INDIANA MICHIGAN POWER

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Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
ANNUAL ENVIRONMENTAL OPERATING REPORT

The Environmental Technical Specification (ETS) 5.4.1 for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2 requires an Annual Environmental Operating Report be submitted to the Nuclear Regulatory Commission (NRC) on an annual basis. Enclosed is CNP's Annual Environmental Operating Report which covers the period from January 1, 2007, through December 31, 2007, and was prepared in accordance with the requirements of ETS 5.4.1.

ETS 3.2 requires notification to the NRC of changes to the National Pollutant Discharge Elimination System (NPDES) Permit within 30 days of receipt of the change by the licensee. ETS 3.2 also requires that the NRC be notified of, and be provided a copy of, proposed changes to the NPDES Permit. By letters dated May 22, 2007, and September 25, 2007, to the Michigan Department of Environmental Quality (MI DEQ), Indiana Michigan Power (I&M), licensee for CNP Units 1 and 2, requested a change to CNP's NPDES Permit. By letter dated December 13, 2007, to I&M, MI DEQ issued a revised NPDES Permit for CNP.

Notification of the change to CNP's NPDES Permit, as described above, was not previously provided to the NRC as required by ETS 3.2. The enclosed Annual Environmental Operating Report provides copies of the requested changes to the NPDES Permit and copies of the draft and final change to CNP's NPDES Permit issued by MI DEQ. This letter constitutes the notification to the NRC as required by ETS 3.2. This late notification to the NRC of the change to CNP's NPDES Permit has been entered into CNP's Corrective Action Program.

IE25
NRR

There are no new commitments in this submittal. Should you have any questions, please contact Mr. James M. Petro, Jr., Regulatory Affairs Manager, at (269) 466-2491.

Sincerely,

Mark A. Peifer
Site Vice President

HLE/rdw

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ENCLOSURE TO AEP:NRC:8541

ANNUAL ENVIRONMENTAL OPERATING REPORT

Donald C. Cook Nuclear Plant Units 1 & 2

Annual Environmental Operating Report

January 1 2007, through
December 31, 2007

Indiana Michigan Power Company
Bridgman, Michigan

Docket Nos. 50-315 & 50-316

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I. INTRODUCTION

Technical Specifications Appendix B, Part II, Section 5.4.1, requires that an Annual Environmental Operating Report be produced and include summaries and analyses of the results of the environmental protection activities required by Section 4.2 of the Environmental Protection Plan for the report period. The Annual Environmental Operating Report shall include a comparison with preoperational studies, operational controls (as appropriate), previous non-radiological environmental monitoring reports, and an assessment of the observed impacts of the plant operation on the environment.

This report serves to fulfill these requirements and represents the Annual Environmental Operating Report for Units 1 and 2 of the Donald C. Cook Nuclear Plant (CNP) for the operating period from January 1, 2007, through December 31, 2007.

The following table summarizes the pertinent data concerning CNP's operation during the period from January 1, 2007, through December 31, 2007.

Parameter	**Unit 1**	**Unit 2**
Gross Electrical Generation (megawatt hours)	9,559,146	8,389,164
Unit Service Factor (%)	99.6	85.5
Unit Capacity Factor – Maximum Dependable Capacity Net (%)	101.1	86.1

II. CHANGES TO THE ENVIRONMENTAL TECHNICAL SPECIFICATIONS

There were no changes to Environmental Technical Specifications in 2007.

III. NON-RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

A. Non-Routine Reports

A summary of the 2007 non-routine events is located in Appendix I of this Report. No long-term, adverse environmental effects were noted.

B. Environmental Protection Plan

There were no instances of noncompliance with the Environmental Protection Plan in 2007.

C. Plant Design and Operation

During 2007, there were no changes in station design, operations, tests, or experiments that involved a potentially significant unreviewed environmental issue. There were no environmental evaluations performed during the reporting period.

D. Environmental Monitoring – Herbicide Application

Technical Specification Appendix B, Part II Section 4.2., requires the use of herbicides to conform to the approved use of selected herbicides as registered by the EPA and approved by State authorities. There were no preoperational herbicide studies to which comparisons could be made. Herbicide applications are managed by plant procedure PMP-2160-HER-001, Guidelines for the Application of Approved Herbicides.

A summary of the 2007 herbicide application is contained in Appendix II of this report. Based on observations, there were no negative impacts or evidence of trends toward irreversible change to the environment as a result of the herbicide applications. Based on our review of application records and field observations, the applications conformed to Environmental Protection Agency and State requirements for the approved use of herbicide.

E. Mollusc Biofouling Monitoring Program

Macrofouling monitoring and control activities during 2007 are discussed in Appendix III of this report.

F. NPDES Applications

Groundwater

On March 8, 2007, the Michigan Department of Environmental Quality (MI DEQ) issued a modified groundwater discharge authorization on permit GW1810102. The changes included Process Wastewater being added to Seepage Basins Location and Sanitary Sewage Wastewater being added to Rapid Infiltration Basins on page 6 of the permit.

Surface Water

On May 22, 2007, the plant requested a change to its NPDES Permit (MI0005827) that would remove the entire text of Part I.A.10. This request was a result of the U. S. EPA's letter, dated March 10, 2007, notifying the Regional Administrators and delegated states of the suspension of Section 316(b), Phase II rule. A second letter, dated September 25, 2007, requested modification of CNP's NPDES Permit by changing the language in Part I.A.10 to be in accordance with the suspension of the Phase II rules.

On October 4, 2007, the MI DEQ issued CNP's draft NPDES Permit and public notice that included revisions that reflected the U.S. EPA suspension of the Section 316(b), Phase II rules in Part I.A..11 of the permit; and Deicing Discharge Authorization, Outfall 003 in Part I.A.9 of the permit. CNP's final permit was issued by the MI DEQ on December 13, 2007, with the above revisions.

The above mentioned 2007 Groundwater and Surface Water permit application correspondence is included in Appendix IV of this report.

G. Special Reports

On June 8, 2007, an interim report was submitted to the U.S. EPA, Office of Chemical Emergency Preparedness and Prevention in Chicago, IL. The report was submitted in accordance with paragraph 22 of the Consent Agreement and Final Order (CAFO) to address the status of the supplemental environmental project (SEP) and associated costs to upgrade CNP's sodium hypochlorite system. The new double-walled feed piping for the plant sodium hypochlorite system, improved leak detection, and a new sodium hypochlorite pump room with improved secondary containment remains in operation since its installation on May 11, 2006. The actual costs incurred for purchasing and installing the SEP were $730,827.10. To date, the costs incurred for purchase, installation, operation, and maintenance of the SEP are $848,427.68. These SEP costs exceed the minimum amount ($66,000) required by Paragraph 17 of the CAFO.

In 2005, CNP contracted with Normandeau and Associates to perform a Section 316(b), Phase II, Fish Impingement Mortality and Entrainment Characterization Study. The study results are presented in Appendix V of this report. It includes the impingement and entrainment monitoring program and nearfield sampling program results. Impingement mortality and entrainment estimates were made for the study period assuming the impingement morality and entrainment rates were proportional to intake flow and the plant used the design intake flow 100% of the year. Results from the nearfield sampling are discussed to characterize the fish community in the vicinity of CNP's intake structures.

APPENDIX I

NON-ROUTINE REPORTS

2007

2007 Non-Routine Reports

January 3, 2007 – Notice was made to the MI DEQ that during a review of our steam generator draining process, we have evaluated one of our processes to increase our outage efficiency by shortening drainage time. The present steam generator maximum drain rate is about 40 gpm. The plant proposed to increase the maximum drain rate to 100 gpm thereby increasing Carbohydrazide, Hydrazine, and ETA concentrations in Outfall 001 and 002 by a factor of 2.5. In a reply dated July 26, 2007, the MI DEQ determined that under the proposed conditions, Hydrazine concentrations would exceed monthly average water quality-based effluent limit (WQBEL) concentrations and therefore was not approved; but Carbohydrazide and ETA would remain below WQBEL concentrations and was approved. Since the steam generator effluent contains all three chemicals, the plant elected not to increase the maximum drain rate from 40 gpm to 100 gpm.

March 16, 2007 – On March 8, 2007, at 1618 hours, the Plant's Environmental Department was notified that a sample pump containing a small amount of oil was lost in the Unit 2 discharge piping. Approximately 0.17 liters of seal oil was contained in the pump assembly. The pump could eventually be damaged by the high velocity flow and the tortuous path of the discharge to a point where the oil would be released to the environment. Plant personnel performed a visual inspection of the plant's discharges and the beach in the vicinity of the Unit 2 discharge. No sheen or oil was observed. It was concluded that due to the small volume of oil, this event did not pose a threat to the environment, public health, or safety. Notice of this event was made to the NRC in a separate letter dated March 19, 2007.

April 27, 2007 – Notice was made to the MI DEQ informing them of our intent to place the supplemental cooling system in service that was initially requested in a letter dated August 18, 2006. The predicted rise in Lake Michigan temperature had caused us to install supplemental cooling for both units' containment buildings. This supplemental cooling successfully reduced ambient temperatures below technical specification limits of 120 degrees Fahrenheit in the 2006 operating year. The supplemental cooling system consists of pumps drawing Lake Michigan water from the North Intake Tunnel of the Circulating Water System. The untreated lake water is strained and cooled by portable air conditioning units before entering the containment ventilation units. The supplement cooling water enters the Non Essential Service Water (NESW) system and is routed to the normal NESW discharge point. No chemicals are added to this system and the total volumes for NESW discharge remained unchanged. The system did not result in new or increased loadings of pollutants to the receiving waters of the State, and was deemed not reportable under Part II.C.10, "Notification of Change in Discharge". The system was installed on June 1, 2007, and removed from site on November 9, 2007.

June 5, 2007 – On June 1, 2007, at 1230 hours, a plume was observed from Stormwater Outfall 002S. The plume was approximately 300' X 6' in size in Lake Michigan. The lake conditions were calm which prevented the plume from mixing. The source of the plume was from cooling system flushing operations. The flush water had mixed with the surrounding gravel and created turbid water that overflowed the filter fence area into a storm drain that was not protected by filter fabric. The discharge to the lake contained soil particles thereby increasing its turbidity and creating the plume. The cause of the failure was due to excessive flush water flow rates and clogged filter fabric on the drains. The flushing operations were stopped until remedial measures could be made to the flushing/filter system. Notice of this event was made to the NRC in a separate letter dated June 13, 2007.

June 20, 2007 – On June 11, 2007, at 0130 hours, the Environmental Department was notified that a diesel driven water pump had leaked a small amount of seal oil into the plant discharge piping via the supplemental containment cooling system, which discharges to Outfall 001 and 002. Approximately 1.5 gallons of seal oil was lost through a failed pump seal to the discharge side of the pump. Due to the small volume of oil, the spill was dispersed. No sheen was noted

during a visual observation of the discharge performed during the morning of June 11, 2007. This spill did not pose a threat to the environment, public health, or safety. The pump was removed from service and replaced with a new unit. Notice of this event was made to the NRC in a separate letter dated July 2, 2007.

APPENDIX II

HERBICIDE APPLICATION REPORT

2007

AEP INDIANA MICHIGAN POWER®
A unit of American Electric Power

Date March 19, 2008

Subject **2007 Herbicide Spray Report - Cook Nuclear Plant**

From Steve Hitt

To Jon Harner, Environmental Manager

The following herbicides were applied per manufacturers' direction by certified Michigan licensed applicators on Cook Nuclear Plant property during 2007:

Via Contractor	Via AEP Personnel
Spike 80 DF/Dow	Round–Up Pro
Glyphosate/Du Pont	Pro-Scape 19-2-9 with
Milestone VM/Dow	Confront

DeAngelo Brothers Applications:
DeAngelo Brothers; a Michigan licensed herbicide applicator on contract to the AEP Energy Delivery and Customer Relations performed the applications (Bill Rahm).

On the dates of June 26 and 27 of 2007 a mixture of Spike 80 DF, Glyphosate, and Milestone VM was used for total plant control in the 69 KV and 765 KV switch yards (345 KV yard not sprayed), railroad (right-of-way) tracks, switches, derails & train bridge. The rail areas were applied with a spray pattern corresponding to railroad specifications, generally 16' to 20' wide pattern from a hi-railer where grass was present along railroad. Any ditches along the right-of-way were checked for water and spray pattern decreased in these areas. A total of 38.3 pounds of Spike 80 DF, 96.2 ounces of Milestone VM, and 19.0 quarts of Glyphosate were used for the application and spread over 23.8 acres in accordance with the manufacturers' labels.

Product Name	Quantity Used		Quantity Used/Acre		Quantity Allowed/Acre	
Spike 80 DF	38.3	lbs.	1.6	lbs	2.0	lbs
Milestone VM	96.2	oz	4.0	oz	5.0	oz
Glyphosate	19.0	qt	0.8	qt	1.0	qt

Maintenance Building and Grounds:
Round-Up Pro mixed with water in a sprayer was applied to Owner Controlled Areas by licensed applicators from the Maintenance Building and Grounds crew (L. Everett Hartwig Sr. and John Mock).

Weeds were sprayed at the Training Center Parking Lot (including around chiller units), the sidewalk from the Training Center to North Access, the fence along the East side of the Protected Area from North Access to South Access, the backside of TSOC (length of

building x 10' wide) stone areas inside the Protected Area, and both Sanitary Absorption Ponds. A total of 720 ounces of Round-Up Pro were used for spraying in 2007. According to the product label, spraying should contain a 5 - 10% solution and a total permitted concentration of 40 gallons per acre. A total of 6 gallons of solution were used to treat 1.5 acres (total of 60 gallons of 10% mixed solution used).

ProScape fertilizer with Confront herbicide was applied on May 16, 2007 to all grassy areas in the Protected Area and along the main plant road near the plant entrance. Approximately six and one-half (~6.5), forty pound bags (258 lbs.) were applied to approximately 2 acres (~86,000 ft^2) via the #14 setting on an Earthway Rotary Spreader as recommended on the manufacturer's label. The herbicide was applied by a licensed applicator (L. Everett Hartwig) from the Maintenance Buildings and Grounds crew.

The following table details the application rates used for weed control in the grass and garden beds compared to the allowable application rates.

Product Name	Quantity Used	Concentration Used	Concentration Allowed
Round-Up Pro	720 oz	10.0% solution – 6 gallons of solution for 60 gallons used.	40 gallons per acre, 1.5 acres treated.
Pro-Scape with Confront	258 lbs.	~6.5 bags/2 acres applied by #14 setting on Earthway Rotary Spreader	3.6 lbs/1000 ft^2 = 154.5 lbs/acre

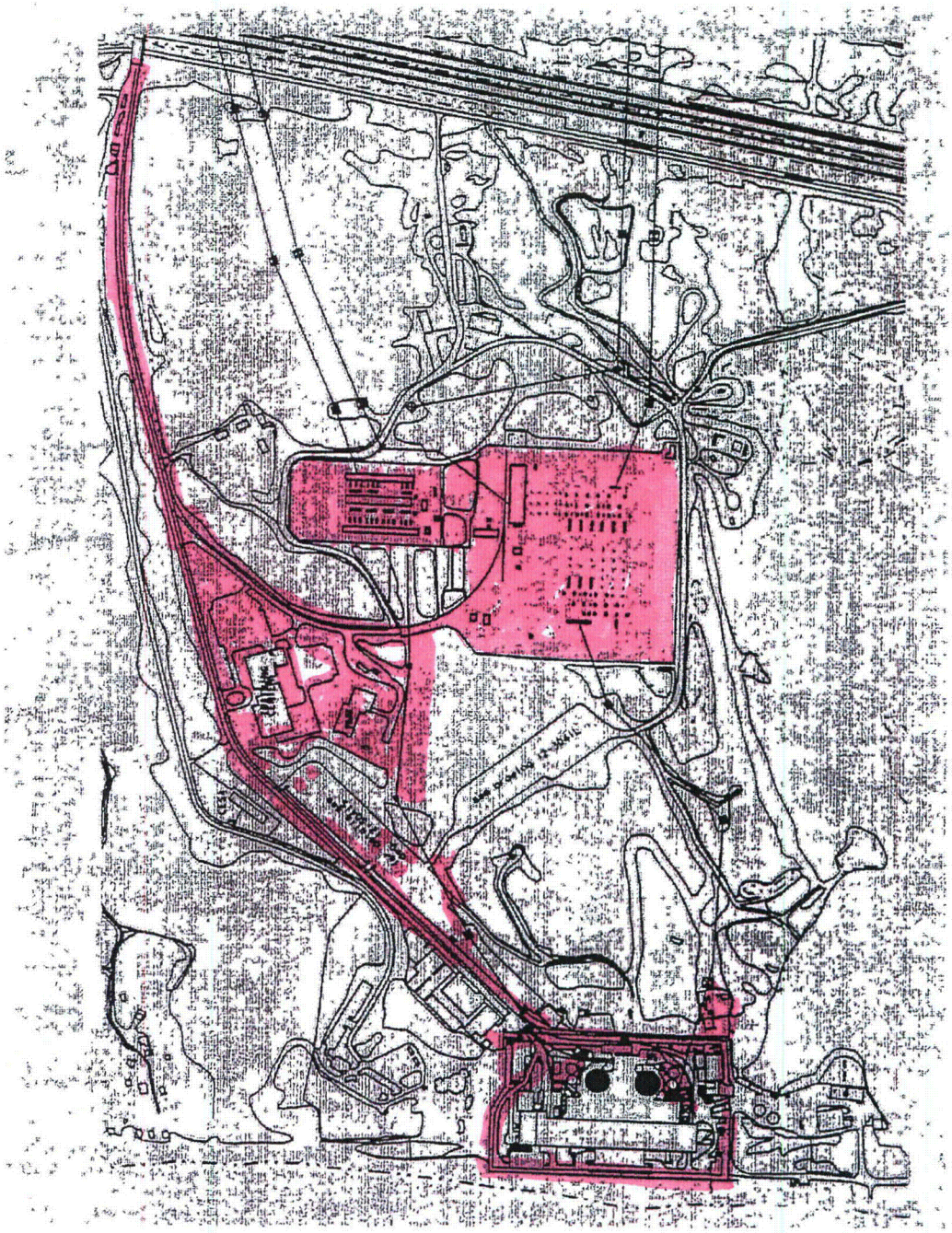
Mortality Inspection:
On December 4, 20, 26 and 27, 2007, those portions of the owner controlled area where herbicides were applied in 2007 were surveyed. There was no evidence of spillage, overspray or excessive application. No adverse environmental effects were noted during the inspection. Herbicides were applied in accordance with manufacturer's label instructions and Federal and State requirements by Michigan-certified applicators. Preparation and application descriptions were documented on PMP-2160-HER-001 Data Sheet 1 forms. Herbicides used by DeAngelo Brothers were Spike 80DF, Milestone VM, and Glyphosate. Sun States' licensed applicator applied Roundup Pro and Pro-Scape 19-2-9 with Confront.

DeAngelo Brothers treated areas kept void of vegetation for safety and/or security reasons. These areas were in the 69kV and 765kV Yards, and railroad tracks to Red Arrow Highway. Herbicide control was successful overall with typically 85-95% of the weeds eradicated. There was some plant growth inside the north fence of the 69kV Yard.

The flower beds, stone areas, and lawns treated by Sun States had few weeds except for broadleaves in areas excavated for Oil/Water Separator isolation valve installation and the CD EDG fuel oil unloading stone area. Other areas where the spraying was not as effective include the inside fenced area around 2-TR201AB and around U2 Main Transformers. Also, numerous weeds were observed in the grass area south of North Guard House, west of the Search Portal. The stone, mulch, microwave zones and 345 kV Yard were treated by Sun States to eliminate vegetation; these treatments were very successful.

Summary:

In summary, based upon our review of the application records, manufacturer specifications, material safety data sheets (MSDSs) and observations of the treated areas, the herbicides were applied according to the manufacturer's labeled instructions and according to Federal and State requirements. All personnel performing herbicide applications were licensed by the State of Michigan. A map has been included with this report indicating areas of herbicide application. A detailed map and application records are filed in accordance with PMP-2160-HER-001, Guidelines for the Application of Approved Herbicides. No signs of over spray or spillage were observed. No adverse environmental effects occurred.



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APPENDIX III

MOLLUSC BIOFOULING MONITORING PROGRAM REPORT

2007

Mollusc Biofouling Monitoring Program 2007

Performed at Donald C. Cook Nuclear Plant

Performed and Submitted
By
Cook Plant Environmental

Prepared for:

American Electric Power
Donald C. Cook Nuclear Plant
One Cook Place
Bridgman, Michigan

MOLLUSC BIOFOULING MONITORING PROGRAM
2007

March 2008

Cook Nuclear Plant
Environmental Section

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Executive Summary

Biofouling studies have been conducted at the Donald C. Cook Nuclear Plant since 1983. In 1991, monitoring of zebra mussels in the circulating water, essential service water (ESW), and nonessential service water (NESW) systems was added to the program. The objectives of this monitoring program are to detect the presence and determine the density of zebra mussel veligers in the Circulating Water System and postveliger settlement and growth rate in the forebay and service water systems, and to determine the effectiveness of oxidizing and non-oxidizing biocides in the plant systems by comparing densities and sizes of settled zebra mussels when applicable.

Veligers were present in the forebay from 26 April through 5 December 2007. Peak densities occurred on 7 June, 20 July, 30 August, and 11 October, with the major peak occurring on 20 July (196,000 veligers per cubic meter). Past years' studies have determined that zebra mussel density is independent of the volume of water entering the plant, as the concentration of veligers in the water remains the same regardless of the flow rate through the plant. The past seventeen years data suggest that the zebra mussel population is highly variable and future populations of zebra mussels are difficult to accurately predict.

Cumulative settlement was monitored in the forebay using a six-inch PVC pipe. As in 2006, the time period of collection was made to more accurately coincide with the annual fall intake crib cleaning to estimate the size and density of mussels the divers might encounter at the time of cleaning. The PVC pipe was deployed on 15 September 2006 and was retrieved on 13 September 2007. The settlement density and average size of postveligers for the 12-month period was 129,425 individuals/m^2 and 3,328u (3.3 mm).

For comparison, the sample substrate that was pulled in 2006 had a density of 303,801 individuals/m^2 and average size of 2,470u (2.5 mm). An explanation for this difference could be attributed to a large peak veliger density (455,000 ind./m^3) occurring in the Fall of 2005 that was more than twice the peak veliger density (191,750 ind./m^3) occurring in the Fall of 2006.

Service Water Systems and Miscellaneous Sealing and Cooling Water

The return sides (after systems' use) of the ESW and NESW systems and the MSCW system were monitored in the 2007 Mollusc Biofouling Monitoring Program. The results indicate that the chlorination system was effective in preventing growth and prolonged settlement of postveligers in the service water systems. Zebra mussel settlement on the service water and MSCW artificial substrates became elevated when chlorination was secured during the Unit 2 C17 Refueling Outage. Settlement was again brought under control when chlorination was resumed near the end of the outage. The results showed that even when the system was taken out of service for short periods of time for system maintenance, or that system TRC residuals fell below their target band of 0.08-0.6 ppm, settlement control was quickly re-established.

Biocide Treatment

There were no biocide treatments in 2007.

Chapter 1

Introduction

1.1 Past History

American Electric Power Company (AEP) has been conducting zebra mussel monitoring studies at the Donald C. Cook Nuclear Plant since 1991. The purpose of these studies is to monitor zebra mussel veliger and postveliger settlement densities in the Circulating Water, Essential Service Water (ESW), Nonessential Service Water (NESW), and Miscellaneous Sealing and Cooling Water (MSCW) systems to help determine the effectiveness of the zebra mussel control program.

Since 1999, Grand Analysis conducted the monitoring program, designed to detect the timing of spawning and settling of zebra mussels at the Cook Nuclear Plant. In 2004 the program was taken "in house" by the Plant's Environmental staff. The program also determines densities for: 1) whole water samples for planktonic veligers; and 2) artificial substrates set within the ESW, NESW, and MSCW systems for cumulative postveliger settlement. In the Circulating Water System, a section of PVC piping was used to determine the cumulative settlement in the intake forebay.

1.2 Objectives

Specific objectives for the 2007 Mollusc Biofouling Monitoring Program were as follows:

- Conduct whole-water sampling of the Circulating Water System weekly (July-September), bimonthly (May, June, October & November), and monthly (April and December) to determine the presence and density of larval zebra mussels.

- Deploy artificial substrates (microscope slides in test tube racks) in the service water systems to determine cumulative settlement of postveligers. Collect samples monthly from May through December.

- Deploy a PVC piping section, also as an artificial substrate, in the intake forebay to determine cumulative settlement for approximately one year.

Chapter 2

Methods

2.1 Whole-Water Sampling

Whole-water sampling of the Circulating Water System was conducted from 26 April to 5 December 2007 (Table 2-1). Samples were collected from mid-depth in the intake forebay by pumping lake water through an in-line flowmeter into a plankton net. The sampling location was consistent with that of previous studies. Two replicates (2,000 liters each) were collected during each sampling date.

A Myers Model 2JF-51-8 pump or equivalent was connected to an in-line flowmeter assembly (Signet Model #P58640) and pumped water into a plankton net for approximately one hour. To minimize organism abrasion, measured flow was directed into a No. 20 plankton net that was suspended in a partially filled 55-gallon plastic barrel.

Samples were gently washed into the cod-end bucket of the plankton net using filtered Circulating Water System water and then transferred to a one-liter plastic container. Filtered water was added to the container to ensure that a full liter was analyzed. The two samples were analyzed in an on-site laboratory.

Samples were mixed thoroughly for three minutes using a magnetic stir plate. Then, using a calibrated Pasteur pipette, a 1-milliliter aliquot of mixed sample was placed into a Sedgewick-Rafter cell for counting. An Olympus SZ-1145 binocular microscope (18-110x) equipped with cross-polarizing filters was used. Ten aliquots

TABLE 2-1

SAMPLING SCHEDULE FOR ZEBRA MUSSEL MONITORING AT THE D.C. COOK NUCLEAR PLANT IN 2007

Date		Whole Water	Artificial Substrates
April	26	X(1)	
May	10	X	
	31	X	X(3)
June	7	X	
	21	X	
	28		X
July	6	X	
	12	X	
	20	X	
	26	X	X
August	2	X	
	9	X	
	16	X	
	23	X	X
	30	X	
September	6	X	
	13	X	X (2)
	19	X	
	28	X	
October	11	X	X
	25	X	
November	8	X	X
	29	X	
December	5	X	X

1. Deploy slide racks.
2. Retrieve PVC pipe section. Read, clean & re-deploy.
3. No flow through bio-box

were counted and the average was extrapolated to determine the number of individuals per cubic meter. The density was calculated as follows:

Density (#/m3)=(average #*DF)/0.001L*1L/2000L*1000L/m3

DF- Dilution Factor

This process was repeated for the second replicate and the mean of the two values was calculated to yield a final density value. Size measurements were recorded for up to 50 organisms from each sample. Veliger size was measured using an ocular micrometer that was calibrated to a stage micrometer.

2.2 Artificial Substrates

To determine zebra mussel settlement in the Circulating Water, a PVC section was deployed in the intake forebay, upstream of the trash racks. Bio-box side-stream samplers were installed on the return sides of both service water systems and on the Miscellaneous Sealing and Cooling Water System to determine settlement in these systems. The side-stream samplers consisted of modified test-tube racks designed to hold microscope slides and placed in bio-boxes for cumulative sampling.

2.2.1 Intake Forebay

On 13 September 2007, a PVC pipe section was analyzed that was placed in the forebay on 15 September 2006. The PVC section measured 6 inches long and had an inside diameter of 3.5 inches. It had been cut in half lengthwise, rejoined using hose clamps, attached to a rope weighted by a stainless steel pipe section, and suspended at

mid-depth in the intake forebay. The PVC sampler was analyzed for densities and shell sizes by analyzing scrapings from two separate one-inch square sections of the PVC sampler. The PVC sampler was designed to provide information on zebra mussel accumulated infestation and sizes occurring over a 1-year period from September 2006 to September 2007.

2.2.2 Service Water Systems

Side-stream bio-boxes were placed on the return side of the service water systems (1 ESW, 2 ESW, NESW) and the Miscellaneous Sealing and Cooling (MSCW) Water System. Each bio-box contained two modified test tube racks containing a total of 80 microscope slides. The racks held the slides above the bio-box base that allowed silt and sediment to fall out before they could affect the slide settlement. The bio-boxes were covered with a plant-approved fireproof fabric to limit light exposure. Plant personnel checked the bio-boxes periodically to ensure that adequate flow was available, and flow was adjusted as necessary. Ten slides from each location were retrieved monthly and immediately analyzed for densities and shell size.

2.2.3 Artificial Substrate Cumulative Sample Analysis

An Olympus SZ-1145 binocular microscope (18-110x) equipped with cross polarizing filters was used for analyzing samples. After one side of the slide was scraped clean, the slide was placed on the microscope stage so that the attached postveligers could be counted. When slides became heavily infested, a sub-sampling technique was followed:

- The slides were sub-sampled using a straight edge that permitted either half or a quarter of the slide to be counted. Counts were then proportionally extrapolated to one square meter.

Settlement rates were computed by taking the average number of mussels from the ten slides and multiplying this value by 533.33 to obtain the density of zebra mussels per square meter. (One postveliger/microscope slide equals 533.33 postveligers per square meter.)

Shell diameters were measured for up to 50 random individuals to obtain maximum, minimum and mean sizes. Diameters were measured using an ocular micrometer calibrated to a stage micrometer.

Chapter 3

Results and Discussion

The zebra mussel monitoring system performed up to expectations in 2007. The whole-water sampling for free-swimming veligers coupled with monitoring postveliger settlement on artificial substrates provided sample results that could be compared with previous years' data.

Appendix Table 1 shows the chlorination values for the ESW and NESW systems. A 0.08-0.6 ppm total residual chlorine (TRC) was the target band for the control of zebra mussel settlement. Total residual chlorine values for the ESW and NESW systems were taken periodically. The MSCW system, which was cross-connected to the NESW system, was chlorinated on all of the dates that the NESW system was chlorinated.

3.1 Whole-Water Sampling

Sampling of planktonic veligers in the circulating water system was initiated 26 April and was completed on 5 December. Results are presented in Table 3-1 and in Figure 3-1. Veligers were present in all samples throughout the monitoring season.

Heaviest spawning activity occurred during late-May to early June, mid-July, late August, and mid to late October. The major peak density occurred on 20 July (196,000 ind./m^3). This major peak occurred three months earlier than 2006's and was not matched in timing by any of the previous years' sampling. Overall, 2007's Whole-Water

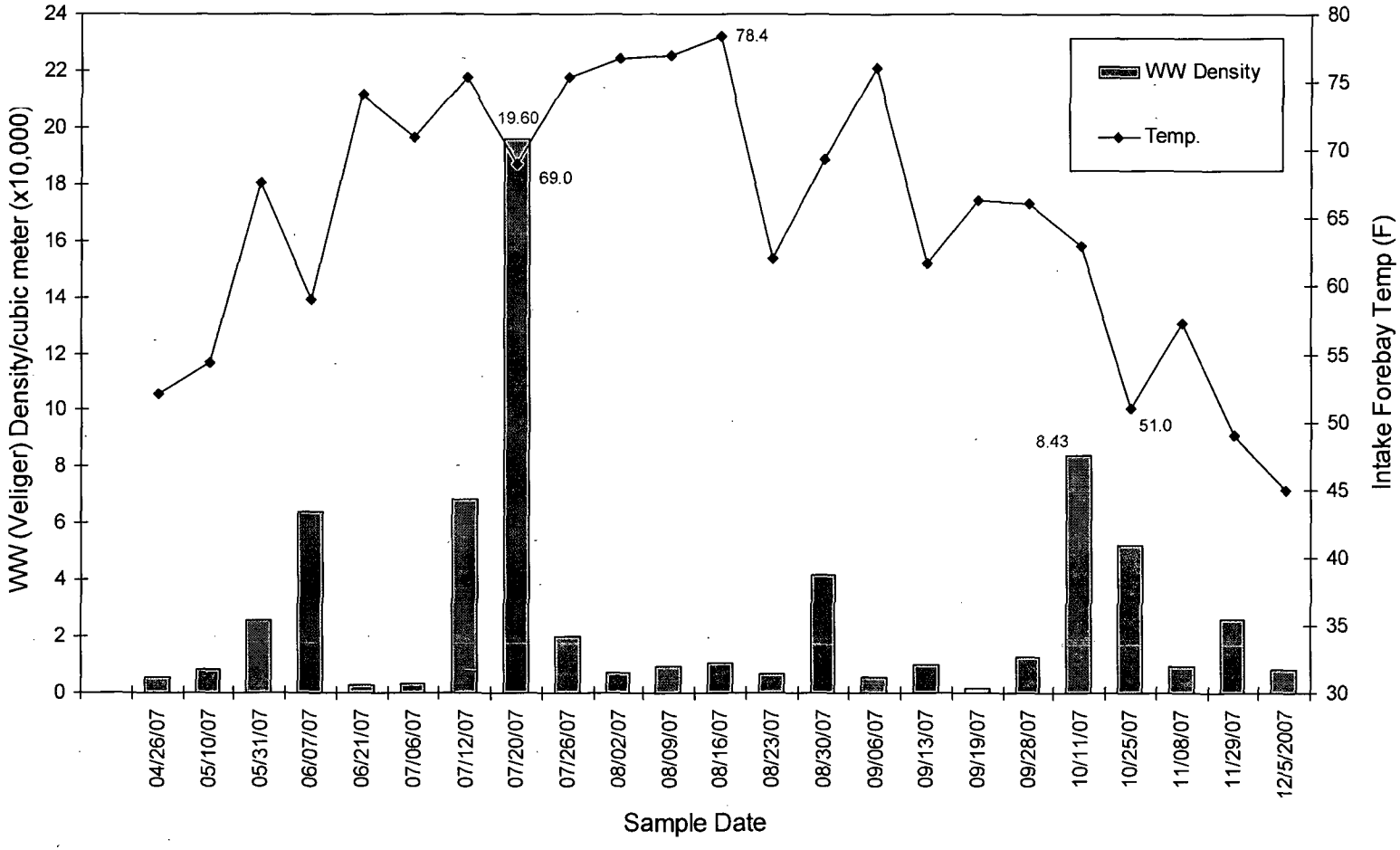
TABLE 3-1

Whole-Water Sampling Program Number of Zebra Mussel Veligers Per Cubic Meter, Veliger Size Range, and Mean Veliger Size (*u*m) Collected in The D.C. Cook Nuclear Plant Forebay in 2007

Date	Density (No./m3)	Size Range (*u*m)	Mean Size (*u*m)
4/26/07	5475	83-133	107
5/10/07	8525	100-150	118
5/31/07	25550	100-233	140
6/7/07	64000	100-233	157
6/21/76	2825	100-233	139
7/6/07	3350	100-300	179
7/12/07	68500	100-266	152
7/20/07	196000	83-200	134
7/26/07	19800	100-333	169
8/2/07	7425	117-433	202
8/09/07	9675	100-366	209
8/16/07	10825	117-300	205
8/23/07	6875	100-333	227
8/30/07	41650	83-283	113
9/6/07	5525	100-500	180
9/13/07	10200	67-333	118
9/19/07	1425	100-333	150
9/28/07	12650	83-466	149
10/11/07	84250	78-412	173
10/25/07	52500	83-433	125
11/8/07	9475	83-333	134
11/29/07	26325	100-466	189
12/5/07	8600	100-300	142

FIGURE 3-1

2007 D.C. Cook Plant- Whole-Water Zebra Mussel Veliger Density and Water Column Temperature in Intake Forebay



peak density was much the same as 2006's (191,750 ind./m^3) but occurring three months earlier. The recorded peak density for 2007 (196,000 ind./m^3) was less than half of those in recent years 2005 (455,000 ind./m^3) and 2003 (450,000 ind./m^3). Secondary peaks were recorded in 2007 on 7 June (64,000 ind./m^3), 30 August (41,650 ind./m^3) and 11 October (84,250 ind./m^3).

Whole water veliger densities declined after their peak on 11 October with falling lake temperatures into December. The whole-water densities show that there are substantial numbers of veligers in the forebay, indicating the need for effective chlorination in the service water systems.

The 2003 report concluded that yearly results in peak abundances make it difficult to predict when the peak abundance will occur each season other than estimating some time between July and October. Continued whole-water monitoring during the veliger spawning season will detect when these peak abundances occur.

Whole-water densities recorded during 1993 through 1995 for the November and December sampling periods were less than 1,000 ind. /m^3 for sampling conducted after 3 November. During the 2005 through 2007 sampling seasons, whole-water densities recorded in November were about fifty times greater than those of the 1993 through 1995 period, showing that spawning is occurring late into the fall due to warm fall weather, and the larger abundance of mussels in Lake Michigan. Because of the late fall spawning in recent years, there is a need for chlorination to continue into the late fall months to prevent zebra mussel settlement and growth in plant systems.

In summary, zebra mussel veligers were present in the water column on all sampling dates from 26 April through 5 December. Spawning commenced in late April and continued through the end of the sampling program. Peak veliger densities occurred on 7 June, 20 July, 30 August and 11 October.

3.2 Artificial Substrate Sampling, Biocide Treatment, and Mechanical Cleaning

3.2.1 Circulating Water System Artificial Substrate Sampling

Cumulative settlement was monitored in the intake forebay using a six-inch PVC pipe with a 3.5 inch inside diameter. The PVC pipe was set in the forebay on 15 September 2006 and retrieved on 13 September 2007 to determine the average density and size range for 12 months. The density on the substrate was 129,425 ind./m^2. Individuals ranged from 193*u*-15,408*u* (.19 mm – 15.41 mm) and the mean size of fifty randomly selected individuals was 3,328*u* (3.3 mm). As in 2006, the time period of collection was designed to coincide with the annual fall intake crib cleaning to estimate the size and density of mussels the divers might encounter at the time of cleaning. For comparison, the sample substrate that was pulled in 2006 had a density of 303,801 individuals/m^2 and an average size of 2,470u (2.5 mm). An explanation for this difference could be attributed to a large peak veliger density (455,000 ind./m^3) occurring in the Fall of 2005 that was more than twice the peak veliger density (191,750 ind./m^3) occurring in the Fall of 2006.

3.2.2 Service Water Systems and Miscellaneous Sealing and Cooling Water System Artificial Substrate Sampling

The return sides (after systems' use) of the ESW and NESW systems and the MSCW system were monitored in the 2007 Mollusc Biofouling Monitoring Program. Chlorine is injected beneath each ESW pump suction. The ESW trains are typically cross-tied downstream of the chlorine injection point so that both ESW trains are served. A separate chlorine injection point, which is in the suction header, serves the NESW system and subsequently the MSCW system.

The plant's Zebra Mussel Monitoring & Control Program calls for continuous chlorination at 0.08-0.6 ppm total residual chlorine (TRC) of the service water and MSCW systems from May through November to correspond with the zebra mussel spawning season.

Cumulative settlement sampling and analysis was performed on a monthly basis in 2007. Artificial substrate slides were installed on 26 April and ten slides per month were examined and not replaced. The May sample was not taken due to a procedure needing to be developed prior to manipulating the system sample valves; thus flow was not established to the bio-boxes until mid-June. Results are shown in Table 3-2 and Figure 3-2.

The chlorine residual and postveliger settlement data indicate that the permanent chlorination system installed under 12-MOD-50719 on 18 July 2005 performed up to expectations. When chlorine was being delivered to the service water and MSCW systems, post-veliger settlement was maintained under control (<~1,000 ind./m^2). From 1 May until the chlorination system was shutdown on 14 September chlorination

system outages were infrequent and chlorine residuals were generally maintained in the target band of 0.08 – 0.6 ppm. The elevated reading on the MSCW sample of 26 July (3,680 ind./m^2) could be attributed to a reduced flow to the MSCW bio-box on this date as the chlorine residuals for U1 and U2 NESW were 0.34 and 0.36 ppm respectively; well within the chlorination target band. The elevated reading on the U1 ESW sample of 13 September could also be attributed to the reduced flow to the U1 ESW bio-box on this date as the chlorine residuals were 0.36 ppm; well within the chlorination target band.

Zebra mussel settlement on the service water and MSCW artificial substrates became elevated when chlorination was secured on 14 September for the Unit 2 C17 Refueling Outage. Settlement was again brought under control when chlorination was resumed on 31 October near the end of the outage. The results showed that even when the system was taken out of service for short periods of time for system maintenance, or that system TRC residuals fell below their target band of 0.08-0.6 ppm, settlement control was quickly re-established.

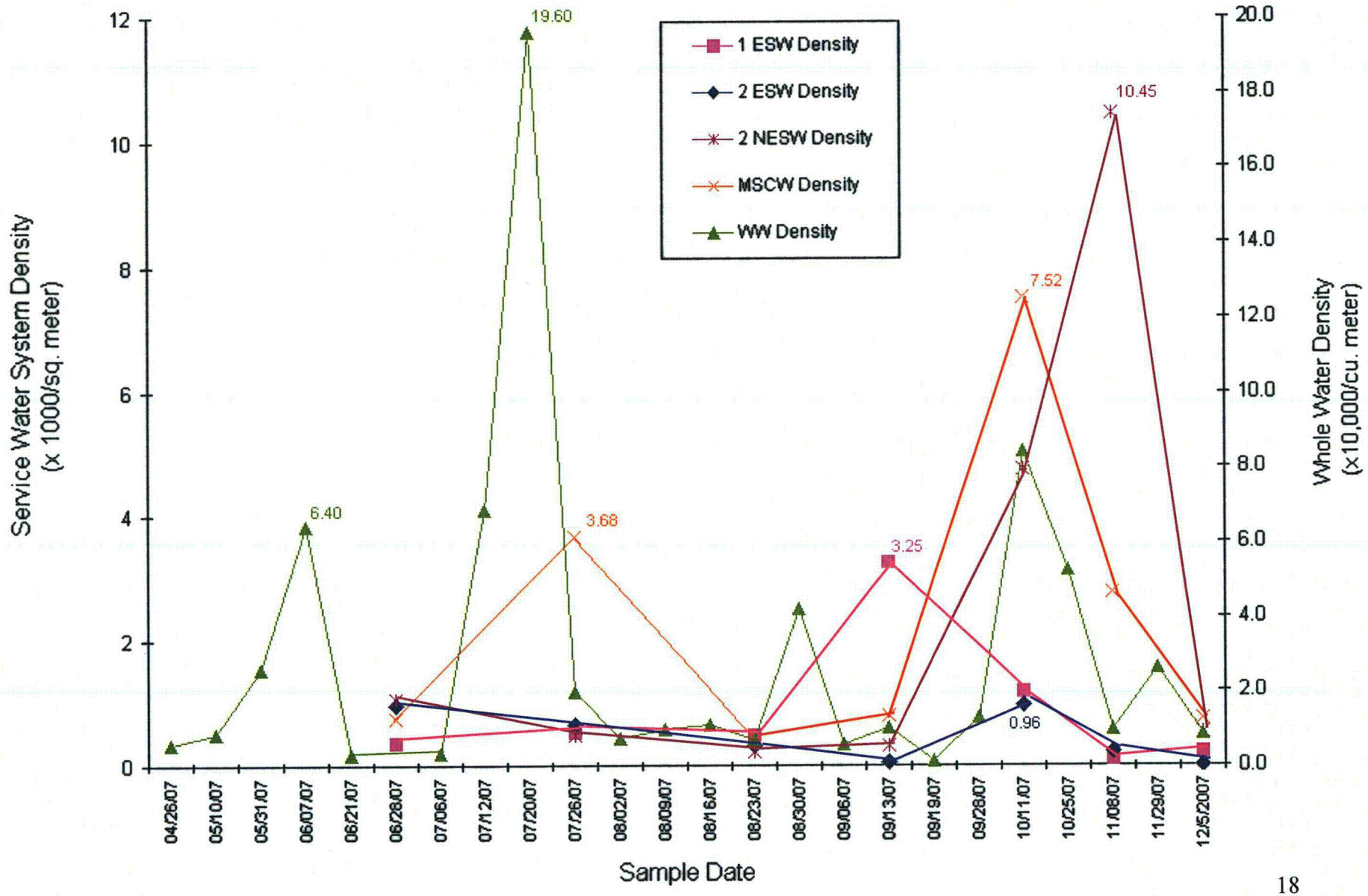
TABLE 3-2

Density, Average Size, and Size Range of Settled Zebra Mussel Postveligers Collected on Cumulative Artificial Substrates Placed in the Forebay, in the Service Water Systems and Miscellaneous Sealing and Cooling Water System in the D.C. Cook Nuclear Plant in 2007.

Cumulative Samples															
	Forebay			NESW			MS&CW			1 ESW			2 ESW		
Date	Density (no/m2)	Avg. Size (um)	Range (um)	Density (no/m2)	Avg. Size (um)	Range (um)	Density (no/m2)	Avg. Size (um)	Range (um)	Density (no/m2)	Avg. Size (um)	Range (um)	Density (no/m2)	Avg. Size (um)	Range (um)
6/28/2007	-	-	-	1067	136	78-274	747	119	78-196	373	146	98-235	960	117	78-235
7/26/2007	-	-	-	480	133	78-353	3680	128	78-353	533	123	78-274	640	134	78-235
8/23/2007	-	-	-	213	294	235-431	480	222	98-353	480	235	98-353	320	196	98-274
9/13/2007	129,425	3328	193-15,408	320	265	118-588	800	303	118-470	3253	440	274-823	53	431	431-431
10/11/2007	-	-	-	4747	448	157-1058	7520	655	274-1294	1173	266	157-627	960	272	157-627
11/8/2007	-	-	-	10,453	555	196-1646	2773	803	196-3606	107	196	118-274	213	333	235-470
12/5/2007	-	-	-	533	423	235-784	747	336	235-392	213	294	196-353	0	-	-

FIGURE 3-2

2007 D.C. Cook Plant- Whole-Water Zebra Mussel Veliger Density and Zebra Mussel Postveliger Cumulative Settlement in the Service Water Systems



In summary, the results indicate that the chlorination system was effective in preventing growth and prolonged settlement of postveligers in the service water systems. Zebra mussel settlement on MSCW and Unit 1 ESW artificial substrates was slightly elevated for two brief periods when there was low sample flow. During the fall Unit 2 C17 Refueling Outage, service water system chlorination was secured due to diver cleaning of the circulating water intake forebay and valve maintenance on the Unit 2 Circulating Water Discharge Vault valves. Settlement was again brought under control when chlorination was resumed near the end of the outage. The results showed that even when the system was taken out of service for short periods of time for system maintenance, or that system TRC residuals fell below their target band of 0.08-0.6 ppm, settlement control was quickly re-established.

3.2.3 Biocide Treatment

There were no biocide treatments in 2007.

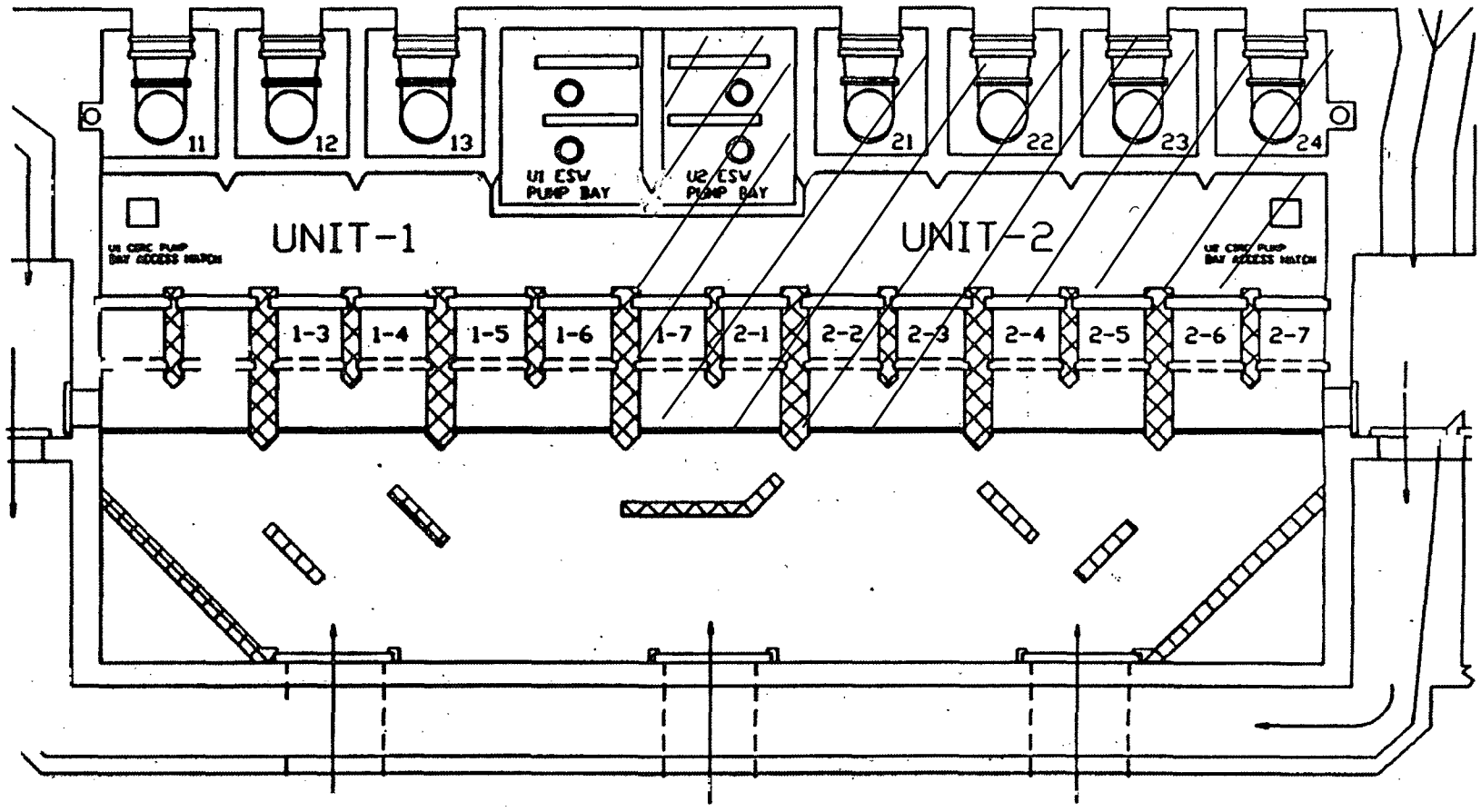
3.2.4 Mechanical Cleaning

During the Unit 2 C17 (September-November) refueling outage, divers were employed to mechanically clean sand, zebra mussels, and debris from the walls and floors of the Unit 2 Circulating Water Intake Forebays and Unit 2 Condenser Inlet Tunnels. The Unit 2 Condenser Inlet Tunnel was cleaned in its entirety. The Unit 2 Intake Forebay was cleaned on the east (plant) side of the traveling screens (Figure 3-3). This included areas of the Unit 2 Circulating Water Pump and Unit 2 ESW Pump bays. The west side (lake side) of traveling screen bays 1-7 and 2-1, and 2-2 and 2-3 were cleaned in their entirety to the trash racks. The area further west of the trash racks extending to the west wall of the

intake forebay was not cleaned as well as the west sides of traveling screen bays 2-4 and 2-5, and 2-6 and 2-7.

