animals are pastured as identified in Table 4.2-2. Suitable analytical procedures shall be used to determine the radioiodine concentration of grass to a sensitivity of 0.1 pCi/gm (wet) at the time of sampling. For activity levels at or above 0.1 pCi/gm, the overall error (one sigma confidence level) of the analysis shall be within ±50%.

4.2.1.3 A census of animals producing milk for human consumption shall be conducted at the beginning of each grazing season to determine their location and number with respect to the site. The census shall be conducted under the following conditions:

(a) Within the calculated 15 mrem/yr isodose line;* a field survey shall be conducted by visually checking for the presence of milch animals.

(b) Within a 10-mile radius for cows and within a 15 mile radius for goats; enumeration by using referenced information from sources such as county agricultural agents or other reliable sources will be used.

The field survey and enumeration shall be documented by a letter in the plant files and a copy sent to the Director of Office of Nuclear Reactor Regulation indicating that each item was performed and whether or not milch animals were located. If it is learned from this census that milch 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 surveillance program as soon as practicable. The sampling

*Doses to be calculated using models and assumptions presented in NRC Regulatory Guide 1.42 (Revision 1, March 1974).

4.2.1 Specifications (Continued)

location having the lowest calculated dose may then be dropped from the surveillance program at the end of the grazing season during which the census was conducted. Also, any location from which milk can no longer be obtained may be dropped from the surveillance program after notifying the NRC in writing within 30 days that milch animals are no longer present at that location or otherwise explaining why milk can no longer be obtained from that location.

4.2.1.4 During time of harvest, representative samples of food products grown within 10 miles of the site shall be collected and analyzed as identified in Table 4.2-1.

4.2.1.5 Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability or to malfunction of automatic sampling equipment. If the latter, every effort shall be made to complete the corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be described in the Annual Environmental Operating Report.

Reporting Requirements

4.2.1.6 Routine Reports. Routine reports for the radiological environmental surveillance program shall be made in accordance with Section 5.6.1.1 Part B and as indicated in Table 5.6-1.

4.2.1.7 Non-routine Reports Non-routine reports for the radiological environmental surveillance program shall be made in accordance with Section 5.6.2.2 if any of the following conditions exist:

(a) If a confirmed measured level of radioactivity in any environmental medium exceeds ten (10) times the control station values.

(b) If milk samples collected over a calendar quarter show average levels of iodine-131 radioactivity of 4.8 pCi/l which could result in accumulated doses to a child of 7.5 mrem for that quarter, the results shall be reported to the Director of Office of Nuclear Reactor Regulation, Washington, D. C. and a plan shall be submitted within 30 days and implemented to limit the iodine-131 discharges so that the annual thyroid dose to a child shall not exceed 15 mrem/yr.

4.2.1 Bases:

The environmental monitoring program showing the number and distribution of sampling locations and the various types of measurements as described in Tables 4.2-1 and 4.2-2, together with the previous radiological programs conducted by the licensee since 1958, prior to operation of Indian Point Unit No. 1, will provide verification of the effectiveness of the effluent control at the three Units as presented in Section 2.4 and indication of measurable changes in the radioactivity in the environment. The New York State Department of Environmental Conservation conducts periodic surveys on samples of air, water, milk, and wildlife and the New York University Medical Center also provides supporting work in the area of radioecology.

In terms of radioiodine monitoring, a concentration of 2.4 pCi/l of cow milk and 3.4 pCi/l of goat milk will result in an annual dose to the thyroid of an infant (2 gram thyroid) of 15 mrem/yr, based upon the consumption of one liter or 0.7 liter per day, respectively, of fresh milk. Reporting requirements for the radioiodine pathways give allowance for six months grazing. See Regulatory Guide 1.42 (Revision 1, March 1974) for calculating doses based on models and assumptions to be used. See Regulatory Guide 4.1 for measuring radioactivity in the environment and Regulatory Guide 4.3 regarding measurements and analysis of iodine-131 in milk.

In the cooperative radiological environmental monitoring program with the New York State Department of Health (now Department of Environmental Conservation), a survey done in 1971 showed that there were five milk processing or receiving plants, which receive milk from 47 dairy farms, 36 of them within the 20 mile radius of the study area covered. There were 268 individual dairy farms within the study area. In Westchester County there were 18 farms and in Orange County, 219 farms. The farms selected for the study program were the Strawtown Dairy, 7 miles south southwest of the site, and the Guard Hill Farms, near Bedford, 10 miles east southeast from the site. The milk processing facilities included the Crowley Milk Company, Newburgh, which processes about 28,000 quarts per day collected from 32 farms located within 20 miles of the Station.

The licensee has reported that the closest dairy farms are located at seven miles in the SSW, WSE, W, WNW, SE, ESE, E, NE, and NNE. The most critical wind sector is in the south southwest direction. Presently, samples will be taken over a monthly basis during the grazing season from farms with the nearest cow in this SSW direction (Strawtown Dairy). Milk from processing dairies such as

4.2.1 Bases (Continued)

the Crowley Milk Company shall also be analyzed. Samples of sufficient quantity shall be taken and analyzed with above required sensitivity for iodine-131. If the results of the analysis of the samples indicate values of greater than 2.4 pCi/l of iodine-131, the licensee will arrange to obtain samples from other farms within seven miles of the Station. Meteorological conditions will be recorded. All results will be reported in the Annual Environmental Operating Report in accordance with Section 5.6.1.1.

References

4.2-1 U. S. Atomic Energy Commission, "Interim Licensing Policy on As Low As Practicable for Gaseous Radioiodine Releases from Light-Water-Cooled Nuclear Power Reactors," Regulatory Guide 1.42 (Revision 1, March 1974).

4.2-2 U. S. Atomic Energy Commission, "Measuring and Reporting of Radioactivity in the Environs of Nuclear Power Plants," Regulatory Guide 4.1, January 18, 1973.

4.2-3 U. S. Atomic Energy Commission, "Measurements of Radionuclides in the Environment - Analysis of I-131 in Milk," Regulatory Guide 4.3, September 1973.

4.2-4 New York State Department of Environmental Conservation, "Environmental and Postoperational Survey for Radioactivity, Consolidated Edison Indian Point Reactors," September 1971.

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TABLE 4.2-1 (Sheet 1 of 2)

INDIAN POINT STATION-RADIOLOGICAL ENVIRONMENTAL MONITORING SURVEY

	Sample	Sample Location	Method of Collection	Sampling Frequency	Type of Analysis
1.	Hudson River Water	Inlet pipe into plant-Point 9 Discharge canal - Point 10.	Continuing flow regulated to fill 2 gallon drums. Representative sample tanken once a week and drums emptied	Monthly Quarterly	Composite for GSA* Composite for T, ^{90}Sr once per year****
2.	Hudson River Aquatic Vegetation	Points 10, 15, 16, 17 and 22.	Grab samples along shoreline.	Once each in Spring and Summer	GSA,
3.	Hudson River Bottom Sediment (including Benthos)	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.
4.	Hudson River Crabs/Clams	Point 25	Catch or grab samples	Once in the Summer or Fall.	GSA, ^{90}Sr once per year****
5.	Hudson River Fish	Point 25	Same as item 4	Monthly	GSA on edible portions, ^{90}Sr once per year****
6.	Fallout (Rain water)	Points 1, 23, and 24	Open pot type collector***	Monthly	GSA, T
7.	Drinking water	Points 7 and 8.	Grab samples	Monthly	GSA, ^{131}I, ^{90}Sr once per year****
8.	Air Particulate	Points 1, 2, 3, 4 and 5 for one week periods consecutively	Membrane filter preceding charcoal cartridge - continuous sampling	Weekly Monthly/Quarterly	GBG,** Composite for GSA, and ^{90}Sr.
9.	Radioiodine	Same as item 8.	Charcoal cartridge	Same as item 8.	^{131}I

* GSA = Gamma Spectrum Analysis

** GBG = Gross Beta Gamma. If the weekly analysis indicates results which are three times higher than previous results, then additional weekly analysis shall be carried out to determine the cause of high results and corrective action taken to reduce levels.

