DEPARTMENT OF ENVIRONMENT AND CONSERVATION

NPDES PERMIT APPLICATION ADDRESSES

All addresses must be completed even if the same address is used:

NPDES PERMIT NUMBER: TN0026450

CORPORATE HEADQUARTERS (where permit should be sent) :

CONTACT PERSON: Stephanie Howard (Name) Environmental Engineer (Title) TELEPHONE: 423-843-6713

COMPANY NAME: Tennessee Valley Authority – Sequoyah Nuclear Plant

STREET AND/OR P.O. BOX: SB 2A, Sequoyah Access Road, P.O. Box 2000

CITY: Soddy-Daisy STATE TN ZIP CODE: 37384

PERMIT BILLING ADDRESS (where invoices should be sent):

CONTACT PERSON: Stephanie Howard (Name) Environmental Engineer (Title) TELEPHONE: 423-843-6713

FACILITY NAME : Tennessee Valley Authority – Sequoyah Nuclear Plant

STREET AND/OR P.O. BOX: SB 2A, Sequoyah Access Road, P.O. Box 2000

CITY: Soddy-Daisy STATE: TN ZIP CODE: 37384

FACILITY LOCATION (actual location of permit site):

CONTACT PERSON: Stephanie Howard (Name) Environmental Engineer (Title)

FACILITY NAME: Tennessee Valley Authority – Sequoyah Nuclear Plant

STREET AND/OR P.O. BOX: SB 2A, Sequoyah Access Road, P.O. Box 2000

CITY: Soddy-Daisy STATE: TN ZIP CODE: 37384

COUNTY: Hamilton County TELEPHONE: 423-843-6713

DMR MAILING ADDRESS (where preprinted Discharge Monitoring Reports should be sent):

CONTACT PERSON: Stephanie Howard (Name) Environmental Engineer (Title) TELEPHONE: 423-843-6713

FACILITY NAME: Tennessee Valley Authority – Sequoyah Nuclear Plant

STREET AND/OR P.O. BOX: SB 2A, Sequoyah Access Road, P.O. Box 2000

CITY: Soddy-Daisy STATE: TN ZIP CODE: 37384

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved. OMB No. 2040-0086. Approval expires 5-31-92

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program
(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

S/F		T/A	C
	T N 5 6 4 0 0 2 0 5 0 4		D
1	2 ... 13	14	15

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete *Items I, III, V, and VI (except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you *must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is* attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see *Section C of the instructions. See also, Section D of the instructions for definitions of* **bold-faced terms.**

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a discharge to **waters of the U.S.**? (FORM 2A)	16	X 17	18
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a discharge to **waters of the U.S.**? (FORM 2B)	19	X 20	21
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X 22	23	X 24
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)	25	X 26	27
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	28	X 29	30
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)	31	X 32	33
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)	34	X 35	36
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)	37	X 38	39
I. Is this facility a proposed **stationary source** which is *one of the 28 industrial categories listed in the instructions* and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	40	X 41	42
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	43	X 44	45

III. NAME OF FACILITY

C 1 SKIP U S T V A SEQUOYAH NUCLEAR PLANT
15 16-29 30 69

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
C 2 STEPHANIE HOWARD ENV. ENGINEER	423 843 6713
15 16 45	46 - 48 / 49 - 51 / 52 - 55

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

C 3 SB 2A P.O. BOX 2000
15 16 45

B. CITY OR TOWN	C. STATE	D. ZIP CODE
C 4 SODDY-DAISY	TN	37384
15 16 40	41 42	47 - 51

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

C 5 SEQUOYAH ACCESS RD.
15 16 45

B. COUNTY NAME

HAMILTON
46 70

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
C 6 SODDY-DAISY	TN	37384	
15 16 40	41 42	47 - 51	52 - 54

CONTINUE ON PAGE 2

CONTINUED FROM PAGE 1

VII. SIC CODES *(4-digit, in order of priority)*

		(specify)
A. FIRST	7 4,9,1,1	Electric Services
B. SECOND	7	
C. THIRD	7	
D. FOURTH	7	

VIII. OPERATOR INFORMATION

A. NAME: 8 TENNESSEE VALLEY AUTHORITY

B. Is the name listed as Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR *(Enter the appropriate letter into the answer box; if "Other", specify.)*

F = FEDERAL
M = PUBLIC *(other than federal or state)*
S = STATE
O = OTHER *(specify)*
P = PRIVATE

Answer: F

D. PHONE *(area code & no.)*: A 423 843 6713

E. STREET OR P.O. BOX: P.O. BOX 2000

F. CITY OR TOWN	G. STATE	H. ZIP CODE
B SODDY-DAISY	TN	37384

IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

	C	T		(specify)
A. NPDES *(Discharges to Surface Water)*	9	N	TN0026450	
B. UIC *(Underground Injection of Fluids)*	9	U		
C. RCRA *(Hazardous Wastes)*	9	R	TN5640020504	
D. PSD *(Air Emissions from Proposed Sources)*	9	P	4150-30600701-01C	Operating permit, Cooling Tower, Unit 1 See Next page for other air permits
E. OTHER *(specify)*	9		DML3310500021	SQN Inert Landfill Permit
E. OTHER *(specify)*	9		TNR050015	General Storm Water Permit

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS *(provide a brief description)*

Production of electric power by thermonuclear fission and other associated operations.

XIII. CERTIFICATION *(see instructions)*

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

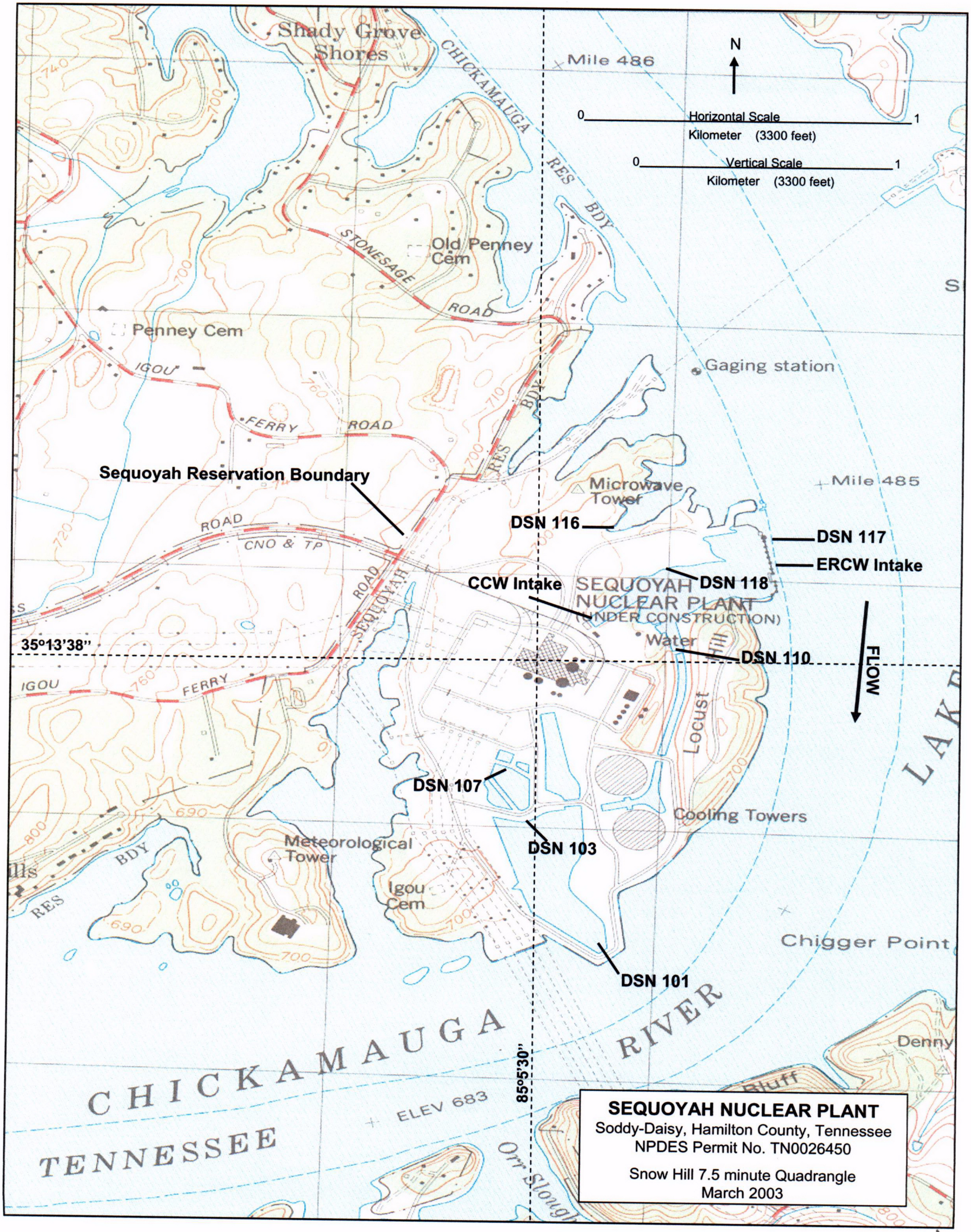
A. NAME & OFFICIAL TITLE *(type or print)*	B. SIGNATURE	C. DATE SIGNED
Richard T. Purcell Site Vice President, Sequoyah Nuclear Plant	Richard T. Purcell	06/30/2003

COMMENTS FOR OFFICIAL USE ONLY

C

Additional Permits

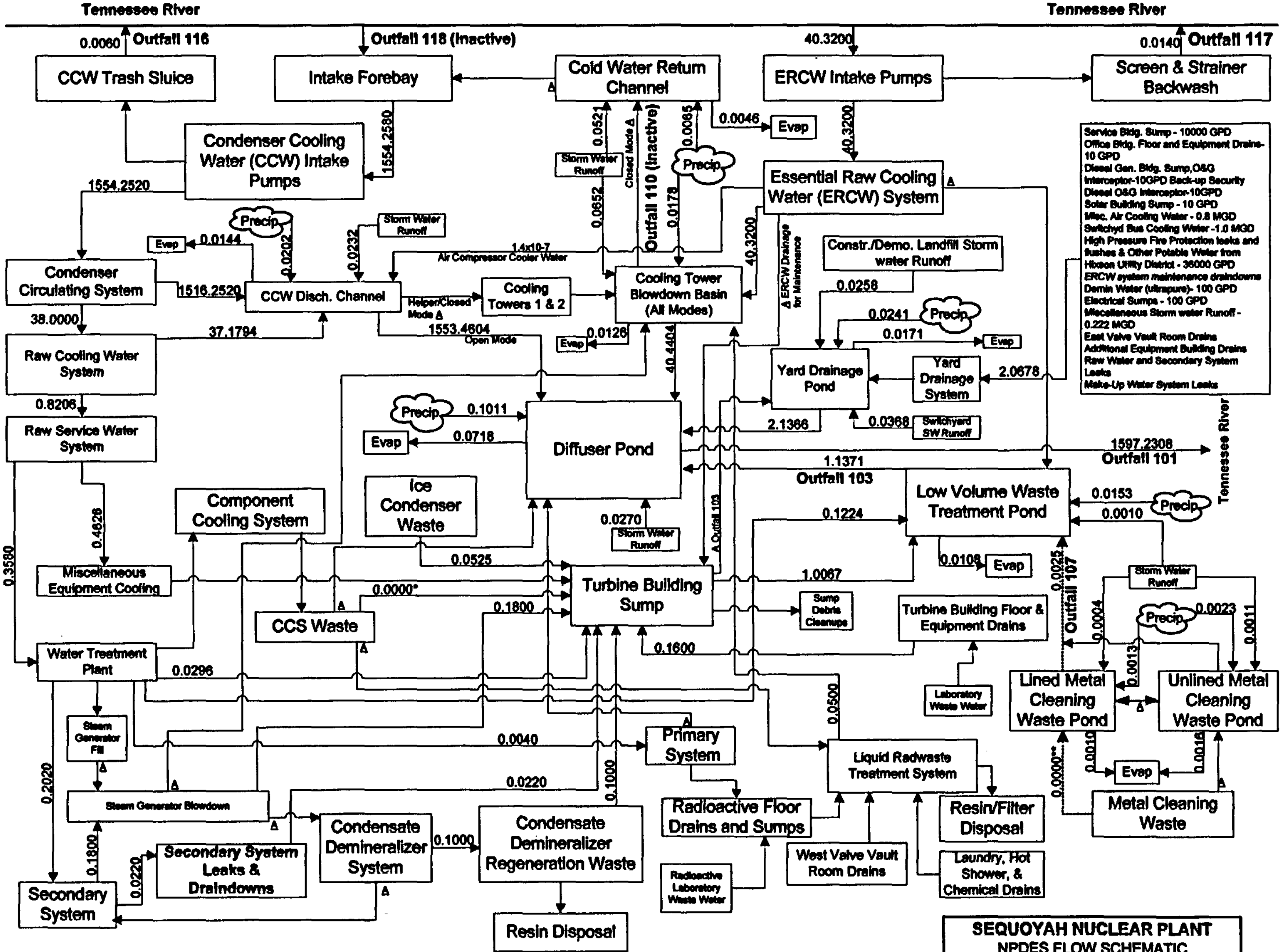
4150-30600701-03C	Operating Permit, Cooling Tower, Unit 2.
4150-30700804-06C	Operating Permit Insulation Saw A
4150-30700804-07C	Operating Permit Insulation Saw B
4150-10200501-08C	Operating Permit Auxiliary Boilers A and B
4150-30703099-09C	Operating Permit Carpenter Shop
4150-30900203-10C	Operating Permit Abrasive Blasting Operation
4150-20200102-11C	Operating Permit Emergency Generators 1A, 1B, 2A, 2B; Security Lighting Generator; Computer System Generator; Fire-Protection Water Pump Engine, and Communications System Generator
TNR110229	General NPDES Permit for Storm Water Discharges Associated With Construction Activity



SEQUOYAH NUCLEAR PLANT
Soddy-Daisy, Hamilton County, Tennessee
NPDES Permit No. TN0026450

Snow Hill 7.5 minute Quadrangle
March 2003

C01



All flows in MGD

---- Represents intermittent flow

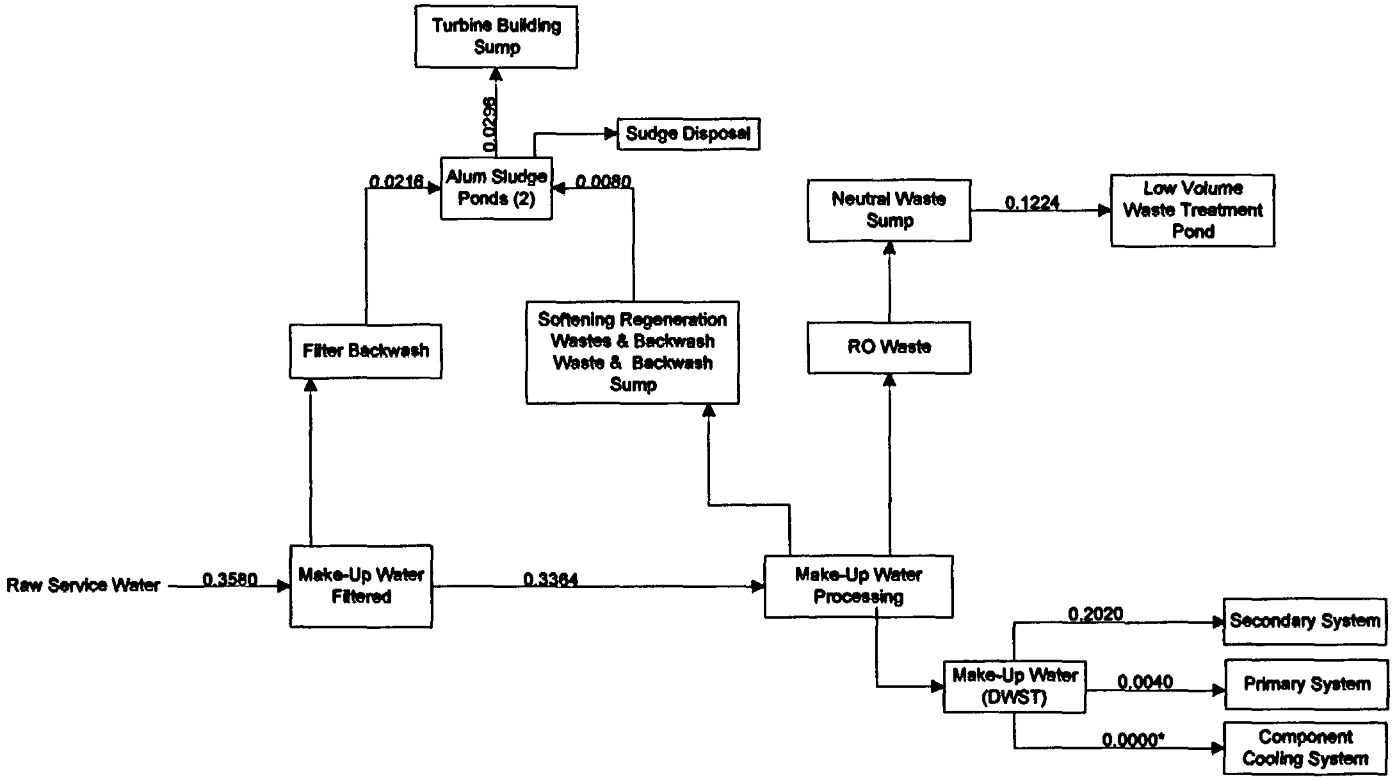
A - denotes alternate flow path to be used by authority of plant management

* Flow is 200 gal/yr

** Flow is 10,000 gal/yr

SEQUOYAH NUCLEAR PLANT
NPDES FLOW SCHEMATIC
NPDES Permit No. TN0026450
June 30, 2003

SEQUOYAH NUCLEAR PLANT WATER TREATMENT PLANT



All flows in MGD

*Flow is 200 gal/yr

SEQUOYAH NUCLEAR PLANT
NPDES FLOW SCHEMATIC
NPDES Permit No. TN0026450
June 30, 2003

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
101	35	12	35	85	05	14	Tennessee River

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
101	Diffuser Pond	1597.2308 MGD	Discharge to Surface Water	4	A
			Sedimentation *(settling)*	1	U
	DSN 101 receives flow from the following				
	sources:				
	Low Volume Waste Treatment Pond (Outfall	1.1371 MGD			
	103):				
	Discharge from metal cleaning waste				
	Ponds (outfall 107)	(0.0025 MGD)			
	Turbine building sump	(1.0067 MGD)			
	Storm water runoff	(0.0010 MGD)			
	Neutral waste sump (WTP)	(0.1224 MGD)			
	CCW discharge channel:	1553.4604 MGD			
	Raw cooling water system	(37.1794 MGD)	Disinfection (other)	2	H
	Condenser circulating system	(1516.2520 MGD)			
	Storm water runoff	(0.0232 MGD)			
	Cooling tower blowdown basin:	40.4404 MGD			
	ERCW system	(40.3200 MGD)	Disinfection (other)	2	H
	Cooling towers (helper/closed mode)	-			
	Storm water runoff	(0.0652 MGD)			
	Liquid radwaste treatment system	(0.0500 MGD)	Ion Exchange	2	J
			Multimedia Filtration	1	Q

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER

EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS

Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
101	35	12	35	85	05	14	Tennessee River

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
101 Con't.	Yard drainage pond:	2.1366 MGD	Sedimentation *(settling)*	1	U
	Constr./Demo. landfill storm water runoff	(0.0258 MGD)			
	Switch yard runoff	(0.0368 MGD)			
	Yard drainage system	(2.0678 MGD)			
	Storm water runoff	0.0270 MGD			
	Precipitation minus evaporation	0.0293 MGD			

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff, leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
107	Metal Cleaning Waste Ponds			0.0025	0.0504			
		When rainwater collects in the Metal Cleaning Waste Ponds, the ponds are discharged (Outfall 107) into the Low Volume Waste Treatment Pond which discharges through Outfall 103 into the Diffuser Pond (Outfall 101). The Metal Cleaning Waste Ponds discharge an average of 10-12 hours per day, approximately 10-30 days out of the year with an average flowrate of 70 gpm.						

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

 Continue on Page 3

EPA ID NUMBER (copy from Item 1 of Form 1)
TN5640020504

CONTINUED FROM PAGE 2

V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided. NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
Dimethylamine (The use of dimethylamine will not result in detectable quantities at Outfall 101 for the following reason: The maximum dimethylamine concentration in the steam generators is 10 ppm during layup. The capacity of each unit's four steam generators is approximately 80,000 gallons. Steam generators can be drained down at a rate of 400 gpm. Both unit's steam generators are not drained down simultaneously. Therefore, the maximum concentration of dimethylamine at Outfall 101 would be 0.007 ppm. The MDL for dimethylamine is 0.1 ppm)	Steam Generator Layup		

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☒ YES *(identify the test(s) and describe their purposes below)* ☐ NO *(go to Section VIII)*

Per the requirements of the SQN NPDES Permit No. TN 0026450, IC25 toxicity testing has been conducted on discharges from Outfall 101 on a quarterly basis and results submitted to the Division of Water Pollution Control on the appropriate Discharge Monitoring Reports.

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Test America	2960 Foster Creighton Drive Nashville, TN 37204	(615) 726-0177	Cyanide and T. Phenols

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*
TN5640020504

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
DSN101

PART A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAYS VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand *(BOD)*	<3	<44710.74					2	mg/L	lbs/day	4	53009.04	1
b. Chemical Oxygen Demand *(COD)*	<5	<74517.90					2	mg/L	lbs/day	<5	<66261.30	1
c. Total Organic Carbon *(TOC)*	3.0	44710.74					2	mg/L	lbs/day	3.1	41082.01	1
d. Total Suspended Solids *(TSS)*	12	178842.96	6	86369	<5.14	<68459.6	58	mg/L	lbs/day	3	39757.78	1
e. Ammonia *(as N)*	0.03	447.11					2	mg/L	lbs/day	0.03	397.57	1
f. Flow	VALUE 1787		VALUE 1726		VALUE 1597		396	MGD		VALUE 1589		1
g. Temperature *(winter)*	VALUE 26.6		VALUE 24.3		VALUE 14.7		221	°C		VALUE 9.6		4
h. Temperature *(summer)*	VALUE 30.5		VALUE 30.0		VALUE 26.3		183	°C		VALUE N/A		N/A
i. pH	MINIMUM 7.2	MAXIMUM 8.0	MINIMUM 7.3	MAXIMUM 8.0			128	STANDARD UNITS				N/A

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)	X		<2	<29807.16					2	mg/L	lbs/day	<2	<26505	1
b. Chlorine, Total Residual	X		<0.05	<745.18	<0.015	<215.92	<0.009	<119.87	519	mg/L	lbs/day	<0.05	<662.61	4
c. Color	X		10						2	PC Units	lbs/day	5		1
d. Fecal Coliform	X		<9.5						8	colonies/ 100mL	lbs/day	<10		4
e. Fluoride (16984-48-8)	X		0.10	1490.36					2	mg/L	lbs/day	0.13	1722.79	1
f. Nitrate-Nitrite (as N)	X		0.47	7004.68					2	mg/L	lbs/day	0.43	5698.47	1

 CONTINUE ON PAGE V-2

ITEM V-B CONTINUED FROM PAGE V-1

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic *(as N)*	X		0.195	2906.20					2	mg/L	lbs/day	0.22	2915.50	1
h. Oil and Grease	X		<6	<89421.48	<5	<71974	<5	<66595	58	mg/L	lbs/day	<5	<66261	4
i. Phosphorus *(as P)*, Total (7723-14-0)	X		0.05	745.18					2	mg/L	lbs/day	0.05	662.61	1
j. Radioactivity														
(1) Alpha, Total	X		<3.405						2	piC/Liter		4.3		1
(2) Beta, Total	X		3.15						2	piC/Liter		2.91		1
(3) Gamma, Isotopic	X		None Detected						2	piC/Liter		None Detected		1
(4) Radium 226, Total		X												
k. Sulfate *(as SO_4)* (14808-79-8)	X		17.5	260812.65					2	mg/L	lbs/day	16	212036	1
l. Sulfide *(as S)*	X		<0.02	<298.07					2	mg/L	lbs/day	<0.02	<265.05	1
m. Sulfite *(as SO_3)* (14265-45-3)	X		1.125	16766.53					8	mg/L	lbs/day	1.0	13252	4
n. Surfactants	X		<0.1	<1490.36					2	mg/L	lbs/day	0.20	2650.45	1
o. Aluminum, Total (7429-90-5)	X		0.325	4843.66					2	mg/L	lbs/day	0.24	3180.54	1
p. Barium, Total (7440-39-3)	X		0.03	447.11					2	mg/L	lbs/day	0.03	397.57	1
q. Boron, Total (7440-42-8)	X		<0.2	<2980.72	<0.2	<2878.97	<0.2	<2663.8	16	mg/L	lbs/day	<0.2	<2650.5	1
r. Cobalt, Total (7440-48-4)	X		<0.001	<14.90					2	mg/L	lbs/day	0.0255	337.93	1
s. Iron, Total (7439-89-6)	X		0.32	4769.15					2	mg/L	lbs/day	0.23	3048.02	1
t. Magnesium, Total (7439-95-4)	X		5.65	84205.23					2	mg/L	lbs/day	5.6	74213	1
u. Molybdenum, Total (7439-98-7)	X		<0.02	<298.07					2	mg/L	lbs/day	<0.02	<265.05	1
v. Manganese, Total (7439-96-5)	X		0.043	640.58					2	mg/L	lbs/day	0.036	477.08	1
w. Tin, Total (7440-31-5)	X		<0.05	<745.18					2	mg/L	lbs/day	<0.05	<662.61	1
x. Titanium, Total (7440-32-6)	X		0.017	253.36					2	mg/L	lbs/day	0.013	172.28	1

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CONTINUED FROM PAGE 3 OF FORM 2-C

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part, please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
METALS, CYANIDE AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.001	<14.90					2	mg/L	lbs/day	0.002	26.50	1
2M. Arsenic, Total (7440-38-2)	X			<0.0016	<23.85					2	mg/L	lbs/day	0.0017	22.53	1
3M. Beryllium, Total (7440-41-7)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.26	1
4M. Cadmium, Total (7440-43-9)	X			0.00016	2.38					2	mg/L	lbs/day	<0.0001	<1.33	1
5M Chromium, Total (7440-47-3)	X			<0.001	<14.90					2	mg/L	lbs/day	0.034	450.58	1
6M. Copper, Total (7440-50-8)	X			0.0041	61.10					2	mg/L	lbs/day	0.0032	42.41	1
7M. Lead, Total (7439-92-1)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
8M. Mercury, Total (7439-97-6)	X			<0.0001	<1.49					2	mg/L	lbs/day	<0.0001	<1.33	1
9M. Nickel, Total (7440-02-0)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
10M. Selenium, Total (7782-49-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
11M. Silver, Total (7440-22-4)	X			<0.0001	<1.49					2	mg/L	lbs/day	<0.0001	<1.33	1
12M. Thallium, Total (7440-28-0)	X			<0.002	<29.81					2	mg/L	lbs/day	0.003	39.76	1
13M. Zinc, Total (7440-66-6)	X			<0.01	<149.04					2	mg/L	lbs/day	0.01	132.52	1
14M. Cyanide, Total (57-12-5)	X			<0.005	<74.52					8	mg/L	lbs/day	<0.005	<66.26	4
15M. Phenols, Total	X			<0.005	<74.52					8	mg/L	lbs/day	<0.005	<66.26	4
DIOXIN															
2,3,7,8-Tetra-chlorodibenzo-P Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

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CONTINUED FROM PAGE V-3

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X" a. TEST-ING RE-QUIRED	2. MARK "X" b. BE-LIEVED PRE-SENT	2. MARK "X" c. BE-LIEVED AB-SENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	3. EFFLUENT b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	3. EFFLUENT b. MAXIMUM 30 DAY VALUE *(if available)* (2) MASS	3. EFFLUENT c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	3. EFFLUENT c. LONG TERM AVRG. VALUE *(if available)* (2) MASS	3. EFFLUENT d. NO. OF ANAL-YSES	4. UNITS a. CONCEN-TRATION	4. UNITS b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE *(optional)* b. NO. OF ANAL-YSES
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
2V. Acrylonitrile (107-13-1)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
3V. Benzene (71-43-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
4V. Bis *(Chloro-methyl)* Ether (542-88-1)			X												
5V. Bromoform (75-25-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
6V. Carbon Tetrachloride (56-23-5)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
7V. Chlorobenzene (108-90-7)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
8V. Chlorodi-bromomethane (124-48-1)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
9V. Chloroethane (75-00-3)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
10V. 2-Chloro-ethylvinyl Ether (110-75-8)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
11V. Chloroform (67-66-3)	X			<0.0005	<7.45					2	mg/L	lbs/day	<0.0005	<6.63	1
12V. Dichloro-bromomethane (75-27-4)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
13V. Dichloro-difluoromethane (75-71-8)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
14V. 1,1-Dichloro-ethane (75-34-3)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
15V. 1,2-Dichloro-ethane (107-06-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
16V. 1,1-Dichloro-ethylene (75-35-4)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
17V. 1,2-Dichloro-propane (78-87-5)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
18V. 1,3-Dichloro-propylene (542-75-6)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
19V. Ethylbenzene (100-41-4)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
20V. Methyl Bromide (74-83-9)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
21V. Methyl Chloride (74-87-3)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1

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EPA I.D. NUMBER (copy from Item 1 of Form 1)	OUTFALL NUMBER
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CONTINUED FROM PAGE V-4

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS (continued)															
22V. Methylene Chloride (75-09-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	X			<0.0005	<7.45					2	mg/L	lbs/day	<0.0005	<6.63	1
24V. Tetrachloroethylene (127-18-4)	X			<0.0005	<7.45					2	mg/L	lbs/day	<0.0005	<6.63	1
25V. Toluene (108-88-3)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
27V. 1,1,1-Trichloroethane (71-55-6)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
28V. 1,1,2-Trichloroethane (79-00-5)	X			<0.0002	<2.98					2	mg/L	lbs/day	<0.0002	<2.65	1
29V. Trichloroethylene (79-01-6)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
30V. Trichlorofluoromethane (75-69-4)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
31V. Vinyl Chloride (75-01-4)	X			<0.002	<29.81					2	mg/L	lbs/day	<0.002	<26.50	1
1A. 2-Chlorophenol (95-57-8)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
2A. 2,4-Dichlorophenol (120-83-2)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
3A. 2,4-Dimethylphenol (105-67-9)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			<0.024	<357.69					2	mg/L	lbs/day	<0.024	<318.05	1
5A. 2,4-Dinitrophenol (51-28-5)	X			<0.02	<298.07					2	mg/L	lbs/day	<0.02	<265.05	1
6A. 2-Nitrophenol (88-75-5)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
7A. 4-Nitrophenol (100-02-7)	X			<0.03	<447.11					2	mg/L	lbs/day	<0.03	<397.58	1
8A. P-Chloro-M Cresol (59-50-7)	X			<0.024	<357.69					2	mg/L	lbs/day	<0.024	<318.05	1
9A. Pentachlorophenol (87-86-5)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
10A. Phenol (108-95-2)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
11A. 2,4,6-Trichlorophenol (88-06-2)	X			<0.0027	<40.24					2	mg/L	lbs/day	<0.0027	<35.78	1

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CONTINUED FROM PAGE V-5

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
2B. Acenaphtylene (208-96-8)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
3B. Anthracene (120-12-7)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
4B. Benzidine (92-87-5)	X			<0.05	<745.18					2	mg/L	lbs/day	<0.05	<662.61	1
5B. Benzo (a) Anthracene (56-55-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
6B. Benzo (a) Pyrene (50-32-8)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
7B. 3,4-Benzo-fluoranthene (205-99-2)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
8B. Benzo (ghi) Perylene (191-24-2)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
9B. Benzo (k) Fluoranthene (207-08-9)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
10B. Bis (2-Chloro-ethoxy) Methane (111-91-1)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
11B. Bis (2-Chloro-ethyl) Ether (111-44-4)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
12B. Bis (2-Chloro-isopropyl) Ether (102-80-1)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
13B. Bis (2-Ethyl-hexyl) Phthalate (117-81-7)	X			<0.0025	<37.26					2	mg/L	lbs/day	<0.0025	<33.13	1
14B. 4-Bromo-phenyl Phenyl Ether (101-55-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
15B. Butyl Benzyl Phthalate (85-68-7)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
16B. 2-Chloro-naphthalene (91-58-7)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
17B. 4-Chloro-phenyl Phenyl Ether (7005-72-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
18B. Chrysene (218-01-9)	X			<0.0025	<37.26					2	mg/L	lbs/day	<0.0025	<33.13	1
19B. Dibenzo (a,h) Anthracene (53-70-3)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
20B. 1,2-Dichloro-benzene (95-50-1)	X			<0.002	<29.81					2	mg/L	lbs/day	<0.002	<26.50	1
21B. 1,3 Dichloro-benzene (541-73-1)	X			<0.002	<29.81					2	mg/L	lbs/day	<0.002	<26.50	1

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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CONTINUED FROM PAGE V-6

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
22B. 1,4-Dichlorobenzene (106-46-7)	X			<0.0044	<65.58					2	mg/L	lbs/day	<0.0044	<58.31	1
23B. 3,3'-Dichlorobenzidine (91-94-1)	X			<0.025	<372.59					2	mg/L	lbs/day	<0.025	<331.31	1
24B. Diethyl Phthalate (84-66-2)	X			<0.0019	<23.32					2	mg/L	lbs/day	<0.0019	<25.18	1
25B. Dimethyl Phthalate (131-11-3)	X			<0.0016	<23.85					2	mg/L	lbs/day	<0.0016	<21.20	1
26B. Di-N-Butyl Phthalate (84-74-2)	X			<0.0025	<37.26					2	mg/L	lbs/day	<0.0025	<33.13	1
27B. 2,4-Dinitrotoluene (121-14-2)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
28B. 2,6-Dinitrotoluene (606-20-2)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
29B. Di-N-Octyl Phthalate (117-84-0)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)			X												
31B. Fluoranthene (206-44-0)	X			<0.0022	<32.79					2	mg/L	lbs/day	<0.0022	<29.15	1
32B. Fluorene (86-73-7)	X			<0.0003	<4.47					2	mg/L	lbs/day	<0.0003	<3.98	1
33B. Hexachlorobenzene (118-74-1)	X			<0.0019	<28.32					2	mg/L	lbs/day	<0.0019	<25.18	1
34B. Hexachlorobutadiene (87-68-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
35B. Hexachlorocyclopentadiene (77-47-4)	X			<0.03	<447.11					2	mg/L	lbs/day	<0.03	<397.58	1
36B. Hexachloroethane (67-72-1)	X			<0.0005	<7.45					2	mg/L	lbs/day	<0.0005	<6.63	1
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)	X			<0.01	<149.04					2	mg/L	lbs/day	<0.01	<132.52	1
38B. Isophorone (78-59-1)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
39B. Naphthalene (91-20-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
40B. Nitrobenzene (98-95-3)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
41B. N-Nitrosodimethylamine (62-75-9)	X			<0.001	<14.90					2	mg/L	lbs/day	<0.001	<13.25	1
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1

 CONTINUE ON PAGE V-8

CONTINUED FROM PAGE V-7

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X" a. TESTING REQUIRED	2. b. BELIEVED PRESENT	2. c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	b. (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	c. (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	a. (2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
43B. N-Nitrosodiphenylamine (86-30-6)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
44B. Phenanthrene (85-01-8)	X			<0.0007	<10.43					2	mg/L	lbs/day	<0.0007	<9.28	1
45B. Pyrene (129-00-0)	X			<0.0003	<4.47					2	mg/L	lbs/day	<0.0003	<3.98	1
46B. 1,2,4 – Trichlorobenzene (120-82-1)	X			<0.005	<74.52					2	mg/L	lbs/day	<0.005	<66.26	1
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X												
2P. α-BHC (319-84-6)			X												
3P. β-BHC (319-85-7)			X												
4P. γ-BHC (58-89-9)			X												
5P. δ-BHC (319-86-8)			X												
6P. Chlordane (57-74-9)			X												
7P. 4,4'-DDT (50-29-3)			X												
8P. 4,4'-DDE (72-55-9)			X												
9P. 4,4'-DDD (72-54-8)			X												
10P. Dieldrin (60-57-1)			X												
11P. α-Endosulfan (115-29-7)			X												
12P. β-Endosulfan (115-29-7)			X												
13P. Endosulfan Sulfate (1031-07-8)			X												
14P. Endrin (72-20-8)			X												
15P. Endrin Aldehyde (7421-93-4)			X												
16P. Heptachlor (76-44-8)			X												

CONTINUE ON PAGE V-9

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN101

CONTINUED FROM PAGE V-8

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES *(continued)*															
17P. Heptachlor Epoxide (1024-57-3)			X												
18P. PCB-1242 (53469-21-9)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
19P. PCB-1254 (11097-69-1)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
20P. PCB-1221 (11104-28-2)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
21P. PCB-1232 (11141-16-5)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
22P. PCB-1248 (12672-29-6)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
23P. PCB-1260 (11096-82-5)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
24P. PCB-1016 (12674-11-2)	X			<0.00005	<0.75					2	mg/L	lbs/day	<0.00005	<0.66	1
25P. Toxaphene (8001-35-2)			X												

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
103	35	08	17	85	08	01	Diffuser Pond

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
103	Low Volume Waste Treatment Pond	1.1371 MGD	Sedimentation *(settling)*	1	U
			Neutralization	2	K
	DSN 103 receives flow from the following				
	sources:				
	Metal Cleaning Waste Ponds (Outfall 107)	0.0025 MGD			
	Turbine building sump:	1.0067 MGD			
	Turbine building floor and equipment				
	drains	(0.1600 MGD)			
	Condensate demineralizer regen. waste	(0.1000 MGD)	Neutralization	2	K
	Secondary system leaks and draindowns	(0.0220 MGD)			
	Steam generator blowdown	(0.1800 MGD)			
	CCS waste	-			
	Miscellaneous equipment cooling	-			
	Ice condenser waste	(0.0525 MGD)			
	Alum sludge ponds (WTP)	(0.0296 MGD)	Sedimentation *(settling)*	1	U
			Gravity Thickening	5	L
			Landfill	5	Q
	Neutral waste sump (WTP)	0.1224 MGD			
	Storm water runoff	0.0010 MGD			
	Precipitation minus evaporation	0.0045 MGD			

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?

☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
107	Discharges from the Metal Cleaning Waste Ponds (Outfall 107) which includes batch discharges of chemical cleaning wastes from various plant systems and accumulated stormwater.			0.0025	0.0504			
		When stormwater collects, the Metal Cleaning Waste Ponds are discharged through Outfall 107. The Metal Cleaning Waste Ponds discharge an average of 10-12 hours per day, approximately 21 days out of the year with an average flowrate of 70 gpm.						

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?

☒ YES *(complete Item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?

☐ YES *(complete Item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.

☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

 Continue on Page 3

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V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
Dimethylamine (The use of dimethylamine will not result in detectable quantities at Outfall 103 for the following reason: The maximum dimethylamine concentration in the steam generators is 10 ppm during layup. The capacity of each unit's four steam generators is approximately 80,000 gallons. Steam generators can be drained down at a rate of 400 gpm. Both unit's steam generators are not drained down simultaneously. Therefore, the maximum concentration of dimethylamine at Outfall 103 would be 0.007 ppm. The MDL for dimethylamine is 0.1 ppm)	Steam Generator Layup		

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

 Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purposes below)* ☒ NO *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Test America	2960 Foster Creighton Drive Nashville, TN 37204	(615) 726-0177	Cyanide and T. Phenols

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*
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V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
DSN103

PART A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAYS VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand *(BOD)*	10	259.79					1	mg/L	lbs/day			
b. Chemical Oxygen Demand *(COD)*	9	233.81					1	mg/L	lbs/day			
c. Total Organic Carbon *(TOC)*	3.9	101.32					1	mg/L	lbs/day			
d. Total Suspended Solids *(TSS)*	43	1117.10	18	204.46	11.66	110.95	61	mg/L	lbs/day			
e. Ammonia *(as N)*	0.40	10.39					1	mg/L	lbs/day			
f. Flow	VALUE 3.115		VALUE 1.362		VALUE 1.137		396	MGD		VALUE		
g. Temperature *(winter)*	VALUE 10.7		VALUE N/A		VALUE N/A		4	°C		VALUE		
h. Temperature *(summer)*	VALUE N/A		VALUE N/A		VALUE N/A		N/A	°C		VALUE		
i. pH	MINIMUM 7.0	MAXIMUM 9.0	MINIMUM 8.4	MAXIMUM 9.0			182	STANDARD UNITS				

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BE-LIEVED PRE-SENT	b. BE-LIEVED AB-SENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANAL-YSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANAL-YSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)	X		<2	<52					1	mg/L	lbs/day			
b. Chlorine, Total Residual	X		<0.05	<1.3					4	mg/L	lbs/day			
c. Color	X		25						1	PC Units				
d. Fecal Coliform	X		<21						6	Colonies/ 100mL				
e. Fluoride (16984-48-8)	X		0.12	3.12					1	mg/L	lbs/day			
f. Nitrate-Nitrite (as N)	X		0.73	18.96					1	mg/L	lbs/day			

CONTINUE ON PAGE V-2

ITEM V-B CONTINUED FROM PAGE V-1

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic *(as N)*	X		0.90	23.38					1	mg/L	lbs/day			
h. Oil and Grease	X		<5	<130	<5	<56.8	<5	<47.4	62	mg/L	lbs/day			
i. Phosphorus *(as P)*, Total (7723-14-0)	X		0.56	14.55					1	mg/L	lbs/day			
j. Radioactivity														
(1) Alpha, Total	X		<4.42						1	piC/Liter				
(2) Beta, Total	X		2.93						1	piC/Liter				
(3) Isotopic Gamma	X		None Detected						1	piC/Liter				
(4) Radium 226, Total		X												
k. Sulfate *(as SO_4)* (14808-79-8)	X		30	779.37					1	mg/L	lbs/day			
l. Sulfide *(as S)*	X		<0.02	<0.52					1	mg/L	lbs/day			
m. Sulfite *(as SO_3)* (14265-45-3)	X		1.0	25.98					4	mg/L	lbs/day			
n. Surfactants	X		0.20	5.20					1	mg/L	lbs/day			
o. Aluminum, Total (7429-90-5)	X		0.88	22.86					1	mg/L	lbs/day			
p. Barium, Total (7440-39-3)	X		0.03	0.78					1	mg/L	lbs/day			
q. Boron, Total (7440-42-8)	X		<0.2	<5.20					1	mg/L	lbs/day			
r. Cobalt, Total (7440-48-4)	X		<0.001	<0.026					1	mg/L	lbs/day			
s. Iron, Total (7439-89-6)	X		0.38	9.87					1	mg/L	lbs/day			
t. Magnesium, Total (7439-95-4)	X		6.2	161.07					1	mg/L	lbs/day			
u. Molybdenum, Total (7439-98-7)	X		<0.02	<0.52					1	mg/L	lbs/day			
v. Manganese, Total (7439-96-5)	X		0.15	3.90					1	mg/L	lbs/day			
w. Tin, Total (7440-31-5)	X		<0.05	<1.30					1	mg/L	lbs/day			
x. Titanium, Total (7440-32-6)	X		0.015	0.39					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-3

CONTINUED FROM PAGE 3 OF FORM 2-C

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN103

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part, please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
METALS, CYANIDE AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.001	<0.026					1	mg/L	lbs/day			
2M. Arsenic, Total (7440-38-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
3M. Beryllium, Total (7440-41-7)	X			<0.001	<0.026					1	mg/L	lbs/day			
4M. Cadmium, Total (7440-43-9)	X			<0.0001	<0.0026					1	mg/L	lbs/day			
5M. Chromium, Total (7440-47-3)	X			<0.001	<0.026					1	mg/L	lbs/day			
6M. Copper, Total (7440-50-8)	X			0.0038	0.099					1	mg/L	lbs/day			
7M. Lead, Total (7439-92-1)	X			<0.001	<0.026					1	mg/L	lbs/day			
8M. Mercury, Total (7439-97-6)	X			<0.0001	<0.0026					1	mg/L	lbs/day			
9M. Nickel, Total (7440-02-0)	X			<0.001	<0.026					1	mg/L	lbs/day			
10M. Selenium, Total (7782-49-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
11M. Silver, Total (7440-22-4)	X			<0.0001	<0.0026					1	mg/L	lbs/day			
12M. Thallium, Total (7440-28-0)	X			<0.002	<0.052					1	mg/L	lbs/day			
13M. Zinc, Total (7440-66-6)	X			<0.01	<0.26					1	mg/L	lbs/day			
14M. Cyanide, Total (57-12-5)	X			<0.005	<0.13					4	mg/L	lbs/day			
15M. Phenols, Total	X			<0.005	<0.13					4	mg/L	lbs/day			
DIOXIN															
2,3,7,8-Tetra-chlorodibenzo-P Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

 CONTINUE ON PAGE V-4

CONTINUED FROM PAGE V-3

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X" a. TESTING REQUIRED	2. MARK "X" b. BELIEVED PRESENT	2. MARK "X" c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	3. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	3. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	3. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	3. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (2) MASS	3. EFFLUENT d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE (optional) b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<0.001	<0.026					1	mg/L	lbs/day			
2V. Acrylonitrile (107-13-1)	X			<0.001	<0.026					1	mg/L	lbs/day			
3V. Benzene (71-43-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
4V. Bis (Chloromethyl) Ether (542-88-1)			X												
5V. Bromoform (75-25-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
6V. Carbon Tetrachloride (56-23-5)	X			<0.001	<0.026					1	mg/L	lbs/day			
7V. Chlorobenzene (108-90-7)	X			<0.01	<0.26					1	mg/L	lbs/day			
8V. Chlorodibromomethane (124-48-1)	X			<0.001	<0.026					1	mg/L	lbs/day			
9V. Chloroethane (75-00-3)	X			<0.01	<0.26					1	mg/L	lbs/day			
10V. 2-Chloroethylvinyl Ether (110-75-8)	X			<0.01	<0.26					1	mg/L	lbs/day			
11V. Chloroform (67-66-3)	X			<0.0005	<0.013					1	mg/L	lbs/day			
12V. Dichlorobromomethane (75-27-4)	X			<0.001	<0.026					1	mg/L	lbs/day			
13V. Dichlorodifluoromethane (75-71-8)	X			<0.001	<0.026					1	mg/L	lbs/day			
14V. 1,1-Dichloroethane (75-34-3)	X			<0.001	<0.026					1	mg/L	lbs/day			
15V. 1,2-Dichloroethane (107-06-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
16V. 1,1-Dichloroethylene (75-35-4)	X			<0.001	<0.026					1	mg/L	lbs/day			
17V. 1,2-Dichloropropane (78-87-5)	X			<0.01	<0.26					1	mg/L	lbs/day			
18V. 1,3-Dichloropropylene (542-75-6)	X			<0.001	<0.026					1	mg/L	lbs/day			
19V. Ethylbenzene (100-41-4)	X			<0.001	<0.026					1	mg/L	lbs/day			
20V. Methyl Bromide (74-83-9)	X			<0.01	<0.26					1	mg/L	lbs/day			
21V. Methyl Chloride (74-87-3)	X			<0.001	<0.026					1	mg/L	lbs/day			

CONTINUE ON PAGE V-5

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN103

CONTINUED FROM PAGE V-4

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X" a. TESTING REQUIRED	2. b. BELIEVED PRESENT	2. c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3. a. (2) MASS	3. b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	3. b. (2) MASS	3. c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	3. c. (2) MASS	3. d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. a. (2) MASS	5. b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS *(continued)*															
22V. Methylene Chloride (75-09-2)	X			<0.001	<0.026					1	mg/L	lbs/day			
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	X			<0.0005	<0.013					1	mg/L	lbs/day			
24V. Tetrachloroethylene (127-18-4)	X			<0.0005	<0.013					1	mg/L	lbs/day			
25V. Toluene (108-88-3)	X			<0.001	<0.026					1	mg/L	lbs/day			
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			<0.01	<0.26					1	mg/L	lbs/day			
27V. 1,1,1-Trichloroethane (71-55-6)	X			<0.001	<0.026					1	mg/L	lbs/day			
28V. 1,1,2-Trichloroethane (79-00-5)	X			<0.0002	<0.0052					1	mg/L	lbs/day			
29V. Trichloroethylene (79-01-6)	X			<0.001	<0.026					1	mg/L	lbs/day			
30V. Trichlorofluoromethane (75-69-4)	X			<0.01	<0.26					1	mg/L	lbs/day			
31V. Vinyl Chloride (75-01-4)	X			<0.002	<0.052					1	mg/L	lbs/day			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)	X			<0.005	<0.13					1	mg/L	lbs/day			
2A. 2,4-Dichlorophenol (120-83-2)	X			<0.005	<0.13					1	mg/L	lbs/day			
3A. 2,4-Dimethylphenol (105-67-9)	X			<0.005	<0.13					1	mg/L	lbs/day			
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			<0.024	<0.62					1	mg/L	lbs/day			
5A. 2,4-Dinitrophenol (51-28-5)	X			<0.02	<0.52					1	mg/L	lbs/day			
6A. 2-Nitrophenol (88-75-5)	X			<0.005	<0.13					1	mg/L	lbs/day			
7A. 4-Nitrophenol (100-02-7)	X			<0.03	<0.78					1	mg/L	lbs/day			
8A. P-Chloro-M Cresol (59-50-7)	X			<0.024	<0.62					1	mg/L	lbs/day			
9A. Pentachlorophenol (87-86-5)	X			<0.005	<0.13					1	mg/L	lbs/day			
10A. Phenol (108-95-2)	X			<0.005	<0.13					1	mg/L	lbs/day			
11A. 2,4,6-Trichlorophenol (88-06-2)	X			<0.0027	<0.07					1	mg/L	lbs/day			

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CONTINUED FROM PAGE V-5

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			<0.005	<0.13					1	mg/L	lbs/day			
2B. Acenaphtylene (208-96-8)	X			<0.005	<0.13					1	mg/L	lbs/day			
3B. Anthracene (120-12-7)	X			<0.005	<0.13					1	mg/L	lbs/day			
4B. Benzidine (92-87-5)	X			<0.05	<1.30					1	mg/L	lbs/day			
5B. Benzo *(a)* Anthracene (56-55-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
6B. Benzo *(a)* Pyrene (50-32-8)	X			<0.01	<0.26					1	mg/L	lbs/day			
7B. 3,4-Benzofluoranthene (205-99-2)	X			<0.01	<0.26					1	mg/L	lbs/day			
8B. Benzo *(ghi)* Perylene (191-24-2)	X			<0.01	<0.26					1	mg/L	lbs/day			
9B. Benzo *(k)* Fluoranthene (207-08-9)	X			<0.01	<0.26					1	mg/L	lbs/day			
10B. Bis *(2-Chloroethoxy)* Methane (111-91-1)	X			<0.005	<0.13					1	mg/L	lbs/day			
11B. Bis *(2-Chloroethyl)* Ether (111-44-4)	X			<0.001	<0.026					1	mg/L	lbs/day			
12B. Bis *(2-Chloroisopropyl)* Ether (102-60-1)	X			<0.005	<0.13					1	mg/L	lbs/day			
13B. Bis *(2-Ethylhexyl)* Phthalate (117-81-7)	X			<0.0025	<0.065					1	mg/L	lbs/day			
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
15B. Butyl Benzyl Phthalate (85-68-7)	X			<0.005	<0.13					1	mg/L	lbs/day			
16B. 2-Chloronaphthalene (91-58-7)	X			<0.005	<0.13					1	mg/L	lbs/day			
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
18B. Chrysene (218-01-9)	X			<0.0025	<0.065					1	mg/L	lbs/day			
19B. Dibenzo *(a,h)* Anthracene (53-70-3)	X			<0.01	<0.26					1	mg/L	lbs/day			
20B. 1,2-Dichlorobenzene (95-50-1)	X			<0.002	<0.052					1	mg/L	lbs/day			
21B. 1,3 Dichlorobenzene (541-73-1)	X			<0.002	<0.052					1	mg/L	lbs/day			

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN103

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
22B. 1,4-Dichloro-benzene (106-46-7)	X			<0.0044	<0.11					1	mg/L	lbs/day			
23B. 3,3'-Dichloro-benzidine (91-94-1)	X			<0.025	<0.65					1	mg/L	lbs/day			
24B. Diethyl Phthalate (84-66-2)	X			<0.0019	<0.049					1	mg/L	lbs/day			
25B. Dimethyl Phthalate (131-11-3)	X			<0.0016	<0.042					1	mg/L	lbs/day			
26B. Di-N-Butyl Phthalate (84-74-2)	X			<0.0025	<0.065					1	mg/L	lbs/day			
27B. 2,4-Dinitro-toluene (121-14-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
28B. 2,6-Dinitro-toluene (606-20-2)	X			<0.005	<0.13					1	mg/L	lbs/day			
29B. Di-N-Octyl Phthalate (117-84-0)	X			<0.01	<0.26					1	mg/L	lbs/day			
30B. 1,2-Diphenyl-hydrazine (as Azo-benzene) (122-66-7)			X												
31B. Fluoranthene (206-44-0)	X			<0.0022	<0.057					1	mg/L	lbs/day			
32B. Fluorene (86-73-7)	X			<0.0003	<0.0078					1	mg/L	lbs/day			
33B. Hexa-chlorobenzene (118-74-1)	X			<0.0019	<0.049					1	mg/L	lbs/day			
34B. Hexa-chlorobutadiene (87-68-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
35B. Hexachloro-cyclopentadiene (77-47-4)	X			<0.03	<0.78					1	mg/L	lbs/day			
36B. Hexachloro-ethane (67-72-1)	X			<0.0005	<0.013					1	mg/L	lbs/day			
37B. Indeno *(1,2,3-cd)* Pyrene (193-39-5)	X			<0.01	<0.26					1	mg/L	lbs/day			
38B. Isophorone (78-59-1)	X			<0.005	<0.13					1	mg/L	lbs/day			
39B. Naphthalene (91-20-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
40B. Nitrobenzene (98-95-3)	X			<0.005	<0.13					1	mg/L	lbs/day			
41B. N-Nitro-sodimethylamine (62-75-9)	X			<0.001	<0.026					1	mg/L	lbs/day			
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			<0.005	<0.13					1	mg/L	lbs/day			

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CONTINUED FROM PAGE V-7

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X" a. TESTING REQUIRED	2. MARK "X" b. BELIEVED PRESENT	2. MARK "X" c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	3. EFFLUENT b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	3. EFFLUENT b. MAXIMUM 30 DAY VALUE (2) MASS	3. EFFLUENT c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	3. EFFLUENT c. LONG TERM AVRG. VALUE (2) MASS	3. EFFLUENT d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
43B. N-Nitrosodiphenylamine (86-30-6)	X			<0.005	<0.13					1	mg/L	lbs/day			
44B. Phenanthrene (85-01-8)	X			<0.0007	<0.018					1	mg/L	lbs/day			
45B. Pyrene (129-00-0)	X			<0.0003	<0.0078					1	mg/L	lbs/day			
46B. 1,2,4 – Trichlorobenzene (120-82-1)	X			<0.005	<0.13					1	mg/L	lbs/day			
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X												
2P. α-BHC (319-84-6)			X												
3P. β-BHC (319-85-7)			X												
4P. γ-BHC (58-89-9)			X												
5P. δ-BHC (319-86-8)			X												
6P. Chlordane (57-74-9)			X												
7P. 4,4'-DDT (50-29-3)			X												
8P. 4,4'-DDE (72-55-9)			X												
9P. 4,4'-DDD (72-54-8)			X												
10P. Dieldrin (60-57-1)			X												
11P. α-Endosulfan (115-29-7)			X												
12P. β-Endosulfan (115-29-7)			X												
13P. Endosulfan Sulfate (1031-07-8)			X												
14P. Endrin (72-20-8)			X												
15P. Endrin Aldehyde (7421-93-4)			X												
16P. Heptachlor (76-44-8)			X												

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES *(continued)*															
17P. Heptachlor Epoxide (1024-57-3)			X												
18P. PCB-1242 (53469-21-9)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
19P. PCB-1254 (11097-69-1)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
20P. PCB-1221 (11104-28-2)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
21P. PCB-1232 (11141-16-5)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
22P. PCB-1248 (12672-29-6)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
23P. PCB-1260 (11096-82-5)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
24P. PCB-1016 (12674-11-2)	X			<0.00005	<0.0013					1	mg/L	lbs/day			
25P. Toxaphene (8001-35-2)			X												

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE 1. DEG.	2. MIN	3. SEC.	C. LONGITUDE 1. DEG	2. MIN	3. SEC	D. RECEIVING WATER *(name)*
107	35	08	24	85	08	03	Low Volume Waste Treatment Pond

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	3. TREATMENT a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
107	Metal Cleaning Waste Ponds	0.0025 MGD	Sedimentation *(settling)*	1	U
			Slow Sand Filtration	1	V
			Chemical Oxidation	2	B
			Chemical Precipitation	2	C
			Neutralization	2	K
			Flocculation	1	G
	DSN 107 receives flow from the following sources:				
	Metal Cleaning Waste	0.0000** MGD			
	Storm water runoff	0.0015 MGD			
	Precipitation minus evaporation	0.0010 MGD			
	** Flow is 10,000 gal/yr (0.00003 MGD)				

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(*s*) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
107	Metal Cleaning Waste as necessary; various plant systems are cleaned/flushed with chemicals including but not limited to: sulfuric acid, phosphate cleanings, caustic, sodium hypochlorite, sodium bromide, citric acid, hydrazine, hydrogen peroxide, EDTA, dimethylamine, ammonium hydroxide, nitric acid, hydrochloric acid, hydrofluoric acid, EDA, phosphoric acid, and corrosion inhibitors.	Frequency and duration of cleanings cannot be determined. Metal Cleaning Wastes are discharged to the pond infrequently.						

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

 Continue on Page 3

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V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding -- Complete one set of tables for each outfall -- Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
Dimethylamine	System/Plant Equipment Cleanings		

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

 Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ **YES** *(identify the test(s) and describe their purposes below)*   ☒ **NO** *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ **YES** *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)*   ☐ **NO** *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Test America	2960 Foster Creighton Drive Nashville, TN 37204	(615) 726-0177	Cyanide and T. Phenols

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*
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V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
DSN107

PART A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	2.a (2) MASS	b. MAXIMUM 30 DAYS VALUE *(if available)* (1) CONCENTRATION	2.b (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	2.c (2) MASS	d. NO. OF ANALYSES	3. UNITS *(specify if blank)* a. CONCENTRATION	3. b. MASS	4. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	4.a (2) MASS	4. b. NO. OF ANALYSES
a. Biochemical Oxygen Demand *(BOD)*	<2	<1.37					1	mg/L	lbs/day			
b. Chemical Oxygen Demand *(COD)*	22	15.12					1	mg/L	lbs/day			
c. Total Organic Carbon *(TOC)*	13	8.93					1	mg/L	lbs/day			
d. Total Suspended Solids *(TSS)*	19	13.06	7.6	3.59	6.8	2.46	21	mg/L	lbs/day			
e. Ammonia *(as N)*	0.28	0.19					1	mg/L	lbs/day			
f. Flow	VALUE 0.0824		VALUE 0.0567		VALUE 0.0434		21	MGD		VALUE		
g. Temperature *(winter)*	VALUE 9.3		VALUE N/A		VALUE N/A		2	°C		VALUE		
h. Temperature *(summer)*	VALUE N/A		VALUE N/A		VALUE N/A		N/A	°C		VALUE		
i. pH	MINIMUM 7.4	MAXIMUM 8.8	MINIMUM 8.8	MAXIMUM 8.8			25	STANDARD UNITS				

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. *(if available)*	2. MARK "X" a. BELIEVED PRESENT	2. b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3.a (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	3.b (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	3.c (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5.a (2) MASS	5. b. NO. OF ANALYSES
a. Bromide (24959-67-9)	X		5	3.44					1	mg/L	lbs/day			
b. Chlorine, Total Residual	X		<0.05	<0.034					2	mg/L	lbs/day			
c. Color	X		15						1	PC Units				
d. Fecal Coliform	X		<10						2	colonies/100mL				
e. Fluoride (16984-48-8)		X												
f. Nitrate-Nitrite (as N)	X		0.16	0.11					1	mg/L	lbs/day			

CONTINUE ON PAGE V-2

ITEM V-B CONTINUED FROM PAGE V-1

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic (as N)	X		1.1	0.76					1	mg/L	lbs/day			
h. Oil and Grease	X		<5	<3.44	<5	<2.36	<5	<1.81	22	mg/L	lbs/day			
i. Phosphorus (as P), Total (7723-14-0)	X		0.07	0.048					1	mg/L	lbs/day			
j. Radioactivity														
(1) Alpha, Total		X												
(2) Beta, Total		X												
(3) Radium, Total		X												
(4) Radium 226, Total		X												
k. Sulfate (as SO_4) (14808-79-8)	X		27	18.55					1	mg/L	lbs/day			
l. Sulfide (as S)	X		0.02	0.014					1	mg/L	lbs/day			
m. Sulfite (as SO_3) (14265-45-3)	X		1.0	0.687					2	mg/L	lbs/day			
n. Surfactants		X												
o. Aluminum, Total (7429-90-5)	X		0.14	0.096					1	mg/L	lbs/day			
p. Barium, Total (7440-39-3)	X		0.02	0.014					1	mg/L	lbs/day			
q. Boron, Total (7440-42-8)	X		0.3	0.206					1	mg/L	lbs/day			
r. Cobalt, Total (7440-48-4)	X		<0.001	<0.0007					1	mg/L	lbs/day			
s. Iron, Total (7439-89-6)	X		1.8	1.237	1.01	0.478	0.74	0.268	27	mg/L	lbs/day			
t. Magnesium, Total (7439-95-4)	X		3.3	2.268					1	mg/L	lbs/day			
u. Molybdenum, Total (7439-98-7)	X		<0.02	<0.014					1	mg/L	lbs/day			
v. Manganese, Total (7439-96-5)	X		0.039	0.0268					1	mg/L	lbs/day			
w. Tin, Total (7440-31-5)	X		0.19	0.131					1	mg/L	lbs/day			
x. Titanium, Total (7440-32-6)	X		0.005	0.003					1	mg/L	lbs/day			

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN107

CONTINUED FROM PAGE 3 OF FORM 2-C

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dintrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part, please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	b. MAXIMUM 30 DAY VALUE *(if available)* (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	c. LONG TERM AVRG. VALUE *(if available)* (2) MASS	d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	a. LONG TERM AVERAGE VALUE (2) MASS	b. NO. OF ANALYSES
METALS, CYANIDE AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.001	<0.0007					1	mg/L	lbs/day			
2M. Arsenic, Total (7440-38-2)	X			<0.001	<0.0007					1	mg/L	lbs/day			
3M. Beryllium, Total (7440-41-7)	X			<0.001	<0.0007					1	mg/L	lbs/day			
4M. Cadmium, Total (7440-43-9)	X			<0.0001	<0.00007					1	mg/L	lbs/day			
5M Chromium, Total (7440-47-3)	X			<0.001	<0.0007					1	mg/L	lbs/day			
6M. Copper, Total (7440-50-8)	X			0.011	0.007	0.0041	0.002	<0.0037	0.001	22	mg/L	lbs/day			
7M. Lead, Total (7439-92-1)	X			<0.001	<0.0007					1	mg/L	lbs/day			
8M. Mercury, Total (7439-97-6)	X			<0.0001	<0.00007					1	mg/L	lbs/day			
9M. Nickel, Total (7440-02-0)	X			0.010	0.007					1	mg/L	lbs/day			
10M. Selenium, Total (7782-49-2)	X			<0.001	<0.0007					1	mg/L	lbs/day			
11M. Silver, Total (7440-22-4)	X			<0.0001	<0.00007					1	mg/L	lbs/day			
12M. Thallium, Total (7440-28-0)	X			<0.002	<0.0014					1	mg/L	lbs/day			
13M. Zinc, Total (7440-66-6)	X			<0.01	<0.007					1	mg/L	lbs/day			
14M. Cyanide, Total (57-12-5)	X			<0.005	<0.003					2	mg/L	lbs/day			
15M. Phenols, Total	X			<0.005	<0.003					2	mg/L	lbs/day			
DIOXIN															
2,3,7,8-Tetra-chlorodibenzo-P Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

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CONTINUED FROM PAGE V-3

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<0.001	<0.0007					2	mg/L	lbs/day			
2V. Acrylonitrile (107-13-1)	X			<0.001	<0.0007					2	mg/L	lbs/day			
3V. Benzene (71-43-2)	X			<0.001	<0.0007					2	mg/L	lbs/day			
4V. Bis (Chloromethyl) Ether (542-88-1)			X												
5V. Bromoform (75-25-2)	X			0.020	0.014					2	mg/L	lbs/day			
6V. Carbon Tetrachloride (56-23-5)	X			<0.001	<0.0007					2	mg/L	lbs/day			
7V. Chlorobezene (108-90-7)	X			<0.01	<0.007					2	mg/L	lbs/day			
8V. Chlorodibromomethane (124-48-1)	X			0.004	0.0027					2	mg/L	lbs/day			
9V. Chloroethane (75-00-3)	X			<0.01	<0.007					2	mg/L	lbs/day			
10V. 2-Chloroethylvinyl Ether (110-75-8)	X			<0.01	<0.007					2	mg/L	lbs/day			
11V. Chloroform (67-66-3)	X			0.012	0.008					2	mg/L	lbs/day			
12V. Dichlorobromomethane (75-27-4)	X			<0.001	<0.0007					2	mg/L	lbs/day			
13V. Dichlorodifluoromethane (75-71-8)	X			<0.001	<0.0007					2	mg/L	lbs/day			
14V. 1,1-Dichloroethane (75-34-3)	X			<0.001	<0.0007					2	mg/L	lbs/day			
15V. 1,2-Dichloroethane (107-06-2)	X			<0.001	<0.0007					2	mg/L	lbs/day			
16V. 1,1-Dichloroethylene (75-35-4)	X			<0.001	<0.0007					2	mg/L	lbs/day			
17V. 1,2-Dichloropropane (78-87-5)	X			<0.01	<0.007					2	mg/L	lbs/day			
18V. 1,3-Dichloropropylene (542-75-6)	X			<0.001	<0.0007					2	mg/L	lbs/day			
19V. Ethylbenzene (100-41-4)	X			<0.001	<0.0007					2	mg/L	lbs/day			
20V. Methyl Bromide (74-83-9)	X			<0.01	<0.007					2	mg/L	lbs/day			
21V. Methyl Chloride (74-87-3)	X			<0.001	<0.0007					2	mg/L	lbs/day			

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1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS *(continued)*															
22V. Methylene Chloride (75-09-2)	X			<0.001	<0.0007					2	mg/L	lbs/day			
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	X			<0.0005	<0.0003					2	mg/L	lbs/day			
24V. Tetrachloroethylene (127-18-4)	X			<0.0005	<0.0003					2	mg/L	lbs/day			
25V. Toluene (108-88-3)	X			<0.001	<0.0007					2	mg/L	lbs/day			
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			<0.01	<0.007					2	mg/L	lbs/day			
27V. 1,1,1-Trichloroethane (71-55-6)	X			<0.001	<0.0007					2	mg/L	lbs/day			
28V. 1,1,2-Trichloroethane (79-00-5)	X			<0.0002	<0.00014					2	mg/L	lbs/day			
29V. Trichloroethylene (79-01-6)	X			<0.001	<0.0007					2	mg/L	lbs/day			
30V. Trichlorofluoromethane (75-69-4)	X			<0.01	<0.007					2	mg/L	lbs/day			
31V. Vinyl Chloride (75-01-4)	X			<0.002	<0.0014					2	mg/L	lbs/day			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)	X			<0.005	<0.003					1	mg/L	lbs/day			
2A. 2,4-Dichlorophenol (120-83-2)	X			<0.005	<0.003					1	mg/L	lbs/day			
3A. 2,4-Dimethylphenol (105-67-9)	X			<0.005	<0.003					1	mg/L	lbs/day			
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			<0.024	<0.016					1	mg/L	lbs/day			
5A. 2,4-Dinitrophenol (51-28-5)	X			<0.02	<0.014					1	mg/L	lbs/day			
6A. 2-Nitrophenol (88-75-5)	X			<0.005	<0.003					1	mg/L	lbs/day			
7A. 4-Nitrophenol (100-02-7)	X			<0.03	<0.021					1	mg/L	lbs/day			
8A. P-Chloro-M Cresol (59-50-7)	X			<0.024	<0.016					1	mg/L	lbs/day			
9A. Pentachlorophenol (87-86-5)	X			<0.005	<0.003					1	mg/L	lbs/day			
10A. Phenol (108-95-2)	X			<0.005	<0.003					1	mg/L	lbs/day			
11A. 2,4,6-Trichlorophenol (88-06-2)	X			<0.0027	<0.0019					1	mg/L	lbs/day			

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1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			<0.005	<0.003					1	mg/L	lbs/ day			
2B. Acenaphtylene (208-96-8)	X			<0.005	<0.003					1	mg/L	lbs/ day			
3B. Anthracene (120-12-7)	X			<0.005	<0.003					1	mg/L	lbs/ day			
4B. Benzidine (92-87-5)	X			<0.05	<0.03					1	mg/L	lbs/ day			
5B. Benzo *(a)* Anthracene (56-55-3)	X			<0.005	<0.003					1	mg/L	lbs/ day			
6B. Benzo *(a)* Pyrene (50-32-8)	X			<0.01	<0.007					1	mg/L	lbs/ day			
7B. 3,4-Benzofluoranthene (205-99-2)	X			<0.01	<0.007					1	mg/L	lbs/ day			
8B. Benzo *(ghi)* Perylene (191-24-2)	X			<0.01	<0.007					1	mg/L	lbs/ day			
9B. Benzo *(k)* Fluoranthene (207-08-9)	X			<0.01	<0.007					1	mg/L	lbs/ day			
10B. Bis *(2-Chloroethoxy)* Methane (111-91-1)	X			<0.005	<0.003					1	mg/L	lbs/ day			
11B. Bis *(2-Chloroethyl)* Ether (111-44-4)	X			<0.001	<0.0007					1	mg/L	lbs/ day			
12B. Bis *(2-Chloroisopropyl)* Ether (102-60-1)	X			<0.005	<0.003					1	mg/L	lbs/ day			
13B. Bis *(2-Ehtylhexyl)* Phthalate (117-81-7)	X			0.0025	<0.0017					1	mg/L	lbs/ day			
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	X			<0.005	<0.003					1	mg/L	lbs/ day			
15B. Butyl Benzyl Phthalate (85-68-7)	X			<0.005	<0.003					1	mg/L	lbs/ day			
16B. 2-Chloronaphthalene (91-58-7)	X			<0.005	<0.003					1	mg/L	lbs/ day			
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)	X			<0.005	<0.003					1	mg/L	lbs/ day			
18B. Chrysene (218-01-9)	X			<0.0025	<0.0017					1	mg/L	lbs/ day			
19B. Dibenzo *(a,h)* Anthracene (53-70-3)	X			<0.01	<0.007					1	mg/L	lbs/ day			
20B. 1,2-Dichlorobenzene (95-50-1)	X			<0.002	<0.0014					1	mg/L	lbs/ day			
21B. 1,3 Dichlorobenzene (541-73-1)	X			<0.002	<0.0014					1	mg/L	lbs/ day			