In the Fall of 2007, the divers cleaned the intake crib velocity caps, ice guards, and trash racks of zebra mussels to remove the food source that attracts wild ducks to the intake cribs.

Figure 3-3
Screenhouse Intake Forebay



Note: Lined out areas were cleaned during the U2C17 Refueling Outage.

Chapter 4

Summary and Recommendations

4.1 Summary

The 2007 Mollusc Biofouling Monitoring Program was initiated on 26 April and continued to 5 December. Heaviest spawning activity occurred during late-May to early June, mid-July, late August, and mid to late October. The major spawning peak occurred on 20 July. Whole water veliger densities declined after their peak on 11 October with falling lake temperatures into December. The whole water densities show that there are substantial numbers of veligers in the forebay, indicating the need for effective chlorination in the service water systems. The 2003 report concluded that yearly results in peak abundances make it difficult to predict when the peak abundance will occur each season other than estimating some time between July and October. Continued whole-water monitoring during the veliger spawning season will detect when these peak abundances occur.

The intake forebay PVC sampler zebra mussel density was 129,425 ind./m^2. Individuals ranged from 193*u*-15,408*u* (.19 mm – 15.41 mm) and the mean size of fifty randomly selected individuals was 3,328*u* (3.3 mm). As in 2006, the time period of collection was designed to coincide with the annual fall intake crib cleaning to estimate the size and density of mussels the divers might encounter at the time of cleaning. For comparison, the sample substrate that was pulled in 2006 had a density of 303,801 individuals/m^2 and an average size of 2,470u (2.5 mm). An explanation for this difference could be attributed to a large peak veliger density (455,000 ind./m^3) occurring in the Fall of 2005 that was more than twice the peak veliger density (191,800 ind./m^3) occurring in the Fall of 2006.

The data indicates that the chlorination system, when operational, was effective in preventing growth and prolonged settlement of postveligers in the service water systems. The results showed that even when the system was taken out of service for short periods of time for system maintenance, or that system TRC residuals fell below their target band of 0.08-0.6 ppm, settlement control was quickly re-established.

Reports of visual inspections of heat exchangers performed during the Unit 2C17 Refueling Outage showed no live zebra mussel colonies residing in systems that were chlorinated.

4.2 Recommendations

Based on observations made during the course of this program, the following recommendations are being made:

- Whole-Water sampling should continue to be initiated in April to determine the presence of veligers in the water column, as currently implemented. The whole-water sampling frequency in 2005 was reduced from weekly to twice monthly in the months of June, October, and November to lessen the sampling burden and better target sampling based on previous years' spawning data. This sampling frequency reduction proved to be effective from 2005 through 2007 as the major spawning peaks were still able to be captured, but with less sampling and analysis effort. This reduced sampling schedule should be continued as currently implemented.
- Studies of cumulative postveliger settlement should continue to be conducted from May through December, as currently implemented.

- Continuous chlorination maintained in the 0.08 -0.6 ppm target band should continue to run throughout the spawning season, as currently implemented. Zebra mussel sampling and analysis in 2007 confirmed the efficacy of this target band. Chlorination system outages should be kept to a minimum to the extent possible to minimize the potential for trans-locator fouling in small bore piping systems.
- Maintain daily bio-box flow checks to ensure bio-box conditions are representative of system conditions.
- Chlorination data from all water systems (ESW, NESW, and MSCW) and temperature data should continue to be made available to allow meaningful interpretation of results.

References

Lawler, Matusky, & Skelly Engineers LLP. 1995. Mollusc biofouling monitoring during 1994, Donald C. Cook Nuclear Plant: Final Report.

Great Lakes Environmental Center. 1996. A Zebra Mussel (Dreissena) Monitoring Survey for the Donald C. Cook Plant April-December 1995: Final Report

Lawler, Matusky,& Skelly Engineers LLP. 1997. Mollusc biofouling monitoring during 1996, Donald C. Cook Nuclear Plant: Final Report.

Lawler, Matusky, & Skelly Engineers LLP. 1999. Mollusc biofouling monitoring during 1998, Donald C. Cook Nuclear Plant: Final Report.

Grand Analysis. 1999. Zebra Mussel Monitoring Project for 1999. Performed at Donald C. Cook Nuclear Plant. Final Report.

Grand Analysis. 2000. Mollusc Biofouling Monitoring Project for 2000. Performed at Donald C. Cook Nuclear Plant. Final Report.

Grand Analysis. 2001. Mollusc Biofouling Monitoring Program for 2001. Performed at Donald C. Cook Nuclear Plant. Final Report.

Grand Analysis. 2002. Mollusc Biofouling Monitoring Program for 2002. Performed at Donald C. Cook Nuclear Plant. Final Report.

Grand Analysis. 2003. Mollusc Biofouling Monitoring Program for 2003. Performed at Donald C. Cook Nuclear Plant. Final Report.

Cook Nuclear Plant Environmental. 2004. Mollusc Biofouling Monitoring Program for 2004. Performed at Donald C. Cook Nuclear Plant. Final Report.

Cook Nuclear Plant Environmental. 2005. Mollusc Biofouling Monitoring Program for 2005. Performed at Donald C. Cook Nuclear Plant. Final Report.

Cook Nuclear Plant Environmental. 2006. Mollusc Biofouling Monitoring Program for 2006. Performed at Donald C. Cook Nuclear Plant. Final Report.

Appendix Table 1

SWS Chlorination Values for 2007 Zebra Mussel Monitoring Program							
		U-1 ESW [Cl2]		U-2 ESW [Cl2]		U-1 NESW	U-2 NESW
		East	West	East	West	[Cl2]	[Cl2]
	Date	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
	5/2/2007	< 0.08	0.2	0.21	< 0.08	0.29	0.37
	5/4/2007	0.13	0.12	0.11	0.08	0.33	0.36
	5/7/2007	0.16	0.15	0.14	0.08	0.31	0.4
	5/9/2007	0.09	0.21	0.22	0.1	0.22	0.24
	5/11/2007	0.09	0.09	0.1	0.09	0.24	0.19
	5/14/2007	0.15	0.12	0.12	0.13	< 0.08	0.19
	5/16/2007	< 0.08	0.11	0.11	0.12	Cl2 OFF	0.27
	5/18/2007	< 0.08	0.32	0.32	< 0.08		
	5/21/2007	0.48	0.13	0.12	0.33		0.28
	5/23/2007	0.13	0.14	0.12	0.14	0.09	0.24
	5/25/2007	< 0.08	0.09	0.1	0.08	< 0.08	0.19
	5/28/2007	0.12	0.1	0.1	0.08	< 0.08	0.14
	5/30/2007	< 0.08	0.09	0.08	0.09	< 0.08	0.22
	6/1/2007	0.1	0.1	0.11	0.17	< 0.08	0.19
	6/4/2007	0.09	< 0.08	< 0.08	0.1	Cl2 ON	0.22
	6/4/2007					0.13	
	6/6/2007	0.14	0.13	0.17	0.1	0.26	0.27
	6/8/2007	0.16	0.12	0.09	0.24	0.2	0.27
	6/11/2007	0.14	0.12	0.11	0.08	0.25	0.3
	6/13/2007	0.12	0.16	0.12	0.14	0.24	0.24
	6/15/2007	< 0.08	0.14	0.14	< 0.08	< 0.08	0.11
	6/19/2007	0.13	0.13	0.11	0.09	0.21	0.23
	6/20/2007	0.11	0.15	0.12	0.13	0.21	0.16
	6/22/2007	< 0.08	0.13	0.12	0.15	0.12	0.25
	6/25/2007	0.1	0.15	0.12	0.1	0.12	0.18
	6/25/2007	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF
	6/27/2007	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON
	6/27/2007	0.09	0.09	0.1	< 0.08	0.17	0.23
	6/29/2007	0.21	0.4	0.15	0.13	0.35	0.21
	7/2/2007	0.14	0.14	0.29	0.3	0.29	0.34
	7/4/2007	0.13	0.13	0.1	0.12	0.32	0.38
	7/9/2007	< 0.08		0.14			

Appendix Table 1

SWS Chlorination Values for 2007 Zebra Mussel Monitoring Program							
		U-1 ESW [Cl2]		U-2 ESW [Cl2]		U-1 NESW	U-2 NESW
		East	West	East	West	[Cl2]	[Cl2]
	Date	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
	7/9/2007		0.13		< 0.08	0.25	0.33
	7/11/2007	< 0.08	0.09	0.1	< 0.08	0.28	0.4
	7/12/2007	< 0.08			0.08		
	7/13/2007	< 0.08	0.15	0.13	0.11	0.16	0.26
	7/14/2007	0.09	0.18	0.16	0.19		
	7/16/2007	0.15	0.09	0.12	0.14	0.26	0.32
	7/18/2007	0.17	0.14	0.12	0.14	0.34	0.37
	7/20/2007	0.47	0.18	0.09	0.1	0.36	0.43
	7/23/2007	0.13	0.17	0.13	0.09	0.41	0.44
	7/25/2007	0.49	0.15	0.14	0.46	0.34	0.36
	7/27/2007	0.15	0.14	0.12	< 0.08	0.26	0.3
	7/30/2007	< 0.08	0.12	0.12	< 0.08	0.25	0.27
	8/1/2007	< 0.08	0.08	0.09	< 0.08	0.16	0.08
	8/3/2007	0.26	0.13	0.11	< 0.08	0.16	0.08
	8/6/2007	0.22	0.13	< 0.08	0.13	0.25	0.29
	8/8/2007	0.12	0.14	0.13	0.1	0.26	0.17
	8/10/2007	< 0.08	0.15	0.22	< 0.08	0.25	0.21
	8/13/2007	0.22	0.23	0.25	0.43	0.26	0.28
	8/15/2007	0.13	0.14	0.22	< 0.08	0.22	0.3
	8/17/2007	0.12	0.26	0.23	0.11	0.34	0.35
	8/20/2007	0.12	0.48	0.56	0.09	0.35	0.49
	8/22/2007	0.89	0.19	0.58	0.21	0.22	0.25
	8/24/2007	0.1	0.25	0.22	0.1	0.21	0.32
	8/27/2007	0.09	0.27	0.23	< 0.08	0.14	0.19
	8/29/2007	0.13	0.25	0.16	0.13	0.09	< 0.08
	8/31/2007	0.1	0.13	0.27	0.1	0.29	0.24
	9/3/2007	0.34	0.16	0.16	0.09	0.14	0.1
	9/5/2007	0.1	0.21	0.19	0.13	0.1	0.14
	9/7/2007	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
	9/10/2007	0.57	0.29	0.32	0.28	0.2	0.24
	9/12/2007	< 0.08	0.29	0.32	< 0.08	0.22	0.26
	9/13/2007	0.36			0.29		

Appendix Table 1

SWS Chlorination Values for 2007 Zebra Mussel Monitoring Program							
		U-1 ESW [Cl2]		U-2 ESW [Cl2]		U-1 NESW	U-2 NESW
		East	West	East	West	[Cl2]	[Cl2]
	Date	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
	9/14/2007	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF	Cl2 OFF
	10/1/2007	CL2 OFF	CL2 OFF	CL2 OFF	CL2 OFF	CL2 OFF	CL2 OFF
	10/31/2007	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON	Cl2 ON
	11/1/2007			< 0.08	< 0.08	< 0.08	< 0.08
	11/2/2007	0.31	0.14	0.13	0.29	0.15	0.21
	11/5/2007	0.13	0.11	0.13	0.19	0.27	0.39
	11/7/2007	0.49	0.08	0.1	0.25	0.24	0.35
	11/9/2007	0.2	0.25	0.25	0.18	0.29	0.36
	11/12/2007	0.18	0.16	0.15	0.16	0.2	0.24
	11/14/2007	0.11	0.16	0.15	0.09	0.12	0.36
	11/16/2007	0.48	0.34	0.13	0.28	0.15	0.41
	11/19/2007	0.11	0.38	0.38	0.09	0.17	0.5
	11/21/2007	0.08	0.32	0.26	0.08	0.16	0.45
	11/23/2007	0.49	0.2	0.14	0.26	0.1	0.08
	11/26/2007	0.13	0.15	0.17	0.09	< 0.08	< 0.08
	11/28/2007	0.48	0.15	0.32	0.12	0.1	0.42
	11/30/2007	0.17	0.28	0.26	0.16	0.29	0.36

APPENDIX IV

NPDES APPLICATIONS

2007

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

March 8, 2007

Mr. John Carlson
Donald Cook Nuclear Plant
1 Cook Place
Mail Zone 5A
Bridgman, MI 49106

Dear Mr. Carlson:

SUBJECT: MODIFIED Groundwater Discharge Authorization for Donald Cook Nuclear Plant, Lake Township, Berrien County

Enclosed is the modified Authorization to Discharge, GW1810102, issued by the Department of Environmental Quality (DEQ) on May 30, 2006

The following change has been made to the authorization:

Page 6
Process Wastewater has been added to Seepage Basins Location, and Sanitary Sewage Wastewater has been added to Rapid Infiltration Basins.

Please review carefully the conditions of the Authorization. In particular, please notice that any change in the discharge will require a new Authorization by the DEQ.

Questions concerning this Authorization can be directed to the Permits Section, Water Bureau (WB), telephone 517-373-8148, or the WB, Kalamazoo District Office, telephone: 269-567-3500.

Sincerely,

James R Janiczek/st

James R. Janiczek, Chief
Groundwater Permits Unit
Water Bureau

Enclosure
cc: Mr. Blair Sordell, Cook Nuclear
Lake Township Supervisor
Mr. Gary Witkowski, Berrien County Health Department
Mr. Greg Danneffel, DEQ - Kalamazoo

2007-267

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER BUREAU

GROUNDWATER DISCHARGE PERMIT

This permit is issued under the provisions of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), being Sections 324.3101 through 324.3119 of the Compiled Laws of Michigan, and the Administrative Rules promulgated thereunder. This permit does not relieve the permittee from obtaining and complying with any other permits required under local, state, or federal law.

Permit Number:	GW1810102	**Authorization Rule:**	2218
Facility Name:	Donald C. Cook Nuclear Plant		
Issue Date:	May 30, 2006	**Effective Date:**	June 1, 2006
Expiration Date:	June 1, 2009		
Modified Date:	March 5, 2007		
Deadline for Submittal of Renewal Application:	December 3, 2008		

Facility Address: 1 Cook Place, Mail Zone 5A, Bridgman, Michigan 49106
Telephone: 269-465-5901, ext.1153 **Fax:** 269-466-2550

Discharge Location Description:
SW 1/4 of the SE 1/4 of Section 6, T06S, R19W, Lake Township, Berrien County, Michigan, as identified in Attachment 1 (Site Map) and fully described in this permit.

Permittee Name: Indiana Michigan Power
Permittee Address: One Summit Square, P.O. Box 60, Fort Wayne, IN 46801
Telephone: 260-421-1400 **Fax:** 260-425-2142

Authorization to discharge a maximum: 2.4 million gallons per day (876 million gallons per year) of process wastewater and 60,000 gallons per day (21.9 million gallons per year) of sanitary sewage in accordance with the limitations, monitoring requirements, and other conditions as set forth in this permit, Part 31, and its administrative rules.

Type of Wastewater #1: Process (Outfall 00D)	**Type of Wastewater #2:** Sanitary Sewage (Outfall 00E)
Method of Treatment: Neutralization	**Method of Treatment:** Sequencing Batch Reactor
Method of Disposal: Seepage Basins	**Method of Disposal:** Rapid Infiltration Basins

In accordance with Section 324.3122 of the Michigan Act, the permittee shall make payment of an annual permit fee to the Department for each December 15 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by March 1 for notices mailed by January 15. The fee is due no later than 45 days after receiving the notice for notices mailed after January 15. Fees paid in accordance with the Michigan Act are not refundable.

All construction, maintenance, operations, and monitoring of this facility must comply with the conditions set forth in this permit or in plans approved by the Department in accordance with this permit. Failure to comply with the terms and provisions of this permit may result in civil and/or criminal penalties as provided in Part 31.

This permit is based upon the information submitted in the July 25, 2005, application for Groundwater Discharge received by the Michigan Department of Environmental Quality and any subsequent amendments. This permit supersedes Permit M 00988 issued to the facility on September 29, 2000.

Issued this 30th day of May 2006, for the Michigan Department of Environmental Quality.

Modified March 5, 2007.

James R. Janiczek, Chief
Groundwater Permits Unit
Water Bureau
Michigan Department of Environmental Quality

A. Effluent Limitations and Monitoring Requirements

The wastewater discharge shall be limited and monitored by the permittee, at a minimum, as specified below. The permittee shall submit reports monthly as specified in Section F.1 of this permit. In the event of any non-compliance of limitations, including any detected in additional sampling to the minimum required below, the permittee shall fulfill the requirements of Section D.1 of this permit (Rule 2227)

SAMPLE LOCATION ID	PARAMETER	LIMITATION-UNITS	MEASUREMENT FREQUENCY	SAMPLE TYPE
Effluent Flows:				
EQ-1 Process Wastewater (Turbine Room Sump) (Outfall 00D)	Flow	2,400,000 GPD	Daily*	Direct Measurement
		876, 000, 000 GPY	Annually	Calculation
EQ-2 Sanitary Sewage Wastewater (Outfall 00E)	Flow	60,000 GPD	Daily	Direct Measurement
		21,900,000 GPY	Annually	Calculation
Effluent Quality:				
EQ-1 Process Wastewater (Turbine Room Sump) (Outfall 00D)	Chloride***	mg/l	Weekly	Grab
	Ethanolamine	mg/l	Weekdays	Grab
	Hydrazine	ug/l	Weekdays	Grab
	pH***	6.5-9.0 S.U..	Weekdays	Grab
	Total Inorganic Nitrogen	mg/l	Monthly	Calculation: Ammonia (N) + Nitrate (N) + Nitrite (N)
	Ammonia Nitrogen	mg/l	Monthly	Grab
	Nitrite Nitrogen	mg/l	Monthly	Grab
	Nitrate Nitrogen	mg/l	Monthly	Grab
	Sodium***	mg/l	Twice/month**	Grab
	Sulfate***	mg/l	Twice/month**	Grab

SAMPLE LOCATION ID	PARAMETER	LIMITATION-UNITS	MEASUREMENT FREQUENCY	SAMPLE TYPE
EQ-2 Sanitary Sewage Wastewater (Outfall 00E)	BOD5	35 mg/l	Weekly	Grab
	Chloride***	mg/l	Weekly	Grab
	Dissolved Oxygen***	mg/l	Weekly	Grab
	Phosphorus	15 mg/l	Weekly	Grab
	pH***	6.0-9.0 S.U.	Weekly	Grab
	Sodium***	mg/l	Weekly	Grab
	Total Inorganic Nitrogen	mg/l daily max	Weekly	Calculation: Ammonia (N) + Nitrate (N) + Nitrite (N)
	Ammonia Nitrogen	mg/l	Weekly	Grab
	Nitrite Nitrogen	mg/l	Weekly	Grab
	Nitrate Nitrogen	mg/l	Weekly	Grab
Land Application: Year Round				
LA-1 Seepage Basins (Outfall 00D)	Application Rate	26.0 gals/ft^2	Daily	Direct Measurement
LA-2 Rapid Infiltration (Basin A) (Outfall 00E)	Application Rate	7.5 gals/ft^2	Daily	Direct Measurement
LA-3 Rapid Infiltration (Basin B) (Outfall 00E)	Application Rate	17.8 gals/ft^2	Daily	Direct Measurement

* The daily maximum is defined as the total discharge by weight, volume or concentration if specified, during any calendar day.

** Sodium and sulfate shall be sampled once/month while the water treatment system regenerates and once/month when no regeneration occurs.

*** Refer to Section E., Item 1.

B. Groundwater Limitations and Monitoring Requirements

The disposal of treated wastewater shall not cause the groundwater quality to exceed the limitations listed below. Groundwater monitoring wells EW-1A, EW-8, EW-12, EW-13, and EW-19 shall be sampled and the groundwater analyzed for the parameters listed below at least at the minimum frequencies indicated. Monitoring well EW-8 is the upgradient well until a new upgradient monitoring well is installed. Then both wells will be used. Compliance with limits established in this section will be measured at monitor wells EW-1A, EW-12, EW-13, and EW-19. Monitoring wells and groundwater flow direction are identified on Attachment 3 (Groundwater Monitoring Well Map). In the event of any non-compliance with limitations, including any detected in sampling additional to the minimum required below, the permittee shall fulfill the requirements of Section D.1 of this permit (Rule 2227).

PARAMETER	LIMITATION UNIT	MEASUREMENT FREQUENCY	SAMPLE TYPE
Static Water Elevation	USGS - Ft	Quarterly	Direct Measurement
pH	6.0-9.0 S.U.	Quarterly	Grab
Chloride	250 mg/l	Quarterly	Grab
Specific Conductance	umhos/cm	Quarterly	Grab
Total Inorganic Nitrogen	5 mg/l	Quarterly	Calculation: Ammonia-N + Nitrate-N + Nitrite-N
Ammonia Nitrogen	mg/l	Quarterly	Grab
Nitrite Nitrogen	0.5 mg/l	Quarterly	Grab
Nitrate Nitrogen	mg/l	Quarterly	Grab
Total Phosphorus	1 mg/l	Quarterly	Grab
Sulfate	250 mg/l	Quarterly	Grab
Dissolved Sodium	120 mg/l	Quarterly	Grab
Total Dissolved Solids	mg/l	Quarterly	Grab
Total Alkalinity	mg/l	Annually	Grab
Bicarbonate	mg/l	Annually	Grab
Dissolved Calcium	mg/l	Annually	Grab
Dissolved Iron	mg/l	Annually	Grab
Dissolved Magnesium	200 mg/l	Annually	Grab
Dissolved Oxygen	mg/l	Annually	Grab
Dissolved Potassium	mg/l	Annually	Grab
Total Organic Carbon	mg/l	Annually	Grab
Phenols	mg/l	Annually	Grab
Ethanolamine	2 mg/l	Annually	Grab
Dissolved Aluminum	150 ug/l	Annually	Grab
Dissolved Barium	440 ug/l	Annually	Grab
Dissolved Boron	1900 ug/l	Annually	Grab
Dissolved Cadmium	2.2 ug/l	Annually	Grab
Dissolved Chromium	11 ug/l	Annually	Grab
Dissolved Copper	9 ug/l	Annually	Grab
Dissolved Lead	10 ug/l	Annually	Grab
Dissolved Manganese	530 ug/l	Annually	Grab
Dissolved Inorganic Mercury	0.0013 ug/l	Annually	Grab
Dissolved Nickel	52 ug/l	Annually	Grab
Dissolved Selenium	5 ug/l	Annually	Grab
Dissolved Silver	0.2 ug/l	Annually	Grab
Dissolved Zinc	120 ug/l	Annually	Grab
Hydrazine	10 ug/l	Annually	Grab

C. Observation Monitoring Requirements

The permittee shall inspect the treatment and disposal facilities for the operational conditions required below at the minimum frequency specified. All inspections shall be documented in a logbook to be maintained at the on-site facility and shall be available for review by Department personnel at all times.

LOCATION	CONDITION	MEASUREMENT FREQUENCY	SAMPLE TYPE
Seepage Basins Process Wastewater (Outfall 00D)	Oil Sheen	Weekdays	Visual Observation
	Dike Inspection	Weekly	Visual Observation
Rapid Infiltration Basins Sanitary Sewage Wastewater (Outfall 00E)	Vegetation Control	Weekly	Visual Observation
	Dike Inspection	Weekly	Visual Observation
	Freeboard	2 feet minimum	Direct Measurement

D. Compliance Requirements If Permit Limits Are Exceeded

1. If a limit described in Section A or B is exceeded, the discharger shall comply with Rule 2227 and undertake the following within the specified timeframes indicated below:

   a. Provide written notification to the Department at the address in Section F.2 of this permit, within seven calendar days, that a limit has been exceeded. Such notification shall include the name of the substance(s), the concentration(s), and the location(s) that exceeded the limit(s).

   b. Resample and analyze for the parameter(s) of concern, within 14 days, at the location where a limit was exceeded.

   c. Submit a report to the Department at the address in Section F.2 of this permit, within 60 days. Such report shall include the results of confirmation sampling, an evaluation of the reasons for the limit being exceeded, and the steps taken or proposed to prevent recurrences.

   d. Complete additional activities as may be required by the Department pursuant to Rule 2227(1)(d).

E. Schedule of Activities – The permittee shall undertake the following activities by the dates specified.

1. Within 90 days of permit issuance, the discharger shall be in compliance with permit effluent limits and monitoring requirements for chloride, dissolved oxygen, pH, sodium and sulfate.

2. Submit for review and receive approval for an updated Operation and Maintenance Manual by August 1, 2006 [Rule 2218(4)(b)].
3. Submit for review and receive approval of a work plan for the installation of monitoring wells by August 1, 2006.
4. Install monitoring wells as described in the approved work plan by September 1, 2006.
5. Submit for review and receive approval of a report of monitoring well installation by October 2, 2006.
6. Submit monitoring well sampling results for background water quality by December 1, 2006.
7. Submit for review and receive approval of Modifications to the Sampling and Analysis Plan by October 1, 2006 (Rule 2223).

F. Submittal Requirements for Self Monitoring Data

1. The permittee shall submit self-monitoring data monthly on the Department's Compliance Monitoring Report (CMR) for each calendar month of the authorized discharge period to:

NMS-CMR-Data Entry-Groundwater Water Bureau Michigan Department of Environmental Quality P.O. Box 30273 Lansing, Michigan, 48909-7773	and	Kalamazoo District Water Bureau-MDEQ 7953 Adobe Road Kalamazoo, Michigan 49009-5026

The forms shall be postmarked no later than the 15th day of the month following each month of the authorized discharge period(s).

Alternative Daily Discharge Monitoring Report formats may be used if they provide equivalent reporting details and are approved by the Department.

2. All other notices, plans, reports, and other submissions required by and pursuant to this permit shall be submitted to the following:

Kalamazoo District Office
DEQ–Water Bureau
7953 Adobe Rd.
Kalamazoo, MI 49009-5026
Telephone: 269-567-3500

G. Other Conditions

1. Effluent shall be isolated from water supply wells as specified in Rule 2204(2)(d).
2. Effluent shall not be applied within 100 feet from property lines.
3. The permittee shall maintain all treatment or control facilities or systems installed or used by the discharger to achieve compliance with this permit in good working order and operate the facilities or systems as efficiently as possible.

4. Pursuant to Rule 2223(1), the Department may modify the effluent or groundwater monitoring parameters or frequency requirements of this permit, or they may be modified upon the request of the permittee with adequate supporting documentation.
5. Prior to any land application of bulk biosolids, the permittee shall submit to the Field Operation Section, Water Bureau, and receive approval of a Residuals Management Program (RMP) that complies with the requirements of the Part 24 Rules (R 323.2401 through R 323.2418 of the Michigan Administrative Code). The permittee is authorized to land apply bulk biosolids or prepare bulk biosolids for land application in accordance with an approved RMP.

H. **Approved Documents** – The following documents, previously submitted and approved are incorporated into this permit by reference. These documents, and those submitted and approved under Section E of this Permit, may be modified upon written approval of the Department.

1. Sampling and Analysis Plan – dated February 23, 2005.
2. Discharge Management Plan – dated July 18, 2005

I. **Permit Application** – Issuance of this permit is based upon the information submitted on the Application for Groundwater Discharge (Application) and any subsequent amendments received by the Department. Any material or intentional inaccuracies found in this information, or omissions of material information, may be grounds for the revocation or modification of this permit or other enforcement action.

The permittee shall inform the Department's Water Bureau, Kalamazoo District Supervisor, of any known material or intentional inaccuracies in the information of the Application which would affect the permittee's ability to comply with the applicable rules or license conditions. The following documents were submitted to the Department as part of the Application:

1. Basis of Design, Rule 2218 – dated November, 1994.
2. Hydrogeological Report, Rule 2221 – dated February 23, 2005.
3. Waste Characterization, Rule 2220 – 2004 Effluent Data.
4. Discharge Management Plan, Rule 2233 – dated July 18, 2005.
5. Restrictive Covenant – dated October 26, 2000

J. **Transfer of Ownership** – The permittee shall notify the Department, in writing, no less than 30 days before a change in ownership of the facility. This permit may be transferred to the new owner by written approval of the Chief of the Permits Section, Water Bureau.

K. **Change or Modification of Treatment or Discharge – Rule 2218 (3)(d) and (e)** The permittee, if proposing to modify the quantity or effluent characteristics of the discharge, if proposing to modify the monitoring program, or if proposing to modify the treatment process for the discharge, shall notify the Department of the proposed modification before it occurs. The Department shall determine if the proposed modification requires the permit to be modified to ensure that the terms of Rule 2204 are met.

Modifications determined by the Department to be significant require that the permittee submit an application for and obtain a reissuance of the permit before such modification occurs. For modifications determined by the Department to be minor based on the quantity or quality of the discharge, the permit may be modified by the Department as requested by the permittee without obtaining a reissuance of the permit before such modification occurs.

L. By-Passing

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except where unavoidable to prevent loss of life, personal injury, or severe property damage. The permittee shall immediately notify the Department of any such occurrence by telephone at 1-800-292-4706. Such notice shall be supplemented by a written report with the next operation report detailing the cause of such diversion or bypass and the corrective actions taken to minimize adverse impact and eliminate the need for future diversion or bypass.

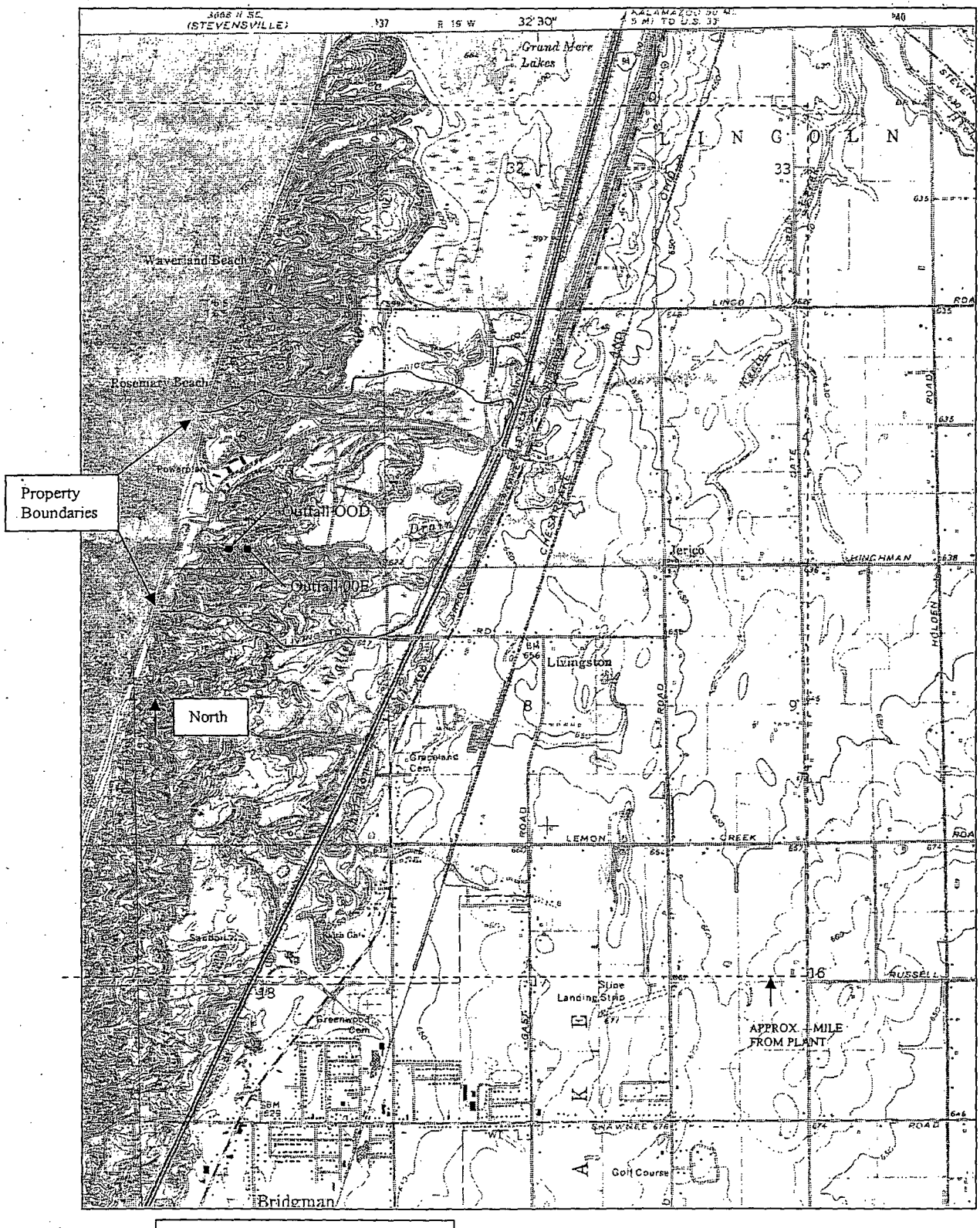
M. Cessation of Discharge-Related Activities

If all or any portion of the permitted treatment facilities and discharge areas is intended to be eliminated, the permittee shall comply with the requirements of Rule 2226.

NOTE:

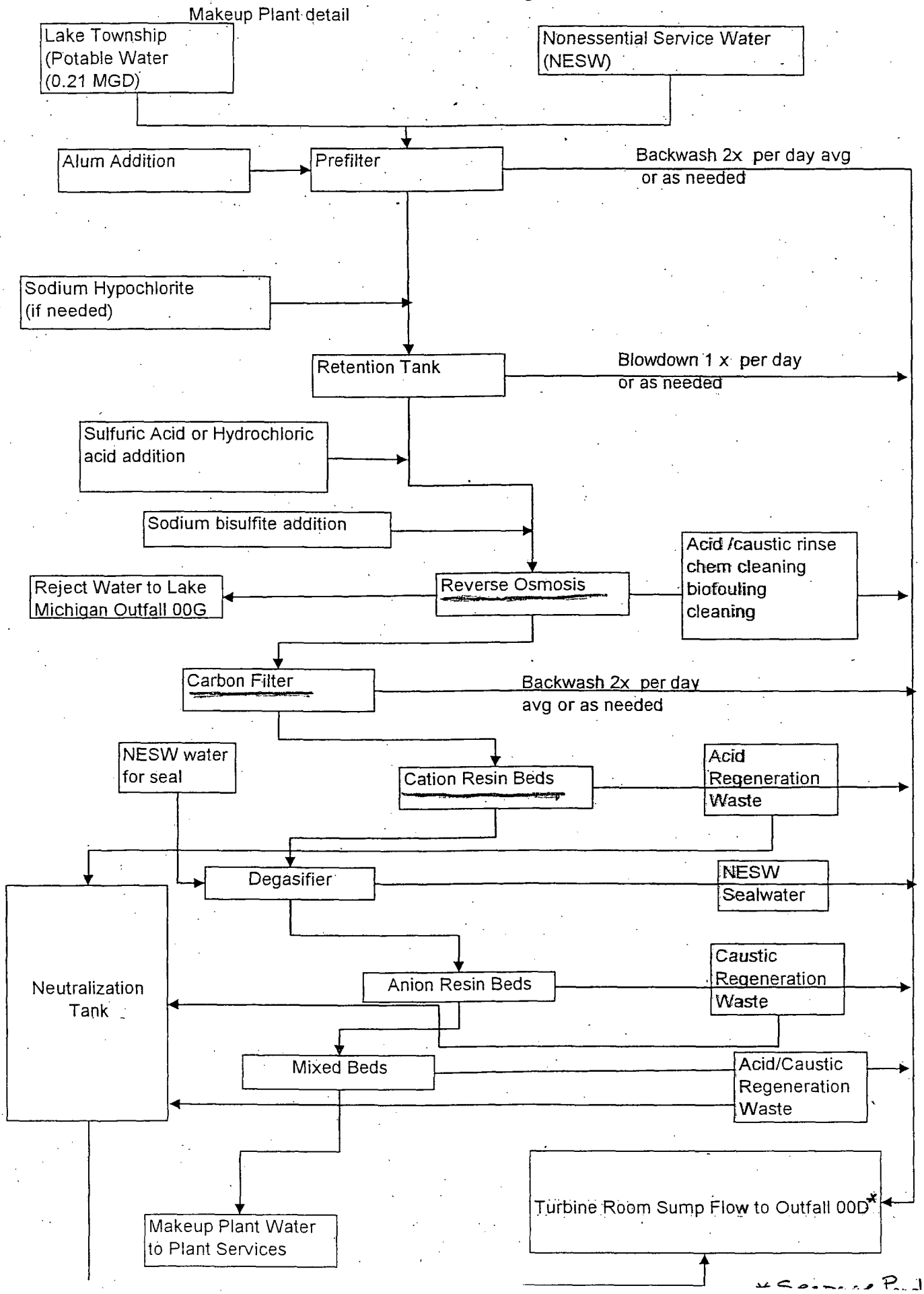
IF THE PERMITTEE WISHES TO CONTINUE DISCHARGING BEYOND THE EXPIRATION DATE, THE PERMITTEE SHALL SUBMIT AN ADMINISTRATIVELY COMPLETE APPLICATION FOR REISSUANCE NO LATER THAN 180 DAYS PRIOR TO THE EXPIRATION DATE IN ACCORDANCE WITH RULE 2151 OF THE PART 21 ADMINISTRATIVE RULES. FAILURE TO SUBMIT AN ADMINISTRATIVELY COMPLETE APPLICATION FOR REISSUANCE BY THE REQUIRED DATE WILL RESULT IN TERMINATION OF THE AUTHORIZATION TO DISCHARGE ON THE EXPIRATION DATE.

ATTACHMENT 1
SITE MAP



Donald C. Cook Nuclear Plant.
Bridgman Michigan
Lake Township
Berrien County
1" = 0.5 mile

ATTACHMENT 2
PROCESS FLOW DIAGRAM

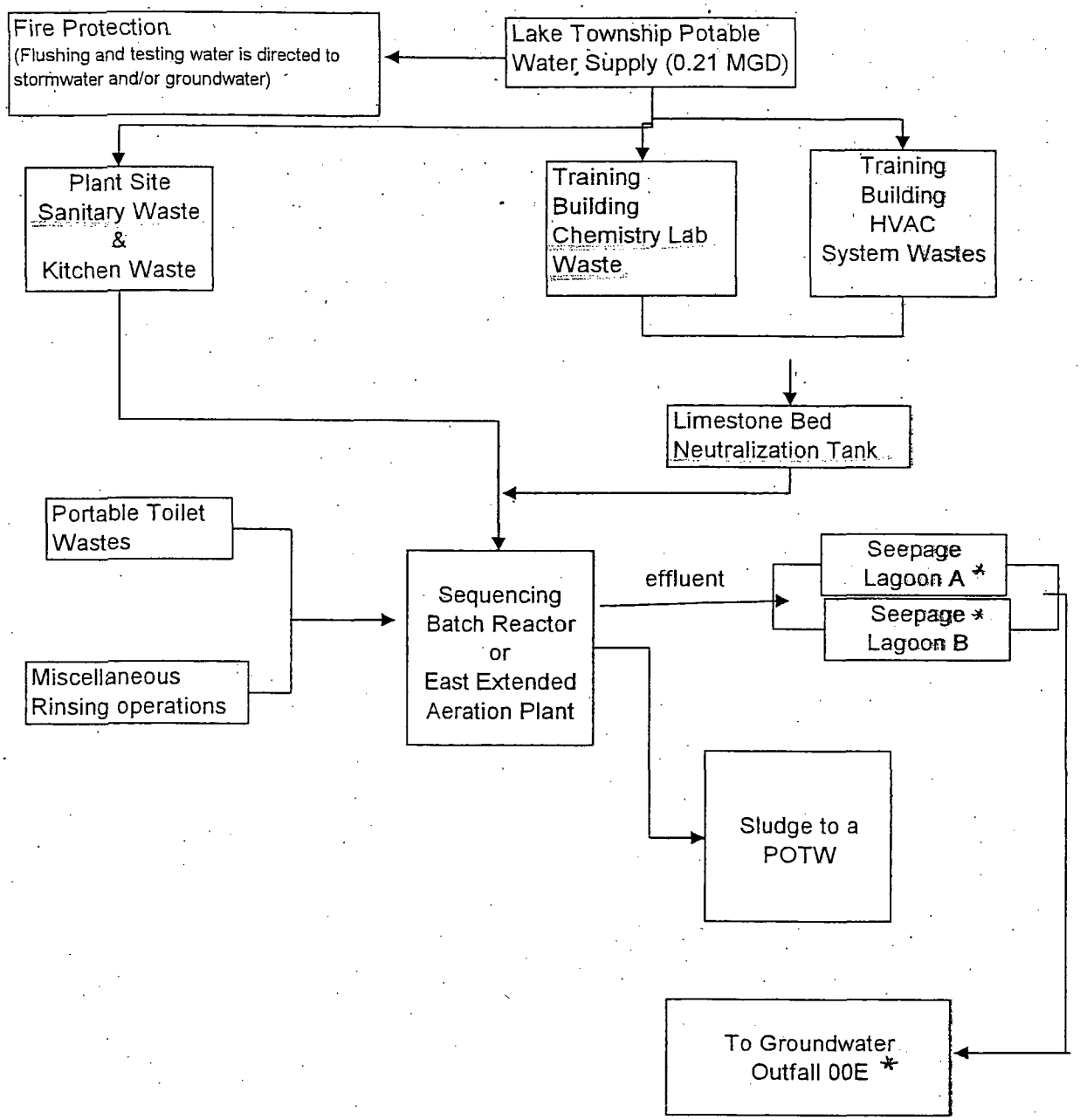


12

* Seamless Pipe

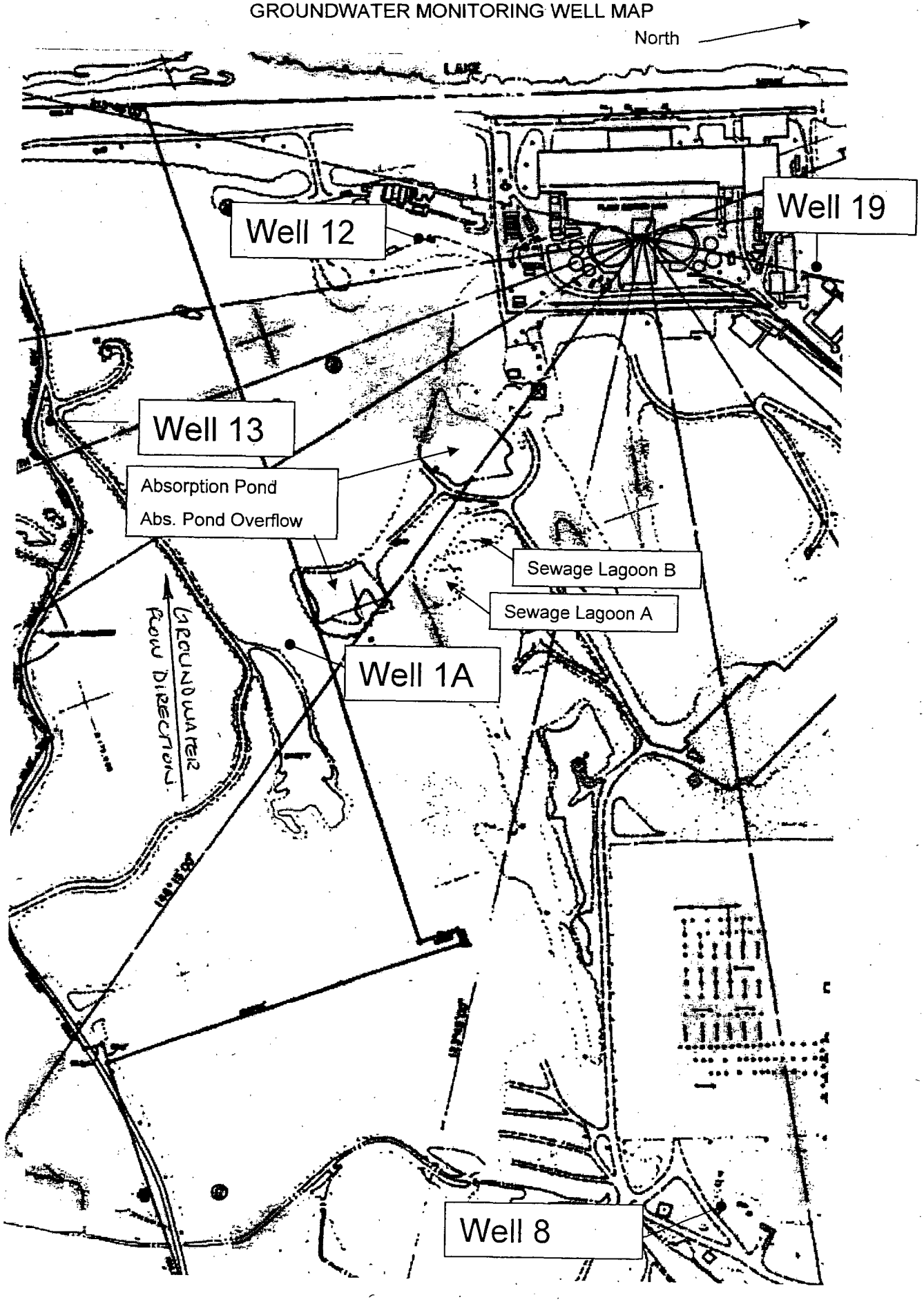
ATTACHMENT 2
PROCESS FLOW DIAGRAM

Sewage treatment plant detail



* Rapid Infiltration Basins

ATTACHMENT 3
GROUNDWATER MONITORING WELL MAP



INDIANA MICHIGAN POWER

Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106

Mr. Greg Danneffel, District Supervisor
Michigan Department of Environmental Quality
Surface Water Quality Division
7953 Adobe Road
Kalamazoo, MI 49009

May 22, 2007

Re: American Electric Power Company
Donald C. Cook Nuclear Plant
NPDES Permit No. MI0005827

Dear Mr. Danneffel:

The following notification is being made pursuant to Cook Nuclear Plant's NPDES permit Part II.C.5 Compliance Dates Notification.

The U.S.EPA issued a letter on March 10, 2007, notifying the Regional Administrators and the delegated states the Section 316(b), Phase II rule was suspended and that such notification would be forthcoming in the Federal Register. Part I.A.10. of the Cook Nuclear Plant NPDES Permit requires the submittal of the information required by 40 CFR Part 122.21(r)(2), (3), and (5) and 40 CFR Part 125.95 to the DEQ Permits Section. AEP is requesting that the Cook Nuclear Plant permit be modified by removing the entire text of Part I.A.10.

Please contact me at telephone (269) 465-5901 extension 2102 if you have any questions regarding this information.

Sincerely,

Jon H. Harner

Jon H. Harner
Environmental Manager

2007-599

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this and all attached documents, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jon H. Harner

J. H. Harner
Environmental Manager

INDIANA MICHIGAN POWER

Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106

Mr. Daniel Dell C/O
Michigan Department of Environmental Quality
Cashier's Office
WB-NP2
P.O. Box 30657
Lansing, MI 48909-8157

September 25, 2007

Re: American Electric Power Company
Donald C. Cook Nuclear Plant
NPDES Permit No. MI0005827

Dear Mr. Dell:

The following notification is being made pursuant to Cook Nuclear Plant's NPDES permit Part II.C.5 Compliance Dates Notification.

The U.S.EPA issued a letter on March 10, 2007, notifying the Regional Administrators and the delegated states the Section 316(b), Phase II rule was suspended and that such notification would be forthcoming in the Federal Register. Part I.A.10. of the Cook Nuclear Plant NPDES Permit requires the submittal of the information required by 40 CFR Part 122.21(r)(2), (3), and (5) and 40 CFR Part 125.95 to the DEQ Permits Section. AEP is requesting that the Cook Nuclear Plant permit be modified by changing the language in accordance with the suspension of the phase 2 rules.

We are enclosing the required application fee of $750. Please contact me at telephone (269) 465-5901 extension 2102 if you have any questions regarding this request.

Sincerely,

Jon H. Harner

Jon H. Harner
Environmental Manager

enclosure

2007-1159

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this and all attached documents, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jon H. Harner

J. H. Harner
Environmental Manager

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

October 4, 2007

Mr. Jon Harner
Donald C. Cook Nuclear Plant
One Cook Place
Bridgman, Michigan 49106

Dear Mr. Harner:

SUBJECT: National Pollutant Discharge Elimination System (NPDES); Permit No. MI0005827
Designated Name: American Elec Power-Cook Plt

Enclosed is a copy of your draft NPDES permit and public notice. Please review these documents carefully. If you have any comments on the terms and conditions of this permit, including information that should be considered in the development of site-specific effluent limitations or comments on the standard permit language, please forward them to us prior to October 25, 2007, so that we can consider them before the draft permit is placed on public notice.

The conditions of this draft permit have been considered on a case-specific basis, and the monitoring program is considered the minimum which will assure environmental protection.

Please note that we are now requesting that the permittee post the public notice of the permit at or nearby the entrance to the permitted facility. We will forward a copy of the public notice package when the permit is ready to be posted. This posting will complement our notice that will also appear on the Department of Environmental Quality (DEQ) Web site. Please let me know if this is not suitable, and we can discuss the other two alternatives, which are (1) Post the notice in the post office or other public building of the municipality nearest the premises of the applicant in which the discharge is or will be located, or (2) Publish the notice in a local newspaper of general circulation.

If you have any questions, please contact me.

Sincerely,

Alvin Lam
Lakes Michigan and Superior Permits Unit
Permits Section
Water Bureau
517-335-4132

al/sea

Enclosures: Draft NPDES Permit
Public Notice

cc: Mr. John Vollmer, Kalamazoo District Office, Water Bureau, DEQ (electronic)
File

PUBLIC NOTICE

Date:
Permit No. MI0005827
American Elec Power-Cook Plt

The Michigan Department of Environmental Quality proposes to modify a discharge permit issued to: the Indiana Michigan Power Company for the American Electric Power Company, Donald C. Cook Nuclear Plant, located at One Cook Place, Bridgman, Michigan 49106. The applicant generates and distributes electricity. The applicant discharges noncontact cooling water, process wastewater, miscellaneous low volume wastes, and storm water runoff to Lake Michigan, in the NW1/4, SW1/4, Section 6, Town 6 S, Range 19 W, Berrien County.

The draft permit includes the following modifications to the previously issued permit: The requirements for cooling water intake structure have been revised to reflect the U.S. EPA suspension of the Section 316(b), Phase II rules and Part I.A.9., Deicing Discharge Authorization, Outfall 003, has been added in accordance with the minor permit modification on November 17, 2004.

Comments or objections to the draft permit received by _____ will be considered in the final decision to issue the permit. Persons desiring information regarding the draft permit, procedures for commenting, or requesting a hearing, should contact: Alvin Lam, Permits Section, Water Bureau, Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan 48909, telephone: 517-335-4132, e-mail: lama@michigan.gov.