*** Modified to reduce evaporation effects.

**** Analysis for Sr-89 + Sr-90 shall also be performed in those months when the gamma spectrum analysis reveals the presence of Cs-137 in the following quantities: Liquids - 100 pCi/l; Aquatic vegetation, crabs, fish - 1 pCi/gm.

TABLE 4.2-1 (Sheet 2 of 2)

INDIAN POINT STATION-RADIOLOGICAL ENVIRONMENTAL MONITORING SURVEY

Sample	Sample Location	Method of Collection	Sampling Frequency	Type of Analysis
10. Surface Lake Water	Points 11, 12 and 13.	Grab 1 liter sample offshore.	Monthly Quarterly	GSA, Composite for T, ^{90}Sr once per year *****
11. Well Water	Points 6, 18, and 26	Grab sample from deep-well pumps.	Quarterly	Composite for GSA and T.
12. Lake Aquatic Vegetation	Points 11, 12 and 13	Same as item 2.	Same as item 2.	GSA,
13. Soil	Points 1, 2, 3, 4, 5, 6, 18 19, 20 and 21	Grab	Once per 3 yrs.	GSA, ^{90}Sr, ^{137}Cs
14. Direct Gamma	Along principal roads within a 5 mile radius of plant.	Spotchecks.	Annually	GGB* (Ion Chamber)
15. Direct Gamma	Selected locations in Buchanan, Verplanck, Montrose, Peekskill, and at a number of points onsite at plant perimeter.	Continuous.	Quarterly	GGB (TLD)**
16. Milk	Selected locations of cows as determined from Spec. 4.2.1.2 Points 39, 40 and 42	Grab samples.	Monthly (when in pasture)	GSA, ^{89}Sr, ^{90}Sr, ^{131}I, ^{134}Cs, ^{137}Cs.
17. Grass***	Same as item 16.	Same as item 16.	Same as item 16.	Same as item 16.
18. Leafy Green Vegetables**** (Food Products)	Appropriate locations in critical wind sectors	Grab samples at point of source.	At time of harvest.	GSA, ^{131}I

* GGB = Gross Gamma Background
** TLD = Thermoluminescent Dosimeters
*** See Specification 4.2.1.2
**** See Specification 4.2.1.4
***** Analysis for SR-89 + Sr-90 shall also be performed in those months when the gamma spectrum analysis reveals the presence of CS-137 in the following quantities: Liquids - 100 pCi/l; Aquatic vegetation, crabs, fish - 1 pCi/gm.

T = Tritium

TABLE 4.2-2
(Sheet 1 of 2)

INDIAN POINT STATION - LOCATION OF SAMPLING STATION POINTS

Sample Station Points	Location/Distance	Sample Types
1	Environmental Laboratory, Onsite - SSE	Air Particulate Radioiodine Direct Gamma
2	Standards Brands, 0.75 mi - NNE	Air Particulate Radioiodine Direct Gamma
3	Service Building, Onsite - SSE	Air Particulate Radioiodine Direct Gamma
4	Algonquin Gas Line, 0.25 mi - S	Air Particulate Radioiodine Direct Gamma
5	NYU Tower, 1 mi - SSE	Air Particulate Radioiodine Direct Gamma
6	Camp Smith, 2.5 mi - NNE	Well Water Soil
7	Camp Field Reservoir, 3.5 mi - NE	Drinking Water
8	New Croton Reservoir, 7 mi - ESE	Drinking Water
9	Inlet pipe into plants - NNE	HR* Water
10	Discharge Canal, Onsite - SW	HR Aquatic Vegetation HR Water HR Bottom Sediment
11	Iroquois Lake, Onsite - E	Surface Lake Water Lake Aquatic Vegetation
12	Trap Rock Lake, 0.75 mi - SSE	Surface Lake Water Lake Aquatic Vegetation
13	Lake Meahagh, 1 mi - SSE	Surface Lake Water Lake Aquatic Vegetation
14	Water Meter House, Onsite - E	Direct Gamma
15	Peekskill Bay, 1.5 mi - NE	HR Aquatic Vegetation HR Bottom Sediment
16	Tompkins Cove, 1.5 mi - WSW	HR Aquatic Vegetation HR Bottom Sediment
17	Off Verplanck, 1 mi - SSW	HR Aquatic Vegetation HR Bottom Sediment
18	Indian Point, Onsite - SE	Soil Well Water
19	St. Mary's Cemetery, 0.75 - SSE	Soil

*HR = Hudson River

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TABLE 4.2-2 (Continued)
(Sheet 2 of 2)

Sample Station Points	Location/Distance	Sample Types
20	Montrose Marina, 1.5 mi - S	Soil
21	George's Island, 2.5 mi - SSE	Soil
22	Lovett, 1.5 mi - WSW	HR Aquatic Vegetation HR Bottom Sediment
23	Roseton,* 20 mi - N	Fallout Air Particulate Radioiodine Food Products
24	Eastview,* 15 mi - SE	Fallout
25	Where available near site	Fish
26	Verplanck, 1 mi - SSW	Well Water
27	Croton Point, 7.5 mi - SSE	Air Particulate Radioiodine Direct Gamma
28	Lent's Cove, 0.5 mi - NE	HR Aquatic Vegetation Bottom Sediment Direct Gamma
29	Grassy Point, 3 mi - S	Air Particulate Radioiodine Direct Gamma
30	Dock, Onsite - W	Direct Gamma
31	Onsite Pole - S	Direct Gamma
32	Factory St. SS, 1 mi - ESE	Direct Gamma
33	Hamilton St. SS, 3 mi - NNE	Direct Gamma
34	SE Corner Onsite - SE	Direct Gamma
35	Beakley & Broadway, Onsite - E	Direct Gamma
36	Old Dump, 0.5 mi - ENE	Direct Gamma
37	NE Corner, Onsite - NE	Direct Gamma
38	Furnace Dock, 3.5 mi - SE	Direct Gamma
39	Strawtown Dairy, 7 mi - SSW	Milk
40	Guard Hill Farm, near Bedford 10 mi - ESE	Milk
41	Appropriate locations in critical wind sections	Food Products (leafy green vegetables)
42	Crowley Milk Co. Newburgh	Milk

*Control Station

TABLE 4.2-3 (Sheet 1 of 3)