 CONTINUE ON PAGE V-7

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN107

CONTINUED FROM PAGE V-6

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
22B. 1,4-Dichlorobenzene (106-46-7)	X			<0.0044	<0.0030					1	mg/L	lbs/day			
23B. 3,3'-Dichlorobenzidine (91-94-1)	X			<0.025	<0.017					1	mg/L	lbs/day			
24B. Diethyl Phthalate (84-66-2)	X			<0.0019	<0.0013					1	mg/L	lbs/day			
25B. Dimethyl Phthalate (131-11-3)	X			<0.0016	<0.0011					1	mg/L	lbs/day			
26B. Di-N-Butyl Phthalate (84-74-2)	X			<0.0025	<0.0017					1	mg/L	lbs/day			
27B. 2,4-Dinitrotoluene (121-14-2)	X			<0.001	<0.0007					1	mg/L	lbs/day			
28B. 2,6-Dinitrotoluene (606-20-2)	X			<0.005	<0.003					1	mg/L	lbs/day			
29B. Di-N-Octyl Phthalate (117-84-0)	X			<0.01	<0.007					1	mg/L	lbs/day			
30B. 1,2-Diphenylhydrazine *(as Azobenzene)* (122-66-7)			X												
31B. Fluoranthene (206-44-0)	X			<0.0022	<0.0015					1	mg/L	lbs/day			
32B. Fluorene (86-73-7)	X			<0.0003	<0.0002					1	mg/L	lbs/day			
33B. Hexachlorobenzene (118-74-1)	X			<0.0019	<0.0013					1	mg/L	lbs/day			
34B. Hexachlorobutadiene (87-68-3)	X			<0.005	<0.003					1	mg/L	lbs/day			
35B. Hexachlorocyclopentadiene (77-47-4)	X			<0.03	<0.021					1	mg/L	lbs/day			
36B. Hexachloroethane (67-72-1)	X			<0.0005	<0.0003					1	mg/L	lbs/day			
37B. Indeno *(1,2,3-cd)* Pyrene (193-39-5)	X			<0.01	<0.007					1	mg/L	lbs/day			
38B. Isophorone (78-59-1)	X			<0.005	<0.003					1	mg/L	lbs/day			
39B. Naphthalene (91-20-3)	X			<0.005	<0.003					1	mg/L	lbs/day			
40B. Nitrobenzene (98-95-3)	X			<0.005	<0.003					1	mg/L	lbs/day			
41B. N-Nitrosodimethylamine (62-75-9)	X			<0.001	<0.0007					1	mg/L	lbs/day			
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			<0.005	<0.003					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-8

CONTINUED FROM PAGE V-7

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (continued)															
43B. N-Nitrosodiphenylamine (86-30-6)	X			<0.005	<0.003					1	mg/L	lbs/day			
44B. Phenanthrene (85-01-8)	X			<0.0007	<0.0005					1	mg/L	lbs/day			
45B. Pyrene (129-00-0)	X			<0.0003	<0.0002					1	mg/L	lbs/day			
46B. 1,2,4 – Trichlorobenzene (120-82-1)	X			<0.005	<0.003					1	mg/L	lbs/day			
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X												
2P. α-BHC (319-84-6)			X												
3P. β-BHC (319-85-7)			X												
4P. γ-BHC (58-89-9)			X												
5P. δ-BHC (319-86-8)			X												
6P. Chlordane (57-74-9)			X												
7P. 4,4'-DDT (50-29-3)			X												
8P. 4,4'-DDE (72-55-9)			X												
9P. 4,4'-DDD (72-54-8)			X												
10P. Dieldrin (60-57-1)			X												
11P. α-Endosulfan (115-29-7)			X												
12P. β-Endosulfan (115-29-7)			X												
13P. Endosulfan Sulfate (1031-07-8)			X												
14P. Endrin (72-20-8)			X												
15P. Endrin Aldehyde (7421-93-4)			X												
16P. Heptachlor (75-44-8)			X												

 CONTINUE ON PAGE V-9

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN107

CONTINUED FROM PAGE V-8

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES *(continued)*															
17P. Heptachlor Epoxide (1024-57-3)			X												
18P. PCB-1242 (53469-21-9)			X												
19P. PCB-1254 (11097-69-1)			X												
20P. PCB-1221 (11104-28-2)			X												
21P. PCB-1232 (11141-16-5)			X												
22P. PCB-1248 (12672-29-6)			X												
23P. PCB-1260 (11096-82-5)			X												
24P. PCB-1016 (12674-11-2)			X												
25P. Toxaphene (8001-35-2)			X												

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
110	35	13	23	85	05	09	Intake Forebay

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
110	Cold Water Return Channel	1593.9008 MGD	Discharge to Surface Water	4	A
	DSN 110 receives flow from the following sources:				
	ERCW system	40.3200 MGD	Disinfection *(Other)*	2	H
	Cooling towers (closed mode)	1553.4604 MGD			
	Liquid radwaste treatment system	0.0500 MGD	Ion Exchange	2	J
			Multimedia Filtration	1	Q
	Storm water runoff	0.0652 MGD			
	Precipitation minus evaporation	0.0052 MGD			
	(Recycled cooling water during closed mode is discharged through Outfall 110. Outfall 110 has been inactive for ~10 years, but remains in the event the plant goes into closed mode.)				
	* Outfall 110 was not sampled during the 24-hour sampling event because it is currently inactive. Therefore, there are no analytical results for this outfall.				

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY a. DAYS PER WEEK *(specify average)*	3. FREQUENCY b. MONTHS PER YEAR *(specify average)*	4. FLOW a. FLOW RATE *(in mgd)* 1. LONG TERM AVERAGE	4. FLOW a. FLOW RATE *(in mgd)* 2. MAXIMUM DAILY	4. FLOW b. TOTAL VOLUME *(specify with units)* 1. LONG TERM AVERAGE	4. FLOW b. TOTAL VOLUME *(specify with units)* 2. MAXIMUM DAILY	4. FLOW c. DURATION *(in days)*
	Cooling Tower Blowdown Basin	Cooling Tower Blowdown Basin discharges recycled cooling water through Outfall 110 while the plant is in closed mode. The plant has not entered closed mode for the last ~10 years. Therefore, Outfall 110 has remained inactive. If the plant does go into closed mode the discharge flow through Outfall 110 will be approximately 1553.9008 MGD.						

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete Item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete Item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	2. AFFECTED OUTFALLS *(list outfall numbers)*

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS a. NO	2. AFFECTED OUTFALLS b. SOURCE OF DISCHARGE	3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE a. REQUIRED	4. FINAL COMPLIANCE DATE b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

 Continue on Page 3

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

CONTINUED FROM PAGE 2

V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding -- Complete one set of tables for each outfall -- Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
Dimethylamine (The use of dimethylamine will not result in detectable quantities at Outfall 101 for the following reason: The maximum dimethylamine concentration in the steam generators is 10 ppm during layup. The capacity of each unit's four steam generators is approximately 80,000 gallons. Steam generators can be drained down at a rate of 400 gpm. Both unit's steam generators are not drained down simultaneously. Therefore, the maximum concentration of dimethylamine at Outfall 101 would be 0.007 ppm. The MDL for dimethylamine is 0.1 ppm)	Steam Generator Layup		

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purposes below)* ☒ NO *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☐ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☒ NO *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER

EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS

Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
116	35	13	33	85	05	13	Tennessee River

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
116	CCW Intake Trash Sluice	0.0060 MGD	Discharge to Surface Water	4	A

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
116	CCW Intake Trash Sluice	1	12	0.0060	0.0450			0.01

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

EPA ID NUMBER (copy from Item 1 of Form 1)
TN5640020504

CONTINUED FROM PAGE 2

V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

 Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purposes below)* ☒ NO *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Test America	2960 Foster Creighton Drive Nashville, TN 37204	(615) 726-0177	Cyanide and T. Phenols

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*
TN5640020504

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
DSN116

PART A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAYS VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand *(BOD)*	<2	<60.0					1	mg/L	lbs/day			
b. Chemical Oxygen Demand *(COD)*	<5	<150					1	mg/L	lbs/day			
c. Total Organic Carbon *(TOC)*	2.2	66.05					1	mg/L	lbs/day			
d. Total Suspended Solids *(TSS)*	3	90.07					1	mg/L	lbs/day			
e. Ammonia *(as N)*	0.05	1.50					1	mg/L	lbs/day			
f. Flow	VALUE 3.6		VALUE N/A		VALUE N/A		1	MGD		VALUE		
g. Temperature *(winter)*	VALUE 9.5		VALUE N/A		VALUE N/A		1	°C		VALUE		
h. Temperature *(summer)*	VALUE N/A		VALUE N/A		VALUE N/A		N/A	°C		VALUE		
i. pH	MINIMUM 8.2	MAXIMUM 8.2	MINIMUM N/A	MAXIMUM N/A			1	STANDARD UNITS				

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BE-LIEVED PRE-SENT	b. BE-LIEVED AB-SENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANAL-YSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANAL-YSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)	X		<2	<60					1	mg/L	lbs/day			
b. Chlorine, Total Residual	X		<0.05	<1.50					1	mg/L	lbs/day			
c. Color	X		5						1	PC Units				
d. Fecal Coliform	X		340						1	colonies /100mL				
e. Fluoride (16984-48-8)		X												
f. Nitrate-Nitrite *(as N)*	X		0.43	12.91					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-2

ITEM V-B CONTINUED FROM PAGE V-1

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic *(as N)*	X		0.18	5.40					1	mg/L	lbs/day			
h. Oil and Grease	X		<5	<150					1	mg/L	lbs/day			
i. Phosphorus *(as P)*, Total (7723-14-0)	X		0.04	1.20					1	mg/L	lbs/day			
j. Radioactivity														
(1) Alpha, Total		X												
(2) Beta, Total		X												
(3) Radium, Total		X												
(4) Radium 226, Total		X												
k. Sulfate *(as SO_4)* (14808-79-8)	X		17	510.41					1	mg/L	lbs/day			
l. Sulfide *(as S)*	X		<0.02	<0.60					1	mg/L	lbs/day			
m. Sulfite *(as SO_3)* (14265-45-3)		X												
n. Surfactants		X												
o. Aluminum, Total (7429-90-5)	X		0.26	7.81					1	mg/L	lbs/day			
p. Barium, Total (7440-39-3)	X		0.03	0.90					1	mg/L	lbs/day			
q. Boron, Total (7440-42-8)	X		<0.2	<6.00					1	mg/L	lbs/day			
r. Cobalt, Total (7440-48-4)	X		<0.001	<0.030					1	mg/L	lbs/day			
s. Iron, Total (7439-89-6)	X		0.28	8.41					1	mg/L	lbs/day			
t. Magnesium, Total (7439-95-4)	X		5.8	174.14					1	mg/L	lbs/day			
u. Molybdenum, Total (7439-98-7)	X		<0.02	<0.60					1	mg/L	lbs/day			
v. Manganese, Total (7439-96-5)	X		0.39	11.71					1	mg/L	lbs/day			
w. Tin, Total (7440-31-5)	X		<0.05	<1.50					1	mg/L	lbs/day			
x. Titanium, Total (7440-32-6)	X		0.013	0.39					1	mg/L	lbs/day			

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CONTINUED FROM PAGE 3 OF FORM 2-C

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part, please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	b. (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	c. (2) MASS	d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	a. (2) MASS	b. NO. OF ANALYSES
METALS, CYANIDE AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.001	<0.03					1	mg/L	lbs/day			
2M. Arsenic, Total (7440-38-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
3M. Beryllium, Total (7440-41-7)	X			<0.001	<0.03					1	mg/L	lbs/day			
4M. Cadmium, Total (7440-43-9)	X			<0.0001	<0.003					1	mg/L	lbs/day			
5M. Chromium, Total (7440-47-3)	X			<0.001	<0.03					1	mg/L	lbs/day			
6M. Copper, Total (7440-50-8)	X			0.0085	<0.26					1	mg/L	lbs/day			
7M. Lead, Total (7439-92-1)	X			<0.001	<0.03					1	mg/L	lbs/day			
8M. Mercury, Total (7439-97-6)	X			<0.0001	<0.003					1	mg/L	lbs/day			
9M. Nickel, Total (7440-02-0)	X			<0.001	<0.03					1	mg/L	lbs/day			
10M. Selenium, Total (7782-49-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
11M. Silver, Total (7440-22-4)	X			<0.0001	<0.003					1	mg/L	lbs/day			
12M. Thallium, Total (7440-28-0)	X			<0.002	<0.06					1	mg/L	lbs/day			
13M. Zinc, Total (7440-66-6)	X			<0.01	<0.30					1	mg/L	lbs/day			
14M. Cyanide, Total (57-12-5)	X			<0.005	<0.15					1	mg/L	lbs/day			
15M. Phenols, Total	X			<0.005	<0.15					1	mg/L	lbs/day			
DIOXIN															
2,3,7,8-Tetra-chlorodibenzo-P Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

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CONTINUED FROM PAGE V-3

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<0.001	<0.03					1	mg/L	lbs/day			
2V. Acrylonitrile (107-13-1)	X			<0.001	<0.03					1	mg/L	lbs/day			
3V. Benzene (71-43-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
4V. Bis *(Chloromethyl)* Ether (542-88-1)			X												
5V. Bromoform (75-25-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
6V. Carbon Tetrachloride (56-23-5)	X			<0.001	<0.03					1	mg/L	lbs/day			
7V. Chlorobezene (108-90-7)	X			<0.01	<0.3					1	mg/L	lbs/day			
8V. Chlorodibromomethane (124-48-1)	X			<0.001	<0.03					1	mg/L	lbs/day			
9V. Chloroethane (75-00-3)	X			<0.01	<0.3					1	mg/L	lbs/day			
10V. 2-Chloroethylvinyl Ether (110-75-8)	X			<0.01	<0.3					1	mg/L	lbs/day			
11V. Chloroform (67-66-3)	X			<0.0005	<0.015					1	mg/L	lbs/day			
12V. Dichlorobromomethane (75-27-4)	X			<0.001	<0.03					1	mg/L	lbs/day			
13V. Dichlorodifluoromethane (75-71-8)	X			<0.001	<0.03					1	mg/L	lbs/day			
14V. 1,1-Dichloroethane (75-34-3)	X			<0.001	<0.03					1	mg/L	lbs/day			
15V. 1,2-Dichloroethane (107-06-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
16V. 1,1-Dichloroethylene (75-35-4)	X			<0.001	<0.03					1	mg/L	lbs/day			
17V. 1,2-Dichloropropane (78-87-5)	X			<0.01	<0.3					1	mg/L	lbs/day			
18V. 1,3-Dichloropropylene (542-75-6)	X			<0.001	<0.03					1	mg/L	lbs/day			
19V. Ethylbenzene (100-41-4)	X			<0.001	<0.03					1	mg/L	lbs/day			
20V. Methyl Bromide (74-83-9)	X			<0.01	<0.3					1	mg/L	lbs/day			
21V. Methyl Chloride (74-87-3)	X			<0.001	<0.03					1	mg/L	lbs/day			

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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CONTINUED FROM PAGE V-4

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TEST-ING RE-QUIRED	b. BE-LIEVED PRE-SENT	c. BE-LIEVED AB-SENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANAL-YSES	a. CONCEN-TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANAL-YSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS *(continued)*															
22V. Methylene Chloride (75-09-2)	X			<0.001	<0.03					1	mg/L	lbs/ day			
23V. 1,1,2,2-Tetra-chloroethane (79-34-5)	X			<0.0005	<0.015					1	mg/L	lbs/ day			
24V. Tetrachloro-ethylene (127-18-4)	X			<0.0005	<0.015					1	mg/L	lbs/ day			
25V. Toluene (108-88-3)	X			<0.001	<0.03					1	mg/L	lbs/ day			
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			<0.01	<0.3					1	mg/L	lbs/ day			
27V. 1,1,1-Tri-chloroethane (71-55-6)	X			<0.001	<0.03					1	mg/L	lbs/ day			
28V. 1,1,2-Tri-chloroethane (79-00-5)	X			<0.0002	<0.006					1	mg/L	lbs/ day			
29V. Trichloro-ethylene (79-01-6)	X			<0.001	<0.03					1	mg/L	lbs/ day			
30V. Trichloro-fluoromethane (75-69-4)	X			<0.01	<0.3					1	mg/L	lbs/ day			
31V. Vinyl Chloride (75-01-4)	X			<0.002	<0.06					1	mg/L	lbs/ day			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)	X			<0.005	<0.15					1	mg/L	lbs/ day			
2A. 2,4-Dichloro-phenol (120-83-2)	X			<0.005	<0.15					1	mg/L	lbs/ day			
3A. 2,4-Dimethyl-phenol (105-67-9)	X			<0.005	<0.15					1	mg/L	lbs/ day			
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			<0.024	<0.72					1	mg/L	lbs/ day			
5A. 2,4-Dinitro-phenol (51-28-5)	X			<0.02	<0.60					1	mg/L	lbs/ day			
6A. 2-Nitrophenol (88-75-5)	X			<0.005	<0.15					1	mg/L	lbs/ day			
7A. 4-Nitrophenol (100-02-7)	X			<0.03	<0.90					1	mg/L	lbs/ day			
8A. P-Chloro-M Cresol (59-50-7)	X			<0.024	<0.72					1	mg/L	lbs/ day			
9A. Pentachloro-phenol (87-86-5)	X			<0.005	<0.15					1	mg/L	lbs/ day			
10A. Phenol (108-95-2)	X			<0.005	<0.15					1	mg/L	lbs/ day			
11A. 2,4,6-Trichlorophenol (88-06-2)	X			<0.0027	<0.08					1	mg/L	lbs/ day			

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CONTINUED FROM PAGE V-5

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			<0.005	<0.15					1	mg/L	lbs/ day			
2B. Acenaphtylene (208-96-8)	X			<0.005	<0.15					1	mg/L	lbs/ day			
3B. Anthracene (120-12-7)	X			<0.005	<0.15					1	mg/L	lbs/ day			
4B. Benzidine (92-87-5)	X			<0.05	<1.50					1	mg/L	lbs/ day			
5B. Benzo *(a)* Anthracene (56-55-3)	X			<0.005	<0.15					1	mg/L	lbs/ day			
6B. Benzo *(a)* Pyrene (50-32-8)	X			<0.01	<0.3					1	mg/L	lbs/ day			
7B. 3,4-Benzo-fluoranthene (205-99-2)	X			<0.01	<0.3					1	mg/L	lbs/ day			
8B. Benzo *(ghi)* Perylene (191-24-2)	X			<0.01	<0.3					1	mg/L	lbs/ day			
9B. Benzo *(k)* Fluoranthene (207-08-9)	X			<0.01	<0.3					1	mg/L	lbs/ day			
10B. Bis *(2-Chloro-ethoxy)* Methane (111-91-1)	X			<0.005	<0.15					1	mg/L	lbs/ day			
11B. Bis *(2-Chloro-ethyl)* Ether (111-44-4)	X			<0.001	<0.03					1	mg/L	lbs/ day			
12B. Bis *(2-Chloro-isopropyl)* Ether (102-60-1)	X			<0.005	<0.15					1	mg/L	lbs/ day			
13B. Bis *(2-Ethyl-hexyl)* Phthalate (117-81-7)	X			<0.0025	<0.08					1	mg/L	lbs/ day			
14B. 4-Bromo-phenyl Phenyl Ether (101-55-3)	X			<0.005	<0.15					1	mg/L	lbs/ day			
15B. Butyl Benzyl Phthalate (85-68-7)	X			<0.005	<0.15					1	mg/L	lbs/ day			
16B. 2-Chloro-naphthalene (91-58-7)	X			<0.005	<0.15					1	mg/L	lbs/ day			
17B. 4-Chloro-phenyl Phenyl Ether (7005-72-3)	X			<0.005	<0.15					1	mg/L	lbs/ day			
18B. Chrysene (218-01-9)	X			<0.0025	<0.08					1	mg/L	lbs/ day			
19B. Dibenzo *(a,h)* Anthracene (53-70-3)	X			<0.01	<0.3					1	mg/L	lbs/ day			
20B. 1,2-Dichloro-benzene (95-50-1)	X			<0.002	<0.06					1	mg/L	lbs/ day			
21B. 1,3 Dichloro-benzene (541-73-1)	X			<0.002	<0.06					1	mg/L	lbs/ day			

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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CONTINUED FROM PAGE V-6

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
22B. 1,4-Dichlorobenzene (106-46-7)	X			<0.0044	<0.13					1	mg/L	lbs/day			
23B. 3,3'-Dichlorobenzidine (91-94-1)	X			<0.025	<0.75					1	mg/L	lbs/day			
24B. Diethyl Phthalate (84-66-2)	X			<0.0019	<0.06					1	mg/L	lbs/day			
25B. Dimethyl Phthalate (131-11-3)	X			<0.0016	<0.05					1	mg/L	lbs/day			
26B. Di-N-Butyl Phthalate (84-74-2)	X			<0.0025	<0.08					1	mg/L	lbs/day			
27B. 2,4-Dinitrotoluene (121-14-2)	X			<0.001	<0.03					1	mg/L	lbs/day			
28B. 2,6-Dinitrotoluene (606-20-2)	X			<0.005	<0.15					1	mg/L	lbs/day			
29B. Di-N-Octyl Phthalate (117-84-0)	X			<0.01	<0.3					1	mg/L	lbs/day			
30B. 1,2-Diphenylhydrazine *(as Azobenzene)* (122-66-7)			X												
31B. Fluoranthene (206-44-0)	X			<0.0022	<0.07					1	mg/L	lbs/day			
32B. Fluorene (86-73-7)	X			<0.0003	<0.01					1	mg/L	lbs/day			
33B. Hexachlorobenzene (118-74-1)	X			<0.0019	<0.06					1	mg/L	lbs/day			
34B. Hexachlorobutadiene (87-68-3)	X			<0.005	<0.15					1	mg/L	lbs/day			
35B. Hexachlorocyclopentadiene (77-47-4)	X			<0.03	<0.90					1	mg/L	lbs/day			
36B. Hexachloroethane (67-72-1)	X			<0.0005	<0.02					1	mg/L	lbs/day			
37B. Indeno *(1,2,3-cd)* Pyrene (193-39-5)	X			<0.01	<0.3					1	mg/L	lbs/day			
38B. Isophorone (78-59-1)	X			<0.005	<0.15					1	mg/L	lbs/day			
39B. Naphthalene (91-20-3)	X			<0.005	<0.15					1	mg/L	lbs/day			
40B. Nitrobenzene (98-95-3)	X			<0.005	<0.15					1	mg/L	lbs/day			
41B. N-Nitrosodimethylamine (62-75-9)	X			<0.001	<0.03					1	mg/L	lbs/day			
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			<0.005	<0.15					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-8

CONTINUED FROM PAGE V-7

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X" a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	b. MASS	5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
43B. N-Nitrosodiphenylamine (86-30-6)	X			<0.005	<0.15					1	mg/L	lbs/ day			
44B. Phenanthrene (85-01-8)	X			<0.0007	<0.02					1	mg/L	lbs/ day			
45B. Pyrene (129-00-0)	X			<0.0003	<0.01					1	mg/L	lbs/ day			
46B. 1,2,4 – Trichlorobenzene (120-82-1)	X			<0.005	<0.15					1	mg/L	lbs/ day			
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X												
2P. α-BHC (319-84-6)			X												
3P. β-BHC (319-85-7)			X												
4P. γ-BHC (58-89-9)			X												
5P. δ-BHC (319-86-8)			X												
6P. Chlordane (57-74-9)			X												
7P. 4,4'-DDT (50-29-3)			X												
8P. 4,4'-DDE (72-55-9)			X												
9P. 4,4'-DDD (72-54-8)			X												
10P. Dieldrin (60-57-1)			X												
11P. α-Endosulfan (115-29-7)			X												
12P. β-Endosulfan (115-29-7)			X												
13P. Endosulfan Sulfate (1031-07-8)			X												
14P. Endrin (72-20-8)			X												
15P. Endrin Aldehyde (7421-93-4)			X												
16P. Heptachlor (76-44-8)			X												

 CONTINUE ON PAGE V-9

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1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES (continued)															
17P. Heptachlor Epoxide (1024-57-3)			X												
18P. PCB-1242 (53469-21-9)			X												
19P. PCB-1254 (11097-69-1)			X												
20P. PCB-1221 (11104-28-2)			X												
21P. PCB-1232 (11141-16-5)			X												
22P. PCB-1248 (12672-29-6)			X												
23P. PCB-1260 (11096-82-5)			X												
24P. PCB-1016 (12674-11-2)			X												
25P. Toxaphene (8001-35-2)			X												

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
117	35	13	32	85	05	03	Tennessee River

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO (list)	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
117	ERCW Screen and Strainer Backwash	0.0140 MGD	Discharge to Surface Water	4	A

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION*(s)* CONTRIBUTING FLOW *(list)*	3. FREQUENCY a. DAYS PER WEEK *(specify average)*	3. FREQUENCY b. MONTHS PER YEAR *(specify average)*	4. FLOW a. FLOW RATE *(in mgd)* 1. LONG TERM AVERAGE	4. FLOW a. FLOW RATE *(in mgd)* 2. MAXIMUM DAILY	4. FLOW b. TOTAL VOLUME *(specify with units)* 1. LONG TERM AVERAGE	4. FLOW b. TOTAL VOLUME *(specify with units)* 2. MAXIMUM DAILY	4. FLOW c. DURATION *(in days)*
117	ERCW Traveling Screen and	4	12	0.0100	0.0216			0.014
	ERCW Strainer Backwash	3	12	0.0040	0.0096			0.0014

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete Item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete Item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	2. AFFECTED OUTFALLS *(list outfall numbers)*

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS a. NO	2. AFFECTED OUTFALLS b. SOURCE OF DISCHARGE	3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE a. REQUIRED	4. FINAL COMPLIANCE DATE b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

 Continue on Page 3

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V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

 Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purposes below)* ☒ NO *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Test America	2960 Foster Creighton Drive Nashville, TN 37204	(615) 726-0177	Cyanide and T. Phenols

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

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V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
DSN117

PART A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAYS VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand *(BOD)*	<2	<24					1	mg/L	lbs/day			
b. Chemical Oxygen Demand *(COD)*	<5	<60					1	mg/L	lbs/day			
c. Total Organic Carbon *(TOC)*	2.3	27.62					1	mg/L	lbs/day			
d. Total Suspended Solids *(TSS)*	4	48.04					1	mg/L	lbs/day			
e. Ammonia *(as N)*	0.03	0.36					1	mg/L	lbs/day			
f. Flow	VALUE 1.44		VALUE N/A		VALUE N/A		1	MGD		VALUE		
g. Temperature *(winter)*	VALUE 9.6		VALUE N/A		VALUE N/A		1	°C		VALUE		
h. Temperature *(summer)*	VALUE N/A		VALUE N/A		VALUE N/A		N/A	°C		VALUE		
i. pH	MINIMUM 8.2	MAXIMUM 8.2	MINIMUM N/A	MAXIMUM N/A			1	STANDARD UNITS				

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)	X		<2	<24					1	mg/L	lbs/day			
b. Chlorine, Total Residual	X		<0.05	<0.60					1	mg/L	lbs/day			
c. Color	X		5						1	PC Units				
d. Fecal Coliform	X		<10						1	colonies/100mL				
e. Fluoride (16984-48-8)		X												
f. Nitrate-Nitrite (as N)	X		0.44	5.28					1	mg/L	lbs/day			

CONTINUE ON PAGE V-2

ITEM V-B CONTINUED FROM PAGE V-1

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"		3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic *(as N)*	X		0.17	2.04					1	mg/L	lbs/day			
h. Oil and Grease	X		<5	<60					1	mg/L	lbs/day			
i. Phosphorus *(as P)*, Total (7723-14-0)	X		0.04	0.48					1	mg/L	lbs/day			
j. Radioactivity														
(1) Alpha, Total		X												
(2) Beta, Total		X												
(3) Radium, Total		X												
(4) Radium 226, Total		X												
k. Sulfate *(as SO_4)* (14808-79-8)	X		13	156.12					1	mg/L	lbs/day			
l. Sulfide *(as S)*	X		<0.02	<0.24					1	mg/L	lbs/day			
m. Sulfite *(as SO_3)* (14265-45-3)		X												
n. Surfactants		X												
o. Aluminum, Total (7429-90-5)	X		0.23	2.76					1	mg/L	lbs/day			
p. Barium, Total (7440-39-3)	X		0.03	0.36					1	mg/L	lbs/day			
q. Boron, Total (7440-42-8)	X		<0.2	<2.40					1	mg/L	lbs/day			
r. Cobalt, Total (7440-48-4)	X		<0.001	<0.01					1	mg/L	lbs/day			
s. Iron, Total (7439-89-6)	X		0.32	3.84					1	mg/L	lbs/day			
t. Magnesium, Total (7439-95-4)	X		5.8	69.66					1	mg/L	lbs/day			
u. Molybdenum, Total (7439-98-7)	X		<0.02	<0.24					1	mg/L	lbs/day			
v. Manganese, Total (7439-96-5)	X		0.039	0.47					1	mg/L	lbs/day			
w. Tin, Total (7440-31-5)	X		<0.05	<0.60					1	mg/L	lbs/day			
x. Titanium, Total (7440-32-6)	X		0.015	0.18					1	mg/L	lbs/day			

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
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PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part, please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
METALS, CYANIDE AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.001	<0.01					1	mg/L	lbs/day			
2M. Arsenic, Total (7440-38-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
3M. Beryllium, Total (7440-41-7)	X			<0.001	<0.01					1	mg/L	lbs/day			
4M. Cadmium, Total (7440-43-9)	X			<0.0001	<0.001					1	mg/L	lbs/day			
5M Chromium, Total (7440-47-3)	X			<0.001	<0.01					1	mg/L	lbs/day			
6M. Copper, Total (7440-50-8)	X			0.0037	0.04					1	mg/L	lbs/day			
7M. Lead, Total (7439-92-1)	X			<0.001	<0.01					1	mg/L	lbs/day			
8M. Mercury, Total (7439-97-6)	X			<0.0001	<0.001					1	mg/L	lbs/day			
9M. Nickel, Total (7440-02-0)	X			<0.001	<0.01					1	mg/L	lbs/day			
10M. Selenium, Total (7782-49-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
11M. Silver, Total (7440-22-4)	X			0.0004	<0.005					1	mg/L	lbs/day			
12M. Thallium, Total (7440-28-0)	X			<0.002	<0.02					1	mg/L	lbs/day			
13M. Zinc, Total (7440-66-6)	X			0.02	0.24					1	mg/L	lbs/day			
14M. Cyanide, Total (57-12-5)	X			<0.005	<0.06					1	mg/L	lbs/day			
15M. Phenols, Total	X			<0.005	<0.06					1	mg/L	lbs/day			
DIOXIN															
2,3,7,8-Tetra-chlorodibenzo-P Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

CONTINUE ON PAGE V-4

CONTINUED FROM PAGE V-3

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<0.001	<0.01					1	mg/L	lbs/day			
2V. Acrylonitrile (107-13-1)	X			<0.001	<0.01					1	mg/L	lbs/day			
3V. Benzene (71-43-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
4V. Bis (Chloromethyl) Ether (542-88-1)			X												
5V. Bromoform (75-25-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
6V. Carbon Tetrachloride (56-23-5)	X			<0.001	<0.01					1	mg/L	lbs/day			
7V. Chlorobenzene (108-90-7)	X			<0.01	<0.12					1	mg/L	lbs/day			
8V. Chlorodibromomethane (124-48-1)	X			<0.001	<0.01					1	mg/L	lbs/day			
9V. Chloroethane (75-00-3)	X			<0.01	<0.12					1	mg/L	lbs/day			
10V. 2-Chloroethylvinyl Ether (110-75-8)	X			<0.01	<0.12					1	mg/L	lbs/day			
11V. Chloroform (67-66-3)	X			<0.0005	<0.006					1	mg/L	lbs/day			
12V. Dichlorobromomethane (75-27-4)	X			<0.001	<0.01					1	mg/L	lbs/day			
13V. Dichlorodifluoromethane (75-71-8)	X			<0.001	<0.01					1	mg/L	lbs/day			
14V. 1,1-Dichloroethane (75-34-3)	X			<0.001	<0.01					1	mg/L	lbs/day			
15V. 1,2-Dichloroethane (107-06-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
16V. 1,1-Dichloroethylene (75-35-4)	X			<0.001	<0.01					1	mg/L	lbs/day			
17V. 1,2-Dichloropropane (78-87-5)	X			<0.01	<0.12					1	mg/L	lbs/day			
18V. 1,3-Dichloropropylene (542-75-6)	X			<0.001	<0.01					1	mg/L	lbs/day			
19V. Ethylbenzene (100-41-4)	X			<0.001	<0.01					1	mg/L	lbs/day			
20V. Methyl Bromide (74-83-9)	X			<0.01	<0.12					1	mg/L	lbs/day			
21V. Methyl Chloride (74-87-3)	X			<0.001	<0.01					1	mg/L	lbs/day			

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1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS *(continued)*															
22V. Methylene Chloride (75-09-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	X			<0.0005	<0.006					1	mg/L	lbs/day			
24V. Tetrachloroethylene (127-18-4)	X			<0.0005	<0.006					1	mg/L	lbs/day			
25V. Toluene (108-88-3)	X			<0.001	<0.01					1	mg/L	lbs/day			
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			<0.01	<0.12					1	mg/L	lbs/day			
27V. 1,1,1-Trichloroethane (71-55-6)	X			<0.001	<0.01					1	mg/L	lbs/day			
28V. 1,1,2-Trichloroethane (79-00-5)	X			<0.0002	<0.002					1	mg/L	lbs/day			
29V. Trichloroethylene (79-01-6)	X			<0.001	<0.01					1	mg/L	lbs/day			
30V. Trichlorofluoromethane (75-69-4)	X			<0.01	<0.12					1	mg/L	lbs/day			
31V. Vinyl Chloride (75-01-4)	X			<0.002	<0.024					1	mg/L	lbs/day			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)	X			<0.005	<0.06					1	mg/L	lbs/day			
2A. 2,4-Dichlorophenol (120-83-2)	X			<0.005	<0.06					1	mg/L	lbs/day			
3A. 2,4-Dimethylphenol (105-67-9)	X			<0.005	<0.06					1	mg/L	lbs/day			
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			<0.024	<0.29					1	mg/L	lbs/day			
5A. 2,4-Dinitrophenol (51-28-5)	X			<0.02	<0.24					1	mg/L	lbs/day			
6A. 2-Nitrophenol (88-75-5)	X			<0.005	<0.06					1	mg/L	lbs/day			
7A. 4-Nitrophenol (100-02-7)	X			<0.03	<0.36					1	mg/L	lbs/day			
8A. P-Chloro-M Cresol (59-50-7)	X			<0.024	<0.29					1	mg/L	lbs/day			
9A. Pentachlorophenol (87-86-5)	X			<0.005	<0.06					1	mg/L	lbs/day			
10A. Phenol (108-95-2)	X			<0.005	<0.06					1	mg/L	lbs/day			
11A. 2,4,6-Trichlorophenol (88-06-2)	X			<0.0027	<0.03					1	mg/L	lbs/day			

