



Entergy

Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Vermont Yankee
322 Governor Hunt Rd.
P.O. Box 157
Vernon, VT 05354
Tel 802-257-7711

29 September 2005

Carol Carpenter
Department of Environmental Conservation
Wastewater Management Division
Vermont Agency of Natural Resources
103 South Main Street – Sewing Building
Waterbury, VT 05671-0405

Reference: Vermont Yankee NPDES Permit No. VT0000264

Subject: Application for NPDES Permit Renewal 2006-2010

Dear Carol,

This letter and the attached documents comprise Vermont Yankee's NPDES renewal application. As in past renewals, we are requesting authorization to change some of the water treatment chemicals that are used in the service and circulating water systems. Entergy is moving to a fleet-wide approach as industry continues to improve and change water treatment chemicals. Our current Permit expires on March 31, 2006. The following attachments are included in support of this application:

1. **Attachment A:** Permit application form WR-82 and Schedule B (WR82B) forms for discharge SN 001 through 012.
2. **Attachment B:** Requested changes to NPDES Permit.
3. **Attachment C:** New MSDS Sheets for Ondeo Nalco water treatment chemicals. All Entergy Stations are making an effort to switch over to treatment chemicals manufactured by Nalco. Vermont Yankee requests the ability to retain a backup treatment chemical in the event those manufactured by Nalco become unavailable. Nalco chemicals will be used preferentially over the backup chemicals.
4. **Attachment D:** Expanded statistical analysis, adding the years 2003 and 2004 to the analysis presented in the 2004 316(a) Demonstration.

5. Attachment E: Updated Station flow diagram relative to NPDES discharge points.

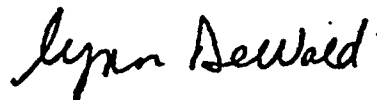
Please note also that the renewed permit will need to include an extended submission schedule for Vermont Yankee's submission of a Proposal for Information Collection ("PIC") and a Comprehensive Demonstration Study ("CDS") as required by the CWA section 316(b) Phase II Rule. Entergy requested this extended submission schedule in a letter dated March 7, 2005, and Mr. Kooiker responded by letter on April 22, 2005 indicating that the PIC and CDS would not be required to be made a part of the NPDES renewal application and that a specific extended submission schedule would be considered as a part of the permit renewal process. Entergy previously has delivered entrainment and impingement data collections completed through the end of 2004 to the Environmental Advisory Committee. Entergy will deliver additional and more recent information, as described in the forthcoming PIC, as part of the CDS.

The 100.00 application fee is also enclosed.

Please do not hesitate to call if you require additional information.

Sincerely,

Entergy Nuclear Vermont Yankee, LLC



Lynn DeWald
Environmental Specialist



Samuel A. Wender, IV
Chemistry Superintendent

10. Receiving Water for Indirect Discharges: Connecticut River
11. ALL other Pretreatment and Direct Discharges: Using a separate serial number (SIN), identify each independent discharge which will result from the activity described above. Attach a separate schedule for each discharge identified below.

Discharge	Receiving Water	Latitude/Longitude (optional)
S/N 001 Main Condenser Cooling & Service Water (SW)	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 002 Radioactive Liquid ¹	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 003 Heating Boiler Blow down	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 004 Water Treatment Carbon Filter Backwash	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 005 RHR Service Water Pump - Cooling Water	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 006 North Storm Drain Outfall	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 007 South Storm Drain Outfall	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 008 Southeast Storm Drain Outfall	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 009 Strainer & Traveling Screen Backwash	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 010 345kV Storm Drain Outfall	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"
S/N 011 115kV North Storm Drain Outfall	Connecticut River at Vernon VT	Latitude: 42° 46' 45" Longitude: 72° 30' 48"

¹ No such discharge has occurred since 1981.

Use an attached sheet for Additional Discharges.

12. 3 V.S.A. Section 2822 Fees: Call 802-241-3822 if you need assistance calculating the application review fee.

Administrative Processing Fee: \$ 100.00 (does not apply to Emergency Pollution Permits)

plus Application Review Fee: \$ 0 (does not apply to renewals)

Total Fee Enclosed: \$ 100.00

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS INFORMATION SUBMITTED ABOVE IS TRUE, ACCURATE AND COMPLETE. I RECOGNIZE THAT BY SIGNING THIS APPLICATION I AM GIVING CONSENT TO EMPLOYEES OF THE STATE TO ENTER THE SUBJECT PROPERTY FOR THE PURPOSE OF PROCESSING THIS APPLICATION.

Lynn Dewald

AUTHORIZED REPRESENTATIVE (please print)

Lynn Dewald
SIGNATURE

Environmental Specialist

TITLE

September 29, 2005

DATE

This application must be signed by the applicant or an officer in the applicant's business, a municipal official, etc. The application CANNOT be signed by the applicant's attorney, engineer, contractor, etc.

Submittal of Application: Attach appropriate schedules, administrative processing and application review fees, plans, specifications and other supporting material. Send application to:

Vermont Department of Environmental Conservation
Wastewater Management Division
103 South Main Street - The Sewing Building
Waterbury VT 05671-0405

Attachment A

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WASTEWATER MANAGEMENT DIVISION
10 V.S.A. Chapter 47 Permit Application Form WR-82

Application For: (Check () one) <input checked="" type="checkbox"/> <u>Municipal/Industrial</u> Discharge Permit <input type="checkbox"/> Emergency Pollution Permit <input type="checkbox"/> Indirect Discharge Permit <input type="checkbox"/> Pretreatment Discharge Permit <input type="checkbox"/> Stormwater Discharge Permit <input type="checkbox"/> UIC (non-stormwater) Permit	with Schedule: A or B E I B D or F Special Form	Action Requested: (Check () one) <input type="checkbox"/> Original Permit <input checked="" type="checkbox"/> Renewal <input type="checkbox"/> Amendment <input type="checkbox"/> Transfer Permit # <u>3-1199</u>
Status of Discharge: (Check () one) <input type="checkbox"/> Proposed <input checked="" type="checkbox"/> Existing	Nature of Waste: (Check () one) <input type="checkbox"/> Sanitary (domestic sewage only) <input checked="" type="checkbox"/> Non-Sewage/Industrial <input type="checkbox"/> Stormwater (surface or subsurface disp.)	

For DEC Use: PIN _____ Reviewer: _____ Check #: _____ Title 3: Y N

1. **Applicant:** Entergy Nuclear Vermont Yankee
2. **Legal Entity:** Limited Liability Company
(Individual, corporation, partnership, firm, state agency, municipality, etc.)
3. **Mailing Address:** 320 Governor Hunt Road Vernon, VT 05354
4. **Contact:** Lynn DeWald Telephone: (802) 258-5526
(Person to contact regarding this application) Fax (optional): (802) 258-5865
4. **Name of Activity:** Vermont Yankee Nuclear Power Station
(John Doe residence, SYZ Corp., Clark Lake State Park, Green Motel, etc.)
5. **Type of Activity:** Steam-Electric Generation
(Residential subdivision, paper mill, state park, motel, etc.)
6. **Description of Waste:** See each serial number listed below
7. **Name of Landowner:** Entergy Nuclear Vermont Yankee, LLC
8. **Location:** 320 Governor Hunt Road Town: Vernon
(Number and Street/Road Name)
9. If this application is for a permit renewal, is the original application still valid in all respects? Yes
10. If not, document changes on a separate attachment.

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 001 DESIGNATION: Main Condenser Cooling Water
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Discharge Structure, Vermont Yankee Nuclear Power Station. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Main Condenser Cooling (Using Connecticut River Water)
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
- SIC: 4911 SUB CATEGORY: Electrical Services
- PRODUCT: Electricity
- PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-6: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Heated Connecticut River water as a result of operation of the Station's Main Condenser.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? YES EXPLAIN AND DESCRIBE
- ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: Depending on ambient conditions, the mechanical draft cooling towers are sometimes used to remove heat.
- IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / . WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? YES IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL. An independent Certificate of Public Good, allowing a power uprate has been approved, but contemplates operations in accordance with the existing NPDES Permit, including as a result of cooling-tower modifications completed in 2005.

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See SN-001 Attachment A: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000 and Site Plan - Recognized Environmental Conditions, May 2001.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> :	WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
	WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> :	WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>543,000,000</u> GPD
	WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>543,000,000</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? NO

IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:

October 15th - May 15th: relatively uniform (mostly open cycle); May 16th - October 14th: variable (mixed open, hybrid and closed cycle) See SN-001 Attachments B and C, providing schematics of these cycles.

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: The mechanical draft cooling towers are used to remove heat from the circulating water discharge under certain conditions. The disposal of cooling tower silt and debris from the travelling screens is described on page 7 in the existing Permit, issued on 4 October 2004, see items 13 and 14.

9-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD₅: not monitored mg/l
 COD: not monitored mg/l
 TSS: not monitored mg/l
 TURBIDITY: not monitored JTU
 SETTLEABLE SOLIDS: none added mg/l
 OIL AND GREASE: none added mg/l
 FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l
 TOTAL PHOSPHORUS AS P: none added mg/l
 TOTAL KJELDAHL NITROGEN (TKN): none added mg/l
 COLOR: none added
 MATERIALS AFFECTING TASTE AND ODOR: none added
 TEMPERATURE RANGE: 70° F TO 105° F (May 16 - October 14)
 pH RANGE: 6.5 TO 8.5 SU

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l
 CADMIUM: none added mg/l
 CHLORINE (FREE): 0.2 mg/l
 CHROMIUM (+6): none added mg/l
 CHROMIUM (+3): none added mg/l
 COPPER: 0.001 - .099 mg/l
 CYANIDE: none added mg/l
 IRON: 0.1 - 5.11 mg/l
 LEAD: none added mg/l
 MANGANESE: none added mg/l

MERCURY: none added mg/l
 NICKEL: none added mg/l
 SELENIUM: none added mg/l
 SILVER: none added mg/l
 ZINC: 0.0029 - 2.07 mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

Added Heat from Condenser Cooling
Bromine (free) 0.2 mg/l
 _____ mg/l

(C) REMARKS: Data for Total Copper, Iron, and Zinc was taken from the Vermont Yankee annual reports 2000 - 2004; Ecological Studies of the Connecticut River, Vernon, Vermont that were previously submitted to the Agency.

NOTE: ** = may be present in trace amounts.

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA..

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 002 DESIGNATION: Radioactive High Purity Water
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Discharge Structure, Vermont Yankee Nuclear Power Station. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Processing radioactively contaminated water from power plant operation
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
- SIC: 4911 SUB CATEGORY: Electrical Services
- PRODUCT: Electricity
- PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGAENIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: High purity water containing radionuclides, mainly tritium.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? YES EXPLAIN AND DESCRIBE
- ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: Treatment facilities would always be in service if this type of discharge were to be scheduled. The last discharge of slightly radioactive water was in 1981.
- IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: ____/____/____ WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- 3-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE, INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See SN-002 Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000 and Site Plan.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | |
|--|----------------------------|
| (A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| (B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>10,000</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>10,000</u> GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? NO
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- Any discharge of this type would be done on a batch by batch basis and as stated above, have not been performed since 1981. However, they may occur.
- B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: Radioactive liquids are processed through the plant Radwaste system using ion exchange resins. When these resins become expended they become radioactive waste which is handled in accordance with NRC and other Federal regulations.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l
 COD: not monitored mg/l
 TSS: not monitored mg/l
 TURBIDITY: not monitored JTU
 SETTLEABLE SOLIDS: none added mg/l
 OIL AND GREASE: none added mg/l
 FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l
 TOTAL PHOSPHORUS AS P: none added mg/l
 TOTAL KJELDAHL NITROGEN (TKN): none added mg/l
 COLOR: none added
 MATERIALS AFFECTING TASTE AND ODOR: none added
 TEMPERATURE RANGE: 45° F TO 113° F
 pH RANGE: 6.5 TO 8.5 SU

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l
 CADMIUM: none added mg/l
 CHLORINE (FREE): none added mg/l
 CHROMIUM (+6): ** mg/l
 CHROMIUM (+3): ** mg/l
 COPPER: 0.001 - 0.09 mg/l
 CYANIDE: none added mg/l
 IRON: 0.1 - 5.11 mg/l
 LEAD: none added mg/l
 MANGANESE: none added mg/l

MERCURY: none added mg/l
 NICKEL: ** mg/l
 SELENIUM: none added mg/l
 SILVER: none added mg/l
 ZINC: 0.003 - 0.099 mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS: Data for Total Copper, Iron, and Zinc was taken from the Vermont Yankee annual reports 2000 - 2004: Ecological Studies of the Connecticut River, Vernon, Vermont that were previously submitted to the Agency.

NOTE: ** = may be present in trace amounts
 (Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 003 DESIGNATION: House Heating Boiler Water
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Discharge Structure, Vermont Yankee Nuclear Power Station, Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B-4: NATURE OF ACTIVITY: Normal operation of the Station's house heating boilers (blowdowns, maintenance etc...)
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR SUB-PART: _____
SIC: 4911 SUB CATEGORY: Electrical Services
PRODUCT: Electricity
PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-6: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: House heating boiler water; The boilers are treated daily from approximately mid October to mid May with Betz Dearborn's Control OS7700.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: These are minor discharges of 1,000 to 2,000 gallons per day which are diluted at a minimum of 1:250 prior to reaching the discharge structure.
IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / . WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See SN-002 Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000 and Site Plan.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | |
|--|---------------------------|
| (A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| (B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>130</u> GPD | MAXIMUM: <u>2,000</u> GPD |
| WEEKENDS AVERAGE: <u>130</u> GPD | MAXIMUM <u>2,000</u> GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? NO
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- Once or twice per day during the heating season, typically mid October to mid May. At the end of the heating season, each boiler is drained of 2,000 gallons of water.
- B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: There is no treatment of this waste stream. The boiler water blowdowns contain some solids and residual boiler treatment chemical. These would not be detectable at the Station's discharge structure.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD₅: not monitored mg/l
 COD: not monitored mg/l
 TSS: not monitored mg/l
 TURBIDITY: not monitored JTU
 SETTLEABLE SOLIDS: none added mg/l
 OIL AND GREASE: none added mg/l
 FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l
 TOTAL PHOSPHORUS AS P: none added mg/l
 TOTAL KJELDAHL NITROGEN (TKN): none added mg/l
 COLOR: yellow to slightly brown
 MATERIALS AFFECTING TASTE AND ODOR: none added
 TEMPERATURE RANGE: 45° F TO 120° F
 pH RANGE: 8.5 TO 11.0 SU

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l
 CADMIUM: none added mg/l
 CHLORINE (FREE): none added mg/l
 CHROMIUM (+6): ** mg/l
 CHROMIUM (+3): ** mg/l
 COPPER: 0.001 - 0.09 mg/l
 CYANIDE: none added mg/l
 IRON: 0.1 - 5.11 mg/l
 LEAD: none added mg/l
 MANGANESE: none added mg/l

MERCURY: none added mg/l
 NICKEL: ** mg/l
 SELENIUM: none added mg/l
 SILVER: none added mg/l
 ZINC: 0.003 - 0.099 mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

Hydroquinone 2-10 mg/l

(C) REMARKS: Data for Total Copper, Iron, and Zinc was taken from the Vermont Yankee annual reports 2000 - 2004; Ecological Studies of the Connecticut River, Vernon, Vermont that were previously submitted to the Agency.

NOTE: ** = may be present in trace amounts.

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 004 DESIGNATION: Carbon Filter Backwash
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Discharge Structure, Vermont Yankee Nuclear Power Station. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Carbon filtration of potable or river water for non-cooling uses
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
- SIC: 4911 SUB CATEGORY: Electrical Services
- PRODUCT: Electricity
- PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Solids from the backwash of potable or river water carbon filter.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: Treatment facility is operated approximately every three to six weeks, year round.
- IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> :	WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
	WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> :	WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>10,000</u> GPD
	WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>10,000</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes

IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:

Discharges are uniform in content but only occur every three to six weeks, year round.

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: The suspended solids (maximum of 8.3 pounds per day) are backwashed to the plant storm drain system and ultimately discharge to the river.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: 0.1-8.6 mg/l

TURBIDITY: not monitored JTU

SETTLABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: 40° F TO 75° F

pH RANGE: 6.0 TO 7.5 SU

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 005 DESIGNATION: RHR Service Water Pump Cooling Water
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Discharge Structure, Vermont Yankee Nuclear Power Station. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B-4: NATURE OF ACTIVITY: Provides Connecticut River water to cool each of the four RHR service water pump motors.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
SIC: 4911 SUB CATEGORY: Electrical Services
PRODUCT: Electricity
PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-6: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Slightly heated Connecticut River water
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment necessary as this is considered a minor cooling water discharge.
IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / . WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- 9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | | | | |
|-------------------------------|------------------------------|-----|----------------------|-----|
| (A) <u>SANITARY WASTES</u> : | WEEKDAYS AVERAGE: <u>N/A</u> | GPD | MAXIMUM: <u>N/A</u> | GPD |
| | WEEKENDS AVERAGE: <u>N/A</u> | GPD | MAXIMUM: <u>N/A</u> | GPD |
| (B) <u>ALL OTHER WASTES</u> : | WEEKDAYS AVERAGE: <u>N/A</u> | GPD | MAXIMUM: <u>0.14</u> | GPD |
| | WEEKENDS AVERAGE: <u>N/A</u> | GPD | MAXIMUM: <u>0.14</u> | GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- 12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLEABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: amount added is immeasurable

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C)

REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 006 DESIGNATION: North Stormwater System
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Approximately 200 yards north of Station's intake structure Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B-4: NATURE OF ACTIVITY: Stormwater and surface water runoff
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
- SIC: 4911 SUB CATEGORY: Electrical Services
- PRODUCT: Electricity
- PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- 5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater and surface water runoff
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required
- IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / . WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- 9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | | |
|-------------------------------|----------------------------------|-------------------------|
| (A) <u>SANITARY WASTES</u> : | WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| | WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| (B) <u>ALL OTHER WASTES</u> : | WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
| | WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- 12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLEABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: none added

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 007 DESIGNATION: South Stormwater System
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Station's discharge structure
Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B-4: NATURE OF ACTIVITY: Stormwater and surface water runoff for the southern portion of the site.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
 SIC: 4911 SUB CATEGORY: Electrical Services
 PRODUCT: Electricity
 PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- 5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating),
 INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater and surface water runoff.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE
 ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required.
 IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: ____/____/____ WILL WASTES BE TREATED PRIOR TO
 DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT
 FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER
 CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL
 LEVEL

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes

IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD₅: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: none added

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 008 DESIGNATION: Southeast Stormwater System
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Southeast corner of site property (50 ft. southeast of southfield groundwater monitoring well WVN 0204 (residuals Mgt monitoring well))
Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Stormwater and surface water runoff for the southern portion of the site.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
SIC: 4911 SUB CATEGORY: Electrical Services
PRODUCT: Electricity
PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGAENIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater and surface water runoff.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required.
IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE, INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes

IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

COD: not monitored mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TSS: not monitored mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

TURBIDITY: not monitored JTU

COLOR: N/A

SETTLABLE SOLIDS: none added mg/l

MATERIALS AFFECTING TASTE AND ODOR: none added

OIL AND GREASE: none added mg/l

TEMPERATURE RANGE: none added

FLOATABLE SOLIDS: none added mg/l

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

MERCURY: none added mg/l

CADMIUM: none added mg/l

NICKEL: none added mg/l

CHLORINE (FREE): none added mg/l

SELENIUM: none added mg/l

CHROMIUM (+6): none added mg/l

SILVER: none added mg/l

CHROMIUM (+3): none added mg/l

ZINC: none added mg/l

COPPER: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 009 DESIGNATION: Strainer and Traveling Screen Backwash
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Station's Intake Structure
Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Backwashing of cooling water intake structure traveling screens using Connecticut River water
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR SUB-PART: _____
 SIC: 4911 SUB CATEGORY: Electrical Services
 PRODUCT: Electricity
 PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- 5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating),
 INCLUDE A TOXIC ORGAENIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Connecticut River water used to backwash service water strainers and circulating water traveling screens that could contain a minimal concentration of NPDES Permit approved penetrant/biodispersent
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE
 ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required
 IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / WILL WASTES BE TREATED PRIOR TO
 DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT
 FACILITIES: There are no treatment facilities for the removal of the insignificant amount of the penetrant/biodispersent used to reduce biofouling of Station piping. All discharges via SN 009 pass through a retention basket with 3/8 in. mesh screening designed to remove debris impinged on the traveling screens, including leaves, wood, and grasses. All debris is disposed of according to state and federal requirements.
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER
 CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL
 LEVEL.

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE, INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: Service water pumps use river water to supply water to the strainer and traveling screen backwash equipment. Backwashed water goes to a retention basket which drains via gravity back to the river at the Station's intake structure. See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>17,000</u> GPD	MAXIMUM <u>50,000</u> GPD
WEEKENDS AVERAGE: <u>17,000</u> GPD	MAXIMUM <u>50,000</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? No. Strainer and traveling screen backwashes are more frequent during periods of high flow and debris loads (fall leaf drop for example)

IF NOT PROVIDE MONTHLY OR SEASONAL BREAKDOWN: Seasonal breakdown: Backwashes are more frequent during spring runoff when high river flows carry large volumes of debris down the river and again in the fall when deciduous trees shed their leaves.

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: Debris from this process is collected in the intake structure's retention basket. The contents of this basket is routinely cleaned out and all debris is deposited into a dumpster for disposal at a waste disposal facility.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: 35°F to 82°F

pH RANGE: 6.0 - 7.5 Su

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

Penetrant/Biodispersent Max = 30 mg/L

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 010 DESIGNATION: 345 KV Switchyard Stormwater Discharge
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Approximately 300 yards north of the Station's discharge structure. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Stormwater runoff from 345 switchyard.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR. SUB-PART: _____
 SIC: 4911 SUB CATEGORY: Electrical Services
 PRODUCT: Electricity
 PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- 5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGAENIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater runoff.
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required.
 IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / . WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A

B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.

B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.

(A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM: <u>N/A</u> GPD
(B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD
WEEKENDS AVERAGE: <u>N/A</u> GPD	MAXIMUM <u>N/A</u> GPD

WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes

IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:

B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A

B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: none added

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA..