MINIMUM DETECTABLE CONCENTRATIONS IN ENVIRONMENTAL SAMPLES AND RESULTING DOSES

	Sample	Analysis	Sample Size	Minimum Detectable Concentration MDC(a)	Annual Dose Associated with MDC mrem (d)	Critical Organ	Annual Intake
1.	Hudson River Water	Composite for GSA	3 liter	5 pCi/l (b)	-	-	
		Composite for T	2 liter	200 pCi/l	0.016	Body tissue	-
		Sr-90	2 liter	1.0 pCi/l	1.0	Bone	
2.	Hudson River Aquatic Vegetation	GSA	1 kg	0.05 pCi/g (b)	-	-	-
		I-131	1 kg	0.05 pCi/g	-	-	-
3.	Hudson River Bottom Sediment (including Benthos)	GSA	1 kg	5.0 pCi/g (b)	-	-	-
4.	Hudson River Crabs/Clams	GSA	100 g	0.5 pCi/g (b)	-	-	-
		Sr-90	100 g	0.01 pCi/g	0.4	Bone	18.3 kg
5.	Hudson River Fish	GSA on edible portions	100 g	1.0 pCi/g (b)	-	-	-
		Sr-90	100 g	0.01 pCi/g			
6.	Fallout (Rain water)	GSA	3 liter when available	5 pCi/l (b)	-	-	-
		T	2 liter	200 pCi/l	0.016	Body tissue	
7.	Drinking water	GSA	3 liter	5 pCi/l (b)	-	-	-
		I-131	4 liter	0.5 pCi/l	1.6	Child's thyroid	440 l
		Sr-90	2 liter	1.0 pCi/l	1.0 (e)	Bone	440 l
8.	Air Particulate	GRG**	270 m^3	0.01 pCi/m^3 (c)	-	-	-
		Composite for GSA	1,080 m^3	0.02 pCi/m^3 (b)	-	-	-
		Sr-90	3240 m^3	0.001 pCi/m^3	-	-	-

See Footnotes at end of Table.

TABLE 4.2-3 (Sheet 2 of 3)

MINIMUM DETECTABLE CONCENTRATIONS IN ENVIRONMENTAL SAMPLES AND RESULTING DOSES

	Sample	Analysis	Sample Size	Minimum Detectable Concentration MDC(a)	Annual Dose Associated with MDC mrem (d)	Critical Organ	Annual Intake
9.	Radioiodine	I-131	270 m^3	0.04 pCi/m^3	0.05	Child's thyroid	1100 m^3
10.	Surface Lake Water	Same as item 1.	Same as item 1.	Same as item 1.	Same as item 1.	Same as item 1.	Same as item 1.
11.	Well Water	Composite for GSA	3 liter	5 pCi/l (b)	-	-	-
		T	2 liter	200 pCi/l	0.016 (e)	Body tissue	440 l
12.	Lake Aquatic Vegetation	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.
13.	Soil	GSA	1 kg	5.0 pCi/g (b)	-	-	-
		Sr-90	1 kg	5.0 pCi/g			
		Cs-137	1 kg	0.2 pCi/g			
14.	Direct Gamma	GGB***	1 month exposure	5 mrem	-	Whole body	12 month exposure
15.	Direct Gamma	GGB(TLD)****	1 month exposure	1 mrem	-	Whole body	12 month exposure
16.	Milk	GSA	1 liter	5.0 pCi/l	-	-	-
		Sr-89	1 liter	2.0 pCi/l	0.08	Bone	
		Sr-90	1 liter	1.0 pCi/l	0.40	Bone	
		I-131	4 liter	0.5 pCi/l	1.6	Child's thyroid	183 l
		Cs-134/137	1 liter	5.0 pCi/l	0.006	Whole body	183 l
17.	Grass	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2	Same as item 2.

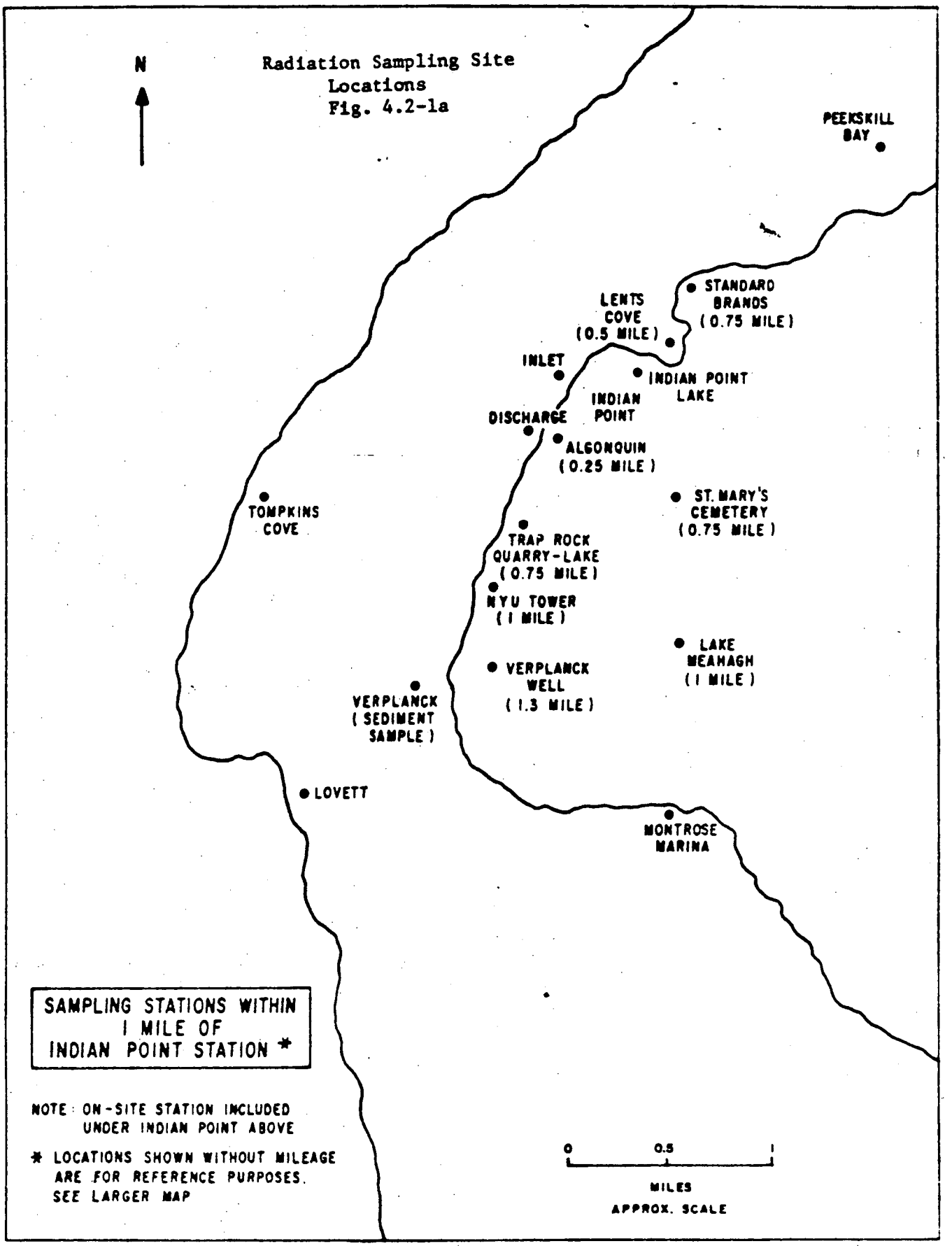
See Footnotes at end of Table.