CONTINUE ON PAGE V-6

CONTINUED FROM PAGE V-5

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT								4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			<0.005	<0.06					1	mg/L	lbs/day			
2B. Acenaphtylene (208-96-8)	X			<0.005	<0.06					1	mg/L	lbs/day			
3B. Anthracene (120-12-7)	X			<0.005	<0.06					1	mg/L	lbs/day			
4B. Benzidine (92-87-5)	X			<0.05	<0.60					1	mg/L	lbs/day			
5B. Benzo *(a)* Anthracene (56-55-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
6B. Benzo *(a)* Pyrene (50-32-8)	X			<0.01	<0.12					1	mg/L	lbs/day			
7B. 3,4-Benzo-fluoranthene (205-99-2)	X			<0.01	<0.12					1	mg/L	lbs/day			
8B. Benzo *(ghi)* Perylene (191-24-2)	X			<0.01	<0.12					1	mg/L	lbs/day			
9B. Benzo *(k)* Fluoranthene (207-08-9)	X			<0.01	<0.12					1	mg/L	lbs/day			
10B. Bis *(2-Chloroethoxy)* Methane (111-91-1)	X			<0.005	<0.06					1	mg/L	lbs/day			
11B. Bis *(2-Chloroethyl)* Ether (111-44-4)	X			<0.001	<0.01					1	mg/L	lbs/day			
12B. Bis *(2-Chloroisopropyl)* Ether (102-80-1)	X			<0.005	<0.06					1	mg/L	lbs/day			
13B. Bis *(2-Ethylhexyl)* Phthalate (117-81-7)	X			<0.0025	<0.03					1	mg/L	lbs/day			
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
15B. Butyl Benzyl Phthalate (85-68-7)	X			<0.005	<0.06					1	mg/L	lbs/day			
16B. 2-Chloronaphthalene (91-58-7)	X			<0.005	<0.06					1	mg/L	lbs/day			
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
18B. Chrysene (218-01-9)	X			<0.0025	<0.03					1	mg/L	lbs/day			
19B. Dibenzo *(a,h)* Anthracene (53-70-3)	X			<0.01	<0.12					1	mg/L	lbs/day			
20B. 1,2-Dichlorobenzene (95-50-1)	X			<0.002	<0.024					1	mg/L	lbs/day			
21B. 1,3 Dichlorobenzene (541-73-1)	X			<0.002	<0.024					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-7

		EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
		TN5640020504	DSN117

CONTINUED FROM PAGE V-6

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
22B. 1,4-Dichlorobenzene (106-46-7)	X			<0.0044	<0.05					1	mg/L	lbs/day			
23B. 3,3'-Dichlorobenzidine (91-94-1)	X			<0.025	<0.30					1	mg/L	lbs/day			
24B. Diethyl Phthalate (84-66-2)	X			<0.0019	<0.02					1	mg/L	lbs/day			
25B. Dimethyl Phthalate (131-11-3)	X			<0.0016	<0.019					1	mg/L	lbs/day			
26B. Di-N-Butyl Phthalate (84-74-2)	X			<0.0025	<0.03					1	mg/L	lbs/day			
27B. 2,4-Dinitrotoluene (121-14-2)	X			<0.001	<0.01					1	mg/L	lbs/day			
28B. 2,6-Dinitrotoluene (606-20-2)	X			<0.005	<0.06					1	mg/L	lbs/day			
29B. Di-N-Octyl Phthalate (117-84-0)	X			<0.01	<0.12					1	mg/L	lbs/day			
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)			X												
31B. Fluoranthene (206-44-0)	X			<0.0022	<0.03					1	mg/L	lbs/day			
32B. Fluorene (86-73-7)	X			<0.0003	<0.004					1	mg/L	lbs/day			
33B. Hexachlorobenzene (118-74-1)	X			<0.0019	<0.02					1	mg/L	lbs/day			
34B. Hexachlorobutadiene (87-68-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
35B. Hexachlorocyclopentadiene (77-47-4)	X			<0.03	<0.36					1	mg/L	lbs/day			
36B. Hexachloroethane (67-72-1)	X			<0.0005	<0.006					1	mg/L	lbs/day			
37B. Indeno (*1,2,3-cd*) Pyrene (193-39-5)	X			<0.01	<0.12					1	mg/L	lbs/day			
38B. Isophorone (78-59-1)	X			<0.005	<0.06					1	mg/L	lbs/day			
39B. Naphthalene (91-20-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
40B. Nitrobenzene (98-95-3)	X			<0.005	<0.06					1	mg/L	lbs/day			
41B. N-Nitrosodimethylamine (62-75-9)	X			<0.001	<0.01					1	mg/L	lbs/day			
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			<0.005	<0.06					1	mg/L	lbs/day			

 CONTINUE ON PAGE V-8

CONTINUED FROM PAGE V-7

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)*															
43B. N-Nitrosodiphenylamine (86-30-6)	X			<0.005	<0.06					1	mg/L	lbs/day			
44B. Phenanthrene (85-01-8)	X			<0.0007	<0.008					1	mg/L	lbs/day			
45B. Pyrene (129-00-0)	X			<0.0003	<0.004					1	mg/L	lbs/day			
46B. 1,2,4 – Trichlorobenzene (120-82-1)	X			<0.005	<0.06					1	mg/L	lbs/day			
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X												
2P. α-BHC (319-84-6)			X												
3P. β-BHC (319-85-7)			X												
4P. γ-BHC (58-89-9)			X												
5P. δ-BHC (319-86-8)			X												
6P. Chlordane (57-74-9)			X												
7P. 4,4'-DDT (50-29-3)			X												
8P. 4,4'-DDE (72-55-9)			X												
9P. 4,4'-DDD (72-54-8)			X												
10P. Dieldrin (60-57-1)			X												
11P. α-Endosulfan (115-29-7)			X												
12P. β-Endosulfan (115-29-7)			X												
13P. Endosulfan Sulfate (1031-07-8)			X												
14P. Endrin (72-20-8)			X												
15P. Endrin Aldehyde (7421-93-4)			X												
16P. Heptachlor (76-44-8)			X												

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EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
TN5640020504	DSN117

CONTINUED FROM PAGE V-8

1. POLLUTANT AND CAS NUMBER *(if available)*	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES *(continued)*															
17P. Heptachlor Epoxide (1024-57-3)			X												
18P. PCB-1242 (53469-21-9)			X												
19P. PCB-1254 (11097-69-1)			X												
20P. PCB-1221 (11104-28-2)			X												
21P. PCB-1232 (11141-16-5)			X												
22P. PCB-1248 (12672-29-6)			X												
23P. PCB-1260 (11096-82-5)			X												
24P. PCB-1016 (12674-11-2)			X												
25P. Toxaphene (8001-35-2)			X												

Please print or type in the unshaded areas only

EPA ID NUMBER (copy from Item 1 of Form 1)

TN5640020504

Form Approved
OMB No.2040-0086
Approval expires 5/31/92

FORM 2C NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURAL OPERATIONS
Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN	3. SEC.	1. DEG	2. MIN	3. SEC	
118	35	13	28	85	05	11	Intake Forebay

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined *(e.g. for certain mining activities)*, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUT-FALL NO *(list)*	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT		
	a. OPERATION *(list)*	b. AVERAGE FLOW *(include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2c-1	
118	ERCW Dredge Pond	None	Discharge to Surface Water	4	A
			Sedimentation *(Settling)*	1	U
	(Dredge Pond is not in service at this time.		Multimedia Filtration	1	Q
	Therefore, Outfall 118 is inactive, only				
	stormwater from surrounding vegetated area				
	discharges. No industrial activity in area.				
	If in service the Dredge Pond would provide				
	sedimentation during dredge activities and				
	filtration for lower depth waste waters.)				
	* Outfall 118 was not sampled during				
	24-hour sampling event due to the inactivity				
	of the Dredge Pond.				

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*

 Continue on Page 2

CONTINUED FROM PAGE 1

C. Except for storm runoff leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?
☒ YES *(complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
118	ERCW Dredge Pond	No dredging operations have been conducted since July 1997. Flow cannot be predicted based on past. Dredge Pond is presently vegetated and no industrial activity is conducted in the vicinity.						

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?
☒ YES *(complete Item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?
☐ YES *(complete Item III-C)* ☒ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.
☐ YES *(complete the following table)* ☒ NO *(go to Item IV-B)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs *(or other environmental projects which may affect your discharges)* you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.
☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

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V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in you possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ☒ NO *(go to Item VI-B)*

 Continue on Page 4

CONTINUED FROM PAGE 3

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on receiving water in relation to your discharge within the last 3 years?

☐ **YES** *(identify the test(s) and describe their purposes below)* ☒ **NO** *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☐ **YES** *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☒ **NO** *(go to Section IX)*

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Richard T. Purcell, Site Vice President, Sequoyah Nuclear Plant	423-843-7001
C. SIGNATURE Richard T. Purcell	**D. DATE SIGNED** June 30, 2003

TENNESSEE VALLEY AUTHORITY (TVA)
SEQUOYAH NUCLEAR PLANT (SQN) - NPDES PERMIT NO. TN0026450 - APPLICATION FOR RENEWAL

Current Whole Effluent (WET) Toxicity Limit: 7-day or 3-brood IC_{25}* = 43.9% effluent (2.3 TUc)

Monitoring Frequency = 4/year

*IC_{25}-based NOEC initiated at SQN beginning September 1996.

Proposed Whole Effluent (WET) Toxicity Limit:

In accordance with EPA's recommendation (Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001), SQN Outfall 101 would not be required to have a WET Limit based on a demonstration of no Reasonable Potential (RP) for excursions above the ambient water quality chronic (CCC) criterion using effluent data for current operating conditions. Following guidance in the Technical Support Document (TSD), when no RP exists, biomonitoring would be conducted at a frequency of only once every 5 years as part of the permit renewal process to document acceptable effluent toxicity. Toxicity at the instream wastewater concentration (IWC) would serve only as a hard trigger for accelerated toxicity biomonitoring, should that amount of toxicity be observed during any future studies.

Since, however, TVA has submitted a request to TDEC allowing modification of the chemical program for control of biofouling organisms, TVA request maintaining the current quarterly testing schedule, without a WET limit until sufficient tests have been conducted (i.e. at least ten WET tests over a period of three years) to determine if a RP exists and if a limit is necessary. The current limit would serve as a monitoring trigger for increased testing in the event toxicity is demonstrated at the IWC. If no toxicity occurs during the time required for the RP determination, the frequency of testing would be reduced to annually, with tests to be conducted during different seasons for the duration of the new permit.

TVA also requests that all references and requirements be updated based on the following three new EPA manuals: *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA-821-R-02-013, October 2002), *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge* System (EPA 833-R-00-003, June 2000), and the *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 CFR Part 136)* (EPA 821-B-00-004, July 2000). Of particular interest are the data review and dose response requirements to determine appropriate statistical methods and test validity, as well as the application of upper and lower PMSD limits to evaluate test sensitivity and validity.

The following RP determination utilizes five years (17 studies) of WET biomonitoring data collected under the current regime of chemical additions. The nine most recent studies were conducted in accordance with Part III.C of the current NPDES Permit TN0026450, effective August 8, 2001. At no time during this monitoring was the permit limit (2.3 TUc) or the CCC (1.0 TUc at the IWC) exceeded. Table 1 summarizes SQN biomonitoring results over the last approximately 15 years. Table 2 provides documentation of chemical additions which occurred during sampling for toxicity tests included in the RP determination. Note that all chemicals used have been tested multiple times and in different combinations, thereby further supporting the request for reduced frequency of biomonitoring.

Reasonable Potential (RP) Determination Based on Effluent Biomonitoring Data
Technical Support Document, Text Box 3-2 and Section 3.3 (EPA/505/2-90-001)

DILUTION

DSN101 = 1532 MGD
River 1Q10 = 3491 MGD

Dilution Factor (DF): $DF = \frac{Qs}{Qw} = \frac{3491}{1532} = 2.3$

Instream Wastewater Concentration (IWC): $IWC = \frac{Qw}{Qs} = \frac{1532}{3491} x100 = 43.9\%$

CHRONIC TOXICITY

Step 1 Seventeen WET Biomonitoring Studies, Maximum Observed Toxicity is 1.1 TUc.

[Permit compliance limit = 2.3 TUc (IC_{25} = 43.9% effluent).]

Step 2-3 Coefficient of variation (CV) = 0.02. For 17 samples and a CV of 0.02, the multiplying factor (99% confidence level and 99% probability) is 1.2.

Step 4 Low river flow = 3491 MGD and SQN Outfall 101 discharge = 1532 MGD = 43.9% Instream Waste Concentration (IWC) after dilution.

At a 0.439 IWC: 1.1 TUc x 1.2 x 0.439 = 0.58 TUc

Step 5 0.58 TUc is less than the ambient CCC criterion of 1.0 TUc. This outcome demonstrates that no Reasonable Potential for excursions above the CCC exists, based on effluent data obtained from testing conducted under current operating conditions.

Table 1. Summary of Sequoyah Outfall 101 WET Biomonitoring Results

			Acute Results (96-h Survival)		Chronic Results
	Test Date	Test Species	% Survival in Undiluted Sample	Study Toxicity Units (TUa)	Study Toxicity Units (TUc)
	Hypothesis-based NOEC:				
	1. Aug. 4-11, 1988	*Ceriodaphnia dubia*	100	<1.0	>1.0 (IC_{25}: 1.4)
		Pimephales promelas	100		
Retest	2. Aug. 24-31, 1988	*Ceriodaphnia dubia*	70	<1.0	1.3
		*Pimephales promelas**	-	-	-
	3. Oct. 20-28, 1988	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	4. Nov. 16-23, 1988	*Ceriodaphnia dubia*	89	<1.0	<1.0
		Pimephales promelas	100		
	5. Dec. 7-22, 1988	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	6. Jan. 5-12, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	97		
	7. Feb. 2-9, 1989	*Ceriodaphnia dubia*	100	<1.0	2.0
		Pimephales promelas	93		
Retest	8. Feb. 15-22, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	9. Mar. 1-9, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	97		
	10. Apr. 5-12, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	11. May 10-17, 1989	*Ceriodaphnia dubia*	100	<1.0	1.3
		Pimephales promelas	100		
Retest	12. May 21-31, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	13. Jun. 7-14, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	14. Jul. 12-19, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	15. Aug. 9-20, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	16. Sep. 13-21, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	17. Oct. 19-26, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	18. Nov. 1-11, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		

Table 1. Summary of Sequoyah Outfall 101 WET Biomonitoring Results. (continued)

	Test Date	Test Species	Acute Results (96-h Survival)		Chronic Results
			% Survival in Undiluted Sample	Study Toxicity Units (TUa)	Study Toxicity Units (TUc)
	19. Dec. 6-13, 1989	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	20. Jun. 16-23, 1990	*Ceriodaphnia dubia*	90	<1.0	>2.0 (IC_{25}: 2.97)
	Jun. 13-20, 1990	*Pimephales promelas*	100		
Retest	21. July 7-18, 1990	*Ceriodaphnia dubia*	100	<1.0	<1.0
	July 11-18, 1990	*Pimephales promelas*	100		
	22. Dec. 5-12, 1990	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	23. Feb. 14-21, 1991	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	98		
	24. Jun. 13-20, 1991	*Ceriodaphnia dubia*	100	<1.0	
		Pimephales promelas	95		>1.0 (IC_{25}: <1.0)
Retest	25. Jun. 27-Jul. 4, 1991	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	26. Dec. 11-18, 1991	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	27. Jun. 24-Jul. 1, 1992	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	98		
	28. Dec. 10-17, 1992	*Ceriodaphnia dubia*	10	1.3	2.0 (IC_{25}: 3.1)
		Pimephales promelas	100		
Retest	29. Dec. 17-24, 1992	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	30. Jun. 23-30, 1993	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	31. Oct. 28-Nov. 4, 1993	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	98		
	32. Apr. 21-28, 1994	*Ceriodaphnia dubia*	100	<1.0	1.3†
		Pimephales promelas	98		
	33. Oct. 12-19, 1994	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	34. Apr. 11-18, 1995	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	35. Oct. 4-11, 1995	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		
	36. Mar. 28-Apr. 4, 1996	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	90		
	IC25-based NOEC:				
	37. Sep. 25-Oct. 2, 1996	*Ceriodaphnia dubia*	100	<1.0	<1.0
		Pimephales promelas	100		

Table 1. Summary of Sequoyah Outfall 101 WET Biomonitoring Results. (continued)

Test Date	Test Species	Acute Results (96-h Survival) % Survival in Undiluted Sample	Acute Results (96-h Survival) Study Toxicity Units (TUa)	Chronic Results Study Toxicity Units (TUc)
38. Mar. 12-19, 1997	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	98		
39. Sept. 10-17, 1997	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
40. Mar. 13-20, 1998‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
41. Sept. 9-16, 1998‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
42. Feb. 23-Mar. 2, 1999‡	*Ceriodaphnia dubia*	100	<1.0	
	Pimephales promelas	100		1.0
43. Aug. 19-26, 1999‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	88		
44. Jan. 31-Feb. 6, 2000‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
45. June 27- Aug. 3, 2000‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	98		
46. Dec. 12-19, 2000‡	*Ceriodaphnia dubia*	100	<1.0	
	Pimephales promelas	100		1.09
47. May 31- June 7, 2001‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	95		
48. Aug. 28-Sept. 9, 2001‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	95		
49. Dec. 10-17, 2001‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	invalid§		
50. Jan. 4-11, 2002†‡	*Ceriodaphnia dubia**	-	-	-
	Pimephales promelas	100	<1.0	<1.0
51. Feb 26-Mar 5, 2002‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
52. May 7-14, 2002‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	98		
53. August 6-13, 2002‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
54. October 8-15, 2002‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		
55. January 14, 2003‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	90		
56. April 8, 2003‡	*Ceriodaphnia dubia*	100	<1.0	<1.0
	Pimephales promelas	100		

*Single species retest.
†Toxicity attributed to upstream Tennessee River water toxicity, not SQN operations.
‡Used in RP determination.
§Test was ruled invalid because of low statistical sensitivity due to an anomalous dose response and high variable survival among replicates within treatments.

Data collected under the current permit.

Table 2. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998 - April 11, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
03/12/1998	0.016	-	-	-	-	-	-
03/13/1998	0.015	-	-	-	-	-	-
03/14/1998	0.013	-	-	-	-	-	-
03/15/1998	0.030	-	-	-	-	-	-
03/16/1998	0.013	-	-	-	-	-	-
03/17/1998	0.020	-	-	-	-	-	-
03/18/1998	0.018	-	-	-	-	-	-
09/08/1998	0.015	-	0.014	0.005	-	-	0.021
09/09/1998	0.003	-	0.031	0.011	-	-	-
09/10/1998	0.014	-	0.060	0.021	-	-	-
09/11/1998	0.013	-	0.055	0.019	-	-	-
09/12/1998	< 0.001	-	0.044	0.015	-	-	-
09/13/1998	< 0.001	-	0.044	0.015	-	-	-
09/14/1998	0.008	-	0.044	0.015	-	-	-
02/22/1999	< 0.001	-	-	-	-	-	-
02/23/1999	0.005	-	-	-	-	-	-
02/24/1999	0.009	-	-	-	-	-	-
02/25/1999	0.012	-	-	-	-	-	-
02/26/1999	0.008	-	-	-	-	-	-
02/27/1999	< 0.001	-	-	-	-	-	-
02/28/1999	< 0.001	-	-	-	-	-	-
08/18/1999	-	0.015	0.069	0.024	0.006	-	-
08/19/1999	-	0.012	0.068	0.024	-	-	-
08/20/1999	-	0.023	0.070	0.024	-	0.120	-
08/21/1999	-	0.022	0.068	0.024	-	-	-
08/22/1999	-	0.022	0.068	0.024	-	-	-
08/23/1999	-	0.025	0.068	0.024	0.006	-	-
08/24/1999	-	0.016	0.067	0.023	0.020	-	-

Table 2 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998 - April 11, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/31/2000	-	< 0.002	0.026	0.009	-	-	-
02/01/2000	-	0.011	0.026	0.028	-	-	-
02/02/2000	-	0.028	0.026	0.009	0.006	-	-
02/03/2000	-	0.008	0.027	0.009	-	-	-
02/04/2000	-	0.006	0.027	0.009	0.005	0.109	-
02/05/2000	-	< 0.002	0.027	0.009	-	-	-
02/06/2000	-	< 0.002	0.027	0.009	-	-	-
07/26/2000	-	< 0.0057	0.055	0.019	-	-	-
07/27/2000	-	0.019	0.055	0.019	-	-	-
07/28/2000	-	0.0088	0.053	0.018	0.004	0.108	-
07/29/2000	-	< 0.0088	0.055	0.019	-	-	-
07/30/2000	-	< 0.0076	0.055	0.019	-	-	-
07/31/2000	-	< 0.0152	0.055	0.019	0.006	-	-
08/01/2000	-	< 0.0141	0.055	0.019	0.005	-	-
12/11/2000	-	0.0143	0.025	0.020	0.005	-	-
12/12/2000	-	0.0092	0.025	0.020	0.005	-	-
12/13/2000	-	< 0.0120	0.025	0.020	-	-	-
12/14/2000	-	< 0.0087	0.025	0.020	-	-	-
12/15/2000	-	0.0120	0.025	0.020	0.005	-	-
12/16/2000	-	< 0.0036	0.025	0.020	-	-	-
12/17/2000	-	< 0.0036	0.025	0.020	-	-	-
08/26/2001	-	0.017	0.06	0.021	0.006	-	-
08/27/2001	-	<0.0096	0.06	0.021	0.005	-	0.021
08/28/2001	-	<0.0085	0.06	0.021	-	-	-
08/29/2001	-	<0.0094	0.059	0.020	0.005	-	0.021
08/30/2001	-	<0.0123	0.06	0.021	0.005	-	-
08/31/2001	-	<0.005	0.059	0.020	-	-	-
11/25/2001	-	<0.0044	-	-	-	-	-
11/26/2001	-	<0.0119	0.024	0.02	0.005	-	-
11/27/2001	-	0.0137	0.023	0.019	0.007	-	-
11/28/2001	-	<0.0089	0.022	0.019	0.006	-	-
11/29/2001	-	0.0132	0.024	0.02	0.007	-	-
11/30/2001	-	< 0.0043	0.024	0.02	-	-	-
12/09/2001	-	<0.0042	-	-	-	-	-
12/10/2001	-	<0.0042	-	-	-	-	-
12/11/2001	-	<0.0104	-	-	-	-	-
12/12/2001	-	0.0128	0.024	0.02	0.008	-	-
12/13/2001	-	<0.0088	0.024	0.02	-	-	-
12/14/2001	-	0.0134	0.024	0.02	0.007	-	-

Table 2 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998 - April 11, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
01/03/2002	-	< 0.0042	0.023	0.014	-	-	-
01/04/2002	-	0.0124	0.024	0.014	0.009	-	-
01/05/2002	-	< 0.0042	-	-	-	-	-
01/06/2002	-	< 0.0042	-	-	-	-	-
01/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
02/24/2002	-	< 0.004	-	-	-	-	-
02/25/2002	-	< 0.004	0.023	0.023	-	-	-
02/26/2002	-	0.0143	0.023	0.023	0.007	-	-
02/27/2002	-	< 0.0041	0.023	0.023	-	-	-
02/28/2002	-	< 0.0041	0.024	0.008	-	-	-
03/01/2002	-	<0.0041	0.024	0.008	-	-	-
05/05/2002	-	-	-	-	-	-	-
05/06/2002	-	-	0.058	0.02	0.014	-	-
05/07/2002	-	-	0.058	0.02	0.015	-	-
05/08/2002	-	-	0.056	0.019	-	-	-
05/09/2002	-	-	0.057	0.02	0.014	-	-
05/10/2002	-	-	0.056	0.019	-	-	-
08/04/2002	-	<0.0058	-	-	-	-	-
08/05/2002	-	<0.0058	0.053	0.018	-	-	0.025
08/06/2002	-	0.0092	0.053	0.018	-	-	-
08/07/2002	-	<0.0107	0.055	0.019	0.007	-	-
08/08/2002	-	<0.0061	0.055	0.019	-	-	-
08/09/2002	-	0.0152	0.054	0.018	0.008	-	-
10/06/2002	-	<0.00497	-	-	-	-	-
10/07/2002	-	0.0153	0.054	0.018	0.009	-	
10/08/2002	-	<0.0092	0.054	0.018	0.007	-	-
10/09/2002	-	0.0124	0.053	0.018	0.009	-	-
10/10/2002	-	0.0134	0.054	0.018	0.009	-	-
10/11/2002	-	<0.0042	0.054	0.018	-	-	-
01/12/2003	-	<0.0035	-	-	-	-	-
01/13/2003	-	<0.006	0.025	0.019	0.009	-	-
01/14/2003	-	<0.0118	0.026	0.020		-	-
01/15/2003	-	<0.0063	0.026	0.020	0.009	-	-
01/16/2003	-	<0.0034	0.026	0.020		-	-
01/17/2003	-	<0.0034	0.026	0.009	-	-	-
04/06/2003	-	<0.0073	-	-	-	-	-
04/07/2003	-	<0.0189	-	0.021	-	-	-
04/08/2003	-	<0.0117	-	0.021	-	-	-
04/09/2003	-	<0.0139	-	0.021	0.016	-	-
04/10/2003	-	<0.0113	-	0.021	0.018	-	-
04/11/2003	-	<0.0073	-	0.022	-	-	-

June 6, 2003

Stephanie Howard, SB 2A-SQN

BIOLOGICAL MONITORING OF THE TENNESSEE RIVER NEAR SEQUOYAH NUCLEAR PLANT (SQN)

To verify Section 316 of the Clean Water Act is being adequately met, the intake operation and design of SQN is currently being evaluated and assessed. Assessments of annual biological monitoring of fish and benthic macroinvertebrate communities, impingement, entrainment and yearling sauger survival surveys are used to evaluate significant changes in plant and reservoir operations.

Annual biological monitoring of the Tennessee River near SQN discharge assesses the overall health of the fish and benthic macroinvertebrate communities in Chickamauga Reservoir. An annual report is submitted in accordance with Part III, Section F of the SQN National Pollutant Discharge Elimination System (NPDES) Permit to the Department of Environment and Conservation Division of Water Pollution Control.

The Effects of Impingement on the Aquatic Populations in Chickamauga Reservoir report was submitted to the Department of Environment and Conservation Division of Water Pollution Control in accordance with Part III, Section F of the SQN NPDES Permit, September of 2002.

Currently, ichthyoplankton samples measuring resident larval fish and fish egg densities during the peak spring spawning period are being collected in the vicinity of the cooling water intake. Collection of entrainment samples will be completed by August 2004. A preliminary report illustrating 2003 data will be submitted in June of 2004. The final report with both 2003 and 2004 data will be submitted in June of 2005.

And lastly, the yearling sauger survival study was proposed to evaluate the continuous release of 8,000 cfs from Watts Bar Dam during April on the effect of spawning success. A preliminary report summarizing existing data with historical data was added to the annual Biological Monitoring of the Tennessee River Near Sequoyah Nuclear Plant, 2002 report. The collection of samples will be completed in the spring of 2004 and a final report summarizing results will be submitted to the Department of Environment and Conservation Division of Water Pollution Control in June of 2004.

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DSB:GS
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SQN biological monitoring.doc

Biological Monitoring of the Tennessee River Near Sequoyah Nuclear Plant Discharge 2001

by
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June 2002
Final

Aquatic Biology Lab
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Acronyms

BIP	Balanced Indigenous Population
NPDES	National Pollutant Discharge Elimination System
QA	Quality Assurance
RFAI	Reservoir Fish Assemblage Index
SFI	Sport Fishing Index
SQN	Sequoyah Nuclear Plant
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
VS	Vital Signs

Introduction

Section 316(a) of the Clean Water Act allows point-source dischargers of heated water to obtain a variance from state water quality standards if the point-source can demonstrate maintenance of balanced indigenous populations (BIP) of aquatic life. Sequoyah Nuclear Plant's (SQN) current National Pollutant Discharge Elimination System (NPDES) permit number TN0026450 states, "For Section 316(b), the permittee shall summarize previous data and indicate whether significant changes have occurred in plant operation, reservoir operations or instream biology that would necessitate that significant changes to the variance". The permittee shall use the Reservoir Fish Assemblage Index (RFAI) to assess Chickamauga Reservoir fish community health. Any apparent declines in the fish community health will be further investigated to discover whether the decline is a valid conclusion and if the decline is real to identify possible sources for the fish community decline. As part of the identification of potential sources for the decline the instream effects of the discharges made under this permit will be investigated (TDEC 2000). In response to this requirement, TVA's Vital Signs (VS) monitoring program (Dycus and Meinert 1993) will be used to evaluate areas of Chickamauga Reservoir upstream and downstream of SQN discharge. The purpose of this document is to briefly summarize and provide Tennessee Department of Environment and Conservation the results of comparisons between current and historical monitoring data.

Prior to 1990, TVA reservoir studies focused on reservoir ecological assessments to meet specific needs as they arose. In 1990, the Tennessee Valley Authority (TVA) instituted a Valley-wide VS monitoring program which is a broad-based evaluation of the overall ecological conditions in major reservoirs. Data is evaluated with a multi-metric monitoring approach utilizing five environmental indicators: dissolved oxygen, chlorophyll, sediment quality, benthic macroinvertebrate community, and the fish community. When this program was initiated, specific evaluation techniques were developed for each indicator, and these techniques were fine-tuned to better represent ecological conditions. The outcome of this effort was development of multi-metric evaluation techniques for the fish assemblage as RFAI and the benthic community, as described below. These multi-metric evaluation techniques have proven successful in TVA's monitoring efforts as well as other federal and state monitoring programs. In the past, the Sport Fishing Index (SFI) was used in support of a thermal variance request at SQN (TVA 1996) and during SCCW monitoring. However, Tennessee Wildlife Resource Agency data, necessary to complete the SFI analyses for Chickamauga Reservoir, will not be available in time to incorporate into this document. Based on the RFAI and benthic macroinvertebrate analyses, TVA biologists have concluded that the SQN operation had no effect on the fish and benthic macroinvertebrate communities in the vicinity of SQN during Calendar Year 2001.

Methods

Fish Community

Reservoirs are typically divided into three zones for VS Monitoring – inflow, transition and forebay. The inflow zone is generally in the upper reaches of the reservoir and is riverine in nature; the transition zone or mid-reservoir is the area where water velocity decreases due to increased cross-sectional area, and the forebay is the lacustrine area near the dam. The

Chickamauga Reservoir inflow zone is located at Tennessee River Mile (TRM) 529.0; the transition zone is located at TRM 490.5, and the forebay zone is located at TRM 472.3. The VS transition zone, which is located approximately 7.2 river miles upstream of the SQN discharge (TRM 483.3), will be used to provide upstream data for the 316(a) thermal variance studies performed in sample years between 1993 and 2001. Beginning in the year 1996, an additional transition station was added downstream of the SQN discharge to more closely monitor Chickamauga Reservoir aquatic communities in close proximity to the SQN thermal effluent. This station is located at TRM 482.0 and will be used for downstream comparisons of aquatic communities for the 1996 and 1999 through 2001 sample seasons. The forebay zone, will serve as the downstream station for 1993 through 1995 and 1997 sample seasons.

Fish samples consisted of fifteen 300-meter electrofishing runs (approximately 10 minutes duration) and ten experimental gill net sets (five 6.1 meter panels with mesh sizes of 2.5, 5.1, 7.6, 10.2, and 12.7 cm) per station. Attained values for each of the 12 metrics were compared to reference conditions for transition zones of mainstream Tennessee River reservoirs and assigned scores based upon three categories hypothesized to represent relative degrees of degradation: least degraded -5; intermediate -3; and most degraded -1. These categories are based on "expected" fish community characteristics in the absence of human-induced impacts other than impoundment. Individual metric scores for a station are summed to obtain the RFAI score.

Comparison of the attained RFAI score from the potential impact zone to a predetermined criterion has been suggested as a method useful in identifying presence of normal community structure and function and hence existence of a BIP. For multi-metric indices, two criteria have been suggested to ensure a conservative screening for a BIP. First, if an RFAI score reaches 70% of the highest attainable score (adjusted upward to include sample variability), and second, if fewer than half of RFAI metrics potentially influenced by thermal discharge receive a low (1) or moderate (3) score, then normal community structure and function would be present indicating that a BIP existed. Under these conditions, the heated discharge would meet screening criteria and no further evaluation would be needed.

The range of RFAI scores possible is from 12 to 60. As discussed in detail below, the average variance for RFAI scores in TVA reservoirs is 6 (± 3). Therefore, any location that attains an RFAI score of 45 (42 + our sample variance of 3) or higher would be considered to demonstrate a BIP. It must be stressed that scores below this endpoint do not necessarily reflect an adversely impacted fish community. The endpoint is used to serve as a conservative screening level; for example, any fish community that meets these criteria is obviously not adversely impacted. RFAI scores below this level would require a more in-depth look to determine if a BIP exist. If a score below this criterion is obtained, an inspection of individual RFAI metric results would be an initial step to help identify if SQN operation is a contributing factor. This approach is appropriate if a validated multi-metric index is being used and scoring criteria applicable to the zone of study are available.

Upstream/downstream stations comparisons can be used to identify if SQN operation is adversely impacting the downstream fish community as well. A similar or higher RFAI score at the downstream station compared to the upstream (control) station is used as one basis for determining presence/absence of SQN operational impacts on the resident fish community. Definition of "similar" is integral to accepting the validity of these interpretations.

The Quality Assurance (QA) component of VS monitoring deals with how well the RFAI scores can be repeated and is accomplished by collecting a second set of samples at 15-20% of the stations each year. Experience to date with the QA component of VS shows that the comparison of RFAI index scores from 54 paired sample sets collected over a seven year period ranged from 0 to 18 points, the 75th percentile was 6, the 90th percentile was 12. The mean difference between these 54 paired scores is 4.6 points with 95% confidence limits of 3.4 and 5.8. Based on these results, a difference of 6 points or less is the value selected for defining "similar" scores between upstream and downstream fish communities. That is, if the downstream RFAI score is within 6 points of the upstream score, the communities will be considered similar. It is important to bear in mind that differences greater than 6 points can be expected simply due to method variation (25% of the QA paired sample sets exceeded that value). When this occurs, a metric-by-metric examination will be conducted to determine what caused the difference in scores and the potential for the difference to be thermally related.

As mentioned in the introduction, modifications in the metrics used in RFAI are continually being evaluated in order to make the index even more indicative of reservoir conditions. Future versions of the RFAI will likely include the refined metrics. Comparisons will be made between present and improved RFAI scores.

<u>Benthic Macroinvertebrate Community</u>

Ten benthic grab samples were collected at equally spaced points along the upstream and downstream transects. A Ponar sampler was used for most samples but a Peterson sampler was used when heavier substrate was encountered. Collection and processing techniques followed standard VS procedures. Bottom sediments were washed on a 533µ screen and organisms were then picked from the screen and remaining substrate and identified to Order or Family level in the field using no magnification. Benthic community results were evaluated using seven community characteristics or metrics. Results for each metric were assigned a rating of 1, 3, or 5 depending upon how they compared to reference conditions developed for VS sample sites. The ratings for the seven metrics were summed to produce a total benthic score for each sample site. Each reservoir section (inflow, transition, or forebay) differs in their maximum potential for benthic diversity; thus, the criteria for assigning metric ratings were adjusted accordingly such that the total benthic scores from sites on different reservoir sections are comparable. Potential scores ranged from 7 to 35. Ecological health ratings (poor, fair, or good) are then applied to scores. A similar or higher benthic index score at the downstream site compared to the upstream site is used as basis for determining SQN's absence of impact on the benthic community.