Copies of the permit application, public notice, and draft permit may be obtained via the Internet (**http://www.michigan.gov/deqnpdes** - click on 'Permits on Public Notice' which is under the Permits banner) or at the Water Bureau Kalamazoo District Office located at 7953 Adobe Road, Kalamazoo, Michigan 49009-5026, telephone: 269-567-3500.

PERMIT NO. MI0005827

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq; the "Federal Act"), Michigan Act 451, Public Acts of 1994, as amended (the "Michigan Act"), Parts 31 and 41, and Michigan Executive Orders 1991-31, 1995-4 and 1995-18,

Indiana Michigan Power Company
One Cook Place
Bridgman, Michigan 49106

is authorized to discharge from the American Electric Power Company, Donald C. Cook Nuclear Plant, located at

One Cook Place
Bridgman, Michigan 49106

designated as American Elec Power-Cook Plt

to the receiving water named Lake Michigan, in accordance with effluent limitations, monitoring requirements and other conditions set forth in this permit.

Unless specified otherwise, all contact with the Michigan Department of Environmental Quality (the "Department") required by this permit shall be made to the Kalamazoo District Supervisor of the Water Bureau. The Kalamazoo District Office is located at 7953 Adobe Road, Kalamazoo, Michigan 49009-5026, telephone: 269-567-3500, fax: 269-567-9440. Unless specified otherwise, all Department approvals specified in this permit shall be by the District Supervisor.

In accordance with Section 324.3120 of the Michigan Act, the permittee shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1. Fees paid in accordance with the Michigan Act are not refundable.

In accordance with Section 324.3118 of the Michigan Act, the permittee shall make payment of an annual storm water fee to the Department for each January 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by March 15 for notices mailed by February 1. The fee is due no later than 45 days after receiving the notice for notices mailed after February 1. Fees paid in accordance with the Michigan Act are not refundable.

Any person who is aggrieved by this permit may file a sworn petition with the Office of Administrative Hearings of the Michigan Department of Environmental Quality, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department may reject any petition filed more than 60 days after issuance as being untimely.

This permit is based on a complete application submitted on April 1, 2003.

This modified permit takes effect immediately. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its effective date this permit shall supersede NPDES Permit No. MI0005827, expiring October 1, 2003, which is hereby revoked upon the effective date of this permit.

This permit and the authorization to discharge shall expire at midnight, October 1, 2008. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application which contains such information, forms, and fees as are required by the Department by April 4, 2008.

Issued September 24, 2004. Based on a request submitted on September 27, 2007, this permit was modified on _____.

10-4-2007

DRAFT PERMIT

_____
William Creal, Chief
Permits Section
Water Bureau

10-4-2007
DRAFT PERMIT

PART I

Section A. Effluent Limitations And Monitoring Requirements

1. Final Effluent Limitations, Monitoring Points 001A & 002A (Combined Discharge)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of one billion five hundred million (1,500,000,000) gallons per day of noncontact condenser cooling water, miscellaneous low volume waters, and storm water runoff from Monitoring Point 001A through Outfall 001; and a maximum of one billion eight hundred twenty million (1,820,000,000) gallons per day of noncontact condenser cooling water, miscellaneous low volume waters, and storm water runoff from Monitoring Point 002A through Outfall 002. Outfalls 001 and 002 discharge to Lake Michigan. Such discharge shall be limited and monitored by the permittee as specified below.

Parameter	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Frequency of Analysis	Sample Type
	Monthly	Daily	Units	Monthly	Daily	Units		
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Residual Oxidant (TRO)								
During Chlorination – No Bromine Use								
Discharge Mode								
Continuous (greater than 160 min/day)	---	---		---	38	ug/l	5X/Week	Grab
Intermittent (less than/equal to 160 min/day)	---	---		---	200	ug/l	5X/Week	Grab
During Bromine Use – the discharge time of bromine shall not exceed 120 min/day								
Intermittent (less than/equal to 120 min/day)	---	---		---	50	ug/l	5X/Week	Grab
TRO Discharge Time	---	---	---	---	(report)	min/day	5X/Week	Report Total Discharge Time
Temperature								
Intake	---	---	---	---	(report)	°F	Daily	Reading
Discharge	---	---	---	---	(report)	°F	Daily	Reading
Heat Addition[h]	---	17,300	MBTU/hr	---	---	---	Daily	Calculation
Total Boron[i]	---	---	---	(report)	(report)	ug/l	Weekly Per Occurrence	Grab
Outfall Observation	(report)	---	---	---	---	---	Daily	Visual
				Minimum Daily	Maximum Daily			
pH	---	---	---	6.5	9.0	S.U.	Daily	Grab

a. Narrative Standard
The receiving water shall contain no unnatural turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge.

b. Monitoring Location
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to discharge to Lake Michigan.

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c. Outfall Observation
Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition. For turbidity caused by the discharge of bentonite clay, the permittee is only required to verbally report to the Department.

d. Water Treatment Additives
This permit does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event a permittee proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the permittee shall submit a request to the Department for approval. See Part I.A.6. for information on requesting water treatment additive use.

e. TRO (Chlorine and Bromine) Requirements
Total Residual Oxidant (TRO) shall be analyzed for using EPA Method 330.1 or Orion Electrode Model 97-70 (other analytical methods specified in 40 CFR 136 may be used upon approval of the Department). TRO monitoring is only required during periods of chlorine or bromine use and subsequent discharge. Limitations for the intermittent discharge of chlorine apply only when the discharge of chlorine is less than or equal to 160 minutes per day, otherwise the limitations for continuous discharge of chlorine apply. The intermittent discharge limitations shall apply when the service water system is chlorinated continuously and the noncontact condenser cooling water is chlorinated intermittently on the same day. Authorization to discharge bromine with or without chlorine is limited to 120 minutes per day at the limitations specified above with the additional requirement that any discharge of chlorine is restricted to a concurrent discharge with bromine (no additional discharge of chlorine is authorized for that day).

During the intermittent discharge of chlorine without bromine ("During Chlorination - No Bromine Use" limitations given above), the daily concentration value reported for TRO shall be the average of a minimum of three (3) equally spaced grab samples taken during a chlorine discharge event, with the additional limitation that no single sample may exceed 300 μg/l.

During the intermittent discharge of bromine with or without chlorine ("During Bromine Use" limitations given above), the daily concentration value reported for TRO shall be the maximum of at least three (3) equally spaced grab samples taken during a bromine discharge event (no single sample may exceed 50 μg/l).

The permittee shall enter a zero ("0") on the Discharge Monitoring Report for the TRO discharge modes not being used.

The permittee may use dehalogenation techniques to achieve the applicable TRO limitations, using sodium thiosulfate, sodium sulfite, sodium bisulfite, or other dehalogenating reagents approved by the Department. The quantity of reagent(s) used shall be limited to 1.5 times the stoichiometric amount of applied chlorine/bromine oxidant. Each month the permittee shall report the quantity of each dehalogenation reagent used per day.

f. Power Plants - PCB Prohibition
Beginning upon the effective date of this permit, the permittee shall not discharge any polychlorinated biphenyls to the receiving waters of the state of Michigan as a result of plant operations other than due to the presence of such compounds in the intake water.

g. Chemical Metal Cleaning Wastes
The permittee shall not discharge chemical metal cleaning wastes to the receiving waters of the state of Michigan as a result of plant operations.

h. Heat Addition
The daily maximum limit of 17,300 MBTU/hr is for the total power plant discharge. The permittee shall report the total of heat loads discharged through Outfalls 001 and 002 under Outfall 001, in addition to reporting the heat loads discharged individually for the Outfalls 001 and 002, in the discharge monitoring reports.

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i. Total Boron Monitoring
During ice melt operations, the permittee shall sample the monitoring tanks for Total Boron prior to discharge through Outfalls 001 and 002. The permittee shall quantify the number of gallons released and perform a mass balance calculation and report the calculated boron discharged through Outfalls 001 and 002 in ug/l.

j. Analytical Method and Quantification Level for Total Boron
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total Boron shall be in accordance with EPA Method 200.7. The quantification level for Total Boron shall be 20 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination. Upon approval of the Department, the permittee may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

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2. Final Effluent Limitations, Monitoring Point 00A (Unit 1 Steam Generator Blowdown) and Monitoring Point 00B (Unit 2 Steam Generator Blowdown)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of one million (1,000,000) gallons per day of steam generator blowdown from Monitoring Point 00A through Outfalls 001 and 002; and one million (1,000,000) gallons per day of steam generator blowdown from Monitoring Point 00B through outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Outfall Observation	(report)	---	---	---	---	---	Daily	Visual

a. Monitoring Location
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken at Monitoring Points 00A and 00B prior to discharge to the intake forebay and thence to Outfalls 001 or 002.

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3. Final Effluent Limitations, Monitoring Point 00C (Plant Heating Boiler Blowdown)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of forty three thousand (43,000) gallons per day of heating boiler blowdown from Monitoring Point 00C through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Suspended Solids[b]	---	---	---	30	100	mg/l	Weekly Per Occurrence	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00C prior to discharge to the intake forebay and thence to Outfalls 001 or 002.

b. Total Suspended Solids
Total Suspended Solids are to be monitored daily per occurrence or weekly if the heating boiler is operated continuously for periods greater than one week.

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4. Final Effluent Limitations, Monitoring Point 00G (Reverse Osmosis System Reject)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of three hundred sixty six thousand (366,000) gallons per day of reverse osmosis system reject from Monitoring Point 00G through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Suspended Solids	---	---	---	30	100	mg/l	Weekly	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00G prior to discharge to the intake forebay and thence to Outfalls 001 and 002.

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5. Final Effluent Limitations, Monitoring Point 00H (Turbine Room Sump Emergency Overflow)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of two million six hundred thousand (2,600,000) gallons per day of turbine room sump emergency overflow from Monitoring Point 00H through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily Per Occurrence	Report Total Daily Flow (by Estimation)
Total Suspended Solids	---	---	---	30	100	mg/l	2X/Month Per Occurrence	Grab
Oil and Grease	---	---	---	15	20	mg/l	2X/Month Per Occurrence	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00H prior to discharge to the intake forebay and thence to Outfalls 001 and 002.

b. Frequency of Analysis
Samples and measurements shall be taken during discharge only.

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6. Request for Discharge of Water Treatment Additives

In the event a permittee proposes to discharge water additives, the permittee shall submit a request to discharge water additives to the Department for approval. Such requests shall be sent to the Surface Water Quality Assessment Section, Water Bureau, Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan 48909, with a copy to the Department contact listed on the cover page of this permit. Instructions to submit a request electronically may be obtained via the Internet (http://www.michigan.gov/deq and on the left side of the screen click on Water, Water Quality Monitoring, and Assessment of Michigan Waters; then click on the Water Treatment Additive List which is under the Information banner). Written approval from the Department to discharge such additives at specified levels shall be obtained prior to discharge by the permittee. Additional monitoring and reporting may be required as a condition for the approval to discharge the additive.

A request to discharge water additives shall include all of the following water additive usage and discharge information:

a. Material Safety Data Sheet;

b. the proposed water additive discharge concentration;

c. the discharge frequency (i.e., number of hours per day and number of days per year);

d. the monitoring point from which the product is to be discharged;

e. the type of removal treatment, if any, that the water additive receives prior to discharge;

f. product function (i.e. microbiocide, flocculant, etc.);

g. a 48-hour LC_{50} or EC_{50} for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.*); and

h. the results of a toxicity test for one other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of Rule 323.1057(2) of the Water Quality Standards.

Prior to submitting the request, the permittee may contact the Surface Water Quality Assessment Section by telephone at 517-335-1180 or via the Internet at the address given above to determine if the Department has the product toxicity data required by items g. and h. above. If the Department has the data, the permittee will not need to submit product toxicity data.

7. Temperature Modification

The Department is considering the necessity of incorporating temperature limitations in this permit to assure that the requirements of Rule 323.1082 of the Water Quality Standards are met. Therefore, when consideration of this issue has been completed, the Department may modify this permit in accordance with applicable laws and rules to add appropriate temperature limitations or requirements.

8. Intake Screen Backwash, Outfall 004

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge intake screen backwash from outfall 004 to Lake Michigan. The permittee shall collect and remove debris accumulated on intake trash bars and dispose of such material on land in an appropriate manner.

9. Deicing Discharge Authorization, Outfall 003

The permittee is authorized to discharge a portion of the flow from outfall 001 or outfall 002 through intake structure outfall 003 to prevent ice buildup. The permittee is not required to provide any additional monitoring of this discharge because the effluent limitations and monitoring requirements specified for outfalls 001 and 002 will determine compliance with applicable water quality standards and any other requirements.

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10. Storm Water Pollution Prevention Plan

The permittee is authorized to discharge storm water associated with industrial activities as defined in 40 CFR 122.26(b)(14). These storm water discharges shall be controlled in accordance with the requirements of this special condition. The permittee has developed and implemented a Storm Water Pollution Prevention Plan (plan). The permittee shall continue implementation of the plan for maximum control of significant materials (as defined in Part I.A.10.i.) so that storm water discharges will not cause a violation of the Water Quality Standards. The plan shall be routinely reviewed and updated in accordance with the requirements of this Special Condition.

a. Source Identification

To identify potential sources of significant materials that can enter storm water and subsequently be discharged from the facility, the plan shall, at a minimum, include the following:

1) A site map identifying the following: buildings and other permanent structures; storage or disposal areas for significant materials; secondary containment structures; storm water discharge outfalls (numbered for reference); location of storm water inlets contributing to each outfall; location of NPDES permitted discharges other than storm water; outlines of the drainage areas contributing to each outfall; structural runoff controls or storm water treatment facilities; areas of vegetation; areas of exposed and/or erodible soils; impervious surfaces (roofs, asphalt, concrete); name and location of receiving water(s); and areas of known or suspected impacts on surface waters as designated under Part 201 (Environmental Response) of the Michigan Act.

2) A list of all significant materials that could enter storm water. For each material listed, the plan shall include the following descriptions:

a) ways in which each type of material has been or has reasonable potential to become exposed to storm water (e.g., spillage during handling; leaks from pipes, pumps, and vessels; contact with storage piles; waste handling and disposal; deposits from dust or overspray, etc.);

b) identification of the outfall or outfalls through which the material may be discharged if released;

c) a listing of spills and leaks of polluting materials in quantities reportable under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code) that occurred at areas that are exposed to precipitation or that otherwise discharge to a point source at the facility. The listing shall include spills and leaks that occurred over the three (3) years prior to the completion of the plan or latest update of the plan; the date, volume and exact location of release; and the action taken to clean up the material and/or prevent exposure to storm water runoff or contamination of surface waters of the state. Any release that occurs after the plan has been developed shall be controlled in accordance with the plan and is cause for the plan to be updated as appropriate within 14 calendar days of obtaining knowledge of the spill or loss; and

d) a summary of existing storm water discharge sampling data (if available) describing pollutants in storm water discharges associated with industrial activity at the facility. This summary shall be accompanied by a description of the suspected source(s) of the pollutants detected.

3) An evaluation of the reasonable potential for contribution of significant materials to runoff from at least the following areas or activities: loading, unloading, and other material handling operations; outdoor storage, including secondary containment structures; outdoor manufacturing or processing activities; significant dust or particulate generating processes; discharge from vents, stacks and air emission controls; on-site waste disposal practices; maintenance and cleaning of vehicles, machines and equipment; sites of exposed and/or erodible soil; sites of environmental contamination listed under Part 201 (Environmental Response) of the Michigan Act; areas of significant material residue; and other areas where storm water may contact significant materials.

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b. Preventive Measures and Source Controls, Non-Structural
To prevent significant materials from contacting storm water at the source, the plan shall, at a minimum, include the following non-structural controls:

1) Description of a program for routine preventive maintenance which includes requirements for inspection and maintenance of storm water management and control devices (e.g., cleaning of oil/water separators and catch basins) as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters. A log of the inspection and corrective actions shall be maintained on file by the permittee, and shall be retained in accordance with Part I.A.10.f.

2) A schedule for comprehensive site inspection to include visual inspection of equipment, plant areas, and structural pollution prevention and treatment controls to be performed at least once every six (6) months. A report of the results of the comprehensive site inspection shall be prepared and retained in accordance with Part I.A.10.f. The report shall identify any incidents of non-compliance with the plan. If there are no reportable incidents of non-compliance, the report shall contain a certification that the facility is in compliance with this plan.

3) A description of good housekeeping procedures to maintain a clean, orderly facility.

4) A description of material handling procedures and storage requirements for significant materials. Equipment and procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The procedures shall identify measures to prevent the spilled materials or material residues on the outside of containers from being discharged into storm water. The plan may include, by reference, requirements of either a Pollution Incident Prevention Plan (PIPP) prepared in accordance with the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); a Hazardous Waste Contingency Plan prepared in accordance with 40 CFR 264 and 265 Subpart D, as required by Part 111 of the Michigan Act; or a Spill Prevention Control and Countermeasure (SPCC) plan prepared in accordance with 40 CFR 112.

5) Identification of areas that, due to topography, activities, or other factors, have a high potential for significant soil erosion. The plan shall also identify measures used to control soil erosion and sedimentation.

6) A description of employee training programs which will be implemented to inform appropriate personnel at all levels of responsibility of the components and goals of the plan. The plan shall identify periodic dates for such training.

7) Identification of significant materials expected to be present in storm water discharges following implementation of non-structural preventative measures and source controls.

c. Structural Controls for Prevention and Treatment
Where implementation of the measures required by Part I.A.10.b. does not control storm water discharges in accordance with Water Quality Standards in Part I.A.10.h., the plan shall provide a description of the location, function, and design criteria of structural controls for prevention and treatment. Structural controls may be necessary:

1) to prevent uncontaminated storm water from contacting or being contacted by significant materials, and/or

2) if preventive measures are not feasible or are inadequate to keep significant materials at the site from contaminating storm water. Structural controls shall be used to treat, divert, isolate, recycle, reuse or otherwise manage storm water in a manner that reduces the level of significant materials in the storm water and provides compliance with the Water Quality Standards in accordance with Part I.A.10.h.

d. Keeping Plans Current
1) The permittee shall review the plan on or before November 4th of each year, and maintain written summaries of the reviews. Based on the review, the permittee shall amend the plan as needed to ensure continued compliance with the terms and conditions of this permit.

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2) The plan shall also be updated or amended whenever changes or spills at the facility increase or have the potential to increase the exposure of significant materials to storm water, or when the plan is determined by the permittee or the Department to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Updates based on increased activity at the facility shall include a description of how the permittee intends to control any new sources of significant materials or respond to and prevent spills in accordance with the requirements of Parts I.A.10.a., I.A.10.b., and I.A.10.c.

3) The Department or authorized representative may notify the permittee at any time that the plan does not meet minimum requirements. Such notification shall identify why the plan does not meet minimum requirements. The permittee shall make the required changes to the plan within 30 days after such notification from the Department or authorized representative, and shall submit to the Department a written certification that the requested changes have been made.

e. Certified Storm Water Operator Update
If the certified operator has changed or an additional certified storm water operator is added, the permittee shall provide the name and certification number of the new operator to the Department. The new operator shall review and sign the plan.

f. Signature and Plan Review
1) The plan shall be signed by the certified storm water operator and by either the permittee or an authorized representative in accordance with 40 CFR 122.22. The plan shall be retained on site of the facility that generates the storm water discharge.

2) The permittee shall make plans, reports, log books, runoff quality data, and supporting documents available upon request to the Department or authorized representative.

g. Record Keeping
The permittee shall maintain records of all inspection and maintenance activities. Records shall also be kept describing incidents such as spills or other discharges that can affect the quality of storm water runoff. All such records shall be retained for three (3) years.

h. Water Quality Standards
At the time of discharge, there shall be no violation of the Water Quality Standards in the receiving waters as a result of this discharge. This requirement includes, but is not limited to, the following conditions:

1) In accordance with Rule 323.1050 of the Water Quality Standards, the receiving waters shall not have any of the following unnatural physical properties in quantities which are or may become injurious to any designated use: unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge.

2) Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

i. Significant Materials
Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the Michigan Act; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

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j. Prohibition of Non-storm Water Discharges
Discharges of material other than storm water shall be in compliance with an NPDES permit issued for the discharge. Storm water shall be defined to include the following non-storm water discharges provided pollution prevention controls for the non-storm water component are identified in the plan: discharges from fire hydrant flushing, potable water sources including water line flushing, fire system test water, irrigation drainage, lawn watering, routine building wash down which does not use detergents or other compounds, pavement wash water where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material have been removed) and where detergents are not used, air conditioning condensate, springs, uncontaminated groundwater, and foundation or footing drains where flows are not contaminated with process materials such as solvents. Discharges from fire fighting activities are authorized by this permit, but do not have to be identified in the plan.

11. Cooling Water Intake Structure

This condition establishes the program necessary for proceeding toward compliance with the regulations under Section 316(b) of the Clean Water Act. The purpose of these regulations is to establish the best technology available for minimizing adverse environmental impact associated with the use of cooling water intake structures.

The permittee submitted the Proposal for Information Collection on June 13, 2005. The permittee shall submit the information regarding Source Water Physical Data, Cooling Water Intake Structure Data, Cooling Water System Data, and Impingement Mortality and/or Entrainment Characterization Study report on or before April 4, 2008. The permittee shall also submit the remaining applicable portions of the Comprehensive Demonstration Study upon notification by the Department. When notifying the permittee, the Department will allow the permittee reasonable amount of time in order to complete the necessary tasks.

Based on the review of the above information, the Department will determine appropriate requirements and conditions, such as specified below, to be included in the permit, either by modification or reissuance of the permit.

a. Cooling water intake structure requirements,

b. Monitoring conditions,

c. Record keeping and reporting, and

d. Biennial status report.

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Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president, or a designated representative, if the representative is responsible for the overall operation of the facility from which the discharge described in the permit application or other NPDES form originates,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

e2 Reporting

The Michigan Department of Environmental Quality (DEQ) encourages you to consider submitting your monthly Discharge Monitoring Reports (DMRs) electronically using the new web based Electronic Environmental Discharge Monitoring Reporting (**e2-DMR**) System. Explore the many benefits of this faster, more efficient alternative to submitting hand-written or paper-based Discharge Monitoring Reports. Participating in ***e²-Reporting*** will:

- ☑ Improve Data Quality
- ☑ Save Time
- ☑ Reduce Compliance Costs
- ☑ Better Utilize State Resources
- ☑ Allow for Immediate Feedback
- ☑ Improve Compliance Assessment

As a fully operational electronic reporting system, all of the necessary legal, security, and electronic signature functionalities have been included for this system to serve as a completely paperless reporting system. A complete ***Facility Participation Package*** which includes information regarding minimum system requirements and registration information can be found on the e2-DMR System Website. To access this document simply type in the following URL on the address line of your internet browser: https://secure1.state.mi.us/e2rs/
Then click on "about e-DMR" to download the ***Facility Participation Package***.

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Section A. Definitions

This list of definitions may include terms not applicable to this permit.

Acute toxic unit (TU_a) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Chronic toxic unit (TU_c) means 100/MATC or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B Biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any individual sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any individual sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any individual sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Department means the Michigan Department of Environmental Quality.

Detection Level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

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Section A. Definitions

Fecal coliform bacteria monthly is the geometric mean of the samples collected in a calendar month (or 30 consecutive days). The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

Fecal coliform bacteria 7-day is the geometric mean of the samples collected in any 7-day period. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Flow Proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:
1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference.]

Land Application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

MGD means million gallons per day.

Monthly frequency of analysis refers to a calendar month. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Monthly concentration is the sum of the daily concentrations determined during a reporting month (or 30 consecutive days) divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

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Section A. Definitions

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined in the reporting month (or 30 consecutive days). The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMRs.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

NOAEL means the highest tested dose or concentration of a substance that results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact Cooling Water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

POTW is a publicly owned treatment works.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly frequency of analysis refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Toxicity Reduction Evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

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Section A. Definitions

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of Act No. 451 of the Public Acts of 1994, as amended, being Rules 323.1041 through 323.1117 of the Michigan Administrative Code.

Weekly frequency of analysis refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Yearly frequency of analysis refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

24-Hour Composite sample is a flow proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period.

3-Portion Composite sample is a sample consisting of three equal volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

7-day loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during any 7 consecutive days in a reporting month. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Preventing Pollution is the Best Solution

The Michigan Department of Environmental Quality (DEQ) encourages you to consider pollution prevention alternatives. In some cases pollution prevention may allow you to avoid the need to discharge pollutants which would otherwise require permit limitations -- or even avoid the need for permits altogether! Pollution prevention can:

- ☑ Save Money
- ☑ Reduce Waste
- ☑ Aid Permit Compliance
- ☑ Protect Our Environment
- ☑ Improve Corporate Image
- ☑ Reduce Liability

The DEQ is helping Michigan's industries save money, reduce waste and protect our environment through pollution prevention. DEQ staff can provide pollution prevention assistance through telephone consultations, technical workshops and seminars, and informational publications. They can also put you directly in touch with local support networks and national pollution prevention resources. For more information, contact the Michigan Department of Environmental Quality, Environmental Science and Services Division, at 1-800-662-9278 or visit our homepage at http://www.michigan.gov/deq.

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Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Chief of the Permits Section, Water Bureau, Michigan Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan, 48909-7773. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

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Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Unless instructed on the effluent limits page to conduct "retained self-monitoring," the permittee shall submit self-monitoring data on the Environmental Protection Agency's Discharge Monitoring Report (DMR) forms (monthly summary information) and the Department's Daily Discharge Monitoring Report forms (daily information) to PCS-Data Entry, Water Bureau, Michigan Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan, 48909-7773, for each calendar month of the authorized discharge period(s). The forms shall be postmarked no later than the **10th day of the month** following each month of the authorized discharge period(s). Electronic Environmental Discharge Monitoring Reporting (**e2-DMR**) System participants shall submit self-monitoring data for each month of the authorized discharge period(s). The electronic forms shall be submitted to the department no later than the **20th day of the month** following each month of the authorized discharge period(s).

Alternative Daily Discharge Monitoring Report formats may be used if they provide equivalent reporting details and are approved by the Department. For information on the electronic submittal of this information, contact the Department or visit the ***e²-Reporting*** website @ https://secure1.state.mi.us/e2rs/ - click on "about e-DMR" to download the **Facility Participation Package.**

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Water Bureau, Michigan Department of Environmental Quality (in the case of hospitals, nursing homes and extended care facilities, to the staff of the Division of Health Facilities and Services, Michigan Department of Consumer and Industry Services). Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the Michigan Act or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a written notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

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Section C. Reporting Requirements

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the Michigan Act, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-hour reporting - Any noncompliance which may endanger health or the environment (including maximum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. other reporting - The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the first page of this permit, or if the notice is provided after regular working hours call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from out-of-state dial 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventative measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24-hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated; and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

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Section C. Reporting Requirements

9. Bypass Prohibition and Notification

a. Bypass Prohibition - Bypass is prohibited unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass - If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass - The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the first page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

d. Written Report of Bypass - A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations - The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.10. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, within 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

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Section C. Reporting Requirements

11. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under Rule 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.12.; and 4) the action or activity will not require notification pursuant to Part II.C.10. Following such notice, the permit may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

12. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of Rules 323.1098 and 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

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Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the Michigan Act and/or the Federal Act and constitutes grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of an application for permit renewal.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the Michigan Act. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the Michigan Act.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the Michigan Act.

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Section D. Management Responsibilities

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit or other pollutants) removed from or resulting from treatment or control of wastewaters, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the Michigan Act, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Treatment System Closure

In the event that discharges from a treatment system are planned to be eliminated, the permittee shall submit a closure plan to the Department for approval. The closure plan shall include characterization of any wastewater and residuals which will remain on-site after the discharges are eliminated, along with disposal methods, proposed schedule, and any other relevant information as required by the Department. Closure activities involving waste treatment residuals shall be consistent with Part II.D.7. of this permit.

The permittee shall implement the closure activities in accordance with the approved plan. Any wastewater or residual disposal inconsistent with the approved plan shall be considered a violation of this permit. After proper closure of the treatment system, this permit may be terminated.

9. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department or the Regional Administrator, upon the presentation of credentials:

a. to enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

10. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (Rule 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the Michigan Act.

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Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the Michigan Act.

2. Facility Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities. Approval for such construction for a POTW must be by permit issued under Part 41 of the Michigan Act. Approval for such construction for a mobile home park, campground or marina shall be from the Water Bureau, Michigan Department of Environmental Quality. Approval for such construction for a hospital, nursing home or extended care facility shall be from the Division of Health Facilities and Services, Michigan Department of Consumer and Industry Services upon request.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits or approvals as may be required by law.

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

ENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

December 13, 2007

Mr. Jon Harner
Donald C. Cook Nuclear Plant
One Cook Place
Bridgman, Michigan 49106

Dear Mr. Harner:

SUBJECT: National Pollutant Discharge Elimination System (NPDES); Permit No. MI0005827
Designated Name: American Elec Power-Cook Plt

Your National Pollutant Discharge Elimination System (NPDES) Permit has been processed in accordance with the appropriate state and federal regulations. It contains the requirements necessary for you to comply with state and federal water pollution control laws.

The issuance of this permit does not authorize the violation of any federal, state, or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environmental Quality (DEQ) permits, or approvals from other units of government as may be required by law.

REVIEW THE PERMIT EFFLUENT LIMITS AND COMPLIANCE SCHEDULES CAREFULLY. These are subject to the criminal and civil enforcement provisions of both state and federal law. Permit violations are audited by the DEQ and the United States Environmental Protection Agency (USEPA), and may appear in a published quarterly noncompliance report made available to agencies and the public.

Your monitoring and reporting responsibilities must be complied with in accordance with this permit. If required by the permit, self-monitoring data shall be reported via the Michigan DEQ Electronic Environmental Discharge Monitoring Reporting (e2-DMR) system. Other reports, notifications, or questions regarding the enclosed permit or the NPDES program should be directed to the following address:

Mr. Greg Danneffel, District Supervisor
Kalamazoo District Office, Water Bureau, DEQ
7953 Adobe Road
Kalamazoo, Michigan 49009-5026
Telephone: 269-567-3500; Fax: 269-567-9440

Sincerely,

William Creal

William Creal, Chief
Permits Section
Water Bureau
517-241-1346

2008-15

wc/sea

Enclosure: Permit No. MI0005827
cc/enc: USEPA-Region 5
Mr. Gregory Danneffel, District Supervisor, Water Bureau (electronic)
PCS Unit, Water Bureau (permit only)
Files

PERMIT NO. MI0005827

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq; the "Federal Act"), Michigan Act 451, Public Acts of 1994, as amended (the "Michigan Act"), Parts 31 and 41, and Michigan Executive Orders 1991-31, 1995-4 and 1995-18,

Indiana Michigan Power Company
One Cook Place
Bridgman, Michigan 49106

is authorized to discharge from the American Electric Power Company, Donald C. Cook Nuclear Plant, located at

One Cook Place
Bridgman, Michigan 49106

designated as American Elec Power-Cook Plt

to the receiving water named Lake Michigan, in accordance with effluent limitations, monitoring requirements and other conditions set forth in this permit.

Unless specified otherwise, all contact with the Michigan Department of Environmental Quality (the "Department") required by this permit shall be made to the Kalamazoo District Supervisor of the Water Bureau. The Kalamazoo District Office is located at 7953 Adobe Road, Kalamazoo, Michigan 49009-5026, telephone: 269-567-3500, fax: 269-567-9440. Unless specified otherwise, all Department approvals specified in this permit shall be by the District Supervisor.

In accordance with Section 324.3120 of the Michigan Act, the permittee shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1. Fees paid in accordance with the Michigan Act are not refundable.

In accordance with Section 324.3118 of the Michigan Act, the permittee shall make payment of an annual storm water fee to the Department for each January 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by March 15 for notices mailed by February 1. The fee is due no later than 45 days after receiving the notice for notices mailed after February 1. Fees paid in accordance with the Michigan Act are not refundable.

Any person who is aggrieved by this permit may file a sworn petition with the Office of Administrative Hearings of the Michigan Department of Labor and Economic Growth, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department may reject any petition filed more than 60 days after issuance as being untimely.

This permit is based on a complete application submitted on April 1, 2003.

This modified permit takes effect immediately. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its effective date this permit shall supersede NPDES Permit No. MI0005827, expiring October 1, 2003, which is hereby revoked upon the effective date of this permit.

This permit and the authorization to discharge shall expire at midnight, October 1, 2008. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application which contains such information, forms, and fees as are required by the Department by April 4, 2008.

Issued September 24, 2004. Based on a request submitted on September 27, 2007, this permit was modified on December 11, 2007

William Creal, Chief
Permits Section
Water Bureau

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PART I

Section A. Effluent Limitations And Monitoring Requirements

1. Final Effluent Limitations, Monitoring Points 001A & 002A (Combined Discharge)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of one billion five hundred million (1,500,000,000) gallons per day of noncontact condenser cooling water, miscellaneous low volume waters, and storm water runoff from Monitoring Point 001A through Outfall 001; and a maximum of one billion eight hundred twenty million (1,820,000,000) gallons per day of noncontact condenser cooling water, miscellaneous low volume waters, and storm water runoff from Monitoring Point 002A through Outfall 002. Outfalls 001 and 002 discharge to Lake Michigan. Such discharge shall be limited and monitored by the permittee as specified below.

Parameter	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Frequency of Analysis	Sample Type
	Monthly	Daily	Units	Monthly	Daily	Units		
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Residual Oxidant (TRO)								
During Chlorination – No Bromine Use								
Discharge Mode								
Continuous (greater than 160 min/day)	---	---		---	38	ug/l	5X/Week	Grab
Intermittent (less than/equal to 160 min/day)	---	---		---	200	ug/l	5X/Week	Grab
During Bromine Use – the discharge time of bromine shall not exceed 120 min/day								
Intermittent (less than/equal to 120 min/day)	---	---		---	50	ug/l	5X/Week	Grab
TRO Discharge Time	---	---	---	---	(report)	min/day	5X/Week	Report Total Discharge Time
Temperature								
Intake	---	---	---	---	(report)	°F	Daily	Reading
Discharge	---	---	---	---	(report)	°F	Daily	Reading
Heat Addition[h]	---	17,300	MBTU/hr	---	---	---	Daily	Calculation
Total Boron[i]	---	---	---	(report)	(report)	ug/l	Weekly Per Occurrence	Grab
Outfall Observation	(report)	---	---	---	---	---	Daily	Visual
				Minimum Daily	Maximum Daily			
pH	---	---	---	6.5	9.0	S.U.	Daily	Grab

a. Narrative Standard
The receiving water shall contain no unnatural turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge.

b. Monitoring Location
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to discharge to Lake Michigan.

PART I

Section A. Effluent Limitations And Monitoring Requirements

c. Outfall Observation
Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition. For turbidity caused by the discharge of bentonite clay, the permittee is only required to verbally report to the Department.

d. Water Treatment Additives
This permit does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event a permittee proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the permittee shall submit a request to the Department for approval. See Part I.A.6. for information on requesting water treatment additive use.

e. TRO (Chlorine and Bromine) Requirements
Total Residual Oxidant (TRO) shall be analyzed for using EPA Method 330.1 or Orion Electrode Model 97-70 (other analytical methods specified in 40 CFR 136 may be used upon approval of the Department). TRO monitoring is only required during periods of chlorine or bromine use and subsequent discharge. Limitations for the intermittent discharge of chlorine apply only when the discharge of chlorine is less than or equal to 160 minutes per day, otherwise the limitations for continuous discharge of chlorine apply. The intermittent discharge limitations shall apply when the service water system is chlorinated continuously and the noncontact condenser cooling water is chlorinated intermittently on the same day. Authorization to discharge bromine with or without chlorine is limited to 120 minutes per day at the limitations specified above with the additional requirement that any discharge of chlorine is restricted to a concurrent discharge with bromine (no additional discharge of chlorine is authorized for that day).

During the intermittent discharge of chlorine without bromine ("During Chlorination - No Bromine Use" limitations given above), the daily concentration value reported for TRO shall be the average of a minimum of three (3) equally spaced grab samples taken during a chlorine discharge event, with the additional limitation that no single sample may exceed 300 μg/l.

During the intermittent discharge of bromine with or without chlorine ("During Bromine Use" limitations given above), the daily concentration value reported for TRO shall be the maximum of at least three (3) equally spaced grab samples taken during a bromine discharge event (no single sample may exceed 50 μg/l).

The permittee shall enter a zero ("0") on the Discharge Monitoring Report for the TRO discharge modes not being used.

The permittee may use dehalogenation techniques to achieve the applicable TRO limitations, using sodium thiosulfate, sodium sulfite, sodium bisulfite, or other dehalogenating reagents approved by the Department. The quantity of reagent(s) used shall be limited to 1.5 times the stoichiometric amount of applied chlorine/bromine oxidant. Each month the permittee shall report the quantity of each dehalogenation reagent used per day.

f. Power Plants - PCB Prohibition
Beginning upon the effective date of this permit, the permittee shall not discharge any polychlorinated biphenyls to the receiving waters of the state of Michigan as a result of plant operations other than due to the presence of such compounds in the intake water.

g. Chemical Metal Cleaning Wastes
The permittee shall not discharge chemical metal cleaning wastes to the receiving waters of the state of Michigan as a result of plant operations.

h. Heat Addition
The daily maximum limit of 17,300 MBTU/hr is for the total power plant discharge. The permittee shall report the total of heat loads discharged through Outfalls 001 and 002 under Outfall 001, in addition to reporting the heat loads discharged individually for the Outfalls 001 and 002, in the discharge monitoring reports.

PART I

Section A. Effluent Limitations And Monitoring Requirements

i. Total Boron Monitoring
During ice melt operations, the permittee shall sample the monitoring tanks for Total Boron prior to discharge through Outfalls 001 and 002. The permittee shall quantify the number of gallons released and perform a mass balance calculation and report the calculated boron discharged through Outfalls 001 and 002 in ug/l.

j. Analytical Method and Quantification Level for Total Boron
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total Boron shall be in accordance with EPA Method 200.7. The quantification level for Total Boron shall be 20 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination. Upon approval of the Department, the permittee may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

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PART I

Section A. Effluent Limitations And Monitoring Requirements

2. Final Effluent Limitations, Monitoring Point 00A (Unit 1 Steam Generator Blowdown) and Monitoring Point 00B (Unit 2 Steam Generator Blowdown)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of one million (1,000,000) gallons per day of steam generator blowdown from Monitoring Point 00A through Outfalls 001 and 002; and one million (1,000,000) gallons per day of steam generator blowdown from Monitoring Point 00B through outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Outfall Observation	(report)	---	---	---	---	---	Daily	Visual

a. Monitoring Location
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken at Monitoring Points 00A and 00B prior to discharge to the intake forebay and thence to Outfalls 001 or 002.

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Section A. Effluent Limitations And Monitoring Requirements

3. Final Effluent Limitations, Monitoring Point 00C (Plant Heating Boiler Blowdown)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of forty three thousand (43,000) gallons per day of heating boiler blowdown from Monitoring Point 00C through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Suspended Solids[b]	---	---	---	30	100	mg/l	Weekly Per Occurrence	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00C prior to discharge to the intake forebay and thence to Outfalls 001 or 002.

b. Total Suspended Solids
Total Suspended Solids are to be monitored daily per occurrence or weekly if the heating boiler is operated continuously for periods greater than one week.

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Section A. Effluent Limitations And Monitoring Requirements

4. Final Effluent Limitations, Monitoring Point 00G (Reverse Osmosis System Reject)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of three hundred sixty six thousand (366,000) gallons per day of reverse osmosis system reject from Monitoring Point 00G through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
Total Suspended Solids	---	---	---	30	100	mg/l	Weekly	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00G prior to discharge to the intake forebay and thence to Outfalls 001 and 002.

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Section A. Effluent Limitations And Monitoring Requirements

5. Final Effluent Limitations, Monitoring Point 00H (Turbine Room Sump Emergency Overflow)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of two million six hundred thousand (2,600,000) gallons per day of turbine room sump emergency overflow from Monitoring Point 00H through Outfalls 001 and 002. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration				
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency of Analysis	Sample Type
Flow	(report)	(report)	MGD	---	---	---	Daily Per Occurrence	Report Total Daily Flow (by Estimation)
Total Suspended Solids	---	---	---	30	100	mg/l	2X/Month Per Occurrence	Grab
Oil and Grease	---	---	---	15	20	mg/l	2X/Month Per Occurrence	Grab

a. Monitoring Location
Samples and measurements taken in compliance with the monitoring requirements above shall be taken at Monitoring Point 00H prior to discharge to the intake forebay and thence to Outfalls 001 and 002.

b. Frequency of Analysis
Samples and measurements shall be taken during discharge only.

PART I

Section A. Effluent Limitations And Monitoring Requirements

6. Request for Discharge of Water Treatment Additives

In the event a permittee proposes to discharge water additives, the permittee shall submit a request to discharge water additives to the Department for approval. Such requests shall be sent to the Surface Water Quality Assessment Section, Water Bureau, Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan 48909, with a copy to the Department contact listed on the cover page of this permit. Instructions to submit a request electronically may be obtained via the Internet (http://www.michigan.gov/deq and on the left side of the screen click on Water, Water Quality Monitoring, and Assessment of Michigan Waters; then click on the Water Treatment Additive List which is under the Information banner). Written approval from the Department to discharge such additives at specified levels shall be obtained prior to discharge by the permittee. Additional monitoring and reporting may be required as a condition for the approval to discharge the additive.

A request to discharge water additives shall include all of the following water additive usage and discharge information:

a. Material Safety Data Sheet;

b. the proposed water additive discharge concentration;

c. the discharge frequency (i.e., number of hours per day and number of days per year);

d. the monitoring point from which the product is to be discharged;

e. the type of removal treatment, if any, that the water additive receives prior to discharge;

f. product function (i.e. microbiocide, flocculant, etc.);

g. a 48-hour LC_{50} or EC_{50} for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.*); and

h. the results of a toxicity test for one other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of Rule 323.1057(2) of the Water Quality Standards.

Prior to submitting the request, the permittee may contact the Surface Water Quality Assessment Section by telephone at 517-335-1180 or via the Internet at the address given above to determine if the Department has the product toxicity data required by items g. and h. above. If the Department has the data, the permittee will not need to submit product toxicity data.

7. Temperature Modification

The Department is considering the necessity of incorporating temperature limitations in this permit to assure that the requirements of Rule 323.1082 of the Water Quality Standards are met. Therefore, when consideration of this issue has been completed, the Department may modify this permit in accordance with applicable laws and rules to add appropriate temperature limitations or requirements.

8. Intake Screen Backwash, Outfall 004

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge intake screen backwash from outfall 004 to Lake Michigan. The permittee shall collect and remove debris accumulated on intake trash bars and dispose of such material on land in an appropriate manner.

9. Deicing Discharge Authorization, Outfall 003

The permittee is authorized to discharge a portion of the flow from outfall 001 or outfall 002 through intake structure outfall 003 to prevent ice buildup. The permittee is not required to provide any additional monitoring of this discharge because the effluent limitations and monitoring requirements specified for outfalls 001 and 002 will determine compliance with applicable water quality standards and any other requirements.

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PART I

Section A. Effluent Limitations And Monitoring Requirements

10. Storm Water Pollution Prevention Plan

The permittee is authorized to discharge storm water associated with industrial activities as defined in 40 CFR 122.26(b)(14). These storm water discharges shall be controlled in accordance with the requirements of this special condition. The permittee has developed and implemented a Storm Water Pollution Prevention Plan (plan). The permittee shall continue implementation of the plan for maximum control of significant materials (as defined in Part I.A.10.i.) so that storm water discharges will not cause a violation of the Water Quality Standards. The plan shall be routinely reviewed and updated in accordance with the requirements of this Special Condition.

a. Source Identification

To identify potential sources of significant materials that can enter storm water and subsequently be discharged from the facility, the plan shall, at a minimum, include the following:

1) A site map identifying the following: buildings and other permanent structures; storage or disposal areas for significant materials; secondary containment structures; storm water discharge outfalls (numbered for reference); location of storm water inlets contributing to each outfall; location of NPDES permitted discharges other than storm water; outlines of the drainage areas contributing to each outfall; structural runoff controls or storm water treatment facilities; areas of vegetation; areas of exposed and/or erodible soils; impervious surfaces (roofs, asphalt, concrete); name and location of receiving water(s); and areas of known or suspected impacts on surface waters as designated under Part 201 (Environmental Response) of the Michigan Act.

2) A list of all significant materials that could enter storm water. For each material listed, the plan shall include the following descriptions:

a) ways in which each type of material has been or has reasonable potential to become exposed to storm water (e.g., spillage during handling; leaks from pipes, pumps, and vessels; contact with storage piles; waste handling and disposal; deposits from dust or overspray, etc.);

b) identification of the outfall or outfalls through which the material may be discharged if released;

c) a listing of spills and leaks of polluting materials in quantities reportable under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code) that occurred at areas that are exposed to precipitation or that otherwise discharge to a point source at the facility. The listing shall include spills and leaks that occurred over the three (3) years prior to the completion of the plan or latest update of the plan; the date, volume and exact location of release; and the action taken to clean up the material and/or prevent exposure to storm water runoff or contamination of surface waters of the state. Any release that occurs after the plan has been developed shall be controlled in accordance with the plan and is cause for the plan to be updated as appropriate within 14 calendar days of obtaining knowledge of the spill or loss; and

d) a summary of existing storm water discharge sampling data (if available) describing pollutants in storm water discharges associated with industrial activity at the facility. This summary shall be accompanied by a description of the suspected source(s) of the pollutants detected.

3) An evaluation of the reasonable potential for contribution of significant materials to runoff from at least the following areas or activities: loading, unloading, and other material handling operations; outdoor storage, including secondary containment structures; outdoor manufacturing or processing activities; significant dust or particulate generating processes; discharge from vents, stacks and air emission controls; on-site waste disposal practices; maintenance and cleaning of vehicles, machines and equipment; sites of exposed and/or erodible soil; sites of environmental contamination listed under Part 201 (Environmental Response) of the Michigan Act; areas of significant material residue; and other areas where storm water may contact significant materials.

PART I

Section A. Effluent Limitations And Monitoring Requirements

b. Preventive Measures and Source Controls, Non-Structural
To prevent significant materials from contacting storm water at the source, the plan shall, at a minimum, include the following non-structural controls:

1) Description of a program for routine preventive maintenance which includes requirements for inspection and maintenance of storm water management and control devices (e.g., cleaning of oil/water separators and catch basins) as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters. A log of the inspection and corrective actions shall be maintained on file by the permittee, and shall be retained in accordance with Part I.A.10.f.

2) A schedule for comprehensive site inspection to include visual inspection of equipment, plant areas, and structural pollution prevention and treatment controls to be performed at least once every six (6) months. A report of the results of the comprehensive site inspection shall be prepared and retained in accordance with Part I.A.10.f. The report shall identify any incidents of non-compliance with the plan. If there are no reportable incidents of non-compliance, the report shall contain a certification that the facility is in compliance with this plan.

3) A description of good housekeeping procedures to maintain a clean, orderly facility.

4) A description of material handling procedures and storage requirements for significant materials. Equipment and procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The procedures shall identify measures to prevent the spilled materials or material residues on the outside of containers from being discharged into storm water. The plan may include, by reference, requirements of either a Pollution Incident Prevention Plan (PIPP) prepared in accordance with the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); a Hazardous Waste Contingency Plan prepared in accordance with 40 CFR 264 and 265 Subpart D, as required by Part 111 of the Michigan Act; or a Spill Prevention Control and Countermeasure (SPCC) plan prepared in accordance with 40 CFR 112.

5) Identification of areas that, due to topography, activities, or other factors, have a high potential for significant soil erosion. The plan shall also identify measures used to control soil erosion and sedimentation.

6) A description of employee training programs which will be implemented to inform appropriate personnel at all levels of responsibility of the components and goals of the plan. The plan shall identify periodic dates for such training.

7) Identification of significant materials expected to be present in storm water discharges following implementation of non-structural preventative measures and source controls.

c. Structural Controls for Prevention and Treatment
Where implementation of the measures required by Part I.A.10.b. does not control storm water discharges in accordance with Water Quality Standards in Part I.A.10.h., the plan shall provide a description of the location, function, and design criteria of structural controls for prevention and treatment. Structural controls may be necessary:

1) to prevent uncontaminated storm water from contacting or being contacted by significant materials, and/or

2) if preventive measures are not feasible or are inadequate to keep significant materials at the site from contaminating storm water. Structural controls shall be used to treat, divert, isolate, recycle, reuse or otherwise manage storm water in a manner that reduces the level of significant materials in the storm water and provides compliance with the Water Quality Standards in accordance with Part I.A.10.h.

d. Keeping Plans Current
1) The permittee shall review the plan on or before November 4th of each year, and maintain written summaries of the reviews. Based on the review, the permittee shall amend the plan as needed to ensure continued compliance with the terms and conditions of this permit.

PART I

Section A. Effluent Limitations And Monitoring Requirements

2) The plan shall also be updated or amended whenever changes or spills at the facility increase or have the potential to increase the exposure of significant materials to storm water, or when the plan is determined by the permittee or the Department to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Updates based on increased activity at the facility shall include a description of how the permittee intends to control any new sources of significant materials or respond to and prevent spills in accordance with the requirements of Parts I.A.10.a., I.A.10.b., and I.A.10.c.

3) The Department or authorized representative may notify the permittee at any time that the plan does not meet minimum requirements. Such notification shall identify why the plan does not meet minimum requirements. The permittee shall make the required changes to the plan within 30 days after such notification from the Department or authorized representative, and shall submit to the Department a written certification that the requested changes have been made.

e. Certified Storm Water Operator Update
If the certified operator has changed or an additional certified storm water operator is added, the permittee shall provide the name and certification number of the new operator to the Department. The new operator shall review and sign the plan.

f. Signature and Plan Review
1) The plan shall be signed by the certified storm water operator and by either the permittee or an authorized representative in accordance with 40 CFR 122.22. The plan shall be retained on site of the facility that generates the storm water discharge.

2) The permittee shall make plans, reports, log books, runoff quality data, and supporting documents available upon request to the Department or authorized representative.

g. Record Keeping
The permittee shall maintain records of all inspection and maintenance activities. Records shall also be kept describing incidents such as spills or other discharges that can affect the quality of storm water runoff. All such records shall be retained for three (3) years.

h. Water Quality Standards
At the time of discharge, there shall be no violation of the Water Quality Standards in the receiving waters as a result of this discharge. This requirement includes, but is not limited to, the following conditions:

1) In accordance with Rule 323.1050 of the Water Quality Standards, the receiving waters shall not have any of the following unnatural physical properties in quantities which are or may become injurious to any designated use: unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge.

2) Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

i. Significant Materials
Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the Michigan Act; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

PART I

Section A. Effluent Limitations And Monitoring Requirements

j. Prohibition of Non-storm Water Discharges
Discharges of material other than storm water shall be in compliance with an NPDES permit issued for the discharge. Storm water shall be defined to include the following non-storm water discharges provided pollution prevention controls for the non-storm water component are identified in the plan: discharges from fire hydrant flushing, potable water sources including water line flushing, fire system test water, irrigation drainage, lawn watering, routine building wash down which does not use detergents or other compounds, pavement wash water where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material have been removed) and where detergents are not used, air conditioning condensate, springs, uncontaminated groundwater, and foundation or footing drains where flows are not contaminated with process materials such as solvents. Discharges from fire fighting activities are authorized by this permit, but do not have to be identified in the plan.

11. Cooling Water Intake Structure

This condition establishes the program necessary for proceeding toward compliance with the regulations under Section 316(b) of the Clean Water Act. The purpose of these regulations is to establish the best technology available for minimizing adverse environmental impact associated with the use of cooling water intake structures.

The permittee submitted the Proposal for Information Collection on June 13, 2005. The permittee shall submit the information regarding Source Water Physical Data, Cooling Water Intake Structure Data, Cooling Water System Data, and Impingement Mortality and/or Entrainment Characterization Study report on or before April 4, 2008. The permittee shall also submit the remaining applicable portions of the Comprehensive Demonstration Study upon notification by the Department. When notifying the permittee, the Department will allow the permittee reasonable amount of time in order to complete the necessary tasks.

Based on the review of the above information, the Department will determine appropriate requirements and conditions, such as specified below, to be included in the permit, either by modification or reissuance of the permit.

a. Cooling water intake structure requirements,

b. Monitoring conditions,

c. Record keeping and reporting, and

d. Biennial status report.

PART I

Section A. Effluent Limitations And Monitoring Requirements

Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president, or a designated representative, if the representative is responsible for the overall operation of the facility from which the discharge described in the permit application or other NPDES form originates,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

e2 Reporting

The Michigan Department of Environmental Quality (DEQ) encourages you to consider submitting your monthly Discharge Monitoring Reports (DMRs) electronically using the new web based Electronic Environmental Discharge Monitoring Reporting (**e2-DMR**) System. Explore the many benefits of this faster, more efficient alternative to submitting hand-written or paper-based Discharge Monitoring Reports. Participating in ***e²-Reporting*** will:

- ☑ Improve Data Quality
- ☑ Save Time
- ☑ Reduce Compliance Costs
- ☑ Better Utilize State Resources
- ☑ Allow for Immediate Feedback
- ☑ Improve Compliance Assessment

As a fully operational electronic reporting system, all of the necessary legal, security, and electronic signature functionalities have been included for this system to serve as a completely paperless reporting system. A complete ***Facility Participation Package*** which includes information regarding minimum system requirements and registration information can be found on the e2-DMR System Website. To access this document simply type in the following URL on the address line of your internet browser: https://secure1.state.mi.us/e2rs/
Then click on "about e-DMR" to download the ***Facility Participation Package***.

PART II

Section A. Definitions

This list of definitions may include terms not applicable to this permit.

Acute toxic unit (TU_a) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Chronic toxic unit (TU_c) means 100/MATC or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B Biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any individual sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any individual sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any individual sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Department means the Michigan Department of Environmental Quality.

Detection Level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

PART II

Section A. Definitions

Fecal coliform bacteria monthly is the geometric mean of the samples collected in a calendar month (or 30 consecutive days). The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

Fecal coliform bacteria 7-day is the geometric mean of the samples collected in any 7-day period. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Flow Proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference.]

Land Application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

MGD means million gallons per day.

Monthly frequency of analysis refers to a calendar month. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Monthly concentration is the sum of the daily concentrations determined during a reporting month (or 30 consecutive days) divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

PART II

Section A. Definitions

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined in the reporting month (or 30 consecutive days). The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMRs.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

NOAEL means the highest tested dose or concentration of a substance that results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact Cooling Water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

POTW is a publicly owned treatment works.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly frequency of analysis refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Toxicity Reduction Evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

PART II

Section A. Definitions

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of Act No. 451 of the Public Acts of 1994, as amended, being Rules 323.1041 through 323.1117 of the Michigan Administrative Code.

Weekly frequency of analysis refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Yearly frequency of analysis refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

24-Hour Composite sample is a flow proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period.

3-Portion Composite sample is a sample consisting of three equal volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

7-day loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during any 7 consecutive days in a reporting month. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Preventing Pollution is the Best Solution

The Michigan Department of Environmental Quality (DEQ) encourages you to consider pollution prevention alternatives. In some cases pollution prevention may allow you to avoid the need to discharge pollutants which would otherwise require permit limitations -- or even avoid the need for permits altogether! Pollution prevention can:

- ☑ Save Money
- ☑ Reduce Waste
- ☑ Aid Permit Compliance
- ☑ Protect Our Environment
- ☑ Improve Corporate Image
- ☑ Reduce Liability

The DEQ is helping Michigan's industries save money, reduce waste and protect our environment through pollution prevention. DEQ staff can provide pollution prevention assistance through telephone consultations, technical workshops and seminars, and informational publications. They can also put you directly in touch with local support networks and national pollution prevention resources. For more information, contact the Michigan Department of Environmental Quality, Environmental Science and Services Division, at 1-800-662-9278 or visit our homepage at http://www.michigan.gov/deq.

PART II

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Chief of the Permits Section, Water Bureau, Michigan Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan, 48909-7773. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

PART II

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Unless instructed on the effluent limits page to conduct "retained self-monitoring," the permittee shall submit self-monitoring data on the Environmental Protection Agency's Discharge Monitoring Report (DMR) forms (monthly summary information) and the Department's Daily Discharge Monitoring Report forms (daily information) to PCS-Data Entry, Water Bureau, Michigan Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan, 48909-7773, for each calendar month of the authorized discharge period(s). The forms shall be postmarked no later than the **10th day of the month** following each month of the authorized discharge period(s). Electronic Environmental Discharge Monitoring Reporting (**e2-DMR**) System participants shall submit self-monitoring data for each month of the authorized discharge period(s). The electronic forms shall be submitted to the department no later than the **20th day of the month** following each month of the authorized discharge period(s).

Alternative Daily Discharge Monitoring Report formats may be used if they provide equivalent reporting details and are approved by the Department. For information on the electronic submittal of this information, contact the Department or visit the ***e²-Reporting*** website @ https://secure1.state.mi.us/e2rs/ - click on "about e-DMR" to download the **Facility Participation Package.**

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Water Bureau, Michigan Department of Environmental Quality (in the case of hospitals, nursing homes and extended care facilities, to the staff of the Division of Health Facilities and Services, Michigan Department of Consumer and Industry Services). Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the Michigan Act or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a written notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

PART II

Section C. Reporting Requirements

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the Michigan Act, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-hour reporting - Any noncompliance which may endanger health or the environment (including maximum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. other reporting - The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the first page of this permit, or if the notice is provided after regular working hours call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from out-of-state dial 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventative measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24-hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated; and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

PART II

Section C. Reporting Requirements

9. Bypass Prohibition and Notification

a. Bypass Prohibition - Bypass is prohibited unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass - If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass - The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the first page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

d. Written Report of Bypass - A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations - The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.10. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, within 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

PART II

Section C. Reporting Requirements

11. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under Rule 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.12.; and 4) the action or activity will not require notification pursuant to Part II.C.10. Following such notice, the permit may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

12. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of Rules 323.1098 and 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

PART II

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the Michigan Act and/or the Federal Act and constitutes grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of an application for permit renewal.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the Michigan Act. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the Michigan Act.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the Michigan Act.

PART II

Section D. Management Responsibilities

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit or other pollutants) removed from or resulting from treatment or control of wastewaters, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the Michigan Act, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Treatment System Closure

In the event that discharges from a treatment system are planned to be eliminated, the permittee shall submit a closure plan to the Department for approval. The closure plan shall include characterization of any wastewater and residuals which will remain on-site after the discharges are eliminated, along with disposal methods, proposed schedule, and any other relevant information as required by the Department. Closure activities involving waste treatment residuals shall be consistent with Part II.D.7. of this permit.

The permittee shall implement the closure activities in accordance with the approved plan. Any wastewater or residual disposal inconsistent with the approved plan shall be considered a violation of this permit. After proper closure of the treatment system, this permit may be terminated.

9. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department or the Regional Administrator, upon the presentation of credentials:

a. to enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

10. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (Rule 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the Michigan Act.

PART II

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the Michigan Act.

2. Facility Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities. Approval for such construction for a POTW must be by permit issued under Part 41 of the Michigan Act. Approval for such construction for a mobile home park, campground or marina shall be from the Water Bureau, Michigan Department of Environmental Quality. Approval for such construction for a hospital, nursing home or extended care facility shall be from the Division of Health Facilities and Services, Michigan Department of Consumer and Industry Services upon request.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits or approvals as may be required by law.

INDIANA MICHIGAN POWER
A unit of American Electric Power

Indiana Michigan Power
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
AEP.com

Mr. James Entzminger (SC-6J)
Office of Chemical Emergency Preparedness and Prevention
U. S. Environmental Protection Agency
77 West Jackson Blvd.
Chicago, IL 60604-3511

June 8, 2007

Subject: Matter of Indiana Michigan Power Company, d/b/a American Electric Power
Cook Nuclear Plant, Bridgman, Michigan
Docket Number CERCLA-05-2004-0010, EPCRA-05-2004-0043, MM-05-2004-0003

Dear Mr. Entzminger:

This interim report is submitted in accordance with Paragraph 22 of the Consent Agreement and Final Order (CAFO) in the referenced matter to address the status of the supplemental environmental project (SEP) and associated costs.

Indiana Michigan Power Company has maintained the SEP at Cook Nuclear Plant for the year 2006. The new double-walled feed piping for the plant sodium hypochlorite system, improved leak detection, and a new sodium hypochlorite pump room with improved secondary containment remains in operation since its installation on May 11, 2006.

The actual costs incurred for purchasing and installing the described SEP were $730,827.10. The actual costs incurred for purchase, installation, operation, and maintenance of the SEP thus far are $848,427.68. These SEP costs exceed the minimum amount required by Paragraph 17 of the CAFO.

Should you have any questions, please contact Mr. Jon H. Harner, Environmental Manager, at (269) 465-5901, extension 2102.

Sincerely,

Joseph N. Jensen
Site Vice President

JEN/rdw

Correspondence Control #2007-512

I certify that I am familiar with the information in this document and that, based on an inquiry of those individuals responsible for obtaining the information, the information is true and complete to the best of my knowledge. I understand there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Joseph N. Jensen
Site Vice President

c: K. D. Curry – AEP, Ft. Wayne
J. T. King – MPSC
K. D. Mack – AEPHQ, Columbus
MDEQ – WHMD/RPMWS

APPENDIX V

SPECIAL REPORTS

2007

SECTION 316(b), PHASE II
FISH IMPINGEMENT MORTALITY AND ENTRAINMENT CHARACTERIZATION STUDY AT THE DONALD C. COOK NUCLEAR PLANT 2005-2007

OCTOBER 2007

RECEIVED
DEC 18 2007
By MaS

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

see Page 33a

SECTION 316(b), PHASE II FISH IMPINGEMENT MORTALITY AND ENTRAINMENT CHARACTERIZATION STUDY AT THE DONALD C. COOK NUCLEAR PLANT 2005-2007

Prepared for
AMERICAN ELECTRIC POWER
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106

Prepared by
NORMANDEAU ASSOCIATES, INC.
25 Nashua Road
Bedford, NH 03110

R-20452.000

October 2007

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1.0 INTRODUCTION

Impingement and entrainment studies were conducted at the Donald C. Cook Nuclear Plant (Cook Nuclear Plant) between June 2005 and January 2007 as part of the compliance effort associated with the Section 316(b), Phase II rule published by U.S. EPA in the Federal Register July 9, 2004. As part of the impingement mortality and entrainment studies, fish and ichthyoplankton sampling was conducted in Lake Michigan near the Cook Nuclear Plant from June 2005 through January 2007.

The Phase II rule established the procedures for complying with Section 316(b) at steam electric plants generating electricity for sale and distribution. Performance criteria were established in the rule for the protection of impinged and entrained aquatic and marine life. These criteria were measured against the calculation baseline, which was to be determined for each facility subject to the rule. The calculation baseline was defined in 40 CFR Section 125.93 as the estimated or actual impingement mortality and entrainment (IM&E) that would occur assuming that the cooling water system conforms with a standard configuration called the baseline case in the rule, which including a bulkhead intake and there are no structural and operational controls that would reduce impingement mortality and entrainment, and the traveling water screens were 3/8th-in, mesh. The rule intended the calculation baseline to be the estimated impingement mortality and entrainment rate for a facility that had no controls to reduce IM&E and used the most common location for intake structures on the water body.

Cook Nuclear Plant does not have a baseline case cooling water intake structure as defined in the rule. Details on the cooling water intake structure and cooling water flows are found in AEPSC (2005). Cooling water at Cook Nuclear Plant is withdrawn through three intake tunnels equipped with velocity caps located about 2,250 ft offshore. The location of these tunnels and velocity caps may serve to reduce IM&E from that which may occur at a baseline case intake structure. Ichthyoplankton and fish sampling in the vicinity of the intakes (nearfield area) was conducted to provide the data that may be used to estimate the reduction in IM&E due to the location and configuration of the intakes.

This report presents the results of the impingement and entrainment monitoring program and nearfield sampling program. Impingement mortality and entrainment estimates are made for the study period assuming the impingement mortality and entrainment rates were proportional to intake flow and the plant used the design intake flow 100% of the year. Results from the nearfield sampling are also presented and discussed to characterize the fish community in the vicinity of the intakes.

2.0 METHODS AND MATERIALS

Detailed field and laboratory methods are presented in the project Standard Operating Procedures (NAI 2007). The following is a summary of the methods used in the project.

2.1 IMPINGEMENT FIELD PROCEDURES

Impingement samples were collected in the last week of June 2005, every other week from July 2005 through January 2006, and then twice per week February 2006 through January 2007. A total of 244 samples were scheduled for the period of June 2005 through January 2007, all of which were collected. The sample consisted of all screenwash material (debris and fish) trapped on the traveling screens during the 12 hour diel collection period. Screenwash material was washed from the screens and into metal mesh baskets (29.25 x 35 x 35 inches). The screenwash material from Units 1 and 2 were kept separate. Samples consisted of two 12-hour collection periods (0400-1600 and 1600-0400 hours). A typical sample day started with the washing of the traveling screens at 0330 for 30 minutes to clear the traveling screens of material prior to the start of the 0400-1600 hrs sample. The termination of the daytime sample (0400-1600 hrs) initiated the beginning of the night sample which ran from approximately 1600 until 0400 the next day. During events where the debris baskets filled before the preset sample termination, the baskets were emptied and all screenwash material sorted and fish enumerated. These fish were considered part of the overall diel sample and included in the final 12 hour sampling event.

Whenever possible, all fish were separated from the screenwash material and identified to species. Additionally, species were separated by length class (those estimated to be young of year (YOY) and those considered to be yearling or older). The first 50 of each species and length class were measured (total length to the nearest mm), weighed (nearest g), and designated as live (moving, red gill filaments) or dead (decaying, light pink/white gill filaments). The remaining fish in a species and lifestage were counted and weighed as an aggregate. If an extremely large number of fish or lifestage were present, the number and weight of the remaining fish were estimated through gravimetric subsampling. In addition to the fish counts, the amount of debris collected in each sample was estimated and recorded.

Subsampling of the entire screenwash material occurred when there were large amounts of debris or fish. Subsampling consisted of taking a manageable section of the debris from the entire sample (rarely less than 1/10 of the total screenwash material). The fish from these subsamples were enumerated per unit volume and scaled up to the total volume of screenwash material impinged in the sample.

2.2 ENTRAINMENT METHODS

Entrainment samples were collected from June-November 2005, and February 2006-January 2007. During 2005, entrainment samples were taken once per week from June 23, 2005 through August 31, 2005 and twice per month from September 1, 2005 through November 30, 2005. During 2006-2007, one monthly entrainment sample was collected during February, October, November, and December of 2006 and in January 2007. Sampling was conducted weekly between 20 March 2006 and 29 May 2006 as well as 4 September 2006 and 29 September 2006. Between 5 June and 28 August 2006, sampling was conducted twice weekly.

Entrainment samples were collected using an electric trash pump with three inch intake and discharge openings. Water was drawn up through flexible three-in diameter hose suspended near the surface in the forebay and then pumped into a 0.300-mm mesh plankton net placed within a plastic tank. This was considered to be a well-mixed sample because water had already been withdrawn through the offshore intake and traveled through the 16-ft diameter intake tunnels located 2,250 ft offshore in 24 ft of water before reaching the forebay. Each sampling period consisted of four samples of 6-hour duration during a 24-hour period (0300-0900, 0900-1500, 1500-2100, 2100-0300). Water was pumped from a grate located near the center point of intake forebay from a depth approximately 8-10 ft below the water surface. Sample water was discharged into the entrainment sampling tank at a rate of 80-110 gpm until the flow meter registered that over 27000 gallons, or 100 m^3, of water had been sampled (approximately 5-6 hours). Previous entrainment sampling conducted in the Cook Nuclear Plant intake forebay indicated the water entering the intake bay was well mixed both horizontally and vertically and there was no potential for stratification of organisms (Bimber et. al. 1984). Therefore the sample location ensured a uniform and representative sample. A total of 252 entrainment samples were scheduled and collected for the program.

The sampling pump was periodically calibrated to the known 110-gallon volume of the sample tank in order to ensure that the amount of error between the calculated gallons/minute and that registered by the flow meter was less than 5 %.

At the termination of an entrainment sample, the pump was stopped and the net removed from the tank. The sample was washed down into the cod-end of the plankton net and then placed into a one quart sample jar. The net was then replaced and the pump restarted to begin the next sample. The jar was removed from the screenhouse and brought back to the on-site trailer where the sample was preserved in 5 % formalin.

2.2.1 Ichthyoplankton (Entrainment and Nearfield Sampling) Laboratory Processing Procedures

Entrainment and nearfield ichthyoplankton samples were sorted to remove fish eggs and larvae. Samples with high abundances were sub-sampled with a Motoda plankton splitter to provide a minimum of 200 eggs and larvae combined. Specimens were identified (usually to species level) and enumerated by life stage (eggs, yolk-sac larvae, post yolk-sac larvae, young-of-the-year, and yearling or older). The descriptions of the larval stages are as follows:

Yolk-sac larva: the transition stage from hatching through the development of a complete, functional digestive system.

Post yolk-sac larva: the transitional stage from the development of a complete functional digestive system to transformation to the juvenile form.

Young-of-the-year: the stage from complete transformation to Age1 (ie. 12 months after hatching). A young-of-the-year has a full complement of fin rays identical to that of an adult.

Yearling or older: a fish at least one year old.

2.3 NEARFIELD SAMPLING

The fisheries resources in the vicinity of the intakes were sampled to characterize the resources and to evaluate alternative intake locations (Figure 2-1). The ichthyoplankton community

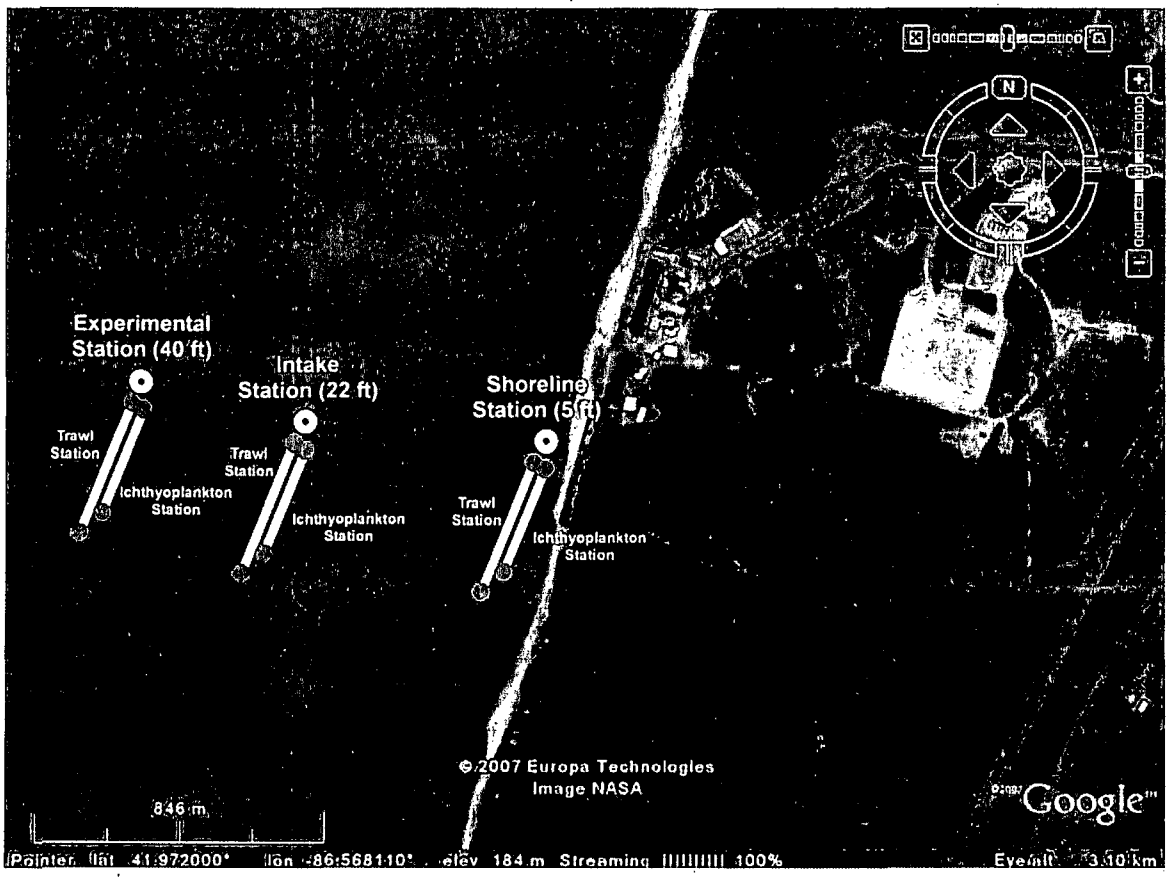

Figure 2-1. Location of sampling stations in the nearfield area in the vicinity of Cook Nuclear Plant.

was sampled at six depth-station combinations using an ichthyoplankton net. The shoreline fish community was sampled with a beach seine. The demersal fish community was sampled with an otter trawl at three stations and the pelagic fish community was sampled with gill nets at two stations.

Water quality measurements were also taken at each station and depth when possible. Dissolved oxygen (mg/l) and temperature (°C) were taken at each station while current (ft/sec) was measured at two gillnet stations.

Air temperature (°C), wind speed (mph), water clarity by Secchi disk depth (m), weather, and wave height (ft) and direction were also recorded for each sample when possible.

2.3.1 Ichthyoplankton Sampling

Ichthyoplankton samples were collected at six stations. A day and night sample was collected once per month from June-November 2005 and April-November 2006 with a target volume of 50 m^3. The night sampling on 2 June 2005 was not conducted due to weather resulting in 189 of the 196 possible samples collected.

A 0.5 m conical ichthyoplankton net and calibrated flow meter was used for the collection of samples at the following stations: shoreline station, between 1-6 ft deep (two samples), 22-ft intake

station (samples taken at surface, 10 ft, and 22 ft), and the 40-ft experimental station (one sample combining surface, 10-ft, and 20-ft depth trawls, and one sample combining 30-ft and 40-ft depth trawls).

Surface tows were conducted by attaching a float to the top of the ichthyoplankton net ensuring the entire sample was from the surface. At depth tows were conducted by attaching a weight to the net and towing it by a line of predetermined length at a 45° angle to the water's surface to ensure that the sample was collected at the specified depths.

Samples collected were washed down into the cod end from the outside of the net and then transferred to sample jars. Sample were preserved in 5% formalin and labeled. Shoreline and intake station samples were individually preserved. At the experimental station, surface, 10-ft, and 20-ft tows were combined into one sample as will the 30-ft and 40-ft plankton tows.

2.3.2 Gill Net Sampling

Experimental gill nets were used to sample pelagic fish communities at the 22-ft intake depth and the 40-ft experimental depth. Gill net samples were conducted during day and night once per month from June-November 2005 and April-November 2006. All 56 possible samples were collected during the study.

Sampling was conducted with 100-ft, four-panel experimental gill nets. Each 25-ft panel had a different mesh size (1/2-in, 1-in, 2-in, and 3-in bar mesh size). Gill nets were set at depth perpendicular to the eastern shoreline south of the no boating zone. Nets were fished for four hours and then retrieved. All fish were removed from the net and identified to species, measured (mm), weighed (g) and released.

2.3.3 Otter Trawl Sampling

An otter trawl was used to sample demersal fish communities at the shoreline station (6 ft), intake depth (22 ft), and experimental depth (40 ft). Sampling was conducted June-November 2005 and April-November 2006. In 2005, no shoreline sampling occurred June-September (8 samples total) resulting in 76 samples collected of the 84 possible. The otter trawl was 18 ft long with 1/2-in bar mesh and a cod end with 1/8-in bar mesh.

Otter trawls were set from the boat at the specified depth and towed south (parallel to the shoreline) at a similar depth for approximately 400 m. The net was then retrieved and all fish were collected, identified to species, measured (mm), weighed (g) and released.

2.3.4 Seine Sampling

Seine surveys were used to sample shoreline fish communities. Sampling occurred at two sites along the shoreline August-November 2005 and April-November 2006. No sampling occurred in June or July of 2005 resulting in 48 of 56 possible samples being collected.

A 100-ft bag seine (1/4-in bar mesh, 1/16-in bar mesh bag) was anchored to the shoreline while the other end was pulled out and then around back to the beach by the boat. The seine was then pulled in and the bag examined for fish. All fish were identified, measured (mm), weighed (g) and released.

2.4 ANALYTIC METHODS

2.4.1 Entrainment Analytic Methods

Entrainment estimates were determined from sample counts and estimates of the actual volume of water pumped by the entrainment sampler during the sampling time frame. Specifically, sample volume was determined in the field based on flowmeter readings. Counts of entrained organisms determined in the lab were weighted by the sample split factor, and divided by the sample volume to calculate sample density for each diel sample:

Density= (count*split factor) /sample volume

These estimates of density were then multiplied by the design cooling water intake flow for the diel period (specific to Unit 1 or 2) to estimate entrainment by the plant during the diel period.

Entrainment estimates were derived for each day during the study period. Non-sample day estimates were calculated from sample day densities and weighted in proportion to their temporal proximity to sample days. Assignment of month was based on the Sunday date for each week, regardless of when actual samples were taken. Daily estimates were summed to obtain monthly estimates, and monthly estimates summed to obtain annual estimates. When appropriate, calculations were performed by taxon and life stage.

2.4.2 Impingement Analytic Methods

Densities of impinged organisms (No./unit of cooling water flow) were estimated for each diel sampling period based on the number of organisms impinged in the sample and the actual cooling water flow during the sample period. Impingement estimates for design cooling water flow were then estimated by multiplying these densities by the design cooling water flow for the diel period (specific to Unit 1 or 2).

Mean weekly diel estimates of impingement at Unit 1 or Unit 2 were determined from one or two samples per week, and then the weekly impingement estimate was determined by multiplying these mean estimates by 7. Monthly estimates were calculated by summing the weekly estimates, and annual estimates were determined based on the sum of the monthly estimates. Assignment of weeks to months was based on the month in which the Sunday of the sample week fell.

Estimates for outage periods were calculated using actual sample data from the two sampled weeks preceding the outage, as well as the two sampled weeks following the outage. Weekly estimates during the outage periods were apportioned from the four actual samples according to the temporal distance the estimated sample was from the actual sample.

2.4.3 Nearfield Sampling Analytic Methods

Catch per unit effort (CPUE) was calculated for each type of sampling effort in the nearfield area. For ichthyoplankton sampling, CPUE was calculated as number of organisms per 100 m^3 sampled. Gill net CPUE was expressed as number of fish per hour of soak time. Trawl and seine CPUE were expressed as number of fish per trawl or seine haul.

2.5 QUALITY ASSURANCE AND CONTROL (QA/QC) METHODS AND SAMPLE CHAIN OF CUSTODY

Impingement and nearfield fisheries samples were analyzed at Normandeau's on-site field office at the Cook Nuclear Plant or in the field and were subject to quality control inspections. During the two year study at Cook Nuclear Plant AEP and Normandeau staff conducted two on-site quality assurance audits. The first audit was conducted by AEP in September 2005 and the second was conducted by Normandeau in January 2007. The AEP audit included impingement, entrainment and nearfield sampling. Otter trawl sampling at the shore station was added as a result of this audit. No significant deficiencies were noted. The second quality assurance audit was conducted by Normandeau in January 2006 and evaluated impingement field collection and laboratory processing at the Cook Nuclear Plant facility. There were no deficiencies recorded in field collection process and laboratory processing of impingement samples in this audit.

After each impingement sample the identification of a subsample of the fish were verified by the field supervisor and the technician. Any species that were not readily identifiable were brought from the site of collection to the field office where they were identified using taxonomic keys. These fish were then sent to the biological lab in Bedford, NH where the identification was verified and they were added to the voucher collection.

Entrainment samples were shipped to Normandeau's Bedford New Hampshire Laboratory with a chain of custody documentation with the following information: Sample collection date, sample collection time, sample identification number and number of jars per sample. Upon receipt of the samples, a Bedford Laboratory representative verified that all jars of all samples were present and signed and dated the chain of custody document. In the laboratory samples were tracked during all phases of analysis by means of sample control logs.

2.5.1 Tasks Subject to Quality Control

The following tasks were subjected to quality control checks consisting of reanalysis of randomly selected samples or measurements:

2.5.2 Inspection Plans

Items are inspected using a quality control (QC) procedure derived from MIL-STD (military-standard) 1235B (single and multiple level continuous sampling procedures and tables for inspection by attributes) to achieve a 10 percent or better AOQL (Average Outgoing Quality Limit). The QC procedure used is the CSP-1 continuous sampling plan, which is conducted in two modes as follows:

Mode 1. One hundred percent of the samples were reinspected until "i" consecutive samples passed.

Mode 2. After "i" consecutive samples passed QC reinspection, a random numbers table was used to select the fraction "f" of the samples for reinspection. If any QC samples failed then that individual's quality control inspection returned to Mode 1.

For this application of CSP-1, i=8 and f=1/7, because the total number of samples analyzed by an individual were less than 500. Items for reanalysis according to the plan were selected using a random number table. The original analyzer did not know whether a sample would be checked before the analysis of that sample had been completed. All quality control checks were performed "blindly"

(i.e., the individual performing the QC inspection did not have knowledge of the original analyst's results).

The QC plan was applied on an individual processor basis, so that each person's work was subjected to the QC plan independently of others, starting at 100% inspection.

A resolution (third person) value may be determined for any sample found defective. All errors found during the QC check, whether the sample was found to be defective or not, were corrected on the data sheets. (A difference between original and QC counts that is within acceptable limits is not considered to be an error).

2.5.3 Acceptance/Rejection Criteria

2.5.3.1 Sorting

A sample was considered defective if the sorter failed to remove 10 percent of the total organisms in the sample (or subsample). Percent error was calculated as follows (where "QC count" denotes the number missed by the sorter):

2.5.3.2 Identification

A sample was considered defective if an error of 10 percent or more is made in identifying, assigning a life stage, or counting any species. In determining whether a sample is defective, analyzer and QC results were compared within each taxon/life stage combination.

For each taxon (or for a life stage within a taxon) the percent error was calculated as follows (except where the QC count is ≤20, the percent error is considered to be zero if analyzer and QC counts differ by no more than two organisms):

$$\% \text{ error} = 100\% \times |\text{analyzer count} - \text{QC count}| / \text{QC count}$$

A sample with a percent error of greater than or equal to 10% for any life stage for any taxon was considered defective.

For each defective sample, a resolution was determined in which a third person reanalyzed the sample (resolution value). The error for each species and life stage was then be calculated using the resolution counts as the divisor. This was done for both identification and QC counts:

$$\% \text{ error} = 100\% \times |\text{identifier count} - \text{resolution count}| / \text{resolution count}$$

$$\% \text{ error} = 100\% \times |\text{QC count} - \text{resolution count}| / \text{resolution count}$$

If the resolution vs. identifier error was <10 percent, the sample passed. If they were not, the sample failed and identifier counts were replaced by QC counts for all cases, provided the QC vs. resolution error was <10 percent. If the resolution vs. identifier and the resolution vs. QC errors were both 10 percent or more, the sample was thoroughly reviewed by all three people and the identifier's sample processing did not continue until agreement was reached on the identification of the sample.

2.5.4 Quality Control Records

Quality control logs were carefully maintained, documenting the samples analyzed, the samples selected for reanalysis according to the QC plan, the results of the QC analysis, and any corrective action performed.

2.5.5 Reference Collection

Each taxon and life stage identified in the Cook Nuclear Plant entrainment program was represented in the general ichthyoplankton reference collection at Normandeau's biology laboratory. In addition, type specimens were retained for all taxa identified in the impingement and nearfield fisheries program.

2.5.6 Data Processing

2.5.6.1 Data Entry Verification and Data Sheet Chain of Custody

A submittal form with each batch of data sheets was submitted to the Technical Data Processing (TDP) department for data entry. Information on the submittal form included names of sender and recipient, date sent, and dates of impingement collections included in the batch. All data entries were keypunched twice, and discrepancies between the two versions were resolved as they were flagged by the data verification program.

2.5.6.2 Systematic Error Checks

Keyed data were subjected to a series of systematic error checking programs developed specifically for the Cook Nuclear plant Project. These checks consisted of univariate, bivariate, and multivariate checks. Univariate range checks identified records for which one or more variables had values outside their valid or expected ranges. Bivariate and multivariate checks compared values of related variables. Additional checks scanned the data for duplicate or missing observations. All records flagged by these programs were resolved, and corrections to both the data files and the data sheets were made as necessary.

2.5.6.4 Quality Control of Data Files

After the systematic error checking process data files underwent a QC inspection to assure a 1% AOQL (Average Outgoing Quality Limit) according to a lot sampling plan (American Society for Quality Control 1993). This procedure insured that ≥99% of the observations in a data file agreed with the original data sheets.

3.0 RESULTS

Impingement and entrainment sampling took place at Cook Nuclear Plant for 20 consecutive months from June 2005 through January 2007. This results section will focus on the 12 month period from February 2006 through January 2007 (primary study period) to provide annual estimates of the number of organisms entrained and impinged at the plant. The remaining eight months of June 2005 through January 2006 will be compared with the corresponding months of June through January 2006 to provide an estimate of the variability in entrainment and impingement between years. Appendix Tables A through G present monthly estimates of entrainment of each lifestage for each month of the study.

Nearfield sampling took place from June through November 2005 and April through November 2006. The entire data set will be used to characterize the ichthyoplankton and fish community in the vicinity of Cook Nuclear Plant.

3.1 ENTRAINMENT

An estimated 105.72 million fish eggs, larvae and older fish were entrained at Cook Nuclear Plant from February 2006 through January 2007 (Table 3-1; Appendix Table A). Larvae were the predominant lifestage entrained (Figure 3-1). The greatest amount of entrainment occurred in July (41.90 million) and June 2006 (36.47 million), accounting for 74% of the annual total. Cyprinids (10.51 million in June) and round goby (27.68 million in July) were the most common taxa entrained in June and July 2006. For the entire 12-month period, round goby, cyprinids, and alewife were the most common taxa entrained, accounting for 82% of the annul total.

An estimated 16.86 million fish eggs were entrained during the 12-month primary study period (Table 3-2; Figure 3-2; Appendix Table B). Most (87%) of the egg entrainment occurred in June 2006 (14.74 million) and this was primarily alewife eggs (7.01 million). Alewife (7.08 million) cyprinid (4.42 million) and unidentified eggs (3.78 million) were the most common egg taxa entrained during the primary study period, accounting for 91% of the annual total.

An estimated 83.82 million fish larvae were entrained during the primary study period (Table 3-3; Figure 3-3; Appendix Tables C, D, E,). Most of this entrainment occurred in June (21.59 million) and July (41.52 million) 2006 accounting for 75% of the annual total. In June and July, round goby (9.73 million in June; July: 27.68 million in July) and cyprinids (7.63 million in June; 7.39 million in July) were the dominant fish larvae entrained. For the 12-month primary study period, round goby (44.04 million) and cyprinids (16.87 million) were the most common larval taxa entrained, accounting for 87% of the annual total.

An estimated 5.04 million YOY and older fish were entrained during the primary study period (Table 3-4; Figure 3-4; Appendix Tables F and G). Highest entrainment of YOY and older fish occurred in August when 1.09 million fish were entrained. The majority (54%) of the August entrainment were alewife (0.59 million). For the 12-month primary study period, yellow perch (1.58 million), spottail shiner (1.13 million), and round goby (1.08 million) were the most common fish entrained.

Entrainment data collected from July 2005 through January 2006 and July 2006 through January 2007 provide an opportunity to assess variability in entrainment estimates among comparable

Table 3-1. Estimated number (in millions) of fish eggs, larvae, and young-of-year and older fish Entrained by Month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Total
Alewife	0.00	0.00	0.00	0.00	10.57	6.23	1.48	1.91	0.00	0.00	0.00	0.00	**20.19**
Common carp	0.00	0.00	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.58**
Rainbow smelt	0.51	0.00	0.00	0.00	0.00	0.09	3.93	5.24	0.00	0.00	0.00	0.00	**9.77**
Round goby	0.04	0.41	0.49	0.64	9.73	27.68	4.23	1.90	0.00	0.00	0.00	0.00	**45.11**
Round whitefish	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.14**
Slimy sculpin	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.27**
Spottail shiner	0.00	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.58	**1.13**
Unidentified	0.00	0.08	0.19	0.24	3.50	0.19	0.00	0.00	0.00	0.00	0.00	0.00	**4.21**
Unidentified cyprinidae	0.00	0.00	0.00	2.96	10.51	7.61	0.20	0.00	0.00	0.00	0.00	0.00	**21.29**
White sucker	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.13**
Yellow perch	0.04	0.37	0.00	0.00	0.30	0.09	0.36	0.11	0.00	0.15	0.46	0.00	**1.88**
All species	**0.59**	**0.86**	**0.95**	**4.11**	**36.47**	**41.90**	**10.20**	**9.16**	**0.00**	**0.15**	**0.75**	**0.58**	**105.72**

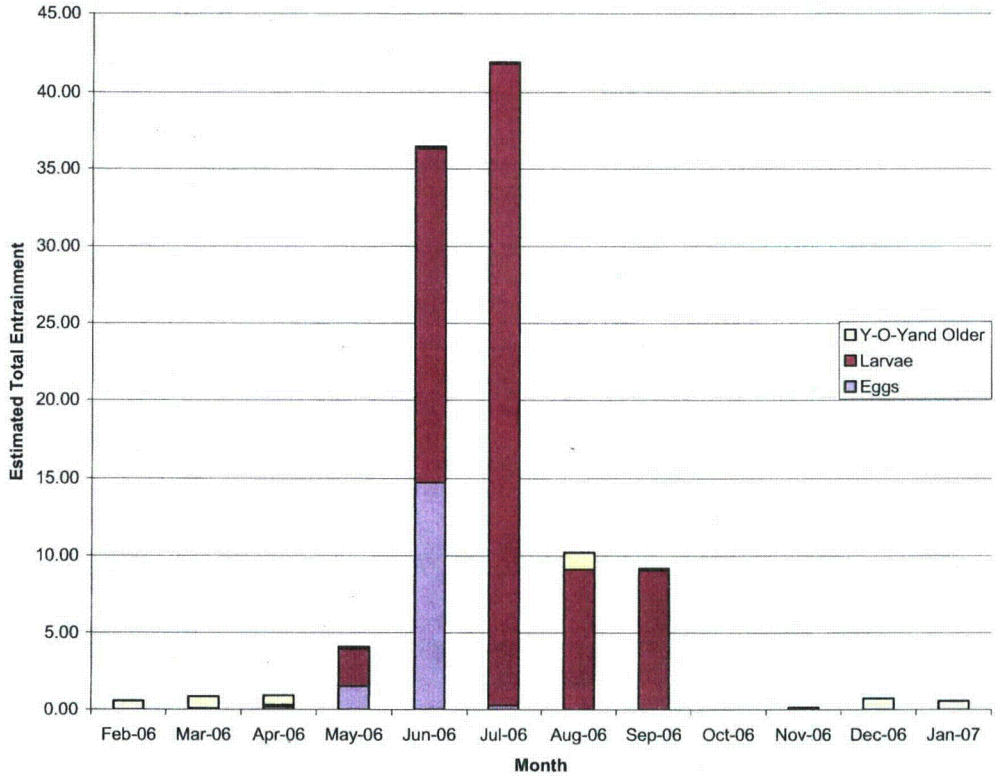

Figure 3-1. Estimated total entrainment (in millions) of fish eggs, larvae, and young-of-the-year and older fish at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

Table 3-2. Estimated number (in millions) of Fish Eggs Entrained by Month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Total
Alewife	0.00	0.00	0.00	0.00	7.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	**7.08**
Common carp	0.00	0.00	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.58**
Rainbow smelt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Round goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Round whitefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Slimy sculpin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Spottail shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Unidentified	0.00	0.08	0.19	0.24	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**3.78**
Unidentified cyprinidae	0.00	0.00	0.00	1.32	2.88	0.22	0.00	0.00	0.00	0.00	0.00	0.00	**4.42**
White sucker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Yellow perch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
All species	**0.00**	**0.08**	**0.19**	**1.56**	**14.74**	**0.29**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.86**

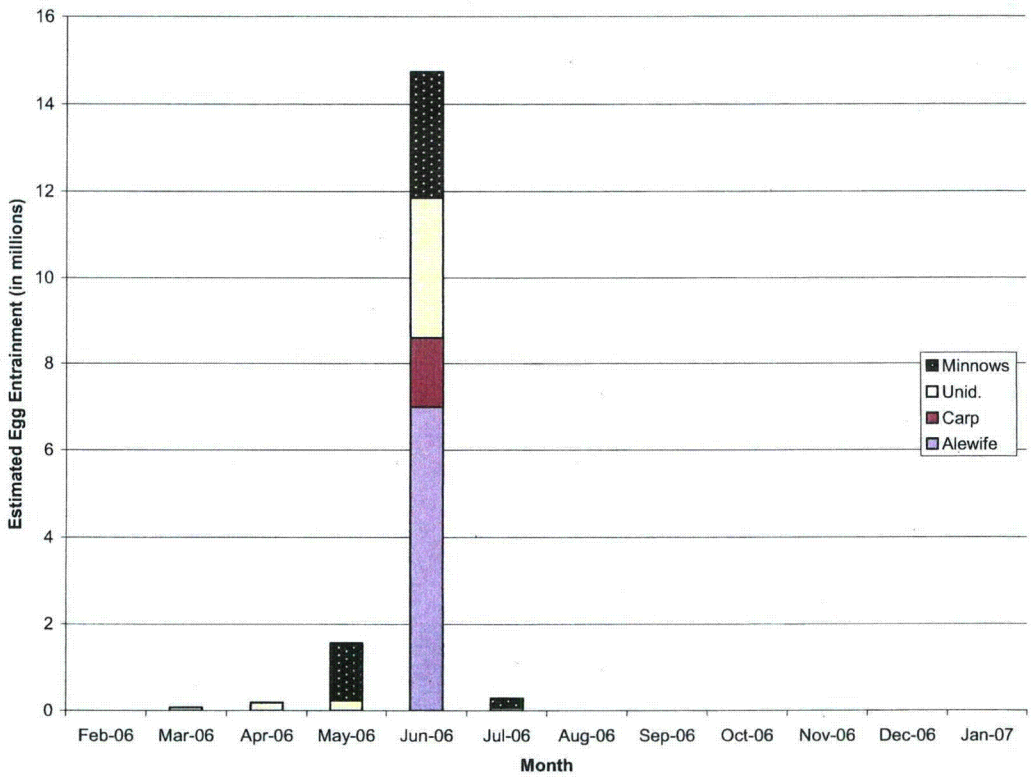

Figure 3-2. Estimated species composition of fish eggs entrained (in millions) by month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

Table 3-3. Estimated number (in millions) of Fish Larvae Entrained by Month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Total
Alewife	0.00	0.00	0.00	0.00	3.42	6.16	0.89	1.91	0.00	0.00	0.00	0.00	**12.38**
Common carp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Rainbow smelt	0.00	0.00	0.00	0.00	0.00	0.09	3.93	5.24	0.00	0.00	0.00	0.00	**9.26**
Round goby	0.00	0.00	0.00	0.64	9.73	27.68	4.09	1.90	0.00	0.00	0.00	0.00	**44.04**
Round whitefish	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.14**
Slimy sculpin	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.27**
Spottail shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Unidentified	0.00	0.00	0.00	0.00	0.24	0.19	0.00	0.00	0.00	0.00	0.00	0.00	**0.43**
Unidentified cyprinidae	0.00	0.00	0.00	1.64	7.63	7.39	0.20	0.00	0.00	0.00	0.00	0.00	**16.87**
White sucker	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.13**
Yellow perch	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.30**
All species	**0.00**	**0.00**	**0.14**	**2.41**	**21.59**	**41.52**	**9.11**	**9.05**	**0.00**	**0.00**	**0.00**	**0.00**	**83.82**

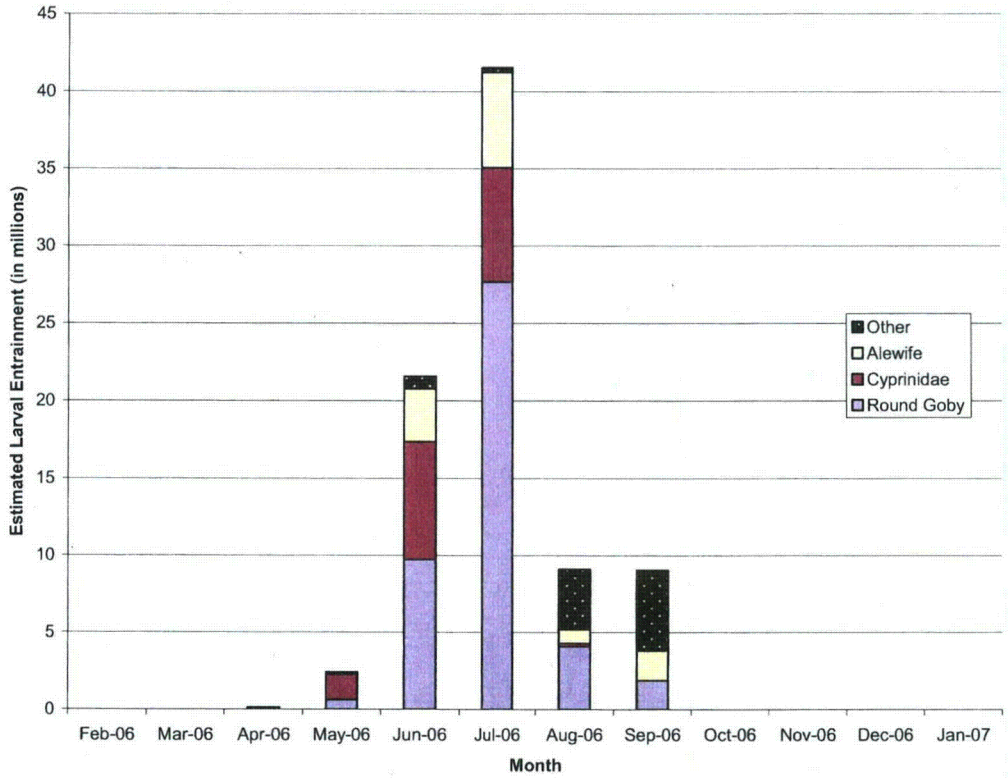

Figure 3-3. Estimated species composition of fish larvae entrained (in millions) by month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

Table 3-4. Estimated number (in millions) of Young-of-the-Year and Older Fish Entrained by Month at Cook Nuclear Power Plan Assuming Design Cooling Water Flow, February 2006 through January 2007.

	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Total
Alewife	0.00	0.00	0.00	0.00	0.14	0.00	0.59	0.00	0.00	0.00	0.00	0.00	**0.74**
Common carp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Rainbow smelt	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.51**
Round goby	0.04	0.41	0.49	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	**1.08**
Round whitefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Slimy sculpin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Spottail shiner	0.00	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.58	**1.13**
Unidentified	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Unidentified cyprinidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
White sucker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Yellow perch	0.04	0.37	0.00	0.00	0.00	0.09	0.36	0.11	0.00	0.15	0.46	0.00	**1.58**
All species	**0.59**	**0.79**	**0.61**	**0.14**	**0.14**	**0.09**	**1.09**	**0.11**	**0.00**	**0.15**	**0.75**	**0.58**	**5.04**

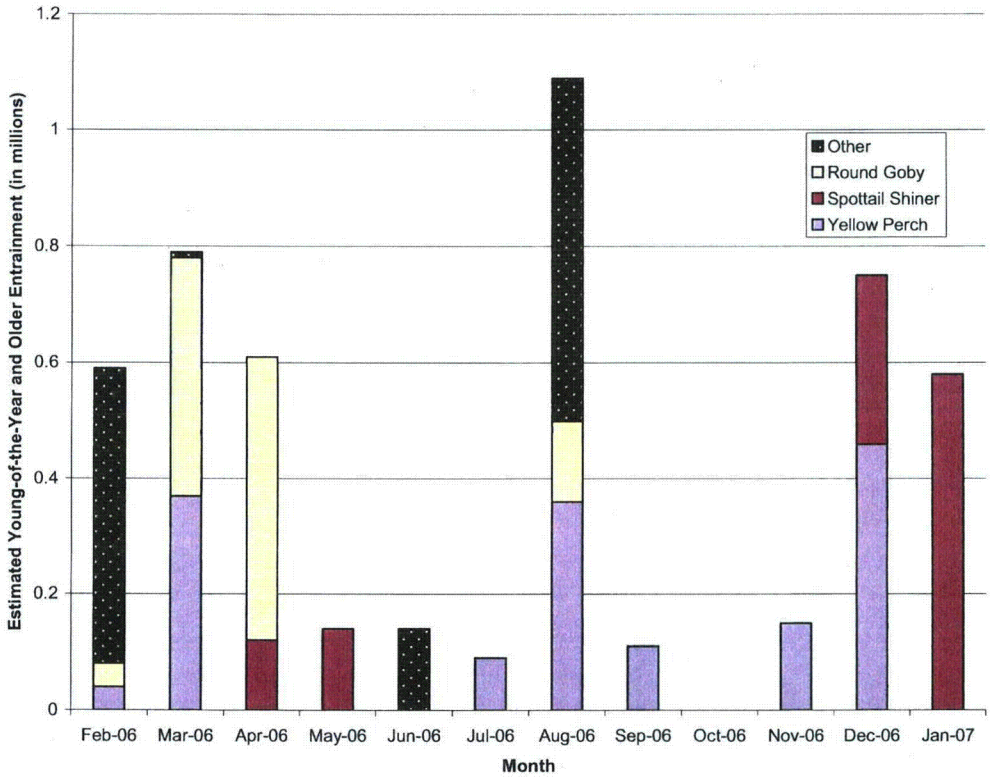

Figure 3-4. Estimated species composition of young-of-the-year and older fish larvae entrained (in millions) by month at Cook Nuclear Plant Assuming Design Cooling Water Flow, February 2006 through January 2007.