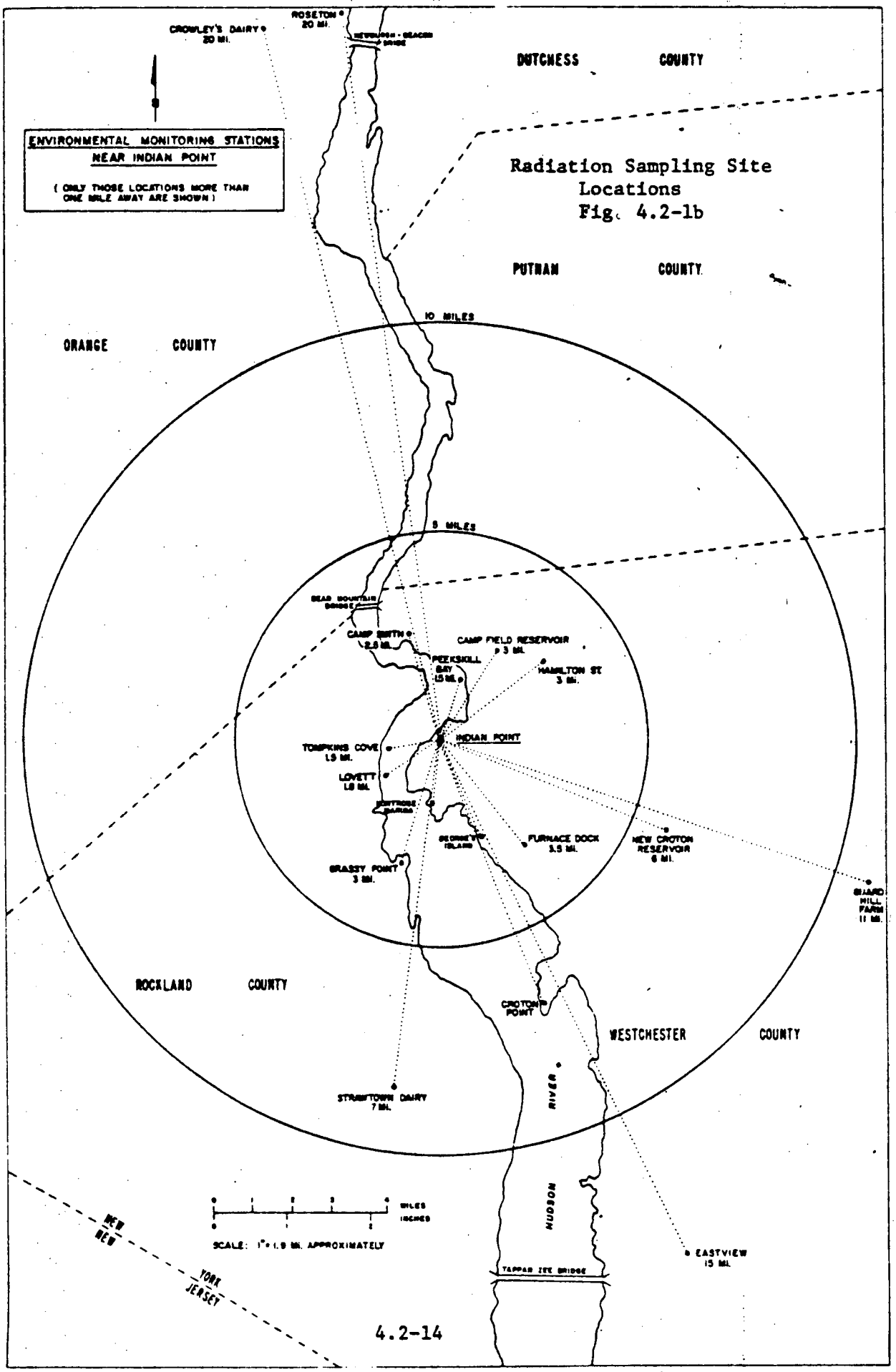
TABLE 4.2-3 (Sheet 3 of 3)

MINIMUM DETECTABLE CONCENTRATIONS IN ENVIRONMENTAL SAMPLES AND RESULTING DOSES

	Sample	Analysis	Sample Size	Minimum Detectable Concentration MDC(a)	Annual Dose Associated with MDC mrem (d)	Critical Organ	Annual Intake
18.	Leafy Green Vegetables (Food Products)	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.	Same as item 2.

* GSA = Gamma Spectrum Analysis
** GBG = Gross Beta Gamma Analysis
*** GGB = Gross Gamma Background (Ion Chambers)
**** TLD = Thermoluminescent Dosimeters
(a) These are minimum practical detectable concentrations (MDC) as opposed to theoretical detection limits. They apply to the activity at the time of sample collection.
(b) For Cs-137 assuming no interference from other nuclides.
(c) Cs-137 used as a reference source.
(d) Based on the Federal Radiation Council reports on Radiation Protection Guides and associated dose.
(e) Applies to drinking water only.
(f) Dose to a child's thyroid through the air-grass-cow-milk-man food chain for an annual intake of 183 l.
(g) From WASH-1258 (July 1973).


N
Radiation Sampling Site
Locations
Fig. 4.2-1a
PEEKSKILL BAY
STANDARD BRANDS (0.75 MILE)
LENTS COVE (0.5 MILE)
INLET
INDIAN POINT LAKE
INDIAN POINT
DISCHARGE
ALGONQUIN (0.25 MILE)
ST. MARY'S CEMETERY (0.75 MILE)
TOMPKINS COVE
TRAP ROCK QUARRY-LAKE (0.75 MILE)
NYU TOWER (1 MILE)
LAKE MEAHAGH (1 MILE)
VERPLANCK WELL (1.3 MILE)
VERPLANCK (SEDIMENT SAMPLE)
LOVETT
MONTROSE MARINA
SAMPLING STATIONS WITHIN 1 MILE OF INDIAN POINT STATION *
NOTE: ON-SITE STATION INCLUDED UNDER INDIAN POINT ABOVE
* LOCATIONS SHOWN WITHOUT MILEAGE ARE FOR REFERENCE PURPOSES. SEE LARGER MAP
0 0.5 1
MILES
APPROX. SCALE


ENVIRONMENTAL MONITORING STATIONS
NEAR INDIAN POINT
(ONLY THOSE LOCATIONS MORE THAN ONE MILE AWAY ARE SHOWN)
Radiation Sampling Site Locations
Fig. 4.2-1b
ROSETON 20 MI.
CROWLEY'S DAIRY 20 MI.
DUTCHESS COUNTY
PUTNAM COUNTY
ORANGE COUNTY
10 MILES
5 MILES
BEAR MOUNTAIN BRIDGE
CAMP SMITH 2.5 MI.
CAMP FIELD RESERVOIR 3 MI.
PEEKSKILL BAY 1.5 MI.
HAMILTON ST. 3 MI.
INDIAN POINT
TOMPKINS COVE 1.5 MI.
LOVETT 1.5 MI.
VERPLANCK
SCOFIELD ISLAND
FURNACE DOCK 3.5 MI.
NEW CROTON RESERVOIR 6 MI.
GRASSY POINT 3 MI.
SHARD HILL FARM 11 MI.
ROCKLAND COUNTY
CROTON POINT
WESTCHESTER COUNTY
STRAWTOWN DAIRY 7 MI.
HUDSON RIVER
MILES
INCHES
SCALE: 1" = 1.9 MI. APPROXIMATELY
NEW YORK
NEW JERSEY
TAPPAN ZEE BRIDGE
EASTVIEW 15 MI.

Objective

To establish the administrative controls that relate to management procedures, recordkeeping and reporting that are considered necessary to provide the assurance and evidence that the plant will be managed as prescribed by the Environmental Technical Specifications and will be operated to provide continuing protection of the environment.