The QA component of VS monitoring shows that the comparison of benthic index scores from 49 paired sample sets collected over a seven year period ranged from 0 to 14 points, the 75th percentile was 4, the 90th percentile was 6. The mean difference between these 49 paired scores is 3.1 points with 95% confidence limits of 2.2 and 4.1. Based on these results, a difference of 4 points or less is the value selected for defining "similar" scores between upstream and downstream benthic communities. That is, if the downstream benthic score is within 4 points of the upstream score, the communities will be considered similar and it will be concluded that SQN has had no effect. Once again, it is important to bear in mind that differences greater than 4 points can be expected simply due to method variation (25% of the QA paired sample sets exceeded that value). When this occurs, a metric-by-metric examination will be conducted to determine what caused the difference in scores and the potential for the difference to be thermally related.

Results and Discussion

Fish Community

In the autumn of 2001, the SQN downstream station rated better than the upstream indicating that resident fish community below the SQN discharge is good quality and considered to have BIP (Tables 1 and 2). As indicated in Table 1, the RFAI scores for upstream and downstream stations, 45 and 47 respectively, were within the 6 point acceptable variation during autumn 2001 and were considered "similar."

These results are supported by Chickamauga Reservoir VS transition and forebay data collected between 1993 and 2001 which reflect little change in the overall good ecological health of the fish communities either above or below the SQN discharge (Figure 1). All upstream and downstream scores, using either the SQN transition or forebay as the downstream station, for sample seasons between 1993 and 1999 were within this range, with the exception of the forebay scoring fair in 1997 (Figure 1).

The VS transition zone was considered to have either good or excellent ecological health for all sample years between 1993 and 2001 (Figure 1). The Sequoyah transition was within the good range for all sample years it was used (Table 3 and Figure 1), and the forebay was in the good range six out of seven sample years (Figure 1). Between 1993 and 2001 sample years, the average RFAI score for the upstream station was 45 (75.0% of the maximum score) (Table 3). The two downstream stations (i.e., SQN transition and forebay) averaged 47 and 42, respectively (78.3% and 70.0% of the maximum score) (Table 3). Based on these observations and the defining characteristics for a BIP, it can be concluded that SQN operation has had no impact on the Chickamauga Reservoir resident fish community for the last eight sampling seasons. Electrofishing and gill netting catch rates for individual species from the downstream station are listed in Table 4 and 5.

Benthic Macroinvertebrate Community

Table 6 provides results and ratings for each metric as well as the overall benthic index score for both monitoring sites. Table 7 summarizes density by taxon at the upstream (TRM 490.5) and downstream (TRM 482) collection sites. In 2001 samples, the upstream site produced a benthic index score of 23 (Fair) and the downstream site scored 31 (Good). Therefore, it appears that SQN has had no adverse effect on the benthic macroinvertebrate community immediately downstream from the plant. Table 8 provides benthic index scores from VS monitoring at the forebay (TRM 472.3) and transition zone sites from 1994 to 2001. The Chickamauga forebay zone sample site is of sufficient distance downstream (11 miles) that results would not be expected to reflect plant effects. The similar scores from TRM 472.3 and TRM 482 also indicate that WBN has had no effect on the macroinvertebrate community immediately downstream from the plant. Since 1994, the average scores from the upstream site and both downstream sites are very similar, further supporting no plant effects on macroinvertebrate communities.

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Table 1. Scoring Results for the Twelve Metrics and Overall Reservoir Fish Assemblage Index for Chickamauga Reservoir at the Sequoyah Transition Sampling Station, 2001.

Metric		Sequoyah TRM482.0 Obs.	Score
A. Species richness and composition			
1. Number of species		30	5
2. Number of sunfish species		5	5
3. Number of sucker species		2	1
4. Number of intolerant species		3	3
5. Percent tolerant individuals	electrofishing	14.0	2.5
	gill netting	27.3	1.5
6. Percent dominance*	electrofishing	45.4	1.5
	gill netting	23.6	2.5
7. Number of piscivore species		11	5
B. Trophic composition			
8. Percent omnivores	electrofishing	11.4	2.5
	gill netting	32.4	1.5
9. Percent insectivores	electrofishing	81.1	2.5
	gill netting	10.2	1.5
C. Reproductive composition			
10. Number of lithophilic spawning species		4	3
D. Fish abundance and health			
11. Average number of individuals	electrofishing	59.5	1.5
	gill netting	35.2	2.5
12. Percent anomalies		1.3	5
RFAI			47 Good

* Percent composition of the most abundant species

Table 2. Scoring Results for the Twelve Metrics and Overall Reservoir Fish Assemblage Index for Chickamauga Reservoir Transition and Forebay Sampling Stations, 2001.

Metric		Forebay TRM472.3 Obs.	Forebay TRM472.3 Score	Transition TRM490.5 Obs.	Transition TRM490.5 Score	Inflow TRM529 Obs.	Inflow TRM529 Score
A. Species richness and composition							
1. Number of species		28	5	32	5	30	5
2. Number of sunfish species		5	5	6	5	6	5
3. Number of sucker species		3	1	3	1	4	3
4. Number of intolerant species		3	3	3	3	4	3
5. Percent tolerant individuals	electrofishing	24.2	1.5	29.4	1.5	13.3	5
	gill netting	22.1	1.5	26.5	1.5		
6. Percent dominance*	electrofishing	18.2	2.5	17.5	2.5	29.5	5
	gill netting	21.9	2.5	28.1	2.5		
7. Number of piscivore species		11	5	10	5	8	5
B. Trophic composition							
8. Percent omnivores	electrofishing	7.6	2.5	28.6	1.5	12.8	5
	gill netting	34.2	1.5	32.9	1.5		
9. Percent insectivores	electrofishing	66.7	1.5	57.5	1.5	78.8	5
	gill netting	4.6	0.5	17.2	2.5		
C. Reproductive composition							
10. Number of lithophilic spawning species		5	3	4	3	7	3
D. Fish abundance and health							
11. Average number of individuals	electrofishing	13.2	0.5	37.0	0.5	37.5	1
	gill netting	36.6	2.5	44.1	2.5		
12. Percent anomalies		2.0	3	0.8	5	1.1	5
RFAI			**42 Good**		**45 Good**		**50 Good**

* Percent composition of the most abundant species

Table 3. Recent (1993-2001) RFAI Scores Collected as Part of the Vital Signs Monitoring Program Upstream and Downstream of Sequoyah Nuclear Plant.

			Year								
Station	**Reservoir**	**Location**	**1993**	**1994**	**1995**	**1996**	**1997**	**1999**	**2000***	**2001**	**1993-2001 Average**
Upstream	Chickamauga	TRM 490.5	51	43	50	44	40	41	44	45	45
Sequoyah Transition	Chickamauga	TRM 482.0				48		43	49	47	47
Forebay	Chickamauga	TRM 472.3	45	41	47		38	39	43	42	42

* The 2000 sample year was not part of the VS monitoring program, however the same methodology was applied.

Table 4. Species Listing and Catch Per Unit Effort for the Embayment and Sequoyah Transects During the Fall Electrofishing and Gill Netting on Chickamauga Reservoir, 2001 (Electrofishing Effort = 300 Meters of Shoreline and Gill Netting Effort = Net-Nights).

Common name	Electrofishing Embayment	Electrofishing Catch Rate Per Hour Embayment	Gill Netting Catch Per Unit Effort Embayment	Electrofishing Sequoyah	Electrofishing Catch Rate Per Hour Sequoyah	Gill Netting Catch Per Unit Effort Sequoyah
Spotted gar				0.33	1.75	0
Longnose gar				0	0	0.30
Skipjack herring	0	0	1.30	0	0	0.60
Gizzard shad	8.40	44.21	5.70	5.07	26.57	8.30
Threadfin shad	0.20	1.05		0.07	0.35	0.20
Mooneye	0	0	0.10			
Common carp	0.13	0.70	0			
Golden shiner	1.07	5.61	0.50	0.73	3.85	0.80
Emerald shiner	3.80	20.00	0	6.53	34.27	0
Spotfin shiner	0.07	0.35	0	2.73	14.34	0
Bluntnose minnow	0.87	4.56	0	0.27	1.40	0
Smallmouth buffalo	1.40	7.37	0.30	0.07	0.35	0.10
Black buffalo	0.07	0.35	0			
Spotted sucker	4.27	22.46	2.10	0.13	0.70	0.80
Golden redhorse	0	0	0.10			
Blue catfish	0	0	0.10	0.13	0.70	1.80
Channel catfish	0.07	0.35	1.10	0.53	2.80	0.40
Flathead catfish	0.13	0.70	0	0.07	0.35	0.10
White bass	0.07	0.35	0.80	0	0	0.30
Yellow bass	0.13	0.70	15.90	0	0	8.00
Warmouth	0.13	0.70	0			
Redbreast sunfish	0.20	1.05	0	2.47	12.94	0.20
Green sunfish	0.13	0.70	0	0.07	0.35	0
Bluegill	17.13	90.18	0.40	27.00	141.61	0.30
Longear sunfish	0.27	1.40	0	3.13	16.43	0.20
Redear sunfish	3.93	20.70	0.70	5.13	26.92	2.00
Hybrid sunfish				0.20	1.05	0
Smallmouth bass				0.27	1.40	0
Spotted bass	0.47	2.46	0.50	1.73	9.09	7.00
Largemouth bass	2.20	11.58	0	1.93	10.14	0.30
White crappie	0.07	0.35	0	0.07	0.35	0.20
Black crappie	0.80	4.21	1.50	0	0	3.20
Yellow perch				0.07	0.35	0
Logperch	0.47	2.46	0	0.33	1.75	0
Sauger	0	0	0.20			
Freshwater drum	0.33	1.75	1.80	0.07	0.35	0.10
Brook silverside	0.80	4.21	0	0.40	2.10	0
Total	**47.61**	**250.51**	**33.1**	**59.53**	**312.26**	**35.2**
Number of samples	**15**		**10**	**15**		**10**
Number collected	**714**		**331**	**893**		**352**
Species collected	**27**		**17**	**26**		**21**

Table 5. Species Listing and Catch Per Unit Effort for the Forebay, Transition, and Inflow Transects During the Fall Electrofishing and Gill Netting on Chickamauga Reservoir, 2001 (Electrofishing Effort = 300 Meters of Shoreline and Gill Netting Effort = Net-Nights).

Common name	Electrofishing Forebay	Electrofishing Catch Rate Per Hour Forebay	Gill Netting Forebay	Electrofishing Trans	Electrofishing Catch Rate Per Hour Trans	Gill Netting Trans	Electrofishing Inflow	Electrofishing Catch Rate Per Hour Inflow
Spotted gar	0.13	0.70	0	0.27	1.40	0.40	0.07	0.29
Skipjack herring	0	0	4.40	0	0	3.90		
Gizzard shad	0.47	2.46	8.00	6.20	32.63	11.50	2.93	12.68
Threadfin shad	0	0	0.30	0.13	0.70	0.20		
Common carp				0.73	3.86	0	0.13	0.58
Golden shiner	0.27	1.41	0.10	0.73	3.86	0.20	0.20	0.86
Emerald shiner	1.33	7.04	0	4.60	24.21	0	2.20	9.51
Spotfin shiner				1.40	7.37	0	2.07	8.93
Bluntnose minnow				1.40	7.37	0	0.07	0.29
Bullhead minnow				0.07	0.35	0		
Smallmouth buffalo	0.07	0.35	0	0.20	1.05	0		
Black buffao	0.07	0.35	0	0.20	1.05	0		
Spotted sucker	0.20	1.06	0.30	0.60	3.16	0.10	0.40	1.73
River redhorse							0.07	0.29
Black redhorse							0.07	0.29
Golden redhorse							0.53	2.31
Blue catfish	0	0	3.80	0	0	1.70	0.73	3.17
Channel catfish	0.13	0.70	0.60	1.13	5.96	1.10	0.73	3.17
Flathead catfish	0	0	0.30	0.20	1.05	0.30	0.53	2.31
White bass	0.07	0.35	0.10	0.07	0.35	0.40	0.07	0.29
Yellow bass	0.07	0.35	8.00	0	0	12.40	0.07	0.29
Hybrid striped x white bass	0	0	0.10	0	0	0.10		
Warmouth				0.13	0.70	0	0.07	0.29
Redbreast sunfish	2.40	12.68	0	2.53	13.33	0	1.00	4.32
Green sunfish	0.07	0.35	0	0.67	3.51	0	0.73	3.17
Bluegill	2.40	12.68	0.20	6.47	34.04	2.30	11.07	47.84
Longear sunfish	0.07	0.35	0	0.53	2.81	0	0.13	0.58
Redear sunfish	1.67	8.80	0.60	1.67	8.77	3.90	9.27	40.06
Hybrid sunfish	0.07	0.35	0	0.47	2.46	0	0.07	0.29
Smallmouth bass	0.07	0.35	0	0.53	2.81	0.10	0.13	0.58
Spotted bass	1.40	7.39	4.30	1.47	7.72	2.70	1.07	4.61
Largemouth bass	1.60	8.45	0.20	2.07	10.88	0	1.13	4.90
White crappie	0	0	0.50	0	0	1.00	0.07	0.29
Black crappie	0.07	0.35	4.10	0.40	2.11	0.50		
Logperch	0.27	1.41	0	1.53	8.07	0	0.20	0.86
Sauger	0	0	0.10					
Freshwater drum	0.07	0.35	0.60	0.13	0.70	1.30	0.40	1.73
Brook silverside	0.27	1.41	0	0.47	2.46	0	1.27	5.48
Total	**13.24**	**69.69**	**36.6**	**37**	**194.74**	**44.1**	**37.48**	**161.99**
Number of samples	**15**		**10**	**15**		**10**	**15**	
Number collected	**198**		**366**	**555**		**441**	**562**	
Species collected	**23**		**19**	**29**		**19**	**30**	

* Only Young-of-Year Collected

Table 6. Individual Metric Ratings and the Overall Benthic Community Index Score for Upstream and Downstream Sites near Sequoyah Nuclear Plant, Chickamauga Reservoir, November 2001.

Metric	TRM 490.5		TRM 482	
	Obs	Rating	Obs	Rating
1. Average number of taxa	6	5	6.2	5
2. Proportion of samples with long-lived organisms	90%	5	80%	5
3. Average number of EPT taxa	0.4	3	0.6	1
4. Average proportion of oligochaete individuals	14.8%	3	27.1%	3
5. Average proportion of total abundance comprised by the two most abundant taxa	79.4%	3	80.8%	5
6. Average density excluding chironomids and oligochaetes	230	1	348.3	5
Zero-samples - proportion of samples containing no organisms	0	5	0	5
Benthic Index Score		**25 Fair**		**31 Good**

*Scored with transition criteria.

Table 7. Average Mean Density Per Square Meter of Benthic Taxa Collected at Upstream and Downstream Sites near Sequoyah Nuclear Plant, Chickamauga Reservoir, November 2001.

Taxa	TRM 490.5	TRM 482
Turbellaria		
Tricladida		
Planaridae		
Dugesia tigrina		2
Oligocheata		
Tubificidae	243	697
Branchiura sowerbyi	25	73
Limnodrilus hoffmeisteri	2	
Hirudinea	2	
Rhynchobdellida		
Glossiphoniidae		
Helobdella stagnalis	3	8
Erpobdellidae		7
Crustacea		
Amphipoda		
Crangonyctidae		
Crangonyx sp.		2
Insecta		
Ephemeroptera		
Ephemeridae		
Hexagenia limbata <10mm	5	42
Hexagenia limbata >10mm	15	53
Caenidae		
Caenis sp.		2
Trichoptera		
Polycentropodidae		
Cyrnellus fraternus		3
Diptera		
Ceratopogonidae		
Bezzia sp.	2	
Chironomidae		
Ablabesmyia annulata	12	38
Axarus sp.		28
Chironomus sp.	50	68
Coelotanypus sp.	28	28
Coelotanypus tricolor	387	63
Cryptochironomus fulvus		7
Epoicocladius sp.		2
Glyptotendipes sp.		3
Harnischia sp.		3
Procladius sp.	13	18

Table 7. (Continued)

Taxa	TRM 490.5	TRM 482
Gastropoda		
Limnophila		
Physidae		
Physella sp.		2
Mesogastropoda		
Pleuroceridae		
Pleurocera canaliculata	2	
Viviparidae		
Campeloma decisum	2	5
Viviparus georgianus	2	12
Bivalvia		
Veneroida		
Corbiculidae		
Corbicula fluminea <10mm	5	85
Corbicula fluminea >10mm	155	123
Dreissenidae		
Dreissena polymorpha		7
Sphaeriidae	7	
Musculium transversum	73	53
Sphaerium sp.	3	
Number of samples	**10**	**10**
Sum	**1036**	**1434**
Sum of area sampled	**0.60**	**0.60**

Table 8. Recent (1994-2001) Benthic Index Scores Collected as Part of the Vital Signs Monitoring Program at Chickamauga Reservoir Transition (TRM 490.5 and TRM 482) and Forebay Zone (TRM 472.3) Sites.

			Year								
Site	**Reservoir**	**Location**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**Average**
Upstream	Chickamauga	TRM 490.5	33	29		31		31	23	25	**28.6**
Downstream	Chickamauga	TRM 482							23	31	**27**
Downstream	Chickamauga	TRM 472.3	31	27		29		25	27	27	**27.6**

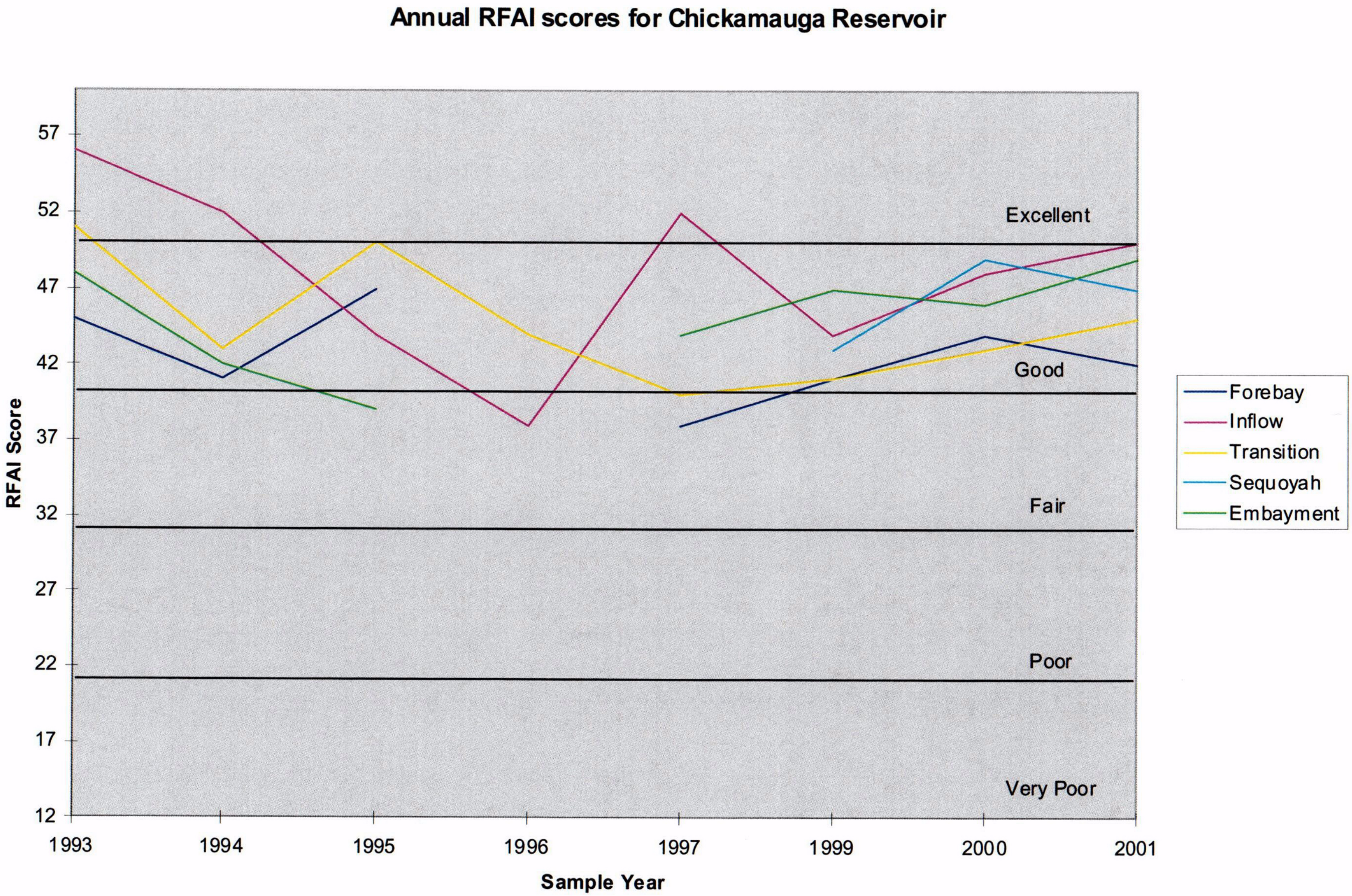

Figure 1. RFAI scores from sample years between 1993 and 2001.

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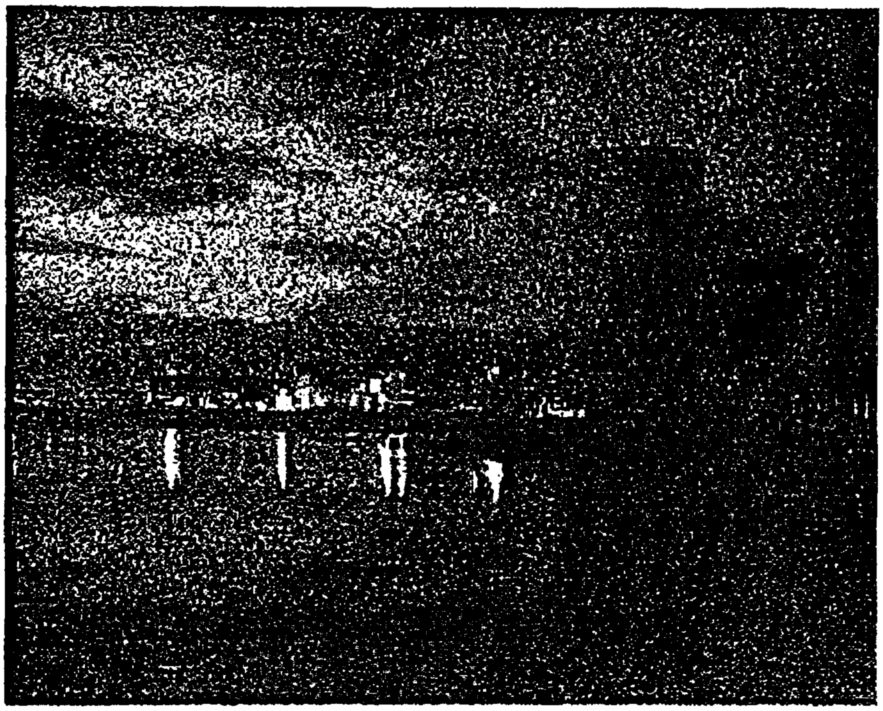

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June 2003
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Acronyms

BIP	Balanced Indigenous Population
NPDES	National Pollutant Discharge Elimination System
PSD	Proportional Stock Density
QA	Quality Assurance
RFAI	Reservoir Fish Assemblage Index
RSDM	Relative Stock Density of Memorable-sized

Acronyms
(Continued)

RSDP	Relative Stock Density of Preferred-sized
RSDT	Relative Stock Density of Trophy-sized
SFI	Sport Fishing Index
SQN	Sequoyah Nuclear Plant
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
VS	Vital Signs
Wr	Relative Weight

Introduction

Section 316(a) of the Clean Water Act specifies that industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Industries responsible for point-source dischargers of heated water can obtain a variance from state water quality standards if the industry can demonstrate compliance with thermal criteria by documenting the maintenance of balanced indigenous populations (BIP) of aquatic life in the vicinity of its discharge. Sequoyah Nuclear Plant's (SQN) current National Pollutant Discharge Elimination System (NPDES) permit number TN0026450 states, "For Section 316(b), the permittee shall summarize previous data and indicate whether significant changes have occurred in plant operation, reservoir operations or in stream biology that would necessitate that significant changes to the permitted variance." The permittee shall use the Reservoir Fish Assemblage Index (RFAI) to assess Chickamauga Reservoir fish community health. Any apparent declines in the fish community health will be further investigated to discover whether the decline is a valid conclusion and if the decline is real to identify possible sources for the fish community decline. As part of the identification of potential sources for the decline, the instream effects of the discharges made under this permit will be investigated (TDEC 2000). In response to this requirement, Tennessee Valley Authority's (TVAs) Vital Signs (VS) monitoring program (Dycus and Meinert 1993) will be used to evaluate areas of Chickamauga Reservoir upstream and downstream of SQN discharge. The purpose of this document is to briefly summarize and provide Tennessee Department of Environment and Conservation the results of comparisons between current and historical monitoring data.

Prior to 1990, the TVA reservoir studies focused on reservoir ecological assessments to meet specific needs as they arose. In 1990, the TVA instituted a Valley-wide VS monitoring program which is a broad-based evaluation of the overall ecological conditions in major reservoirs. Data is evaluated with a multi-metric monitoring approach utilizing five environmental indicators: dissolved oxygen, chlorophyll, sediment quality, benthic macroinvertebrate community, and the fish community. When this program was initiated, specific evaluation techniques were developed for each indicator, and these techniques were fine-tuned to better represent ecological conditions. The outcome of this effort was development of multi-metric evaluation techniques for the fish assemblage (i.e., RFAI) and the benthic community, as described below. These multi-metric evaluation techniques have proven successful in TVA's monitoring efforts as well as other federal and state monitoring programs. Therefore, they will form the basis of evaluating these monitoring results. For consistency, only RFAI analyses between 1993 and 2002 will be utilized.

In the past, the Sport Fishing Index (SFI) was used in support of a thermal variance request at SQN (TVA 1996) and during Supplemental Condenser Cooling Water monitoring. The SFI was developed to quantify sport fishing quality for individual sport fish species. The SFI provides biologists with a reference point to measure the quality of a sport fishery. Comparison of the population sampling parameters and creel results for a particular sport fish species with expectations of these parameters from a high quality fishery (reference conditions) allows for the determination of fishing quality. Indices have been developed for black bass (largemouth,

smallmouth and spotted bass), sauger, striped bass, bluegill, and channel catfish. Each SFI relies on measurements of quantity and quality aspects of angler success and fish population characteristics.

In recent years, SFI information has been used to describe the quality of the resident fishery in conjunction with compliance monitoring, thermal variance requests, and other regulatory issues at TVA nuclear plants in Tennessee. Similar NPDES compliance monitoring programs using the methodologies described above are also being performed at Colbert and Widows Creek Fossil Plants in Alabama.

SFI analyses will be used in this document to support the findings of the other indices used. However, 2002 Tennessee Wildlife Resources Agency (TWRA) data, necessary to complete the SFI analyses for Chickamauga Reservoir, will not be available in time to incorporate into this document, so 2001 results will be used in the analysis.

Methods

Fish Community

Reservoirs are typically divided into three zones for VS Monitoring – inflow, transition and forebay. The inflow zone is generally in the upper reaches of the reservoir and is riverine in nature; the transition zone or mid-reservoir is the area where water velocity decreases due to increased cross-sectional area, and the forebay is the lacustrine area near the dam. The Chickamauga Reservoir inflow zone is located at Tennessee River Mile (TRM) 529.0; the transition zone is located at TRM 490.5, and the forebay zone is located at TRM 472.3. The VS transition zone, which is located approximately 7.2 river miles upstream of the SQN discharge (TRM 483.3), will be used to provide upstream data for the 316(a) thermal variance studies performed in sample years between 1993 and 2002. An additional transition station was later added downstream of the SQN discharge to more closely monitor Chickamauga Reservoir aquatic communities in close proximity to the SQN thermal effluent. This station is located at TRM 482.0 and will be used for downstream comparisons of aquatic communities for the 1999 through 2002 sample seasons. The forebay zone, will serve as the downstream station for 1993 through 1995 and 1997 sample seasons.

Fish samples consisted of fifteen 300-meter electrofishing runs (approximately 10 minutes duration) and ten experimental gill net sets (five 6.1 meter panels with mesh sizes of 2.5, 5.1, 7.6, 10.2, and 12.7 cm) per station. Attained values for each of the 12 metrics were compared to reference conditions for transition zones of mainstream Tennessee River reservoirs and assigned scores based upon three categories hypothesized to represent relative degrees of degradation: least degraded -5; intermediate -3; and most degraded -1. These categories are based on "expected" fish community characteristics in the absence of human-induced impacts other than impoundment. Individual metric scores for a station are summed to obtain the RFAI score.

Comparison of the attained RFAI score from the potential impact zone to a predetermined criterion has been suggested as a method useful in identifying presence of normal community structure and function and hence existence of a BIP. For multi-metric indices, two criteria have

been suggested to ensure a conservative screening for a BIP. First, if an RFAI score reaches 70 percent of the highest attainable score (adjusted upward to include sample variability), and second, if fewer than half of RFAI metrics potentially influenced by thermal discharge receive a low (1) or moderate (3) score, then normal community structure and function would be present indicating that a BIP existed. Under these conditions, the heated discharge would meet screening criteria and no further evaluation would be needed.

The range of RFAI scores possible is from 12 to 60. As discussed in detail below, the average variance for RFAI scores in TVA reservoirs is 6 ($\pm$ 3). Therefore, any location that attains an RFAI score of 45 (42 + our sample variance of 3) or higher would be considered to demonstrate a BIP. It must be stressed that scores below this endpoint do not necessarily reflect an adversely impacted fish community. The endpoint is used to serve as a conservative screening level; for example, any fish community that meets these criteria is obviously not adversely impacted. RFAI scores below this level would require a more in-depth look to determine if a BIP exist. If a score below this criterion is obtained, an inspection of individual RFAI metric results would be an initial step to help identify if SQN operation is a contributing factor. This approach is appropriate if a validated multi-metric index is being used and scoring criteria applicable to the zone of study are available.

Upstream/downstream stations comparisons can be used to identify if SQN operation is adversely affecting the downstream fish community as well. A similar or higher RFAI score at the downstream station compared to the upstream (control) station is used as one basis for determining presence/absence of SQN operational impacts on the resident fish community. Definition of "similar" is integral to accepting the validity of these interpretations.

The Quality Assurance (QA) component of VS monitoring deals with how well the RFAI scores can be repeated and is accomplished by collecting a second set of samples at 15-20 percent of the stations each year. Experience to date with the QA component of VS shows that the comparison of RFAI index scores from 54 paired sample sets collected over a seven year period ranged from 0 to 18 points, the 75th percentile was 6, the 90th percentile was 12. The mean difference between these 54 paired scores is 4.6 points with 95 percent confidence limits of 3.4 and 5.8. Based on these results, a difference of 6 points or less is the value selected for defining "similar" scores between upstream and downstream fish communities. That is, if the downstream RFAI score is within 6 points of the upstream score, the communities will be considered similar. It is important to bear in mind that differences greater than 6 points can be expected simply due to method variation (25 percent of the QA paired sample sets exceeded that value). When this occurs, a metric-by-metric examination will be conducted to determine what caused the difference in scores and the potential for the difference to be thermally related.

As mentioned in the introduction, modifications to the metrics used in RFAI are continually being evaluated in order to make the index better reflect reservoir conditions. For the 2002 sampling season, some RFAI metrics were changed. In addition, several years of RFAI and water quality data have revealed that largemouth bass, in the Tennessee Valley, are actually quite tolerant of poor water quality. The species has shown a tolerance for low dissolved oxygen,

warm water temperatures, and highly eutrophic conditions. Therefore, its water quality tolerance rating has been changed to "Tolerant." Previous years' scores have been adjusted in this report to reflect these changes so as not to affect year-to-year comparisons and averages. Comparisons will be made between present and improved RFAI scores. Future versions of the RFAI will likely include more iterations as this analysis technique is continually fine tuned.

<u>Benthic Macroinvertebrate Community</u>

Ten benthic grab samples were collected at equally spaced points along the upstream and downstream transects. A Ponar sampler was used for most samples but a Peterson sampler was used when heavier substrate was encountered. Collection and processing techniques followed standard VS procedures. Bottom sediments were washed on a 533μ screen and organisms were then picked from the screen and remaining substrate and identified to Order or Family level in the field using no magnification. Benthic community results were evaluated using seven community characteristics or metrics. Results for each metric were assigned a rating of 1, 3, or 5 depending upon how they compared to reference conditions developed for VS sample sites. The ratings for the seven metrics were summed to produce a total benthic score for each sample site. Each reservoir section (inflow, transition, or forebay) differs in their maximum potential for benthic diversity; thus, the criteria for assigning metric ratings were adjusted accordingly such that the total benthic scores from sites on different reservoir sections are comparable. Potential scores ranged from 7 to 35. Ecological health ratings ("Poor," "Fair," or "Good") are then applied to scores. A similar or higher benthic index score at the downstream site compared to the upstream site is used as basis for determining if SQN's thermal discharge is having no effect on the Chickamauga Reservoir benthic community.

The QA component of VS monitoring shows that the comparison of benthic index scores from 49 paired sample sets collected over a seven year period ranged from 0 to 14 points, the 75th percentile was 4, the 90th percentile was 6. The mean difference between these 49 paired scores is 3.1 points with 95 percent confidence limits of 2.2 and 4.1. Based on these results, a difference of 4 points or less is the value selected for defining "similar" scores between upstream and downstream benthic communities. That is, if the downstream benthic score is within 4 points of the upstream score, the communities will be considered similar and it will be concluded that SQN has had no effect. Once again, it is important to bear in mind that differences greater than 4 points can be expected simply due to method variation (25 percent of the QA paired sample sets exceeded that value). When this occurs, a metric-by-metric examination will be conducted to determine what caused the difference in scores and the potential for the difference to be thermally related.

<u>Sport Fishing Index</u>

Calculations described by Hickman (2000) were used to compare SFI values for selected quantity and quality parameters from creel and population samples to expected values that would occur in a good or high quality fishery. Quantity parameters include angler success and catch per unit effort from standard population samples (electrofishing, trap and experimental gill netting). Population quality is based on measurement of five aspects of each resident sport fish community. Four of these aspects address size structure (proportional number of fish in each length group) of the community, Proportional Stock Density (PSD), Relative Stock Density of

Preferred-sized fish (RSDP), Relative Stock Density of Memorable-sized fish (RSDM), and Relative Stock Density of Trophy-sized fish (RSDT) (Figure 1). Relative weight (Wr), a measure of the average condition of individual fish makes up the fifth population quality aspect. As described by Hickman (2000), observed values were compared to reference ranges and assigned a corresponding numerical value. The SFI value is calculated by adding up the scores for quantity and quality from existing data and multiplying by two when only creel or population data are available. Species received a low score when insufficient numbers of individuals were captured to reliably determine proportional densities or relative weights for particular parameters. SFI scores are typically compared to average Tennessee Valley reservoir scores; however, Valley-wide scores are unavailable from natural resource agencies. Therefore, Chickamauga Reservoir fish species scores will be compared to previous years.

Results and Discussion

Fish Community

In the autumn of 2002, the SQN downstream station scored 43 (Good) and the upstream station scored 51 (Excellent) using the new RFAI analysis methodology (Tables 1 and 2). In addition, the downstream, SQN transition station (closest to the SQN discharge) received lower scores than the forebay downstream station for the following RFAI metrics, 1) percent dominance by one species, 2) percent omnivores, and 3) average number per run (Table 1). However, RFAI scores obtained from VS monitoring stations located upstream and downstream of the SQN discharge over the past several years have revealed consistently good fish community results (Tables 3a and 3b and Figure 2). Regardless of analysis methodology or which downstream station was used, the upstream station rating remained in the "Good" range and the downstream continued in the "Good" range, on average (Tables 3a and 3b and Figure 2). As indicated in Table 3b, between 1993 and 2002, the average RFAI score for the upstream station was 47 (78.0 percent of the maximum score). The two downstream stations (i.e., SQN transition and forebay) both averaged 46 (76.6 percent of the maximum score).