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 011 DESIGNATION: 115 KV Switchyard Stormwater Discharge
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Approximately 350 yards north of the Station's discharge structure. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B4: NATURE OF ACTIVITY: Stormwater runoff from 115 switchyard.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR SUB-PART: _____
- SIC: 4911 SUB CATEGORY: Electrical Services
- PRODUCT: Electricity
- PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- 5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGAENIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater runoff
- B-7: EXISTING DISCHARGE? YES IF "YES". ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL-TIME OPERATION OF TREATMENT FACILITIES: No treatment required.
- IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | |
|--|-------------------------|
| (A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| (B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A.

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLEABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: none added

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCHEDULE B: INDUSTRIAL/COMMERCIAL/INSTITUTIONAL WR-82B

CHAPTER 47 OF TITLE 10 VSA.

DATE: 8/24/05

- B-1: APPLICANT: Entergy Nuclear Vermont Yankee, LLC ACTIVITY: Steam-Electric Generation
- B-2: DISCHARGES SN: 012 DESIGNATION: Stormwater runoff from new gravel parking lot
- B-3: EXACT LOCATION ON RECEIVING WATER (describe and Locate on map): Approximately 500 yards north of the Station's discharge structure. Latitude: 42° 46' 45" Longitude: 72° 30' 48"
- B-4: NATURE OF ACTIVITY: Stormwater runoff from 115 switchyard.
- B-5: POINT SOURCE CATEGORY (EPA): Transportation & Public Utility 40 CFR SUB-PART: _____
 SIC: 4911 SUB CATEGORY: Electrical Services
 PRODUCT: Electricity
 PRODUCTION PROCESS: Energy Conversion: Steam-Electric PRODUCTION: N/A TON/DAY N/A
- B-5a: IF THE DISCHARGE IS REGULATED BY EITHER 40 CFR PART 413 OR 40 CFR PART 433 (metal finishing or electroplating), INCLUDE A TOXIC ORGANIC MANAGEMENT PLAN. N/A
- B-6: DESCRIBE WASTES TO BE DISCHARGED: Stormwater runoff.
- B-7: EXISTING DISCHARGE? YES IF "YES", ARE WASTES BEING TREATED? No EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: No treatment required.
 IF "NO", GIVE DATE DISCHARGE WILL COMMENCE: / / WILL WASTES BE TREATED PRIOR TO DISCHARGE? N/A EXPLAIN AND DESCRIBE ANY LESS THAN FULL TIME OPERATION OF TREATMENT FACILITIES: _____
- B-8: ARE NEW TREATMENT FACILITIES OR MODIFICATIONS TO EXISTING FACILITIES IN DESIGN OR UNDER CONSTRUCTION? No IF SO, DESCRIBE AND PROVIDE SCHEDULE FOR ATTAINMENT OF OPERATIONAL LEVEL.

- B-9: IF DESIGN OF PROPOSED TREATMENT FACILITY REQUIRES A PERIOD FOR DATA COLLECTION. HOW MUCH TIME IS REQUIRED? N/A
- B-10: DESCRIBE FLOW SEQUENCE OF DISCHARGE. INCLUDING SOURCE OF INTAKE WATER, OPERATIONS CONTRIBUTING WASTEWATER TO THE EFFLUENT AND TREATMENT FACILITIES. ATTACH LINE DRAWING SHOWING THE WATER FLOW THROUGH THE FACILITY: See Attachment: "Schematic of Design Maximum Capacity Water flow", Revised May, 2000.
- B-11: VOLUMES OF WASTES, AFTER TREATMENT, IF ANY, TO BE DISCHARGED.
- | | |
|--|-------------------------|
| (A) <u>SANITARY WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM: <u>N/A</u> GPD |
| (B) <u>ALL OTHER WASTES</u> : WEEKDAYS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
| WEEKENDS AVERAGE: <u>N/A</u> GPD | MAXIMUM <u>N/A</u> GPD |
- WILL DISCHARGES IN (B) ABOVE BE ESSENTIALLY UNIFORM OVER A 12 MONTH PERIOD? Yes
- IF NOT, PROVIDE MONTHLY OR SEASONAL BREAKDOWN:
- B-12: IS THE PERSON WHO IS, OR WILL BE, RESPONSIBLE FOR OPERATION AND MAINTENANCE OF THE TREATMENT FACILITY CERTIFIED BY THE AGENCY OF NATURAL RESOURCES AS A TREATMENT PLANT OPERATOR? N/A
- B-13: DESCRIBE THE PROCEDURES USED FOR THE DISPOSAL OF ALL SOLIDS, SLUDGES, FILTER BACKWASH OR OTHER POLLUTANTS REMOVED IN THE COURSE OF TREATMENT OR CONTROL OF WASTEWATERS. INCLUDE DISPOSAL SITE OR LOCATION: N/A

B-14: DESCRIBE THE EFFLUENT CHARACTERISTICS OF WASTES, (B-12(A) AND (B) TO BE DISCHARGED WHICH YOU KNOW OR HAVE REASONS TO BELIEVE ARE PRESENT. PROVIDE MAXIMUM CONCENTRATIONS OR RANGE OF CONCENTRATIONS. IF NO CONSTITUENT OF THE TYPE INDICATED IS ADDED, ENTER "NONE ADDED". IF CONSTITUENT IS PRESENT IN UNKNOWN OR UNCERTAIN AMOUNT ENTER "PRESENT" AND DESCRIBE CIRCUMSTANCES RELATING TO ITS PRESENCE, INCLUDING AMOUNTS OF KNOWN CONSTITUENTS, UNDER (C) REMARKS BELOW.

A. BIOCHEMICAL AND PHYSICAL CHARACTERISTICS

BOD5: not monitored mg/l

COD: not monitored mg/l

TSS: not monitored mg/l

TURBIDITY: not monitored JTU

SETTLABLE SOLIDS: none added mg/l

OIL AND GREASE: none added mg/l

FLOATABLE SOLIDS: none added mg/l

TOTAL DISSOLVED SOLIDS: none added mg/l

TOTAL PHOSPHORUS AS P: none added mg/l

TOTAL KJELDAHL NITROGEN (TKN): none added mg/l

COLOR: N/A

MATERIALS AFFECTING TASTE AND ODOR: none added

TEMPERATURE RANGE: none added

pH RANGE: none added

B. CHEMICAL CONSTITUENTS

ARSENIC: none added mg/l

CADMIUM: none added mg/l

CHLORINE (FREE): none added mg/l

CHROMIUM (+6): none added mg/l

CHROMIUM (+3): none added mg/l

COPPER: none added mg/l

CYANIDE: none added mg/l

IRON: none added mg/l

LEAD: none added mg/l

MANGANESE: none added mg/l

MERCURY: none added mg/l

NICKEL: none added mg/l

SELENIUM: none added mg/l

SILVER: none added mg/l

ZINC: none added mg/l

OTHERS (including any other pollutant identified as a priority pollutant by EPA in the NRDC vs. Train consent decree of July 8, 1976)

(C) REMARKS:

(Instructions on reverse side)

Attachment B

NPDES No. VT0000264

Permittee: Entergy Nuclear Vermont Yankee, LLC
320 Governor Hunt Road
Vernon, VT 05354

Entergy Nuclear Vermont Yankee requests the Vermont Department of Environmental Conservation, Wastewater Management Division consider the following requested changes to the Station's NPDES Permit at this time of renewal.

Change No. 1. S/N 001 Circulating water discharge/main condenser cooling and service water.

At the bottom of Page 2, change footnote "b" to read "Oxidant or chlorine injection is limited to discharge during closed cycle only and detectable residuals are not to exceed 2 hours/day with the exception that the service water system may be treated during open/hybrid cycle with no detectable oxidant being measured at the discharge structure".

Reason for requested change: Since the NPDES Permit stipulates that no oxidant or chlorine can be detected at the discharge structure during service water treatments, VY is requesting that the limit on treatment duration, for service water only, be removed. This provides flexibility to the Station in combating biofouling of the service water system while maintaining the intent of the permit by continuing to not allow any discharge of oxidant to the river.

Change No. 2. Delete S/N 005 – Minor Cooling Water from Residual Heat Removal Service Water Pump motors – from the NPDES Permit, page 4, paragraph 5.

Permit Basis and Explanation for requested change: S/N 005 is a minor cooling water supply to 4 motors in the Residual Heat Removal Service Water (RHRSW) system. The motors, in turn, are coupled to pumps which provide cooling water to the Residual Heat Removal Heat Exchangers. The cooling water to the motors is limited to 46,500 gpd. The water runs through the motor coolers continuously. The purpose of the cooling water is to cool the motor bearing oil within the motor and extend the life of the bearings. While the cooling flow is continuous, the motors are operated infrequently. For example, for the preceding 12 months, these 4 pumps combined have less than 300 hours of operation. Any thermal input is insignificant and would be immeasurable at the outfall, which is the Station's discharge structure and in any event is accounted for in S/N 001 as part of the Permitted thermal discharge to the River.

Additionally, it is important to clarify that the water supplied to S/N 005 RHRSW motors is extracted from the flow stream from the service water pumps at the Station intake which is allowed a maximum of 14.4 mgd of water. Thus, the supply source of S/N 005 is already a controlled volume of water supply. Also, the discharge from the S/N 005

RHRWS motors is via S/N 007 discharge to the outfall. This internal discharge will not increase the total discharge through the discharge forebay (S/N 001 and 007). It is simply a re-routing of water from one part of the facility to the RHRWS pumps.

No effluent limits or monitoring is required for this waste stream which discharges through S/N 007 to the Station's discharge structure until it combines with S/N 001. This requirement is unchanged from the existing permit.

Change No. 3. On page 5, item 7 (stormwater runoff) add S/N 012 treated stormwater runoff from a gravel parking lot.

Explanation for requested change: With the recent construction of a new overflow gravel parking lot, the Station applied for and received a Stormwater General Permit (3653-9015) covering the discharge of treated runoff from this parking lot. The stormwater is first treated via either of two micropool extended detention ponds prior to discharging to an unnamed tributary of the Connecticut River approximately 500 yards north of the Station's Intake Structure. Since other stormwater discharges for the Station are captured within the NPDES Permit, this one should also be noted there for completeness.

Change No. 4. On page 8, Following Cortrol OS7700, add a second boiler treatment chemical Conquor CNQR 3588.

Explanation for requested change: Conquor CNQR3588 is an oxygen scavenger and pH control agent containing Diethyl-Hydroxyl-Amine (DEHA) as the oxygen scavenger. DEHA has been shown to have a lower toxicity than hydroquinone which is a constituent in Cortrol OS7700. This new chemical would be used preferentially at Vermont Yankee in the house heating boiler, however, we request retaining Cortrol OS7700 as an option for backup in the event Nalco is unable to provide Conquor CNQR 3588. Boiler discharges would be limited to 30 ppm as DEHA. (MSDS Is attached).

Change No. 5. On page 8, delete Bulab 7034 and change the name of Depositrol BL5303 to Scaletrol PDC 9329 (industry change).

The title should also be changed to read "Scaletrol PDC 9329 is a carbon steel corrosion control inhibitor used during system lay-up". Scaletrol PDC 9329 would be used at a concentration of 30 ppm (MSDS attached)

Change No. 6. On page 8 add the following additional chemicals manufactured by Nalco.

CL-103, manufactured by Nalco, is a non ionic surfactant for use in the Service Water System at a maximum concentration of 10 ppm.

PCL-401, manufactured by Nalco is a copolymeric anionic dispersant for use in the Service Water System. The maximum concentration if used as a slug feed 1-2 hours per day is 20 ppm. For continuous feed the Service Water System maximum concentration is 2.0 ppm.

CL-50, manufactured by Nalco, is a corrosion inhibitor that contains 35% poly phosphonate. This product would be used at a concentration of 15 ppm (MSDS attached).

Change No. 7. On page 6, item 10 a-f, replace the language in bullets a-f only to reflect that Entergy Vermont Yankee may only discharge radioactive liquid effluents in compliance with the NRC limits.

Explanation for requested change:

Retain the paragraph on page 6 that is currently item number 10 and add the following to the end of that paragraph: "Jurisdiction to regulate radioactive materials in water discharge permits is held by the Nuclear Regulatory Commission (NRC) under the Atomic Energy Act, 42 U.S.C. 2021, et seq. Therefore, the Permittee must comply with radiation standards established and regulated by the NRC".

Attachment C



MATERIAL SAFETY DATA SHEET

PRODUCT

CONQUOR® CNQR3588

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: CONQUOR® CNQR3588

APPLICATION: CORROSION INHIBITOR

COMPANY IDENTIFICATION: Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S): (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH: 3/3 FLAMMABILITY: 2/2 REACTIVITY: 0/0 OTHER:

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Cyclohexylamine	108-91-8	10.0 - 30.0
Methoxypropylamine	5332-73-0	10.0 - 30.0
Diethyl-Hydroxyl-Amine	3710-84-7	1.0 - 5.0

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER

Corrosive. Combustible. May cause tissue damage. Harmful if absorbed through skin. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep away from sources of ignition - No smoking. Keep away from heat. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.

Combustible Liquid; may form combustible mixtures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve ammonia (NH4) under fire conditions. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition.

PRIMARY ROUTES OF EXPOSURE:

Eye, Skin, Inhalation

Ondeo Nalco Company Ondeo Nalco Center • Naperville, Illinois 60563-1198

(630)305-1000

1 / 10

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****HUMAN HEALTH HAZARDS - ACUTE :****EYE CONTACT :**

Corrosive. Will cause eye burns and permanent tissue damage.

SKIN CONTACT :

May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered. Harmful if absorbed through skin.

INGESTION :

Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach.

INHALATION :

Irritating, in high concentrations, to the eyes, nose, throat and lungs. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.

SYMPTOMS OF EXPOSURE :**Acute :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES**EYE CONTACT :**

PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :

Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use.

INGESTION :

DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :

Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :

Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****5. FIRE FIGHTING MEASURES****FLASH POINT :** 158 °F / 70 °C (PMCC)**EXTINGUISHING MEDIA :**

Dry powder, Carbon dioxide, Foam, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material.

Keep containers cool by spraying with water.

FIRE AND EXPLOSION HAZARD :

Combustible Liquid; may form combustible mixtures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve ammonia (NH4) under fire conditions. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES**PERSONAL PRECAUTIONS :**

Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Remove sources of ignition. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7. HANDLING AND STORAGE**HANDLING :**

Do not get in eyes, on skin, on clothing. Do not take internally. Do not breathe vapors/gases/dust. Use with adequate ventilation. Avoid generating aerosols and mists. Keep away from acids and oxidizing agents. Do not use, store, spill or pour near heat, sparks or open flame. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****STORAGE CONDITIONS :**

Store the containers tightly closed. Store away from heat and sources of ignition. Use proper grounding procedures. Store separately from acids. Store separately from oxidizers. Amine and sulphite products should not be stored within close proximity or resulting vapors may form visible airborne particles.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**OCCUPATIONAL EXPOSURE LIMITS :**

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

Substance(s)

Cyclohexylamine

TWA: 10 ppm , 41 mg/m3

OSHA/PEL :

Substance(s)

Cyclohexylamine

TWA: 10 ppm , 40 mg/m3

AIHAWHEEL :

Substance(s)

Methoxypropylamine

TWA: 5 ppm

STEL: 15 ppm

ENGINEERING MEASURES :

General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :

If significant mists, vapors or aerosols are generated an approved respirator is recommended. An organic vapor cartridge with dust/mist prefilter or supplied air may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :

Butyl gloves; Most glove materials are of low chemical resistance. Replace gloves regularly.

SKIN PROTECTION :

Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :

Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE	Liquid
APPEARANCE	Clear Light yellow
ODOR	Amine
SPECIFIC GRAVITY	0.949 - 0.961
DENSITY	7.9 - 8.01 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	12.8 - 13.0
VOC CONTENT	46 %

10. STABILITY AND REACTIVITY**STABILITY :**

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Heat and sources of ignition including static discharges.

MATERIALS TO AVOID :

Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Avoid contact with SO₂ or acidic bisulfite products, which may react to form visible airborne amine salt particles. Certain amines in contact with nitrous acid, organic or inorganic nitrites or atmospheres with high nitrous oxide concentrations may produce N-nitrosamines, many of which are cancer-causing agents to laboratory animals.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen, ammonia

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****MUTAGENICITY:**

A mutagenicity test battery on cyclohexylamine was inconclusive. In a short-term test, cyclohexylamine caused mutation in human white blood cells. A bacterial mutagenicity (Ames) bioassay was negative for methoxypropylamine.

12. ECOLOGICAL INFORMATION**ECOTOXICOLOGICAL EFFECTS:**

The following results are for the product.

ACUTE FISH RESULTS:

Species	Exposure	LC50	Test Descriptor
Fathead Minnow	96 hrs	220 mg/l	Product

Rating: Essentially non-toxic

ACUTE INVERTEBRATE RESULTS:

Species	Exposure	LC50	EC50	Test Descriptor
Ceriodaphnia dubia	48 hrs	157 mg/l		Product
Daphnia magna	48 hrs	274 mg/l		Product

Rating: Essentially non-toxic

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT:

Proper Shipping Name:
Technical Name(s):
UN/ID No:

AMINES, LIQUID, CORROSIVE, N.O.S.
CYCLOHEXYLAMINE, METHOXYPROPYLAMINE
UN 2735

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC**

Hazard Class - Primary : 8
Packing Group : III
Flash Point : 70 °C / 158 °F

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : AMINES, LIQUID, CORROSIVE, N.O.S.
Technical Name(s) : CYCLOHEXYLAMINE, METHOXYPROPYLAMINE
UN/ID No : UN 2735
Hazard Class - Primary : 8
Packing Group : III
IATA Cargo Packing Instructions : 820
IATA Cargo Aircraft Limit : 60 L (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : AMINES, LIQUID, CORROSIVE, N.O.S.
Technical Name(s) : CYCLOHEXYLAMINE, METHOXYPROPYLAMINE
UN/ID No : UN 2735
Hazard Class - Primary : 8
Packing Group : III

5. REGULATORY INFORMATION**NATIONAL REGULATIONS, USA :****OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :**

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Cyclohexylamine : Corrosive, Flammable
Methoxypropylamine : Corrosive, Flammable
Diethyl-Hydroxyl-Amine : Irritant, Combustible.

CERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :**SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :**

This product contains the following substance(s) which is listed in Appendix A and B as an Extremely Hazardous Substance. Listed below are the statutory Threshold Planning Quantity (TPQ) for the substance(s) and the Reportable Quantity (RQ) of the product.

Extremely Hazardous Substance
Cyclohexylamine

TPQ
10,000 lbs

RQ
10,000 lbs

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :**

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

- | | |
|---|-----------------------------------|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| X | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b), Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

This product contains the following substances listed in the regulation:

<u>Substance(s)</u>	<u>Citations</u>
Cyclohexylamine :	Sec. 111

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Cyclohexylamine	108-91-8
Methoxypropylamine	5332-73-0

NATIONAL REGULATIONS, CANADA :**WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CONQUOR® CNQR3588****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****WHMIS CLASSIFICATION :****B3 - Combustible Liquids, E - Corrosive Material****CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :**

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.



MATERIAL SAFETY DATA SHEET

PRODUCT

CONQUOR® CNQR3588

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Prepared By : Product Safety Department

Date issued : 04/17/2000

Replaces : 06/25/1996

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : PCL-401

APPLICATION : WATER TREATMENT

COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH: 0/1 **FLAMMABILITY:** 1/1 **REACTIVITY:** 0/0 **OTHER:**
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

HAZARDS IDENTIFICATION****EMERGENCY OVERVIEW******CAUTION**

May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :**EYE CONTACT :**

May cause irritation with prolonged contact.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

Not a likely route of exposure. No adverse effects expected.

ONDEO Nalco Company ONDEO Nalco Center • Naperville, Illinois 60563-1198**(630)305-1000****1 / 8**

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC****INHALATION :**

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :**Acute :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES**EYE CONTACT :**

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : > 200 °F / > 93 °C ()

EXTINGUISHING MEDIA :

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



MATERIAL SAFETY DATA SHEET

PRODUCT

PCL-401

EMERGENCY TELEPHONE NUMBER

(800) 424-9300 (24 Hours) CHEMTREC

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Do not touch spilled material. Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible.

METHODS FOR CLEANING UP:

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS:

Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING:

Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS:

Store the containers tightly closed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES:

General ventilation is recommended.

RESPIRATORY PROTECTION:

Respiratory protection is not normally needed.

HAND PROTECTION:

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION:

Wear standard protective clothing.

EYE PROTECTION:

Wear chemical splash goggles.

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC****HYGIENE RECOMMENDATIONS :**

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Light yellow
ODOR	None
SPECIFIC GRAVITY	1.16 - 1.20
SOLUBILITY IN WATER	Complete
pH ()	4.2 - 5.0
VISCOSITY	20 - 160 cps
FREEZING POINT	25 °F /
VAPOR PRESSURE	Same as water
VOC CONTENT	0.00 %

10. STABILITY AND REACTIVITY**STABILITY :**

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

MATERIALS TO AVOID :

Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

Species	LD50	Tested Substance
Rat	5 g/kg	Product
Rating : Non-Hazardous		

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC****ACUTE DERMAL TOXICITY :**

Species LD50
Rabbit 2 g/kg
Rating : Non-Hazardous

Tested Substance
Product

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

12. ECOLOGICAL INFORMATION**ECOTOXICOLOGICAL EFFECTS :**

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Tested Substance
Bluegill Sunfish	96 hrs	> 5,000 mg/l	Product
Rainbow Trout	96 hrs	4,900 mg/l	Product

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Tested Substance
Daphnia magna	48 hrs	2,800 mg/l		Product

Rating : Essentially non-toxic

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC****LAND TRANSPORT :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING
TRANSPORTATION****AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING
TRANSPORTATION****MARINE TRANSPORT (IMDG/IMO) :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING
TRANSPORTATION****15. REGULATORY INFORMATION****NATIONAL REGULATIONS, USA :****OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :**

Based on our hazard evaluation, none of the substances in this product are hazardous.

ERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :**SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :**

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710) or are sold commercially under the polymer exemption (40 CFR 723.250).

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.



MATERIAL SAFETY DATA SHEET

PRODUCT

PCL-401

EMERGENCY TELEPHONE NUMBER

(800) 424-9300 (24 Hours) CHEMTREC

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances):

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65:

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS:

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS:

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA:

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS):

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION:

Not considered a WHMIS controlled product.