Table 3-5. Comparison of fish entrainment estimates (in millions) between July 2005 through January 2006 and July 2006 through January 2007 at Cook Nuclear Plant.

Lifestage	Year	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Total
Total	2006-2007	41.90	10.20	9.16	0.00	0.15	0.75	0.58	62.74
	2005-2006	106.32	27.20	13.11	4.21	1.92	2.91	0.81	156.48
	% Difference	**154**	**167**	**43**		**1180**	**288**	**40**	**149**
Eggs	2006-2007	0.29	00	0	0	0	0	0	0.29
	2005-2006	43.22	0	0	0	0	0	0	43.22
	% Difference	**14803**	**0**	**0**	**0**	**0**	**0**	**0**	**14803**
Larvae	2006-2007	41.52	9.11	9.05	0	0	0	0	59.68
	2005-2006	62.67	26.42	12.07	3.95	0	0	0	105.11
	% Difference	**51**	**190**	**33**		**0**	**0**	**0**	**76**
YOY and Older	2006-2007	0.09	1.09	0.11	0	0.15	0.75	0.58	2.77
	2005-2006	0.43	0.79	1.04	0.26	1.92	2.91	0.81	8.16
	% Difference	**378**	**-28**	**845**		**1180**	**288**	**40**	**195**

There were substantial differences in entrainment estimates among diel periods (Table 3-6). Entrainment for all life stages combined was highest in the 2100-0300 diel period, followed by the 0300-0900 diel period. Entrainment of eggs was relatively similar among diel periods, but larval entrainment was much higher in 2100-0300 period compared to the other periods. Entrainment of post yolk-sac round goby was much higher in the 2100-0300 diel period (36.84 million) compared to the other three diel periods (0.07– 6.97 million; Appendix Table E) and made the largest contribution to overall higher entrainment in this diel period.

Analysis of variance (ANOVA) was used to quantify the influence of month and diel period on entrainment estimates of each lifestage. Eggs were only entrained in March through July and there were significant differences in entrainment estimates among months (Table 3-7; Figure 3-2). Egg entrainment in June 2006 was significantly greater than all other months and egg entrainment in May 2006 was significantly greater than February 2006, August through December 2006, and January 2007 (Table 3-8). High estimates of alewife egg entrainment in May and June 2006 made these months significantly different from the majority of the other months.

Monthly entrainment estimates for larvae did not show a consistent pattern among diel periods and months, resulting in a significant interaction term of these two main effects. In general, larval entrainment was highest in the 2100-0300 hrs and 0300-0900 hrs diel periods (Table 3-5) and in June and July 2006 (Table 3-3). However, the significant interaction term between these main effects in the ANOVA indicates that the relationship varied among diel periods and months. Entrainment estimates in a few month-diel combinations such as July 2006, 2100-0300 hours, June 2006, 2100-0300 hours, and July 2006, 0300-0900 hours were significantly higher than the other 45 month-diel combinations. Post yolk-sac round goby larvae were dominant in the entrainment estimates for these periods along with post yolk-sac alewife larvae in the July 2006 0300-0900 estimate (Appendix Table E).

Entrainment patterns of YOY and older fish also were also not consistent among months and diel period combinations as indicated by the significant interaction term. Entrainment of these lifestages was generally highest in August and lower in the 0900-1500 hours diel periods. However, entrainment of these lifestages was significantly higher in March 2006 1500-2100 hours, August 2006

0300-0900 hours, and January 2007 0300-0900 hours month-diel combinations compared to most of the other 45 month-diel combinations. Yearling and older yellow perch and round goby were

Table 3-6. Entrainment estimates (in millions) for each lifestage among the four diel periods sampled at the Cook Nuclear Plant.

	Diel Period	Eggs	Larvae	YOY and Older	All Lifestages
Alewife	**0300-0900**	1.24	5.5	0.45	7.33
	0900-1500	1.87	1.48	0.22	3.57
	1500-2100	0.29	2.21	0	2.51
	2100-0300	3.68	3.04	0.07	6.79
Rainbow smelt	**0300-0900**	0	4.2	0.51	4.7
	0900-1500	0	0.14	0	0.14
	1500-2100	0	1	0	1
	2100-0300	0	3.92	0	3.92
Spottail shiner	**0300-0900**	0	0	0	0
	0900-1500	0	0	0	0
	1500-2100	0	0	0.26	0.26
	2100-0300	0	0	0.87	0.87
Yellow perch	**0300-0900**	0	0	0.28	0.28
	0900-1500	0	0.3	0	0.3
	1500-2100	0	0	1.09	1.09
	2100-0300	0	0	0.21	0.21
All species combined	**0300-0900**	3.92	23.48	1.38	32.14
	0900-1500	2.58	2.44	0.22	5.46
	1500-2100	5.56	3.36	1.77	11.11
	2100-0300	4.79	48.82	1.68	57.01

Table 3-7. Results of Analysis of Variance of Entrained Ichthyoplankton Lifestages at Cook Nuclear Plant. Data are Log_{10} (x+1) transformed.

Lifestage	Source of Variation	df	MS	Pr>F
Eggs	Month(Year)	11	0.083	**<0.001**
	Diel	3	0.002	0.517
	Month(Year) X Diel	33	0.001	0.994
	Error	160	0.003	
Larvae	Month(Year)	11	0.304	**<0.001**
	Diel	3	0.306	**<0.001**
	Month(Year) X Diel	33	0.059	**<0.001**
	Error	160	0.007	
YOY and Older	Month(Year)	11	0.001	**<0.001**
	Diel	3	0.002	**<0.001**
	Month(Year) X Diel	33	0.001	**<0.001**
	Error	160	<0.001	

Table 3-8. Results of Least Squares Mean Multiple Comparisons Tests among Months for Monthly Egg Entrainment Estimates at Cook Nuclear Plant. Months marked with an x in the same row are not significantly different.

Month and Year											
Sep-06	Oct-06	Nov-06	Dec-06	Aug-06	Feb-06	Jan-07	Mar-06	Apr-06	Jul-06	May-06	Jun-06
x	x	x	x	x	x	x	x	x	x		
							x	x	x	x	

dominant in March 2006, 1500-2100 hours, YOY alewife were dominant in August 2006, 0300-0900 hours, and YOY spottail shiner were dominant in January, 2007 2100-0300 hours (Appendix Tables F and G).

3.2 IMPINGEMENT

Impingement estimates are presented and discussed for Units 1 and 2 of Cook Nuclear Plant.

3.2.1 Unit 1

An estimated 561,211 fish were impinged at Unit 1 between February 2006 and January 2007, with the greatest amount of impingement occurring in February 2006 (237,285 fish) (Figure 3-5; Table 3-9). The majority of the fish impinged in the 12 month period were yellow perch (442,580; 79%), alewife (41,812; 7%) and spottail shiner (38,350; 7%). Impingement of yellow perch occurred in every month, but was highest in February, December, and March. Alewife were impinged every month except October and counts were highest in June. Spottail shiner were impinged every month and impingement was highest in December. These three fishes accounted for 93% of the fish impinged at Unit 1.

There were significant differences in total impingement estimates among months, but no significant differences among diel periods (Table 3-10). Impingement was lower in the summer and early fall months compared to most other months (Table 3-11; Figure 3-5).

Yellow perch were the most common fish impinged at Unit 1 and there were significant differences among months, but not diel periods (Tables 3-12, 3-13). Impingement of yellow perch was highest in February and December 2006 and lowest in the summer and fall (Figure 3-5). Fish from the 2005 year class were dominant in February 2006 and fish from the 2006 year class were dominant in December 2006.

There were significant differences in alewife impingement among months at Unit 1 but not between diel periods (Tables 3-14, 3-15). In general, impingement of alewife was lowest in February through March and in September through October. Impingement of alewife was highest in June and November 2006 (Figure 3-4) and these were predominantly from the 2005 year class in June and the 2006 year class in November.

Impingement of spottail shiner at Unit 1 was significantly difference among months but not between diel periods (Tables 3-16, 3-17). Impingement was lowest in the summer months and highest in December, February and March. These were predominantly yearling and older fish (Figure 3-5).

Table 3-9. Estimated Number of Fish Impinged, at Cook Nuclear Plant Unit 1, Assuming Design Cooling Water Flow, February 2006 through January 2007.

Species	2006											2007	Total
	February	March	April	May	June	July	August	September	October	November	December	January	
Alewife	193	29	63	1,015	34,170	592	698	18	0	3,351	1,492	192	41,812
Bloater	14	44	60	0	0	0	0	15	0	14	219	11	375
Bluegill	7	218	25	0	0	0	0	1	10	0	67	21	347
Bluntnose minnow	0	0	0	0	4	0	0	0	0	0	0	0	4
Brook silverside	0	14	0	0	0	0	0	0	0	0	0	0	14
Brown bullhead	0	11	4	0	0	0	0	0	0	0	0	0	15
Brown trout	0	20	4	4	3	93	0	0	0	0	0	0	124
Burbot	21	98	7	18	7	0	0	0	0	17	22	31	222
Central mudminnow	0	48	4	0	0	0	0	0	0	0	0	0	52
Channel catfish	469	315	64	14	11	0	18	1	10	15	31	101	1,048
Chestnut lamprey	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook	0	98	21	0	0	0	0	0	0	0	0	0	119
Coho	0	20	14	0	0	0	0	0	0	0	0	0	34
Common carp	0	4	0	0	3	0	0	0	0	0	14	0	21
Deepwater sculpin	0	14	4	0	0	0	0	0	0	20	0	0	38
Eastern banded killifish	0	34	0	0	0	0	0	0	0	0	0	0	34
Flathead catfish	0	0	0	0	0	0	0	0	0	0	0	0	0
Freshwater drum	0	0	0	11	0	0	4	6	4	0	8	0	33
Gizzard shad	381	1,085	21	0	0	0	0	5	68	481	5,056	1,130	8,227
Golden redhorse	0	0	0	11	0	0	0	0	0	0	14	15	40
Golden shiner	0	0	0	0	0	0	0	0	0	0	0	0	0
Greater redhorse	0	0	0	0	0	0	0	0	0	0	0	7	7
Lake chub	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake sturgeon	0	0	0	0	0	0	0	0	0	0	14	0	14
Lake trout	0	4	0	4	14	0	0	0	0	3	29	0	53
Lake whitefish	713	137	56	7	0	14	0	0	0	28	2,715	765	4,436
Largemouth bass	0	0	0	0	0	0	0	0	0	0	0	0	0
Longnose dace	0	0	0	0	0	0	0	0	0	0	0	0	0
Longnose sucker	18	216	74	35	21	7	4	0	0	0	56	61	492
Mottled sculpin	0	0	7	0	0	0	0	0	0	3	0	0	11
Ninespine stickleback	14	0	42	91	10	0	0	0	0	0	0	0	158
Northern pike	0	20	0	0	0	0	0	0	0	0	0	0	20

(continued)

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Table 3-9. (Continued)

Species	2006											2007	Total
	February	March	April	May	June	July	August	September	October	November	December	January	
Pumpkinseed	4	15	0	0	0	0	0	0	0	0	0	0	**18**
Rainbow smelt	1,450	827	210	301	11	21	4	0	7	49	415	704	**3,997**
Rock bass	0	13	0	0	0	0	0	0	0	0	0	7	**20**
Round goby	983	928	1,282	6,648	1,491	956	517	205	64	788	1,559	508	**15,929**
Sea lamprey	200	78	25	4	0	0	0	0	0	0	0	70	**376**
Shorthead redhorse	0	4	0	0	0	0	0	0	0	0	0	0	**4**
Silver redhorse	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slimy sculpin	119	168	229	67	88	14	0	0	0	4	0	14	**702**
Smallmouth bass	4	0	0	0	0	0	0	0	0	0	0	0	**4**
Spottail shiner	7,425	3,442	2,686	655	129	98	165	73	15	652	20,675	2,336	**38,350**
Steelhead	7	10	4	0	0	0	0	0	0	0	0	0	**21**
Threespine stickleback	475	150	56	60	38	0	0	0	0	0	26	60	**866**
Trout-perch	0	49	0	17	10	0	0	0	0	14	150	24	**265**
Unidentified	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Walleye	0	0	0	0	0	0	0	0	0	0	0	0	**0**
White perch	35	28	0	0	4	0	0	0	0	0	14	28	**108**
White sucker	4	71	4	28	32	3	0	4	0	0	28	48	**221**
Yellow perch	224,751	62,419	26,670	11,821	2,410	675	4,912	311	46	16,586	71,524	20,454	**442,580**
Total	**237,285**	**70,631**	**31,635**	**20,808**	**38,455**	**2,473**	**6,321**	**638**	**225**	**22,026**	**104,128**	**26,586**	**561,211**

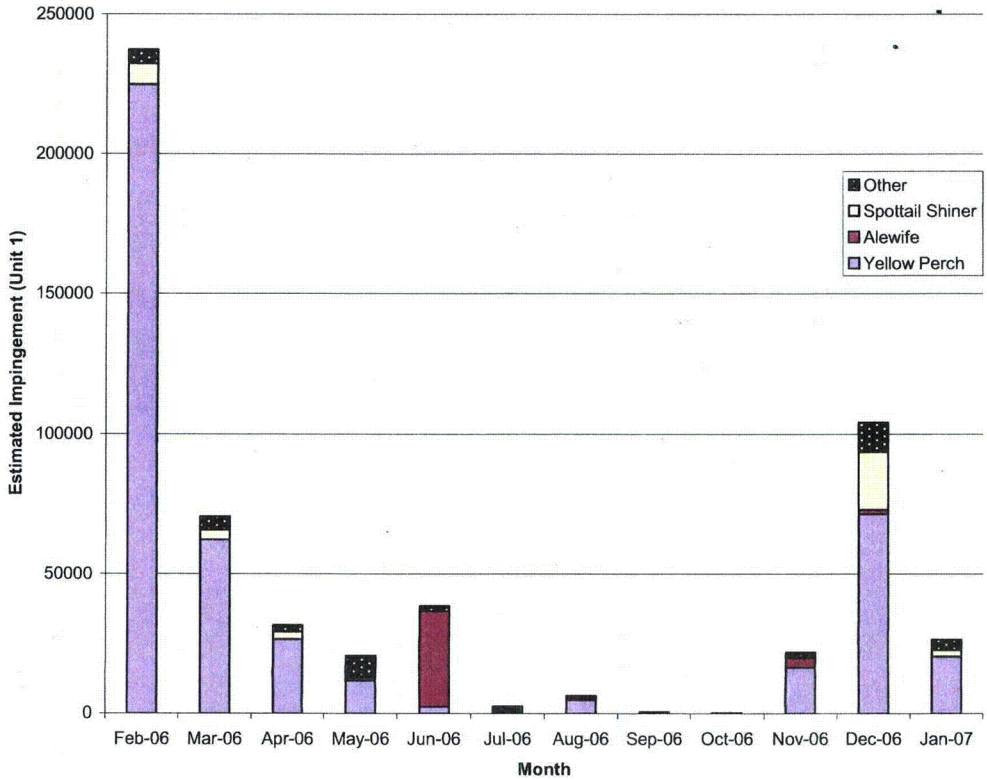

Figure 3-5. Estimated total number of fish impinged and species composition by month at Unit 1 of Cook Nuclear Power Place February 2006 through January 2007.

Table 3-10. Results of Analysis of Variance of Impinged Fish at Cook Nuclear Plant Unit 1. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	Df	MS	Pr>F
All Species	Month (Year)	11	6.08	**<0.001**
	Diel	1	0.13	0.529
	Month (Year) X Diel	11	0.03	1.000
	Error	84	0.34	

Table 3-11. Results of Scheffe's Multiple Comparisons Test among Months for Total Impingement Estimates at Cook Nuclear Plant Unit 1. Months marked with an x in the same row are not significantly different.

Month and Year											
Feb-06	**Dec-06**	**Mar-06**	**Jan-07**	**May-06**	**Apr-06**	**Jun-06**	**Nov-06**	**Aug-06**	**Jul-06**	**Sep-06**	**Oct-06**
x	x	x	x	x	x	x	x				
		x	x	x	x	x	x	x	x		
							x	x	x	x	x
									x	x	x

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Table 3-12. Results of Analysis of Variance of Yellow Perch Impingement at Cook Nuclear Plant Unit 1. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	df	MS	Pr>F
Yellow Perch	Month(Year)	11	9.47	**<0.001**
	Diel	1	0.30	0.452
	Month(Year) X Diel	11	0.07	0.100
	Error	84	0.53	

Table 3-13. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Yellow Perch at Cook Nuclear Plant Unit 1. Months marked with an x in the same row are not significantly different.

Month and Year											
Feb-06	**Dec-06**	**Mar-06**	**Jan-07**	**Apr-06**	**May-06**	**Nov-06**	**Aug-06**	**Jun-06**	**Jul-06**	**Sep-06**	**Oct-06**
x	x	x	x	x	x	x	x				
	x	x	x	x	x	x	x	x			
			x	x	x	x	x	x	x		
				x	x	x	x	x	x	x	
									x	x	x

Table 3-14. Results of Analysis of Variance of Alewife Impingement at Cook Nuclear Plant Unit 1. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	df	MS	Pr>F
Alewife	Month(Year)	11	5.71	**<0.001**
	Diel	1	0.01	0.919
	Month(Year) X Diel	11	0.05	1.000
	Error	84	0.78	

Table 3-15. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Alewife at Cook Nuclear Plant Unit 1. Months marked with an x in the same row are not significantly different.

Month and Year											
Jun-06	**Nov-06**	**Dec-06**	**May-06**	**Aug-06**	**Jul-06**	**Jan-06**	**Feb-06**	**Apr-06**	**Mar-06**	**Sep-06**	**Oct-06**
x	x	x	x	x	x						
	x	x	x	x	x	x	x	x	x	x	
		x	x	x	x	x	x	x	x	x	x

Table 3-16. Results of Analysis of Variance of Spottail Shiner Impingement at Cook Nuclear Plant Unit 1. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	df	MS	Pr>F
Spottail Shiner	Month (Year)	11	7.13	**<0.001**
	Diel	1	0.06	0.746
	Month (Year) X Diel	11	0.27	0.800
	Error	84	0.44	

Table 3-17. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Spottail Shiner at Cook Nuclear Plant Unit 1. Months marked with an x in the same row are not significantly different.

Month and Year											
Dec-06	Mar-06	Feb-06	Jan-07	Apr-06	Nov-06	May-06	Jun-06	Aug-06	Jul-06	Sep-06	Oct-06
x	x	x	x	x							
	x	x	x	x	x	x					
		x	x	x	x	x	x	x			
				x	x	x	x	x	x	x	
					x	x	x	x	x	x	x

Impingement data collected from July 2005 through January 2006 and July 2006 through January 2007 provide an opportunity to assess variability in impingement estimates among comparable months (Appendix Table H). Total impingement was about 63% greater for the same months in 2005-2006 compared to 2006-2007 (Table 3-18). The greatest variation between the two years occurred in September and October. Greater numbers of yellow perch, gizzard shad, and spottail shiner were impinged in September and October of 2005 compared to 2006.

Impingement of fish biomass showed a similar seasonal pattern to numerical impingement, but the relative contribution among species was slightly different (Figure 3-6). An estimated 5,366 kg of fish were impinged at Unit 1 between February 2006 and January 2007 with the greatest amount of biomass impingement (1,395 kg) occurring in December 2006 (Appendix Table J). Similar to fish impingement, yellow perch were the largest component (2,452 kg) of the total biomass impingement making up 46% of the total. In contrast to fish impingement, lake whitefish (675 kg; 13%) and spottail shiner (337 kg; 6%) ranked second and third in impingement biomass (Appendix Table I). Biomass impingement of yellow perch was greatest in February of 2006 when 822 kg were impinged. Lake whitefish and spottail shiner biomass impingement was greatest in December 2006 when 361 kg and 190 kg were impinged.

3.2.2 Unit 2

An estimated 824,812 fish were impinged at Unit 2 between February 2006 and January 2007 (Figure 3-7; Table 3-19). The majority of these fish were yellow perch (673,720; 82%), spottail shiner (48,970; 6%) and alewife (40,893; 5%). Impingement of yellow perch occurred every month, but was highest in February (352,834). Similarly, impingement of spottail shiner and alewife occurred in every month. Spottail shiner impingement was greatest in December (27,121) and impingement of alewife was greatest in June (30,897). These three fish composed 93% of the total impingement.

There were significant differences in total impingement estimates among months, but no significant differences among diel periods (Table 3-20). Impingement was lower in the summer and early fall months compared to most other months (Table 3-21, Figure 3-7). Impingement was highest in February, December and March primarily due to impingement of yellow perch and spottail shiner.

Table 3-18. Comparison of fish impingement estimates between July 2005 through January 2006 and July 2006 through January 2007 at Cook Nuclear Plant Unit 1.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Total
2006-2007	2,473	6,321	638	225	22,026	104,128	26,586	**162,397**
2005-2006	853	7,706	62,923	8,034	122,765	20,461	42,656	**265,398**
% Difference	-65	22	9,762	3,470	457	-80	60	**63**

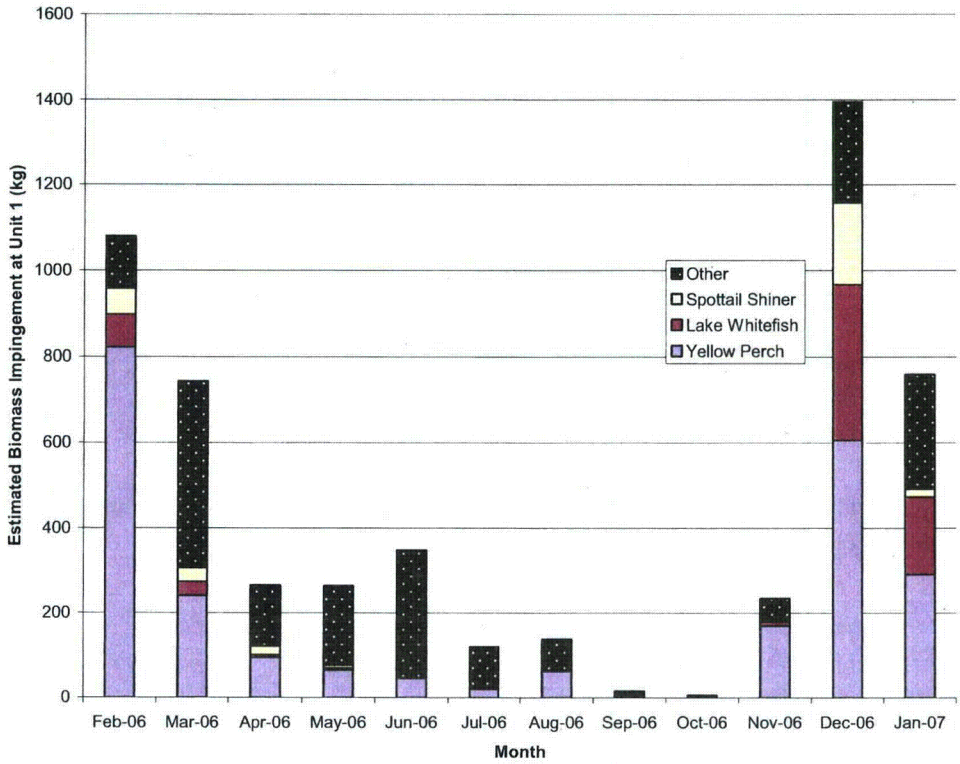

Figure 3-6. Estimated biomass (kg) of fish impinged and biomass composition by month at Unit 1 of Cook Nuclear Plant February 2006 through January 2007.

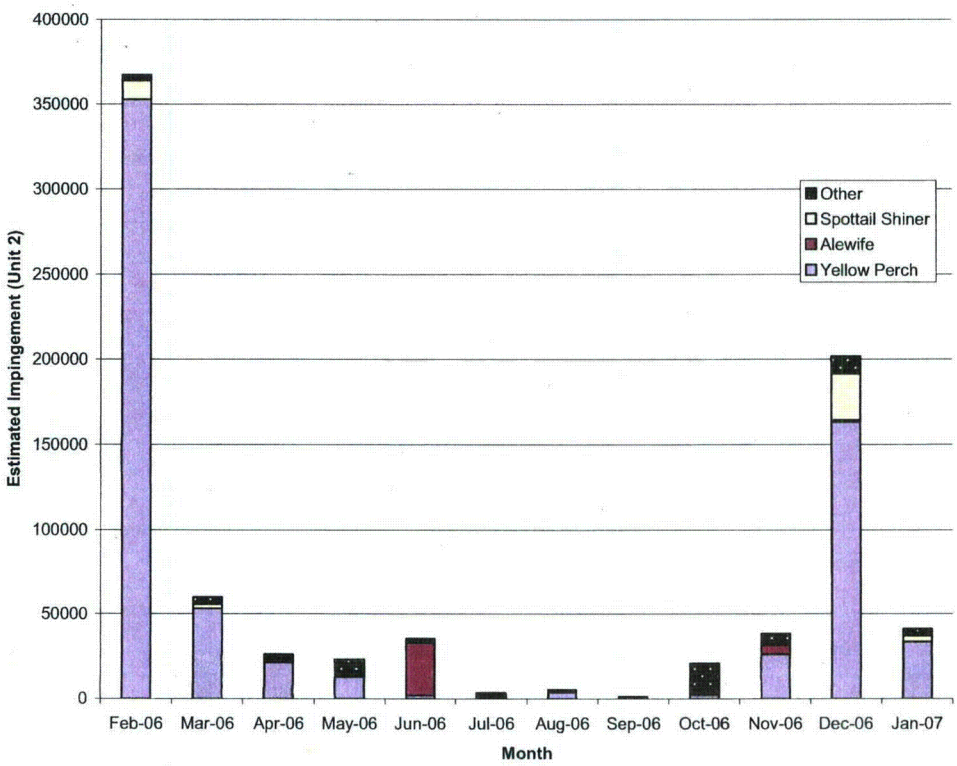

Figure 3-7. Estimated total number of fish impinged and species composition by month at Unit 2 of Cook Nuclear Plant February 2006 through January 2007.

Table 3-19. Estimated Number of Fish Impinged, at Cook Nuclear Plant Unit 2, Assuming Design Cooling Water Flow, February 2006 through January 2007.

Species	2006											2007	TOTAL
	February	March	April	May	June	July	August	September	October	November	December	January	
Alewife	152	31	20	1,286	30,897	793	538	140	569	5,281	1,040	146	**40,893**
Bloater	32	13	8	0	0	0	4	25	270	84	194	11	**640**
Bluegill	32	274	183	18	0	0	0	0	4	60	67	24	**661**
Bluntnose minnow	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Brook silverside	4	0	0	0	3	0	0	0	0	0	0	0	**7**
Brown bullhead	0	27	19	4	0	0	0	0	4	0	0	0	**53**
Brown trout	0	13	8	18	7	42	0	0	0	0	0	19	**106**
Burbot	7	40	27	35	7	7	0	0	18	52	3	56	**253**
Central mudminnow	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Channel catfish	308	280	174	39	0	0	27	0	0	25	167	34	**1,054**
Chestnut lamprey	0	0	0	0	0	0	0	0	0	0	0	21	**21**
Chinook	18	39	17	4	0	13	0	0	4	0	0	0	**94**
Coho	0	22	12	0	0	7	0	0	0	0	0	0	**41**
Common carp	0	0	0	0	0	0	13	0	0	0	0	0	**13**
Deepwater sculpin	0	0	0	0	0	0	0	0	0	0	0	7	**7**
Eastern banded killifish	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Flathead catfish	0	0	0	0	0	0	0	0	0	3	0	14	**17**
Freshwater drum	0	0	0	0	0	0	0	0	0	0	35	0	**35**
Gizzard shad	560	1,252	780	0	0	0	0	47	15,682	3,984	3,273	570	**26,147**
Golden redhorse	0	1	20	4	0	0	4	0	0	0	9	0	**38**
Golden shiner	0	4	0	0	0	0	0	0	0	0	0	0	**4**
Greater redhorse	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lake chub	0	0	0	0	0	0	7	0	0	0	0	0	**7**
Lake sturgeon	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lake trout	0	0	0	0	14	0	0	0	4	10	9	4	**41**
Lake whitefish	489	63	9	25	0	0	11	0	0	78	3,556	750	**4,980**
Largemouth bass	7	0	0	0	0	0	0	0	7	0	0	0	**14**
Longnose dace	0	0	0	0	0	0	0	0	0	0	13	0	**13**
Longnose sucker	70	106	39	81	95	13	0	0	7	0	52	4	**466**
Mottled sculpin	0	0	0	4	11	0	0	0	0	0	0	0	**14**
Ninespine stickleback	32	19	22	70	21	0	0	0	0	0	0	7	**171**
Northern pike	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumpkinseed	0	0	0	4	0	0	0	0	0	0	0	0	**4**
Rainbow smelt	780	828	721	355	35	0	24	0	35	81	469	1,666	**4,993**

(continued)

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Table 3-19. (Continued)

Species	2006											2007	TOTAL
	February	March	April	May	June	July	August	September	October	November	December	January	
Rock bass	0	0	0	0	7	0	0	0	0	0	0	7	**14**
Round goby	432	643	916	7,249	2,180	1,939	827	265	956	1,370	1,945	530	**19,251**
Sea lamprey	74	14	0	11	0	0	0	0	0	0	0	49	**147**
Shorthead redhorse	7	0	0	0	0	0	0	0	0	0	0	0	**7**
Silver redhorse	0	0	0	0	0	0	0	0	7	0	0	0	**7**
Slimy sculpin	70	37	51	84	42	20	0	0	0	4	0	0	**308**
Smallmouth bass	7	0	0	0	0	0	0	0	0	4	0	0	**11**
Spottail shiner	11,169	2,576	1,284	945	152	105	66	133	1,088	1,031	27,121	3,300	**48,970**
Steelhead	25	14	19	4	14	0	0	0	0	0	0	25	**99**
Threespine stickleback	385	97	38	75	28	0	0	0	0	14	24	94	**755**
Trout-perch	46	30	18	14	0	0	0	0	14	0	150	0	**271**
Unidentified	0	18	12	0	0	0	0	0	0	0	0	0	**30**
Walleye	0	0	0	0	0	0	0	0	0	0	0	0	**0**
White perch	0	44	29	0	0	0	0	0	0	0	3	0	**77**
White sucker	11	44	18	77	49	7	0	4	14	0	43	94	**360**
Yellow perch	352,834	53,174	21,753	12,878	2,041	581	3,850	739	2,274	26,375	163,495	33,727	**673,720**
TOTAL	**367,548**	**59,701**	**26,194**	**23,281**	**35,604**	**3,526**	**5,371**	**1,352**	**20,955**	**38,454**	**201,669**	**41,155**	**824,812**

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Table 3-20. Results of Analysis of Variance of Impinged Fish at Cook Nuclear Plant Unit 2. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	Df	MS	Pr>F
All Species	Month(Year)	11	3.47	**<0.001**
	Diel	1	0.09	0.524
	Month(Year) X Diel	11	0.07	0.971
	Error	84	0.21	

Table 3-21. Results of Scheffe's Multiple Comparisons Test among Months for Total Impingement Estimates at Cook Nuclear Plant Unit 2. Months marked with an x in the same row are not significantly different.

Month and Year											
Feb-06	Dec-06	Mar-06	Jan-07	Nov-06	Apr-06	May-06	Jun-06	Oct-06	Aug-06	Jul-06	Sep-06
x	x	x	x	x	x						
	x	x	x	x	x	x	x	x			
			x	x	x	x	x	x	x		
						x	x	x	x	x	
							x	x	x	x	x

There were significant differences in impingement of yellow perch among months but not between periods (Table 3-22). Impingement of yellow perch was relatively low during the summer months and highest in February and December (Figure 3-7; Table 3-23). These fish were predominantly from the 2005 year class in February and the 2006 year class in December.

Table 3-22. Results of Analysis of Variance of Impinged Yellow Perch at Cook Nuclear Plant Unit 2. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	Df	MS	Pr>F
All Species	Month(Year)	11	6.49	**<0.001**
	Diel	1	0.05	0.716
	Month(Year) X Diel	11	0.15	0.942
	Error	84	0.36	

Table 3-23. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Yellow Perch at Cook Nuclear Plant Unit 2. Months marked with an x in the same row are not significantly different.

Month and Year											
Feb-06	Dec-06	Mar-06	Jan-07	Apr-06	Nov-06	May-06	Aug-06	Jun-07	Oct-06	Sep-06	Jul-06
x	x	x	x	x	x						
	x	x	x	x	x	x					
		x	x	x	x	x	x	x			
				x	x	x	x	x	x		
					x	x	x	x	x	x	
							x	x	x	x	x

There were significant differences in impingement of spottail shiner among months at Unit 2 but not between diel periods (Table 3-24). Impingement was relatively low from June through September and highest in February and December (Figure 3-7; Table 3-25). Yearling and older fish were dominant in these months.

Table 3-24. Results of Analysis of Variance of Impinged Spottail Shiner at Cook Nuclear Plant Unit 2. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	df	MS	Pr>F
All Species	Month(Year)	11	7.00	**<0.001**
	Diel	1	0.03	0.753
	Month(Year) X Diel	11	0.27	0.586
	Error	84	0.31	

Table 3-25. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Spottail Shiner at Cook Nuclear Plant Unit 2. Months marked with an x in the same row are not significantly different.

Month and Year											
Dec-06	**Feb-06**	**Jan-07**	**Mar-06**	**Apr-06**	**Nov-06**	**Oct-06**	**May-06**	**Jun-06**	**Sep-06**	**Jul-06**	**Aug-06**
x	x	x	x	x							
	x	x	x	x	x	x	x				
				x	x	x	x	x			
					x	x	x	x	x		
						x	x	x	x	x	
							x	x	x	x	x

Similar to yellow perch and spottail shiner, there were significant differences in alewife impingement among months but not between diel periods (Table 3-26). Impingement of alewife was relatively low during January through March, and increased dramatically in May and June, and again in November and December (Figure 3-7; Table 3-27). The alewife impinged in May and June 2006 were primarily members of the 2005 year class and the alewife impinged in November and December were members of the 2006 year class.

Table 3-26. Results of Analysis of Variance of Impinged Alewife at Cook Nuclear Plant Unit 2. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	df	MS	Pr>F
All Species	Month(Year)	11	4.58	**<0.001**
	Diel	1	1.03	0.207
	Month(Year) X Diel	11	0.21	0.978
	Error	84	0.63	

Table 3-27. Results of Scheffe's Multiple Comparisons Test among Months for Impingement of Alewife at Cook Nuclear Plant Unit 2. Months marked with an x in the same row are not significantly different.

Month and Year											
Jun-06	Nov-06	Oct-06	May-06	Aug-06	Jul-06	Dec-06	Sep-06	Jan-07	Feb-06	Apr-06	Mar-06
x	x	x	x	x	x	x	x				
	x	X	x	x	x	x	x	x			
		x	x	x	x	x	x	x	x	x	x

Impingement data collected from July 2005 through January 2006 and July 2006 through January 2007 provide an opportunity to assess variability in impingement estimates among comparable months. Total impingement for the pooled seven-month periods was only 1% different between 2005-2006 and 2006-2007 (Table 3-28). However, there were large differences in individual monthly impingement estimates between 2005-2006 and 2006-2007. The greatest variation occurred in September and November due to greater numbers of alewife and yellow perch being impinged in September and November of 2005 compared to the same months in 2006.

Table 3-28. Comparison of fish impingement estimates between July 2005 through January 2006 and July 2006 through January 2007 at Cook Nuclear Plant Unit 2.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Total
2005-2006	3,526	5,371	1,352	20,955	38,454	201,669	41,155	312,482
2006-2007	1,056	16,561	21,325	6,357	166,050	28,644	69,159	309,152
% Difference	-70	208	1,477	-70	331	-86	68	-1

An estimated 7,091 kg of fish were impinged at Unit 2 from February 2006 through January 2007 (Figure 3-8; Appendix Table K). Impingement of biomass was greatest in December 2006 when 2,140 kg were impinged. Yellow perch (3,532 kg; 50%), lake whitefish (966 kg; 14%) and longnose sucker (499 kg; 7%) contributed most to the total biomass impingement.

3.3 NEARFIELD SAMPLING

Sampling of the ichthyoplankton, pelagic fish and demersal fish communities was conducted from June through November in 2005 and April through November in 2006 in the nearfield area of the Cook Nuclear Plant intakes to characterize these communities at various depths and locations.

3.3.1 Ichthyoplankton Sampling

Ichthyoplankton sampling in 2005 was conducted June-November and in 2006 from April through November. In June 2005, daytime sampling only was done at the intake and experimental stations and the shoreline station was not sampled. All stations were sampled starting in July 2005. In general, ichthyoplankton densities were higher at the shoreline station each sampling year (Figure 3-9).

3.3.1.1 Shoreline Station

The shoreline station was characterized by higher densities of post yolk-sac larvae compared to other life stages (Table 3-29), and the majority of these were alewife and Cyprinidae (Appendix

Table 3-29. Mean Density (No./100 m^3) of Ichthyoplankton Collected at the Shoreline Station in the Vicinity of Cook Nuclear Plant July through November 2005, and April through November 2006.

Shoreline

		April	May	June	July	August	September	October	November	Average
		Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3
2005	Unidentified				0	0	0	0	0	**0**
	Egg				0	0	0	0	0	**0**
	Yolk-sac larvae				0.995	0	0	0	0	**0.199**
	Post-yolk-sac larvae				15.913	0	0	0	0	**3.183**
	Total				**16.908**	**0**	**0**	**0**	**0**	**3.382**
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	6.881	0	0	0	0	0	**0.86**
	Yolk-sac larvae	2.219	0	25.147	2.363	0	0	0	0	**3.716**
	Post-yolk-sac larvae	0	0.685	18.547	32.303	0.631	0	0	0	**6.521**
	Total	**2.219**	**0.685**	**50.575**	**34.666**	**0.631**	**0**	**0**	**0**	**11.097**

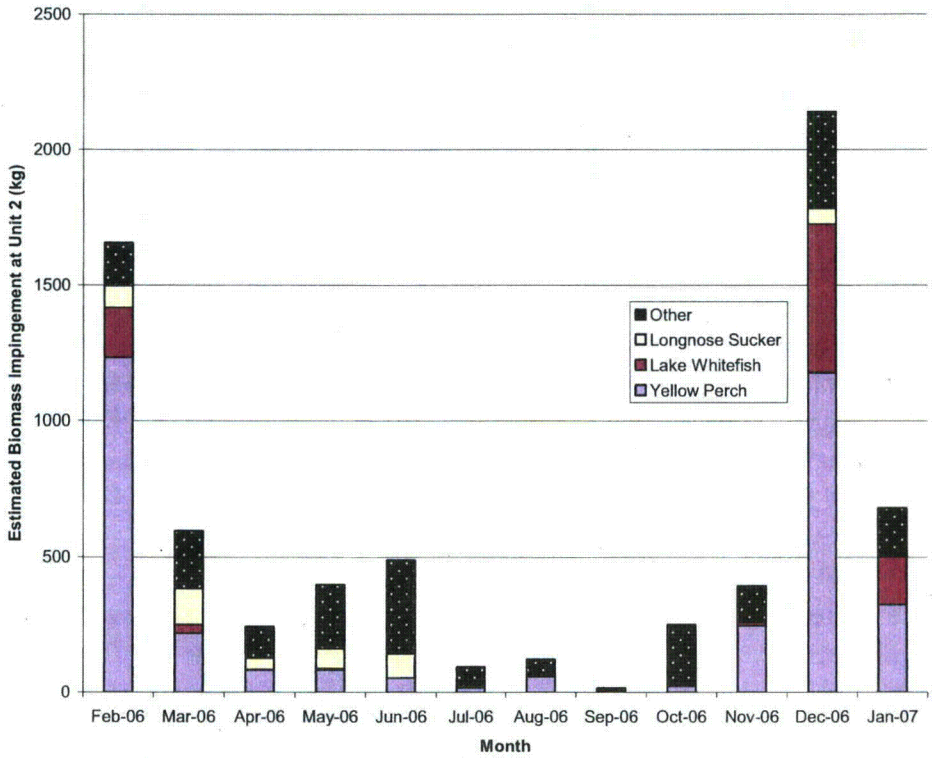

Figure 3-8. Estimated biomass (kg) of fish impinged and biomass composition by month at Unit 2 of Cook Nuclear Plant February 2006 through January 2007.

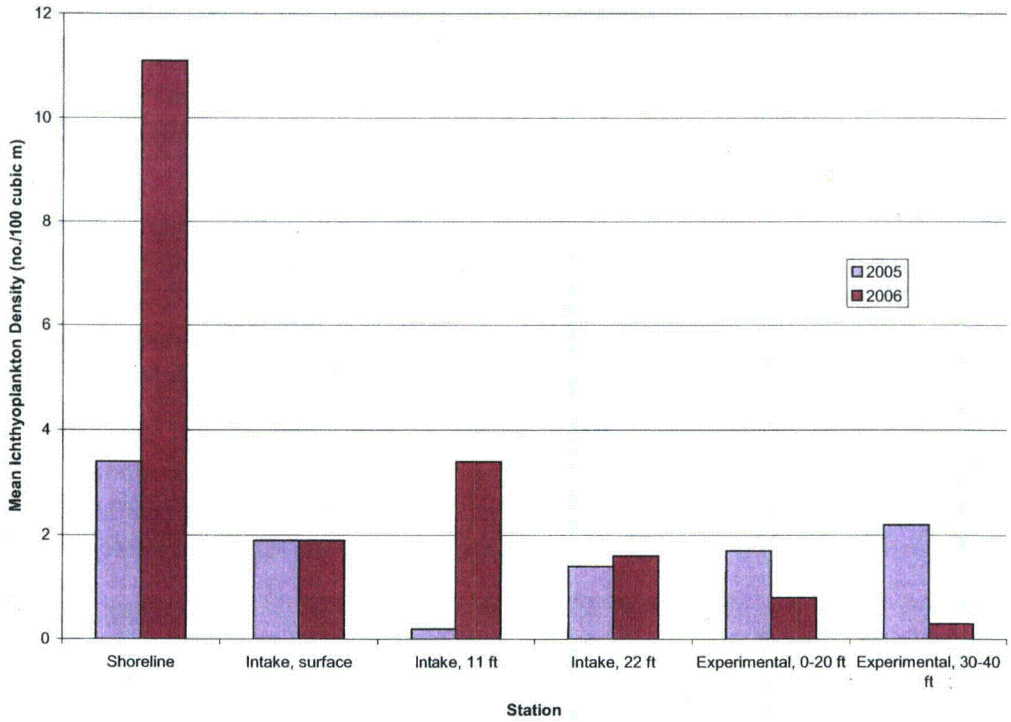

Figure 3-9. Mean Ichthyoplankton Density (No./100 m^3) at the Ichthyoplankton Sampling Stations in the Nearfield Area, April through November 2005 and 2006, off Cook Nuclear Plant.

Table L). The shoreline station was the only location where fish eggs were captured and these were exclusively alewife.

In 2005 at the shoreline station, ichthyoplankton was only captured in July (Table 3-29). The mean density was 16.9/100m^3, most of which was composed of post-yolk-sac larvae (15.9/100 m^3). The most commonly captured species were alewives (80%) with Cyprinidae and common carp making up the remainder (Appendix Table L).

In 2006, at the shoreline station highest catches occurred in June and July (Table 3-29). The mean density in June was 50.6/100 m^3, made up of yolk-sac larvae (25.1/100 m^3), post-yolk-sac larvae (18.5/100 m^3), and eggs (6.9/100 m^3). The larvae were almost entirely Cyprinidae (99%), while alewife made up the entire egg component (Appendix Table L). In July the mean density was 34.7/100 m^3, and consisted of mainly of post-yolk-sac larvae (32.3/100 m3), of which 90% were alewife (Appendix Table L). Yolk-sac larvae (2.4/100 m$^{3)}$ made up smaller component of the total and 64% of these were Cyprinidae (Appendix Table L).

3.3.1.2 Intake Station

The intake station was characterized by relatively equal densities of yolk-sac and post yolk-sac larvae. Ichthyoplankton densities were lower than the shoreline station and were relatively similar among sampling depths (Figure 3-9). Alewife larvae were the dominant species.

Sampling was conducted in 22 ft of water at the intake station during the day in June 2005 and day and night from July through November 2005 and April through November 2006. During each sampling event samples were collected at the surface, at mid-depth (11 ft) and near the bottom (22 ft).

Among the surface samples ichthyoplankton density was highest in June 2005 (9.2/100 m^3) and these were entirely of post-yolk-sac alewife larvae (Table 3-30; Appendix Table L). July was the only other month in 2005 were ichthyoplankton was captured (2.0/100 m^3) and these were post yolk-sac alewife larvae (Appendix Table L).

In 2006, the highest density of ichthyoplankton among the surface samples occurred in June (7.3/100 m^3; Table 3-30). Yolk-sac larvae were dominant, and these were alewife (45%) and yellow perch (37%) of the total density (Appendix Table L). Post yolk-sac Cyprinidae and yellow perch larvae were also present. Ichthyoplankton also occurred in July (6.9/100 m^3) and April (0.9/100 m^3). In July, post yolk-sac alewife larvae were dominant (66%) and in April post yolk-sac round whitefish (100%) were dominant (Appendix Table L).

Ichthyoplankton were present in the mid-depth samples at the intake station in July 2005, and June and July 2006. In July 2005, mean density was 2.0/100 m^3 (Table 3-30) and these were post yolk-sac larvae alewife (50%) and yolk-sac larvae Cyprinidae (50%) (Appendix Table L).

In 2006, ichthyoplankton density among the mid-depth samples was highest in July at 24.3/100 m^3 (Table 3-30). Post yolk-sac alewife larvae alewife (53%) and post yolk-sac round goby larvae were dominant (22%) (Appendix Table L). In June 2006, mean density was 3.2/100 m^3. Yolk-sac alewife larvae (72%) and post yolk-sac Cyprinidae larvae (28%) occurred (Appendix Table L).

Table 3-30. Mean Density (No./100 m³) of Ichthyoplankton Collected at the Surface, Mid-depth (11 ft) and Bottom (22 ft) of the Intake Station in the Vicinity of Cook Nuclear Plant June through November 2005, and April through November 2006.

Intake, surface

		April	May	June	July	August	September	October	November	Total
		Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³
2005	Unidentified			0	0	0	0	0	0	**0**
	Egg			0	0	0	0	0	0	**0**
	Yolk-sac larvae			0	0	0	0	0	0	**0**
	Post-yolk-sac larvae			9.214	1.995	0	0	0	0	**1.868**
	Total			**9.214**	**1.995**	**0**	**0**	**0**	**0**	**1.868**
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	0	0	0	0	0	0	**0**
	Yolk-sac larvae	0	0	5.94	2.307	0	0	0	0	**1.031**
	Post-yolk-sac larvae	0.935	0	1.32	4.615	0	0	0	0	**0.859**
	Total	**0.935**	**0**	**7.26**	**6.922**	**0**	**0**	**0**	**0**	**1.89**

Intake, 11 ft

		April	May	June	July	August	September	October	November	Total
		Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³
2005	Unidentified			0	0	0	0	0	0	**0**
	Egg			0	0	0	0	0	0	**0**
	Yolk-sac larvae			0	0.541	0	0	0	0	**0.09**
	Post-yolk-sac larvae			0	0.541	0	0	0	0	**0.09**
	Total			**0**	**1.081**	**0**	**0**	**0**	**0**	**0.18**
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	0	0	0	0	0	0	**0**
	Yolk-sac larvae	0	0	2.284	5.098	0	0	0	0	**0.923**
	Post-yolk-sac larvae	0	0	0.901	19.172	0	0	0	0	**2.509**
	Total	**0**	**0**	**3.185**	**24.27**	**0**	**0**	**0**	**0**	**3.432**

Intake, 22 ft

		April	May	June	July	August	September	October	November	Total
		Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³	Density/100 m³
2005	Unidentified			0	0	0	0	0	0	**0**
	Egg			0	0	0	0	0	0	**0**
	Yolk-sac larvae			0	0.953	0	0	0	0	**0.159**
	Post-yolk-sac larvae			0	7.654	0	0	0	0	**1.276**
	Total			**0**	**8.607**	**0**	**0**	**0**	**0**	**1.434**
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	0	0	0	0	0	0	**0**
	Yolk-sac larvae	0	0	1.642	2.008	0	0	0	0	**0.456**
	Post-yolk-sac larvae	0	0	0	8.944	0	0	0	0	**1.118**
	Total	**0**	**0**	**1.642**	**10.952**	**0**	**0**	**0**	**0**	**1.574**

In 2006, ichthyoplankton were present in the bottom samples of the intake station in June (1.6/100 m^3) and July (11.0/100 m^3). In June, the catch was made up entirely of yolk-sac alewife larvae. In July, post yolk-sac round goby larvae (64%) were dominant (Appendix Table L).

3.3.1.3 Experimental Station

Density of all ichthyoplankton was lower at the experimental station compared to the other stations (Figure 3-9) and post yolk-sac larvae was the dominant lifestage at this station. Alewife and yellow perch larvae were the dominant species at the experimental station.

Sampling was conducted in 40 ft of water at the experimental station from June through November 2005 and April through November 2006. This station was sampled during the day in June 2005 and day and night starting in July 2005. Two composite samples were collected: one containing ichthyoplankton collected from the surface, 10 ft, and 20 ft of depth; and the second from 30 and 40 ft of depth.

Ichthyoplankton were present from the surface to 20 ft in June and July of 2005 and 2006 (Table 3-31). Mean density in June 2005 was (5.7/100 m^3) and post yolk-sac yellow perch (44%) and alewife (33%) were dominant (Appendix Table L). In July of 2005 mean density was 4.5/100 m^3 post yolk-sac alewife (92%) were dominant.

In 2006, mean density at the surface to 20 ft was highest in July (5.9/100 m^3) and ichthyoplankton were also present in June with a mean density of 0.2/100 m^3. Post yolk-sac alewife larvae were dominant in July (56%) and yolk-sac alewife larvae and post yolk-sac round goby larvae were also present (Appendix Table L). In June, only post yolk-sac yellow perch larvae were present.

At the 40 ft depth of the experimental station, ichthyoplankton occurred in June (7.3/100 m^3) and July (5.4/100 m^3) of 2005 and July of 2006 (2.8/100 m^3) (Table 3-30). The June 2005 samples consisted primarily (56%) of post yolk-sac yellow perch larvae (Appendix Table L). The July samples were exclusively post-yolk-sac yellow perch larvae. In July 2006, there were equal densities of yolk sac and post yolk-sac alewife larvae and post yolk-sac round goby larvae (Appendix L).