The 2002 upstream and downstream RFAI stations have a difference greater than 6 points which does not meet one of the criteria identified in the Methods section as indicative of a BIP. However, as you will note in the following benthic community discussion, the downstream benthic station (TRM 482) scored better than the upstream station which does not support the RFAI findings. Since the 2002 RFAI data only represents one year, further investigation may be warranted in the future, if the trend continues, to determine if method variation can account for the change or if it is water quality related.

Based on the average upstream and downstream RFAI scores, 2002 macroinvertebrate community data, and the defining characteristics for a BIP, it can be concluded that SQN operation has had no impact on the Chickamauga Reservoir resident fish community, on average, for eight sampling seasons. Electrofishing and gill netting catch rates for individual species from the downstream station are listed in Table 4 and 5.

Benthic Macroinvertebrate Community
Table 6 provides ratings for each metric as well as the overall benthic index score for both monitoring sites. Table 7 summarizes density by taxon at the upstream (TRM 490.5) and downstream (TRM 482) collection stations. In the 2002 sampling season, the upstream station produced a benthic index score of 23 (Fair) and the downstream station scored 27 (Good). Therefore, it appears that SQN has had no adverse effect on the benthic macroinvertebrate community immediately downstream from the plant. Table 8 provides benthic index scores from VS monitoring at the forebay (TRM 472.3) and transition zone stations from 1994 to 2002. The Chickamauga forebay zone sample station is of sufficient distance downstream (11 miles) that results would not be expected to reflect plant effects. The similar scores from TRM 472.3 and TRM 482 also indicate that SQN has had no effect on the macroinvertebrate community immediately downstream from the plant.

Sport Fishing Index
In the autumn of 2001, Chickamauga Reservoir's black bass, largemouth, and spotted bass, bluegill, and sauger received lower SFI scores than they did in 2000 and smallmouth bass received a higher score (Table 9 and Figure 3). The score for largemouth was the lowest it has been since 1997 when this analysis technique was implemented by TVA. Here again, this is only one year's dataset, and a reservoir-wide analysis (rather than upstream, downstream comparison), so it is not necessarily indicative of a trend. Historical data indicates that SFI scores typically vary across years. However if future scores would continue to decline, further investigation would be warranted. Smallmouth bass and striped bass received their highest SFI scores to date and walleye were not collected in sufficient numbers to analyze (Table 9 and Figure 3). Tables 10 and 11 illustrate sport fish index scoring criteria for population metrics and creel quantity and quality.

Sauger population estimates based on rotenone data have increased annually since 1988 in Wheeler Reservoir. The 1994 sauger population estimate (38 fish/ha) and the estimated number of young-of-year (35 fish/ha) were the second highest reported for each category during the 1969-1997 time period. In 1997, the last year rotenone data was available, Wheeler Reservoir sauger population averaged 5.6 fish/ha (Baxter and Buchanan 1998).

Hickman et al., (1990) noted that sauger populations across the Tennessee Valley declined during the mid- to late-1980's due to a prolonged drought. The Tennessee Valley is currently in another drought cycle and populations may decline further. Maceina et al., (1998) described population characteristics and exploitation rates of sauger during 1993-1995 in the tailraces of Guntersville, Wheeler and Wilson Dams. Maceina reported that total annual mortality between age-1 and age-2 fish was high (64 percent-83 percent) and that saugers were harvested at high rates before reaching their full growth potential.

Sauger, striped bass, and channel catfish are easily caught during their spring migration to preferred spawning habitats. Fishing creel surveys conducted in the spring would better describe and evaluate these species compared to only using autumn fisheries surveys.

Watts Bar Sauger Spawning Study, 2003 Update

While no SQN operational impacts on sauger spawning have been identified, TVA has found that reservoir releases from Watts Bar Dam during April significantly influence success of sauger spawning in Chickamauga Reservoir. Relative failures of sauger yearclasses were documented during the drought period of the late 1980's, a time during which instantaneous minimum flows were not provided (Yeager and Shiao 1992; Hickman and Buchanan 1996). A continuous minimum release of about 8,000 cfs from Watts Bar Dam during April is usually sufficient to produce an adequate sauger yearclass. However, under dry conditions, a release of 8,000 cfs cannot be sustained.

In April 1999 only 4,000 cfs were provided (Figure 4), and that failed to produce a good yearclass (Hickman 2003). The next year adequate water was available to maintain at least 8,000 cfs during April. However, during the dry spring of 2001, the specified minimum flows were again unobtainable. Since 4,000 cfs were found to be inadequate in 1999, special releases for sauger were modified in 2001 to provide 6,000 cfs for the three week period from April 9 to April 30, the period of greatest spawning activity. The success of this spawning flow regime was to be determined by a series of hourly gill net samples collected during the late winter of 2002 and compared to historical sample results.

Unfortunately, high flows beginning in mid-March 2002 (Figure 4) negated our ability to safely collect gill net samples downstream from Watts Bar Dam. When the flows subsided in mid-April, water temperatures had already risen beyond the sauger spawning peak, and very few sauger were collected in the gill nets. What few that were collected had already spawned, so it was presumed that the bulk of sauger spawning activity had occurred during the high flows when gill netting was not possible. Although we were unable to assess the success of the 2001 spawn, the likelihood of a good 2002 yearclass was strong.

Plans were made to return to Watts Bar Tailwater in the winter of 2003 to again attempt sampling of the 2001 sauger yearclass. However, those plans were jeopardized by the fire at the Watts Bar Dam powerhouse and subsequent loss of hydroturbine operation in the fall of 2002. While the turbines were inoperable, all the water passing the dam was via the spillways. Additional hindrances to sampling in the late winter of 2003 were high flows (Figure 4), especially since they were over the spillway, making it impossible to sample the area below dam safely. Flows subsided briefly during the first week of April, and a few samples were collected, but not enough sauger were captured before high flows returned.

Because insufficient numbers of sauger were collected in gill net samples below Watts Bar Dam during 2002 and 2003, inferences from TWRA creel surveys on Chickamauga Reservoir were drawn to evaluate sauger abundance and yearclass strength (Table 12).

Sauger fishing is highly seasonal, beginning in December and ending in March, when sauger migrate to the headwaters of Chickamauga Reservoir below Watts Bar Dam before the spring spawning season. Most sauger are caught during January and February, as in 1992 (TWRA 1993). To help maintain the fishery, TWRA enforces a 15" minimum size limit, which allows them at least one spawning season before being harvested. Most fish are in their third growing

season when they reach legal size. Since sauger are sought mostly for food, as opposed to a catch-and-release fishery, the majority of those released are under legal size. The percentage of caught fish released (Table 12) gives an approximation of one and two-year old fish in the Chickamauga Reservoir sauger fishery. Average weight of harvested sauger also indicates the yearclass composition of the fishery among years.

Creel statistics for 2000 and 2001 are somewhat similar in total number caught, total number harvested, percent of caught fish released, and average weight. This indicates that the yearclass composition of harvested sauger from Chickamauga Reservoir were basically the same, although the abundance may have been slightly more in 2000. Nearly two-thirds of the sauger caught were released, implying they were of sub-legal size (i.e., one and two-year old fish). The abundance of sub-legal sauger caught indicates relative spawning success during the previous two years.

But in 2002, creel statistics show a change in yearclass composition and a decline in recruitment of smaller, younger fish to the fishery. That decline can be largely traced to the relative weakness of the 1999 yearclass of sauger, which was attributed to the minimum April 1999 flows of 4,000 cfs from Watts Bar Dam (Figure 4). The total 2002 catch was approximately half those of the previous two years, and the average size was larger. Furthermore, the lower percentage of caught and released fish in 2002 implies a decline in abundance of sub-legal sauger, which would include the 2001 yearclass. If future data confirm this to be true, then the 6,000 cfs maintained for the last three weeks in April 2001 was insufficient to produce a strong sauger yearclass.

One cautionary note on using creel data to evaluate sauger abundance is necessary. Since sauger are primarily harvested during the two month period preceding their spawning season, inclement weather or flow conditions (such as high, muddy discharges) at that time could hinder sauger fishing and produce creel statistics that do not accurately reflect the true abundance of sauger in Chickamauga Reservoir. Also note that flows in February 2002 were not excessive (Figure 4), and the creel statistics for that year, as discussed above, should be accurate. The same is not true for Watts Bar Dam discharges in 2003, however, but those data are not yet available from TWRA.

Additional gill net samples will be collected during the winter of 2004, hopefully in the absence of uncontrolled discharges from Watts Bar Dam. With adequate numbers of sauger collected next year, length and yearclass analysis should be sufficient to determine the adequacy of reduced minimum flows of 6,000 cfs during three weeks of April in years when rainfall is low.

In summary, assessment of 2001 sauger spawning success during three weeks of 6,000 cfs minimum flows during the spawning season was not possible using gill net information collected in 2002 or 2003 due to unusual flow conditions. Instead, inferences were made on the relative success of the 2001 spawn using TWRA creel information. Those data indicate the 2001 spawn was poor. However, creel data in 2000-2002 indicate that even during the recent drought, the fishery did not crash, as it did during the drought years of the late 1980's, before April minimum flows were maintained at Watts Bar Dam (Hickman and Buchanan 1996). Better understanding of the 2001 yearclass of sauger should be available following gill netting data collected next year.

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Table 1. Scoring Results for the Twelve Metrics and Overall Reservoir Fish Assemblage Index for Chickamauga Reservoir at the Sequoyah Downstream Sampling Station, 2002.

		Forebay TRM 472.3		Transition TRM 482.0 *Downstream Station*	
Metric		**Obs.**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		25	3	24	3
2. Number of centrachid species		7	5	7	5
3. Number of benthic invertivores		3	1	3	1
4. Number of intolerant species		5	5	5	5
5. Percent tolerant species	electrofishing	52.5	1.5	70.3	0.5
	gill netting	16.6	1.5	6.2	2.5
6. Percent dominance by one species	electrofishing	27.1	1.5	30.6	1.5
	gill netting	28.0	1.5	42.0	0.5
7. Number non-native species	electrofishing	0.4	2.5	0.5	2.5
	gill netting	2.3	2.5	3.7	2.5
8. Number of top carnivore species		8	5	10	5
B. Trophic composition					
9. Percent top carnivores	electrofishing	8.1	1.5	14.3	2.5
	gill netting	76.0	2.5	67.9	2.5
9. Percent omnivores	electrofishing	10.3	2.5	33.5	1.5
	gill netting	12.0	2.5	17.3	1.5
C. Fish abundance and health					
11. Average number per run	electrofishing	45.3	0.5	38.8	0.5
	gill netting	17.5	1.5	8.1	0.5
12. Percent anomalies	electrofishing	1.0	2.5	0.9	2.5
	gill netting	0	2.5	0	2.5
RFAI			**46 Good**		**43 Good**

Table 2. Scoring Results for the Twelve Metrics and Overall Reservoir Fish Assemblage Index for Chickamauga Reservoir at the Upstream Sampling Station, 2002.

		Transition TRM 490.5 *Upstream Station*		Inflow TRM 529.0	
Metric		Obs.	Score	Obs	Score
A. Species richness and composition					
1. Number of species		30	5	26	3
2. Number of centrachid species		8	5	7	5
3. Number of benthic invertivores		5	3	5	3
4. Number of intolerant species		6	5	6	5
5. Percent tolerant species	electrofishing	57.9	1.5	37.5	3
	gill netting	9.8	2.5	0	0
6. Percent dominance by one species	electrofishing	32.0	1.5	29.4	3
	gill netting	34.8	0.5	0	0
7. Number non-native species	electrofishing	0.8	2.5	0.8	5
	gill netting	2.3	2.5	0	0
8. Number of top carnivore species		10	5	7	5
B. Trophic composition					
9. Percent top carnivores	electrofishing	16.3	2.5	12.1	3
	gill netting	81.1	2.5	0	0
10. Percent omnivores	electrofishing	18.0	2.5	13.2	5
	gill netting	11.4	2.5	0	0
C. Fish abundance and health					
11. Average number per run	electrofishing	75.3	0.5	85.7	3
	gill netting	13.2	1.5	0	0
12. Percent anomalies	electrofishing	0.6	2.5	0.5	5
	gill netting	0	2.5	0	0
RFAI			**51 Excellent**		**48 Good**

Table 3a. Recent (1993-2001) RFAI Scores Collected as Part of the Vital Signs Monitoring Program Upstream and Downstream of Sequoyah Nuclear Plant.

Station	Reservoir	Location	1993	1994	1995	1997	1999	1993-1999 Average	2000*	2001	1993-2001 Average
Upstream	Chickamauga	TRM 490.5	51	43	50	40	41	45 (Good)	44	45	45 (Good)
Sequoyah Transition	Chickamauga	TRM 482.0					43	43 (Good)	49	47	48 (Good)
Forebay	Chickamauga	TRM 472.3	45	41	47	38	39	42 (Good)	43	42	43 (Good)

*The 2000 sample year was not part of the VS monitoring program, however the same methodology was applied.

Table 3b. Recent (1993-2002) RFAI Scores Developed Using the New (2002) RFAI Metrics.

Station	Reservoir	Location	1993	1994	1995	1997	1999	1993-1999 Average	2000*	2001	2002*	1993-2002 Average
Upstream	Chickamauga	TRM 490.5	49	40	46	39	45	44 (Good)	46	45	51	47 (Good)
Sequoyah Transition	Chickamauga	TRM 482.0					41	41 (Good)	48	46	43	46 (Good)
Forebay	Chickamauga	TRM 472.3	44	44	47	39	45	44 (Good)	45	48	46	46 (Good)

*The 2000 and 2002 sample years were not part of the VS monitoring program, however the same methodology was applied.

Table 4. Species Listing and Catch Per Unit Effort for the Embayment and Sequoyah Transects During the Fall Electrofishing and Gill Netting on Chickamauga Reservoir, 2002 (Electrofishing Effort = 300 Meters of Shoreline and Gill Netting Effort = Net-Nights).

	Forebay TRM 472.3			Transition TRM 482.0		
Common Name	**Electrofishing Catch Rate Per Run**	**Electrofishing Catch Rate Per Hour**	**Gill Netting Catch Rate Per Net Night**	**Electrofishing Catch Rate Per Run**	**Electrofishing Catch Rate Per Hour**	**Gill Netting Catch Rate Per Net Night**
Skipjack herring	.	.	2.4	.	.	0.3
Gizzard shad	3.27	18.01	1.2	11.33	71.13	0.3
Threadfin shad	8.33	45.96	0.1	.	.	.
Common carp	0.2	1.1	0.1	0.2	1.26	.
Golden shiner	1.13	6.25	0.1	0.07	0.42	.
Emerald shiner	4.27	23.53	.	1.27	7.95	.
Spotted sucker	0.27	1.47	0.8	0.33	2.09	0.3
Blue catfish	.	.	0.5	0.53	3.35	0.2
Channel catfish	0.07	0.37	0.2	0.87	5.44	0.9
Flathead catfish	.	.	0.1	0.2	1.26	0.3
White bass	.	.	.	0.07	0.42	.
Yellow bass	.	.	1.7	0.07	0.42	0.1
Striped bass	.	.	0.3	.	.	0.3
Warmouth	0.07	0.37	.	0.27	1.67	0.1
Redbreast sunfish	4.67	25.74	0.1	1.67	10.46	.
Green sunfish	0.33	1.84	.	.	.	.
Bluegill	12.27	67.65	0.2	11.87	74.48	.
Longear sunfish	1.07	5.88	.	0.53	3.35	.
Redear sunfish	1.93	10.66	0.5	3.33	20.92	0.2
Smallmouth bass	0.47	2.57	0.3	0.53	3.35	0.2
Spotted bass	1.2	6.62	4.9	2.33	14.64	3.4
Largemouth bass	1.93	10.66	1.2	2.13	13.39	.
White crappie	.	.	.	.	.	0.2
Black crappie	0.07	0.37	2.3	0.2	1.26	0.1
Logperch	0.27	1.47	.	0.13	0.84	.
Sauger	.	.	0.1	.	.	0.6
Freshwater drum	0.07	0.37	0.4	0.13	0.84	0.6
Brook silverside	3.4	18.75	.	0.73	4.6	.
Chestnut lamprey	0.07	0.37	.	.	.	.
Total	**45.36**	**250.01**	**17.5**	**38.79**	**243.54**	**8.1**
Number Samples	**15**		**10**	**15**		**10**
Number Collected	**680**		**175**	**582**		**81**
Species Collected	**21**		**20**	**22**		**16**

Table 5. Species Listing and Catch Per Unit Effort for the Forebay, Transition, and Inflow Transects During the Fall Electrofishing and Gill Netting on Chickamauga Reservoir, 2002 (Electrofishing Effort = 300 Meters of Shoreline and Gill Netting Effort = Net-Nights).

	Transition TRM 490.5			Inflow TRM 529.0	
Common Name	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Gill Netting Catch Rate Per Net Night	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour
Skipjack herring	.	.	1.5	.	.
Gizzard shad	10.87	61.51	1.2	9.2	51.49
Threadfin shad	8.93	50.57	.	25.2	141.04
Common carp	0.47	2.64	.	0.47	2.61
Golden shiner	1.07	6.04	.	0.2	1.12
Emerald shiner	3.6	20.38	.	0.13	0.75
Spotfin shiner	0.47	2.64	.	1.87	10.45
Bullhead minnow	0.07	0.38	.	0.4	2.24
Northern hog sucker	0.07	0.38	.	0.07	0.37
Spotted sucker	0.27	1.51	.	0.53	2.99
Black redhorse	.	.	.	0.13	0.75
Golden redhorse	0.07	0.38	0.1	0.47	2.61
Channel catfish	1.13	6.42	0.3	1.47	8.21
Flathead catfish	0.13	0.75	0.3	0.4	2.24
White bass	.	.	0.4	0.6	3.36
Yellow bass	1.2	6.79	4.6	2.33	13.06
Striped bass	.	.	0.2	0.07	0.37
Hybrid striped x white	.	.	0.1	.	.
Warmouth	1.6	9.06	.	0.33	1.87
Redbreast sunfish	2.67	15.09	.	1.27	7.09
Green sunfish	0.27	1.51	.	0.27	1.49
Bluegill	24.07	136.23	.	16.27	91.04
Longear sunfish	0.93	5.28	.	0.53	2.99
Redear sunfish	4.73	26.79	0.6	14.73	82.46
Smallmouth bass	1.93	10.94	0.2	1.07	5.97
Spotted bass	4.07	23.02	2.1	2.07	11.57
Largemouth bass	3.73	21.13	.	2.6	14.55
White crappie	.	.	0.1	.	.
Black crappie	1.13	6.42	0.8	1.2	6.72
Yellow perch	0.13	0.75	.	0.13	0.75
Logperch	0.07	0.38	.	.	.
Sauger	0.07	0.38	0.4	.	.
Freshwater drum	0.47	2.64	0.3	0.4	2.24
Brook silverside	0.87	4.91	.	1.33	7.46
Chestnut lamprey	0.2	1.13	.	.	.
Total	**75.29**	**426.05**	**13.2**	**85.74**	**479.86**
Number Samples	**15**		**10**	**15**	
Number Collected	**1129**		**132**	**1286**	
Species Collected	**29**			**29**	

*Only Young-of-Year Collected

Table 6. Individual Metric Ratings and the Overall Benthic Community Index Score for Upstream and Downstream Stations near Sequoyah Nuclear Plant, Chickamauga Reservoir, November 2002.

	TRM 490.5 Upstream		TRM 482 Downstream	
Metric	**Obs**	**Rating**	**Obs**	**Rating**
1. Average number of taxa	5.4	3	4.8	3
2. Proportion of samples with long-lived organisms	100%	5	100%	5
3. Average number of EPT taxa	0.4	1	0.4	1
4. Average proportion of oligochaete individuals	10%	5	21%	3
5. Average proportion of total abundance comprised by the two most abundant taxa	83.8%	3	78.5%	5
6. Average density excluding chironomids and oligochaetes	200	1	383.3	5
Zero-samples - proportion of samples containing no organisms	0	5	0	5
Benthic Index Score		**23 Fair**		**27 Good**

*Scored with transition criteria.

Table 7. Average Mean Density Per Square Meter of Benthic Taxa Collected at Upstream and Downstream Stations near Sequoyah Nuclear Plant, Chickamauga Reservoir, November 2002.

	Chickamauga Reservoir	TRM 490.5 Upstream	
	Species	Mean Density	Occurrence per site
Phylum	Annelida		
Subclass	Oligocheata		
Family	Tubificidae	77	6
	Branchiura sowerbyi	2	1
	Limnodrilus hoffmeisteri	20	5
Class	Hirudinea		
Family	Glossiphoniidae		
	Placobdella pediculata	2	1
	Crustacea		
	Amphipoda		
	Talitridae		
	Hyalella azteca	2	1
Phylum	Insecta		
Order	Ephemeroptera		
Family	Ephemeridae		
	Hexagenia limbata <10mm	2	1
	Hexagenia limbata >10mm	5	2
Order	Trichoptera		
Family	Leptoceridae		
	Oecetis sp.	2	1
Order	Diptera		
Family	Chironomidae		
	Ablabesmyia annulata	7	4
	Chironomus sp.	23	5
	Coelotanypus tricolor	507	10
	Acari		
	Parasitengonia		
	Acariformes		
	Unionicola sp.	2	1
Phylum	Mollusca		
Class	Gastropoda		
Order	Mesogastropoda		
Family	Viviparidae		
	Viviparus Georgianus	2	1

Table 7. (continued)

	Chickamauga Reservoir	TRM 490.5 Upstream	
	Species	**Mean Density**	**Occurrence per site**
Class	Bivalvia		
	Veneroida		
Family	Corbiculidae		
	Corbicula fluminea <10mm	8	2
	Corbicula fluminea >10mm	68	10
Family	Sphaeriidae		
	Musculium transversum	108	9
	Number of samples	**10**	
	Sum	**835**	
	Number of taxa	**13**	
	Number of EPT taxa	**2**	
	Sum of area sampled	**0.60**	

	Chickamauga Reservoir	TRM 482 Downstream	
	Species	**Mean Density**	**Occurrence per site**
Phylum	Annelida		
Subclass	Oligocheata		
Family	Enchytraeidae		
Family	Lumbricidae	3	1
Family	Tubificidae	105	6
	Branchiura sowerbyi	3	1
	Limnodrilus hoffmeisteri	18	4
Class	Hirudinea	18	3
Phylum	Insecta		
Order	Ephemeroptera		
Family	Ephemeridae		
	Hexagenia limbata >10mm	57	4
Order	Diptera		
Family	Chironomidae		
	Branchiura sowerbyi	3	1
	Ablabesmyia annulata	17	4

Table 7. (continued)

	Chickamauga Reservoir	TRM 482 Downstream	
	Species	**Mean Density**	**Occurrence per site**
	Axarus sp.	5	2
	Unionicola sp.	2	1
Phylum	Mollusca		
Class	Gastropoda		
Order	Mesogastropoda		
Family	Viviparidae		
	Campeloma sp.	2	1
	Viviparus Georgianus	22	6
Class	Bivalvia		
	Veneroida		
Family	Corbiculidae		
	Campeloma sp.	2	1
	Viviparus Georgianus	22	6
Class	Bivalvia		
	Veneroida		
Family	Corbiculidae		
	Corbicula fluminea <10mm	77	6
	Corbicula fluminea >10mm	108	9
Family	Dressenidae		
	Dreissena polymorpha	8	1
Family	Sphaeriidae		
	Musculium transversum	90	7
	Number of samples	**10**	
	Sum	**644**	
	Number of taxa	**15**	
	Number of EPT taxa	**1**	
	Sum of area sampled	**0.60**	

Table 8. Recent (1994-2002) Benthic Index Scores Collected as Part of the Vital Signs Monitoring Program at Chickamauga Reservoir Transition (TRM 490.5 and TRM 482) and Forebay Zone (TRM 472.3) Stations.

			Year									
Site	**Reservoir**	**Location**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Average**
Upstream	Chickamauga	TRM 490.5	33	29		31		31	23	25	**23**	**27.8**
Downstream	Chickamauga	TRM 482							23	31	**27**	**27**
Downstream	Chickamauga	TRM 472.3	31	27		29		25	27	27	**23**	**27**

Table 9. Sport Fishing Index Results for Chickmauga Reservoir, 2002

	Years					
Species	**1997**	**1998**	**1999**	**2000**	**2001**	**1997-2001 Average SFI Score**
Black bass		40.5	24.5	34.5	30.5	26
Bluegill			32	33	32	19.4
Channel catfish				29	30	11.8
Crappie	30		31	31	32	25
Hybrid striped x white bass				26	34	12
Largemouth bass	39	37	34	32	28	34
Spotted bass	25	37	24	40	26	30
Sauger	27	36	26	39	30	32
Smallmouth bass	25	20	24	22	40	26
Striped bass			30	30	40	20
Walleye	20			20		8
White bass			31	30	30	18

Table 10. Sport Fish Index Population Quantity and Creel Quantity and Quality Metrics and Scoring Criteria.

Metrics	Scores		
	5	10	15
Black bass			
Population (quantity)			
TVA electrofishing catch/hour	< 15	15-31	> 31
State electrofishing (catch/hour)	< 62	62-124	> 124
Creel (quantity)[a]			
Anglers (catch/hour)	< 0.3	0.3-0.6	> 0.6
BAIT and BITE data	< 1.1	1.1-2.3	> 2.3
Creel (quality)			
Pressure (hours/acre)	< 8	8-16	> 16
Largemouth bass			
Population (quantity)[b]			
TVA electrofishing catch/hour	< 13	13-25	> 25
State electrofishing (catch/hour)	< 53	53-106	> 106
Creel (quantity)			
Anglers (catch/hour)	< 0.29	0.29-0.58	> 0.58
Creel (quality)			
Pressure (hours/acre)	< 8	8-16	> 16
Smallmouth bass			
Population (quantity)			
TVA electrofishing catch/hour	< 4	4-8	> 8
State electrofishing (catch/hour)	< 8	8-15	> 15
Creel (quantity)			
Anglers (catch/hour)	< 0.1	0.1-0.3	> 0.3
Creel (quality)			
Pressure (hours/acre)	< 8	8-16	> 16
Spotted bass			
Population (quantity)			
TVA electrofishing catch/hour	< 5	5-11	> 11
State electrofishing (catch/hour)	< 14	14-27	> 27
Creel (quantity)			
Anglers (catch/hour)	< 0.07	0.07-0.13	> 0.13
Creel (quality)			
Pressure (hours/acre)	< 8	8-16	> 16

Table 10. (Continued)

Metrics	Scores 5	10	15
Sauger			
Population (quantity)			
Experimental gill net (catch/net night)	< 9	9-17	> 17
Creel (quantity)			
Anglers (catch/hour)	< 0.5	0.5-1	> 1
Creel (quality)			
Pressure (hours/acre)	< 5	5-10	> 10
Channel catfish			
Population (quantity)			
Experimental gill net (catch/net night)	< 2	2-4	> 4
Creel (quantity)			
Anglers (catch/hour)	< 0.3	0.3-0.7	> 0.7
Creel (quality)			
Pressure (hours/acre)	< 9	9-19	> 19

[a]Each worth 2.5, 5.0, and 7.5 points if both data sets are available.
[b]TVA electrofishing only used when state agency electrofishing data is unavailable.

Table 11. Sport Fish Index Population Quality Metrics and Scoring Criteria.

	Scores		
	5	10	15
Metrics			
Population (quality)	1	2	3
PSD	< 20 or > 80	20-39 or 61-80	40-60
RSDP (preferred)	0 or > 60	1-9 or 41-60	10-40
RSDM (memorable)	0 or > 25	1-4 or 11-25	5-10
RSDT (trophy)	0	< 1	≥ 1
W_r (Stock-preferred size fish)	< 90	> 110	90-110

Table 12. Estimated Sauger Harvest from Chickamauga Reservoir, 2000-2002 (TWRA data).

Year	Total number caught	Total number harvested	Percent of caught fish released	Average weight (lbs.)
2000	18,784	7,160	61.9	1.46
2001	15,265	5,518	63.9	1.45
2002	8,245	4,071	50.6	1.65

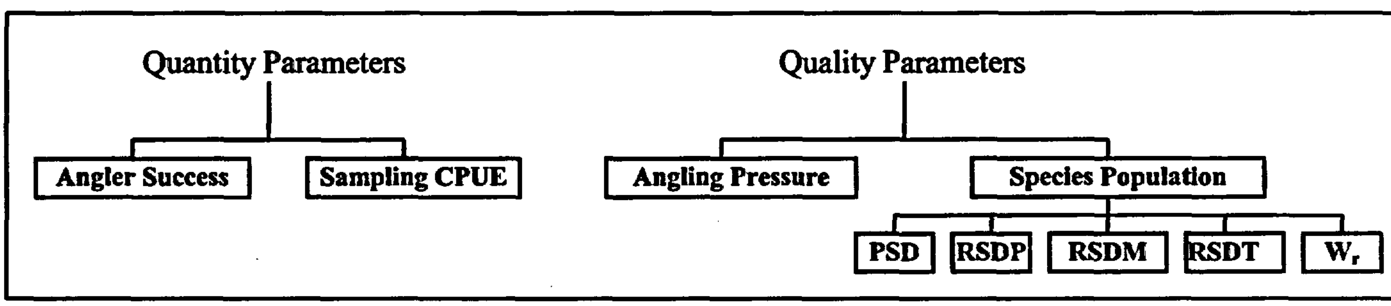


Figure 1. Parameters used to calculate the Sport Fishing Index (SFI).

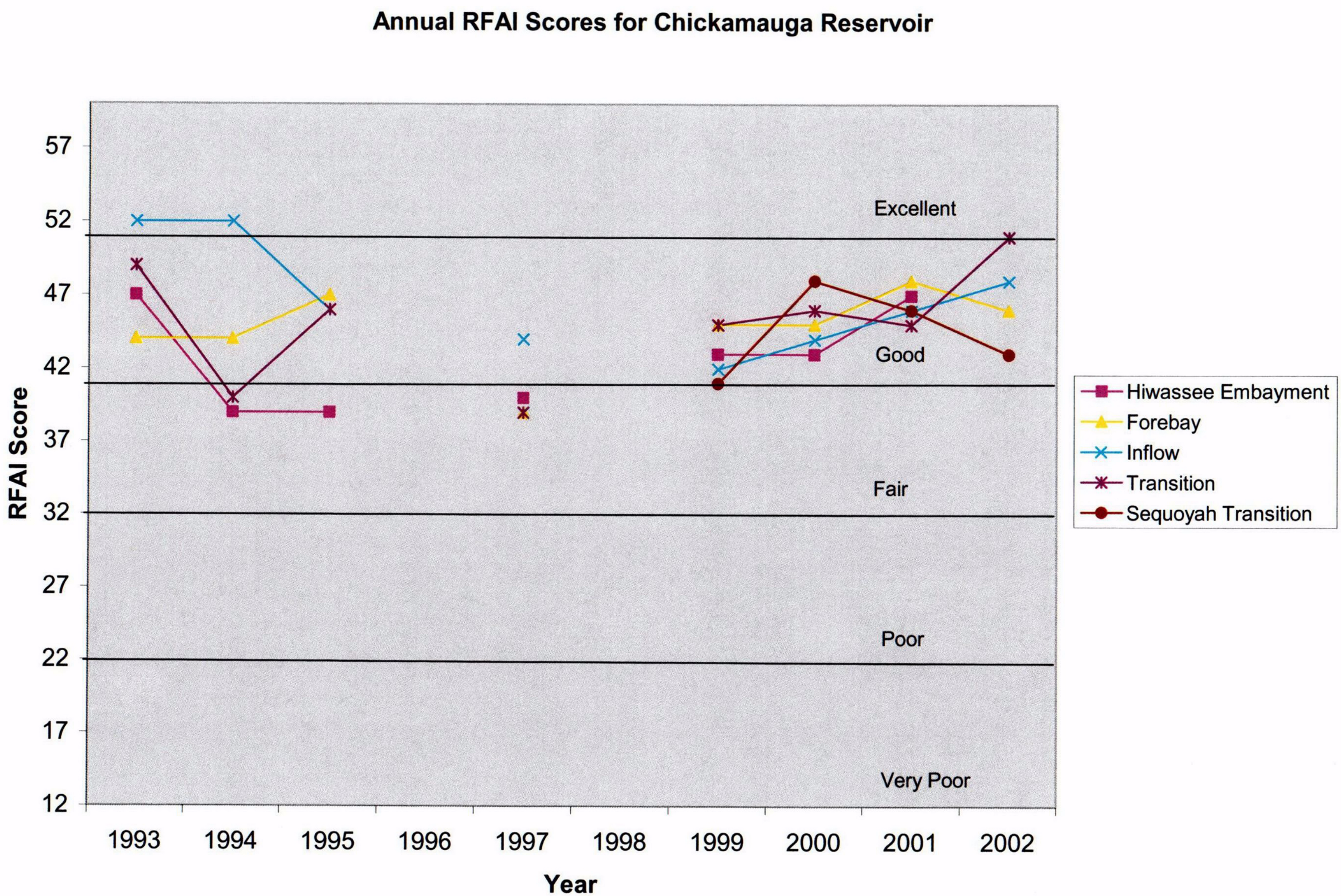


Figure 2. RFAI scores from sample years between 1993 and 2002.

C03

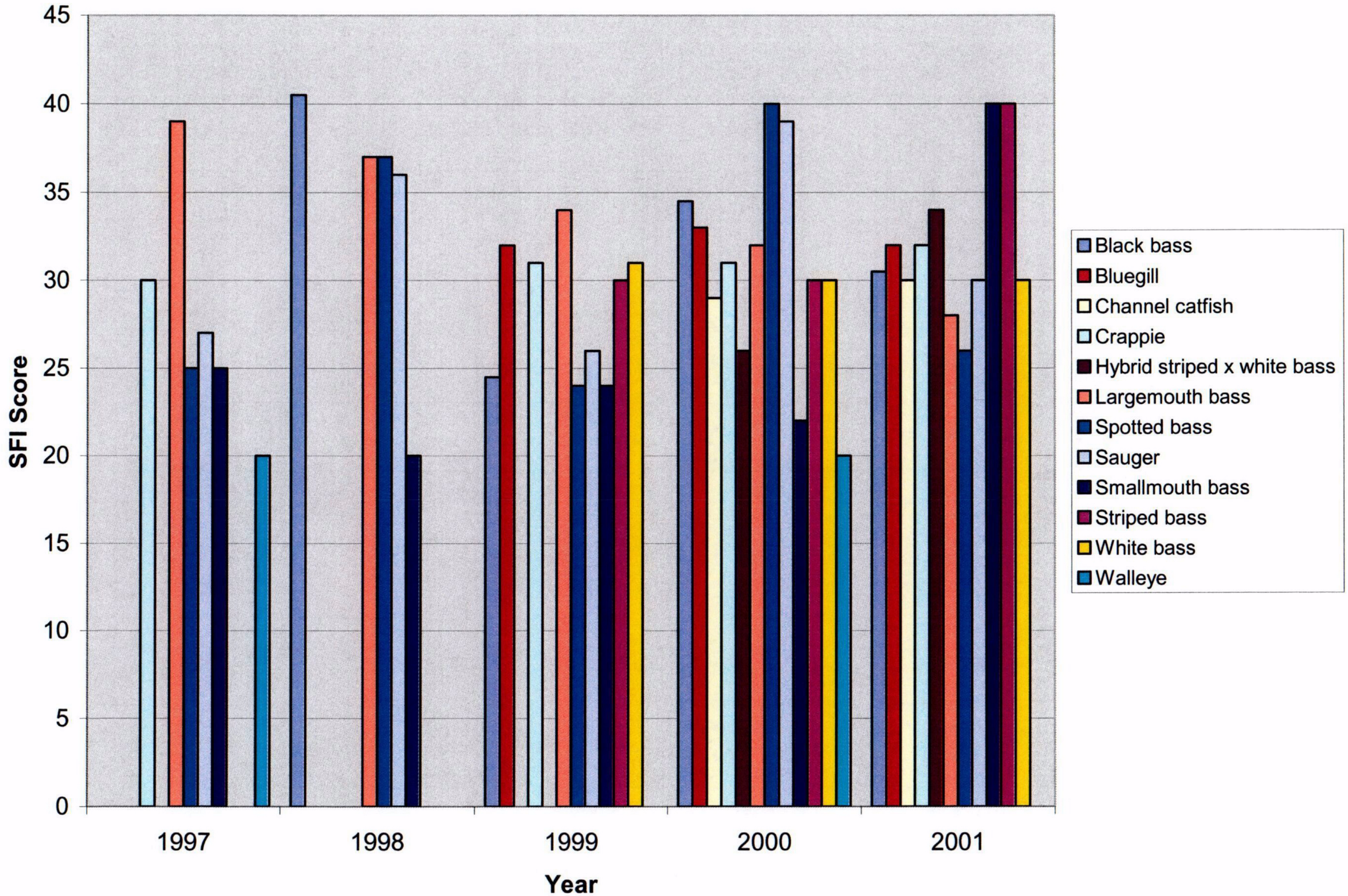


Figure 3. Sport Fishing Index results for Chickamauga Reservoir between 1997 and 2001.