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER****(800) 424-9300 (24 Hours) CHEMTREC**

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

Prepared By : Product Safety Department

Date Issued : 02/10/2000

Replaces : 06/18/1999

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-103****EMERGENCY TELEPHONE NUMBER****(800)424-9300 (24 Hours) CHEMTREC****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : CL-103
APPLICATION : DEPOSIT PENETRANT
CHEMICAL DESCRIPTION : Polymer, Water
COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198
EMERGENCY TELEPHONE NUMBER : (800)424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH: 0/1 **FLAMMABILITY:** 1/1 **REACTIVITY:** 0/0 **OTHER:**
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

3. HAZARDS IDENTIFICATION****EMERGENCY OVERVIEW******CAUTION**

May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.
May evolve oxides of carbon (COx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :**EYE CONTACT :**

May cause irritation with prolonged contact.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

Not a likely route of exposure. No adverse effects expected.

ONDEO Nalco Company ONDEO Nalco Center • Naperville, Illinois 60563-1198
(630)305-1000



MATERIAL SAFETY DATA SHEET

PRODUCT

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INHALATION :

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES

EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : > 400 °F / > 200 °C (COC)

EXTINGUISHING MEDIA :

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



MATERIAL SAFETY DATA SHEET

PRODUCT

CL-103

EMERGENCY TELEPHONE NUMBER

(800)424-9300 (24 Hours) CHEMTREC

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Do not touch spilled material. Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING :

Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :

Store the containers tightly closed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended.

RESPIRATORY PROTECTION :

Respiratory protection is not normally needed.

HAND PROTECTION :

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-103****EMERGENCY TELEPHONE NUMBER****(800)424-9300 (24 Hours) CHEMTREC****HYGIENE RECOMMENDATIONS:**

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES**PHYSICAL STATE** Liquid**APPEARANCE** Clear Colorless**ODOR** None**SPECIFIC GRAVITY** 0.99 - 1.03 @ 77 °F / 25 °C**SOLUBILITY IN WATER** Complete**pH (100 %)** 6.6 - 7.0**10. STABILITY AND REACTIVITY****STABILITY:**

Stable under normal conditions.

HAZARDOUS POLYMERIZATION:

Hazardous polymerization will not occur.

CONDITIONS TO AVOID:

Freezing temperatures.

MATERIALS TO AVOID:

None known.

HAZARDOUS DECOMPOSITION PRODUCTS:

Under fire conditions: Oxides of carbon

11. TOXICOLOGICAL INFORMATION

The following results are for the polymer.

ACUTE ORAL TOXICITY:

Species	LD50	Tested Substance
Rat	2,300 - 16,000 mg/kg	

CARCINOGENICITY:

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).



PRODUCT

CL-103

EMERGENCY TELEPHONE NUMBER

(800)424-9300 (24 Hours) CHEMTREC

12. ECOLOGICAL INFORMATION**ECOTOXICOLOGICAL EFFECTS:**

The following results are for the product.

ACUTE FISH RESULTS:

Species	Exposure	LC50	Tested Substance
Rainbow Trout	96 hrs	> 1,000 mg/l	
Bluegill Sunfish	96 hrs	> 1,000 mg/l	

Rating: Essentially non-toxic

ACUTE INVERTEBRATE RESULTS:

Species	Exposure	LC50	EC50	Tested Substance
Daphnia magna	48 hrs		> 1,000 mg/l	

Rating: Essentially non-toxic

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT:

Proper Shipping Name:

PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA):

Proper Shipping Name:

PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO):

Proper Shipping Name:

PRODUCT IS NOT REGULATED DURING TRANSPORTATION

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-103****EMERGENCY TELEPHONE NUMBER****(800)424-9300 (24 Hours) CHEMTREC****15. REGULATORY INFORMATION****NATIONAL REGULATIONS, USA:****OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200:**

Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302:

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313:**SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355):**

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370):

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372):

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA):

The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710).

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act:

When use situations necessitate compliance with FDA regulations, this product is acceptable under: 21 CFR 173.340 Defoaming Agents, 21 CFR 175.105 - Adhesives, 21 CFR 176.200 Defoaming Agents used in coatings, 21 CFR 176.210 Defoaming agents used in the manufacture of paper and paperboard, 21 CFR 176.300 - Slimicides, 21 CFR 177.1200 - Cellophane, 21 CFR 177.1400 - Hydroxyethyl cellulose film, water-insoluble, 21 CFR 178.1010 - Sanitizing solutions, 21 CFR 178.3120 - Animal glue

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311:

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances):

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65:

This product does not contain substances which require warning under California Proposition 65.



MATERIAL SAFETY DATA SHEET

PRODUCT

CL-103

EMERGENCY TELEPHONE NUMBER

(800)424-9300 (24 Hours) CHEMTREC

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-103****EMERGENCY TELEPHONE NUMBER****(800)424-9300 (24.Hours) CHEMTREC**

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

Prepared By : Product Safety Department
Date issued : 04/07/2000
Replaces : 02/19/1997

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION****PRODUCT NAME:** CL-50**APPLICATION:** CORROSION INHIBITOR**COMPANY IDENTIFICATION:** Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198**EMERGENCY TELEPHONE NUMBER(S):** (800) 424-9300 (24 Hours) CHEMTREC**NFPA 704M/HMIS RATING****HEALTH:** 0/1 **FLAMMABILITY:** 0/0 **REACTIVITY:** 0/0 **OTHER:**

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

HAZARDS IDENTIFICATION****EMERGENCY OVERVIEW******CAUTION**

May cause irritation with prolonged contact.

Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water. Protect product from freezing.

Not flammable or combustible. May evolve oxides of phosphorus (POx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE:

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE:**EYE CONTACT:**

May cause irritation with prolonged contact.

SKIN CONTACT:

May cause irritation with prolonged contact.

INGESTION:

Not a likely route of exposure. No adverse effects expected.

INHALATION:

a likely route of exposure. No adverse effects expected.

Ondeo Nalco Company Ondeo Nalco Center • Naperville, Illinois 60563-1198

(630)305-1000

1/9

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****SYMPTOMS OF EXPOSURE :****Acute :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES**EYE CONTACT :**

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES**FLASH POINT :**

Not flammable

EXTINGUISHING MEDIA :

Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :

Not flammable or combustible. May evolve oxides of phosphorus (POx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



MATERIAL SAFETY DATA SHEET

PRODUCT

CL-50

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Do not touch spilled material. Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING :

Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :

Store the containers tightly closed. Protect product from freezing.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended.

RESPIRATORY PROTECTION :

Respiratory protection is not normally needed.

HAND PROTECTION :

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****HYGIENE RECOMMENDATIONS :**

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES**PHYSICAL STATE** Liquid**APPEARANCE** Colorless**ODOR** None

SPECIFIC GRAVITY	1.37 - 1.42 @ 77 °F / 25 °C
DENSITY	11.4 - 11.8 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	6.0 - 7.0
BOILING POINT	> 212 °F / > 100 °C
VAPOR PRESSURE	Same as water
EVAPORATION RATE	Same as water
VOC CONTENT	0.00 %

10. STABILITY AND REACTIVITY**STABILITY :**

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

Keep at temperatures above 38 °F

MATERIALS TO AVOID :

None known

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of phosphorus

11. TOXICOLOGICAL INFORMATION

The following results are for the product.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****ACUTE ORAL TOXICITY :**

Species LD50
Rat > 5,000 mg/kg
Rating : Non-Hazardous

Test Descriptor
Product

PRIMARY SKIN IRRITATION :

Draize Score Test Descriptor
0.2 / 8.0 Product
Rating : Minimally irritating

PRIMARY EYE IRRITATION :

Draize Score Test Descriptor
0.0 - 4 / 110.0 Product
Rating : Practically non-irritating

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

12. ECOLOGICAL INFORMATION**ECOTOXICOLOGICAL EFFECTS :**

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Fathead Minnow	96 hrs	1,162 mg/l	Product

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	> 1,000 mg/l	910 mg/l	Product

Rating : Essentially non-toxic

MOBILITY AND BIOACCUMULATION POTENTIAL

High phosphate levels in surface water can cause eutrophication with subsequent algal blooms and oxygen depletion.

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	SODIUM PHOSPHATE, TRIBASIC
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III
Flash Point :	Not flammable
DOT Reportable Quantity (per package) :	13,251 lbs
DOT RQ Component :	SODIUM PHOSPHATE, TRIBASIC

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	SODIUM PHOSPHATE, TRIBASIC
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III
IATA Cargo Packing Instructions :	914
IATA Cargo Aircraft Limit :	NO LIMIT (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
------------------------	--

15. REGULATORY INFORMATION**NATIONAL REGULATIONS, USA :**

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC**

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :

This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product.

RQ Substance**Sodium Phosphate, Tribasic****RQ****13,250 lbs**

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives, 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

NSF INTERNATIONAL :

This product has received NSF/International certification under ANSI/NSF Standard 60 in the corrosion and scale control and sequestering categories. The official name is "Blended phosphates." Maximum product application dosage is : 28 mg/l. Only product manufactured at Plant 11 USA and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

This product contains the following substances listed in the regulation:

Substance(s)**Sodium Phosphate, Tribasic :****Citations****Sec. 311**

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

**MATERIAL SAFETY DATA SHEET****PRODUCT****CL-50****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****CALIFORNIA PROPOSITION 65 :**

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Sodium Phosphate, Tribasic

7601-54-9

NATIONAL REGULATIONS, CANADA :**WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.



MATERIAL SAFETY DATA SHEET

PRODUCT

CL-50

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 01/27/2000

Replaces : 02/10/1997

Attachment D

**ANALYSIS OF INTER-ANNUAL TRENDS IN THE
ABUNDANCE OF BENTHIC MACROINVERTEBRATE
TAXA AND REPRESENTATIVE IMPORTANT FISH
SPECIES SAMPLED BY VERMONT YANKEE'S NPDES
PERMIT-REQUIRED MONITORING PROGRAM**

1991-2004

SEPTEMBER 2005

**ANALYSIS OF INTER-ANNUAL TRENDS IN THE
ABUNDANCE OF BENTHIC MACROINVERTEBRATE
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SPECIES SAMPLED BY VERMONT YANKEE'S NPDES
PERMIT-REQUIRED MONITORING PROGRAM**

1991-2004

**Prepared for
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**Prepared by
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R-18980.040

September 2005

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1.0 INTRODUCTION

Vermont Yankee's 316(a) Demonstration Report April 2004 (Normandeau 2004) demonstrated that a balanced indigenous community of aquatic biota has been maintained in the vicinity of Vermont Yankee during the many years of plant operation and will be maintained under the proposed changes in thermal discharge limits described in the Demonstration Report. This conclusion was reached in part by statistical analysis of the results of NPDES permit-required biological monitoring programs that were performed to quantify the year-to-year (inter-annual) trends in abundance of benthic macroinvertebrates and fish populations during 1991 through 2002. Two more years of NPDES permit-required monitoring have occurred since issuance of the 316(a) Demonstration Report (2003 and 2004), and the purpose of this report is to add these newest data and extend the previous statistical analysis to the 1991-2004 time series.

The Connecticut River study area where NPDES permit-required biological monitoring programs were performed during the 1991-2004 period includes areas both upstream and downstream of Vermont Yankee within the lower Vernon Pool, and in the tailrace waters immediately below Vernon Dam (Figure 1-1). Vernon Dam divides the study area into two primary habitat types, lentic and lotic. The slow-flowing or ponded areas of the Connecticut River found in lower Vernon Pool represent the lentic habitat. The rapid-flowing or turbulent areas of the Connecticut River found in the Vernon Dam tailrace represent the lotic habitat. The fish and benthic macroinvertebrate communities in the Connecticut River study area are characterized by diversity, presence of food chain as well as predatory species, and non-domination by pollution-tolerant species. Although certain fish species have been introduced to the study area by human activities over the years (i.e., via fish ladder installation), none of these species can be characterized as heat-tolerant, such that they will benefit by the thermal discharge and therefore either could cause the displacement of endemic species or become so numerous as to constitute a nuisance. The biological community has changed somewhat over the years in terms of relative abundance of various species, but this variability has been relatively minor and is consistent with natural variation. Both the fish and benthic macroinvertebrate community structures are diverse and resilient and do not resemble a simpler successional stage than is natural for the locality. Continued thermal discharge has not reduced successful completion of life cycles of the indigenous species or those re-introduced migratory species. Furthermore, the thermal discharge has not eliminated any established or potential economic or recreational use of the River. Thus, the available biological monitoring data demonstrates the requisite assurance of the protection and propagation of the balanced indigenous aquatic community of the Connecticut River in the vicinity of Vermont Yankee.

2.0 BENTHIC MACROINVERTEBRATES

2.1 METHODS

Macroinvertebrate samples were collected at four locations in the Connecticut River from 1991 through 2001. Two locations (Stations 2 and 3) are downstream from Vernon Dam and two (Stations 4 and 5) are upstream from the Dam (Figure 1-1). The two sampling methods used from 1991 through 2001 were grab sampling (Ekman grab prior to 1996; Ponar grab 1996 to present) and "rock basket" colonization sampling. Beginning in 2002, and continuing to present, changes in the benthic macroinvertebrate monitoring program were requested by the Vermont Agency of Natural Resources (VANR) and implemented by Vermont Yankee. The revised benthic macroinvertebrate program beginning in 2002 deployed rock basket colonization samplers at two locations in the Vernon Dam tailwaters downstream

from Vernon Dam, Stations 2 and 3 (Figure 2-1). No grab sampling was required by VANR after 2001, and no benthic macroinvertebrate sampling was required by VANR in the Connecticut River upstream from Vernon Dam (Stations 4 and 5). Since the data analyzed in the 316(a) Demonstration Report April 2004 (Normandeau 2004) from 1991-2002 includes all of the permit-required grab sampling effort and all of the permit-required rock basket samples collected in the Connecticut River upstream from Vernon Dam, this report will present the inter-annual trend analysis based on the addition of the new data collected in 2003 and 2004 by rock basket sampling from the two locations (Stations 2 and 3) found downstream from Vernon Dam.

Sampling effort has varied during the 1991-2004 period due to equipment loss, changes in gear, and changes in permit monitoring requirements. In an attempt to adjust or standardize these data for the sampling gear and deployment variability, count data from rock basket samples were standardized as the number of invertebrates collected per rock basket per 30 days of deployment. However, these adjustments do not fully standardize for the gear differences (Appendix 4 of the 316(a) Demonstration Report, April 2004; Normandeau 2004) so statistical trend analysis of the rock basket data presented in this report was only performed using the 1996 through 2004 data collected by Normandeau using fully documented procedures (Normandeau 2005a).

Rock basket samples were collected after 30 to 60 days (average 48 ± 11 , $N=77$) Connecticut River exposure on two occasions during the interval June through October in each year, except from 2001 to present when VANR directed in the current NPDES permit that an additional sampling effort be undertaken at Stations 2 and 3, and that sampling at Stations 4 and 5 be eliminated. Each rock basket sample was transported in an individual bucket to the laboratory where the samplers were disassembled and the rocks were rinsed over U.S. Standard No. 30 sieves. From 2001 on, samples were rinsed and preserved in the field with 70% ethanol for later identification. All organisms found attached to the rocks in each sample were removed and preserved along with the sample residue retained on the sieves. The residue from one of each pair of rock basket samples collected at each station per sample date was randomly selected for macroinvertebrate sorting under 2X magnification from 1996 to 2000 and extrapolated to 2 baskets. From 2001 until present, each rock basket was sorted and identified in its entirety. At least 100 macroinvertebrates were sorted from each sample (if present), and the sorted organisms were examined with a stereomicroscope, identified, and enumerated. Counts by taxon were extrapolated to total numbers for entire samples based on the fraction of each sample analyzed.

The macroinvertebrates in each sorted fraction were identified to the lowest practical taxonomic level, given their life stage and condition, using dissecting (45X magnification) and compound (1,000X magnification) microscopes. Chironomids and oligochaetes were separated by subfamily, tribe, or recognizable type prior to identification to the genus/species level. All or representative subsamples from each grouping were prepared by clearing and mounting, and identified with a compound microscope. Where subsampled, the number of specimens identified to genus/species was used to proportion the remaining individuals from each group into specific taxa. In instances where chironomids or Oligochaetes could be identified to genus or species without the aid of a compound microscope, no preparation was necessary.

A nonparametric Mann-Kendall test was used to examine the 1996-2004 annual time series of each major grouping of macroinvertebrate CPUE for significant increasing or decreasing trends (Helsel and Hirsch 1991, Chapter 12). The field sampling design has consistently sampled Stations 2 and 3 in the Connecticut River downstream from Vernon Dam during the same months in each of the nine most recent consecutive years in the rock basket time series (1996-2004), making annual mean CPUE the appropriate

response variable in the time series analysis. All invertebrates for a given year were grouped into nine major taxonomic groupings (Crustacea, Diptera, Ephemeroptera, Gastropoda, Oligochaeta, Other, Pelecypoda, Trichoptera, and Turbellaria) at the request of VANR. Rock basket effort was standardized across samples by converting total abundance of a major taxonomic grouping in a year to numbers of that taxon per basket per 30 days of deployment. The Mann-Kendall test is robust with respect to parametric assumptions of data normality and variance heterogeneity (Helsel and Hirsch 1991; Siegel 1956), and was performed on untransformed data. The null hypothesis was that there is no statistically significant ($p < 0.05$) trend in a taxon's abundance during the period analyzed as measured by the Kendall Tau b correlation coefficient. If a statistically significant negative (decreasing) trend is observed, it will be interpreted with respect to whether Vermont Yankee's thermal discharge may be a contributing factor. Finding no significant trend over time or finding a significant increasing trend will be considered to statistically support a finding of "no prior appreciable harm."

2.2 RESULTS AND DISCUSSION

The benthic macroinvertebrate community present in the River upstream and downstream of Vernon Dam is representative of a balanced indigenous population not adversely affected by operation of Vermont Yankee. Fourteen years of permit-required monitoring produced samples that contained a diverse mixture of taxa, including invertebrate species considered sensitive to poor water quality or habitat disturbance, therefore demonstrating that such conditions exist below detectable levels affecting populations. Although the numbers of individuals, numbers of taxa, and taxonomic composition varied year to year, the observed shifts were well within the range of natural stochastic and response processes affecting invertebrate populations.

Total numbers of macroinvertebrates collected in rock baskets and sample composition based on higher taxonomic groups (Order and above) are presented in Table 2-1. Total number of macroinvertebrates collected in rock baskets ranged from 50 individuals at Station 2 in 1997 to 9,181 individuals at Station 3 in 2001. Total numbers exceeded 1,000 individuals in nine out of fifty station by year comparisons. There is no discernable relationship between station location and total numbers of macroinvertebrates collected.

The identity of the higher taxonomic groups collected in greatest numbers by rock basket sampling varied greatly from year to year at most stations. The exception was Station 5, where Diptera and Crustacea were collected in greatest numbers in 10 of 12 years of sampling. This variability is likely due to the microhabitat that the rock baskets were deployed in, for instance whether they were deployed in sand or gravel substrates at a station with diverse microhabitats. Other factors that may influence the colonizing taxa are the amount of organic material captured by the rock basket, the degree of primary production during incubation, and the availability of colonizing taxa from surrounding substrate. These factors are all influenced by the particular timing and microhabitat of deployment with respect to river flow conditions. Given these and other sources of variation, the rock basket samples do reflect the availability of colonizing taxa, the overall condition of the dominant invertebrate prey taxa, and a gross measurement of abundance. These data can be used to judge not only the presence and maintenance of a balanced indigenous population but also the degree of plasticity in the invertebrate community to adjust to changes in habitat.

Overall community composition and species richness appears to have remained relatively constant throughout the 1996-2004 time period based on the 20 separate trend analyses completed for each taxon

and station (Table 2-2, Figures 2-2 through 2-11). No significant (p-values less than 0.05) increasing or decreasing trends were among these 20 tests (Table 2-2).

Macroinvertebrate relative species abundance and annual total abundance have remained nearly constant during the annual 1991 to 2004 monitoring programs. Contributions of each taxonomic group to overall species abundance has varied little over the monitoring period, allowing for changes in taxonomic scrutiny and gear changes in 1996 and 2000, respectively. Mann-Kendall correlation analyses showed a non-significant but decreasing trend from eight of the twenty analyses conducted, while eleven tests showed non-significant positive trends in catch for certain taxa. The remaining two tests showed no readily discernable overall trends. Therefore, these trend analyses collectively demonstrate that the macroinvertebrate community in the vicinity of Vermont Yankee has maintained a stable community composition and is considered to statistically support a finding of "no prior appreciable harm."

3.0 FISH

Nine Representative Important Species of fish (RIS) were identified by VANR using USEPA's criteria and analyzed using the same methods in the 316(a) Demonstration Report April 2004 (Normandeau 2004). The nine fish species identified as RIS are: American shad (*Alosa pseudoharengus*), Atlantic salmon (*Salmo salar*), spottail shiner (*Notropis hudsonius*), smallmouth bass (*Microperus dolomieu*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus* formerly *Stizostedion vitreum*), largemouth bass (*Microperus salmoides*), fallfish (*Semotilus corporalis*), and white sucker (*Catostomus commersoni*). The lentic guild of fish represents the community inhabiting slow flowing or ponded areas of the Connecticut River like the habitat sampled by permit-required general electrofishing upstream from Vernon Dam in a reach of the Connecticut River referred to as lower Vernon Pool (Figure 3-1). The lotic guild of fish represents the community inhabiting the rapid flowing or turbulent areas of the Connecticut River like the habitat sampled by general electrofishing downstream from Vernon Dam in the Vernon Dam tailrace (Figure 3-1). The lentic guild of RIS is represented by largemouth bass and yellow perch, while smallmouth bass and fallfish represent the lotic guild. Walleye, white sucker, and spottail shiner are considered generalists that occupy both lentic and lotic guilds. American shad and Atlantic salmon are both anadromous species, with the adults passing through both lentic and lotic habitats in the vicinity of Vermont Yankee during the spawning migration, while their egg, larval and juvenile life stages inhabit the lentic and lotic (shad) or lotic (shad and salmon) habitats at certain times of the year until they migrate to the sea.