Specifications

5.1 Organization, Responsibilities, Review and Audit

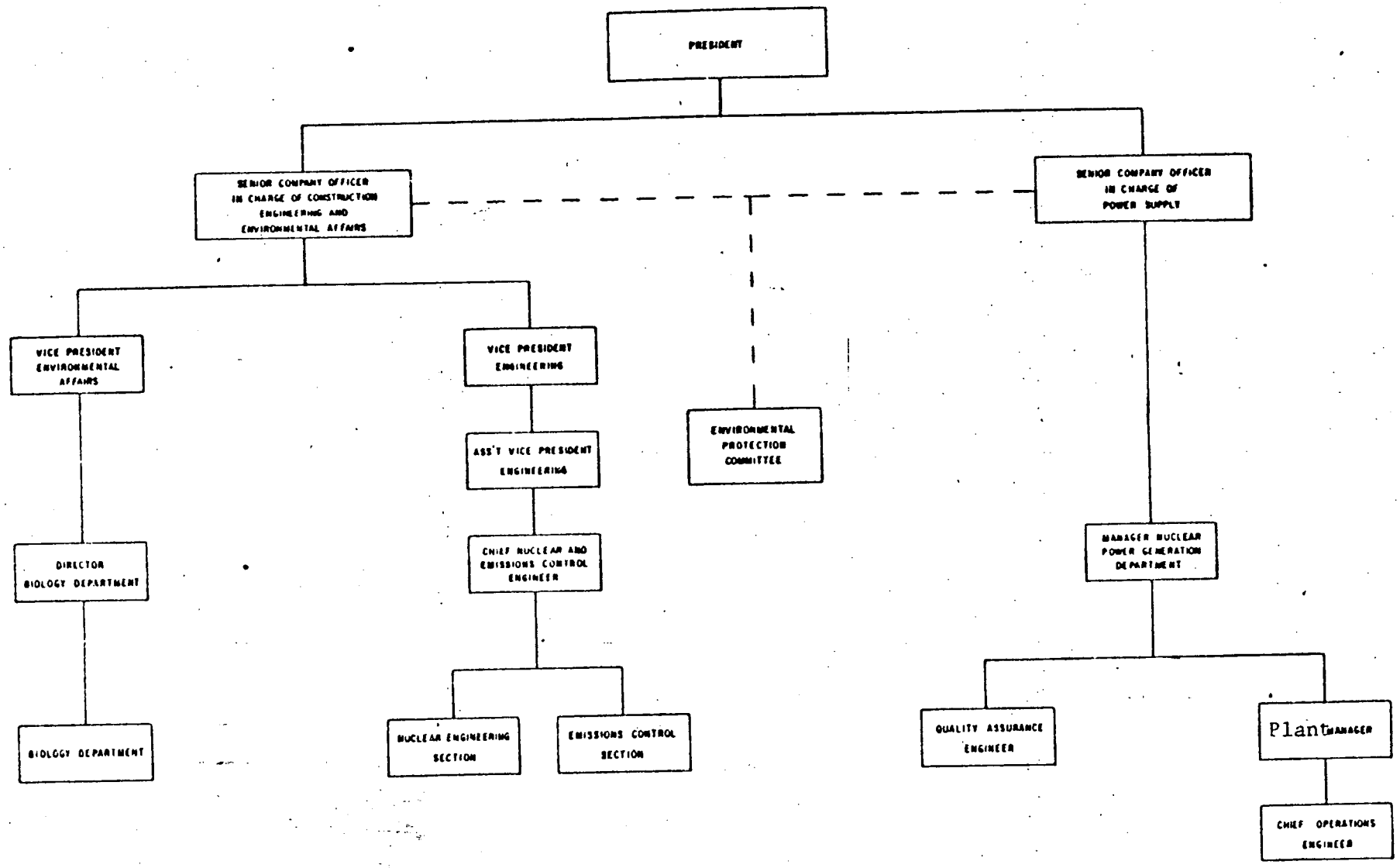
5.1.1 Organization and Responsibilities

5.1.1.1 The ultimate responsibility for the implementation of the Environmental Technical Specifications shall reside with the corporate officers of Consolidated Edison Company of New York, Inc. The corporate and Station level organization chart is shown in Figure 5.1-1.

5.1.1.2 The Plant Manager shall have direct responsibility for the safe operation and maintenance of all facilities comprising Indian Point Station and to assure that the limiting conditions of operation as noted in the Environmental Technical Specifications as defined herein are not exceeded. This responsibility shall be expressly delegated to a specified member of the Station management staff during any off-duty status period of the Plant Manager. The Chief Operations Engineer, who shall report to the Plant Manager, shall have direct responsibility for the safe operation of all nuclear Units at the Station. The Operations Engineer, who shall report to the Chief Operations Engineer, shall have direct responsibility for the safe operation of his assigned nuclear Unit. The Plant Manager shall report to the Manager of the Nuclear Power Generation Department who reports to the Assistant Vice President of Power Generation Operations, who is in charge of all of its generating facilities. See Section 6.1 of Appendix A, Technical Specifications for a detailed description of responsibility of the licensee's facilities.

5.1.1.3 The Senior Engineer, Environmental, Nuclear and Gas Testing Group, shall report via the Division Engineer, Chief Chemical Engineer, and Manager, Operations Services, to the Assistant Vice President, Power Generation Operations and either he, or his designee, has primary responsibility for the conduct of the nuclear environmental monitoring program and long term or life-of-the-plant type environmental monitoring programs. The Chief Nuclear and Emissions Control Engineer, who shall report to the Assistant Vice President, Engineering, and the Director of the Biology Department, who shall report to the Vice President, Environmental Affairs of the Company, have primary responsibility for execution of environmental surveillance studies.

Figure 5.1-1 ORGANIZATION CHART



5.1 Specifications (Continued)

The environmental surveillance programs and the special ecological studies will be performed by the licensee's staff and/or through contractural arrangement between the licensee and its contractors.

5.1.1.4 The immediate responsibility for the review and updating of each program lies with Senior Engineer, Environmental, Nuclear and Gas Testing Group, Chief Nuclear and Emissions Control Engineer, and the Director of the Biology Department.

5.1.1.5 Any change in the organization and responsibilities described in this Section shall be reported to the Director of Office of Nuclear Reactor Regulation within 30 days and the implementation of any change shall not be deemed a violation of an environmental technical specification.

5.1.2 Review and Audit

5.1.2.1 Establishment

An Environmental Protection Committee (EPC) shall be constituted to advise the Chairman, the President, the Senior Vice President, Construction, Engineering and Environmental Affairs, and Senior Vice President, Power Supply (or equivalent senior management of the Company), concerning environmental aspects of nuclear power facilities. The EPC will have the responsibility of performing the independent review and audit of the nonradiological environmental monitoring, surveillance and special studies program as presented in Section 5.1.2.7. A charter, describing the EPC functions and responsibilities shall be on file for inspections. The Nuclear Facility Safety Committee (NFSC) as described in Section 6 of Appendix A shall have the responsibility to perform the review and audit of the radiological environmental monitoring program.

5.1.2.2 Composition

a. The Committee (EPC) shall have membership of at least ten (10) persons, including, the Senior Engineer, Environmental, Nuclear and Gas Testing Group, the Chief Nuclear and Emissions Control Engineer, and the Director of the Biology Department or their designees. The remaining members shall include technically competent persons from all departments of Consolidated Edison having an interest in environmental effects or their control as related to facility design or operation and shall be appointed by their respective Vice President in accordance with the Committee's charter.

The Chairman and Vice Chairman shall be officers of the Company experienced in fields related to environmental effects or their control.

The Chairman of the EPC Committee, hereafter referred to as the Chairman, shall be appointed by the Chairman of the Board or the President of the Company.

5.1 Specifications (Continued)

The Vice Chairman shall be appointed by the Chairman of the Board or the President of the Company. In the absence of the Chairman, he shall serve as Chairman.