C04

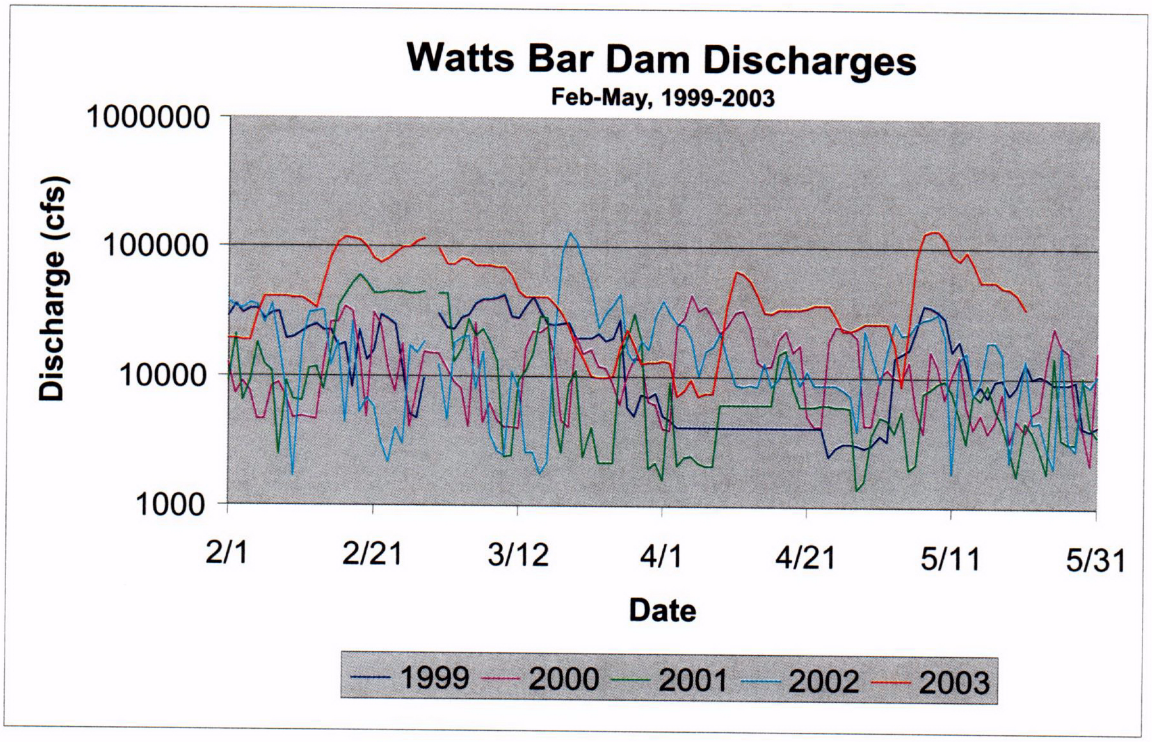


Figure 4. Watts Bar Dam discharges during late winter-early spring, 1999-2003.

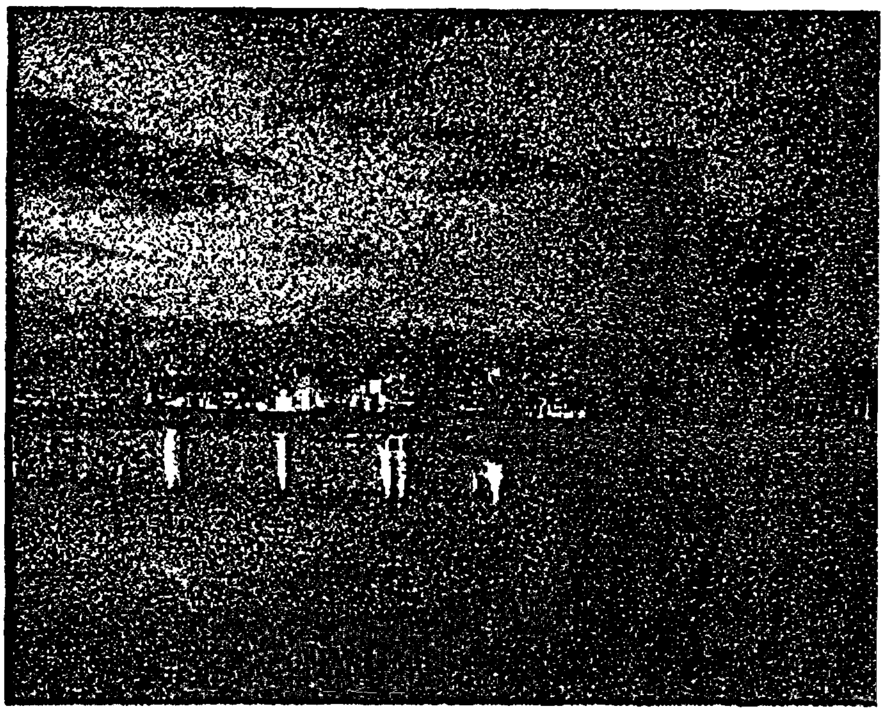
C05

TENNESSEE VALLEY AUTHORITY

RESOURCE STEWARDSHIP

SEQUOYAH NUCLEAR PLANT
316(b) MONITORING PROGRAM

EFFECTS OF IMPINGEMENT ON THE AQUATIC POPULATIONS IN CHICKAMAUGA RESERVOIR



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September 2002

Executive Summary

In accordance with the National Pollutant Discharge Elimination System (NPDES) Number TN0026450 the Tennessee Valley Authority's Sequoyah Nuclear Plant (SQN) conducted monitoring to evaluate the effects of the operation of SQN's condenser-cooling water intake on the aquatic community of Chickamauga Reservoir. Impingement samples were collected in the winter of 2001-2002 from the SQN traveling screens. Seasonal peaks of fish impingement were selected from historical data sets to (1) assess the impact of current operation on the aquatic populations, (2) compare current operation with previous operational data, and (3) to ensure compliance. The 2001-2002 data were similar to the 1981-1985 historical data; threadfin shad was the dominant species and other species were impinged in low numbers. Based on the 2001-2002 data, current operation of SQN is having no significant effect on the aquatic populations in Chickamauga Reservoir.

Introduction

Sequoyah Nuclear Plant (SQN) withdraws condenser-cooling water (CCW) from the Tennessee River and is subject to compliance with the Tennessee Water Quality Act and the Clean Water Act (CWA). Section 316(b) of the CWA requires facilities to demonstrate that the CCW is having no significant impact on the aquatic community. Impingement is a component of 316(b) and is defined as an impact of which fish and other aquatic organisms are trapped or impinged against the intake screens. TVA conducted impingement studies at SQN from 1981 through July 1985 to assess the effects of operation on the aquatic community. No significant impact was observed in these studies. The Emergency Raw Cooling Water (ERCW) contributes only 0.7 percent of the pumping capacity and, historically, impinges low numbers of fish. Therefore, potential impacts from operation of the ERCW are minimal and no additional evaluations are included in this report. This report presents impingement data collected from the CCW intake screens in the winter of 2001-2002 with comparisons to historical data.

Plant Description and Operation During Study Period

SQN is located on the west shore of Chickamauga Reservoir at Tennessee River Mile (TRM) 484.5 (Figure 1). The two units (water pressurized reactors) have a total nameplate rating of 2,441 megawatts (MW). Natural draft cooling towers enables SQN to operate in an open, closed, or helper mode. In open mode operation with both units at maximum power, total water demand is 72.45 m^3/s (2,558 cfs). CCW is drawn from Chickamauga Reservoir into the intake channel through an opening approximately 165 m in length and 3 m height located near the bottom of the skimmer wall. The skimmer wall is situated near the river channel enabling SQN to withdraw cooler water from the lower stratum. From the intake channel, water passes through six, 3-m wide traveling screens to the intake pumps. Mesh openings on screens are 0.95 cm^2.

Both units were near full load December 2001 through February 2002 (Figure 2). Average daily generation for the two combined was 2373 MV; Unit 1 averaged 1186 MV and Unit 2 1187 MV. Six intake pumps were usually in operation producing an average daily intake flow of 2536 cfs. Velocity at traveling screens averaged 1.2 fps with a maximum of 1.3 and a minimum of 1.2 fps.

Materials and Methods

The 2001-2002 impingement study was conducted in winter, historically, when peak numbers of fish are impinged at SQN. Ten impingement samples were collected from the CCW screens between December 19, 2001 and February 25, 2002. Each of the six intake screens were washed and rotated to remove all fish and debris. After approximately 24 hours, screens were individually washed and rotated. Fish were collected in the catch basket at the end of the sluice pipe. Due to problems, one sample, collected on January 17, 2002, was for a 48-hour period. Fish were identified, separated into 25 mm length classes, enumerated, and weighed. Estimates of monthly impingement rates were calculated and compared with historical data.

Results and Discussion

Fifteen fish species representing eight families and one exotic mussel (zebra mussel) were collected in the SQN impingement samples (Table 1). The prolific non-native zebra mussel is a nuisance species introduced into the Tennessee River system in the last ten years. Zebra mussels are not an impingement concern and must be monitored to ensure accumulation in the intake structure does not impede flow. One species, alewife, was observed for the first time in SQN impingement samples. Alewife is a cool water forage species introduced into Watauga Reservoir in 1976 and continues to extend its range downstream.

A total of 13,570 fish weighing 50,532 grams was collected in the ten samples (Table 2). Threadfin shad was the dominant species comprising 97 percent of the total number collected and 74 percent of the total weight (Table 3). All other species contributed less than one percent of the total number; both bluegill and freshwater drum contributed 0.8 percent. By weight, freshwater drum ranked second comprising 15 percent of total.

Threadfin shad are typically the dominant species impinged at TVA power plants and significant annual and seasonal fluctuations in population estimates for the species is common. The average monthly impingement rate for threadfin shad was 36,427 in the winter of 2001-2002; monthly estimates were 45,720 in December, 53,400 in January, and 6944 in February. This is higher than the historical monthly average (Figure 3) but similar to the 46,000 estimated for December 1981. Historical data was averaged over a 52-week period in 1981 through 1984 and January through July in 1985, whereas, the 2001-2002 data was collected during winter. Threadfin shad have a high fecundity rate, move in large schools, and are intolerant to cold temperatures, often resulting in high mortality rates in winter. These traits are probably major contributing factors to the annual and seasonal fluctuation in numbers of fish impinged at SQN. Annual fluctuation in population estimates for threadfin shad in Chickamauga Reservoir was also observed in historical rotenone data (Figure 4). Gizzard shad, bluegill, and freshwater drum were impinged at rates near the median or below historical estimates (Figures 5, 6, and 7). Impingement estimates for channel catfish was higher for 2001-2002 (Figures 8) but numbers were low compared to reservoir population. Species not impinged in 2001-2002 that ranked in the top five one or more years between 1981 and 1985 were skipjack herring, yellow bass, yellow perch, and spotted bass.

Summary and Conclusions

The 2001-2002 data presented the worse case scenario, samples collected in the winter when peak numbers are typically impinged at SQN. Impingement estimates for all species, except threadfin shad, were low numbers and consistent with the 1981-1985 historical data. Numbers estimated for threadfin shad were similar to historical peaks and the significant drop in the numbers impinged in February 2002 is consistent with seasonal fluctuations previously reported. The 2001-2002 data shows no change in SQN operation since the 1981-1985 operational studies that would potentially impact the fish populations in Chickamauga Reservoir.

Table 1. List of species impinged on the intake screen at Sequoyah Nuclear Plant in ten samples collected between December 18, 2001 and February 25, 2002.

	Family	Common Name	Scientific Name
Fish			
	Clupeidae		
		Alewife	*Alosa pseudoherengus*
		Gizzard shad	*Dorosoma cepedianum*
		Threadfin shad	*Dorosoma petenense*
	Cyprinidae		
		Bluntnose minnow	*Pimephales notatus*
	Ictaluridae		
		Channel catfish	*Ictalurus punctatus*
		Flathead catfish	*Pylodictis olivaris*
	Poeciliidae		
		Mosquitofish	*Gambusia affinis*
	Percichthyidae		
		Striped bass	*Morone saxatilis*
	Centrarchidae		
		Redbreast sunfish	*Lepomis auritus*
		Bluegill	*Lepomis macrochirus*
		Redear sunfish	*Lepomis microlophus*
		Largemouth bass	*Micropterus salmoides*
		White crappie	*Pomoxis annularis*
	Percidae		
		Logperch	*Percina caprodes*
	Sciaenidae		
		Freshwater drum	*Aplodinotus grunniens*
Mussels			
		Zebra mussels	*Dreissena polymorpha*

Table 2. Total number and weight (grams) of each species impinged on the intake screen at Sequoyah Nuclear Plant in ten samples collected between December 18, 2001 and February 25,2002.

Sample Date	19-Dec	2-Jan	9-Jan	17-Jan	23-Jan	30-Jan	6-Feb	20-Feb	22-Feb	25-Feb	Species
Hours Sampled	25.5	25.5	23.2	48.5	25.5	25.0	24.0	24.0	24.0	24.0	Total
Common Name	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Alewife					1	7	10	5	5	3	31
Gizzard shad		2		2	1	23	20		2	9	59
Threadfin shad	1567	644	3945	3326	2046	640	880	57	33	22	13160
Bluntnose minnow		1				2					3
Channel catfish		4	6	4	2	12	2	4	1	3	38
Flathead catfish				2	1						3
Mosquitofish	10		2	4			1		1		18
Striped bass						5	14	2	4	8	33
Redbreast sunfish					1						1
Bluegill	11	4	1	1	39	25	20	2	2	4	109
Redear sunfish							3				3
Largemouth bass			1								1
White crappie	1	1									2
Logperch					2	2					4
Freshwater drum	3	1	8	32	45	7	4	3		2	105
Fish Totals:	**1592**	**657**	**3963**	**3371**	**2138**	**723**	**954**	**73**	**48**	**51**	**13570**
Zebra mussels	4	16									20
Common Name	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**	**Weight**
Alewife					37	97	102	85	55	36	412
Gizzard shad		140		138	194	90	64		8	36	670
Threadfin shad	4189	1611	11440	9407	6692	1280	2552	141	81	48	37441
Bluntnose minnow		8				5					13
Channel catfish		11	13	10	5	28	5	90	495	15	672
Flathead catfish				2360	5						2365
Mosquitofish	2		2	1					1		6
Striped bass						26	82	57	26	43	234
Redbreast sunfish					370						370
Bluegill	31	12	3	22	123	48	49	5	5	27	325
Redear sunfish							9				9
Largemouth bass			135								135
White crappie	3	418									421
Logperch					20	19					39
Freshwater drum	226	233	1021	2036	2819	389	91	567		38	7420
Fish Totals:	**4451**	**2433**	**12614**	**13974**	**10265**	**1982**	**2954**	**945**	**671**	**243**	**50532**
Zebra mussels											

Table 3. Percent composition of fish impinged by Sequoyah Nuclear Plant between December 18, 2001 and February 25,2002.

Category	Common Name	Number Percent	Weight Percent
Forage			
	Alewife	0.23	0.82
	Gizzard shad	0.43	1.33
	Threadfin shad	96.98	74.09
	Bluntnose minnow	0.02	0.03
	Mosquitofish	0.13	0.01
	Logperch	0.03	0.08
	Forage Totals	**97.82**	**76.36**
Commercial			
	Channel catfish	0.28	1.33
	Flathead catfish	0.02	4.68
	Freshwater drum	0.77	14.68
	Commercial Totals	**1.07**	**20.69**
Game			
	Striped bass	0.24	0.46
	Redbreast sunfish	0.01	0.73
	Bluegill	0.80	0.64
	Redear sunfish	0.02	0.02
	Largemouth bass	0.01	0.27
	White crappie	0.01	0.83
	Game Totals	**1.09**	**2.95**

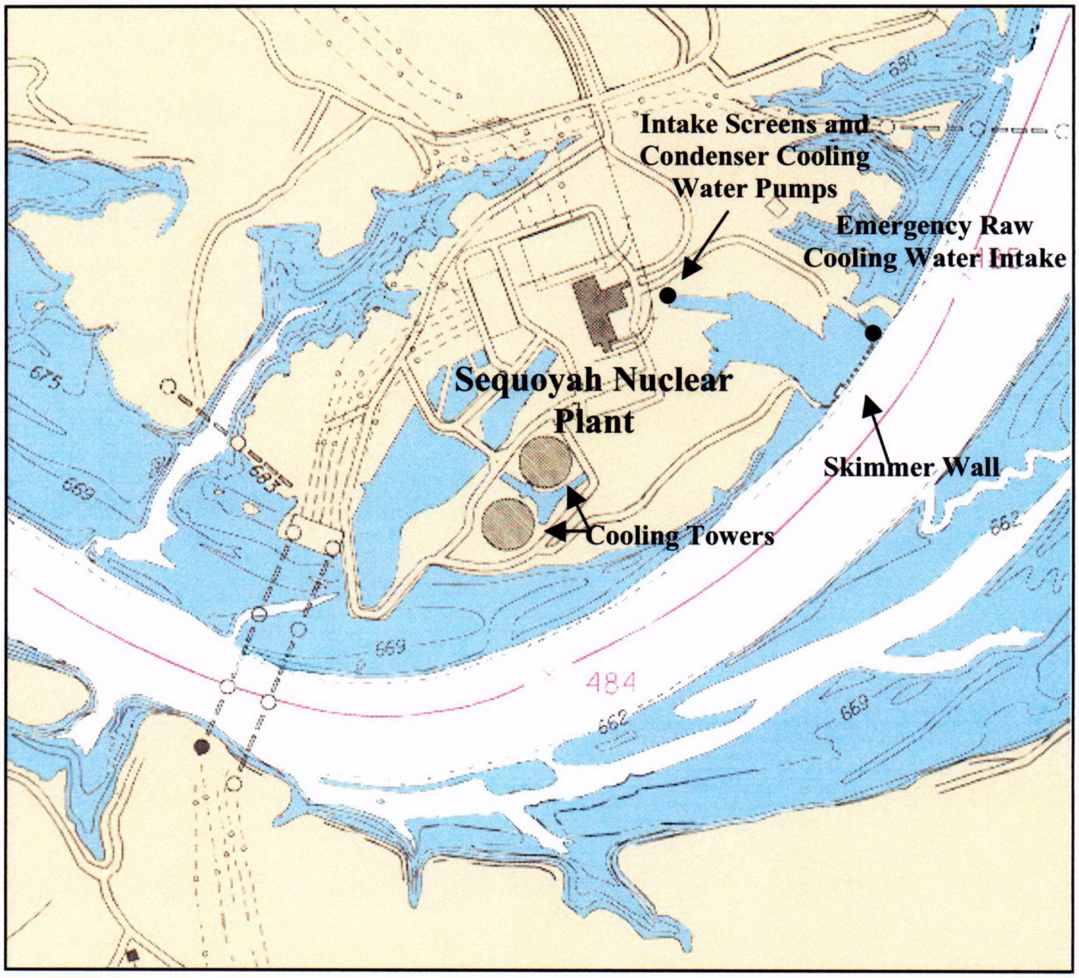

Figure 1. Sequoyah Nuclear Plant cooling water intake structure.

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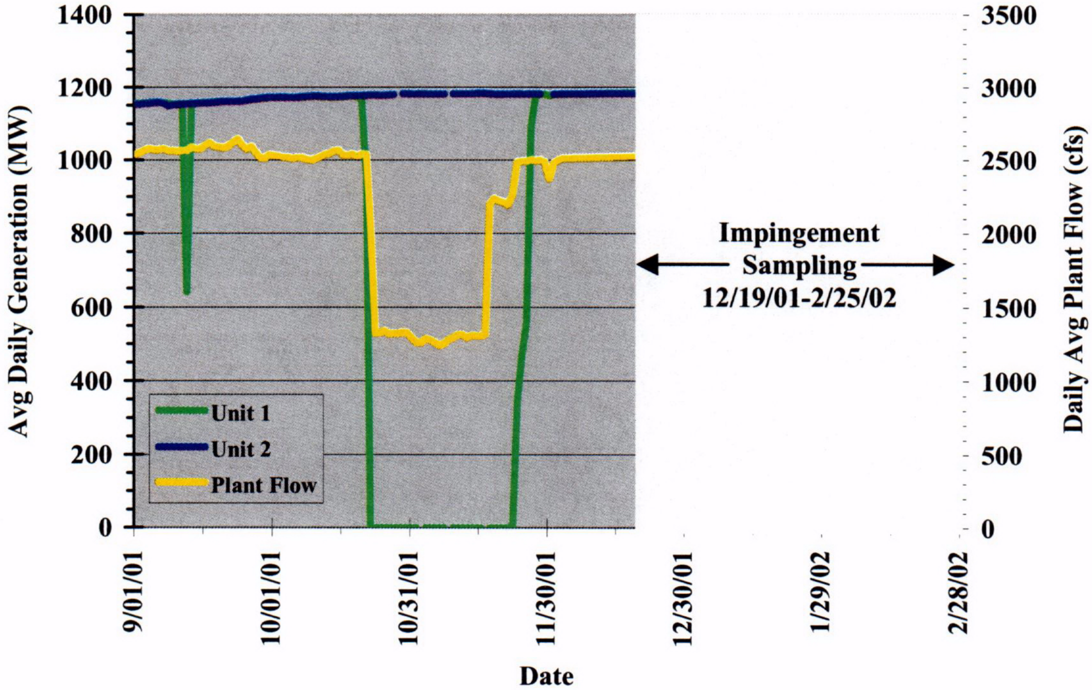

Figure 2. Average Daily Generation (MW) and Intake Flow (cfs) at Sequoyah Nuclear Plant, September 2001 through February 2002. Light gray identifies impingement sampling period.

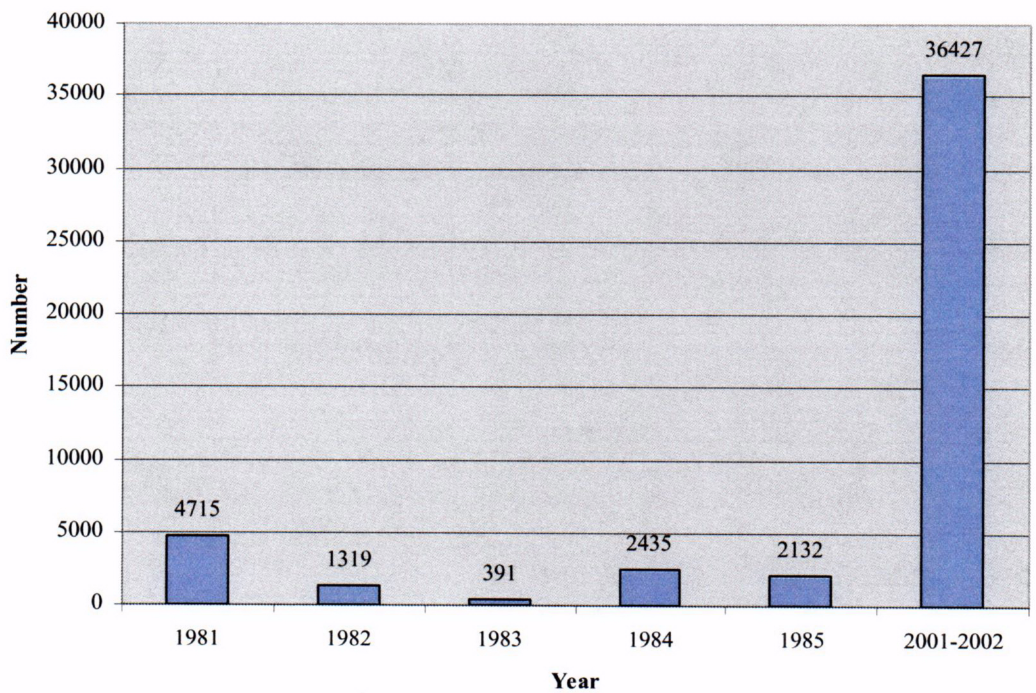

Figure 3. Estimated monthly impingement rate for threadfin shad in winter, 2001-2002, with historical comparisons.

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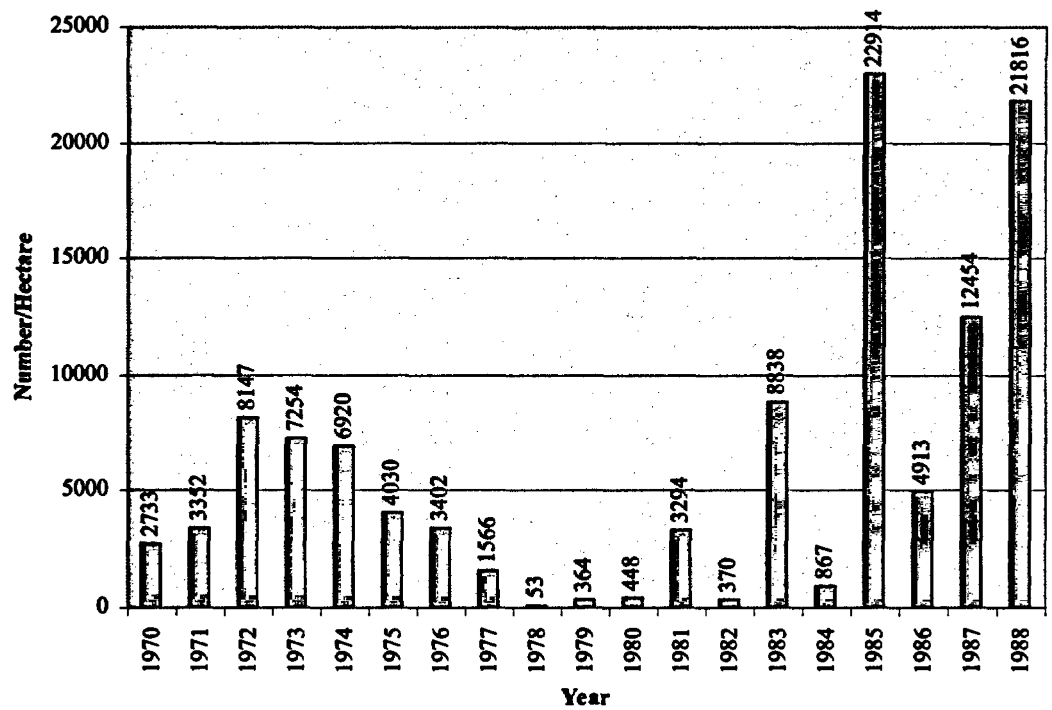

Figure 4. Numbers of threadfin shad in cove rotenone samples, Chickamauga Reservoir, 1970-1988.

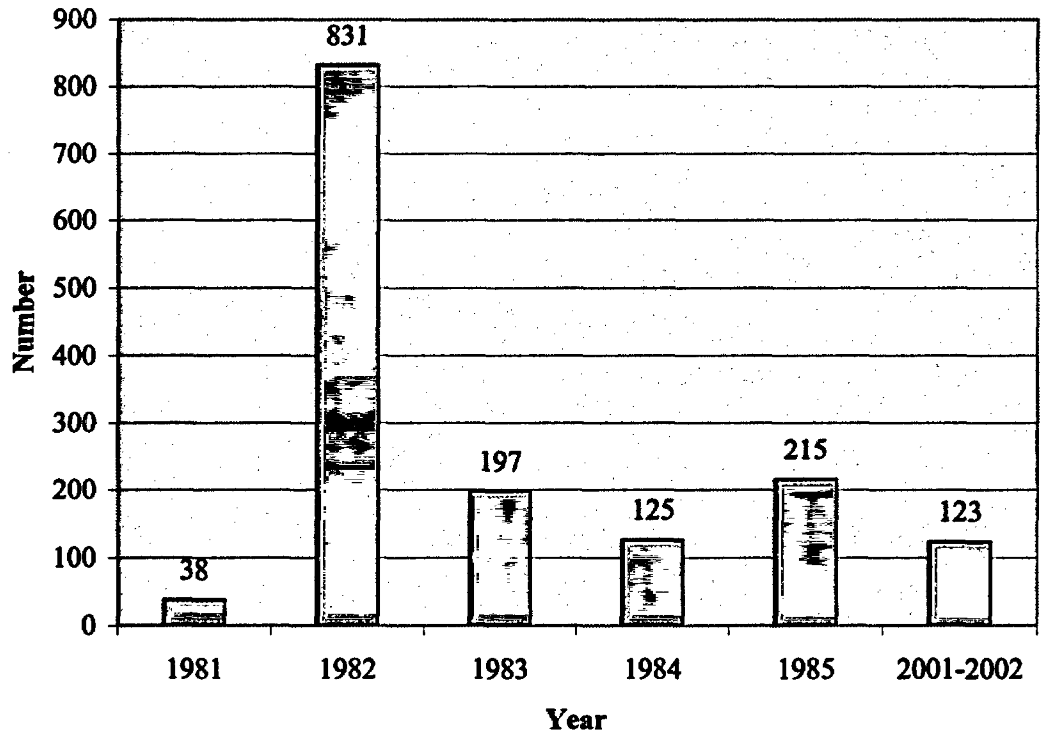

Figure 5. Estimated monthly impingement rate for gizzard shad in winter, 2001-2002, with historical comparisons.

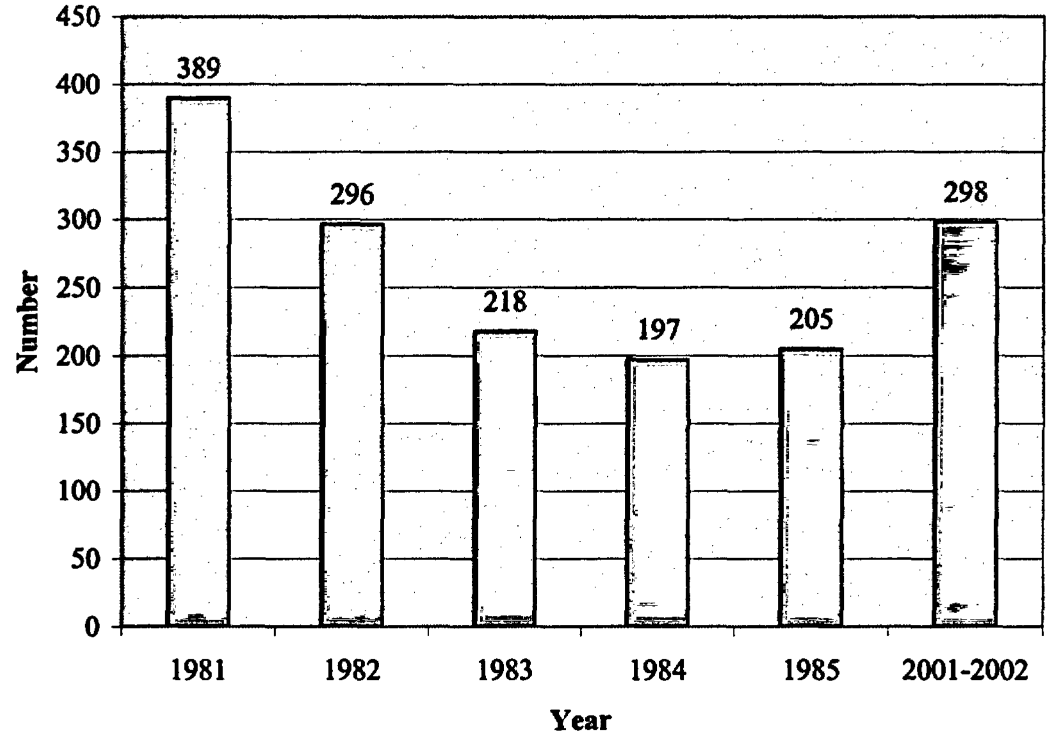

Figure 6. Estimated monthly impingement rate for bluegill in winter, 2001-2002, with historical comparisons.

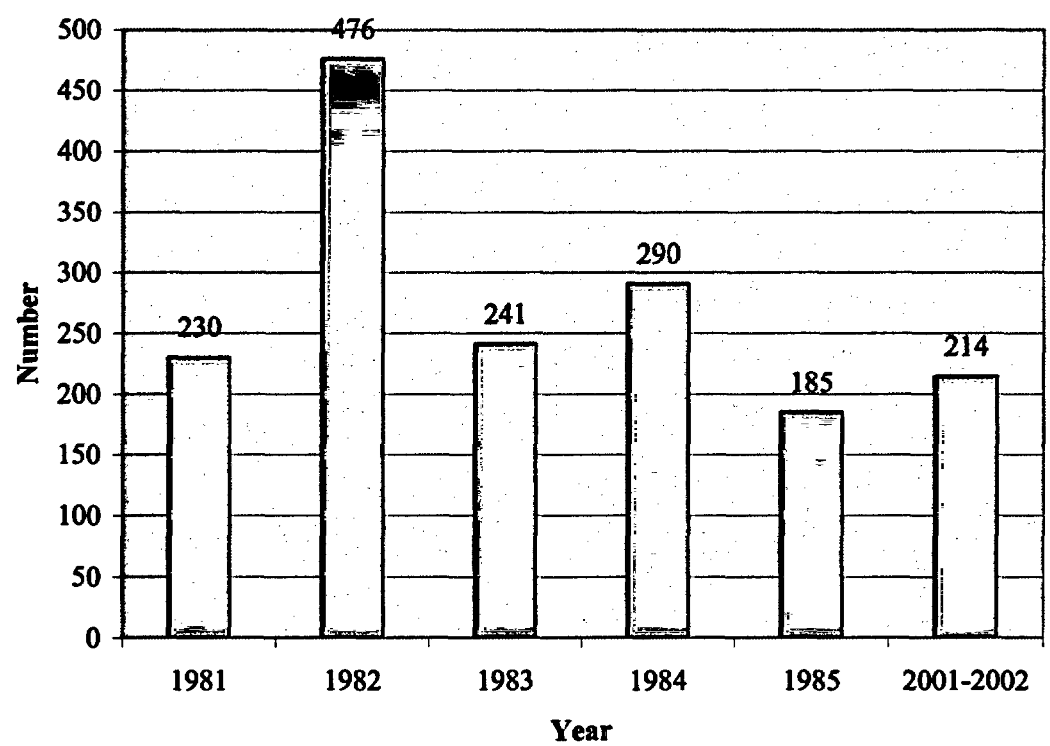

Figure 7. Estimated monthly impingement rate for freshwater drum in winter, 2001-2002, with historical comparisons.