3.1 METHODS

Electrofishing and trap net sampling occurred during May, June, September and October of each year, unless excessively high or low water levels or extremely dense vegetation rendered sampling dangerous or ineffective. Electrofishing was performed throughout the 14-year period, while trap net sampling was discontinued at the direction of VANR and the EAC after 1999. The data analyzed in the 316(a) Demonstration Report April 2004 (Normandeau 2004) from 1991-2002 includes all of the permit-required trap net sampling effort and all of the permit-required general electrofishing samples collected in the Connecticut River at permit-required locations both upstream and downstream from Vernon Dam. Since there is no new trap net data, the analysis of the 1991-1999 trap net time series will not be repeated here. This section of the report will present the inter-annual trend analysis of general electrofishing data based on the addition of the new data collected in 2003 and 2004 to represent the 1991-2004 inter-annual time series.

Electrofishing was performed with a boat electroshocker employing a bow-mounted cathode array and a Coffelt Electronics Model VVP-15 variable voltage pulsator. Sampling was carried out in the evening beginning approximately 0.5 hour after sunset. Eight stations with a total of 10 sub-locations (six located upstream and four downstream of Vernon Dam) were sampled (Figure 3-1). Electrofishing is an active sampling method wherein the boat moves through a sampling site. Fish encountering the electrical field in front of the boat are stunned, netted from the water, temporarily held in a livewell for processing and then released. Fish collected were identified to species, enumerated, weighed to the nearest gram (wet weight), and measured for total length to the nearest millimeter. Electrofishing samples represented about 15 or 20 minutes of current applied to the water, and the catch per unit of effort (CPUE) was expressed as the number of fish caught per hour.

A nonparametric Mann-Kendall test was used to examine the 1991-2004 general electrofishing time series for significant increasing or decreasing trends (Helsel and Hirsch 1991, Chapter 12) in annual total catch per unit of effort (CPUE expressed as fish caught per hour of electrofishing effort) for the entire fish community (Total) and for each of the nine RIS and analyzed using the same methods in the 316(a) Demonstration Report April 2004 (Normandeau 2004). The field sampling design has relatively consistently sampled the same stations with the same gear during the same months in each of the 14 consecutive years in the electrofishing time series, making annual total CPUE the appropriate response variable in the time series analysis (Appendix 4 in Normandeau 2004). The Mann-Kendall test is robust with respect to parametric assumptions of data normality and variance heterogeneity (Helsel and Hirsch 1991; Siegel 1956), and was performed on untransformed annual total CPUE. The null hypothesis was that there is no statistically significant ($p < 0.05$) interannual trend in abundance during the period analyzed as measured by the Kendall Tau b correlation coefficient. If a statistically significant negative (decreasing) trend was observed, it was interpreted with respect to whether the plant thermal discharge may be a contributing factor by examining the time series trend in a subset of the data representing the population directly exposed to Vermont Yankee's thermal plume compared to the population outside of the influence of the plume. Finding no significant trend over time or finding a significant increasing trend was considered to statistically support a finding of "no prior appreciable harm."

3.2 RESULTS AND DISCUSSION

The fish community observed through this permit-required electrofishing program consists of over 35 species, most characteristic of warm-water environments. The Vernon Dam tailwaters provide a lentic (free-flowing) habitat and Vernon Pool provides a lotic (pond-like) habitat for this fish community, and these habitat differences are reflected in the composition of dominant fish species in each location. A total of 12,512 fish specimens representing 36 taxa were obtained in the combined general electrofishing collections at sampling stations in Vernon Pool located upstream from Vernon Dam during the period 1991 - 2004 (Table 3-1). The most common fishes, making up at least 5% of the combined total electrofishing catch in Vernon Pool over the 14-year period, were yellow perch (35.8%), bluegill (19.5%), pumpkinseed (9.2%), spottail shiner (8.6%), and largemouth bass (6.7%) (Table 3-1). In the Vernon Dam tailwaters located downstream from Vernon Dam a total of 5,032 fish specimens representing 35 taxa were obtained in the combined general electrofishing collections at sampling stations located in the tailwaters during the period 1991 - 2004 (Table 3-2). The most common fishes, making up at least 5% of the combined total electrofishing catch in Vernon Dam tailwaters over the 14-year period, were smallmouth bass (27.2%), spottail shiner (17.5%), American shad (10.9%), rock bass (8.3%), white sucker (7.4%), bluegill (6.2%) and fallfish (6.2%) (Table 3-2). Only one Atlantic salmon smolt was collected

among the 576 general electrofishing samples taken since 1991, and this one fish was caught in the Vernon Dam tailwaters in 1995 (Table 3-2). American shad was the most numerous anadromous fish in both Vernon Pool (1.1 fish/hour; Table 3-1) and in the Vernon Dam tailwaters (10.2 fish/hour; Table 3-2). Blueback herring was rarely seen. Sea lamprey and American eel were collected fairly regularly, but in very low numbers. Typical cold-water species, other than one brook trout collected downstream from Vernon Dam in 2002, were not collected during the 1991 – 2004 time series and were rarely collected in prior years (Downey et al. 1990).

Overall, general electrofishing CPUE both upstream and downstream of Vernon Dam displayed an increasing trend over the 14-year period (Kendall Tau $b = 0.121$ for both), although this trend was not significant ($p = 0.547$ for both for the total of all fish species combined (Figure 3-2).

3.2.1 American Shad

The annual catch of American shad by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 1992 (3.6 fish per hour). No American shad were caught by electrofishing in the lower Vernon Pool in years 1997, 1998, 1999, 2001, 2002, 2003 or 2004. Catch per unit effort of American shad by electrofishing was higher downstream from Vernon Dam (Table 3-2) where the highest annual CPUE was in 1991 (30 fish per hour) and the lowest in 1999 (0.4 fish per hour).

No statistically significant negative (decreasing) trend was observed in American shad annual total CPUE during the 1991-2004 period in the Vernon Dam tailwaters (Figure 3-3B). The electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall Tau b of -0.363 with a probability level of $p=0.071$ (Figure 3-3B). However a statistically significant decreasing trend was observed in the time series of annual total electrofishing CPUE from lower Vernon Pool, which exhibited a Kendall's Tau b of -0.652 with a probability level of $p=0.002$ (Figure 3-3A). A similar decreasing trend in lower Vernon Pool was observed in the 1991-2002 electrofishing CPUE time series in the 316(a) Demonstration Report April 2004 (Normandeau 2004), which was attributed to lower annual fish passage counts in recent years at the Vernon Dam fishway beginning in about 1997 and continuing through 2003.

A closer examination of the significantly decreasing inter-annual trend in juvenile American shad CPUE observed in the general electrofishing program during 1991-2004 revealed that the decrease occurred both at sampling stations upstream from Vermont Yankee's discharge and at stations exposed to the thermal plume in lower Vernon Pool (Figure 3-4). Stations 5, Rum Point, and the New Hampshire Setback (Figure 3-1) were all upstream from the influence of Vermont Yankee's thermal plume, and the trend in the combined general electrofishing CPUE for juvenile American shad from these upstream locations exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.636 and a significance probability of $p=0.004$ (Figure 3-4A). Station 4 was within lower Vernon Pool but downstream from Vermont Yankee's discharge (Figure 3-1), and the trend in the combined general electrofishing CPUE for juvenile American shad from this downstream location also exhibited a significant ($p=0.024$) decreasing trend with a Kendall Tau b correlation coefficient of -0.489 (Figure 3-4B). Therefore, it is unlikely that the finding of an overall significant decrease in juvenile American shad CPUE from the general electrofishing program conducted in lower Vernon Pool during the period 1991 through 2004 can be attributed to Vermont Yankee's thermal discharge.

The decrease in American shad CPUE observed in the general electrofishing program conducted in lower Vernon Pool during the period 1991 through 2004 is most noticeable beginning in 1996 or 1997 and continuing through 2004 (Figure 3-3). When Normandeau first began the field program in 1996, our field

biologists observed what appeared to be the ineffectiveness of the electrofishing gear to stun and capture juvenile American shad in lower Vernon Pool, while the same gear and deployment practices were effective in capturing juvenile American shad in the Vernon Dam tailrace (Bulletin 71; Normandeau 1998). The observed ineffectiveness applied to both the general electrofishing survey, and to a supplemental survey referred to as the anadromous fish electrofishing survey, which sampled biweekly in the intervening times between the monthly general electrofishing sampling events in each year. Numerous discussions were held between Normandeau, the EAC, and VANR, and several field evaluations were performed among these parties in a failed attempt to diagnose and remedy the situation. Finally, in 2000, and with the concurrence of the EAC and VANR, the anadromous electrofishing program in lower Vernon Pool was replaced with a biweekly program of seining and midwater trawling (Bulletin 76; Normandeau 2001). This biweekly "juvenile shad" program has continued annually to date, with the program sampling exclusively with seines beginning in 2004 (Bulletin 82; Normandeau 2005b). Standing crop estimates of juvenile shad abundance in lower Vernon Pool based on the juvenile shad program have varied by more than an order of magnitude among the five years (2000-2004), and appear related mostly to the number of female American shad passing upstream through the Vernon Dam fishway into Vernon Pool and spawning there (Bulletin 82; Normandeau 2005). Therefore, the significant decrease in American shad annual total CPUE for electrofishing in lower Vernon Pool is most likely due to a change in the collection efficiency of the sampling method beginning in 1996 and not due to any effect of Vermont Yankee.

3.2.2 Atlantic Salmon

The restoration program for Atlantic salmon has met with limited success, and very low numbers of adults are re-entering the Connecticut River currently. Atlantic salmon are rarely collected during the regular permit-required monitoring program for Vermont Yankee; just three salmon smolts were collected by trap net and electrofishing combined over the past 14 years between 1991 and 2004. No salmon were collected in lower Vernon Pool by the permit-required electrofishing monitoring (Table 3-1) or by trap netting (Normandeau 2004), and only one salmon smolt was captured (in 1995) by electrofishing downstream from Vernon Dam between 1991 and 2004 (Table 3-2). The remaining two smolts were collected in trap nets fished downstream from Vernon Dam in 1991 (Normandeau 2004). The annual salmon electrofishing CPUE downstream of Vernon Dam in 1995 was 0.2 fish per hour, which was 0.3% of the total catch (Table 3-2). The 1991 salmon trap net CPUE and percent composition downstream of Vernon Dam was 0.05 fish per 24 hours and 0.2% of total catch, respectively (Normandeau 2004). This rare occurrence of Atlantic salmon smolts in the permit-required electrofishing survey performed from 1991 through 2004 precludes any meaningful statistical trend analysis of these data.

3.2.3 Spottail Shiner

The annual catch per unit effort (CPUE) of spottail shiner by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 1996 (72 fish per hour) and lowest in 2004 (1.5 fish per hour). CPUE of spottail shiner by electrofishing was similar downstream from Vernon Dam (Table 3-2) where annual CPUE was highest in 1996 (55 fish per hour) and lowest in 1995 (4.4 fish per hour). No statistically significant trends were observed in spottail shiner annual total CPUE during the 1991-2004 period, supporting a finding of "no prior appreciable harm" to spottail shiner due to Vermont Yankee's continued operation. The time series of annual total electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau b of -0.209 with a probability level of $p=0.298$ (Figure 3-5A), while the

electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of -0.143 with a probability level of $p=0.447$ (Figure 3-5B).

3.2.4 Smallmouth Bass

The annual catch rate (i.e. total catch per unit effort or CPUE) of smallmouth bass by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 1998 (6 fish per hour) and lowest in 2004 (0 fish per hour). The CPUE of smallmouth bass by electrofishing was higher downstream from Vernon Dam (Table 3-2) where annual CPUE was highest in 2001 (73 fish per hour) and lowest in 1992 (14 fish per hour). No statistically significant negative (decreasing) trends were observed in smallmouth bass annual mean CPUE during the 1991-2004 period, supporting a finding of "no prior appreciable harm" due to Vermont Yankee's continued operations. The time series of annual total electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau of -0.187 with a probability level of $p=0.352$ (Figure 3-6A), while the electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of 0.319 with a probability level of $p=0.112$ (Figure 3-6B).

3.2.5 Yellow Perch

The annual catch of yellow perch by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 2001 (114 fish per hour) and lowest in 1992 (32 fish per hour). Catch per unit effort (CPUE) of yellow perch by electrofishing was lower downstream from Vernon Dam (Table 3-2) where annual CPUE was highest in 1999 (17 fish per hour) and lowest in 2002 (0.4 fish per hour). No statistically significant negative (decreasing) trends were observed in yellow perch annual CPUE during the 1991-2004 period, supporting a finding of "no prior appreciable harm" due to Vermont Yankee's continued operations. The time series of annual electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau b of -0.011 with a probability level of $p=0.956$ (Figure 3-7A), while the electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of -0.253 with a probability level of $p=0.208$ (Figure 3-7B).

3.2.6 Walleye

Electrofishing CPUE in the Vernon Dam tailrace averaged 1.9 fish per hour compared to 1.2 fish per hour in lower Vernon Pool during 1991-2004 (Tables 3-1 and 3-2). The range in annual electrofishing CPUE in the Vernon Dam tailrace was 0.0 fish per hour in 2004 to 4.4 fish per hour in 1999 (Table 3-2). The range in annual electrofishing CPUE in lower Vernon Pool was 0 fish per hour in 2003 and 2004 to 1.9 fish per hour in 1991 (Table 3-1). The nonparametric Mann-Kendall test used to examine the annual catch rate data for significant increasing or decreasing trends during 1991-2004 revealed a significant, decreasing trend in walleye abundance for the electrofishing time series in both lower Vernon Pool and in the Vernon Dam tailwaters (Figure 3-8). The Kendall Tau b coefficient was -0.464 at a probability level of $p=0.021$ for the Vernon Pool time series (Figure 3-8A). The Kendall Tau b coefficient was -0.451 at a probability level of $p=0.025$ for the Vernon Dam tailrace time series (Figure 3-8B).

The electrofishing time series data for walleye was subject to further analysis by partitioning it into stations in lower Vernon Pool that were exposed to Vermont Yankee's thermal discharge (Station 4; Figure 3-1) and those further upstream and not exposed to the influence of Vermont Yankee's thermal plume (Stations 5, Rum Point, and the New Hampshire Setback; Figure 3-1) to see if the decreasing trend was attributed to proximity to Vermont Yankee's discharge. The electrofishing CPUE time series from stations in Vernon Pool that were upstream and not exposed to Vermont Yankee exhibited a significant

($p=0.38$) decreasing trend with a Kendall's Tau b correlation coefficient of 0.431 (Figure 3-9A), while the time series from stations exposed to Vermont Yankee exhibited no significant decreasing trend (Kendall's Tau b correlation coefficient = -0.171, $p=0.405$; Figure 3-9B).

Partitioning the walleye electrofishing time series data obtained by general electrofishing in the Vernon Dam tailrace into the most upstream sampling stations found between the foot of the dam (Station 2) and Stebbins Island (Figure 3-1), and stations at least four miles downstream from the dam revealed a significant decreasing trend in both zones (Figure 3-9C and 3-9D). Stations 0.1 miles south of Vernon Dam, Station 3 and Stebbins Island (Figure 3-1), were all in the most upstream portion of the tailrace and closest to the influence of Vermont Yankee's thermal plume, and the trend in the combined general electrofishing CPUE from these upstream locations exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.407 and a significance probability of $p=0.043$ (Figure 3-9C). Station 2 was located about four miles downstream from Vernon Dam (Figure 3-1), and the trend in the combined general electrofishing CPUE from this downstream location also exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.467 and a significance probability of $p=0.029$ (Figure 3-9D).

Therefore, it appears that there was an overall decrease in walleye electrofishing CPUE in both lower Vernon Pool and in the Vernon Dam tailwaters during the period 1991 through 2004. However, this decrease could not be attributed to Vermont Yankee's thermal discharge because a significant time series trend was not observed at the sampling locations in lower Vernon Pool in direct contact with the plume.

Therefore, it is unlikely that the finding of an overall significant decrease in walleye CPUE from the general electrofishing program conducted in lower Vernon Pool during the period 1991 through 2004 can be attributed to Vermont Yankee's thermal discharge.

3.2.7 Largemouth Bass

The annual catch rate (i.e. catch per unit effort or CPUE) of largemouth bass by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 2001 (23 fish per hour) and lowest in 1998 (7 fish per hour). The CPUE of largemouth bass by electrofishing was lower downstream from Vernon Dam (Table 3-2) where annual CPUE was highest in 2001 (3 fish per hour) and lowest in 2000 (0 fish per hour). No statistically significant negative (decreasing) trends were observed in largemouth bass annual mean CPUE during the 1991-2004 period, supporting a finding of "no prior appreciable harm" due to Vermont Yankee's operations. The time series of annual mean electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau b of -0.385 with a probability level of $p=0.055$ (Figure 3-10A), while the electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of -0.221 with a probability level of $p=0.273$ (Figure 3-10B).

3.2.8 Fallfish

A total of two fallfish were captured by electrofishing upstream of Vernon Dam from 1991 – 2004 (Table 3-1). Catch per unit effort of fallfish by electrofishing was higher downstream from Vernon Dam (Table 3-2) where the highest annual CPUE was in 1999 (31.9 fish per hour) and the lowest in 1997 (0 fish per hour). Fallfish were not captured in great numbers above Vernon Dam because they prefer flowing water found in the lotic habitat of the Vernon Dam tailrace. No statistically significant negative trends were observed in fallfish annual total CPUE during the 1991-2004 period. The time series of annual total electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau b of -0.398 with a probability

level of $p=0.084$ (Figure 3-11A). The electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of -0.044 with a probability level of $p=0.826$ (Figure 3-11B).

3.2.9 White Sucker

The annual catch of white sucker by electrofishing from 1991-2004 in lower Vernon Pool (Table 3-1) was highest in 1994 (16.6 fish per hour) and lowest in 2004 (1.0 fish per hour). Catch per unit effort (CPUE) of white sucker by electrofishing was similar downstream from Vernon Dam (Table 3-2) where annual CPUE was highest in 1991 (13.0 fish per hour) and lowest in 2004 (1.9 fish per hour). A statistically significant negative (decreasing) trend was observed in white sucker annual total CPUE during the 1991-2004 period for electrofishing. General electrofishing CPUE decreased significantly in both lower Vernon Pool and in the Vernon Dam tailrace (Figure 3-12). The time series of annual mean electrofishing CPUE from lower Vernon Pool exhibited a Kendall's Tau b of -0.648 with a probability level of $p=0.001$ (Figure 3-12A), while the electrofishing time series from the Vernon Dam tailrace area exhibited a Kendall's Tau b of -0.648 with a probability level of $p=0.001$ (Figure 3-12B).

Partitioning the white sucker CPUE data obtained by general electrofishing in lower Vernon Pool into sampling stations upstream from Vermont Yankee's discharge and stations exposed to the thermal plume revealed that significant decreasing trends existed in both areas (Figure 3-13). Stations 5, Rum Point, and the New Hampshire Setback (Figure 3-1) were all upstream from the influence of Vermont Yankee's thermal plume, and the trend in the combined general electrofishing CPUE from these upstream locations exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.626 and a significance probability of $p=0.002$ (Figure 3-13A). Station 4 was located in lower Vernon Pool but downstream from Vermont Yankee's discharge (Figure 3-1), and the time series in the combined general electrofishing CPUE from this location also exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.648 and a significance probability of $p=0.001$ (Figure 3-13B). Further partitioning of the Station 4 general electrofishing CPUE data for white sucker into the samples taken along the Vermont shore closest to Vermont Yankee's discharge, and the samples taken along the New Hampshire shore that were downstream but opposite Vermont Yankee's discharge, revealed that both subsets exhibited significant decreasing trends in white sucker CPUE between 1991 and 2004 (Figure 3-13C and 3-13D). Therefore, there was a significant decrease in white sucker CPUE from the general electrofishing program conducted throughout lower Vernon Pool during the period 1991 through 2004 in both areas exposed and not exposed to Vermont Yankee's thermal plume.

Partitioning the white sucker CPUE data obtained by general electrofishing in the Vernon Dam tailrace into the most upstream sampling stations found between the foot of the dam (Station 2) and Stebbins Island (Figure 3-1), and stations at least four miles downstream from the dam revealed a significant decreasing trend nearest to the dam and no trend further downstream (Figures 3-13E and 3-13F). Stations 0.1 miles south of Vernon Dam, Station 3 and Stebbins Island (Figure 3-1), were all in the most upstream portion of the tailrace and closest to the influence of Vermont Yankee's thermal plume, and the trend in the combined general electrofishing CPUE from these upstream locations exhibited a significant decreasing trend with a Kendall Tau b correlation coefficient of -0.685 and a significance probability of $p=0.001$ (Figure 3-13E). Station 2 was located about four miles downstream from Vernon Dam (Figure 3-1), and the trend in the combined general electrofishing CPUE from this downstream location exhibited no significant trend with a Kendall Tau b correlation coefficient of -0.326 and a significance probability of $p=0.110$ (Figure 3-13F). Therefore, there was a significant decrease in white sucker CPUE from the general electrofishing program in the tailrace area immediately below Vernon Dam during the period

1991 through 2002, but no significant decrease was observed further downstream in upper Turners Falls Pool.

In summary, white sucker has shown a significant decrease in annual total electrofishing CPUE throughout the entire permit-required monitoring area of the Connecticut River for the time series from 1991 through 2004. This decrease represents a broad decline that was independent of proximity to Vermont Yankee's thermal plume.

4.0 REFERENCES

- Downey, P.C., R.C. Binkerd, and D.J. Marx. 1990. 316 Demonstration, Engineering, Hydrological and Biological Information and Environmental Impact Assessment for Vermont Yankee Nuclear Power Corporation. Aquatec, Inc., So. Burlington, VT.
- Helsel, D.R. and R.M. Hirsch. 1991. Chapter A3. Statistical Methods in Water Resources. U.S. Geological survey. 510 p.
- Normandeau Associates, Inc. 1998. Bulletin No. 71. Abundance of juvenile American shad in the Vernon Pool during 1997.
- Normandeau Associates, Inc. 2001. Bulletin No. 76. Abundance of juvenile American shad in the Vernon Pool during 2000.
- Normandeau Associates, Inc. 2005a. Abundance of juvenile American shad in the Vernon Pool during 2004. Vermont Yankee/Connecticut River System, Analytical Bulletin 82.
- Normandeau Associates, Inc. 2005b. Entergy Nuclear Vermont Yankee, LLC Environmental Services Quality Program and Standard Operating Procedures for NPDES Permit Monitoring. Revision 2.
- Normandeau Associates, Inc. 2004. §316(a) Demonstration in support of a request for increased discharge temperature limits at Vermont Yankee Nuclear Power Station during May through October. April 2004.
- Siegel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. McGraw Hill Book company, Inc. New York. 312 p.