3.3.1.4 Quantitative Comparisons among Ichthyoplankton Stations

Analysis of variance on ichthyoplankton densities was performed to determine if there were significant differences in density among the shoreline, intake, and experimental stations. Sources of variation were sampling station, month and the interaction of these main effects (Table 3-32). The interaction term was significant indicating that the relationship in ichthyoplankton density between station and month was not consistent. Among the 24 station and month combinations, ichthyoplankton density was significantly higher at the shoreline station in June, followed by the shoreline station in July, and the intake station in July of 2006. Ichthyoplankton density at these three station-month combinations was significantly different from each other, and higher than the remaining 21 station-month combinations. There were no significant differences among the remaining 21 station-month combination. This analysis indicates that during the months of high ichthyoplankton abundance density is highest in the shallower waters.

Table 3-31. Mean Density (No./100 m^3) of Ichthyoplankton Collected at the Surface to Mid-depth (0-20 ft) and Bottom (30-40 ft) of the Experimental Station in the Vicinity of Cook Nuclear Plant June through November 2005, and April through November 2006.

Experimental, 0-20 ft

		April	May	June	July	August	September	October	November	Total
		Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3
2005	Unidentified			0	0	0	0	0	0	**0**
	Egg			0	0	0	0	0	0	**0**
	Yolk-sac larvae			1.265	0.328	0	0	0	0	**0.266**
	Post-yolk-sac larvae			4.427	4.221	0	0	0	0	**1.441**
	Total			5.692	4.549	0	0	0	0	1.707
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	0	0	0	0	0	0	**0**
	Yolk-sac larvae	0	0	0	2.375	0	0	0	0	**0.297**
	Post-yolk-sac larvae	0	0	0.241	3.562	0	0	0	0	**0.475**
	Total	**0**	**0**	**0.241**	**5.937**	**0**	**0**	**0**	**0**	**0.772**

Experimental, 30-40 ft

		April	May	June	July	August	September	October	November	Total
		Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3	Density/100 m^3
2005	Unidentified			1.622	0	0	0	0	0	**0.27**
	Egg			0	0	0	0	0	0	**0**
	Yolk-sac larvae			1.622	0	0	0	0	0	**0.27**
	Post-yolk-sac larvae			4.055	5.398	0	0	0	0	**1.575**
	Total			**7.298**	**5.398**	**0**	**0**	**0**	**0**	**2.116**
2006	Unidentified	0	0	0	0	0	0	0	0	**0**
	Egg	0	0	0	0	0	0	0	0	**0**
	Yolk-sac larvae	0	0	0	0.925	0	0	0	0	**0.116**
	Post-yolk-sac larvae	0	0	0	1.85	0	0	0	0	**0.231**
	Total	**0**	**0**	**0**	**2.775**	**0**	**0**	**0**	**0**	**0.347**

Table 3-32. Results of Analysis of Variance of Ichthyoplankton Densities in the Nearfield Area at Cook Nuclear Plant.

Species	Source of Variation	Df	MS	Pr>F
All Species	Station	2	526.12	<0.001
	Month	7	458.22	<0.001
	Station X Month	14	232.52	<0.001
	Error	32	10.57	

3.3.2 Gill Net Sampling

Gill net sampling was conducted June through November in 2005 and April through November in 2006. Sampling occurred only in the day in June 2005 and day and night after that. Sampling was conducted at the intake station in 22 ft of water and at the experimental station in 40 ft of water. Gill nets were set at mid-depth at each station. CPUE was higher at the intake station than the experimental station in both years (Figure 3-10). Yellow perch and spottail shiner were the dominant fish at both stations each year (Appendix Table M).

3.3.2.1 Intake Station

In 2005 at the intake station, CPUE (fish /hour) was greatest during June (8.2 fish/hr), July (4.3 fish/hr), and September (3.7 fish/hr) (Table 3-32). In each June and September yellow perch were the dominant fish (June: 57%; September: 63%). In July, spottail shiner (50%) was the dominant fish. For all months sampled in 2005 yellow perch (43%) and spottail shiner (40%) made the greatest contribution to the overall CPUE. White sucker, rainbow smelt, lake trout, and freshwater drum each accounted for 3% of the total CPUE at the intake station in 2005.

In 2006 at the intake station, the CPUE was greatest during the months of October (3.4 fish/hour), July (1.1 fish/hour), and June (1.1 fish/hour) (Table 3-33). The most common species in October and July were spottail shiner (October: 38%; July: 55%). In June, longnose sucker were most common (55%). Two lake sturgeon, a state threatened species in Michigan, were captured during the month of August but did not make up a large percentage of the total CPUE in 2006. Spottail shiner (40%) and yellow perch (24%) were the dominant fish at the intake station in 2006.

3.3.2.2 Experimental Station

In 2005 at the experimental station, CPUE was highest in the months of July (4.4 fish/hr), October (1.2 fish/hr), and August (1.1 fish/hr) (Table 3-33). The majority of the catch in July were yellow perch (57%) and spottail shiner (34%), while the largest component of the October catch were alewife (75%) and the August catch were mostly yellow perch (45%) and rainbow smelt (36%). Yellow perch (42%) and spottail shiner (25%) were the dominant fish at the intake station in 2005.

In 2006 at the experimental station, CPUE was highest during the months of July (1.3 fish/hour), October (0.9 fish/hour), and August (0.8 fish/hour) (Table 3-33). Spottail shiner (53%), yellow perch (15%), and white sucker (15%) were major components of the July catch. In October, yellow perch (56%) and freshwater drum (33%) made up the majority of the catch while the most common species in August were spottail shiner (56%) and yellow perch (44%). Spottail shiner (40%) and yellow perch (40%) were the dominant species at the experimental station in 2006.

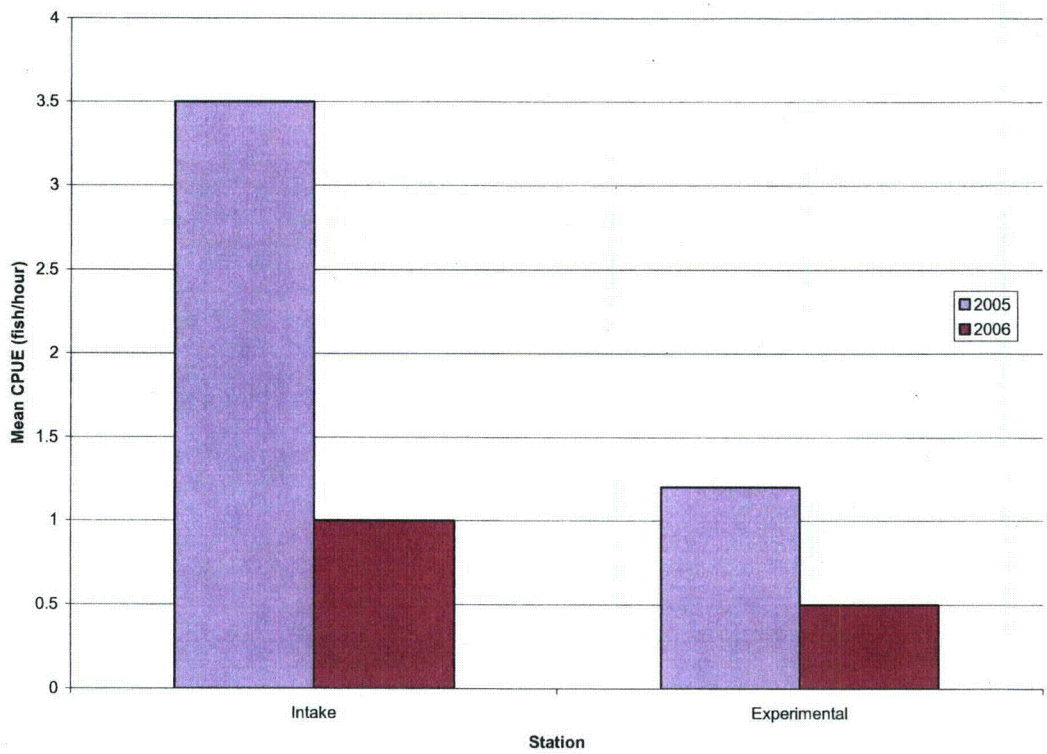

Figure 3-10. Mean Catch per Unit Effort (fish/hour) at the Gill Net Sampling Stations in the Nearfield Area, April through November 2005 and 2006, off Cook Nuclear Plant.

3.3.2.3 Quantitative Comparisons among Gill Net Stations

Analysis of variance on gill net CPUE was performed to determine if there were significant differences in CPUE between the intake and experimental stations. Sources of variation were month and sampling station and the interaction of these main effects. The overall ANOVA model was not significant, but it did explain 43% of the variability in CPUE. Although the main effects were not significant, overall CPUE (pooled across stations) was highest in October (2.14 fish/hour) followed by July (1.20 fish/hour) and August (0.67 fish/hour). Similarly overall CPUE (pooled across months) was higher at the intake station (0.99 fish/hour) compared to the experimental station 0.51 (fish/hour).

3.3.3 Otter Trawl Sampling

Otter trawl sampling was conducted at the intake station (22 ft of water) and experimental stations (40 ft of water) June through November in 2005 and April through November in 2006. Sampling at the intake and experimental stations occurred only in the day in June 2005 and day and night after that. Sampling at a shoreline station (5 ft of water) started in October 2005 and was conducted day and night each sampling month after that. CPUE was highest at the intake station followed by the experimental and shoreline station (Figure 3-11). Yellow perch and round goby were the most common fish captured (Appendix Table N).

3.3.3.1 Shoreline Station

During the two months of sampling at the shoreline station in 2005, fish were only captured during the month of October (Table 3-34). Mean CPUE was 12 fish/tow with the main catch

Table 3-33. Mean Catch per Unit Effort (fish/hour) for Fish Captured in the Gill Net at the Intake Station (22 ft) and Experimental Station (40 ft) in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.

Intake Station

		April	May	June	July	August	September	October	November	Total
		CPUE	CPUE	CPUE	CPUE	CPUE	CPUE	CPUE	CPUE	CPUE
2005	Alewife			0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bloater			0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Channel catfish			0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Common carp			0.00	0.00	0.00	0.12	0.12	0.00	0.04
	Freshwater drum			0.00	0.00	0.00	0.12	0.37	0.00	0.08
	Gizzard shad			0.00	0.00	0.00	0.24	0.00	0.00	0.04
	Golden redhorse			0.00	0.00	0.00	0.00	0.00	0.12	0.02
	Lake sturgeon			0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lake trout			0.00	0.00	0.36	0.00	0.00	0.00	0.06
	Lake whitefish			0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Longnose sucker			0.12	0.00	0.00	0.00	0.00	0.00	0.02
	Rainbow smelt			0.00	0.00	0.59	0.00	0.00	0.23	0.14
	Round goby			0.00	0.00	0.00	0.00	0.00	0.24	0.04
	Spottail shiner			2.88	2.17	0.47	0.86	0.49	1.30	1.36
	Walleye			0.00	0.12	0.12	0.00	0.00	0.00	0.04
	White sucker			0.56	0.00	0.12	0.00	0.00	0.00	0.11
	Yellow perch			4.67	2.05	0.24	2.33	0.00	0.00	1.55
	Total			8.23	4.34	1.89	3.67	0.98	1.91	3.50
2006	Alewife	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.02
	Bloater	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.13	0.03
	Channel catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.03
	Common carp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00	0.00	0.12	0.40	0.00	0.06
	Gizzard shad	0.11	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.05
	Golden redhorse	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.03
	Lake trout	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.12	0.03
	Lake whitefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.02
	Longnose sucker	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.08
	Rainbow smelt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.01
	Spottail shiner	0.11	0.25	0.36	0.58	0.00	0.36	1.32	0.12	0.39
	Walleye	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.02
	White sucker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.36	0.12	0.36	1.06	0.00	0.24
	Total	0.23	0.25	1.09	1.10	0.50	0.84	3.42	0.50	0.99

(continued)

Table 3-33. (Continued)

Experimental Station

		April CPUE	May CPUE	June CPUE	July CPUE	August CPUE	September CPUE	October CPUE	November CPUE	Total CPUE
2005	Alewife			0.00	0.00	0.00	0.00	0.87	0.00	**0.14**
	Bloater			0.00	0.00	0.12	0.00	0.25	0.00	**0.06**
	Channel catfish			0.00	0.25	0.00	0.00	0.00	0.00	**0.04**
	Common carp			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Freshwater drum			0.00	0.00	0.00	0.00	0.12	0.00	**0.02**
	Gizzard shad			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Golden redhorse			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Lake sturgeon			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Lake trout			0.24	0.00	0.12	0.00	0.00	0.00	**0.06**
	Lake whitefish			0.12	0.00	0.00	0.00	0.00	0.00	**0.02**
	Longnose sucker			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Rainbow smelt			0.00	0.00	0.38	0.00	0.00	0.00	**0.06**
	Round goby			0.00	0.13	0.00	0.00	0.00	0.00	**0.02**
	Spottail shiner			0.00	1.50	0.00	0.00	0.00	0.25	**0.29**
	Walleye			0.00	0.00	0.00	0.00	0.00	0.12	**0.02**
	White sucker			0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Yellow perch			0.00	2.50	0.50	0.00	0.00	0.00	**0.50**
	Total			**0.37**	**4.38**	**1.11**	**0.00**	**1.24**	**0.37**	**1.24**
2006	Alewife	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	**0.01**
	Bloater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	**0.02**
	Channel catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Common carp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Freshwater drum	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	**0.03**
	Gizzard shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Golden redhorse	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Lake sturgeon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Lake trout	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**
	Lake whitefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	**0.02**
	Longnose sucker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	**0.02**
	Rainbow smelt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Round goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Spottail shiner	0.00	0.00	0.00	0.71	0.47	0.12	0.13	0.12	**0.19**
	Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	**0.02**
	White sucker	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	**0.03**
	Yellow perch	0.00	0.00	0.00	0.24	0.38	0.12	0.50	0.12	**0.17**
	Total	**0.11**	**0.00**	**0.00**	**1.30**	**0.84**	**0.24**	**0.88**	**0.72**	**0.51**

Table 3-34. Mean Catch per Unit Effort (fish/trawl) for Fish Captured in the Otter Trawl at the Shoreline Station (5 ft) Intake Station (22 ft) and Experimental Station (40 ft) in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.

5 ft depth		April	May	June	July	August	September	October	November	Total
2005	Alewife							0.5	0.0	**0.3**
	Bloater							1.5	0.0	**0.8**
	Gizzard shad							8.5	0.0	**4.3**
	Lake whitefish							0.0	0.0	**0.0**
	Rainbow smelt							0.0	0.0	**0.0**
	Round goby							0.0	0.0	**0.0**
	Slimy sculpin							0.0	0.0	**0.0**
	Spottail shiner							0.5	0.0	**0.3**
	White sucker							0.0	0.0	**0.0**
	Yellow perch							1.0	0.0	**0.5**
	Total							12.0	0.0	**6.0**
2006	Alewife	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Round goby	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Spottail shiner	0.5	2.5	0.0	0.0	0.5	0.0	0.5	0.5	**0.6**
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Yellow perch	0.5	1.0	1.0	25.0	0.0	0.0	0.0	0.5	**3.5**
	Total	**1.0**	**4.0**	**1.0**	**25.0**	**0.5**	**0.0**	**0.5**	**1.0**	**4.1**

Table 3-34. (Continued)

Intake		April	May	June	July	August	September	October	November	Total
2005	Alewife			2.0	0.0	1.5	0.0	0.5	0.0	**0.7**
	Bloater			0.0	0.0	0.0	0.0	1.5	0.0	**0.3**
	Gizzard shad			0.0	0.0	0.0	0.0	1.5	0.0	**0.3**
	Lake whitefish			0.5	0.0	0.0	0.5	0.0	0.0	**0.2**
	Rainbow smelt			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Round goby			2.0	0.0	0.0	0.0	0.0	0.0	**0.3**
	Slimy sculpin			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Spottail shiner			8.5	0.5	2.0	0.0	1.0	0.5	**2.1**
	White sucker			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Yellow perch			5.0	0.0	0.5	49.5	5.5	2.0	**10.4**
	Total			18.0	0.5	4.0	50.0	10.0	2.5	**14.2**
2006	Alewife	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	**0.2**
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Round goby	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	**0.1**
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Spottail shiner	0.0	0.5	1.5	1.0	0.0	0.0	0.0	0.5	**0.4**
	White sucker	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	**0.1**
	Yellow perch	1.5	7.0	33.5	56.0	1.0	0.5	0.5	0.5	**12.6**
	Total	**1.5**	**8.0**	**35.5**	**59.0**	**1.0**	**0.5**	**0.5**	**1.0**	**13.4**

Table 3-34. (Continued)

40 ft depth		April	May	June	July	August	September	October	November	Total
2005	Alewife			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Bloater			0.0	0.0	0.0	0.0	4.5	0.0	**0.8**
	Gizzard shad			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Lake whitefish			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Rainbow smelt			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Round goby			0.0	0.0	2.0	2.0	0.5	0.0	**0.8**
	Slimy sculpin			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Spottail shiner			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	White sucker			0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Yellow perch			1.0	1.0	0.0	0.0	11.0	0.0	**2.2**
	Total			1.0	1.0	2.0	2.0	16.0	0.0	**3.7**
2006	Alewife	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	**0.3**
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Lake whitefish	0.0	2.0	1.0	2.5	0.0	0.0	0.0	0.0	**0.7**
	Rainbow smelt	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
	Round goby	1.0	2.5	4.5	8.0	1.5	0.5	0.0	0.0	**2.3**
	Slimy sculpin	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
	Spottail shiner	1.0	0.5	0.5	2.0	0.0	0.0	0.0	4.0	**1.0**
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Yellow perch	2.5	5.0	0.5	2.0	0.5	1.0	0.5	2.5	**1.8**
	Total	**5.5**	**11**	**6.5**	**17**	**2**	**1.5**	**0.5**	**6.5**	**6.3**

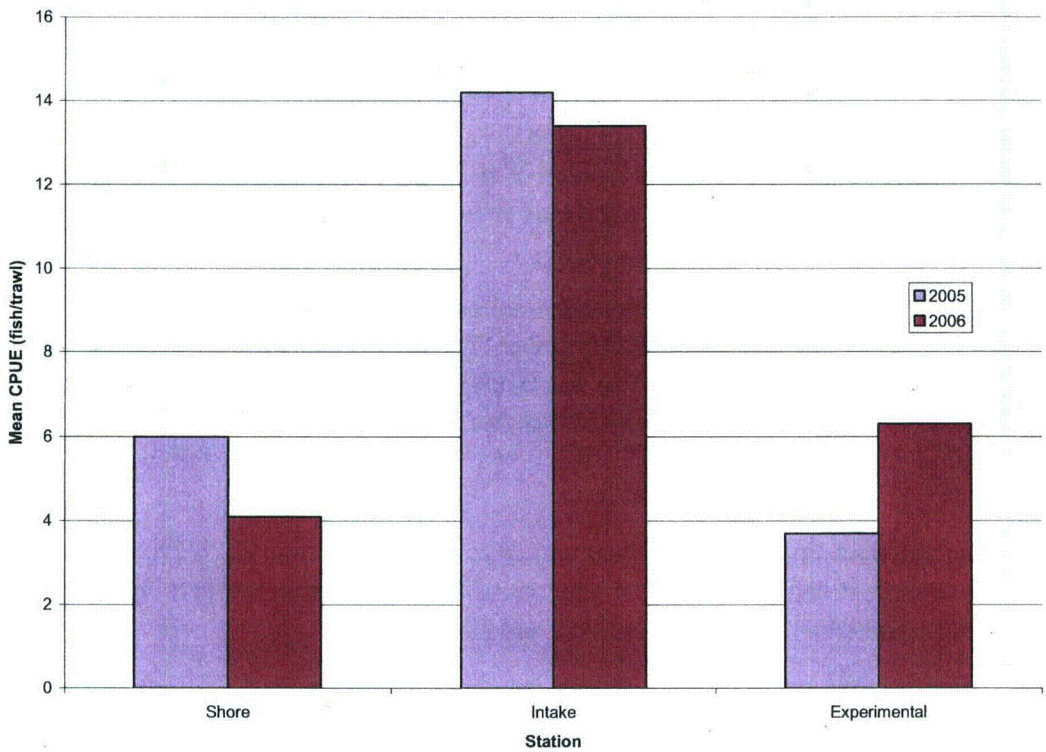

Figure 3-11. Mean Catch per Unit Effort (fish/trawl) at the Trawl Sampling Stations in the Nearfield Area, April through November 2005 and 2006, off Cook Nuclear Plant.

Sampling in 2006 took place from April-November. At the shoreline station the highest mean CPUE occurred during July (25 fish/trawl), made up entirely of yellow perch (Table 3-33). The next highest CPUE occurred in May (4 fish/trawl) with spottail shiner (63%), yellow perch (25%), and round goby (13%) the only species caught.

Yellow perch were the dominant fish at this station accounting for 85% of the total CPUE. A smaller component of the catch was made up of spottail shiner and round goby.

3.3.3.2 Intake Station

In 2005 at the intake station, the highest mean CPUE occurred during the months of September (50.0 fish/trawl), June (18.0 fish/trawl), and October (10 fish/trawl) (Table 3-34). Yellow perch were dominant in September catch (98%) as well as the October catch (55%). The June catch contained mostly spottail shiners (47%) and yellow perch (28%). Yellow perch were the dominant fish at the intake station in 2005, making up 73% of the total CPUE. Spottail shiners were the second most common catch at 15% of the total. Other species contributing to the total CPUE were: alewives (5%), bloaters (2%), gizzard shad (2%), round goby (2%), and lake whitefish (1%).

In 2006, mean CPUE at the intake station was highest during July (59.0 fish/trawl), June (35.5 fish/trawl), and May (8 fish/trawl) (Table 3-33). Yellow perch was the largest component of the catch in each month (July: 95%; June: 94%: May: 88%).

Yellow perch were also the largest contributor to the overall mean CPUE in 2006, accounting for 94% of the total. Spottail shiner (3%), alewives (1%), round goby (1%), and white sucker (1%) also made up smaller components of the total catch.

3.3.3.3 Experimental Station

In 2005, CPUE at the experimental station was greatest during October (16 fish/trawl) with the majority of the catch consisting of yellow perch (69%) and bloaters (28%) the only fish captured (Table 3-34). The next highest catch rates occurred in August (2.0 fish/trawl) and September (2.0 fish/trawl) with round goby as the only component of each monthly mean CPUE. The species composition in 2005 at the experimental station was yellow perch (58%) round goby (22%) and boater (22%)

In 2006, the highest CPUE at the experimental station was 17 fish/trawl in July, 11 fish/trawl in May, and 6.5 fish/trawl in both June and November (Table 3-33). In July, the dominant fish was round goby (47%) followed by alewife (15%) and lake whitefish (15%). The May CPUE consisted primarily of yellow perch (45%), round goby (23%), and lake whitefish (18%) and the June CPUE consisted of round goby (69%) and lake whitefish (15%). In November the CPUE was dominated by spottail shiner (62%) and yellow perch (38%).

Overall, all sampling months in 2006, round goby (37%), yellow perch (29%), and spottail shiners (16%) were the dominant species. A smaller component of the total CPUE at this site consisted of lake whitefish (11%), alewives (5%), and rainbow smelt.

3.3.3.4 Quantitative Comparisons among Otter Trawl Stations

Analysis of variance on otter trawl $\log_{10}$ (x+1) CPUE was performed to determine if there were significant differences in CPUE between the shoreline, intake, and experimental stations. Sources of variation were month and sampling station and the interaction of these main effects. There were significant differences among months and stations (Table 3-35). CPUE was highest in April through July and November and there were no significant differences among these months (Table 3-36). Similarly there were no significant differences in CPUE among April through June, and August through November.

When the data were $\log_{10}$ (x+1) transformed there were significant differences in CPUE among stations (Table 3-37). There were no significant differences between the experimental station and the intake station, and between the intake and shore stations.

Table 3-35. Results of Analysis of Variation of Trawl CPUE in the Nearfield Area of Cook Nuclear Plant. Data are Log_{10} (x+1) transformed.

Species	Source of Variation	Df	MS	Pr>F
All Species	Station	2	0.69	**0.0004**
	Month	7	0.91	**0.0201**
	Station X Month	14	0.13	0.6050
	Error	24	0.15	

Table 3-36. Results of Scheffe's Multiple Comparisons Test among Months for Otter Trawl CPUE (catch per trawl) in the Nearfield Area of Cook Nuclear Plant. Months marked with an x in the same row are not significantly different.

Sampling Month							
Jul-06	May-06	Jun-06	Apr-06	Nov-06	Aug-06	Oct-06	Sep 06
x	x	x	x	x			
	x	x	x	x	x	x	x

Table 3-37. Results of Scheffe's Multiple Comparisons Test among Sampling Stations for Otter Trawl CPUE (catch per trawl) in the Nearfield Area of Cook Nuclear Plant. Stations marked with an x in the same row are not significantly different.

Sampling Station		
Experimental	Intake	Shoreline
x	x	
	x	x

3.3.4 Seine Sampling

Seine sampling in 2005 occurred from August-November (Table 3-38; Appendix Table O). During that time, highest mean CPUE occurred during August (334.5 fish/haul) and October 45.8 fish/haul). The August catch was composed mostly of yellow perch (306.8 fish/haul) and spottail shiner (15.5 fish/haul) and the October catch was composed primarily of gizzard shad (30.3 fish/haul) and bloater (8.8 fish/haul).

Yellow perch were the most common fish captured species in 2005 accounting for 78% of the total CPUE (Table 3-38) with the majority being captured in August. Gizzard shad were the second most commonly captured species accounting for 10% of the total CPUE, and the majority of these were captured in October. Species making up a smaller component of the 2005 total CPUE were spottail shiner (5%), alewife (3%) and bloater (3%).

In 2006, seine sampling took place from April-November and mean CPUE was greatest during the months of June (57.5 fish/haul) and October (39.5 fish/haul) (Table 3-37; Appendix Table O). The June catch was composed mostly of spottail shiners (44.5 fish/haul) and to a lesser degree yellow perch (4.8 fish/haul). The largest component of the October catch was bloater (20.3 fish/haul) and alewife (16.0 fish/haul).

Spottail shiners made up the largest component of the seine sampling in 2006 contributing 54% to the total CPUE. Spottail shiners were captured during each month of sampling in 2006 and the largest catches occurred in June (44.5 fish/haul) and May (16 fish/haul). Alewife contributed 15% to the total CPUE catch with the largest catches in October (16.0 fish/haul) and July (3.3 fish/haul). Bloater contributed 14% to the total CPUE with the largest catches occurring in October (20.3 fish/haul).

Table 3-38. Mean Catch per Unit Effort (fish/haul) for Fish Captured in the Seine at the Shore Station in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.

Year	Species	April	May	June	July	August	September	October	November	Total
2005	Alewife					9.80	0.00	3.80	0.30	3.40
	Bloater					1.50	0.30	8.80	0.00	2.60
	Bluegill					0.00	0.00	0.30	0.00	0.10
	Brook silverside					0.00	0.00	0.00	0.00	0.00
	Chinook					0.00	0.00	0.00	0.00	0.00
	Coho					0.00	0.00	0.00	0.30	0.10
	Eastern banded killifish					0.50	0.30	0.30	0.00	0.30
	Gizzard shad					0.00	0.30	30.30	7.80	9.60
	Lake trout					0.00	0.00	0.00	0.30	0.10
	Longnose sucker					0.00	0.00	0.00	0.30	0.10
	Muskellunge					0.00	0.00	0.30	0.00	0.10
	Rainbow smelt					0.00	0.00	0.00	0.00	0.00
	Round goby					0.50	0.00	0.00	0.00	0.10
	Shorthead redhorse					0.00	0.00	0.00	0.00	0.00
	Spottail shiner					15.50	0.30	2.00	2.30	5.00
	Steelhead					0.00	0.00	0.00	0.00	0.00
	Walleye					0.00	0.00	0.00	0.00	0.00
	White sucker					0.00	0.00	0.00	0.00	0.00
	Yellow perch					306.80	0.00	0.30	0.00	76.80
	TOTAL					**334.50**	**1.00**	**45.80**	**11.00**	**98.10**
2006	Alewife	0.00	0.00	2.50	3.30	0.30	0.00	16.00	0.00	2.80
	Bloater	0.00	0.00	0.50	0.00	0.00	0.00	20.30	0.30	2.60
	Bluegill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Brook silverside	0.80	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	Chinook	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
	Coho	0.00	0.00	0.50	0.00	0.00	0.30	0.00	0.00	0.10
	Eastern banded killifish	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.10
	Gizzard shad	0.30	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.10
	Lake trout	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Muskellunge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	4.00	0.00	0.00	0.00	0.30	0.00	0.50
	Round goby	3.50	1.30	0.00	0.50	0.30	0.00	0.00	0.00	0.70
	Shorthead redhorse	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.10
	Spottail shiner	2.50	16.00	44.50	12.30	0.30	1.30	2.00	0.80	9.90
	Steelhead	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
	Walleye	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00
	White sucker	0.50	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.10
	Yellow perch	0.80	0.00	4.80	2.00	1.00	0.80	0.00	0.30	1.20
	TOTAL	**8.30**	**17.50**	**57.50**	**18.80**	**1.80**	**2.30**	**39.50**	**1.30**	**18.30**

3.4 WATER QUALITY

Water quality data (surface and bottom temperature and dissolved oxygen, and were collected with each nearshore fisheries sample. None of the water quality parameters were within ranges that would affect fish distribution, and there was not obvious association between water quality and impingement and entrainment rates.

3.4.1 Ichthyoplankton Water Quality Sampling

Water quality data was collected in association with ichthyoplankton sampling at the three sampling stations. Surface water quality was collected at the shoreline station, and also at each sampling depth at the intake (22 ft) and experimental (40 ft) stations (Appendix table P). Water temperatures were generally highest at the surface stations declining with depth, except in April 2006 where water temperatures at the intake and experimental depth were uniform throughout. The highest water temperature recorded was 27.1°C at the surface of the intake station in July 2005. The lowest temperature recorded was 6.1°C at the experimental station in April, 2006.

Dissolved Oxygen levels (mg/l) were generally greater early in the sampling season and tended to increase with depth and declining water temperatures. The highest measured levels of dissolved Oxygen occurred at the 30-40 ft depth of the experimental station (13.5 mg/l) in June, 2006. The lowest occurred at the surface-20 ft depth at the experimental station (8.0 mg/l) in July 2005. Neither water temperature nor dissolved oxygen levels were limiting to fish distribution.

3.4.2 Gill Net Water Quality Sampling

Water quality data collected in association with the gill net sampling at the intake (22 ft) and experimental (40 ft) stations (appendix Table Q). Water temperatures at both the intake and experimental stations were lowest in the April of 2006 (6.0°C) and increased to the annual high in August (22.9°C). The seasonal pattern in dissolved oxygen levels was opposite to that of temperatures with the highest dissolved oxygen levels occurring in April (12.7 mg/l) and the lowest in September (8.4 mg/l) when water temperatures were still relatively high. Neither water temperature nor dissolved oxygen levels were limiting to fish distribution.

3.4.3 Otter Trawl Water Quality Sampling

Water quality data were collected in association with the otter trawl sampling at the three stations. Surface water quality data were collected at the 5 ft station, and surface and bottom data were collected at the Intake (22 ft) and Experimental (40 ft) stations (Appendix Table Q). In general, water temperatures were most extreme at the surface. The warmest water temperature recorded was 27.1 °C at the surface at the intake station and the coldest temperature of 6.1 °C occurred at the experimental station at the surface. The lowest levels of dissolved oxygen (8.6 mg/l) occurred in September at the surface of the intake station and at the surface and bottom of the experimental station in September. The highest level of dissolved oxygen occurred at the surface of the experimental station in April when water temperatures were relatively cool. Neither water temperature nor dissolved oxygen levels were limiting to fish distribution.

3.4.4 Seine Water Quality Sampling

Water Quality data was collected in association with the seine sampling at the surface (Appendix Table Q). Water temperatures ranged from 25.0 °C in September 2005 to 8.5 °C in April 2006. Dissolved oxygen ranged form 8.8 mg/l in September 2005 to 12.5 mg/l in April 2006. Both water temperature and dissolved oxygen were within limits that would not affect fish distribution.

3.5 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) RESULTS

A comprehensive Quality Assurance and Quality Control (QA/QC) program (see Section 2.5) was instituted during this study. Audits of field procedures were conducted twice during the program. The first audit was conducted in September 2005 by AEP personnel and resulted in the start of otter trawl sampling at the shoreline station in October 2005. The second audit occurred in January 2007 and confirmed that all field sampling procedures were in conformance with the SOP.

The laboratory analysis of entrainment and ichthyoplankton samples was subject to a MIL-STD 1235B single and multiple level continuous sampling procedures and tables for inspection by attributes for the tasks of sorting and identification that resulted in an AOQL of 10% or better. In this plan, eight samples in a row for each analyst were reinspected and if all eight samples passed QC, then 1 out 7 samples would be randomly selected for reinspection. Any samples that failed QC were reanalyzed. A total of 72 samples were reinspected for sorting with one failure, and 27 samples were reinspected for identification with no failures.

All data files were also subject QC reinspection that resulted in data sets with an AOQL of 1% or better. Lot sampling plans based on the number of records in the data file (American Society for Quality Control 1993) were used to determine the number of data records for reinspection, and the number of incorrect data records that would result in a failed data file. Each randomly selected data record was then verified against original field or lab data sheets. If a data file failed QC it was either subject to 100% inspection if the failure was due to random error, or recreated if the failure was due to a systematic error. All data files passed QC on the first audit.

4.0 DISCUSSION

The University of Michigan conducted extensive investigations into the impact of the operation of Cook Nuclear Plant on southeastern nearshore Lake Michigan (UM 1986). The impingement and entrainment studies conducted by UM from 1978 to 1982 when both units were operational provide the best available data for comparison with the present study. However, there were important differences in the methodology and taxonomy between the two studies. The UM study did not attempt to identify fish eggs to the species level, although it is likely that the majority were alewife. Similarly, in the present study we did not make major effort to distinguish among minnow (Cyprinidae) larvae, although the majority were probably spottail shiner. Furthermore, the UM entrainment study did not identify any specimens as either YOY or older lifestages although they probably were present. In the UM study entrainment estimates were based on the annual number of fish eggs and larvae entrained and actual cooling water flow, which ranged from 1,138 million m^3 in 1977 to 2,830 m^3 in 1980. The present study assumed that cooling water system was in full operation all year and annual cooling water flow was 3,322 m^3 per year. Despite these differences between the studies, valid comparisons between the time periods can be made.

Fish eggs were much more abundant in 1978 through 1982 than in the present study (Table 4-1). Alewife are one of the few species that have pelagic eggs in Lake Michigan and with the increased abundance of alewife in the 1970s and 1980s, it is likely that the majority of the eggs entrained in 1978 through 1982 were alewife. Alewife were the most abundant eggs entrained in this study, although density was much lower than the UM study probably due to the current decreased stock size of alewife.

Table 4-1. Average number of fish eggs entrained at Cook Nuclear Plant between 1978 and 1982, and in the present study.

	Annual Average Number of Eggs Entrained (in millions)	
Species	**1978-1982[a]**	**Feb. 2006-Jan. 2007[b]**
Alewife		7.08
Cyprinidae		4.42
Unidentified	3,713.85	3.78
Common carp		1.58
TOTAL	3,713.85	16.86
Eggs/10^6 m^3	1.41	0.025

[a] Entrainment estimates are based on actual cooling water flow.
[b] Entrainment estimates are based on design cooling water flow.

The average annual number of larvae entrained was relatively similar between the two studies. An average of 115 million larvae were entrained annually between 1978 and 1982, while 83 million larvae were entrained in this study (Table 4-2). However, when standardized for cooling the entrainment rates of both fish eggs and larvae indicate that entrainment is not always proportional to cooling water flow. When standardized for cooling water flow, there were orders of magnitude differences in both fish egg and larval annual entrainment rates between 1978-1982 and the present. The differences in entrainment estimates between July 2005 through January 2006, and July 2006 through January 2007 also illustrate the effect of the abundance of fish eggs and larvae in the

Table 4-2. Annual Average number of fish larvae entrained at Cook Nuclear Plant between 1975 and 1982 and in the present study.

Species	Annual Average Number of Larvae Entrained (in millions)	
	1978-1982[a]	Feb. 2006-Jan. 2007[b]
Alewife	82.01	12.38
Spottail shiner	12.01	0.00
Rainbow smelt	6.77	9.26
Yellow perch	2.36	0.30
Trout-perch	0.61	0.00
Round goby	0.00	44.04
Cyprinidae	0.46	16.87
Others	11.16	0.97
TOTAL	**115.38**	**83.82**
Larvae/10^6 m^3	0.04	0.005

[a] Entrainment estimates are based on actual cooling water flow.
[b] Entrainment estimates are based on design cooling water flow.

withdrawal waters on entrainment (Table 3-5). These data indicate that the abundance of the fish eggs and larvae in the withdrawal waters is an important factor in fish egg and larvae entrainment.

The seasonality of larval entrainment was similar between the two studies. Entrainment typically began in April and peaked in June and July when alewife and Cyprinidae larvae (both studies) and round goby larvae (present study) were most abundant.

The UM study found a significant differences in larval entrainment between diel periods. Entrainment was greater in the dusk to midnight and midnight to dawn periods than during the day (UM 1986). The present study supports that finding to some degree, although it is not possible to fully evaluate the UM findings because the ANOVA results are not presented. In the present study entrainment was greater at night, although there was a significant interaction between diel period and month which indicated that this relationship was not consistent in all months.

Table 4-3. Annual Average number of fish Impinged at Cook Nuclear Plant (Units 1 and 2) between 1975 and 1982 and in the present study.

Species	Annual Average Number of Fish Impinged	
	1978-1982[a]	Feb. 2006-Jan. 2007[b]
Alewife	926,241	82,705
Spottail shiner	91,376	87,320
Yellow perch	134,439	1,116300
Trout-perch	32,093	536
Rainbow smelt	72,439	8,990
Slimy sculpin	4,964	1,010
Round goby	0	35,180
Gizzard shad	1,444	34,374
Others	13,965	19,608
TOTAL	1,252,965	1,386,023

[a] Impingement estimates are based on actual cooling water flow.
[b] Impingement estimates are based on design cooling water flow.

The trends in annual impingement reflect the trends in annual abundance of fish in Lake Michigan. The decrease in alewife impingement can be attributed to the decline in alewife abundance in Lake Michigan since 2002 (Bunnell et al. 2007), and the operation of the acoustic fish deterrence system at Cook Nuclear Plant. The reduction in rainbow smelt abundance in impingement samples can also be attributed to a decrease in stock size since its peak in 1981-1993 (Bunnell et al. 2007). The increased impingement of yellow perch in the present study can be attributed to the record 2005 year class. Round goby were not present in Lake Michigan in 1978-1982 and are presently increasing in abundance (Bunnell et al. 2007), which accounts for their presence in impingement in the present study. Gizzard shad was first reported from Lake Michigan in 1953 (Miller 1957) and it may be more abundant now than in 1978-1982, as indicated by the large increase in gizzard shad impingement.

The temporal variability in impingement is also indicated by a comparison of impingement estimates between July 2005 through January 2006, and July 2006 through January 2007. At Unit 1 there was 63% difference in the impingement estimates for the two time periods and at Unit 2 there was only a 1% difference between the time periods (Tables 3-18 and 3-27). However, at both units the monthly estimates varied widely, and in the case of Unit 2, positive and negative variations almost cancelled each other out. These results and the comparisons with the UM studies indicate that there is a large degree of temporal variation in impingement estimates, and impingement may not be proportional to cooling water flow.

Further indications of the temporal variability in impingement is indicated by a comparison of monthly impingement and species composition between 1978-1982 and the present study. In 1978-1982, impingement was highest in April through October and was attributed to an inshore movement of fish in the spring followed by an offshore movement in the fall (UM 1986). In the present study impingement was greatest in February 2006, and November 2006 through January 2007. Yellow perch were the primary fish impinged during this period and this species was much less abundant in 1978-1982. Therefore the temporal variability in impingement is strongly influenced by the species composition in the nearfield area and the year-class strength of the dominant species.

The nearfield sampling of ichthyoplankton and fish provides a characterization of the fish community in the vicinity of Cook Nuclear Plant, and provides data for preliminary evaluation of alternate intake locations. There was general trend of decreasing density of ichthyoplankton with distance offshore, especially in 2006 when more months were sampled (Table 4-4). Alewife eggs, and post yolk-sac larvae alewife and Cyprinidae were the dominant lifestages and taxa at the nearshore station. With distance offshore, yellow perch and round goby larvae became more abundant. These data indicate that shoreline bulkhead intake might result in substantially higher entrainment levels than the present intake location.

The situation is less clear for adult fish. CPUE in the trawl was highest at the intake station (22 ft) followed by the experimental (40 ft) and shoreline (5 ft) stations (Figure 3-11). CPUE in the gill net was also highest at the intake station (Figure 3-10). It is not clear if fish abundance is actually higher at the 22-ft contour of the intake station, or if the intake structure is acting as an artificial reef and attracting fish. This section of Lake Michigan is relatively featureless, and any structure may attract fish, and possibly fish larvae. If this is the case, than an intake structure in almost any depth will likely attract fish.

Table 4-4. Mean Monthly Total Ichthyoplankton Density at Sampling Stations in the Vicinity of Cook Nuclear Plant June through November 2005 and April through November 2006

Station	Mean Monthly Total Ichthyoplankton Density (No./ 100 m^3)	
	2005 (June-November)	2006 (April through November)
Shoreline	3.382	11.097
Intake – Surface	1.868	1.890
Intake – 11 ft	0.180	3.432
Intake – 22 ft	1.434	1.574
Experimental – 0-20 ft	1.707	0.772
Experimental – 30-40 ft	2.116	0.347

The results from this study and the previous UM study illustrate the variability in impingement and entrainment at Cook Nuclear Plant. Impingement and entrainment estimates are driven by the composition of the ichthyoplankton and fish community in the withdrawal waters. Changes in the fish community of Lake Michigan such as the introduction of round goby, or the occurrence of a dominant year class of yellow perch, are reflected in the impingement and entrainment estimates.

5.0 LITERATURE CITED

AEPS Co. (American Electric Power Service Corporation) 2005. Proposal for Information Collection Prepared for the Donald C. Cook Nuclear Plant to fulfill requirements of 40 CFR Part 125.959(b)(1). Prepared by the Environmental Services Division, Water and Ecological Resources Section, 1 Riverside Plaza, Columbus OH 43215-2373.

American Society for Quality Control. 1993. Sampling procedures and tables for inspection by attributes. ANSI/ASQC Z1.4-1993.

Bimber, D. L., M. Perrone, L.S. Noguchi and D.J. Jude. (1984) Field Distribution and Entrainment of Fish Larvae and Eggs at the Donald C. Cook Nuclear Power Plant, Southeastern Lake Mighigan, 1973-1979. Special Report No. 105 of the Great Lakes Research Division, University of Michigan.

Bunnell, D.B., C.P. Madenjian, J.D. Holuszko, T.J. Desorcie, and J.V. Adams. 2007. Status and Trends of Prey Fish Populations in Lake Michigan, 2006. U.S. Geological Survey, Great Lakes Science Center, 1251 Green Road, Ann Arbor Michigan.

Miller, R.R. 1957. Origin and dispersal of the alewife, *Alosa pseudoharengus*, and the gizzard shad, *Dorosoma cepedianum*, in the Great Lakes. Transactions of the American Fisheries Society 86(1):97-111.

NAI (Normandeau Associates Inc.) 2007. Cook Nuclear Plant 2005-2006 Impingement and Entrainment Study Quality Assurance Plan. Prepared for American Electric Power Service Corporation, Environmental Services, Water and Ecological Resources Section, Columbus Ohio.

UM (University of Michigan) 1986. Southeastern Nearshore Lake Michigan: Impact of the Donald C. Cook Nuclear Plant. The University of Michigan, Great Lakes Research Division, Publication 22.

APPENDIX

Appendix Table A. **Estimated Total Number (in millions) of fish eggs, larvae, young-of-the-year and older fish Entrained by Month at Cook Nuclear Plant Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.**

		Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	4.55	27.39	0.82	0.34	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.85	2.49	1.08	0.91	0.00	0.00	0.00	0.00	7.33
	0900-1500	4.39	15.97	0.39	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.34	0.93	0.14	0.15	0.00	0.00	0.00	0.00	3.57
	1500-2100	1.40	11.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31	1.15	0.05	0.00	0.00	0.00	0.00	0.00	2.51
	2100-0300	5.12	23.95	0.55	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.07	1.66	0.21	0.85	0.00	0.00	0.00	0.00	6.79
	Total	**15.46**	**79.23**	**1.76**	**0.53**	**1.51**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.57**	**6.23**	**1.48**	**1.91**	**0.00**	**0.00**	**0.00**	**0.00**	**20.19**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**
Cyprinidae	0300-0900	0.55	2.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	5.96	4.55	0.20	0.00	0.00	0.00	0.00	0.00	12.35
	0900-1500	0.00	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.82	0.25	0.00	0.00	0.00	0.00	0.00	0.00	1.11
	1500-2100	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.19	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.65
	2100-0300	0.71	3.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	3.53	2.66	0.00	0.00	0.00	0.00	0.00	0.00	7.17
	Total	**1.26**	**8.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.96**	**10.51**	**7.61**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.29**
Rainbow smelt	0300-0900	0.00	0.00	2.03	1.20	0.37	0.00	0.00	0.65	0.51	0.00	0.00	0.00	0.00	0.00	1.74	2.46	0.00	0.00	0.00	0.00	4.70
	0900-1500	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.14
	1500-2100	0.00	0.00	0.53	0.26	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
	2100-0300	0.00	0.00	16.45	8.28	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	2.05	1.78	0.00	0.00	0.00	0.00	3.92
	Total	**0.00**	**0.00**	**19.01**	**9.74**	**1.87**	**0.00**	**0.00**	**0.65**	**0.51**	**0.00**	**0.00**	**0.00**	**0.00**	**0.09**	**3.93**	**5.24**	**0.00**	**0.00**	**0.00**	**0.00**	**9.77**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.35	0.71	4.97	0.61	0.33	0.00	0.00	0.00	0.00	7.11
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.37	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.48
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.28	9.02	22.49	3.62	1.57	0.00	0.00	0.00	0.00	37.37
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.41**	**0.49**	**0.64**	**9.73**	**27.68**	**4.23**	**1.90**	**0.00**	**0.00**	**0.00**	**0.00**	**45.11**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**
Slimy sculpin	0300-0900	1.10	2.76	1.07	0.39	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	3.55	15.27	4.84	1.65	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
	Total	**4.65**	**18.35**	**5.91**	**2.05**	**0.63**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**

(continued)

Appendix Table A. (Continued)

Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
	2100-0300	0.00	0.00	0.13	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.58	0.87
	Total	**0.00**	**0.00**	**0.13**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.12**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**	**0.58**	**1.13**
Unidentified	0300-0900	0.00	0.00	0.27	0.14	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.21
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
	1500-2100	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	3.38	0.14	0.00	0.00	0.00	0.00	0.00	0.00	3.68
	2100-0300	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
	Total	**0.00**	**0.56**	**0.27**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.08**	**0.19**	**0.24**	**3.50**	**0.19**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.21**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**
Yellow perch	0300-0900	0.00	0.15	0.00	0.40	0.13	1.60	2.42	0.13	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.11	0.00	0.00	0.00	0.00	0.28
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.37	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.15	0.46	0.00	1.09
	2100-0300	0.00	0.00	0.13	0.19	0.06	0.32	0.49	0.03	0.00	0.00	0.00	0.00	0.00	0.07	0.14	0.00	0.00	0.00	0.00	0.00	0.21
	Total	**0.00**	**0.15**	**0.13**	**0.59**	**0.20**	**1.92**	**2.91**	**0.16**	**0.04**	**0.37**	**0.00**	**0.00**	**0.30**	**0.09**	**0.36**	**0.11**	**0.00**	**0.15**	**0.46**	**0.00**	**1.88**
All species	0300-0900	6.20	32.91	4.18	2.46	2.27	1.60	2.42	0.78	0.51	0.08	0.20	1.99	9.69	12.08	3.79	3.81	0.00	0.00	0.00	0.00	32.14
	0900-1500	4.39	17.62	0.39	0.06	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.13	3.57	1.33	0.28	0.15	0.00	0.00	0.00	0.00	5.46
	1500-2100	1.40	12.79	0.53	0.26	0.24	0.00	0.00	0.00	0.08	0.75	0.12	0.60	6.32	1.51	0.12	1.00	0.00	0.15	0.46	0.00	11.11
	2100-0300	9.38	43.00	22.10	10.32	1.22	0.32	0.49	0.03	0.00	0.04	0.62	1.39	16.90	26.98	6.02	4.20	0.00	0.00	0.29	0.58	57.01
	Total	**21.37**	**106.32**	**27.20**	**13.11**	**4.21**	**1.92**	**2.91**	**0.81**	**0.59**	**0.86**	**0.95**	**4.11**	**36.47**	**41.90**	**10.20**	**9.16**	**0.00**	**0.15**	**0.75**	**0.58**	**105.72**

Appendix Table B. **Estimated Total Number (in millions) of fish eggs, Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.**

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	4.27	15.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24
	0900-1500	4.23	6.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87
	1500-2100	0.70	6.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
	2100-0300	4.69	13.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.61	0.07	0.00	0.00	0.00	0.00	0.00	0.00	3.68
	Total	**13.89**	**42.81**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.01**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.08**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**
Cyprinidae	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	1.57	0.15	0.00	0.00	0.00	0.00	0.00	0.00	2.40
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.12	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.50
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.32**	**2.88**	**0.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.42**
Rainbow smelt	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Slimy sculpin	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(continued)

Appendix Table B. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Unidenti-fied	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
	1500-2100	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	3.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.32
	2100-0300	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
	Total	**0.00**	**0.41**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.08**	**0.19**	**0.24**	**3.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.78**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Yellow perch	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
All species	0300-0900	4.27	15.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.69	2.95	0.15	0.00	0.00	0.00	0.00	0.00	0.00	3.92
	0900-1500	4.23	6.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	2.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.58
	1500-2100	0.70	7.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	5.02	0.07	0.00	0.00	0.00	0.00	0.00	0.00	5.56
	2100-0300	4.69	13.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.28	4.31	0.07	0.00	0.00	0.00	0.00	0.00	0.00	4.79
	Total	**13.89**	**43.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.08**	**0.19**	**1.56**	**14.74**	**0.29**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.86**

Appendix Table C. **Estimated Total Number (in millions) of Undetermined Larval Lifestage Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.**

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.15**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cypri-nidae	0300-0900	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26	1.66	0.20	0.00	0.00	0.00	0.00	0.00	3.13
	0900-1500	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.22
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	2100-0300	0.00	1.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.74	0.85	0.00	0.00	0.00	0.00	0.00	0.00	1.72
	Total	**0.00**	**3.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**	**2.22**	**2.59**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.15**
Rainbow smelt	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Slimy sculpin	0300-0900	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.43**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(continued)

Appendix Table C. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Unidentified	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.36
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.24**	**0.19**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.43**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Yellow perch	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
All species	0300-0900	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	1.72	0.20	0.00	0.00	0.00	0.00	0.00	3.35
	0900-1500	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.22
	1500-2100	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.43
	2100-0300	0.00	1.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.74	0.85	0.00	0.00	0.00	0.00	0.00	0.00	1.72
	Total	**0.00**	**3.81**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**	**2.60**	**2.79**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.73**

Appendix Table D. **Estimated Total Number (in millions) of Yolk-sac Larvae Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.**

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cypri-nidae	0300-0900	0.41	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	1.26	1.13	0.00	0.00	0.00	0.00	0.00	0.00	3.20
	0900-1500	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.22
	1500-2100	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	2100-0300	0.43	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	1.16	0.77	0.00	0.00	0.00	0.00	0.00	0.00	2.49
	Total	**0.84**	**3.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.37**	**2.53**	**2.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.97**
Rainbow smelt	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**
Slimy sculpin	0300-0900	0.28	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.28**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(continued)

Appendix Table D. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Unidentified	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Yellow perch	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.23**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.23**
All species	0300-0900	0.83	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	1.26	1.13	0.00	0.00	0.00	0.00	0.00	0.00	3.20
	0900-1500	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.44
	1500-2100	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	2100-0300	0.43	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.56	1.16	0.77	0.00	0.00	0.00	0.00	0.00	0.00	2.63
	Total	**1.25**	**3.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**1.37**	**2.75**	**2.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.41**

Appendix Table E. Estimated Total Number (in millions) of Post Yolk-Sac Larvae Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	0.14	11.36	0.68	0.27	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.46	2.49	0.63	0.91	0.00	0.00	0.00	0.00	5.50
	0900-1500	0.16	8.90	0.39	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.93	0.07	0.15	0.00	0.00	0.00	0.00	1.48
	1500-2100	0.70	4.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.07	0.05	0.00	0.00	0.00	0.00	0.00	2.14
	2100-0300	0.43	10.94	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.59	0.14	0.85	0.00	0.00	0.00	0.00	3.04
	Total	**1.43**	**36.13**	**1.37**	**0.33**	**1.51**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.27**	**6.09**	**0.89**	**1.91**	**0.00**	**0.00**	**0.00**	**0.00**	**12.16**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cyprinidae	0300-0900	0.14	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	1.87	1.61	0.00	0.00	0.00	0.00	0.00	0.00	3.62
	0900-1500	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.15
	1500-2100	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.28	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	1.04	0.00	0.00	0.00	0.00	0.00	0.00	1.98
	Total	**0.42**	**1.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**2.88**	**2.73**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.75**
Rainbow smelt	0300-0900	0.00	0.00	2.03	1.20	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74	2.46	0.00	0.00	0.00	0.00	4.20
	0900-1500	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.14
	1500-2100	0.00	0.00	0.53	0.26	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
	2100-0300	0.00	0.00	16.45	8.28	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	2.05	1.78	0.00	0.00	0.00	0.00	3.92
	Total	**0.00**	**0.00**	**19.01**	**9.74**	**1.87**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.09**	**3.93**	**5.24**	**0.00**	**0.00**	**0.00**	**0.00**	**9.26**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.71	4.97	0.61	0.33	0.00	0.00	0.00	0.00	6.97
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	9.02	22.49	3.48	1.57	0.00	0.00	0.00	0.00	36.84
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.64**	**9.73**	**27.68**	**4.09**	**1.90**	**0.00**	**0.00**	**0.00**	**0.00**	**44.04**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Slimy sculpin	0300-0900	0.83	2.18	0.93	0.39	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	3.55	15.12	4.84	1.46	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
	Total	**4.38**	**17.62**	**5.77**	**1.86**	**0.57**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**

(continued)

Appendix Table E. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Unidentified	0300-0900	0.00	0.00	0.27	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.27**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**
Yellow perch	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**
All species	0300-0900	1.10	13.96	3.91	2.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.49	4.04	9.07	2.98	3.70	0.00	0.00	0.00	0.00	20.28
	0900-1500	0.16	9.35	0.39	0.06	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	1.15	0.21	0.15	0.00	0.00	0.00	0.00	1.99
	1500-2100	0.70	5.08	0.53	0.26	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.15	0.05	1.00	0.00	0.00	0.00	0.00	3.22
	2100-0300	4.26	26.59	21.59	9.75	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.42	10.69	25.22	5.67	4.20	0.00	0.00	0.00	0.00	46.19
	Total	**6.23**	**54.98**	**26.42**	**12.07**	**3.95**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.91**	**16.23**	**36.59**	**8.91**	**9.05**	**0.00**	**0.00**	**0.00**	**0.00**	**71.68**

Appendix Table F. **Estimated Total Number (in millions) of Young-of-the-Year Fish Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.**

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	0.00	0.13	0.14	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.45
	0900-1500	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	Total	**0.00**	**0.28**	**0.39**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.59**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cyprinidae	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Rainbow smelt	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.53
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.49**	**0.00**	**0.00**	**0.00**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.67**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Slimy sculpin	0300-0900	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.19	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.14**	**0.19**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(continued)

Appendix Table F. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.13	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.58	0.87
	Total	**0.00**	**0.00**	**0.13**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**	**0.58**	**0.87**
Unidentified	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Yellow perch	0300-0900	0.00	0.15	0.00	0.20	0.07	1.60	2.42	0.13	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.11	0.00	0.00	0.00	0.00	0.28
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.15	0.46	0.00	0.68
	2100-0300	0.00	0.00	0.13	0.19	0.06	0.32	0.49	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.14
	Total	**0.00**	**0.15**	**0.13**	**0.39**	**0.13**	**1.92**	**2.91**	**0.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.36**	**0.11**	**0.00**	**0.15**	**0.46**	**0.00**	**1.10**
All species	0300-0900	0.00	0.28	0.27	0.27	0.07	1.60	2.42	0.13	0.00	0.04	0.10	0.00	0.00	0.02	0.60	0.11	0.00	0.00	0.00	0.00	0.87
	0900-1500	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.15	0.46	0.00	0.68
	2100-0300	0.00	0.00	0.51	0.57	0.13	0.32	0.49	0.03	0.00	0.00	0.39	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.29	0.58	1.61
	Total	**0.00**	**0.43**	**0.79**	**0.84**	**0.19**	**1.92**	**2.91**	**0.16**	**0.00**	**0.04**	**0.49**	**0.00**	**0.00**	**0.02**	**1.09**	**0.11**	**0.00**	**0.15**	**0.75**	**0.58**	**3.23**

Appendix Table G. Estimated Total Number (in millions) of Yearling and Older Fish Entrained at Cook Nuclear Plant by Month Assuming Design Cooling Water Flow, June 2005 through February 2007 (June 2005 represents the entrainment estimate only for the last week in June.