Each member shall have one vote. Subject to the Chairman's approval, each member may designate a permanent alternate to serve in his absence. Alternate members shall have voting rights. Persons, including nonemployees of the Company, may be appointed as Consultants by the Chairman. Consultants will serve in the advisory capacity and shall not have the right to vote.

b. A list of members and permanent alternates of the Committee shall be maintained on a current list by the Secretary, and will be filed in the Committee files and available for inspection.

5.1.2.3 Qualifications

Members shall collectively have the capability required to review the nonradiological areas of:

- environmental monitoring and surveillance
- chemistry
- instrumentation and control
- aquatic biology
- airborne pollutants
- effluent control engineering
- other environmental effects
- other appropriate fields required by the unique characteristics of the plants involved.

5.1.2.4 Records and Reports

a. Written minutes of all meetings shall be kept and be retained for at least five years in the files of the Committee (see Section 5.5.1). Copies of approved minutes shall be promptly distributed to each Committee member, to the Chairman and Vice Chairman of the Nuclear Facilities Safety Committee, and to appropriate senior members of management having responsibility in the area reviewed.

b. An audit program will be prepared as part of the charter and recommended to the appropriate senior members of management having responsibility in the area reviewed.

c. Written reports of each audit or review function performed, including follow-up action and re-audits, shall be prepared, approved, and forwarded to senior management members having responsibility

5.1 Specifications (Continued)

in the areas audited. Copies of these reports shall be retained for at least five years in the files of the Committee.

d. The findings of all reviews of the Environmental Technical Specification Requirements (ETSR), violations and recommendations to prevent recurrence shall be reported in writing to the senior management members having responsibility in the areas audited.

5.1.2.5 Meetings

a. The Committee shall meet at least once per quarter.

b. At the request of the senior management having responsibility in the areas involved, the Committee shall be promptly convened to review and act upon nonroutine reportable environmental occurrences or other matters related to compliance with the ETSR.

5.1.2.6 Quorum and Voting

As a minimum, a majority of the Committee members, which shall include the Chairman and/or the Vice Chairman, shall constitute a quorum for meetings of the Committee. Any action by the Committee shall require, as a minimum, the vote of the majority of those present.

5.1.2.7 Responsibilities

a. The Committee herein established will advise the Chairman of the Board, the President, and senior management members concerning the environmental aspects of facility operation. The Committee is to be kept fully and currently informed by the senior management on all matters bearing on the environmental effects of operation of the plants.

b. The Chairman may establish subcommittees and designate members of the Committee for assignment to subcommittees or to particular areas of cognizance. The Chairman, Vice Chairman and Secretary of the Committee are ex-officio members of all subcommittees. A list of all such assignments shall be kept current by the Secretary in accordance with the procedures set forth as an appendix to the charter.

5.1 Specifications (Continued)

c. The Committee shall have the responsibility of performing semiannually the independent review and audit of nonradiological environmental monitoring, surveillance, and special studies programs, and their results in accordance with the ETSR and the Committee procedures set forth as an appendix to the charter.

d. The Committee shall have the responsibility of semiannually reviewing proposed changes in facility systems or equipment, changes in operating procedures, and the evaluation of the impacts resulting from the changes and proposed tests or experiments as proposed by the senior members of management to the extent required by the ETSR, in accordance with the procedures set forth in the ETSR and the Committee procedures set forth as an appendix to the charter.

e. The Committee shall review all proposed changes to the ETSR and the evaluated impacts of such changes, in accordance with the ETSR and the procedures set forth as an appendix to the charter.

f. The Committee shall review all reported instances of nonroutine reportable environmental occurrences. Where investigation indicates to the Committee that such action is necessary, evaluation and formulation of recommendations to prevent recurrence of such violations shall be made, in accordance with ETSR and the procedures set forth as an appendix to the charter.

g. The Committee shall coordinate with the NTSC the development of the ETSR and the development of procedures and programs pursuant to them to avoid conflicts and maintain consistency. Coordination procedures shall be in accordance with those of an appendix to the charter.

h. The Committee shall have the responsibility of performing the independent review and audit of proposed written procedures, as described in Section 5.4, and proposed changes thereto which affect the plant's environmental impact.

i. The Committee shall review the results of the environmental monitoring program in each Annual Environmental Operating Report prior to submission of the report to NRC. See Section 5.6.1.1.

j. Other related matters deemed appropriate.

5.1 Specifications (Continued)

5.1.2.8 Authority

a. The Committee shall report to, and advise, the senior members of management on matters related to its areas of environmental concern.

b. Committee members shall be allowed full access to all relevant facility records.

5.2 Action to be Taken in the Event of an Abnormal Environmental Occurrence

5.2.1 Remedial action as permitted by the ETSR shall be taken until the nonroutine reportable occurrences can be alleviated.

5.2.2 Any nonroutine reportable environmental occurrence shall be promptly reported to and investigated by the Plant Manager and his staff.

5.2.3 The Plant Manager shall promptly notify the Manager of the Nuclear Power Generation Department and the Chairman of the EPC for nonradiological matters or the NFSC for radiological matters of any nonroutine reportable environmental occurrence.

5.2.4 The Plant Manager shall prepare and submit promptly a report in writing to the Manager of the Nuclear Power Generation Department following the observation of an nonroutine reportable environmental occurrence. Such report shall describe the circumstances leading up to, and resulting from the occurrence, and shall recommend appropriate action to prevent or reduce the probability of a repetition of occurrence. A copy of the report shall be submitted to the Chairman of the EPC (nonradiological matters) and NFSC (for radiological matters) for review of any recommendations contained therein. The EPC or NFSC (as appropriate) shall concur with such appropriate actions.

5.2.5 The Manager of the Nuclear Power Generation Department shall inform his supervisor of the nonroutine reportable occurrence and shall report the circumstances of any nonroutine reportable environmental occurrence to the NRC as required in these specifications and as specified in Specification 5.6.2.1. Each such occurrence shall be listed in the Annual Environmental Operating Report (Section 5.6.1.1).

5.3 Actions to be Taken Prior to Special Tests or Changes

5.3.1 If a significant change in the facility or facility operating procedures is proposed, or a test or experiment is proposed and the Plant Manager concludes that the proposed change, test or experiment does not involve a change in the ETSR or an unreviewed environmental question, he may order the change, test or experiment to be made, shall enter a description thereof in the operating records of the facility, and shall send a copy of the instructions pertinent thereto, to the Chairman of the EPC. If the Chairman of the EPC, upon reviewing such instructions, is of the opinion that the change, test or experiment is of such a nature as to warrant consideration by the Committee, he shall order such consideration.

5.3.2 If a significant change in the facility or operating procedures is proposed, or a test or experiment is proposed which in the Plant Manager's opinion might involve a change in the ETSR, might involve an unreviewed environmental impact question or might otherwise not be in accordance with the license, he shall not order such change, test or experiment until he has referred the matter to the EPC for review and report. If the EPC is of the opinion that the proposed change, test or experiment does not require approval by the NRC under the terms of the license, it shall so report in writing to the Plant Manager, together with a statement of the reasons for the EPC decision. The Plant Manager may then proceed with the change, test or experiment. If, on the other hand, the Committee is of the opinion that approval of the NRC is required, the EPC shall prepare a request for such approval, including an appropriate environmental analysis in support of the request, and forward its report and request to the senior members of management for their review with a copy to the Plant Manager. These Company officials shall then take appropriate action to obtain NRC approval, as such approval is deemed necessary.