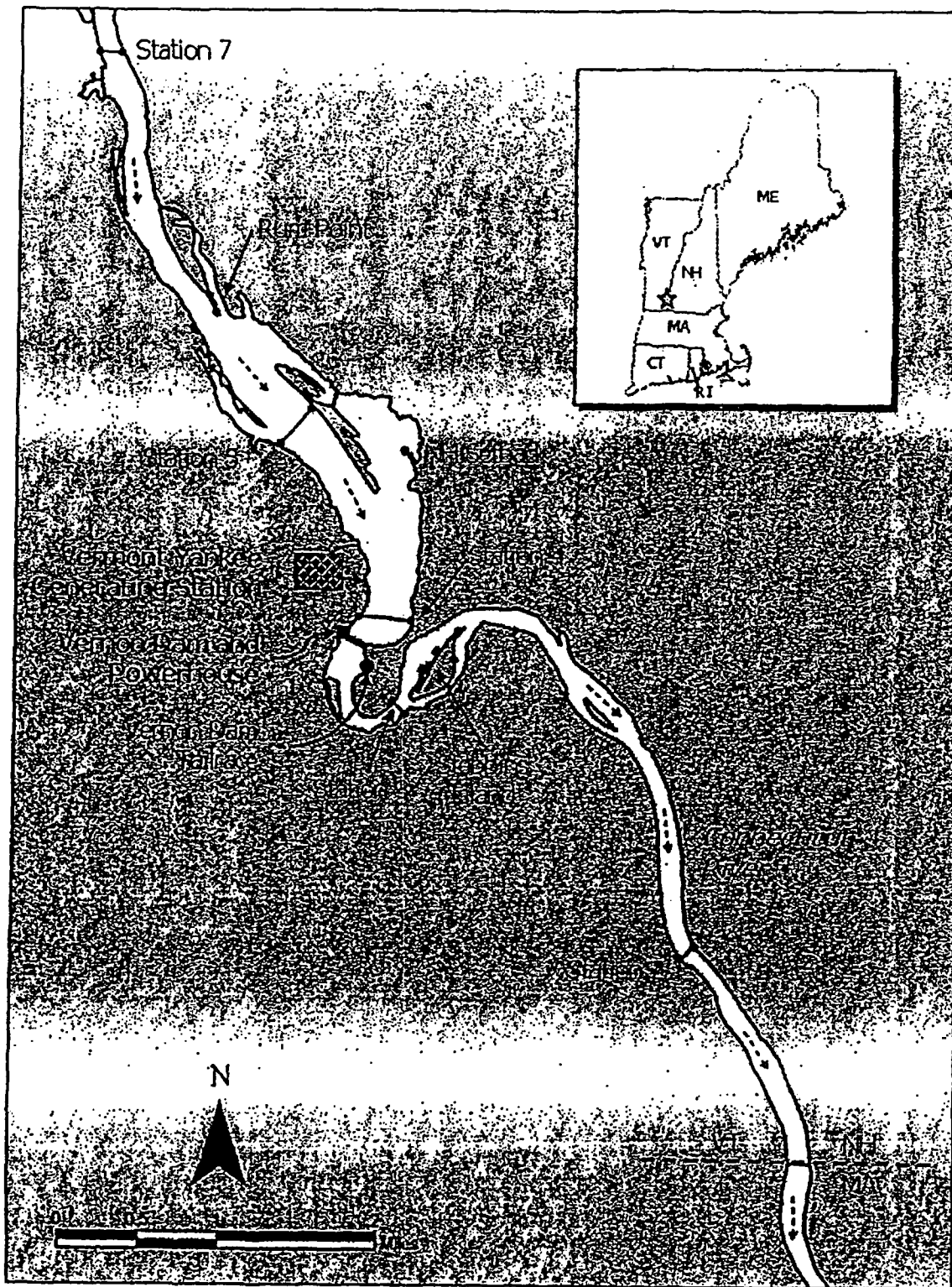


Figure 1-1. Connecticut River in the Vicinity of Vernon Pool.

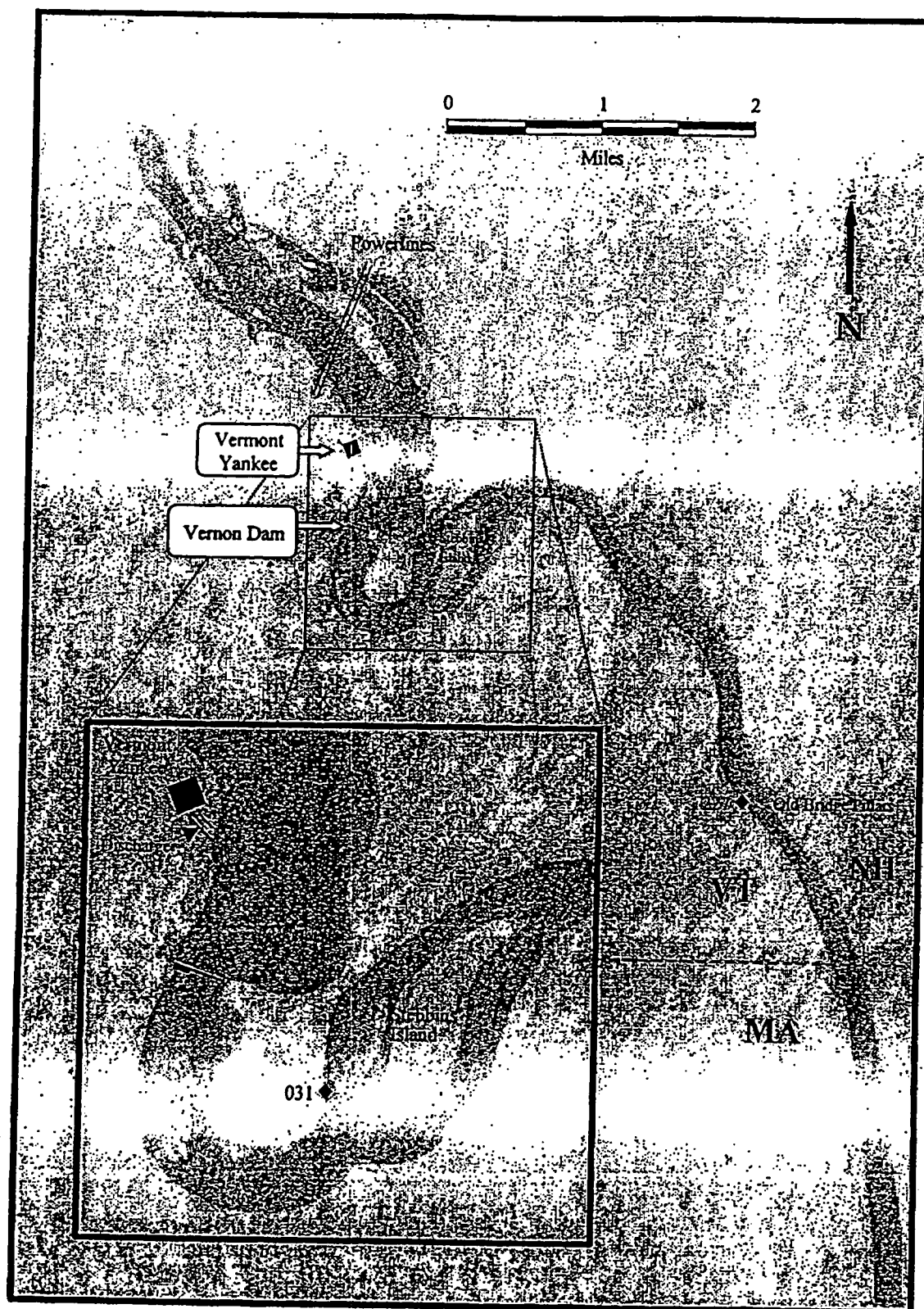


Figure 2-1. NPDES macroinvertebrate rock basket sampling at Stations 227 and 031.

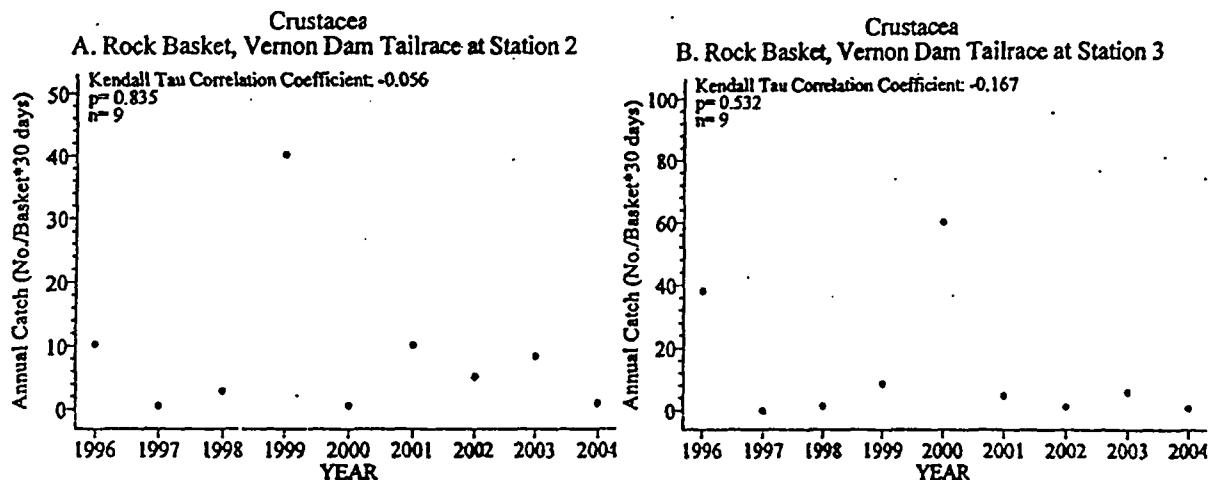


Figure 2-2. Scatter plots comparing Crustacea annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

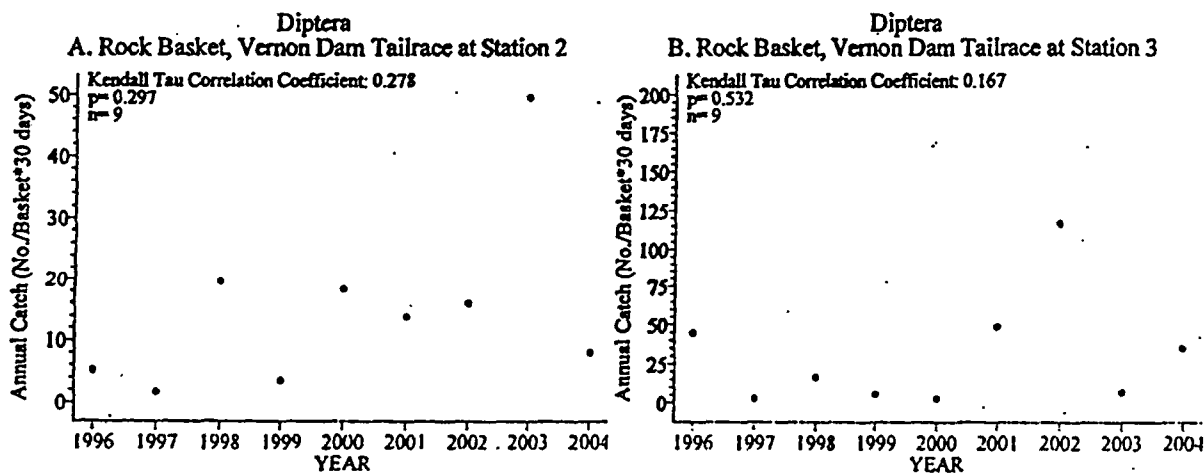


Figure 2-3. Scatter plots comparing Diptera annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

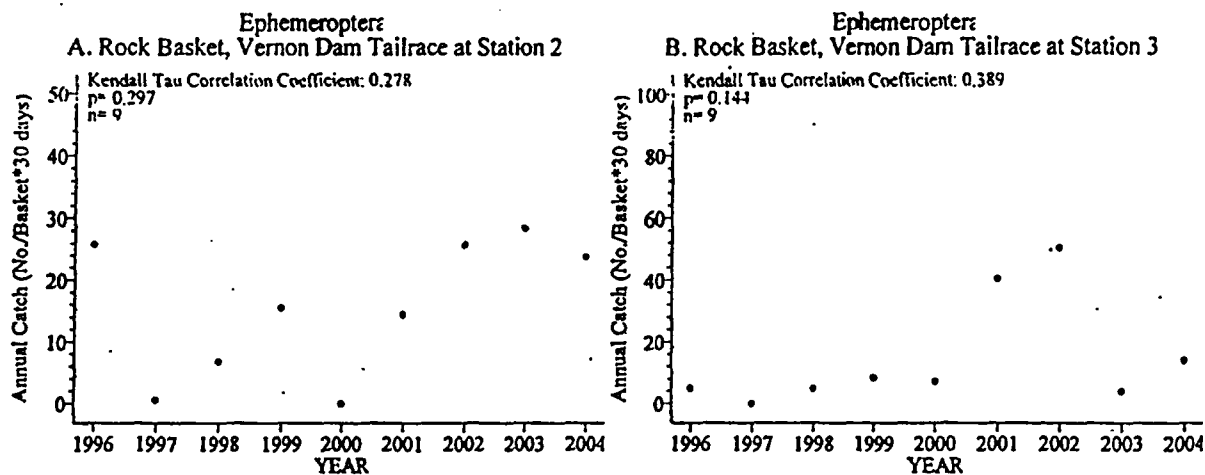


Figure 2-4. Scatter plots comparing Ephemeroptera annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

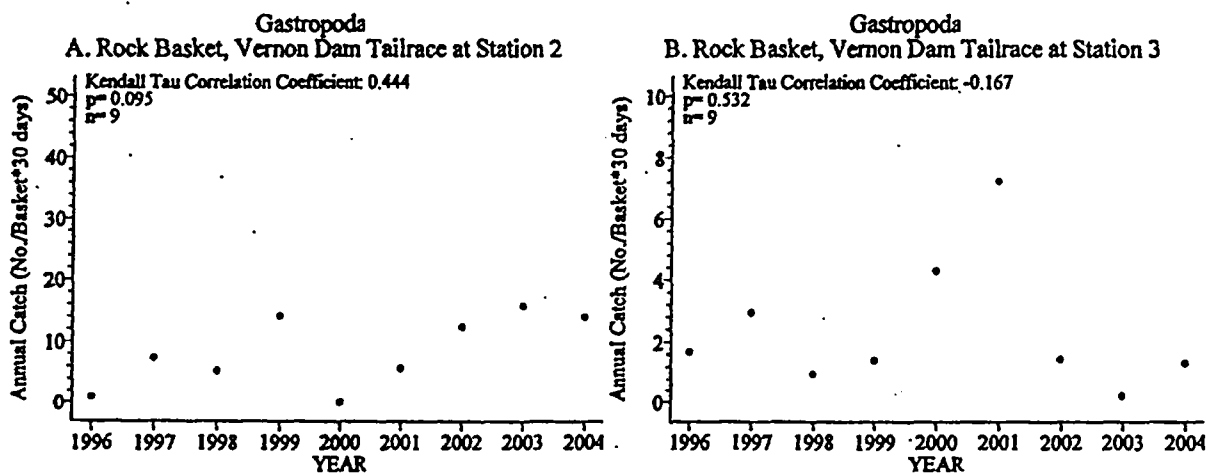


Figure 2-5. Scatter plots comparing Gastropoda annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

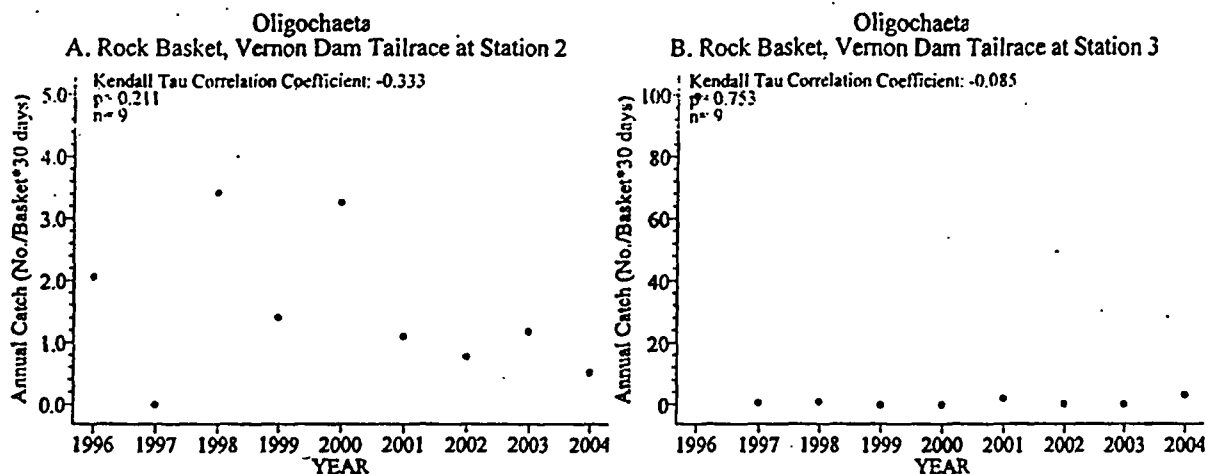


Figure 2-6. Scatter plots comparing Oligochaeta annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

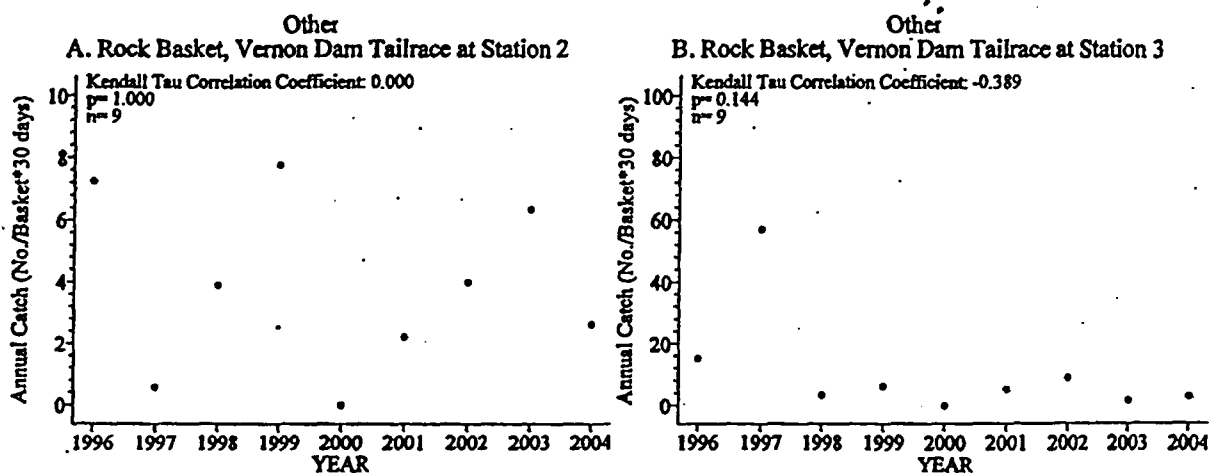


Figure 2-7. Scatter plots comparing annual catch (no./basket*30 days) of other macroinvertebrates for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

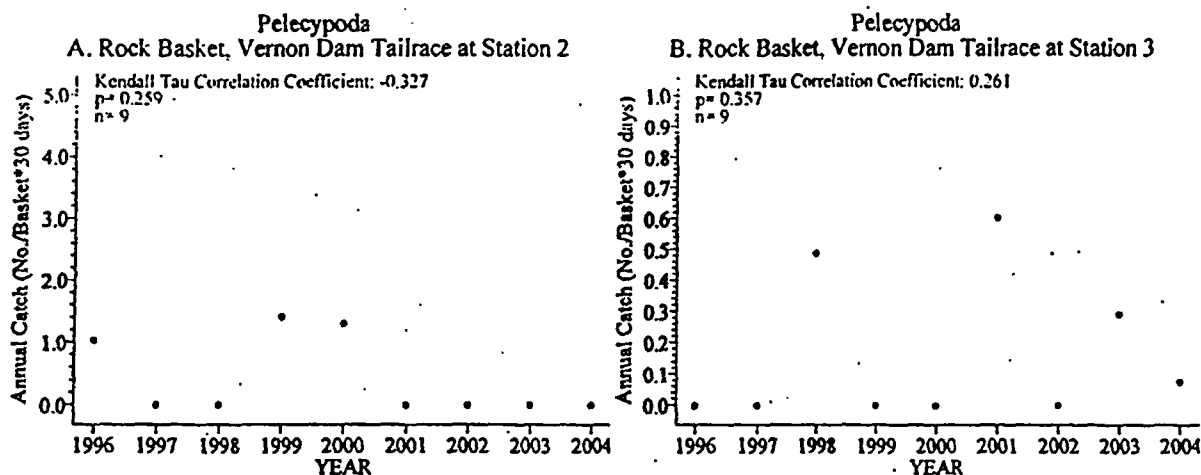


Figure 2-8. Scatter plots comparing Pelecypoda annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

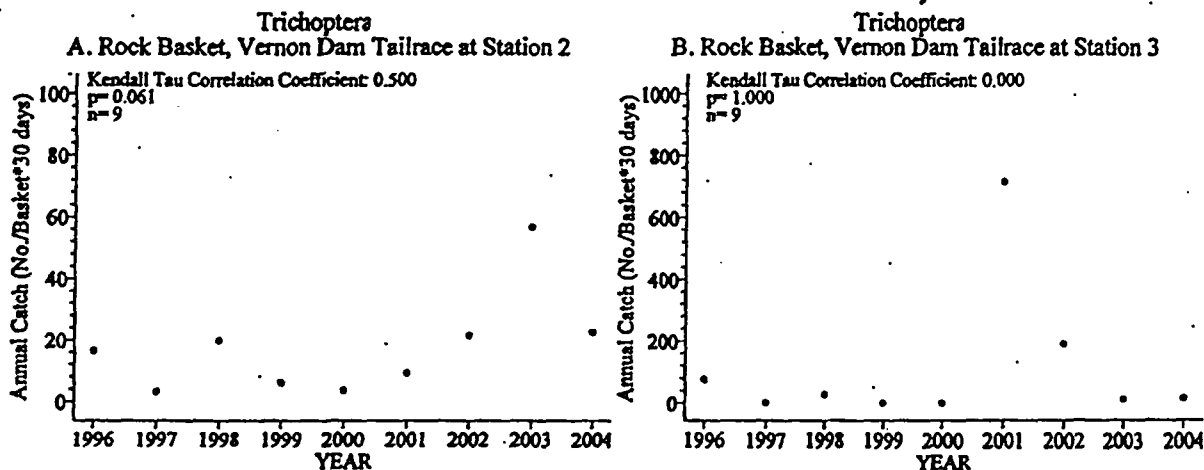


Figure 2-9. Scatter plots comparing Trichoptera annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