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Alewife	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**
Common carp	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cyprinidae	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Rainbow smelt	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.65**	**0.51**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.51**
Round goby	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.37**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.41**
Round whitefish	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Slimy sculpin	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(continued)

Appendix Table G. (Continued)

Species	Diel	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb.06-Jan.07
Spottail shiner	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.12**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.26**
Unidentified	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
White sucker	0300-0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Yellow perch	0300-0900	0.00	0.00	0.00	0.20	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	Total	**0.00**	**0.00**	**0.00**	**0.20**	**0.07**	**0.00**	**0.00**	**0.00**	**0.04**	**0.37**	**0.00**	**0.00**	**0.00**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.48**
All species	0300-0900	0.00	0.00	0.00	0.20	0.07	0.00	0.00	0.65	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
	0900-1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	1500-2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.75	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09
	2100-0300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	Total	**0.00**	**0.00**	**0.00**	**0.20**	**0.07**	**0.00**	**0.00**	**0.65**	**0.59**	**0.75**	**0.12**	**0.14**	**0.14**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.81**

Appendix Table H. Estimated Number of Fish Impinged at Cook Nuclear Plant Unit 1, Assuming Design Cooling Water Flow, June 2005 through January 2007 (June 2005 represents the impingement estimate only for the last week in June).

Species	Diel	2005							2006												2007	
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb.06-Jan.07
Alewife	0600-1800	26	0	28	392	144	0	0	65	147	14	53	374	30,895	331	274	4	0	1,386	478	42	33,997
	1800-0600	21	7	7	217	59	0	105	46	46	15	11	641	3,275	261	424	14	0	1,965	1,014	150	7,815
	Total	**47**	**7**	**35**	**609**	**204**	**0**	**105**	**111**	**193**	**29**	**63**	**1,015**	**34,170**	**592**	**698**	**18**	**0**	**3,351**	**1,492**	**192**	**41,812**
Bloater	0600-1800	0	0	28	3,031	143	0	175	56	14	44	56	0	0	0	0	0	0	0	125	11	249
	1800-0600	0	0	26	637	233	0	196	21	0	0	4	0	0	0	0	15	0	14	94	0	126
	Total	**0**	**0**	**54**	**3,668**	**376**	**0**	**371**	**77**	**14**	**44**	**60**	**0**	**0**	**0**	**0**	**15**	**0**	**14**	**219**	**11**	**375**
Bluegill	0600-1800	0	0	0	0	0	0	0	28	0	152	0	0	0	0	0	0	0	0	28	0	179
	1800-0600	0	0	0	0	0	0	0	4	7	66	25	0	0	0	0	1	10	0	39	21	168
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**7**	**218**	**25**	**0**	**0**	**0**	**0**	**1**	**10**	**0**	**67**	**21**	**347**
Bluntnose minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**
Brook silverside	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	14
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**
Brown bullhead	0600-1800	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	7	0	11	4	0	0	0	0	0	0	0	0	0	15
	Total	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**7**	**0**	**11**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**
Brown trout	0600-1800	0	0	0	0	0	0	0	0	0	20	0	0	3	72	0	0	0	0	0	0	96
	1800-0600	0	7	0	0	0	0	0	0	0	0	4	4	0	21	0	0	0	0	0	0	29
	Total	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**4**	**4**	**3**	**93**	**0**	**0**	**0**	**0**	**0**	**0**	**124**
Burbot	0600-1800	7	0	0	0	0	0	0	28	0	18	0	14	4	0	0	0	0	3	14	4	56
	1800-0600	0	0	0	0	7	0	0	0	21	81	7	4	3	0	0	0	0	14	8	28	166
	Total	**7**	**0**	**0**	**0**	**7**	**0**	**0**	**28**	**21**	**98**	**7**	**18**	**7**	**0**	**0**	**0**	**0**	**17**	**22**	**31**	**222**
Central mud-minnow	0600-1800	0	0	0	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0	0	0	34
	1800-0600	0	0	0	0	0	0	0	70	0	14	4	0	0	0	0	0	0	0	0	0	18
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**70**	**0**	**48**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**52**
Channel catfish	0600-1800	0	0	0	7	0	0	0	4	130	94	11	4	0	0	14	0	0	0	23	56	331
	1800-0600	0	0	0	0	8	140	28	0	340	221	53	11	11	0	4	1	10	15	8	45	717
	Total	**0**	**0**	**0**	**7**	**8**	**140**	**28**	**4**	**469**	**315**	**64**	**14**	**11**	**0**	**18**	**1**	**10**	**15**	**31**	**101**	**1,048**
Chestnut lamprey	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chinook	0600-1800	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	28
	1800-0600	0	0	0	0	0	0	0	0	0	70	21	0	0	0	0	0	0	0	0	0	91
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**98**	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**119**

(continued)

Appendix Table H. (Continued)

Species	Diel	2005							2006												2007	
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb.06-Jan.07
Coho	0600-1800	0	0	0	0	0	0	0	0	0	20	14	0	0	0	0	0	0	0	0	0	34
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34**
Common carp	0600-1800	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	14	0	18
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**21**
Deepwater sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	20
	1800-0600	0	0	0	0	0	0	0	0	0	14	4	0	0	0	0	0	0	0	0	0	18
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**38**
Eastern banded killifish	0600-1800	0	0	0	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0	0	0	34
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34**
Flathead catfish	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Freshwater drum	0600-1800	0	0	7	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	7
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	6	4	0	8	0	26
	Total	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**0**	**4**	**6**	**4**	**0**	**8**	**0**	**33**
Gizzard shad	0600-1800	0	0	14	0	138	910	840	175	206	510	0	0	0	0	0	4	58	229	2,186	378	3,571
	1800-0600	0	0	13	15,890	362	700	175	224	175	575	21	0	0	0	0	1	10	252	2,870	752	4,656
	Total	**0**	**0**	**27**	**15,890**	**500**	**1,610**	**1,015**	**399**	**381**	**1,085**	**21**	**0**	**0**	**0**	**0**	**5**	**68**	**481**	**5,056**	**1,130**	**8,227**
Golden redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	15	22
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	14	0	18
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**15**	**40**
Golden shiner	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Greater redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**7**
Lake chub	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake sturgeon	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**14**
Lake trout	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	3	3	0	17
	1800-0600	0	0	0	0	0	0	0	4	0	4	0	4	3	0	0	0	0	0	25	0	36
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**4**	**14**	**0**	**0**	**0**	**0**	**3**	**29**	**0**	**53**

(continued)

Appendix Table H. (Continued)

Species	Diel	2005							2006												2007	
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb.06-Jan.07
Lake whitefish	0600-1800	0	7	0	0	0	0	315	51	156	105	14	0	0	14	0	0	0	24	1,560	180	2,053
	1800-0600	0	0	0	0	0	140	168	168	557	33	42	7	0	0	0	0	0	4	1,155	585	2,383
	Total	**0**	**7**	**0**	**0**	**0**	**140**	**483**	**219**	**713**	**137**	**56**	**7**	**0**	**14**	**0**	**0**	**0**	**28**	**2,715**	**765**	**4,436**
Largemouth bass	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Longnose dace	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Longnose sucker	0600-1800	0	0	0	0	0	0	0	28	0	144	32	25	18	7	4	0	0	0	35	36	299
	1800-0600	7	0	0	70	0	0	0	0	18	73	42	11	3	0	0	0	0	0	21	24	193
	Total	**7**	**0**	**0**	**70**	**0**	**0**	**0**	**28**	**18**	**216**	**74**	**35**	**21**	**7**	**4**	**0**	**0**	**0**	**56**	**61**	**492**
Mottled sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	3	0	0	7
	1800-0600	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**11**
Ninespine stickleback	0600-1800	0	0	0	0	0	0	0	0	0	0	35	70	4	0	0	0	0	0	0	0	108
	1800-0600	0	0	0	0	0	0	0	0	14	0	7	21	7	0	0	0	0	0	0	0	49
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**42**	**91**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**158**
Northern pike	0600-1800	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	20
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**
Pumpkin-seed	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	4	15	0	0	0	0	0	0	0	0	0	0	18
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**
Rainbow smelt	0600-1800	0	0	182	28	0	0	0	88	819	221	189	193	4	7	0	0	0	21	271	275	2,001
	1800-0600	0	14	33	0	0	0	56	39	631	606	21	107	7	14	4	0	7	28	143	428	1,996
	Total	**0**	**14**	**215**	**28**	**0**	**0**	**56**	**126**	**1,450**	**827**	**210**	**301**	**11**	**21**	**4**	**0**	**7**	**49**	**415**	**704**	**3,997**
Rock bass	0600-1800	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	13
	1800-0600	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	7	7
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**20**
Round goby	0600-1800	164	241	330	21	135	0	315	305	589	371	553	3,614	971	620	314	127	8	475	775	319	8,736
	1800-0600	478	198	110	630	21	1,815	91	287	394	556	729	3,034	520	336	203	78	56	313	784	189	7,193
	Total	**642**	**439**	**440**	**651**	**156**	**1,815**	**406**	**592**	**983**	**928**	**1,282**	**6,648**	**1,491**	**956**	**517**	**205**	**64**	**788**	**1,559**	**508**	**15,929**
Sea lamprey	0600-1800	0	0	0	0	0	0	0	0	189	24	4	4	0	0	0	0	0	0	0	46	266
	1800-0600	0	0	0	0	0	0	0	11	11	54	21	0	0	0	0	0	0	0	0	24	110
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**200**	**78**	**25**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**70**	**376**
Shorthead redhorse	0600-1800	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	7	0	0	70	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
	Total	**7**	**0**	**7**	**70**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**

(continued)

Appendix Table H. (Continued)

Species	Diel	2005 Jun	Jul	Aug	Sep	Oct	Nov	Dec	2006 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2007 Jan	Feb.06-Jan.07
Silver redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Slimy sculpin	0600-1800	0	0	0	0	0	0	0	0	70	66	98	35	46	14	0	0	0	4	0	0	331
	1800-0600	0	0	0	0	0	0	0	7	49	102	131	32	42	0	0	0	0	0	0	14	371
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**119**	**168**	**229**	**67**	**88**	**14**	**0**	**0**	**0**	**4**	**0**	**14**	**702**
Smallmouth bass	0600-1800	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**
Spottail shiner	0600-1800	59	53	670	308	105	910	2,590	323	3,772	877	1,350	468	102	55	45	26	15	203	13,792	960	21,665
	1800-0600	119	84	73	2,800	657	1,666	2,226	1,334	3,653	2,565	1,336	187	28	43	120	47	0	448	6,883	1,375	16,685
	Total	**179**	**137**	**743**	**3,108**	**762**	**2,576**	**4,816**	**1,657**	**7,425**	**3,442**	**2,686**	**655**	**129**	**98**	**165**	**73**	**15**	**652**	**20,675**	**2,336**	**38,350**
Steelhead	0600-1800	0	0	0	0	0	0	0	18	7	4	4	0	0	0	0	0	0	0	0	0	14
	1800-0600	0	7	0	0	0	0	0	70	0	7	0	0	0	0	0	0	0	0	0	0	7
	Total	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**88**	**7**	**10**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**
Threespine stickleback	0600-1800	0	0	0	0	0	0	0	4	394	57	32	14	11	0	0	0	0	0	13	31	551
	1800-0600	7	0	0	0	0	0	28	7	81	92	25	46	28	0	0	0	0	0	14	29	315
	Total	**7**	**0**	**0**	**0**	**0**	**0**	**28**	**11**	**475**	**150**	**56**	**60**	**38**	**0**	**0**	**0**	**0**	**0**	**26**	**60**	**866**
Trout-perch	0600-1800	0	0	0	0	0	0	0	28	0	20	0	14	0	0	0	0	0	14	111	0	158
	1800-0600	0	0	0	0	0	0	0	0	0	29	0	4	10	0	0	0	0	0	39	24	106
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**0**	**49**	**0**	**17**	**10**	**0**	**0**	**0**	**0**	**14**	**150**	**24**	**265**
Unidentified	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Walleye	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
White perch	0600-1800	0	0	0	0	0	0	0	0	35	28	0	0	4	0	0	0	0	0	0	7	74
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	21	35
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**28**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**14**	**28**	**108**
White sucker	0600-1800	7	0	0	0	0	0	0	0	4	35	0	25	11	3	0	0	0	0	14	18	108
	1800-0600	7	0	7	0	0	0	0	7	0	37	4	4	21	0	0	4	0	0	14	31	113
	Total	**14**	**0**	**7**	**0**	**0**	**0**	**0**	**7**	**4**	**71**	**4**	**28**	**32**	**3**	**0**	**4**	**0**	**0**	**28**	**48**	**221**
Yellow perch	0600-1800	72	87	5,431	17,681	2,742	67,270	10,080	20,366	69,780	28,188	11,910	5,126	1,235	322	2,110	131	42	10,044	51,292	8,956	189,136
	1800-0600	56	148	728	21,140	3,280	49,213	3,073	18,780	154,971	34,231	14,760	6,696	1,174	353	2,802	180	4	6,543	20,231	11,498	253,444
	Total	**128**	**235**	**6,159**	**38,821**	**6,022**	**116,483**	**13,153**	**39,146**	**224,751**	**62,419**	**26,670**	**11,821**	**2,410**	**675**	**4,912**	**311**	**46**	**16,586**	**71,524**	**20,454**	**442,580**
Total	0600-1800	335	388	6,709	21,468	3,406	69,090	14,315	21,566	76,314	31,144	14,355	9,987	33,318	1,444	2,765	292	124	12,431	70,734	11,341	264,250
	1800-0600	710	465	997	41,455	4,628	53,675	6,146	21,091	160,970	39,486	17,279	10,821	5,137	1,028	3,556	346	101	9,595	33,394	15,245	296,961
	Total	**1,045**	**853**	**7,706**	**62,923**	**8,034**	**122,765**	**20,461**	**42,656**	**237,285**	**70,631**	**31,635**	**20,808**	**38,455**	**2,473**	**6,321**	**638**	**225**	**22,026**	**104,128**	**26,586**	**561,211**

Appendix Table I. **Estimated Biomass (g) impinged at Cook Nuclear Plant Unit 1, Assuming Design Cooling Water Flow, June 2005 through January 2007 (June 2005 represents the biomass impingement estimate only for the last week in June).**

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alewife	0600-1800	413	0	91	756	906	0	0	246	441	518	1,673	3,200	180,025	2,848	4,012	4	0	2,765	1,479
	1800-0600	682	203	139	232	163	0	770	102	172	59	179	5,164	21,998	1,968	6,150	32	0	6,124	2,588
	Total	**1,095**	**203**	**230**	**988**	**1,069**	**0**	**770**	**348**	**613**	**577**	**1,852**	**8,365**	**202,023**	**4,816**	**10,162**	**35**	**0**	**8,889**	**4,068**
Bloater	0600-1800	0	0	56	6,454	319	0	595	700	77	171	980	0	0	0	0	0	0	0	683
	1800-0600	0	0	53	1,547	519	0	3,801	133	0	0	15	0	0	0	0	58	0	70	401
	Total	**0**	**0**	**109**	**8,001**	**838**	**0**	**4,396**	**833**	**77**	**171**	**995**	**0**	**0**	**0**	**0**	**58**	**0**	**70**	**1,085**
Bluegill	0600-1800	0	0	0	0	0	0	0	140	0	318	0	0	0	0	0	0	0	0	83
	1800-0600	0	0	0	0	0	0	0	21	28	306	50	0	0	0	0	1	20	0	306
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**161**	**28**	**624**	**50**	**0**	**0**	**0**	**0**	**1**	**20**	**0**	**389**
Bluntnose minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**
Brook silverside	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Brown bullhead	0600-1800	0	0	9,588	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	2,093	0	55	57	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**9,588**	**0**	**0**	**0**	**0**	**2,093**	**0**	**55**	**57**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Brown trout	0600-1800	0	0	0	0	0	0	0	0	0	6,149	0	0	20,367	60,420	0	0	0	0	0
	1800-0600	0	23,425	0	0	0	0	0	0	0	0	6,337	3,150	0	11,324	0	0	0	0	0
	Total	**0**	**23,425**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6,149**	**6,337**	**3,150**	**20,367**	**71,744**	**0**	**0**	**0**	**0**	**0**
Burbot	0600-1800	459	0	0	0	0	0	0	308	0	105	0	116	133	0	0	0	0	27	4,270
	1800-0600	**0**	**0**	**0**	**0**	**175**	**0**	**0**	**0**	**93**	**391**	**137**	**60**	**132**	**0**	**0**	**0**	**0**	**140**	**146**
	Total	**459**	**0**	**0**	**0**	**175**	**0**	**0**	**308**	**93**	**496**	**137**	**176**	**265**	**0**	**0**	**0**	**0**	**167**	**4,416**
Central mud-minnow	0600-1800	0	0	0	0	0	0	0	0	0	137	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	560	0	210	29	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**560**	**0**	**347**	**29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Channel catfish	0600-1800	0	0	0	322	0	0	0	8	256	326	40	25	0	0	51,100	0	0	0	5,930
	1800-0600	0	0	0	0	23	560	12,824	0	1,089	749	1,810	40	5,812	0	1,617	12	167	934	259
	Total	**0**	**0**	**0**	**322**	**23**	**560**	**12,824**	**8**	**1,344**	**1,075**	**1,850**	**65**	**5,812**	**0**	**52,717**	**12**	**167**	**934**	**6,189**
Chestnut lamprey	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chinook	0600-1800	0	0	0	0	0	0	0	0	0	25,522	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	29,756	20,102	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**55,278**	**20,102**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table I. (Continued)

Species	Diel	2005							2006												
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coho	0600-1800	0	0	0	0	0	0	0	0	0	17,116	16,694	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17,116**	**16,694**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Common carp	0600-1800	0	0	0	0	0	0	0	0	0	10,507	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	5,151	0	0	0	0	0	129
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10,507**	**0**	**0**	**5,151**	**0**	**0**	**0**	**0**	**0**	**129**
Deep-water sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	383	0
	1800-0600	0	0	0	0	0	0	0	0	0	252	194	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**252**	**194**	**0**	**0**	**0**	**0**	**0**	**0**	**383**	**0**
Eastern banded killifish	0600-1800	0	0	0	0	0	0	0	0	0	82	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**82**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Flathead catfish	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fresh-water drum	0600-1800	0	0	5,229	0	0	0	0	0	0	0	0	2,380	0	0	2,856	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	3,017	0	0	0	4,407	2,938	0	154
	Total	**0**	**0**	**5,229**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,397**	**0**	**0**	**2,856**	**4,407**	**2,938**	**0**	**154**
Gizzard shad	0600-1800	0	0	91	0	808	5,180	5,460	1,376	1,272	18,379	0	0	0	0	0	16	222	1,476	20,907
	1800-0600	0	0	40	51,730	346	2,380	2,275	2,735	7,036	44,939	212	0	0	0	0	6	78	4,067	20,394
	Total	**0**	**0**	**131**	**51,730**	**1,154**	**7,560**	**7,735**	**4,111**	**8,308**	**63,318**	**212**	**0**	**0**	**0**	**0**	**21**	**301**	**5,543**	**41,301**
Golden redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	9,614	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	2,645
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9,639**	**0**	**0**	**0**	**0**	**0**	**0**	**2,645**
Golden shiner	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Greater redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake chub	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake sturgeon	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,212
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9,212**
Lake trout	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	217	0	0	0	0	18,686	7,486
	1800-0600	0	0	0	0	0	0	0	10,573	0	9,855	0	7,175	59	0	0	0	0	0	48,713
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10,573**	**0**	**9,855**	**0**	**7,175**	**276**	**0**	**0**	**0**	**0**	**18,686**	**56,199**

(continued)

Appendix Table I. (Continued)

Species	Diel	2005 Jun	Jul	Aug	Sep	Oct	Nov	Dec	2006 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lake whitefish	0600-1800	0	14	0	0	0	0	30,520	9,099	5,657	27,319	207	0	0	3,327	0	0	0	5,951	245,412
	1800-0600	0	0	0	0	0	41,580	48,468	9,394	69,565	5,639	5,613	4,735	0	0	0	0	0	3,936	115,999
	Total	**0**	**14**	**0**	**0**	**0**	**41,580**	**78,988**	**18,493**	**75,222**	**32,958**	**5,821**	**4,735**	**0**	**3,327**	**0**	**0**	**0**	**9,887**	**361,411**
Large-mouth bass	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Longnose dace	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Longnose sucker	0600-1800	0	0	0	0	0	0	0	20,104	0	119,953	24,938	21,970	18,907	3,955	1,155	0	0	0	26,112
	1800-0600	6,291	0	0	91,000	0	0	0	0	29,750	67,868	32,409	6,004	2,812	0	0	0	0	0	36,954
	Total	**6,291**	**0**	**0**	**91,000**	**0**	**0**	**0**	**20,104**	**29,750**	**187,821**	**57,348**	**27,974**	**21,719**	**3,955**	**1,155**	**0**	**0**	**0**	**63,067**
Mottled sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	41	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**68**	**0**	**0**	**0**	**0**	**0**	**0**	**41**	**0**
Ninespine stickle-back	0600-1800	0	0	0	0	0	0	0	0	0	0	77	640	11	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	35	0	18	60	14	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**0**	**95**	**700**	**24**	**0**	**0**	**0**	**0**	**0**	**0**
Northern pike	0600-1800	0	0	0	0	0	0	0	0	0	363	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**363**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pumpkin-seed	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	130	652	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**130**	**652**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rainbow smelt	0600-1800	0	0	1,022	336	0	0	0	98	3,948	505	483	471	7	21	0	0	0	62	1,875
	1800-0600	0	56	152	0	0	0	980	368	1,495	11,703	21	111	7	14	4	0	7	84	1,223
	Total	**0**	**56**	**1,174**	**336**	**0**	**0**	**980**	**466**	**5,443**	**12,209**	**504**	**582**	**14**	**35**	**4**	**0**	**7**	**146**	**3,098**
Rock bass	0600-1800	0	0	0	0	0	0	0	0	0	159	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**159**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Round goby	0600-1800	1,949	2,834	4,050	210	2,300	0	3,325	4,806	4,239	3,655	8,036	58,693	8,836	6,523	3,925	1,700	424	9,802	18,303
	1800-0600	6,460	2,851	1,436	5,460	259	33,646	2,065	3,549	4,025	5,394	11,009	46,189	6,601	3,874	1,897	854	1,433	6,802	10,367
	Total	**8,409**	**5,685**	**5,486**	**5,670**	**2,559**	**33,646**	**5,390**	**8,355**	**8,264**	**9,049**	**19,044**	**104,882**	**15,437**	**10,398**	**5,821**	**2,554**	**1,857**	**16,604**	**28,670**
Sea lamprey	0600-1800	0	0	0	0	0	0	0	0	53,449	7,045	1,341	168	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	4,067	2,751	13,087	6,122	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,067**	**56,200**	**20,132**	**7,462**	**168**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Short-head redhorse	0600-1800	0	0	7,701	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	5,202	0	0	119,000	0	0	0	0	0	777	0	0	0	0	0	0	0	0	0
	Total	**5,202**	**0**	**7,701**	**119,000**	**0**	**0**	**0**	**0**	**0**	**777**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table I. (Continued)

Species	Diel	2005 Jun	Jul	Aug	Sep	Oct	Nov	Dec	2006 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Silver redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Slimy sculpin	0600-1800	0	0	0	0	0	0	0	0	1,050	509	791	248	415	137	0	0	0	49	0
	1800-0600	0	0	0	0	0	0	0	126	551	905	1,002	232	324	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**126**	**1,601**	**1,414**	**1,792**	**480**	**739**	**137**	**0**	**0**	**0**	**49**	**0**
Small-mouth bass	0600-1800	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Spottail shiner	0600-1800	282	327	4,817	2,576	375	4,060	27,475	2,732	31,760	7,958	9,655	4,403	995	584	345	152	144	1,074	109,271
	1800-0600	1,083	994	456	15,050	1,365	10,936	21,364	10,247	28,400	23,971	11,682	2,176	293	411	1,228	488	0	2,109	81,697
	Total	**1,365**	**1,321**	**5,273**	**17,626**	**1,740**	**14,996**	**48,839**	**12,979**	**60,160**	**31,928**	**21,337**	**6,578**	**1,288**	**995**	**1,572**	**640**	**144**	**3,183**	**190,968**
Steelhead	0600-1800	0	0	0	0	0	0	0	1,383	7,000	497	4,841	0	0	0	0	0	0	0	0
	1800-0600	0	5,679	0	0	0	0	0	9,590	0	4,650	0	0	0	0	0	0	0	0	0
	Total	**0**	**5,679**	**0**	**0**	**0**	**0**	**0**	**10,973**	**7,000**	**5,147**	**4,841**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Three-spine stickle-back	0600-1800	0	0	0	0	0	0	0	4	471	78	49	17	14	0	0	0	0	0	16
	1800-0600	14	0	0	0	0	0	28	7	126	153	46	75	38	0	0	0	0	0	14
	Total	**14**	**0**	**0**	**0**	**0**	**0**	**28**	**11**	**597**	**230**	**95**	**92**	**52**	**0**	**0**	**0**	**0**	**0**	**30**
Trout-perch	0600-1800	0	0	0	0	0	0	0	196	0	81	0	58	0	0	0	0	0	70	747
	1800-0600	0	0	0	0	0	0	0	0	0	172	0	11	49	0	0	0	0	0	422
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**196**	**0**	**253**	**0**	**69**	**49**	**0**	**0**	**0**	**0**	**70**	**1,169**
Unidenti-fied	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Walleye	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	12,653	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**12,653**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
White perch	0600-1800	0	0	0	0	0	0	0	0	1,365	5,278	0	0	2,566	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,365**	**5,278**	**0**	**0**	**2,566**	**0**	**0**	**0**	**0**	**0**	**70**
White sucker	0600-1800	9,188	0	0	0	0	0	0	0	1,050	14,527	0	16,103	8,376	2,876	0	0	0	0	4,018
	1800-0600	7,908	0	4,164	0	0	0	0	6,426	0	13,111	3,192	2,625	17,675	0	0	3,233	0	0	11,494
	Total	**17,095**	**0**	**4,164**	**0**	**0**	**0**	**0**	**6,426**	**1,050**	**27,638**	**3,192**	**18,728**	**26,051**	**2,876**	**0**	**3,233**	**0**	**0**	**15,512**
Yellow perch	0600-1800	361	2,360	14,373	59,375	9,564	289,450	44,170	98,894	258,226	108,895	41,509	30,591	20,831	9,609	22,077	2,991	189	84,470	322,907
	1800-0600	2,334	927	2,663	120,610	9,734	201,490	15,617	103,565	564,599	131,976	53,144	34,547	25,095	11,694	40,960	2,531	13	84,552	282,643
	Total	**2,695**	**3,287**	**17,037**	**179,985**	**19,298**	**490,940**	**59,787**	**202,459**	**822,825**	**240,871**	**94,653**	**65,138**	**45,926**	**21,303**	**63,037**	**5,522**	**202**	**169,021**	**605,550**
TOTAL	0600-1800	12,653	5,535	47,018	70,030	14,271	298,690	111,545	140,093	370,285	376,151	111,342	148,697	261,713	90,302	85,469	4,863	980	124,856	778,712
	1800-0600	42,626	34,135	9,102	404,629	12,584	290,592	108,192	163,570	709,843	366,644	153,419	115,395	86,060	29,284	51,854	11,623	4,656	108,817	616,618
	Total	**55,278**	**39,670**	**56,120**	**474,659**	**26,855**	**589,282**	**219,737**	**303,663**	**1,080,128**	**742,795**	**264,761**	**264,092**	**347,773**	**119,586**	**137,324**	**16,486**	**5,635**	**233,673**	**1,395,330**

(continued)

Appendix Table I. (Continued)

Species	Diel	2007 Jan	Feb.06-Jan.07
Alewife	0600-1800	172	197,137
	1800-0600	550	44,983
	Total	**722**	**242,120**
Bloater	0600-1800	53	1,964
	1800-0600	0	544
	Total	**53**	**2,508**
Bluegill	0600-1800	0	401
	1800-0600	226	937
	Total	**226**	**1,338**
Blunt-nose minnow	0600-1800	0	14
	1800-0600	0	0
	Total	**0**	**14**
Brook silver-side	0600-1800	0	0
	1800-0600	0	14
	Total	**0**	**14**
Brown bullhead	0600-1800	0	0
	1800-0600	0	112
	Total	**0**	**112**
Brown trout	0600-1800	0	86,936
	1800-0600	0	20,810
	Total	**0**	**107,747**
Burbot	0600-1800	21	4,673
	1800-0600	146	1,243
	Total	**167**	**5,916**
Central mudminnow	0600-1800	0	137
	1800-0600	0	239
	Total	**0**	**376**
Channel catfish	0600-1800	583	58,260
	1800-0600	152	12,639
	Total	**735**	**70,899**
Chestnut lamprey	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Chinook	0600-1800	0	25,522
	1800-0600	0	49,858
	Total	**0**	**75,380**
Coho	0600-1800	0	33,810
	1800-0600	0	0
	Total	**0**	**33,810**

(continued)

Appendix Table I. (Continued)

Species	Diel	2007 Jan	Feb.06-Jan.07
Common carp	0600-1800	0	10,507
	1800-0600	0	5,280
	Total	**0**	**15,787**
Deepwater sculpin	0600-1800	0	383
	1800-0600	0	446
	Total	**0**	**829**
Eastern banded killifish	0600-1800	0	82
	1800-0600	0	0
	Total	**0**	**82**
Flathead catfish	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Freshwater drum	0600-1800	0	5,236
	1800-0600	0	10,516
	Total	**0**	**15,752**
Gizzard shad	0600-1800	34,540	76,812
	1800-0600	81,642	158,373
	Total	**116,182**	**235,185**
Golden redhorse	0600-1800	2,528	12,142
	1800-0600	0	2,670
	Total	**2,528**	**14,812**
Golden shiner	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Greater redhorse	0600-1800	1,212	1,212
	1800-0600	0	0
	Total	**1,212**	**1,212**
Lake chub	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Lake sturgeon	0600-1800	0	9,212
	1800-0600	0	0
	Total	**0**	**9,212**
Lake trout	0600-1800	0	26,389
	1800-0600	0	65,802
	Total	**0**	**92,191**
Lake whitefish	0600-1800	38,026	325,899
	1800-0600	143,969	349,456
	Total	**181,994**	**675,355**

(continued)

Appendix Table I. (Continued)

Species	Diel	2007 Jan	Feb.06-Jan.07
Largemouth bass	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Longnose dace	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Longnose sucker	0600-1800	43,545	260,536
	1800-0600	32,585	208,383
	Total	**76,130**	**468,918**
Mottled sculpin	0600-1800	0	69
	1800-0600	0	40
	Total	**0**	**109**
Ninespine stickleback	0600-1800	0	728
	1800-0600	0	127
	Total	**0**	**855**
Northern pike	0600-1800	0	363
	1800-0600	0	0
	Total	**0**	**363**
Pumpkinseed	0600-1800	0	0
	1800-0600	0	782
	Total	**0**	**782**
Rainbow smelt	0600-1800	910	8,283
	1800-0600	1,085	15,754
	Total	**1,995**	**24,037**
Rock bass	0600-1800	0	159
	1800-0600	7	7
	Total	**7**	**166**
Round goby	0600-1800	7,874	132,010
	1800-0600	4,444	102,887
	Total	**12,317**	**234,897**
Sea lamprey	0600-1800	16,059	78,061
	1800-0600	7,547	29,508
	Total	**23,606**	**107,568**
Shorthead redhorse	0600-1800	0	0
	1800-0600	0	777
	Total	**0**	**777**
Silver redhorse	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**

(continued)

Appendix Table I. (Continued)

Species	Diel	2007 Jan	Feb.06-Jan.07
Slimy sculpin	0600-1800	0	3,199
	1800-0600	70	3,084
	Total	**70**	**6,283**
Smallmouth bass	0600-1800	0	25
	1800-0600	0	0
	Total	**0**	**25**
Spottail shiner	0600-1800	7,703	174,044
	1800-0600	10,879	163,333
	Total	**18,581**	**337,377**
Steelhead	0600-1800	0	12,338
	1800-0600	0	4,650
	Total	**0**	**16,988**
Threespine stickleback	0600-1800	55	700
	1800-0600	29	480
	Total	**84**	**1,181**
Trout-perch	0600-1800	0	956
	1800-0600	202	856
	Total	202	1,812
Unidentified	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Walleye	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
White perch	0600-1800	747	9,956
	1800-0600	2,079	2,149
	Total	**2,827**	**12,105**
White sucker	0600-1800	17,287	64,236
	1800-0600	11,080	62,411
	Total	**28,367**	**126,647**
Yellow perch	0600-1800	154,855	1,057,148
	1800-0600	136,464	1,368,217
	Total	291,318	2,425,366
TOTAL	0600-1800	326,169	2,679,538
	1800-0600	433,155	2,687,369
	Total	**759,324**	**5,366,907**

Appendix Table J. **Estimated Number of Fish Impinged at Cook Nuclear Plant Unit 2, Assuming Design Cooling Water Flow, June 2005 through January 2007 (June 2005 represents the impingement estimate only for the last week in June).**

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alewife	0600-1800	13	0	7	273	87	70	0	54	84	0	0	730	28,243	430	160	80	370	1,251	531
	1800-0600	0	56	0	2,940	43	413	70	35	68	31	20	556	2,654	362	378	60	200	4,030	509
	Total	**13**	**56**	**7**	**3,213**	**130**	**483**	**70**	**89**	**152**	**31**	**20**	**1,286**	**30,897**	**793**	**538**	**140**	**569**	**5,281**	**1,040**
Bloater	0600-1800	0	0	126	931	81	140	315	0	14	13	8	0	0	0	4	11	49	0	126
	1800-0600	0	0	40	420	285	138	392	147	18	0	0	0	0	0	0	14	222	84	68
	Total	0	0	166	1,351	365	278	707	147	32	13	8	0	0	0	4	25	270	84	194
Bluegill	0600-1800	0	0	0	0	0	0	0	28	14	169	113	0	0	0	0	0	4	14	21
	1800-0600	0	0	0	0	8	0	14	74	18	105	70	18	0	0	0	0	0	46	46
	Total	**0**	**0**	**0**	**0**	**8**	**0**	**14**	**102**	**32**	**274**	**183**	**18**	**0**	**0**	**0**	**0**	**4**	**60**	**67**
Blunt-nose minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Brook silverside	0600-1800	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**
Brown bull-head	0600-1800	0	0	0	0	0	0	0	0	0	14	10	4	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	13	9	0	0	0	0	0	4	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**27**	**19**	**4**	**0**	**0**	**0**	**0**	**4**	**0**	**0**
Brown trout	0600-1800	0	14	0	0	0	0	0	0	0	13	8	7	7	14	0	0	0	0	0
	1800-0600	0	28	0	0	0	0	0	0	0	0	0	11	0	28	0	0	0	0	0
	Total	**0**	**42**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**8**	**18**	**7**	**42**	**0**	**0**	**0**	**0**	**0**
Burbot	0600-1800	0	0	0	0	0	0	0	0	0	13	0	14	3	0	0	0	4	38	3
	1800-0600	0	0	0	0	0	0	7	0	7	27	27	21	3	7	0	0	14	14	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**7**	**40**	**27**	**35**	**7**	**7**	**0**	**0**	**18**	**52**	**3**
Central mud-minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Channel catfish	0600-1800	0	0	0	0	0	0	0	56	147	131	109	18	0	0	13	0	0	7	48
	1800-0600	0	0	0	0	8	0	56	70	161	149	64	21	0	0	14	0	0	19	119
	Total	**0**	**0**	**0**	**0**	**8**	**0**	**56**	**126**	**308**	**280**	**174**	**39**	**0**	**0**	**27**	**0**	**0**	**25**	**167**
Chestnut lamprey	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chinook	0600-1800	0	0	0	0	0	0	0	0	18	26	8	0	0	0	0	0	0	0	0
	1800-0600	0	14	0	0	0	0	0	0	0	13	9	4	0	13	0	0	4	0	0
	Total	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**39**	**17**	**4**	**0**	**13**	**0**	**0**	**4**	**0**	**0**

(continued)

Appendix Table J. (Continued)

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coho	0600-1800	7	0	0	0	0	0	0	0	0	22	12	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
	Total	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**12**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**
Common carp	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0
	1800-0600	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**
Deepwater sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Eastern banded killifish	0600-1800	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Flathead catfish	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**
Freshwater drum	0600-1800	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
	1800-0600	0	0	14	0	0	0	56	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**21**	**0**	**0**	**0**	**56**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**
Gizzard shad	0600-1800	0	7	28	0	259	700	595	173	424	686	456	0	0	0	0	7	5,140	1,497	1,557
	1800-0600	0	0	20	2,891	170	2,238	371	378	137	566	324	0	0	0	0	40	10,542	2,487	1,716
	Total	**0**	**7**	**48**	**2,891**	**430**	**2,938**	**966**	**551**	**560**	**1,252**	**780**	**0**	**0**	**0**	**0**	**47**	**15,682**	**3,984**	**3,273**
Golden redhorse	0600-1800	0	0	7	0	0	0	0	0	0	1	10	4	0	0	4	0	0	0	9
	1800-0600	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**20**	**4**	**0**	**0**	**4**	**0**	**0**	**0**	**9**
Golden shiner	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Greater redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake chub	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**
Lake sturgeon	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake trout	0600-1800	0	0	7	0	0	0	0	0	0	0	0	0	7	0	0	0	4	7	9
	1800-0600	0	0	0	0	8	0	0	0	0	0	0	0	7	0	0	0	0	4	0
	Total	**0**	**0**	**7**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**4**	**10**	**9**

(continued)

Appendix Table J. (Continued)

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lake whitefish	0600-1800	0	0	0	0	7	0	140	120	105	13	0	21	0	0	11	0	0	14	1,309
	1800-0600	0	0	0	0	0	140	161	88	384	50	9	4	0	0	0	0	0	64	2,247
	Total	**0**	**0**	**0**	**0**	**7**	**140**	**301**	**207**	**489**	**63**	**9**	**25**	**0**	**0**	**11**	**0**	**0**	**78**	**3,556**
Largemouth bass	0600-1800	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	7	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**
Longnose dace	0600-1800	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	6
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**
Longnose sucker	0600-1800	20	0	0	0	7	0	0	0	32	75	39	34	43	13	0	0	7	0	19
	1800-0600	0	0	0	0	8	0	7	77	39	32	0	47	53	0	0	0	0	0	32
	Total	**20**	**0**	**0**	**0**	**14**	**0**	**7**	**77**	**70**	**106**	**39**	**81**	**95**	**13**	**0**	**0**	**7**	**0**	**52**
Mottled sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**11**	**0**	**0**	**0**	**0**	**0**	**0**
Ninespine stickleback	0600-1800	0	0	0	0	0	0	0	0	14	19	22	35	7	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	18	0	0	36	14	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**19**	**22**	**70**	**21**	**0**	**0**	**0**	**0**	**0**	**0**
Northern pike	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pumpkinseed	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rainbow smelt	0600-1800	0	0	392	42	14	0	105	119	438	466	441	283	25	0	13	0	4	67	210
	1800-0600	0	14	81	0	8	280	84	305	343	362	280	72	10	0	11	0	32	14	259
	Total	**0**	**14**	**473**	**42**	**21**	**280**	**189**	**424**	**780**	**828**	**721**	**355**	**35**	**0**	**24**	**0**	**35**	**81**	**469**
Rock bass	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**
Round goby	0600-1800	256	218	568	63	172	420	140	270	203	276	497	3,960	1,210	1,187	591	136	366	533	1,209
	1800-0600	478	261	193	574	142	2,518	392	340	229	367	419	3,289	970	752	236	129	590	837	736
	Total	**734**	**480**	**761**	**637**	**314**	**2,938**	**532**	**610**	**432**	**643**	**916**	**7,249**	**2,180**	**1,939**	**827**	**265**	**956**	**1,370**	**1,945**
Sea lamprey	0600-1800	0	0	0	0	0	0	0	0	49	11	0	11	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	28	7	25	4	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**7**	**74**	**14**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorthead redhorse	0600-1800	0	0	0	0	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table J. (Continued)

Species	Diel	2005							2006												
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Silver redhorse	0600-1800	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
	Total	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**
Slimy sculpin	0600-1800	0	0	0	0	0	0	0	4	70	19	22	42	35	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	18	29	42	7	20	0	0	0	4	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**70**	**37**	**51**	**84**	**42**	**20**	**0**	**0**	**0**	**4**	**0**
Small-mouth bass	0600-1800	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**
Spottail shiner	0600-1800	125	47	1,980	175	153	1,050	1,435	830	7,056	788	677	646	96	17	56	73	257	332	13,176
	1800-0600	0	133	223	470	655	4,000	4,235	1,653	4,114	1,788	607	299	56	87	11	60	831	699	13,945
	Total	**125**	**180**	**2,203**	**645**	**808**	**5,050**	**5,670**	**2,482**	**11,169**	**2,576**	**1,284**	**945**	**152**	**105**	**66**	**133**	**1,088**	**1,031**	**27,121**
Steelhead	0600-1800	0	14	0	0	0	0	0	14	4	1	10	0	4	0	0	0	0	0	0
	1800-0600	0	35	0	0	0	0	0	70	21	13	9	4	11	0	0	0	0	0	0
	Total	**0**	**49**	**0**	**0**	**0**	**0**	**0**	**84**	**25**	**14**	**19**	**4**	**14**	**0**	**0**	**0**	**0**	**0**	**0**
Threespine stickleback	0600-1800	0	0	0	0	0	0	0	35	200	73	29	24	4	0	0	0	0	14	17
	1800-0600	0	0	0	0	0	0	28	84	186	23	9	50	25	0	0	0	0	0	7
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**119**	**385**	**97**	**38**	**75**	**28**	**0**	**0**	**0**	**0**	**14**	**24**
Trout-perch	0600-1800	0	0	0	0	0	0	0	0	7	4	0	7	0	0	0	0	7	0	85
	1800-0600	0	0	0	0	0	140	70	7	39	26	18	7	0	0	0	0	7	0	65
	Total	**0**	**0**	**0**	**0**	**0**	**140**	**70**	**7**	**46**	**30**	**18**	**14**	**0**	**0**	**0**	**0**	**14**	**0**	**150**
Unidenti-fied	0600-1800	0	0	14	0	0	0	0	0	0	18	12	0	0	0	0	0	0	0	0
	1800-0600	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**7**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Walleye	0600-1800	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**7**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
White perch	0600-1800	0	0	0	0	0	0	0	0	0	31	20	0	0	0	0	0	0	0	3
	1800-0600	0	0	0	0	0	0	0	0	0	13	9	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**44**	**29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
White sucker	0600-1800	7	7	0	7	0	0	0	63	11	11	0	42	39	0	0	4	4	0	0
	1800-0600	0	0	0	0	7	0	7	0	0	33	18	36	10	7	0	0	11	0	43
	Total	**7**	**7**	**0**	**7**	**7**	**0**	**7**	**63**	**11**	**44**	**18**	**77**	**49**	**7**	**0**	**4**	**14**	**0**	**43**
Yellow perch	0600-1800	53	40	12,408	5,201	1,798	83,510	6,615	34,612	218,077	21,934	12,947	6,327	1,040	167	2,149	420	1,182	14,816	122,230
	1800-0600	49	154	440	7,337	2,428	70,294	13,286	29,416	134,757	31,240	8,806	6,552	1,001	414	1,701	318	1,092	11,558	41,265
	Total	**102**	**194**	**12,848**	**12,538**	**4,226**	**153,804**	**19,901**	**64,029**	**352,834**	**53,174**	**21,753**	**12,878**	**2,041**	**581**	**3,850**	**739**	**2,274**	**26,375**	**163,495**
TOTAL	0600-1800	479	353	15,551	6,692	2,590	85,890	9,380	36,410	226,987	24,825	15,451	12,210	30,766	1,828	3,021	731	7,403	18,593	140,605
	1800-0600	527	704	1,010	14,633	3,768	80,160	19,264	32,749	140,560	34,876	10,743	11,071	4,839	1,698	2,350	621	13,553	19,862	61,065
	Total	**1,006**	**1,056**	**16,561**	**21,325**	**6,357**	**166,050**	**28,644**	**69,159**	**367,548**	**59,701**	**26,194**	**23,281**	**35,604**	**3,526**	**5,371**	**1,352**	**20,955**	**38,454**	**201,669**

(continued)

Appendix Table J. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Alewife	0600-1800	40	31,921
	1800-0600	105	8,972
	Total	**146**	**40,893**
Bloater	0600-1800	11	235
	1800-0600	0	406
	Total	**11**	**640**
Bluegill	0600-1800	4	338
	1800-0600	20	323
	Total	**24**	**661**
Bluntnose minnow	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Brook silverside	0600-1800	0	4
	1800-0600	0	3
	Total	**0**	**7**
Brown bullhead	0600-1800	0	27
	1800-0600	0	25
	Total	**0**	**53**
Brown trout	0600-1800	19	67
	1800-0600	0	39
	Total	**19**	**106**
Burbot	0600-1800	35	111
	1800-0600	21	142
	Total	**56**	**253**
Central mudminnow	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Channel catfish	0600-1800	27	500
	1800-0600	7	554
	Total	**34**	**1,054**
Chestnut lamprey	0600-1800	21	21
	1800-0600	0	0
	Total	**21**	**21**
Chinook	**0600-1800**	**0**	**52**
	1800-0600	0	42
	Total	**0**	**94**
Coho	0600-1800	0	34
	1800-0600	0	7
	Total	**0**	**41**

(continued)

Appendix Table J. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Common carp	0600-1800	0	13
	1800-0600	0	0
	Total	**0**	**13**
Deepwater sculpin	0600-1800	0	0
	1800-0600	7	7
	Total	**7**	**7**
Eastern banded killifish	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Flathead catfish	0600-1800	14	17
	1800-0600	0	0
	Total	**14**	**17**
Freshwater drum	0600-1800	0	35
	1800-0600	0	0
	Total	**0**	**35**
Gizzard shad	0600-1800	341	10,107
	1800-0600	229	16,040
	Total	**570**	**26,147**
Golden redhorse	0600-1800	0	27
	1800-0600	0	11
	Total	**0**	**38**
Golden shiner	0600-1800	0	0
	1800-0600	0	4
	Total	0	4
Greater redhorse	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Lake chub	0600-1800	0	7
	1800-0600	0	0
	Total	**0**	**7**
Lake sturgeon	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Lake trout	0600-1800	4	30
	1800-0600	0	11
	Total	**4**	**41**
Lake whitefish	0600-1800	277	1,750
	1800-0600	473	3,230
	Total	**750**	**4,980**

(continued)

Appendix Table J. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Largemouth bass	0600-1800	0	14
	1800-0600	0	0
	Total	**0**	**14**
Longnose dace	0600-1800	0	6
	1800-0600	0	7
	Total	**0**	**13**
Longnose sucker	0600-1800	4	264
	1800-0600	0	202
	Total	**4**	**466**
Mottled sculpin	0600-1800	0	7
	1800-0600	0	7
	Total	**0**	**14**
Ninespine stickleback	0600-1800	7	104
	1800-0600	0	67
	Total	**7**	**171**
Northern pike	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Pumpkinseed	0600-1800	0	0
	1800-0600	0	4
	Total	**0**	**4**
Rainbow smelt	0600-1800	354	2,299
	1800-0600	1,312	2,694
	Total	**1,666**	**4,993**
Rock bass	0600-1800	7	7
	1800-0600	0	7
	Total	**7**	**14**

(continued)

Appendix Table J. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Round goby	0600-1800	342	10,510
	1800-0600	188	8,741
	Total	**530**	**19,251**
Sea lamprey	0600-1800	39	109
	1800-0600	11	39
	Total	**49**	**147**
Shorthead redhorse	0600-1800	0	7
	1800-0600	0	0
	Total	**0**	**7**
Silver redhorse	0600-1800	0	0
	1800-0600	0	7
	Total	**0**	**7**
Slimy sculpin	0600-1800	0	188
	1800-0600	0	120
	Total	**0**	**308**
Smallmouth bass	0600-1800	0	7
	1800-0600	0	4
	Total	**0**	**11**
Spottail shiner	0600-1800	1,139	24,313
	1800-0600	2,161	24,657
	Total	**3,300**	**48,970**
Steelhead	0600-1800	14	31
	1800-0600	11	68
	Total	**25**	**99**
Threespine stickleback	0600-1800	35	396
	1800-0600	59	359
	Total	**94**	**755**

(continued)

Appendix Table J. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Trout-perch	0600-1800	0	110
	1800-0600	0	161
	Total	**0**	**271**
Unidentified	0600-1800	0	30
	1800-0600	0	0
	Total	**0**	**30**
Walleye	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
White perch	0600-1800	0	55
	1800-0600	0	22
	Total	**0**	**77**
White sucker	0600-1800	81	189
	1800-0600	13	171
	Total	**94**	**360**
Yellow perch	0600-1800	20,258	421,548
	1800-0600	13,469	252,172
	Total	**33,727**	**673,720**
TOTAL	0600-1800	23,069	505,489
	1800-0600	18,086	319,323
	Total	**41,155**	**824,812**

Appendix Table K. Estimated Biomass (g) impinged at Cook Nuclear Plant Unit 2, Assuming Design Cooling Water Flow, June 2005 through January 2007 (June 2005 represents the biomass impingement estimate only for the last week in June).