5.4 Operating Procedures

5.4.1 Detailed written procedures including check-off lists and instructions, where applicable, shall be prepared, approved, and adhered to for the following activities involved in carrying out the ETSR:

5.4.1.1 Additions of chemicals for both the primary and secondary systems.

5.4.1.2 Release of chemicals in the circulating water discharge.

5.4.1.3 Control of discharge waters to remain within the allowable rate of change, temperature differentials and discharge temperatures and water quality.

5.4.1.4 All environmental sampling.

5.4.1.5 Preventive or corrective maintenance procedures which could have an effect on the environmental aspects of the plant.

5.4.1.6 Calibration of various instruments used in measuring and analyzing the samples which are required by these specifications.

5.4.1.7 Data recording and storage and measurements and analysis.

5.4.1.8 Testing frequency of any alarms shall be included. These frequencies shall be determined from experience with similar instruments in similar environments and from manufacturers' technical manuals.

5.4.2 All procedures and temporary changes, as they pertain to these specifications, shall be reviewed by and approved by the EPC within 30 days after implementation, and, if they affect plant operations, approved by the Plant Manager. The implementation and approval dates shall be documented.

5.4.3 All standard procedures shall include provisions to ensure the plant and all its systems and components are operated in compliance with the limiting conditions for operation established as part of the ETSR.

5.5 Record Retention

5.5.1 Record Retention - 5 years

Records and/or logs relative to the following items shall be kept in a manner convenient for review and retained for five years:

5.5.1.1 Records of normal plant operation, including power levels and period of operation at each power level.

5.5.5.2 Records of principal maintenance activities, including repair, substitution or replacement of principal items of equipment pertaining to environmental impact.

5.5.1.3 Records of occurrences involving violation of Environmental Technical Specifications.

5.5.1.4 Records of periodic checks, inspections and calibration performed to verify that environmental surveillance requirements are being met.

5.5.1.5 Records of any special operational modes (tests or experiments) affecting environmental impact.

5.5.1.6 Records of changes made to procedures, equipment, permits and certificates affecting environmental impact.

5.5.1.7 Records of changes to operating procedures affecting environmental impact.

5.5.1.8 Environmental Protection Committee meeting minutes.

5.5.2 Record Retention - Life of Plant

Records relative to the following items shall be kept in a manner convenient for review and retained for the life of the plant.

5.5.2.1 Reports of all environmental monitoring surveys, and special surveillance and study activities required by the ETSR in Section 4.0.

5.5.2.2 Records and drawings detailing plant design changes and modifications made to system and equipment as described in Section 5.6.

5.6 Plant Reporting Requirements

5.6.1 Routine Reports

5.6.1.1 Annual Environmental Operating Report

Part A: Nonradiological Report. A report on the environmental surveillance programs for the previous 12 months of operation shall be submitted to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director, Office of Nuclear Reactor Regulation) as a separate document within 120 days after January 1 of each year. The period of the first report shall begin on January 1, 1975. The report shall include summaries, interpretations, and statistical evaluation of the results of the nonradiological environmental monitoring programs required by limiting conditions for operation (Section 3.0). This report shall be expanded at the completion of the studies reported under Section 5.6.1.2 to include long-term environmental surveillance activities. This expanded report shall include a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports and an assessment of the observed impacts of the plant operation on the environment. If harmful effects or evidence of irreversible damage are detected by the monitoring, the licensee shall provide an analysis of the problem and a proposed course of action to alleviate the problem. Specifically the following information shall be provided in this report.

a. Thermal Discharges and Hydraulics

- Data on daily maximum, minimum, and average temperature measurements of the water in the intake and discharge canal water, and the ΔTc across the CWS during full and reduced flows and during pump maintenance and deicing operations.
- Any rate of temperature change across the condenser pursuant to Sections 2.1.4 and 3.1.4.
- Condenser flow rates, and changes in flow rates including date and time of day when reduced flow takes place.
- Total thermal energy in Btu released through the discharge outfall during the month.
- Maximum and average release rate of energy through the discharge outfall in Btu per hour.
- Calculated intake velocity and flow rate per intake screen.
- Discharge velocity, head differential across the discharge canal (24 hrs. average), results of adjustments of gates of discharge structure.

5.6 Plant Reporting Requirements (Continued)

b. Chlorination of Cooling Water

- The dates on which chlorination was performed.
- Amount of sodium hypochlorite consumed during each chlorination.
- Concentration of sodium hypochlorite used.
- Analytical results of chlorine tests.
- Cooling water flow rate during chlorination.

c. Chemical Discharges and Water Quality

- Dates and times at which samples were taken and analyzed in accordance with Table 2.3-1.
- Analytical results of tests performed in accordance with Table 2.3-1.
- Inventory of chemicals discharged in accordance with Table 2.3-2.
- Water flow rate in the discharge canal at times of releases.
- Amount of non-radioactive solid waste material collected (in cubic feet) at the intake screens and disposed of as solid waste in accordance with local regulations.
- Dissolved oxygen concentration measurements.
- pH measurements.

5.6 Plant Reporting Requirements (Continued)

Part B: Radiological Report. A report on the radiological environmental surveillance programs for the previous 12 months of operation shall be submitted to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director of the Office of Nuclear Reactor Regulation) as a separate document within 90 days after January 1 of each year. The period of the first report for Unit Nos. 1 and 2 shall begin on January 1, 1975, and for Unit No. 3, the period of the first report shall begin on date of criticality of Unit No. 3. The reports shall include summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports and an assessment of the observed impacts of the plant operation on the environment.

Results of all radiological environmental samples taken shall be summarized on an annual basis following the format of Table 5-1. In the event that some results are not available within the 90-day period, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

5.6.1.2 Semiannual, and/or Special Environmental Operating Reports

A. Non-radiological

A Progress Report and/or Annual Report shall be submitted by the licensee to the Director of Office of Nuclear Reactor Regulations, Washington, D.C. 20555, by the end of July and the end Janaury, or as otherwise specified below, describing activities of the Thermal Plume Mapping and Ecological Survey Program, Entrainment Studies, Impingement Studies, and Special studies for for the prior six-month interval. Information to be presented will include the following:

a. Effects of chlorine and other chemical discharges on the ecosystem of the Hudson River in accordance with Sections 2.3 and 3.3 and 4.1.2a(2).

b. Reduction in frequency of chlorination and reduction in concentration of free and combined residual chlorine in the discharge canal.

c. Thermal plume model verification and mapping (near and far field) in accordance with Section 4.1.1.a.

d. Ecological effects of thermal discharges in accordance with Section 4.1.2.a(2).

5.6 Plant Reporting Requirements (Continued)

e. Potential reduction in dissolved oxygen in the cooling water through the plant.

f. An assessment of performance of fish pumps as installed.

g. Results of the general ecological survey in accordance with Section 4.1.2a(1).

h. Ecological effects of entrainment of organisms in accordance with Section 4.1.2a(2)V.

i. Evaluation of head loss across the fixed intake screens as a function of velocity through the screens and fish collected.

j. Ecological effects of fish impingement in accordance with Section 4.1.2a(2)VI.

k. Operational experience of air bubblers at Units Nos. 1 and 2 to prevent fish impingement.

l. Other ecological effects as indicated in Section 4.0.

m. Evaluation of data in accordance with Section 4.1.2a(2) (I through IV).

Upon completion of the environmental surveillance studies as described in Section 4.0 a final summary report for each individual project shall be submitted within six (6) months of completion of each study to the Director of Office of Nuclear Reactor Regulation, Washington, D.C. 20555. A final overall summary report when all the projects are completed shall be furnished on the same schedule as above.