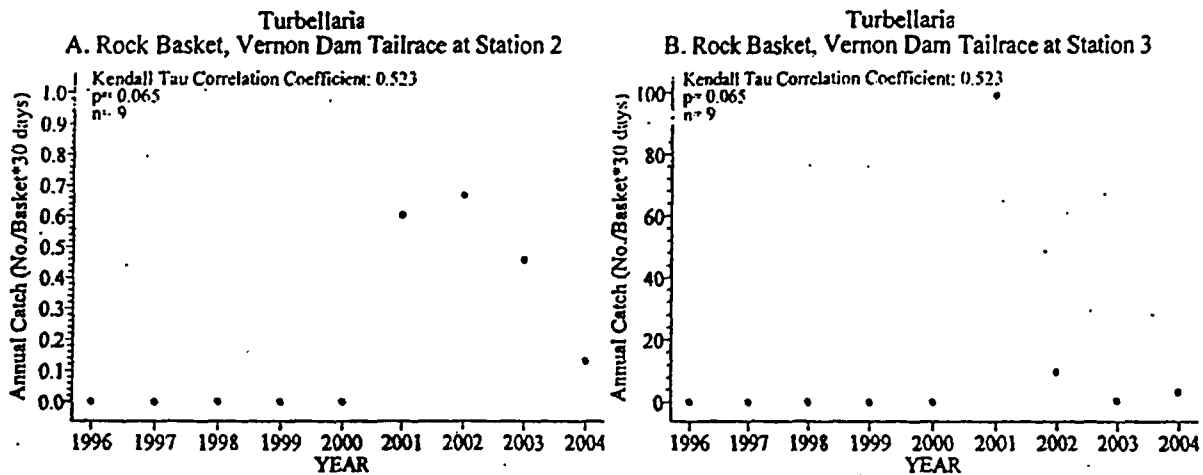


Figure 2-10. Scatter plots comparing Turbellaria annual catch (no./basket*30 days) for rock basket during 1993-2000 in Lower Vernon Pool and 1991-2002 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

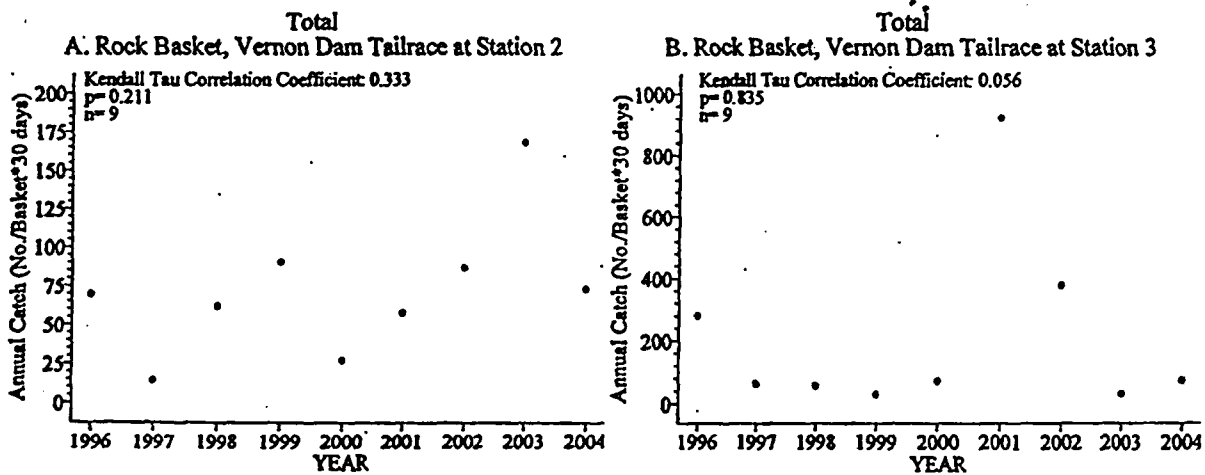


Figure 2-11. Scatter plots comparing total macroinvertebrate annual catch (no./basket*30 days) for rock basket during 1996-2004 in the Vernon Dam Tailrace of the Connecticut River near Vernon, Vermont.

Table 2-1. Composition of macroinvertebrates collected in rock baskets placed in the Connecticut River upstream and downstream of Vernon Dam, 1991 through 2004. Upstream rock basket sampling was discontinued in 2002.

	1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Downstream Station 2																												
Crustacea	20	4.8	28	5.1	107	10.7	38	3.4	58	9.0	20	14.9	2	4.0	12	4.7	114	44.5	2	2.4	101	17.7	47	6.0	92	5.0	8	1.4
Diptera	111	26.5	132	23.9	296	29.8	307	27.7	191	29.7	10	7.5	6	12.0	60	31.5	10	3.9	58	66.7	137	24.0	144	18.4	540	29.6	61	11.0
Ephemeroptera	24	5.7	67	12.1	69	6.9	207	18.7	87	10.4	80	37.3	2	4.0	28	11.0	44	17.2	0	0.0	144	25.2	232	29.7	311	17.1	181	32.8
Gastropoda	18	4.3	26	4.7	30	3.0	18	1.6	8	0.9	2	1.5	26	52.0	22	8.7	40	15.6	0	0.0	57	10.0	112	14.3	172	9.4	106	19.1
Oligochaeta	6	1.2	51	9.2	13	1.3	26	2.3	10	1.6	4	3.0	0	0.0	14	5.5	4	1.6	10	11.9	11	1.9	7	0.9	13	0.7	4	0.7
Other	43	10.3	29	5.3	20	2.0	74	6.7	52	8.1	14	10.4	2	4.0	16	6.3	22	8.6	0	0.0	22	3.9	36	4.6	69	3.8	20	3.6
Pelecypoda	7	1.7	142	25.7	5	0.5	1	0.1	1	0.2	2	1.5	0	0.0	0	0.0	4	1.6	4	4.8	0	0.0	0	0.0	0	0.0	0	0.0
Trichoptera	130	31.0	58	10.5	185	18.5	437	39.5	221	34.4	32	23.9	12	24.0	82	32.3	18	7.0	12	14.3	93	16.3	197	25.2	621	34.1	174	31.4
Turbellaria	61	14.6	19	3.4	274	27.4	0	0.0	37	5.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	1.1	6	0.8	5	0.3	1	0.2
Total	419	100.0	552	100.0	999	100.0	1,107	100.0	643	100.0	134	100.0	89	100.0	284	100.0	286	100.0	64	100.0	571	100.0	781	100.0	1,823	100.0	555	100.0
Downstream Station 3																												
Crustacea	1	1.0	94	10.9	41	11.0	30	4.4	19	4.4	136	13.6	0	0.0	6	2.6	24	27.3	84	80.8	47	0.5	11	0.3	61	17.5	11	1.1
Diptera	25	25.8	91	10.6	65	17.4	271	39.9	161	37.2	160	16.0	10	4.5	68	28.6	18	18.2	4	3.8	484	5.3	1050	30.7	72	20.7	473	45.5
Ephemeroptera	8	9.3	59	6.8	69	18.5	25	3.7	59	13.6	18	1.8	0	0.0	20	8.5	24	27.3	10	9.6	401	4.4	452	13.2	40	11.5	187	18.0
Gastropoda	7	7.2	18	2.1	45	12.1	74	10.9	3	0.7	6	0.6	10	4.5	4	1.7	4	4.5	8	5.8	72	0.8	13	0.4	2	0.6	18	1.7
Oligochaeta	0	0.0	16	1.9	0	0.0	0	0.0	3	0.7	358	35.5	2	0.9	4	1.7	0	0.0	0	0.0	19	0.2	2	0.1	8	2.3	43	4.1
Other	11	11.3	412	47.8	90	24.1	170	25.0	147	33.9	84	5.4	194	88.2	14	5.9	18	20.5	0	0.0	54	0.6	81	2.4	19	5.5	42	4.0
Pelecypoda	0	0.0	0	0.0	0	0.0	4	0.6	0	0.0	0	0.0	0	0.0	2	0.8	0	0.0	0	0.0	6	0.1	0	0.0	3	0.9	1	0.1
Trichoptera	8	8.2	76	8.8	63	16.9	98	14.4	39	9.0	272	27.1	4	1.8	118	50.0	2	2.3	0	0.0	7114	77.5	1722	60.4	139	39.9	224	21.5
Turbellaria	36	37.1	98	11.1	0	0.0	8	1.2	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	984	10.7	86	2.5	4	1.1	41	3.9
Total	97	100.0	862	100.0	373	100.0	880	100.0	433	100.0	1,002	100.0	229	100.0	236	100.0	88	100.0	104	100.0	8,184	100.0	3,417	100.0	348	100.0	1,040	100.0
Upstream Station 4																												
Crustacea	15	4.1	129	19.2	15	6.9	142	6.0	55	14.4	186	47.7	2,002	75.0	334	38.9	84	37.8	204	20.9	42	10.9						
Diptera	145	39.5	166	24.7	38	17.6	641	26.9	77	20.1	72	18.5	208	7.8	180	21.0	18	8.1	102	10.4	44	11.5						
Ephemeroptera	48	13.1	110	16.4	107	49.5	131	5.5	97	25.3	60	15.4	24	0.9	84	9.8	18	8.1	48	4.9	40	10.4						
Gastropoda	7	1.9	8	1.2	14	6.5	476	20.0	9	2.3	8	2.1	8	0.3	38	4.4	20	9.0	50	5.1	81	15.9						
Oligochaeta	0	0.0	112	16.7	3	1.4	132	5.5	7	1.8	26	6.7	140	5.2	99	11.2	28	12.6	64	6.5	96	25.0						
Other	96	26.2	101	15.1	20	9.3	86	3.6	42	11.0	12	3.1	92	3.4	65	7.9	40	18.0	484	49.5	50	13.0						
Pelecypoda	0	0.0	0	0.0	0	0.0	12	0.5	0	0.0	0	0.0	8	0.3	4	0.5	0	0.0	0	0.0	0	0.0						
Trichoptera	52	14.2	45	6.7	17	7.9	717	30.1	93	24.3	26	6.7	186	7.0	64	6.3	14	6.3	26	2.7	51	13.3						
Turbellaria	4	1.1	0	0.0	2	0.9	42	1.6	3	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0						
Total	367	100.0	671	100.0	216	100.0	2,378	100.0	383	100.0	390	100.0	2,668	100.0	858	100.0	222	100.0	978	100.0	384	100.0						
Upstream Station 5																												
Crustacea	29	3.3	14	1.0	94	18.2	16	1.7	27	6.1	84	23.0	320	63.7	168	40.4	300	63.0	424	52.0	28	7.2						
Diptera	271	31.3	815	58.9	198	38.4	378	42.1	183	41.1	106	31.5	72	12.1	68	13.6	20	4.2	44	5.4	53	13.6						
Ephemeroptera	15	1.7	42	3.0	53	10.3	126	14.0	107	24.0	84	19.0	46	7.7	82	19.7	26	5.5	30	3.7	15	3.9						
Gastropoda	18	2.1	46	3.3	8	1.6	22	2.6	17	3.8	8	2.4	26	4.4	4	1.0	72	15.1	162	19.9	39	10.0						
Oligochaeta	7	0.8	48	3.5	0	0.0	30	3.3	10	2.2	26	7.7	2	0.3	12	2.9	0	0.0	36	4.4	28	7.2						
Other	45	5.2	290	21.0	32	6.2	32	3.6	18	4.0	16	4.8	92	15.4	70	16.8	36	7.6	70	8.8	182	46.8						
Pelecypoda	8	0.9	1	0.1	0	0.0	28	3.1	0	0.0	0	0.0	4	0.7	0	0.0	0	0.0	4	0.5	1	0.3						
Trichoptera	325	37.5	122	8.8	81	15.7	246	27.4	81	18.2	32	9.5	34	5.7	24	5.8	22	4.6	46	5.8	43	11.1						
Turbellaria	148	17.1	6	0.4	50	9.7	20	2.2	2	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0						
Total	886	100.0	1,383	100.0	516	100.0	897	100.0	445	100.0	336	100.0	596	100.0	416	100.0	476	100.0	816	100.0	389	100.0						

Table 2-2. Summary of the results of a Kendall-Tau correlation analysis of time series trends in each benthic macroinvertebrate taxonomic grouping collected by rock basket sampling in the Connecticut River at Station 2 and Station 3 located downstream from Vernon Dam, 1996-2004.

Taxa	Station	Trend Direction	Kendall-Tau coefficient	p-value	Significance
Crustacea	2	Decreasing	-0.056	0.835	Not Significant
Diptera	2	Increasing	0.278	0.297	Not Significant
Ephemeroptera	2	Increasing	0.278	0.297	Not Significant
Gastropoda	2	Increasing	0.444	0.095	Not Significant
Oligochaeta	2	Decreasing	-0.333	0.211	Not Significant
Other	2	None	0.000	1.000	Not Significant
Pelecypoda	2	Decreasing	-0.327	0.259	Not Significant
Tricoptera	2	Increasing	0.500	0.061	Not Significant
Turbellaria	2	Increasing	0.523	0.065	Not Significant
All Taxa	2	Increasing	0.333	0.211	Not Significant
Crustacea	3	Decreasing	-0.167	0.532	Not Significant
Diptera	3	Increasing	0.167	0.532	Not Significant
Ephemeroptera	3	Increasing	0.389	0.144	Not Significant
Gastropoda	3	Decreasing	-0.167	0.532	Not Significant
Oligochaeta	3	Decreasing	-0.085	0.753	Not Significant
Other	3	Decreasing	-0.389	0.144	Not Significant
Pelecypoda	3	Increasing	0.261	0.357	Not Significant
Tricoptera	3	None	0.000	1.000	Not Significant
Turbellaria	3	Increasing	0.523	0.065	Not Significant
All Taxa	3	Increasing	0.056	0.835	Not Significant

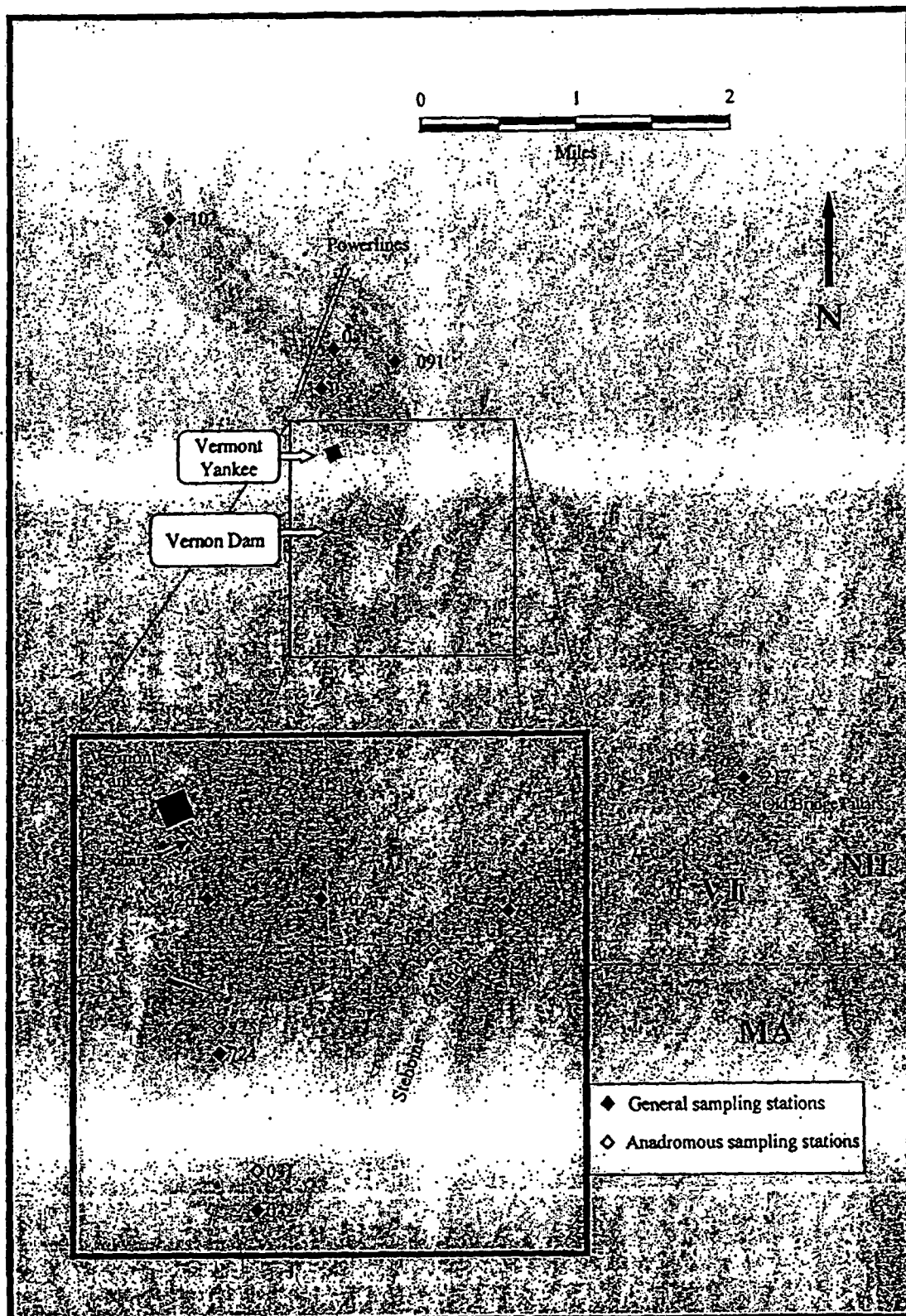


Figure 3-1. General and anadromous fish electrofishing sampling stations.

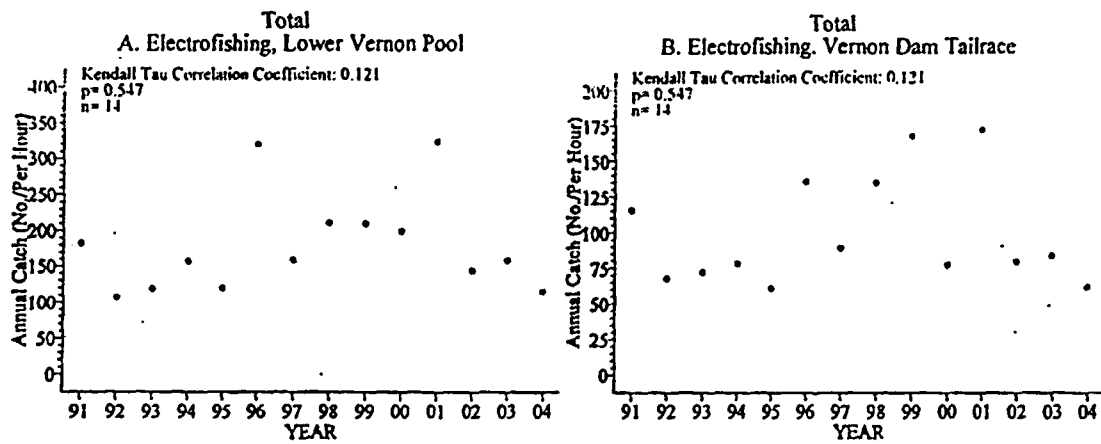


Figure 3-2. Scatter plots comparing annual mean catch per hour of all fish species combined (Total) for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

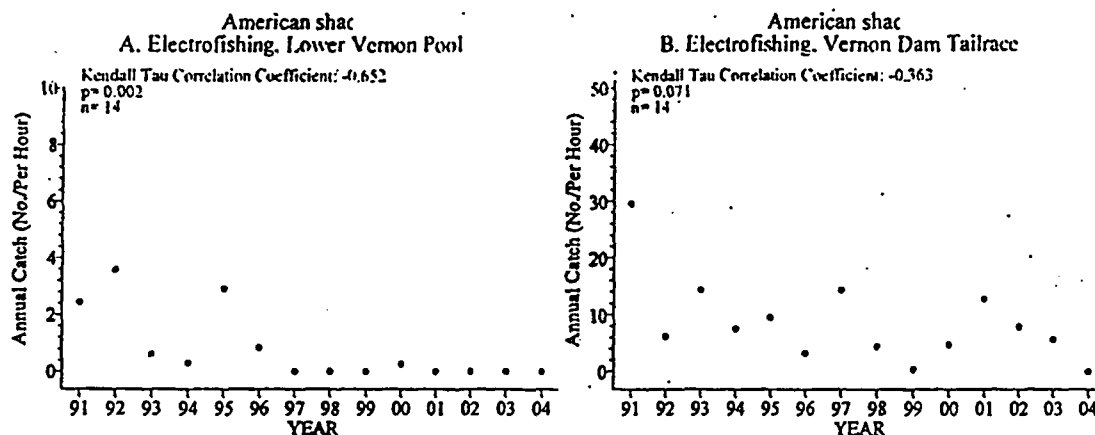


Figure 3.3 Scatter plots comparing American shad annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

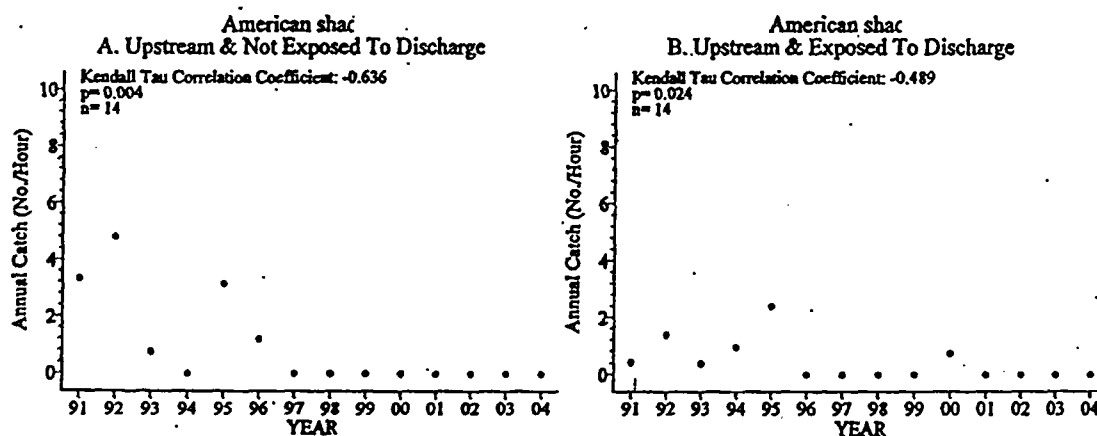


Figure 3.4 Scatter plots comparing American shad annual mean catch per hour for general electrofishing during 1991 through 2004 at stations upstream (A) and downstream (B) from Vermont Yankee in Lower Vernon Pool of the Connecticut River near Vernon, Vermont.