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alewife	0600-1800	289	0	7	532	293	140	0	171	270	0	0	8,469	189,752	3,171	1,548	381	2,040	3,010	1,342
	1800-0600	0	1,589	0	5,740	541	689	350	81	1,106	132	186	5,466	73,984	2,674	4,749	286	833	9,674	1,254
	Total	**289**	**1,589**	**7**	**6,272**	**834**	**829**	**350**	**252**	**1,376**	**132**	**186**	**13,936**	**263,736**	**5,845**	**6,297**	**667**	**2,874**	**12,684**	**2,596**
Bloater	0600-1800	0	0	168	1,995	241	560	945	0	70	25	17	0	0	0	11	21	147	0	569
	1800-0600	0	0	67	910	550	964	1,771	4,417	70	0	0	0	0	0	0	43	686	154	244
	Total	**0**	**0**	**235**	**2,905**	**792**	**1,524**	**2,716**	**4,417**	**140**	**25**	**17**	**0**	**0**	**0**	**11**	**64**	**833**	**154**	**813**
Bluegill	0600-1800	0	0	0	0	0	0	0	56	42	721	472	0	0	0	0	0	4	28	93
	1800-0600	0	0	0	0	23	0	56	217	18	1,157	771	402	0	0	0	0	0	277	134
	Total	**0**	**0**	**0**	**0**	**23**	**0**	**56**	**273**	**60**	**1,878**	**1,244**	**402**	**0**	**0**	**0**	**0**	**4**	**305**	**227**
Bluntnose minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Brook silverside	0600-1800	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**0**
Brown bullhead	0600-1800	0	0	0	0	0	0	0	0	0	162	39	270	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	39	26	0	0	0	0	0	11	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**201**	**65**	**270**	**0**	**0**	**0**	**0**	**11**	**0**	**0**
Brown trout	0600-1800	0	21,943	0	0	0	0	0	0	0	1,751	1,168	10,971	3,637	9,899	0	0	0	0	0
	1800-0600	0	48,625	0	0	0	0	0	0	0	0	0	64	0	15,014	0	0	0	0	0
	Total	**0**	**70,568**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,751**	**1,168**	**11,035**	**3,637**	**24,913**	**0**	**0**	**0**	**0**	**0**
Burbot	0600-1800	0	0	0	0	0	0	0	0	0	40	0	90	83	0	0	0	18	601	31
	1800-0600	0	0	0	0	0	0	42	0	37	134	117	128	41	416	0	0	224	210	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**42**	**0**	**37**	**173**	**117**	**218**	**124**	**416**	**0**	**0**	**242**	**811**	**31**
Central mud-minnow	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Channel catfish	0600-1800	0	0	0	0	0	0	0	112	336	14,447	8,602	46	0	0	4,269	0	0	68	10,529
	1800-0600	0	0	0	0	23	0	19,880	4,690	9,251	626	149	46	0	0	400	0	0	815	24,070
	Total	**0**	**0**	**0**	**0**	**23**	**0**	**19,880**	**4,802**	**9,587**	**15,073**	**8,750**	**92**	**0**	**0**	**4,670**	**0**	**0**	**883**	**34,599**
Chestnut lamprey	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chinook	0600-1800	0	0	0	0	0	0	0	0	3,185	25,628	9,358	0	0	0	0	0	0	0	0
	1800-0600	0	233	0	0	0	0	0	0	0	13,832	9,221	15	0	413	0	0	202	0	0
	Total	**0**	**233**	**0**	**0**	**0**	**0**	**0**	**0**	**3,185**	**39,460**	**18,579**	**15**	**0**	**413**	**0**	**0**	**202**	**0**	**0**

(continued)

Appendix Table K. (Continued)

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coho	0600-1800	3,747	0	0	0	0	0	0	0	0	19,998	11,685	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	7,147	0	0	0	0	0
	Total	**3,747**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19,998**	**11,685**	**0**	**0**	**7,147**	**0**	**0**	**0**	**0**	**0**
Common carp	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32,032	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32,032**	**0**	**0**	**0**	**0**
Deepwater sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Eastern banded killifish	0600-1800	0	0	0	0	0	0	315	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**315**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Flathead catfish	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,434	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,434**	**0**
Freshwater drum	0600-1800	0	0	4,599	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63,570
	1800-0600	0	0	27,852	0	0	0	75,404	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**32,451**	**0**	**0**	**0**	**75,404**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**63,570**
Gizzard shad	0600-1800	0	5,271	105	0	1,566	3,570	3,010	7,742	6,510	18,851	3,849	0	0	0	0	466	96,615	10,598	8,846
	1800-0600	0	0	40	11,306	736	9,222	2,296	4,631	1,306	29,132	3,506	0	0	0	0	240	74,793	27,896	11,251
	Total	**0**	**5,271**	**145**	**11,306**	**2,302**	**12,792**	**5,306**	**12,373**	**7,816**	**47,983**	**7,356**	**0**	**0**	**0**	**0**	**706**	**171,409**	**38,494**	**20,097**
Golden redhorse	0600-1800	0	0	14	0	0	0	0	0	0	1,064	14,896	5,163	0	0	8,221	0	0	0	1,644
	1800-0600	0	0	0	0	0	0	0	0	0	2	29	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**1,066**	**14,925**	**5,163**	**0**	**0**	**8,221**	**0**	**0**	**0**	**1,644**
Golden shiner	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	123	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**123**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Greater redhorse	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake chub	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	196	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**196**	**0**	**0**	**0**	**0**
Lake sturgeon	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake trout	0600-1800	0	0	147	0	0	0	0	0	0	0	0	0	161	0	0	0	12,285	30,307	29,768
	1800-0600	0	0	0	0	144	0	0	0	0	0	0	0	112	0	0	0	0	8,291	0
	Total	**0**	**0**	**147**	**0**	**144**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**273**	**0**	**0**	**0**	**12,285**	**38,598**	**29,768**

(continued)

Appendix Table K. (Continued)

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lake whitefish	0600-1800	0	0	0	0	3,252	0	176,540	30,841	59,465	15,929	0	235	0	0	2,342	0	0	6,782	210,722
	1800-0600	0	0	0	0	0	66,360	94,500	16,104	126,178	15,206	1,078	5,478	0	0	0	0	0	6,258	339,964
	Total	**0**	**0**	**0**	**0**	**3,252**	**66,360**	**271,040**	**46,945**	**185,643**	**31,135**	**1,078**	**5,713**	**0**	**0**	**2,342**	**0**	**0**	**13,039**	**550,686**
Largemouth bass	0600-1800	0	0	0	0	0	0	0	0	266	0	0	0	0	0	0	0	28	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**266**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**0**	**0**
Longnose dace	0600-1800	0	0	0	0	0	0	0	308	0	0	0	0	0	0	0	0	0	0	24
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**308**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**38**
Longnose sucker	0600-1800	14,792	0	0	0	6,828	0	0	0	34,626	96,820	42,565	27,582	38,655	8,941	0	0	6,393	0	24,136
	1800-0600	0	0	0	0	7,200	0	1,498	114,436	45,497	36,069	0	46,542	51,075	0	0	0	0	0	34,135
	Total	**14,792**	**0**	**0**	**0**	**14,028**	**0**	**1,498**	**114,436**	**80,122**	**132,889**	**42,565**	**74,124**	**89,729**	**8,941**	**0**	**0**	**6,393**	**0**	**58,270**
Mottled sculpin	0600-1800	0	0	0	0	0	0	0	0	0	0	0	42	35	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	77	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**42**	**112**	**0**	**0**	**0**	**0**	**0**	**0**
Ninespine stickleback	0600-1800	0	0	0	0	0	0	0	0	35	38	54	98	18	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	35	0	0	103	35	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**70**	**38**	**54**	**201**	**52**	**0**	**0**	**0**	**0**	**0**	**0**
Northern pike	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pumpkinseed	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rainbow smelt	0600-1800	0	0	1,771	637	82	0	420	347	753	1,183	1,143	353	25	0	132	0	165	396	1,357
	1800-0600	0	35	430	0	129	5,460	700	767	846	730	638	176	21	0	11	0	137	336	2,378
	Total	**0**	**35**	**2,201**	**637**	**211**	**5,460**	**1,120**	**1,114**	**1,598**	**1,913**	**1,781**	**528**	**46**	**0**	**142**	**0**	**301**	**732**	**3,735**
Rock bass	0600-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	1,904	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,904**	**0**	**0**	**0**	**0**	**0**	**0**
Round goby	0600-1800	4,607	3,223	9,043	1,281	3,092	4,830	875	3,049	2,422	2,135	6,966	56,833	15,927	14,060	7,198	1,728	9,141	10,277	20,808
	1800-0600	6,460	3,328	2,559	6,974	2,978	47,997	4,676	6,973	3,512	2,874	5,717	53,533	12,040	8,254	2,969	2,944	12,937	21,046	10,496
	Total	**11,067**	**6,551**	**11,602**	**8,255**	**6,070**	**52,827**	**5,551**	**10,023**	**5,934**	**5,009**	**12,683**	**110,365**	**27,967**	**22,314**	**10,167**	**4,672**	**22,078**	**31,323**	**31,304**
Sea lamprey	0600-1800	0	0	0	0	0	0	0	0	18,981	3,700	0	210	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	11,844	3,164	7,623	690	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**11,844**	**3,164**	**26,604**	**4,389**	**0**	**210**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorthead redhorse	0600-1800	0	0	0	0	10,730	0	0	0	2,289	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**10,730**	**0**	**0**	**0**	**2,289**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table K. (Continued)

Species	Diel	2005							2006											
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Silver redhorse	0600-1800	0	16,471	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0
	Total	**0**	**16,471**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**0**	**0**
Slimy sculpin	0600-1800	0	0	0	0	0	0	0	11	350	112	122	391	358	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	101	158	335	70	140	0	0	0	14	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**350**	**214**	**279**	**726**	**428**	**140**	**0**	**0**	**0**	**14**	**0**
Smallmouth bass	0600-1800	0	0	0	0	0	0	0	0	3,143	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,143**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**
Spottail shiner	0600-1800	1,247	266	13,330	1,323	735	4,970	15,330	5,331	53,738	6,584	5,298	7,120	1,127	210	489	314	1,077	2,279	76,905
	1800-0600	0	1,338	1,404	3,157	1,918	38,046	39,137	9,345	31,309	14,721	4,512	3,049	654	860	63	378	3,258	4,078	59,750
	Total	**1,247**	**1,604**	**14,734**	**4,480**	**2,654**	**43,016**	**54,467**	**14,676**	**85,047**	**21,305**	**9,810**	**10,169**	**1,781**	**1,070**	**552**	**692**	**4,336**	**6,356**	**136,655**
Steelhead	0600-1800	0	14,421	0	0	0	0	0	3,430	5,607	694	9,722	0	46	0	0	0	0	0	0
	1800-0600	0	41,314	0	0	0	0	0	52,640	3,318	2,761	1,841	4,260	147	0	0	0	0	0	0
	Total	**0**	**55,734**	**0**	**0**	**0**	**0**	**0**	**56,070**	**8,925**	**3,455**	**11,562**	**4,260**	**193**	**0**	**0**	**0**	**0**	**0**	**0**
Threespine stickleback	0600-1800	0	0	0	0	0	0	0	67	270	99	37	38	4	0	0	0	0	14	31
	1800-0600	0	0	0	0	0	0	28	91	238	27	9	79	42	0	0	0	0	0	11
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**28**	**158**	**508**	**126**	**46**	**117**	**46**	**0**	**0**	**0**	**0**	**14**	**42**
Trout-perch	0600-1800	0	0	0	0	0	0	0	0	49	18	0	34	0	0	0	0	21	0	703
	1800-0600	0	0	0	0	0	840	532	49	214	131	88	29	0	0	0	0	39	0	424
	Total	**0**	**0**	**0**	**0**	**0**	**840**	**532**	**49**	**263**	**149**	**88**	**64**	**0**	**0**	**0**	**0**	**60**	**0**	**1,128**
Unidentified	0600-1800	0	0	14	0	0	0	0	0	0	272	181	0	0	0	0	0	0	0	0
	1800-0600	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**21**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**272**	**181**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Walleye	0600-1800	0	0	1,694	0	5,203	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1800-0600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**1,694**	**0**	**5,203**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
White perch	0600-1800	0	0	0	0	0	0	0	0	0	3,327	2,218	0	0	0	0	0	0	0	14
	1800-0600	0	0	0	0	0	0	0	0	0	1,288	859	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,615**	**3,077**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**
White sucker	0600-1800	8,531	3,086	0	9,317	0	0	0	24,933	2,090	14,315	0	42,342	36,638	0	0	2,891	3,196	0	0
	1800-0600	0	0	0	0	8,750	0	4,466	0	0	28,677	14,568	35,844	8,769	5,716	0	0	2,942	0	29,695
	Total	**8,531**	**3,086**	**0**	**9,317**	**8,750**	**0**	**4,466**	**24,933**	**2,090**	**42,992**	**14,568**	**78,187**	**45,407**	**5,716**	**0**	**2,891**	**6,137**	**0**	**29,695**
Yellow perch	0600-1800	827	523	27,426	30,639	8,313	377,020	24,780	157,472	706,140	94,705	50,431	30,450	18,274	5,993	40,048	4,861	9,183	134,997	567,130
	1800-0600	2,256	9,696	2,869	30,222	7,296	343,512	57,106	137,566	525,951	125,882	32,977	52,970	35,808	12,419	18,127	1,819	15,457	113,493	608,752
	Total	**3,083**	**10,220**	**30,295**	**60,861**	**15,610**	**720,532**	**81,886**	**295,038**	**1,232,091**	**220,587**	**83,407**	**83,420**	**54,082**	**18,411**	**58,175**	**6,680**	**24,640**	**248,490**	**1,175,882**
TOTAL	0600-1800	34,040	65,203	58,318	45,724	40,336	391,090	222,215	233,870	900,641	322,620	168,821	190,736	304,739	42,274	96,485	10,662	140,312	201,790	1,018,221
	1800-0600	8,716	106,179	35,221	58,309	30,288	513,089	314,286	355,171	756,506	274,333	76,449	208,551	184,795	53,051	26,320	5,710	111,547	192,556	1,122,573
	Total	**42,756**	**171,382**	**93,539**	**104,033**	**70,624**	**904,179**	**536,501**	**589,042**	**1,657,147**	**596,952**	**245,270**	**399,287**	**489,534**	**95,325**	**122,804**	**16,372**	**251,859**	**394,347**	**2,140,794**

(continued)

Appendix Table K. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Alewife	0600-1800	362	210,346
	1800-0600	301	100,646
	Total	**664**	**310,991**
Bloater	0600-1800	64	923
	1800-0600	0	1,198
	Total	**64**	**2,121**
Bluegill	0600-1800	4	1,364
	1800-0600	20	2,778
	Total	**24**	**4,142**
Bluntnose minnow	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Brook silverside	0600-1800	0	7
	1800-0600	0	17
	Total	**0**	**24**
Brown bullhead	0600-1800	0	471
	1800-0600	0	76
	Total	**0**	**547**
Brown trout	0600-1800	12,378	39,804
	1800-0600	0	15,078
	Total	**12,378**	**54,882**
Burbot	0600-1800	10,983	11,845
	1800-0600	244	1,549
	Total	**11,227**	**13,394**
Central mudminnow	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Channel catfish	0600-1800	952	39,249
	1800-0600	27	35,384
	Total	**979**	**74,633**
Chestnut lamprey	0600-1800	924	924
	1800-0600	0	0
	Total	**924**	**924**
Chinook	0600-1800	0	38,171
	1800-0600	0	23,682
	Total	**0**	**61,853**
Coho	0600-1800	0	31,683
	1800-0600	0	7,147
	Total	**0**	**38,830**

(continued)

Appendix Table K. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Common carp	0600-1800	0	32,032
	1800-0600	0	0
	Total	**0**	**32,032**
Deepwater sculpin	0600-1800	0	0
	1800-0600	112	112
	Total	**112**	**112**
Eastern banded killifish	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Flathead catfish	0600-1800	17,278	19,713
	1800-0600	0	0
	Total	**17,278**	**19,713**
Freshwater drum	0600-1800	0	63,570
	1800-0600	0	0
	Total	**0**	**63,570**
Gizzard shad	0600-1800	30,958	176,693
	1800-0600	25,049	173,174
	Total	**56,006**	**349,866**
Golden redhorse	0600-1800	0	30,988
	1800-0600	0	32
	Total	**0**	**31,020**
Golden shiner	0600-1800	0	0
	1800-0600	0	123
	Total	**0**	**123**
Greater redhorse	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Lake chub	0600-1800	0	196
	1800-0600	0	0
	Total	**0**	**196**
Lake sturgeon	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Lake trout	0600-1800	7,614	80,135
	1800-0600	0	8,403
	Total	**7,614**	**88,537**
Lake whitefish	0600-1800	58,543	354,017
	1800-0600	117,880	612,042
	Total	**176,423**	**966,059**

(continued)

Appendix Table K. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Largemouth bass	0600-1800	0	294
	1800-0600	0	0
	Total	**0**	**294**
Longnose dace	0600-1800	0	24
	1800-0600	0	14
	Total	**0**	**38**
Longnose sucker	0600-1800	5,962	285,679
	1800-0600	0	213,317
	Total	**5,962**	**498,996**
Mottled sculpin	0600-1800	0	77
	1800-0600	0	77
	Total	**0**	**154**
Ninespine stickleback	0600-1800	14	256
	1800-0600	0	173
	Total	**14**	**429**
Northern pike	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
Pumpkinseed	0600-1800	0	0
	1800-0600	0	32
	Total	**0**	**32**
Rainbow smelt	0600-1800	451	5,954
	1800-0600	1,841	7,114
	Total	**2,292**	**13,068**
Rock bass	0600-1800	529	529
	1800-0600	0	1,904
	Total	**529**	**2,433**
Round goby	0600-1800	4,810	152,305
	1800-0600	2,183	138,504
	Total	**6,993**	**290,809**
Sea lamprey	0600-1800	14,006	36,896
	1800-0600	3,744	12,057
	Total	**17,750**	**48,952**
Shorthead redhorse	0600-1800	0	2,289
	1800-0600	0	0
	Total	**0**	**2,289**
Silver redhorse	0600-1800	0	0
	1800-0600	0	28
	Total	**0**	**28**

(continued)

Appendix Table K. (Continued)

Species	Diel	2007 Jan	2007 Feb.06-Jan.07
Slimy sculpin	0600-1800	0	1,333
	1800-0600	0	819
	Total	**0**	**2,152**
Smallmouth bass	0600-1800	0	3,143
	1800-0600	0	14
	Total	**0**	**3,157**
Spottail shiner	0600-1800	7,834	162,974
	1800-0600	11,958	134,589
	Total	**19,792**	**297,563**
Steelhead	0600-1800	2,416	18,485
	1800-0600	149	12,477
	Total	**2,566**	**30,961**
Threespine stickleback	0600-1800	35	528
	1800-0600	69	475
	Total	**104**	**1,003**
Trout-perch	0600-1800	0	825
	1800-0600	0	925
	Total	**0**	**1,750**
Unidentified	0600-1800	0	454
	1800-0600	0	0
	Total	**0**	**454**
Walleye	0600-1800	0	0
	1800-0600	0	0
	Total	**0**	**0**
White perch	0600-1800	0	5,559
	1800-0600	0	2,147
	Total	**0**	**7,706**
White sucker	0600-1800	13,675	115,146
	1800-0600	2,096	128,305
	Total	**15,770**	**243,451**
Yellow perch	0600-1800	177,166	1,839,378
	1800-0600	148,865	1,692,519
	Total	**326,031**	**3,531,897**
TOTAL	0600-1800	366,956	3,764,256
	1800-0600	314,538	3,326,929
	Total	**681,494**	**7,091,185**

Appendix Table L. **Mean Density (No./100 m^3) of Ichthyoplankton collected at the Shoreline, Intake, and Experimental Stations in the vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.**

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3	Density /100 m^3
Jun-05	Alewife	Egg	0		0		0		0		0			
		Yolk-sac larvae	0		0.6		0		0		0			
		Post-yolk-sac larvae	0		1.9		0		0		9.2			
	Common carp	Post-yolk-sac larvae	0		0		0		0		0			
	Cyprinidae	Unidentified	1.6		0		0		0		0			
		Yolk-sac larvae	0		0		0		0		0			
		Post-yolk-sac larvae	0		0		0		0		0			
	Round goby	Post-yolk-sac larvae	0		0		0		0		0			
	Round whitefish	Yolk-sac larvae	0		0		0		0		0			
		Post-yolk-sac larvae	0		0		0		0		0			
	Slimy sculpin	Post-yolk-sac larvae	0		0		0		0		0			
	Yellow perch	Yolk-sac larvae	1.6		0.6		0		0		0			
		Post-yolk-sac larvae	4.1		2.5		0		0		0			
	Total		**7.3**		**5.7**		**0**		**0**		**9.2**			

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Jul-05	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0.9	9.9	2.5	5.9	2	11.4	0	1.1	0	4	1.9	25.1
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0.9	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0.7	0	1.9	0	1.1	0	0	0.9	1
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	2.8	1
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	1.9	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		0.9	9.9	2.5	6.6	2	15.3	0	2.2	0	4	6.6	27.2

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Aug-05	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		0	0	0	0	0	0	0	0	0	0	0	0

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Sep-05	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Oct-05	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Nov-05	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Apr-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	1.8
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	2.7
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	1.9	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.9**	**0**	**0**	**4.4**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
May -06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	1
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Jun-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	13.8
		Yolk-sac larvae	0	0	0	0	0	3.3	0	4.6	0	6.6	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	1.1	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	50.3
		Post-yolk-sac larvae	0	0	0	0	0	0	1.8	0	0	1.3	1.1	34.9
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	5.3	0	0
		Post-yolk-sac larvae	0	0	0.5	0	0	0	0	0	0	1.3	0	0
	Total		**0**	**0**	**0.5**	**0**	**0**	**3.3**	**1.8**	**4.6**	**0**	**14.5**	**2.1**	**99**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Jul-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	1.9	2.7	2	0	2	6.6	1.8	0	4.6	1.7	0
		Post-yolk-sac larvae	0	1.9	0.5	6.1	3.8	0	7.9	17.9	0	9.2	0.9	57.8
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	2	0	1.8	0	0	0	3
		Post-yolk-sac larvae	0	0	0	0	0	0	0	1.8	0	0	0	6
	Round goby	Post-yolk-sac larvae	0	1.9	0	0.5	0	14.1	0	10.7	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**5.6**	**3.3**	**8.6**	**3.8**	**18.1**	**14.6**	**34**	**0**	**13.8**	**2.6**	**66.7**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Aug-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0.9
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.9**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Sep-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		0	0	0	0	0	0	0	0	0	0	0	0

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Oct-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(continued)

Appendix Table L. (Continued)

			Station											
			Experimental, 30-40 feet		Experimental, surface - 20 feet		Intake, 22 feet		Intake, 11 feet		Intake, surface		Shoreline	
			Diel		Diel		Diel		Diel		Diel		Diel	
			Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
			Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³	Density /100 m³
Nov-06	Alewife	Egg	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Common carp	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Cyprinidae	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0
		Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round goby	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Round whitefish	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Slimy sculpin	Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow perch	Yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
		Post-yolk-sac larvae	0	0	0	0	0	0	0	0	0	0	0	0
	Total		0	0	0	0	0	0	0	0	0	0	0	0

Appendix Table M. Mean Catch per Unit Effort (fish per hour) of Fish Captured in Gill Nets in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.

		Station			
		Intake		40 ft	
		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE
Jun-05	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.49
	Lake whitefish	0.00	0.00	0.00	0.24
	Longnose sucker	0.00	0.24	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	5.76	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.89	0.24	0.00	0.00
	Yellow perch	9.33	0.00	0.00	0.00
	Total	**10.22**	**6.24**	**0.00**	**0.73**
Jul-05	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.50
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.25
	Spottail shiner	0.00	4.34	0.00	3.00
	Walleye	0.00	0.24	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	4.10	4.75	0.25
	Total	**0.00**	**8.67**	**4.75**	**4.00**
Aug-05	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.24
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.71	0.00	0.24
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	1.18	0.00	0.75	0.00
	Round goby	0.00	0.00	0.00	0.00

(continued)

Appendix Table M. (Continued)

		Station			
		Intake		40 ft	
		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE
Aug-05 (Cont'd)	Spottail shiner	0.00	0.95	0.00	0.00
	Walleye	0.00	0.24	0.00	0.00
	White sucker	0.24	0.00	0.00	0.00
	Yellow perch	0.24	0.24	1.00	0.00
	Total	**1.65**	**2.13**	**1.76**	**0.47**
Sep-05	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.24	0.00	0.00
	Freshwater drum	0.00	0.24	0.00	0.00
	Gizzard shad	0.23	0.24	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	1.71	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	4.42	0.24	0.00	0.00
	Total	**4.65**	**2.69**	**0.00**	**0.00**
Oct-05	Alewife	0.00	0.00	1.74	0.00
	Bloater	0.00	0.00	0.50	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.25	0.00	0.00
	Freshwater drum	0.00	0.74	0.25	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.98	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.00
	Total	**0.00**	**1.97**	**2.48**	**0.00**
Nov-05	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.24	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00

(continued)

Appendix Table M. (Continued)

		Station			
		Intake		40 ft	
		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE
Nov-05 (Cont'd)	Rainbow smelt	0.47	0.00	0.00	0.00
	Round goby	0.00	0.49	0.00	0.00
	Spottail shiner	1.88	0.73	0.50	0.00
	Walleye	0.00	0.00	0.25	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.00
	Total	**2.34**	**1.47**	**0.74**	**0.00**
Apr-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.23	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.22	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.23	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.46**	**0.22**	**0.00**
May-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.50	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.50**	**0.00**	**0.00**
Jun-06	Alewife	0.26	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00

(continued)

Appendix Table M. (Continued)

		Station			
		Intake		40 ft	
		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE
Jun-06 (Cont'd)	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	1.20	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.72	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.00
	Total	**0.26**	**1.92**	**0.00**	**0.00**
Jul-06	Alewife	0.00	0.00	0.24	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.17	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.17	0.00	0.00
	Spottail shiner	0.48	0.67	1.42	0.00
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.47	0.00
	Yellow perch	0.73	0.00	0.47	0.00
	Total	**1.21**	**1.00**	**2.60**	**0.00**
Aug-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.50	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.00	0.00	0.93
	Walleye	0.00	0.25	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.25	0.00	0.75	0.00
	Total	**0.25**	**0.75**	**0.75**	**0.93**
Sep-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.24	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00

(continued)

Appendix Table M. (Continued)

		Station			
		Intake		40 ft	
		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE
Sep-06 (Cont'd)	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.72	0.00	0.24
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.72	0.00	0.24
	Total	**0.00**	**1.69**	**0.00**	**0.47**
Oct-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.00	0.26	0.00	0.00
	Channel catfish	0.25	0.26	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.79	0.00	0.50
	Gizzard shad	0.25	0.26	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.00	0.00	0.00
	Lake whitefish	0.00	0.00	0.00	0.00
	Longnose sucker	0.00	0.00	0.00	0.00
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	2.64	0.00	0.25
	Walleye	0.00	0.00	0.00	0.00
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	2.11	0.00	1.00
	Total	**0.50**	**6.34**	**0.00**	**1.76**
Nov-06	Alewife	0.00	0.00	0.00	0.00
	Bloater	0.25	0.00	0.00	0.24
	Channel catfish	0.00	0.00	0.00	0.00
	Common carp	0.00	0.00	0.00	0.00
	Freshwater drum	0.00	0.00	0.00	0.00
	Gizzard shad	0.00	0.00	0.00	0.00
	Golden redhorse	0.00	0.00	0.00	0.00
	Lake sturgeon	0.00	0.00	0.00	0.00
	Lake trout	0.00	0.25	0.00	0.00
	Lake whitefish	0.00	0.25	0.00	0.24
	Longnose sucker	0.00	0.00	0.00	0.24
	Rainbow smelt	0.00	0.00	0.00	0.00
	Round goby	0.00	0.00	0.00	0.00
	Spottail shiner	0.00	0.25	0.00	0.24
	Walleye	0.00	0.00	0.00	0.24
	White sucker	0.00	0.00	0.00	0.00
	Yellow perch	0.00	0.00	0.00	0.24
	Total	**0.25**	**0.74**	**0.00**	**1.45**

Appendix Table N. **Mean Catch per Unit Effort (fish per trawl) of Fish Captured in the Otter Trawl in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.**

		Station					
		Shore		Intake (22 ft)		Experimental (40 ft)	
		Diel		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE	CPUE	CPUE
Jun-05	Alewife			1.0	3.0	0.0	0.0
	Bloater			0.0	0.0	0.0	0.0
	Gizzard shad			0.0	0.0	0.0	0.0
	Lake whitefish			0.0	1.0	0.0	0.0
	Rainbow smelt			0.0	0.0	0.0	0.0
	Round goby			0.0	4.0	0.0	0.0
	Slimy sculpin			0.0	0.0	0.0	0.0
	Spottail shiner			3.0	14.0	0.0	0.0
	White sucker			0.0	0.0	0.0	0.0
	Yellow perch			5.0	5.0	1.0	1.0
	Total			**9.0**	**27.0**	**1.0**	**1.0**
Jul-05	Alewife			0.0	0.0	0.0	0.0
	Bloater			0.0	0.0	0.0	0.0
	Gizzard shad			0.0	0.0	0.0	0.0
	Lake whitefish			0.0	0.0	0.0	0.0
	Rainbow smelt			0.0	0.0	0.0	0.0
	Round goby			0.0	0.0	0.0	0.0
	Slimy sculpin			0.0	0.0	0.0	0.0
	Spottail shiner			0.0	1.0	0.0	0.0
	White sucker			0.0	0.0	0.0	0.0
	Yellow perch			0.0	0.0	2.0	0.0
	Total			**0.0**	**1.0**	**2.0**	**0.0**
Aug-05	Alewife			0.0	3.0	0.0	0.0
	Bloater			0.0	0.0	0.0	0.0
	Gizzard shad			0.0	0.0	0.0	0.0
	Lake whitefish			0.0	0.0	0.0	0.0
	Rainbow smelt			0.0	0.0	0.0	0.0
	Round goby			0.0	0.0	1.0	3.0
	Slimy sculpin			0.0	0.0	0.0	0.0
	Spottail shiner			0.0	4.0	0.0	0.0
	White sucker			0.0	0.0	0.0	0.0
	Yellow perch			1.0	0.0	0.0	0.0
	Total			**1.0**	**7.0**	**1.0**	**3.0**
Sep-05	Alewife			0.0	0.0	0.0	0.0
	Bloater			0.0	0.0	0.0	0.0
	Gizzard shad			0.0	0.0	0.0	0.0
	Lake whitefish			0.0	1.0	0.0	0.0
	Rainbow smelt			0.0	0.0	0.0	0.0
	Round goby			0.0	0.0	4.0	0.0
	Slimy sculpin			0.0	0.0	0.0	0.0
	Spottail shiner			0.0	0.0	0.0	0.0
	White sucker			0.0	0.0	0.0	0.0
	Yellow perch			99.0	0.0	0.0	0.0
	Total			**99.0**	**1.0**	**4.0**	**0.0**

(continued)

Appendix Table N. (Continued)

		Station					
		Shore		Intake (22 ft)		Experimental (40 ft)	
		Diel		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE	CPUE	CPUE
Oct-05	Alewife	0.0	1.0	0.0	1.0	0.0	0.0
	Bloater	0.0	3.0	0.0	3.0	0.0	9.0
	Gizzard shad	0.0	17.0	0.0	3.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	0.0	1.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	1.0	0.0	0.0	2.0	0.0	0.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	2.0	0.0	11.0	6.0	16.0
	Total	**1.0**	**23.0**	**0.0**	**20.0**	**6.0**	**26.0**
Nov-05	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	0.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	0.0	0.0	1.0	0.0	0.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	0.0	4.0	0.0	0.0	0.0
	Total	**0.0**	**0.0**	**4.0**	**1.0**	**0.0**	**0.0**
Apr-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	1.0
	Round goby	0.0	0.0	0.0	0.0	2.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	1.0
	Spottail shiner	0.0	1.0	0.0	0.0	0.0	2.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	1.0	0.0	3.0	0.0	3.0	2.0
	Total	**1.0**	**1.0**	**3.0**	**0.0**	**5.0**	**6.0**
May-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	4.0
	Rainbow smelt	0.0	0.0	0.0	0.0	1.0	1.0
	Round goby	0.0	1.0	0.0	1.0	2.0	3.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	5.0	0.0	1.0	0.0	1.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	1.0	1.0	5.0	9.0	7.0	3.0
	Total	**1.0**	**7.0**	**5.0**	**11.0**	**10.0**	**12.0**

(continued)

Appendix Table N. (Continued)

		Station					
		Shore		Intake (22 ft)		Experimental (40 ft)	
		Diel		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE	CPUE	CPUE
Jun-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	2.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	6.0	3.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	0.0	0.0	3.0	0.0	1.0
	White sucker	0.0	0.0	1.0	0.0	0.0	0.0
	Yellow perch	2.0	0.0	57.0	10.0	0.0	1.0
	Total	**2.0**	**0.0**	**58.0**	**13.0**	**6.0**	**7.0**
Jul-06	Alewife	0.0	0.0	0.0	3.0	1.0	4.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	5.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	1.0	5.0	11.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	0.0	0.0	2.0	2.0	2.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	50.0	0.0	105.0	7.0	3.0	1.0
	Total	**50.0**	**0.0**	**105.0**	**13.0**	**11.0**	**23.0**
Aug-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	3.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	1.0	0.0	0.0	0.0	0.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	0.0	0.0	2.0	0.0	1.0
	Total	**0.0**	**1.0**	**0.0**	**2.0**	**3.0**	**1.0**
Sep-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	1.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	0.0	0.0	0.0	0.0	0.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	0.0	1.0	0.0	2.0	0.0
	Total	**0.0**	**0.0**	**1.0**	**0.0**	**3.0**	**0.0**

(continued)

Appendix Table N. (Continued)

		Station					
		Shore		Intake (22 ft)		Experimental (40 ft)	
		Diel		Diel		Diel	
		Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)	Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE	CPUE	CPUE	CPUE	CPUE
Oct-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	0.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	1.0	0.0	0.0	0.0	0.0	0.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	0.0	1.0	0.0	0.0	1.0
	Total	**1.0**	**0.0**	**1.0**	**0.0**	**0.0**	**1.0**
Nov-06	Alewife	0.0	0.0	0.0	0.0	0.0	0.0
	Bloater	0.0	0.0	0.0	0.0	0.0	0.0
	Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0
	Lake whitefish	0.0	0.0	0.0	0.0	0.0	0.0
	Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0
	Round goby	0.0	0.0	0.0	0.0	0.0	0.0
	Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0
	Spottail shiner	0.0	1.0	0.0	1.0	0.0	8.0
	White sucker	0.0	0.0	0.0	0.0	0.0	0.0
	Yellow perch	0.0	1.0	0.0	1.0	2.0	3.0
	Total	**0.0**	**2.0**	**0.0**	**2.0**	**2.0**	**11.0**

Appendix Table O. Mean Catch per Unit Effort (fish per haul) of Fish Captured in the Seine in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Aug-05	Alewife	2.5	17.0
	Bloater	1.0	2.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	1.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.5	0.5
	Shorthead redhorse	0.0	0.0
	Spottail shiner	1.0	30.0
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	545.5	68.0
	Total	**551.5**	**117.5**
Sep-05	Alewife	0.0	0.0
	Bloater	0.5	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.5	0.0
	Gizzard shad	0.0	0.5
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	0.5	0.0
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	0.0
	Total	**1.5**	**0.5**

(continued)

Appendix Table O. (Continued)

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Oct-05	Alewife	4.0	3.5
	Bloater	16.0	1.5
	Bluegill	0.5	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.5	0.0
	Gizzard shad	13.5	47.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.5	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	3.5	0.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.5	0.0
	Total	**39.0**	**52.5**
Nov-05	Alewife	0.0	0.5
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.5
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	15.5
	Lake trout	0.0	0.5
	Longnose sucker	0.0	0.5
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	3.0	1.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	0.0
	Total	**3.0**	**19.0**

Appendix Table O. (Continued)

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Apr-06	Alewife	0.0	0.0
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	1.5
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.5
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	7.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	0.0	5.0
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	1.0
	Yellow perch	0.5	1.0
	Total	**0.5**	**16.0**
May-06	Alewife	0.0	0.0
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.5	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.5	2.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	2.5	29.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	0.0
	Total	**3.5**	**31.5**

Appendix Table O. (Continued)

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Jun-06	Alewife	0.5	4.5
	Bloater	1.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	1.0	0.0
	Eastern banded killifish	1.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	8.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	61.0	28.0
	Steelhead	0.0	0.0
	Walleye	0.0	0.5
	White sucker	0.0	0.0
	Yellow perch	6.5	3.0
	Total	**79.0**	**36.0**
Jul-06	Alewife	0.0	6.5
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.5	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	1.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	2.5	22.0
	Steelhead	0.5	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.5
	Yellow perch	2.0	2.0
	Total	**5.5**	**32.0**

Appendix Table O. (Continued)

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Aug-06	Alewife	0.0	0.5
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.5
	Shorthead redhorse	0.0	0.0
	Spottail shiner	0.0	0.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	1.5	0.5
	Total	**1.5**	**2.0**
Sep-06	Alewife	0.0	0.0
	Bloater	0.0	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.5
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	2.0	0.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	1.5
	Total	**2.0**	**2.5**

Appendix Table O. (Continued)

		Diel	
		Day (0600-1800)	Night (1800-0600)
		CPUE	CPUE
Oct-06	Alewife	32.0	0.0
	Bloater	40.5	0.0
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.5
	Lake trout	0.0	0.5
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.5	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	1.0	0.0
	Spottail shiner	3.5	0.5
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	0.0
	Total	**77.5**	**1.5**
Nov-06	Alewife	0.0	0.0
	Bloater	0.0	0.5
	Bluegill	0.0	0.0
	Brook silverside	0.0	0.0
	Chinook	0.0	0.0
	Coho	0.0	0.0
	Eastern banded killifish	0.0	0.0
	Gizzard shad	0.0	0.0
	Lake trout	0.0	0.0
	Longnose sucker	0.0	0.0
	Muskellunge	0.0	0.0
	Rainbow smelt	0.0	0.0
	Round goby	0.0	0.0
	Shorthead redhorse	0.0	0.0
	Spottail shiner	1.5	0.0
	Steelhead	0.0	0.0
	Walleye	0.0	0.0
	White sucker	0.0	0.0
	Yellow perch	0.0	0.5
	Total	1.5	1.0

Appendix Table P. **Water Quality Data Associated with Ichthyoplankton Sampling in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.**

		April	May	June	July	August	September	October	November
Location=Inshore Station									
2005	Surface Temperature (° C)					18.6	23.1	12.0	13.2
	Surface Dissolved Oxygen (mg/l)					9.8	9.1	9.9	10.8
2006	Surface Temperature (° C)	7.3	10.5	19.4	23.0	23.2	22.2		9.9
	Surface Dissolved Oxygen (mg/l)	13.3	12.4	10.7	8.5	8.9	9.2		10.9
Location=Intake Station (22 ft in depth)									
2005	Surface Temperature (° C)			26.0	27.2	19.5	22.8	12.8	12.9
	Mid-depth Temperature (° C)			22.4	24.7	17.3	22.6	11.9	12.8
	Bottom Temperature (° C)			19.7	24.5	14.7	22.3	10.9	12.4
	Surface Dissolved Oxygen (mg/l)			8.9	7.8	9.4	9.1	9.5	10.5
	Mid-depth Dissolved Oxygen (mg/l)			9.5	8.2	10.4	9.1	9.6	10.5
	Bottom Dissolved Oxygen (mg/l)			10.3	8.2	11.2	9.2	9.5	10.4
2006	Surface Temperature (° C)	6.4	10.5	18.2	23.9	22.4	22.1		10.6
	Mid-depth Temperature (° C)	6.4	9.6	17.5	22.4	21.8	20.8		9.7
	Bottom Temperature (° C)	6.4	9.0	17.1	19.0	21.2	20.8		9.5
	Surface Dissolved Oxygen (mg/l)	13.3	12.4	10.9	8.7	9.0	9.2		10.7
	Mid-depth Dissolved Oxygen (mg/l)	13.2	12.4	11.1	9.3	9.3	9.3		10.7
	Bottom Dissolved Oxygen (mg/l)	13.3	12.5	11.3	10.8	9.4	9.2		10.9
Location=Experimental Station (40 ft in depth)									
2005	Surface - 20 ft. Water Temperature (° C)			23.5	25.4	17.0	22.6	12.6	12.8
	30-40 ft Water Temperature (° C)			12.0	24.5	11.7	20.2	10.5	12.2
	Surface - 20 ft. Water Dissolved Oxygen (mg/l)			9.5	8.0	10.4	9.1	9.6	10.5
	30-40 ft. Water Bottom Dissolved Oxygen (mg/l)			13.1	8.2	11.9	9.9	9.3	10.5
2006	Surface - 20 ft. Water Temperature (° C)	6.1	9.4	17.4	23.0	21.4	21.3		10.0
	30-40 ft Water Temperature (° C)	6.1	7.8	12.2	17.0	20.6	20.6		9.3
	Surface - 20 ft. Water Dissolved Oxygen (mg/l)	13.4	12.4	11.3	9.3	9.2	9.2		10.7
	30-40 ft. Water Bottom Dissolved Oxygen (mg/l)	13.3	12.6	13.5	10.9	9.4	9.2		11.1

Appendix Table Q. **Water Quality Data Associated with Gill Net (A), Otter Trawl (B), and Seine (C) Sampling in the Vicinity of Cook Nuclear Plant, June through November 2005 and April through November 2006.**

A. Gill Net

Location			April	May	June	July	August	September	October	November
Intake	2005	Surface Temperature (° C)			22	27.2	19.9	25.2	13.4	13.1
		Bottom Temperature (° C)			21.2	24.4	15.8	22.5	11.2	12.4
		Surface Dissolved Oxygen (mg/l)			9.3	7.9	9.5	8.6	9.6	10.5
		Bottom Dissolved Oxygen (mg/l)			9.6	8.2	10.9	9	9.6	10.5
	2006	Surface Temperature (° C)	6.4	10	18.3	24.2	22.9	22.4		10.8
		Bottom Temperature (° C)	6.3	8.5	17.1	20.2	21.6	20.5		9.6
		Surface Dissolved Oxygen (mg/l)	13.4	12.7	10.9	8.8	9	8.5		10.5
		Bottom Dissolved Oxygen (mg/l)	13.3	12.7	11.4	10.1	9.2	8.6		10.6
40 ft	2005	Surface Temperature (° C)			22.5	27.8	19.6	24.6	13	13.2
		Bottom Temperature (° C)			10.1	24.5	11.7	14.1	10.5	12.3
		Surface Dissolved Oxygen (mg/l)			9.3	7.6	9.7	8.7	9.7	10.5
		Bottom Dissolved Oxygen (mg/l)			13.6	8.2	12.1	11.7	9.3	10.4
	2006	Surface Temperature (° C)	6.1	10.6	18.2	24	22.4	22.5		11.1
		Bottom Temperature (° C)	6	7.8	11.7	15.1	21.1	20.4		9.4
		Surface Dissolved Oxygen (mg/l)	13.6	12.4	11	8.9	9.1	8.5		10.7
		Bottom Dissolved Oxygen (mg/l)	13.3	12.6	13.7	11.4	9.3	8.4		10.1

Appendix Table Q. (Continued)

B. Otter Trawl

			April	May	June	July	August	September	October	November
5 ft	2005	Surface Temperature (° C)							12.3	13.2
		Surface Dissolved Oxygen (mg/l)							9.9	11
	2006	Surface Temperature (° C)	7.1	10.4	19.8	23	22.5	20.9		9.5
		Surface Dissolved Oxygen (mg/l)	13.2	12.4	10.7	8.9	8.9	8.7		10.9
Intake (22 ft)	2005	Surface Temperature (° C)			22.4	27.1	20.3	25.5	12.4	12.7
		Bottom Temperature (° C)			21.2	24.4	15	22.5		12.3
		Surface Dissolved Oxygen (mg/l)			9.3	7.8	9.6	8.7	9.8	10.8
		Bottom Dissolved Oxygen (mg/l)			9.7	8.5	11.3	9.1		10.7
	2006	Surface Temperature (° C)	6.4	10	21.3	23.9	22.1	21		10
		Bottom Temperature (° C)	6.4	8.9	18.5	19	21.7	20.5		9.2
		Surface Dissolved Oxygen (mg/l)	13.3	12.5	10.9	8.7	9	8.6		10.7
		Bottom Dissolved Oxygen (mg/l)	13.2	12.5	11.1	10.8	9.2	8.7		11.1
Experimental (40 ft)	2005	Surface Temperature (° C)			22	27.7	19.7	24.4	13.6	12.9
		Bottom Temperature (° C)			10.2	24.4	12	17.6		12.2
		Surface Dissolved Oxygen (mg/l)			9.3	7.6	9.9	8.6	9.8	10.7
		Bottom Dissolved Oxygen (mg/l)			13.5	8	12.1	10.7		10.5
	2006	Surface Temperature (° C)	6.1	10.1	20.4	24	21.9	21.4		10.3
		Bottom Temperature (° C)	6.1	7.9	15.9	15.4	20.6	20.5		9.2
		Surface Dissolved Oxygen (mg/l)	13.6	12.6	10.9	8.9	9.1	8.6		10.8
		Bottom Dissolved Oxygen (mg/l)	13.2	12.6	12.1	11.9	9.5	8.6		10

C. Seine

		April	May	June	July	August	September	October	November
2005	Surface Temperature (° C)					18.7	25		12.8
	Surface Dissolved Oxygen (mg/l)					9.7	8.8		10.7
2006	Surface Temperature (° C)	8.5	10.6	19.5	23.1	23.1	21.5		9.9
	Surface Dissolved Oxygen (mg/l)	12.5	12.3	10.8	8.4	9	8.7		10.5