Monthly report on the number of each species of fish collected per day on the intake screens shall be submitted to the Region I Office of Inspection and Enforcement and copies to the Director of Office of Nuclear Reactor Regulation and the New York Department of Environmental Conservation, in accordance with items (b) and (c) under Reporting Requirements in Section 4.1.2a(2)VI.

All reports submitted to other Federal agencies or to the New York State Department of Environmental Conservation as a requirement of a permit or certificate involving environmental matters containing information not already covered in the ETSR, shall also be submitted to the NRC at the same time.

5.6 Plant Reporting Requirements (Continued)

B. Radiological

A report on the radioactive discharges released from the site during the previous six (6) months of operation shall be submitted to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director of Office of Nuclear Reactor Regulation) within 60 days after January 1 and July 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the plant following the format of Appendix B of Regulatory Guide 1.21, measuring, evaluating, and reporting radioactivity in solid wastes and releases of radioactive materials in liquid and gaseous effluents from light-water-cooled nuclear power plants with data summarized on a quarterly basis following the format of Appendix B thereof.

The report shall include a summary of the meteorological conditions concurrent with the release of gaseous effluents during each quarter with data summarized on a quarterly basis following the format of Appendix B Regulatory Guide 1.21. Calculated offsite dose to humans resulting from the release of effluents and their subsequent dispersion in the atmosphere shall be reported as recommended in Regulatory Guide 1.21.

5.6.2 Nonroutine Reports

5.6.2.1 Nonroutine Environmental Operating Reports

A report shall be submitted in the event that (a) a limiting condition for operation is exceeded (as specified in Section 2.0, "Limiting Conditions for Operation"), (b) a report level is reached (as specified in Section 4.0, "Environmental Surveillance"). Reports shall be submitted under one of the report schedules described below.

a. Prompt Report. Those events requiring prompt reports within 24 hours by telephone, telegraph, or facsimile transmission to the Director of the Region I Office of Inspection and Enforcement and within 10 days by a written report to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director of Office of Nuclear Reactor Regulation).

5.6 Plant Reporting Requirements (Continued)

b. 30-Day Report. Those events not requiring a prompt report shall be reported within 30 days by a written report to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director of Office of Nuclear Reactor Regulation).

The reporting schedule for reports concerning limiting conditions for operation and report levels shall be specified in the licensee's technical specifications. Reports concerning unusual or important events shall be reported on the prompt schedule.

Written 10-day and 30-day reports and, to the extent possible, the preliminary telephone, telegraph, or facsimile reports shall (a) describe, analyze, and evaluate the occurrence, including extent and magnitude of the impact, (b) describe the cause of the occurrence, and (c) indicate the corrective action (including any significant changes made in procedures) taken to preclude repetition of the occurrence and to prevent similar occurrences involving similar components or systems.

The significance of an unusual or apparently important event with regard to environmental impact may not be obvious or fully appreciated at the time of occurrence. In such cases, the NRC shall be informed promptly of changes in the licensee's assessment of the significance of the event and a corrected report shall be submitted as expeditiously as possible.

5.6.2.2 Nonroutine Radiological Environmental Operating Report

a. Anomalous Measurement Report. If, during any yearly report period, a confirmed measured level of radioactivity in any environmental medium exceeds ten times the control station value, a written report shall be submitted to the Director of the Region I Office of Inspection and Enforcement (with copies to the Director of Office of Nuclear Reactor Regulation) within 10 days after confirmation.* This report shall include an evaluation of any release conditions, environmental factors, or other aspects necessary to explain the anomalous result.

*A confirmatory reanalysis of the original, a duplicate or a new sample may be desirable, as appropriate. The results of the confirmatory analysis shall be completed at the earliest time consistent with the analysis but in any case within 30 days. If the high volume is real, the report to the NRC shall be submitted.

5.6 Plant Reporting Requirements (Continued)

b. Milk Pathway Measurements

i. If cow or goat milk samples collected over a calendar quarter show average concentrations of 4.8 picocuries per liter or greater, respectively, a plan shall be submitted within 30 days advising the Director of Office of Inspection and Enforcement of the proposed action to ensure the plant-related annual doses will be within the design objective of 15 mrem/yr to the thyroid of any individual.

ii. When pasture grass is sampled rather than goat milk, if individual pasture grass samples show I-131 concentrations of 0.022 picocuries per gram (wet weight) or greater, a plan shall be submitted within 30 days advising the Director of Office of Inspection and Enforcement of the proposed action to ensure that plant-related annual doses will be within the design objective of 15 mrem/yr to the thyroid of any individual.

c. Nonroutine Radioactive Effluent Report

The reporting requirements for nonroutine radioactive discharges are specified in Section 2.4 and 3.4 of these specifications.

5.6.3 Changes in Environmental Technical Specifications

5.6.3.1 A report shall be made to the NRC prior to implementation of a change in plant design, in plant operation, or in procedures described in Section 5.5 if the change would have a significant effect on the environment or involves an environmental matter or question not previously reviewed and evaluated by the NRC. The report shall include a description and evaluation of the changes and a supporting benefit-cost analysis of the changes. These changes do not preclude making changes on short notice that are significant in terms of decreasing the adverse environmental impact.

5.6.3.2 Request for changes in environmental technical specifications shall be submitted to the Director for Reactor Licensing, for review and authorization. At the same time, the licensee shall notify the N.Y.S. Department of Environmental Conservation of the request. The request shall include an evaluation of the environmental impact of the proposed change and a supporting benefit-cost analysis.

5.6.3.3 When changes or additions to permits and certificates required by Federal, state, local, and regional authorities for the protection of the environment are submitted to the concerned agency for approval, they will also be submitted to the Director for Reactor Licensing, USNRC, for information.

TABLE 5.6-1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility _____ Docket No. _____

Location of Facility _____ Reporting Period _____
(County, State)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analyses Performed	Lower Limit of Detection a/ (LLD)	All Indicator Locations Mean b/ Range b/	Location with Highest Annual Mean: Name, Distance and Direction	Location with Highest Annual Mean: Mean b/ Range b/	Control Locations Mean b/ Range b/	Number of Nonroutine Reported Measurements
Air Particulates (pCi/m^3)	β 416	0.003	0.08 (200/312) (0.05-2.0)	Middletown 5 miles 340°	0.10 (5/52) (0.08 - 2.0)	0.08 (8/104) (0.05-1.40)	1
	γ 32 ^{137}Cs	0.003	0.05 (4/24) (0.03-0.13)	Smithville 2.5 miles 160°	0.08 (2/4) (0.03 - 0.13)	<LLD	4
	^{140}Ba	0.003	0.03 (2/24) (0.01-0.08)	Podunk 4.0 miles 270°	0.05 (2/4) (0.01 - 0.08)	0.02 (1/8)	1
	^{89}Sr 40	0.002	<LLD	-	-	<LLD	0
	^{90}Sr 40	0.0003	<LLD	-	-	<LLD	0
Fish pCi/kg (dry weight)	γ 8 ^{137}Cs	80	<LLD	-	<LLD	90 (1/4)	0
	^{134}Cs	80	<LLD	-	<LLD	<LLD	0
	^{60}Co	80	120 (3/4) (90-200)	River Mile 35 Podunk River	See Column 4	<LLD	0

a/ Nominal Lower Limit of Detection (LLD) as defined in HASL-300 (Rev. 8/73), pp. D-08-01, 02, 03.

b/ Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses

c/ Nonroutine reported measurements are defined in Section 5.6.2b.

d/ Note: The example data are provided for illustrative purposes only.

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