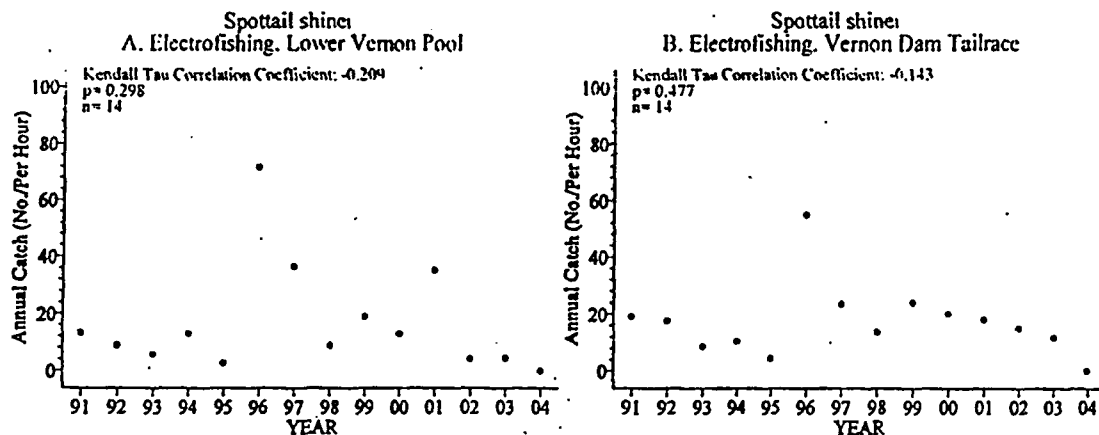


Figure 3-5. Scatter plots comparing spottail shiner annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

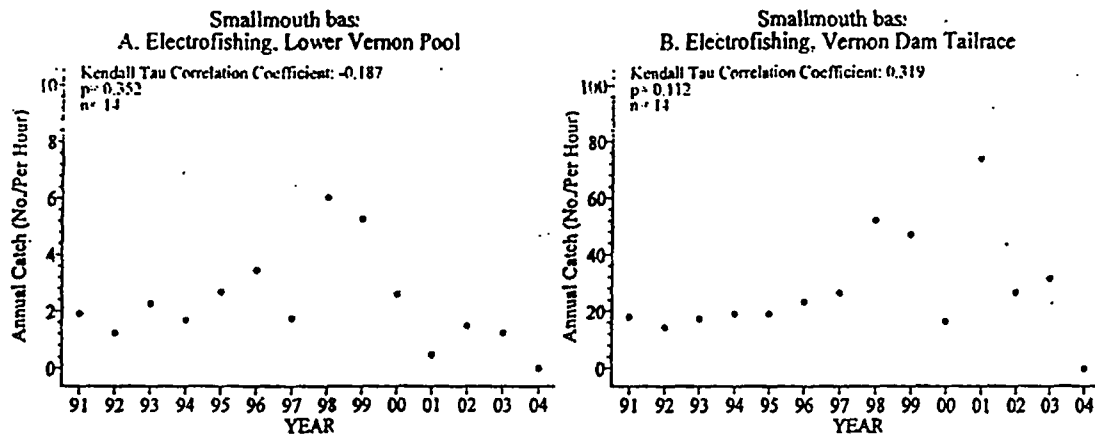


Figure 3-6. Scatter plots comparing smallmouth bass annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

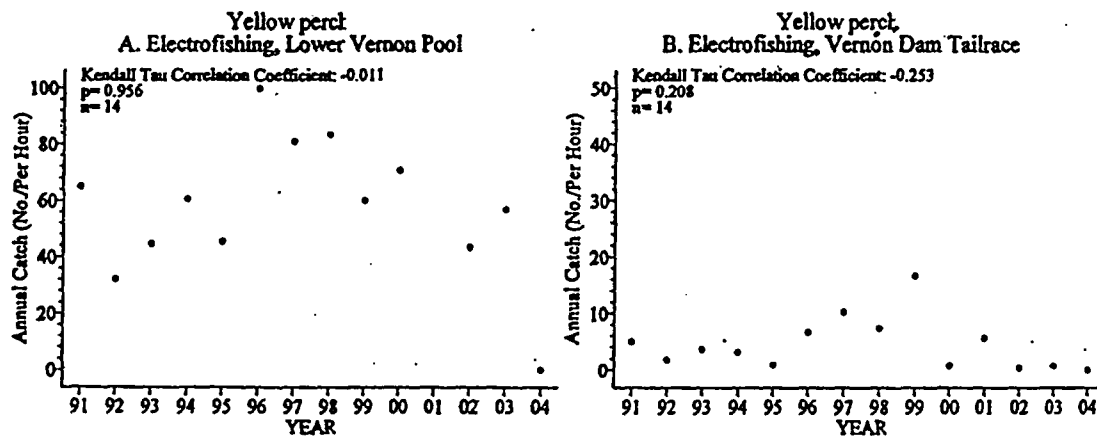


Figure 3-7. Scatter plots comparing yellow perch annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

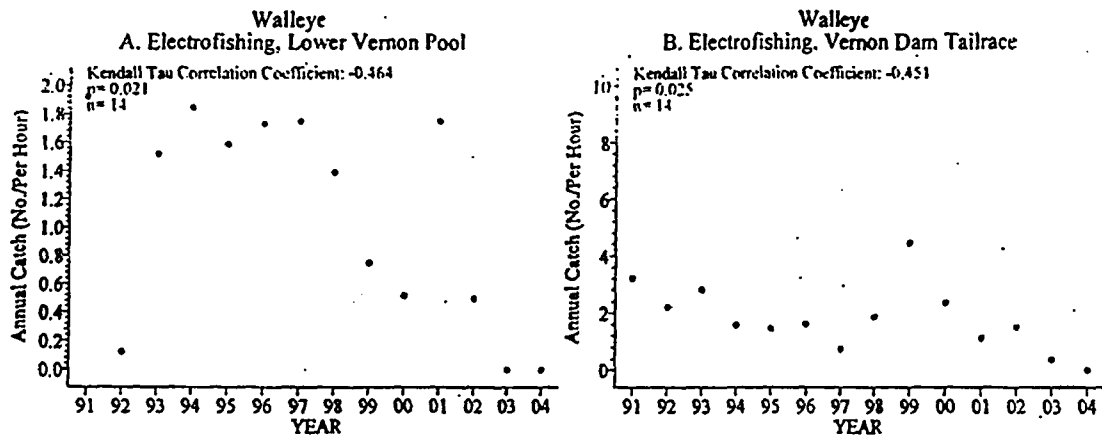


Figure 3-8. Scatter plots comparing walleye annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

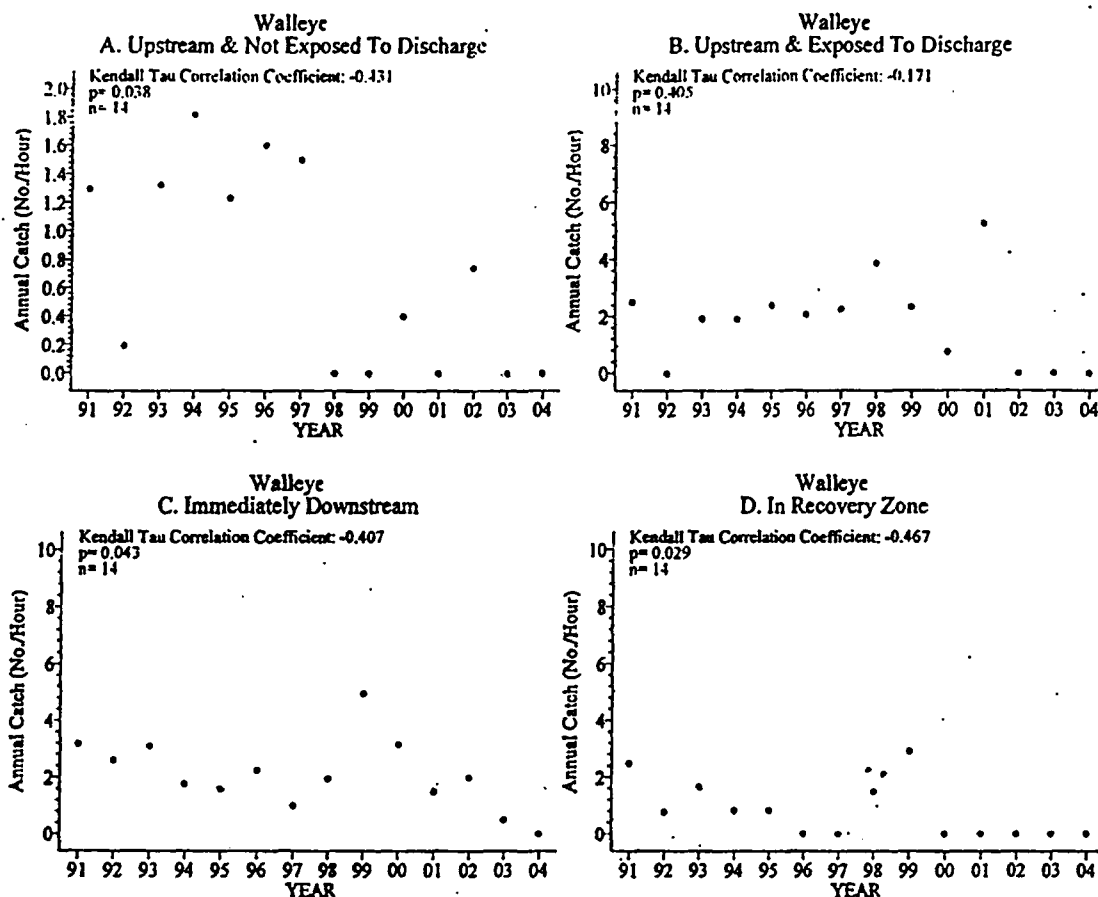


Figure 3-9. Scatter plots comparing walleye annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool at locations upstream (A) and downstream (B) from Vermont Yankee, and in the Vernon Dam Tailrace near the dam (C) or further downriver in a recovery zone (D) of the Connecticut River near Vernon, Vermont.

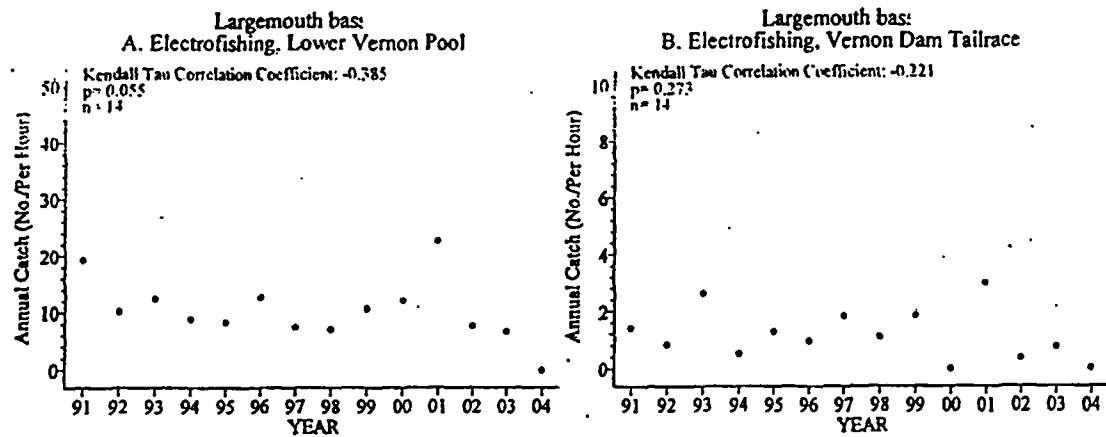


Figure 3-10. Scatter plots comparing largemouth bass annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

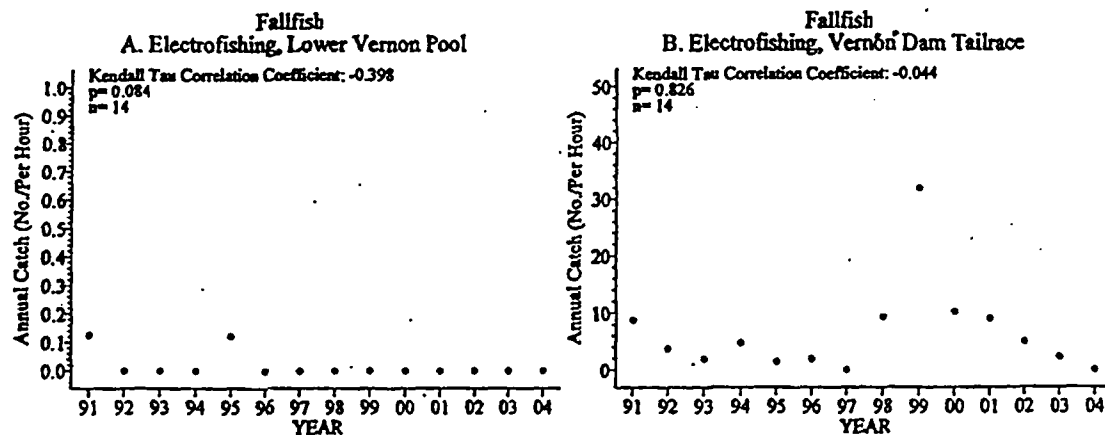


Figure 3-11. Scatter plots comparing fallfish annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

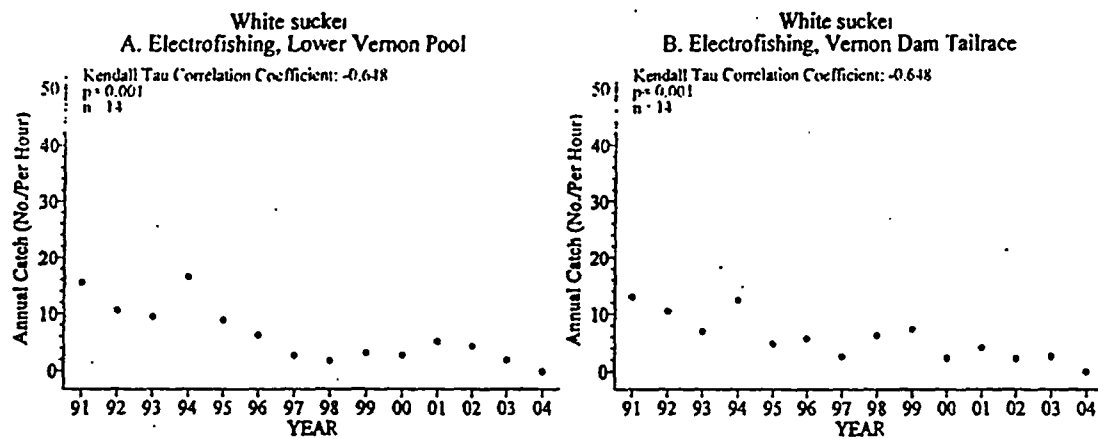


Figure 3-12. Scatter plots comparing white sucker annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool (A) and the Vernon Dam Tailrace (B) of the Connecticut River near Vernon, Vermont.

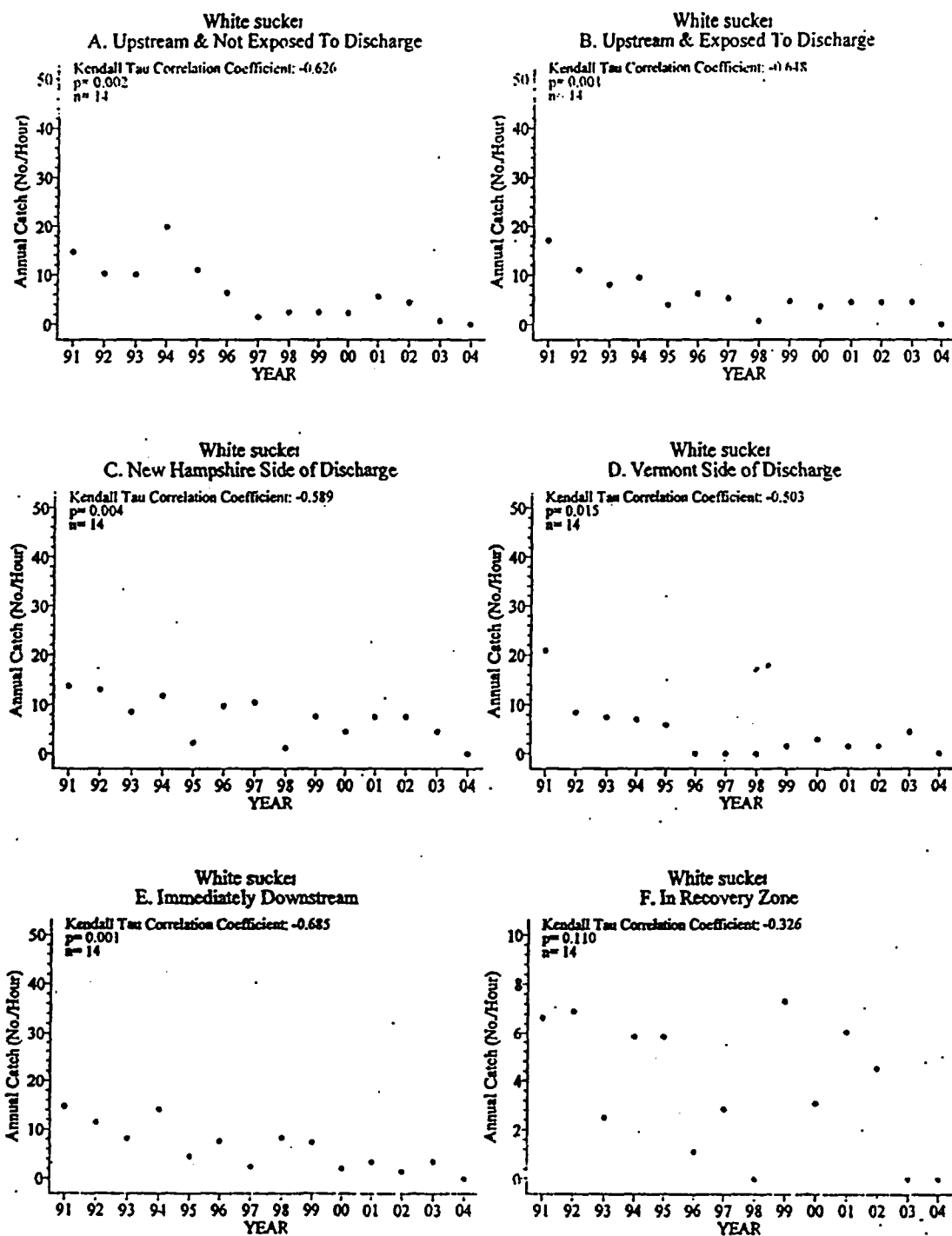


Figure 3-13. Scatter plots comparing white sucker annual mean catch per hour for general electrofishing during 1991 through 2004 in Lower Vernon Pool at locations upstream (A) and downstream (B) from Vermont Yankee, in Vernon Pool but on the New Hampshire (C) or Vermont (D) sides, and in the Vernon Dam Tailrace near the dam (E) or further downriver in a recovery zone (F) of the Connecticut River near Vernon, Vermont.

Table 3-1. Summary of the Number and Percent of Fish Species Collected by General Electrofishing Upstream of Vernon Dam, from 1991 through 2004¹.

Species	1991		1992		1993		1994		1995		1996	
	N	%	N	%	N	%	N	%	N	%	N	%
American eel	7	0.5	2	0.2	8	0.8	4	0.4	2	0.2	0	0.0
American shad	19	1.3	29	3.3	5	0.5	2	0.2	24	2.4	3	0.3
Atlantic salmon	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Banded killifish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Black crappie	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	0.4
Blueback herring	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bluegill	128	9.0	56	6.4	99	10.5	118	11.5	135	13.7	222	19.8
Brook trout	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Brown bullhead	19	1.3	19	2.2	29	3.1	8	0.8	20	2.0	1	0.1
Chain pickerel	17	1.2	29	3.3	5	0.5	4	0.4	5	0.5	12	1.1
Common carp	11	0.8	6	0.7	8	0.8	7	0.7	11	1.1	2	0.2
Common shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
E. silvery minnow	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Fallfish	1	0.1	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0
Gizzard shad	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0
Golden shiner	74	5.2	70	8.0	16	1.7	41	4.0	46	4.7	39	3.5
Goldfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Largemouth bass	151	10.6	83	9.5	99	10.5	58	5.7	69	7.0	44	3.9
Lepomis sp.	0	0.0	1	0.1	1	0.1	12	1.2	49	5.0	0	0.0
Mimic shiner	6	0.4	0	0.0	0	0.0	17	1.7	5	0.5	0	0.0
Northern pike	7	0.5	11	1.3	6	0.6	2	0.2	6	0.6	4	0.4
Notropis sp.	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Pumpkinseed	157	11.0	94	10.8	144	15.2	97	9.5	68	6.9	109	9.7
Redbreast sunfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rock bass	37	2.6	26	3.0	10	1.1	5	0.5	18	1.8	41	3.7
Sea lamprey	2	0.1	0	0.0	1	0.1	0	0.0	0	0.0	1	0.1
Smallmouth bass	15	1.1	10	1.1	18	1.9	11	1.1	22	2.2	12	1.1
Spotfin shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Spottail shiner	104	7.3	73	8.4	46	4.9	85	8.3	23	2.3	249	22.2
Tessellated darter	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Walleye	15	1.1	1	0.1	12	1.3	12	1.2	13	1.3	6	0.5
White perch	19	1.3	11	1.3	7	0.7	34	3.3	18	1.8	0	0.0
White sucker	121	8.5	86	9.9	75	7.9	108	10.6	73	7.4	22	2.0
Yellow bullhead	5	0.4	4	0.5	5	0.5	4	0.4	7	0.7	2	0.2
Yellow perch	507	35.6	260	29.8	352	37.2	394	38.5	373	37.7	346	30.9
Unidentifiable	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total Number	1424	100	872	100	946	100	1023	100	989	100	1120	100
No. Collections	24		24		24		24		24		20	
Effort (Hrs)	7.8		8.1		7.9		6.5		8.2		3.5	
No. Fish/Hr. (CPUE)²	182.6		107.7		119.7		157.4		120.6		320.0	

(continued)

¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-1 (Upstream Continued)

Species	1997		1998		1999		2000		2001		2002	
	N	%	N	%	N	%	N	%	N	%	N	%
American eel	0	0.0	2	0.2	1	0.1	0	0.0	0	0.0	0	0.0
American shad	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
Atlantic salmon	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Banded killifish	0	0.0	0	0.0	0	0.0	1	0.1	4	0.3	0	0.0
Black crappie	3	0.5	7	0.8	10	1.2	12	1.5	9	0.7	4	0.7
Blueback herring	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bluegill	46	7.2	234	25.8	296	35.2	221	28.4	360	27.8	197	34.1
Brook trout	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Brown bullhead	2	0.3	2	0.2	0	0.0	3	0.4	2	0.2	0	0.0
Chain pickerel	14	2.2	20	2.2	9	1.1	12	1.5	11	0.8	5	0.9
Common carp	1	0.2	2	0.2	3	0.4	2	0.3	0	0.0	1	0.2
Common shiner	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0
E. silvery minnow	0	0.0	0	0.0	9	1.1	5	0.6	0	0.0	2	0.3
Fallfish	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
Golden shiner	15	2.4	74	8.1	66	7.8	24	3.1	55	4.2	29	5.0
Goldfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Largemouth bass	30	4.7	31	3.4	43	5.1	47	6.0	91	7.0	31	5.4
Lepomis sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mimic shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Northern pike	0	0.0	0	0.0	0	0.0	4	0.5	1	0.1	1	0.2
Notropis sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pumpkinseed	11	1.7	71	7.8	23	2.7	70	9.0	104	8.0	81	14.0
Redbreast sunfish	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rock bass	9	1.4	17	1.9	18	2.1	24	3.1	21	1.6	5	0.9
Sea lamprey	9	1.4	5	0.6	4	0.5	1	0.1	4	0.3	0	0.0
Smallmouth bass	7	1.1	26	2.9	21	2.5	10	1.3	2	0.2	6	1.0
Spotfin shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Spottail shiner	146	22.9	39	4.3	76	9.0	50	6.4	141	10.9	17	2.9
Tessellated darter	0	0.0	2	0.2	0	0.0	0	0.0	4	0.3	1	0.2
Walleye	7	1.1	6	0.7	3	0.4	2	0.3	7	0.5	2	0.3
White perch	1	0.2	0	0.0	1	0.1	0	0.0	0	0.0	3	0.5
White sucker	11	1.7	8	0.9	13	1.5	11	1.4	21	1.6	18	3.1
Yellow bullhead	0	0.0	2	0.2	4	0.5	7	0.9	5	0.4	0	0.0
Yellow perch	324	50.9	360	39.6	240	28.5	272	34.9	454	35.0	175	30.3
Unidentifiable	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total Number	637	100	908	100	841	100	779	100	1296	100	578	100
No. Collections	24		24		24		24		24		24	
Effort (Hrs)	4.0		4.3		4.0		3.9		4.0		4.0	
No. Fish/Hr. (CPUE) ²	159.3		211.2		210.3		199.7		324.0		144.5	

(continued)

¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-1 (Upstream Continued)

Species	2003		2004		All Years		
	N	%	N	%	N	% CPUE ²	
American eel	0	0.0	1	0.2	27	0.2	0.4
American shad	0	0.0	0	0.0	83	0.7	1.1
Atlantic salmon	0	0.0	0	0.0	0	0.0	0.0
Banded killifish	0	0.0	0	0.0	5	0.0	0.1
Black crappie	13	2.0	9	1.9	72	0.6	1.0
Blueback herring	0	0.0	0	0.0	0	0.0	0.0
Bluegill	202	31.8	123	26.6	2437	19.5	32.8
Brook trout	0	0.0	0	0.0	0	0.0	0.0
Brown bullhead	3	0.5	1	0.2	109	0.9	1.5
Chain pickerel	8	1.3	2	0.4	153	1.2	2.1
Common carp	0	0.0	4	0.9	58	0.5	0.8
Common shiner	1	0.2	0	0.0	2	0.0	0.0
E. silvery minnow	0	0.0	0	0.0	16	0.1	0.2
Fallfish	0	0.0	0	0.0	2	0.0	0.0
Gizzard shad	0	0.0	0	0.0	1	0.0	0.0
Golden shiner	19	3.0	27	5.8	595	4.8	8.0
Goldfish	0	0.0	0	0.0	0	0.0	0.0
Largemouth bass	27	4.2	33	7.1	837	6.7	11.3
Lepomis sp.	11	1.7	0	0.0	74	0.6	1.0
Mimic shiner	0	0.0	0	0.0	28	0.2	0.4
Northern pike	0	0.0	0	0.0	42	0.3	0.6
Notropis sp.	0	0.0	0	0.0	1	0.0	0.0
Pumpkinseed	75	11.8	48	10.4	1152	9.2	15.5
Redbreast sunfish	0	0.0	0	0.0	1	0.0	0.0
Rock bass	9	1.4	3	0.6	243	1.9	3.3
Sea lamprey	4	0.6	0	0.0	31	0.2	0.4
Smallmouth bass	5	0.8	0	0.0	165	1.3	2.2
Spotfin shiner	0	0.0	0	0.0	0	0.0	0.0
Spottail shiner	18	2.8	6	1.3	1073	8.6	14.5
Tessellated darter	0	0.0	2	0.4	11	0.1	0.1
Walleye	0	0.0	0	0.0	86	0.7	1.2
White perch	2	0.3	0	0.0	96	0.8	1.3
White sucker	8	1.3	4	0.9	579	4.6	7.8
Yellow bullhead	3	0.5	4	0.9	52	0.4	0.7
Yellow perch	228	35.8	194	41.9	4479	35.8	60.4
Unidentifiable	0	0.0	2	0.4	2	0.0	0.0
Total Number	636	100	463	100	12512	100	168.6
No. Collections	24		24		332		
Effort (Hrs)	4.0		4.0		74.2		
No. Fish/Hr. (CPUE)²	158.3		115.7		168.6		

¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-2. Summary of the Number and Percent of Fish Species Collected by General Electrofishing Downstream of Vernon Dam, from 1991 through 2004¹.

Species	1991		1992		1993		1994		1995		1996	
	N	%	N	%	N	%	N	%	N	%	N	%
American eel	13	2.0	1	0.2	10	2.4	7	1.6	1	0.3	1	0.2
American shad	166	25.6	37	9.2	82	19.9	43	9.6	59	15.6	10	2.4
Atlantic salmon	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0
Banded killifish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Black crappie	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Blueback herring	0	0.0	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0
Bluegill	8	1.2	12	3.0	15	3.6	28	6.3	25	6.6	37	8.8
Brook trout	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Brown bullhead	1	0.2	1	0.2	2	0.5	0	0.0	5	1.3	0	0.0
Chain pickerel	3	0.5	6	1.5	4	1.0	2	0.4	0	0.0	3	0.7
Common carp	3	0.5	1	0.2	3	0.7	4	0.9	7	1.8	4	1.0
Common shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
E. silvery minnow	0	0.0	0	0.0	0	0.0	0	0.0	6	1.6	0	0.0
Fallfish	49	7.6	22	5.5	11	2.7	27	6.1	9	2.4	6	1.4
Gizzard shad	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	2	0.5
Golden shiner	5	0.8	2	0.5	4	1.0	4	0.9	0	0.0	14	3.3
Goldfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.2
Largemouth bass	8	1.2	5	1.2	15	3.6	3	0.7	8	2.1	3	0.7
Lepomis sp.	6	0.9	0	0.0	1	0.2	0	0.0	0	0.0	0	0.0
Mimic shiner	15	2.3	0	0.0	4	1.0	6	1.3	1	0.3	0	0.0
Northern pike	2	0.3	7	1.7	0	0.0	6	1.3	10	2.6	3	0.7
Notropis sp.	0	0.0	0	0.0	0	0.0	8	1.8	2	0.5	0	0.0
Pumpkinseed	11	1.7	3	0.7	3	0.7	4	0.9	4	1.1	5	1.2
Redbreast sunfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rock bass	30	4.6	25	6.2	22	5.3	37	8.3	47	12.4	37	8.8
Sea lamprey	0	0.0	1	0.2	3	0.7	0	0.0	0	0.0	7	1.7
Smallmouth bass	101	15.6	85	21.2	99	24.0	109	24.4	118	31.1	73	17.3
Spotfin shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Spottail shiner	107	16.5	104	25.9	49	11.9	60	13.5	27	7.1	171	40.6
Tessellated darter	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Walleye	18	2.8	13	3.2	16	3.9	9	2.0	9	2.4	5	1.2
White perch	1	0.2	1	0.2	8	1.9	0	0.0	2	0.5	0	0.0
White sucker	73	11.3	62	15.5	40	9.7	71	15.9	30	7.9	18	4.3
Yellow bullhead	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0
Yellow perch	28	4.3	11	2.7	21	5.1	18	4.0	6	1.6	21	5.0
Total Number	648	100.1	401	99.5	412	99.8	446	99.9	379	100.1	421	100.0
No. Collections	20		20		20		20		20		16	
Effort (Hrs)	5.6		5.9		5.7		5.7		6.2		3.1	
No. Fish/Hr.(CPUE)²	115.7		68.0		72.3		78.2		61.1		135.8	

(continued)

¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-2. (Downstream Continued)

Species	1997		1998		1999		2000		2001		2002	
	N	%	N	%	N	%	N	%	N	%	N	%
American eel	1	0.4	3	0.8	0	0.0	2	1.0	0	0.0	2	0.9
American shad	39	16.2	12	3.3	1	0.2	12	6.0	34	7.3	21	9.8
Atlantic salmon	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Banded killifish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.9
Black crappie	0	0.0	3	0.8	0	0.0	0	0.0	1	0.2	3	1.4
Blueback herring	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bluegill	5	2.1	28	7.7	12	2.6	23	11.4	41	8.8	22	10.2
Brook trout	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5
Brown bullhead	0	0.0	0	0.0	2	0.4	0	0.0	0	0.0	0	0.0
Chain pickerel	3	1.2	0	0.0	0	0.0	1	0.5	1	0.2	0	0.0
Common carp	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Common shiner	0	0.0	0	0.0	21	4.6	1	0.5	1	0.2	0	0.0
E. silvery minnow	0	0.0	5	1.4	0	0.0	0	0.0	0	0.0	2	0.9
Fallfish	0	0.0	25	6.8	86	19.0	26	12.9	24	5.2	13	6.0
Gizzard shad	0	0.0	0	0.0	1	0.2	1	0.5	0	0.0	0	0.0
Golden shiner	4	1.7	4	1.1	10	2.2	3	1.5	1	0.2	1	0.5
Goldfish	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Largemouth bass	5	2.1	3	0.8	5	1.1	0	0.0	8	1.7	1	0.5
Lepomis sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mimic shiner	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Northern pike	1	0.4	0	0.0	0	0.0	0	0.0	1	0.2	0	0.0
Notropis sp.	0	0.0	0	0.0	0	0.0	2	1.0	9	1.9	0	0.0
Pumpkinseed	3	1.2	10	2.7	5	1.1	10	5.0	5	1.1	10	4.7
Redbreast sunfish	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0
Rock bass	6	2.5	43	11.8	38	8.4	13	6.5	60	12.9	13	6.0
Sea lamprey	0	0.0	6	1.6	3	0.7	0	0.0	3	0.6	2	0.9
Smallmouth bass	72	29.9	141	38.6	127	28.0	42	20.9	197	42.5	71	33.0
Spotfin shiner	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0
Spottail shiner	64	26.6	37	10.1	65	14.3	51	25.4	48	10.3	40	18.6
Tessellated darter	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0
Walleye	2	0.8	5	1.4	12	2.6	6	3.0	3	0.6	4	1.9
White perch	1	0.4	0	0.0	0	0.0	0	0.0	1	0.2	0	0.0
White sucker	7	2.9	17	4.7	20	4.4	6	3.0	11	2.4	6	2.8
Yellow bullhead	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Yellow perch	28	11.6	20	5.5	45	9.9	2	1.0	15	3.2	1	0.5
Total Number	241	100.0	365	100.0	453	99.7	201	100.1	464	99.7	215	100.0
No. Collections	16		16		16		16		16		16	
Effort (Hrs)	2.7		2.7		2.7		2.6		2.7		2.7	
No. Fish/Hr.(CPUE) ²	89.3		135.2		167.8		77.3		171.9		79.6	

(continued)

¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-2. (Downstream Continued)

Species	2003		2004		All Years		
	N	%	N	%	N	%	CPUE ²
American eel	0	0.0	0	0.0	41	0.8	0.8
American shad	15	6.8	19	11.6	550	10.9	10.2
Atlantic salmon	0	0.0	0	0.0	1	0.0	0.0
Banded killifish	0	0.0	0	0.0	2	0.0	0.0
Black crappie	1	0.5	1	0.6	9	0.2	0.2
Blueback herring	0	0.0	0	0.0	2	0.0	0.0
Bluegill	42	18.9	12	7.3	310	6.2	5.8
Brook trout	0	0.0	0	0.0	1	0.0	0.0
Brown bullhead	0	0.0	0	0.0	11	0.2	0.2
Chain pickerel	2	0.9	0	0.0	25	0.5	0.5
Common carp	2	0.9	0	0.0	24	0.5	0.4
Common shiner	1	0.5	0	0.0	24	0.5	0.4
E. silvery minnow	0	0.0	0	0.0	13	0.3	0.2
Fallfish	6	2.7	8	4.9	312	6.2	5.8
Gizzard shad	0	0.0	0	0.0	5	0.1	0.1
Golden shiner	0	0.0	0	0.0	52	1.0	1.0
Goldfish	0	0.0	0	0.0	1	0.0	0.0
Largemouth bass	2	0.9	7	4.3	73	1.5	1.4
Lepomis sp.	0	0.0	0	0.0	7	0.1	0.1
Mimic shiner	0	0.0	0	0.0	26	0.5	0.5
Northern pike	0	0.0	0	0.0	30	0.6	0.6
Notropis sp.	0	0.0	0	0.0	21	0.4	0.4
Pumpkinseed	5	2.3	2	1.2	80	1.6	1.5
Redbreast sunfish	0	0.0	0	0.0	1	0.0	0.0
Rock bass	18	8.1	30	18.3	419	8.3	7.8
Sea lamprey	1	0.5	1	0.6	27	0.5	0.5
Smallmouth bass	84	37.8	48	29.3	1367	27.2	25.5
Spotfin shiner	0	0.0	0	0.0	1	0.0	0.0
Spottail shiner	31	14.0	26	15.9	880	17.5	16.4
Tessellated darter	1	0.5	0	0.0	2	0.0	0.0
Walleye	1	0.5	0	0.0	103	2.0	1.9
White perch	1	0.5	0	0.0	15	0.3	0.3
White sucker	7	3.2	5	3.0	373	7.4	6.9
Yellow bullhead	0	0.0	0	0.0	1	0.0	0.0
Yellow perch	2	0.9	5	3.0	223	4.4	4.2
Total Number	222	100.4	164	100.0	5032	100.0	93.7
No. Collections	16		16		244		
Effort (Hrs)	2.7		2.7		53.7		
No. Fish/Hr.(CPUE)²	83.3		61.5		93.7		

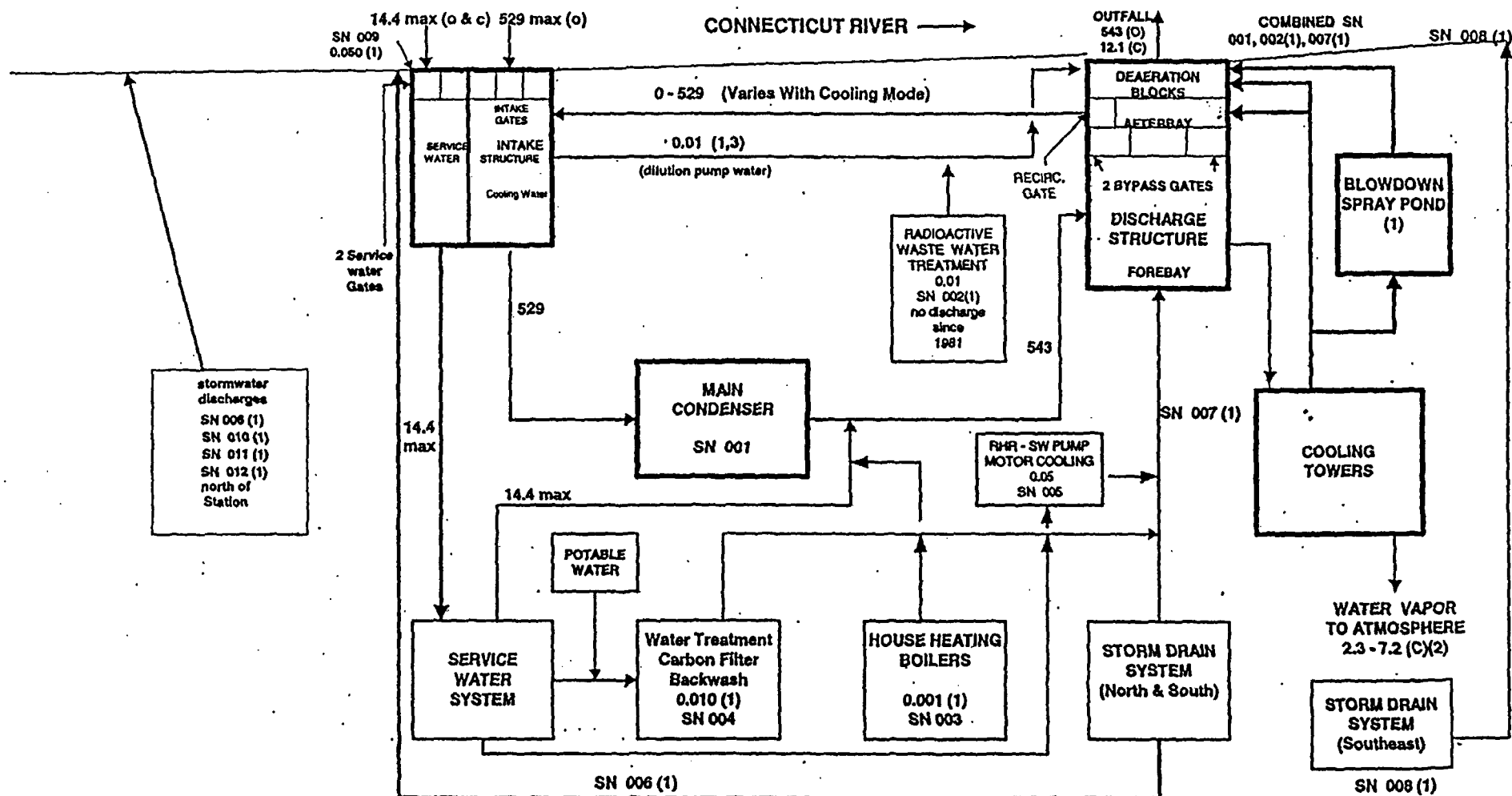
¹ Data from 1991-2004 were obtained by transcription from annual reports.

² CPUE is catch per unit of effort expressed as fish per hour.

Table 3-3. Summary of the results of a Kendall-Tau correlation analysis of time series trends in each of the nine Representative Important Species (RIS) of fish and for all fish species combined (Total) collected by general electrofishing in the Connecticut River at permit-required Stations located upstream and downstream from Vernon Dam, 1991-2004.

RIS	Location	Trend Direction	Kendall-Tau coefficient	p-value	Significance
American Shad	Upstream	Decreasing	-0.652	0.002	Significant
Atlantic Salmon	Upstream	None	N/A	N/A	N/A
Spottail Shiner	Upstream	Decreasing	-0.209	0.298	Not Significant
Smallmouth Bass	Upstream	Decreasing	-0.187	0.352	Not Significant
Yellow Perch	Upstream	Decreasing	-0.011	0.956	Not Significant
Walleye	Upstream	Decreasing	-0.464	0.021	Significant
Largemouth Bass	Upstream	Decreasing	-0.385	0.055	Not Significant
Fallfish	Upstream	Decreasing	-0.398	0.084	Not Significant
White Sucker	Upstream	Decreasing	-0.648	0.001	Significant
Total	Upstream	Increasing	0.121	0.547	Not Significant
American Shad	Downstream	Decreasing	-0.363	0.071	Not Significant
Atlantic Salmon	Downstream	None	N/A	N/A	N/A
Spottail Shiner	Downstream	Decreasing	-0.143	0.477	Not Significant
Smallmouth Bass	Downstream	Increasing	0.319	0.112	Not Significant
Yellow Perch	Downstream	Decreasing	-0.253	0.208	Not Significant
Walleye	Downstream	Decreasing	-0.451	0.025	Significant
Largemouth Bass	Downstream	Decreasing	-0.221	0.273	Not Significant
Fallfish	Downstream	Decreasing	-0.044	0.826	Not Significant
White Sucker	Downstream	Decreasing	-0.648	0.001	Significant
Total	Downstream	Increasing	0.121	0.547	Not Significant

Attachment E



All flows x 10⁶ Gal/Day (MGD)

(o) Open Cycle (1) Intermittent Flow (as needed)
(c) Closed Cycle (2) Seasonal Flow, (3) Based on a 12 hour day

NOTE: Several possible hybrid cycle cooling modes are not indicated in this diagram. In hybrid cycle, SN 001 flows and heat content will vary between nearly full open cycle to nearly full closed cycle through the selective operation of gates and pumps.

Schematic of Design Maximum Capacity Water Flow

Revised October 2005