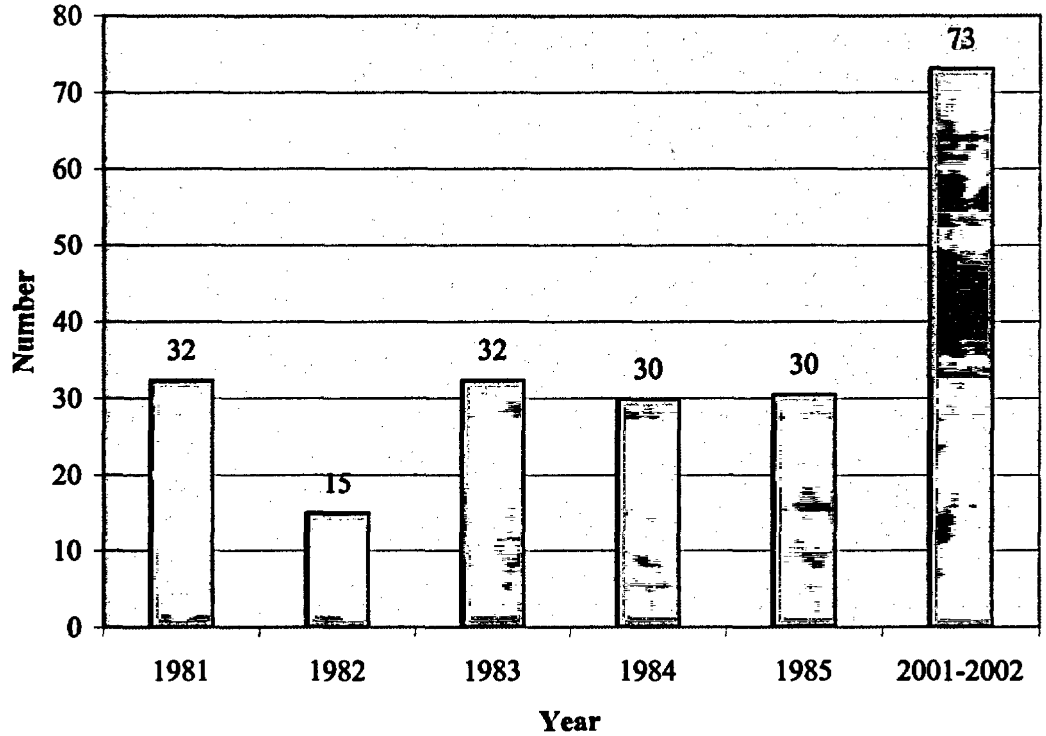

Figure 8. Estimated monthly impingement rate for channel catfish in winter, 2001-2002, with historical comparisons.

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June 25, 2003

Stephanie A. Howard, SB 2A-SQN

INFORMATION ON RESERVOIR OPERATIONS FOR SEQUOYAH NUCLEAR PLANT NPDES PERMIT APPLICATION

Part III, Section F of NPDES Permit TN0026450 for Sequoyah Nuclear Plant effective August 8, 2001, states that *"For Section 316(a), the permittee shall analyze previous and new data to determine whether significant changes have occurred in plant operation, reservoir operation or instream biology that would necessitate the need for changes in the thermal variance."* As for river operations, no significant changes have occurred during the tenure of the NPDES permit effective August 8, 2001. It should be noted, however, that TVA currently is engaged in a Reservoir Operations Study (ROS) to evaluate its management of the Tennessee River system and see if changes in operating policies would provide greater overall value to the public (see http://www.tva.com/feature_rostudy/index.htm). Rick Sinclair, Deputy Commissioner of the Tennessee Department of Environment and Conservation, and Paul Davis, Director of the Tennessee Division of Water Pollution Control, are currently working on an interagency team assisting TVA with the study. Part of the study involves analyses of the impact of alternate operating policies on water quality. In regard to these analyses, it is assumed that Sequoyah Nuclear Plant will always operate in a manner that maintains the thermal criteria as specified in the current NPDES permit with no changes in the thermal variance. Based on the current schedule, the draft EIS for ROS, documenting the technical analyses of the alternate policies, will be released in June 2003. The final EIS identifying TVA's preferred alternative will be issued in fall 2003. In winter 2003-2004, TVA's Board of Directors will announce a decision for ROS and the rationale for that decision.

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TENNESSEE VALLEY AUTHORITY
River System Operations & Environment

Background and Workplan for Ambient Temperature and Mixing Zone Studies for Sequoyah Nuclear Plant as Required by NPDES Permit No. TN0026450 of August 2001

WR2003-1-45-148

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May 2003

TVA

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EXECUTIVE SUMMARY

The August 2001 National Pollutant Discharge Elimination System (NPDES) Permit for Sequoyah Nuclear Plant (SQN) requires a number of studies related to Section 316 of the Clean Water Act. These are for the plant diffuser discharge, identified in the NPDES permit as Outfall 101. Among these are a study to determine the adequacy of measurements for ambient river temperature and a study to determine the adequacy of the diffuser mixing zone. As background for these studies, this report provides a description of the thermal criteria and monitoring requirements for SQN. Due to the evolution of understanding for the hydrothermal and biological characteristics of Chickamauga Reservoir, and due to the evolution of understanding for the operational characteristics of the nuclear plant and river system, changes have been necessary over the years for both the thermal criteria and the monitoring requirements. The requirements for an ambient temperature study and a mixing zone study are based on the need to confirm that, with these changes, the impact of the plant thermal discharge is yet being adequately monitored and does not adversely effect the balanced, indigenous population of shellfish, fish, and wildlife in the receiving water.

As specified by the NPDES study requirements, summaries are provided herein for previous field studies for the ambient temperature and mixing zone. In general, these have confirmed the adequacy of the mixing zone and method for monitoring the diffuser discharge. However, the results of the previous studies are not without concern and do not include sufficient data to address the goals of the studies as required by the NPDES permit. In particular, for the ambient temperature study, previous data does not fully address "*the major factors contributing to the interaction between main channel and overbank flows*" or "*the impacts on water temperatures in the thermal mixing zone*" or "*the optimal location of monitors to record the ambient temperature.*" For the mixing zone, previous data does not fully address "*the impact of hydro peaking operations on the behavior of the thermal plume.*" Previous data also is insufficient to assess the behavior of the thermal discharge based on 1-hour averaging vs. 24-hour averaging.

Under these circumstances, TVA has initiated new studies to supplement previous data and fully comply with the requirements of the NPDES permit. These include not only field studies for the ambient temperature and mixing zone, but also the development of three-dimensional numerical models. The field studies for ambient temperature will include the deployment of about twenty temporary temperature stations in overbank and main channel areas throughout the reach of Chickamauga Reservoir including SQN. Similarly, the field studies for the mixing zone will include the deployment of about thirty temporary temperature stations in and around the mixing zone. Each field study will provide 200 or more time-series temperature measurements over a period of between seven to ten days. This will include periods containing river flows characteristic of weekday and weekend peaking operations. On selected days, each field study also will include measurements for water velocity during periods of steady flow.

The ambient temperature and mixing zone field studies will include both summer and winter deployments, as required by the NPDES permit. The summer deployment currently is planned for July-August 2003, and the winter deployment for January-February 2004. The time-series measurements from the field studies will allow correlation analyses to be performed to evaluate

the interactions among key hydrothermal parameters, such as river temperature and flow, among different locations in the reservoir, such as the main channel, overbank, and mixing zone. The measurements also will allow an evaluation of the impact of peaking on the behavior of the ambient temperature and diffuser plumes, both for 1-hour averaging and 24-hour averaging of the time-series data.

Two three-dimensional numerical models will be developed, one to evaluate the ambient temperature and one to evaluate the diffuser mixing zone. The formulations for the models will follow recent TVA experience in developing a numerical model for the diffuser discharge from the Browns Ferry Nuclear Plant. The data from the new Sequoyah field studies will be used to calibrate the three-dimensional numerical models. In lieu of performing ongoing field studies, such as those summarized herein, and after demonstrating the adequacy of the calibrations, it is proposed that the three-dimensional numerical models become the primary tool for evaluating the behavior of the ambient flow or diffuser discharge for other operating conditions of the river and SQN.

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BACKGROUND AND WORKPLAN FOR AMBIENT TEMPERATURE AND MIXING ZONE STUDIES FOR SEQUOYAH NUCLEAR PLANT AS REQUIRED BY NPDES PERMIT NO. TN0026450 OF AUGUST 2001

1.0 INTRODUCTION

Part III, Section F of the National Pollutant Discharge Elimination System (NPDES) Permit TN0026450 for Sequoyah Nuclear Plant (SQN), effective August 8, 2001, includes a number of requirements related to the evaluation of Section 316 of the Clean Water Act. These requirements address questions that have arisen concerning Outfall 101, which includes, among other constituents, the discharge of waste heat into Chickamauga Reservoir through two submerged, multiport diffusers in the main channel of the Tennessee River. This workplan summarizes studies that will be conducted by TVA to fulfill two of the Section F requirements. These are as follows:

> *To determine the adequacy of measurements for ambient river temperature, TVA shall conduct a study to evaluate the spatial distribution of water temperature in the overbank and main channel regions of Chickamauga Reservoir upstream of the plant diffuser. The study shall supplement data from previous evaluations, as needed, by measuring temperature profiles at selected sites in the reservoir. The study shall consider both winter and summer hydrothermal regimes, and both 1-hour and 24-hour averaging. The goal of the study is to determine the major factors contributing to the interaction between main channel and overbank flows, the impacts on water temperatures in the thermal mixing zone, and optimal location of monitors to record the ambient temperature.*

> *To determine the adequacy of the mixing zone, TVA shall conduct a study to evaluate the dynamic behavior of thermal plume from the plant diffuser. The study shall examine the justification for the existing mixing zone and supplement data from previous evaluations, as needed, by measuring temperature profiles at selected sites in and about the mixing zone. The study shall consider both winter and summer hydrothermal regimes, and both 1-hour and 24-hour averaging. The goal of the study is to better determine the impact of hydro peaking operations on the behavior of the thermal plume, and to determine if there is any need to redefine the extent of the mixing zone.*

The first of these studies is identified herein as the *ambient temperature study*. The second is identified as the *mixing zone study*. In the following sections, the history of the thermal criteria for SQN is briefly summarized, including the specific aspects of the ambient temperature and mixing zone for Outfall 101 that have led to the above requirements. Previous studies relevant to the ambient temperature and mixing zone are discussed. Finally, the goals and basic activities of proposed new studies are provided, including plans for developing advanced numerical models of the river flow at SQN and plans for new field studies.

2.0 BACKGROUND

2.1 History of SQN Thermal Criteria and Monitoring Requirements

Operating SQN in a fashion to fulfill TVA's goals of supplying low-cost reliable power and supporting a thriving river system is no trivial task. In this process, the awareness and understanding of the ever changing biological, hydrothermal, and operational aspects of Chickamauga Reservoir and SQN continue to evolve. It is no surprise, therefore, that modifications of the SQN thermal criteria and monitoring requirements have been needed to accommodate issues important to both TVA and the regulatory community.

The initial thermal criteria for SQN were based on temperature limits adopted by the Tennessee Water Quality Board in December 1971 and approved by the Environmental Protection Agency (EPA) in June 1972. The criteria include:

- A maximum instream temperature $\mathbf{T_d}$ of 30.5°C (86.9°F).
- A maximum instream temperature rise ΔT of 3.0 C° (5.4 F°).
- A maximum instream temperature rate-of-change $\mathbf{dT_d/dt}$ of ±2.0 C°/hour (±3.6 F°/hour).

The monitoring requirements for these criteria were first specified in the Sequoyah NPDES permit effective July 1979. The criteria were to be applied to the area outside of a mixing zone of size appropriate for the multiport diffusers. The requirement for temperature rise was applied between this area and a suitable upstream control point, the latter which defines the ambient temperature for the thermal discharge. The locations of monitoring points, shown in Figure 1, were as recommended by TVA in February 1979 (TVA, 1979a). The upstream control point includes a water temperature station located at the skimmer wall of the plant intake, Station 13. The area outside of the mixing zone was monitored by two water temperature stations located near the outer edges of the mixing zone downstream of the diffusers, Stations 8 and 11. The temperature at these stations is determined as the average of individual sensor readings at water depths of about 3 feet, 5 feet, and 7 feet (1.0 meter, 1.5 meter, and 2.0 meter). Furthermore, the compliance temperatures (i.e., $\mathbf{T_d}$, ΔT, and $\mathbf{dT_d/dt}$) were computed as "hourly" averages every 15 minutes by averaging the current and previous four 15-minute readings.

In the early eighties an issue arose concerning the validity of the downstream temperature measurements at Station 8 and Station 11. Field data found that temperatures from these monitors were, at times, not representative of the cross-sectional average temperature at the end of the mixing zone. Since the mixing zone resides in the navigation channel, instream temperature stations cannot be placed at locations optimal for obtaining a good cross-sectional average temperature. To avoid plant derating and cooling tower operation, as may be required by the instream mounting of Figure 1 vs. the actual impact by the SQN thermal discharge, a hydrothermal model capable of predicting the temperature at the downstream end of the mixing zone was developed. The basic requirements for the model were outlined in the NPDES permit

effective April 1983, which stated *"upon approval by the Director, Water Management Division, and the State Director, compliance with the river limitations shall be monitored by means of a numerical model that solves the thermohydrodynamic equations governing the flow and thermal conditions in the reservoir."* Field tests were conducted to verify the diffuser performance for the model and the model subsequently was found to provide a more accurate representation of the downstream temperature than that of the instream monitors (TVA, 1983). In March 1984, approval was granted for TVA to use the numerical model to monitor compliance of the NPDES temperature requirements.

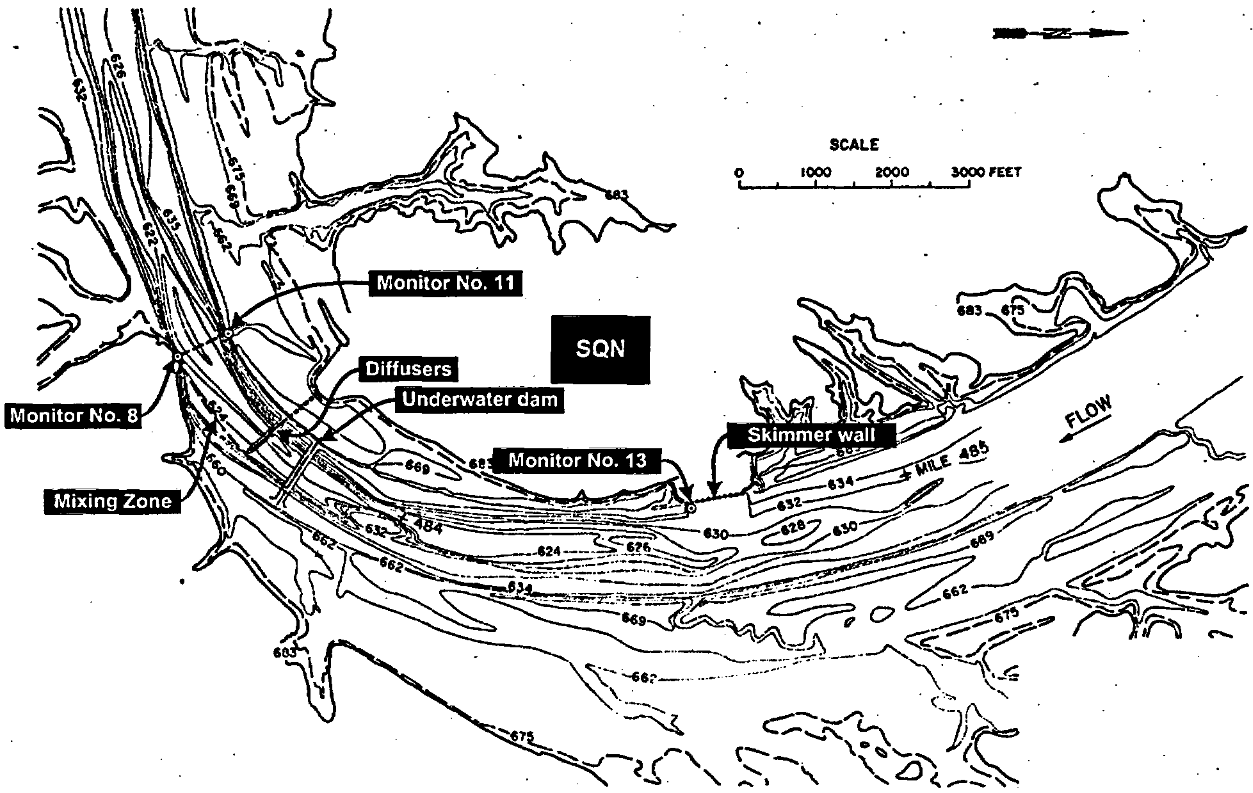

Figure 1. Water Temperature Station Locations for Initial Operation of SQN (after TVA, 1979b)

Briefly, the hydrothermal model solves the fundamental equations for the conservation of mass, momentum, and heat to determine the average temperature along the centerline of the thermal discharge from a submerged diffuser in a stratified, ambient crossflow. The basic parameters required by the model are shown in Figure 2. Values for these parameters are determined from measurements at the SQN water temperature stations, shown in Figure 3, and at the hydroplants immediately upstream and downstream of SQN. The upstream ambient river temperature T_R is measured at Station 13. The measurements at the 3-foot, 5-foot, and 7-foot depths are averaged to obtain the upstream temperature T_u. Note that T_u is required to determine the temperature rise $\Delta T = T_d - T_u$. The temperature of the effluent from Sequoyah T_{SQN} is measured at the entrance of the diffuser conduits at Station 12, located in a pond situated between the outlet of the plant and the river. In addition to temperature, Station 12 and Station 13 also contain a stage recorder to

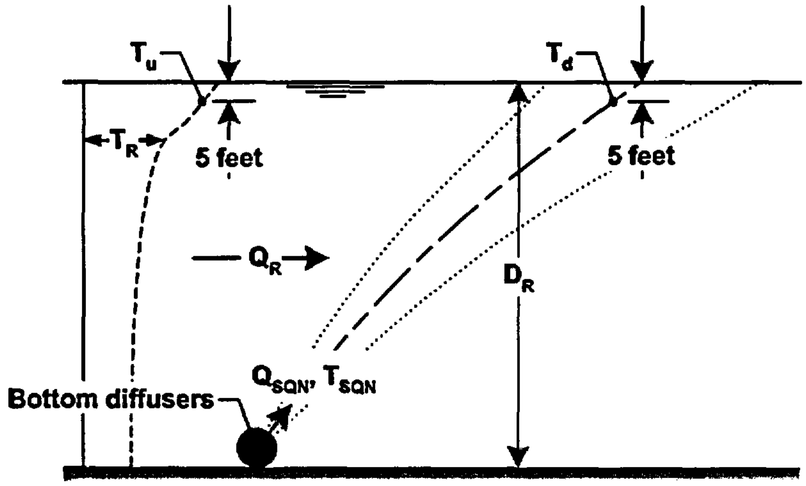

Figure 2. Basic Parameters for SQN Hydrothermal Model

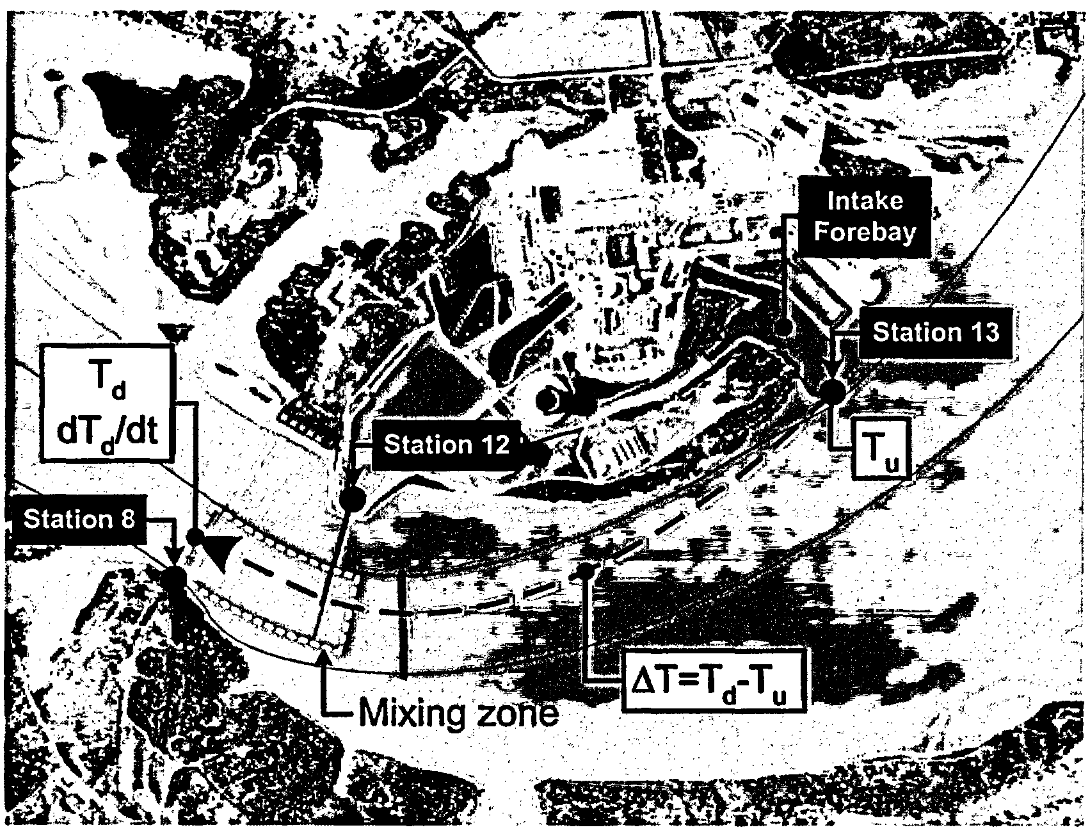

Figure 3. Water Temperature Stations for SQN Computed Compliance

measure, respectively, the water surface elevation in the diffuser pond and the water surface elevation in the river. The water surface elevation in the river is used to determine the depth of flow at the diffusers D_R. The discharge of effluent from Sequoyah Q_{SQN} is determined based on a calibrated rating curve giving Q_{SQN} as a function of the difference in water surface elevation between the diffuser pond and river. The river discharge at Sequoyah Q_R is computed based on a calibrated, one-dimensional flow model of Chickamauga Reservoir. The flow model requires discharges measured at the Watts Bar Hydroplant (WBH), located 45.5 miles upstream of SQN, and the Chickamauga Hydroplant, located 13.5 miles downstream of SQN. All of this information is collected over communication links by an Environmental Data Station (EDS) located at Sequoyah. The model subsequently computes the compliance temperatures $\mathbf{T_d}$, $\mathbf{\Delta T}$, and $\mathbf{dT_d/dt}$ every 15 minutes. Hourly average values are computed as previously summarized.

In implementing the "computed compliance," Station 11 was removed from service. Station 8, however, was retained to provide a backup for the downstream temperature measurement in the event of failure of the computed compliance system and to verify general trends determined by the hydrothermal model. In this arrangement it is emphasized that because Station 8 resides on the outer edge of the mixing zone, it regularly is dominated by processes significantly different from those in the mixing zone, such as heating and cooling in overbank and embayments areas in the immediate vicinity of the station.

The next significant issue to emerge occurred in the mid-eighties and involved problems related to the cooling towers. During periods of low flow in the wintertime, operation of the cooling towers is needed to prevent exceedances of the criterion for maximum temperature rise (i.e., 3.0 C° or 5.4 F°). However, due to cold air temperatures, use of the cooling towers during these periods induces ice damage in the towers, which is extremely costly and jeopardizes the availability of the towers for subsequent months, particularly the summer. This prompted a 316(a) demonstrative request in 1989 to increase the $\mathbf{\Delta T}$ limits during the months November through March from 3.0 C° to 5.0 C° (TVA, 1989). TVA analyses found that this increase would not adversely impact the balanced, indigenous population of shellfish, fish, and wildlife in Chickamauga Reservoir. The request to raise the temperature rise limit was subsequently accepted by EPA and the State of Tennessee in the Sequoyah NPDES permit effective September 1993. With this, the thermal criteria became:

- A maximum instream temperature $\mathbf{T_d}$ of 30.5°C (86.9°F).
- A maximum instream temperature rise $\mathbf{\Delta T}$ of 5.0 C° (9.0 F°) for November thru March (i.e., "wintertime" operation).
- A maximum instream temperature rise $\mathbf{\Delta T}$ of 3.0 C° (5.4 F°) for April thru October (i.e., "summertime" operation).
- A maximum instream temperature rate-of-change $\mathbf{dT_d/dt}$ of ±2.0 C°/hour (±3.6 F°/hour).

The overall monitoring requirements for the new criteria remained largely unchanged. That is, the hydrothermal modeling system was considered adequate for determining the temperature in the mixing zone and the thermal criteria continued to be interpreted on an hourly average basis.

The most recent issues emerged in the mid-nineties and involved the effects on Sequoyah of certain unsteady behaviors in Chickamauga Reservoir. The behaviors are caused primarily by two processes, both of which are beyond the direct control of SQN. The first is the daily variation of river flow that occurs as a normal part of peaking operations at TVA hydro plants, and the second is fluctuations in the ambient river temperature that likely are due to a combination of atmospheric heat exchange and mixing in the river. Depending on the exact circumstances, these processes can give rise to individual events threatening the limit for $\mathbf{T_d}$, $\mathbf{\Delta T}$, or $\mathbf{dT_d/dt}$. Those for $\mathbf{dT_d/dt}$ are the most problematic and occur in both the winter and summer. In the winter, cooling tower operation cannot be used to control $\mathbf{dT_d/dt}$, again due to icing. In the summer, the $\mathbf{dT_d/dt}$ events occur in the ambient temperature upstream of the plant and cannot be controlled by tower operation. Events threatening the limits for $\mathbf{T_d}$ are related to the unpredictability of summertime spikes in the ambient temperature and the rate of onset of these spikes. In the hydrothermal model, the impact of the waste heat from Sequoyah is superimposed on the ambient temperature to yield the downstream temperature. Thus, spikes in the upstream temperature also occur in the downstream temperature. In some cases, the cooling towers can be used to control fluctuations in downstream temperature; but, due to the inherent complexity of the equipment, the towers cannot be brought into service in short notice, as may be required to respond to the rapid onset of temperature spikes. Problems for $\mathbf{\Delta T}$ occur primarily in April and May, when river flows are restricted to help fill TVA reservoirs.

In light of the inability of SQN to fully control these events, and to avoid derating the plant, special operations of the river system were regularly used to maintain compliance of the thermal criteria. Due to the large extent of these special operations, a supplemental 316(a) demonstration was performed in 1996 to make additional changes in the thermal criteria and monitoring requirements (TVA, 1996). The proposed changes included the following:

- Increase the maximum instream temperature rate-of-change $\mathbf{dT_d/dt}$ from ±2.0 C°/hour to ±5.0 C°/hour (from ±3.6 F°/hour to ±9.0 F°/hour).

- Include April and May in the period of wintertime operation, allowing a maximum instream temperature rise $\mathbf{\Delta T}$ of 5.0 C° (9.0 F°) for November thru May.

- Monitor the instream temperature $\mathbf{T_d}$ and instream temperature rise $\mathbf{\Delta T}$ based on a 24-hour average.

As before, TVA analyses found that the proposed changes would not adversely impact shellfish, fish, and wildlife in Chickamauga Reservoir. In ensuing debate, however, the first two items were denied by the State. The third item, though, was accepted. Since this did not resolve the problems related to the temperature rate-of-change, and since SQN was not directly responsible for unsteady behaviors resulting from daily variations in river flow and atmospheric heat exchange, TVA proposed an alternate method for monitoring $\mathbf{dT_d/dt}$. In the method, spikes in

ambient reservoir conditions are filtered by using 24-hour average values in the hydrothermal model for the ambient river temperature, river discharge, and river depth (i.e., T_R, Q_R, and D_R in Figure 2). The impact of short-term variations in SQN operations is incorporated by using 15-minute values for the discharge and temperature of the Sequoyah effluent (i.e., Q_{SQN} and T_{SQN} in Figure 2). The hourly average temperature rate-of-change is computed, as before, using the current and previous four 15-minute dT_d/dt values.

Monitoring dT_d/dt by 24-hour filtering of the ambient was approved by the State, subject to the hydrothermal studies summarized herein. It is important to note that this filtering is used only for the computation of dT_d/dt. For T_d and ΔT, 15-minute values are yet determined solely from 15-minute values of the model parameters identified in Figure 2. It also is emphasized that in approving the changes for T_d, ΔT, and dT_d/dt there were no additional changes in the fundamental thermal criteria. That is, the supplemental 316(a) of 1996 was not invoked— changes in the requirements for monitoring can be made outside of the 316(a) process. With these changes, the basic thermal criteria and monitoring requirements found in the Sequoyah NPDES permit effective August 2001 included the following:

- A maximum instream temperature T_d of 30.5°C (86.9°F).
- A maximum instream temperature rise ΔT of 5.0 C° (9.0 F°) for November thru March.
- A maximum instream temperature rise ΔT of 3.0 C° (5.4 F°) for April thru October.
- A maximum instream temperature rate-of-change dT_d/dt of ±2.0 C°/hour (±3.6 F°/hour).
- T_d and ΔT are to be monitored based on 24-hour average values, calculated every 15-minutes by averaging the current 15-minute values with the previous ninety-six 15-minute values.
- dT_d/dt is to be monitored based on an hourly average value, calculated every 15 minutes by averaging the current 15-minute value with the previous four 15-minute values, where each 15-minute value is determined based on the 24-hour average river conditions (i.e., T_R, Q_R, and D_R) and current 15-minute plant conditions (i.e., Q_{SQN} and T_{SQN}).
-

In addition to the above, it is noted that other concerns over the years have led to other specific monitoring requirements. For example, the following items also are found in the current NPDES permit (i.e., August 2001):

- To allow operation of the plant when the ambient temperature exceeds the thermal criteria, when the 24-hour average upstream temperature T_u exceeds 29.4°C (84.9°F), the 24-hour average downstream temperature T_d may exceed 30.5°C (86.9°F), if the plant is operating the cooling towers with at least three lift pumps per operating unit.
- In no case shall the 1-hour average downstream temperature T_d exceed 33.9°C without consent of the permitting authority.

Overall, the current thermal criteria and NPDES monitoring requirements have resolved essentially all of the issues prompting the supplemental 316(a) of 1996 and have allowed TVA to supply power and environmental protection in a combined, efficient manner.

It is emphasized that the above summary has focused only on the major issues emerging since the beginning SQN commercial operation. In general, in designing the heat dissipation system, in performing the required monitoring for the diffuser discharge, in responding to regulatory inquiries, and in evaluating water temperature issues such as those above, TVA has provided continuous study of the thermal discharge from SQN, and will continue to do so. Apart from the information summarized below for the mixing zone and ambient temperature, a historical review including the detailed aspects of each and every issue that has emerged over the years is beyond the scope of this report. Such information, however, is maintained in TVA files and can be provided in support of any future concern that may arise.

2.2 Ambient Temperature

The specifications for monitoring the SQN upstream ambient temperature were recommended by TVA in February 1979 (TVA, 1979a). The State granted approval of the recommendations in the NPDES permit effective July 1979. As previously summarized, the ambient temperature is measured at Station 13, located on the reservoir-side of the plant intake skimmer wall, and is computed as the average of sensor readings at depths of 3 feet, 5 feet, and 7 feet. These requirements have remained unchanged through the current NPDES permit effective August 2002.

The exact basis for the selected location for the ambient temperature measurement was not given with the TVA recommendation, but the following reasons are obvious:

- Station 13 allows a good measurement of the temperature of water entering into and impacted by the plant.

- Station 13 borders the main channel of the river, which, in all likelihood, provides the main source of water for dilution of the thermal effluent from the discharge diffusers.

In the NPDES permit effective April 1983, the State emphasized the requirement that *"under no conditions shall the thermal plume be allowed to reach the ambient temperature recorder."* If the plume reached the ambient temperature recorder, the temperature rise ΔT would be biased low, thereby underestimating the impact of the SQN thermal discharge on Chickamauga Reservoir. Subsequent analyses by TVA indicated that the probability of a thermal wedge from the diffusers extending upstream 3000 feet, about one-half the distance to the Station 13 monitor, is of magnitude 0.0008 percent. To date, monitoring data from Station 13 has never demonstrated any behavior suggesting interference in the ambient temperature by the plant thermal effluent. This includes operation over a period of at least 14 years, encompassing a wide range of river conditions with SQN generation of two units at full power.

Problems with spiking of the ambient temperature occur during high river flow when the thermal effluent is assimilated downstream. Under these conditions there is very little, if any, upstream migration of a thermal wedge from the diffusers. An example event with spiking in the ambient temperature is given in Figure 4, which shows the calculated river discharge at SQN along with the measured ambient temperature at Station 13 and the resulting ambient temperature rate-of-change. The event occurred the first two days of June 2000. The temperatures include both 15-minute and hourly average data. It is emphasized that in June 2000 the plant was operating under the NPDES permit effective September 1993 and did not include 24-hour averaging of ambient river conditions for the temperature rate-of-change. During afternoon peaking operations, when the river flow exceeds about 30,000 cfs, it can be seen that the ambient temperature begins to fluctuate in a manner creating 15-minute variations that at times surpasses ±2 F°. The corresponding 15-minute values for the temperature rate-of-change were as high as ±10 F°/hour, and, on June 2, the resulting hourly average value hit the compliance limit ±3.6 F°/hour. These ambient variations, in turn, were superimposed by the hydrothermal model on the compliance parameters computed at the downstream end of the mixing zone.

In general, it appears that troublesome spiking of the ambient temperature occurs when the river discharge exceeds about 38,000 cfs. It is speculated that the reason why ambient spiking had not been problematic in the years prior to the mid-nineties is related to the condition of the hydroplant at Chickamauga Dam. Over the past 50 years, plant equipment had degraded to a point where the maximum discharge through the hydraulic turbines was limited to about 38,000 cfs. Between 1994 and 1997 the hydro units and other related equipment were upgraded, allowing the Chickamauga discharge to match levels similar to the capacity of the original turbines, over 45,000 cfs. This, in turn, has allegedly resulted in ambient temperature events that until recently had never been observed in the life of SQN.

Based on the evaluations presented in the supplemental 316(a) demonstration of 1996 (TVA, 1996), the spikes in ambient temperature will not adversely impact shellfish, fish, and wildlife in Chickamauga Reservoir. Under these conditions, the items of primary interest for the ambient temperature are twofold. First, it is desired to better understand the processes responsible for ambient temperature spikes, and second, it is desired to determine if the location of the Station 13 monitor gives ambient temperatures that are truly representative of that for the discharge diffuser, located about one mile downstream.

Several processes are envisioned as potentially playing a role in ambient temperature spiking. In the summer, late afternoon solar heating can cause the water temperature in the near surface region of the flow to become much warmer than the water at a depth of 5 feet. Higher levels of turbulence created by high river discharges subsequently can mix the surface water downward creating intermittent temperature fluctuations. In the winter, a similar phenomenon can occur with surface cooling, which is exacerbated by the fact that such cooling is innately unstable (i.e., cool water underlain by warmer water is unstable). In addition to vertical variations in temperature, fluctuations also can occur as a result of lateral differences between the main channel and overbanks. Water in shallow overbank areas will heat-up and cool-off much faster than water in the deep main channel. At high river flow, turbulent interactions between the main channel and overbank can entrain parcels of water from the overbanks, again creating

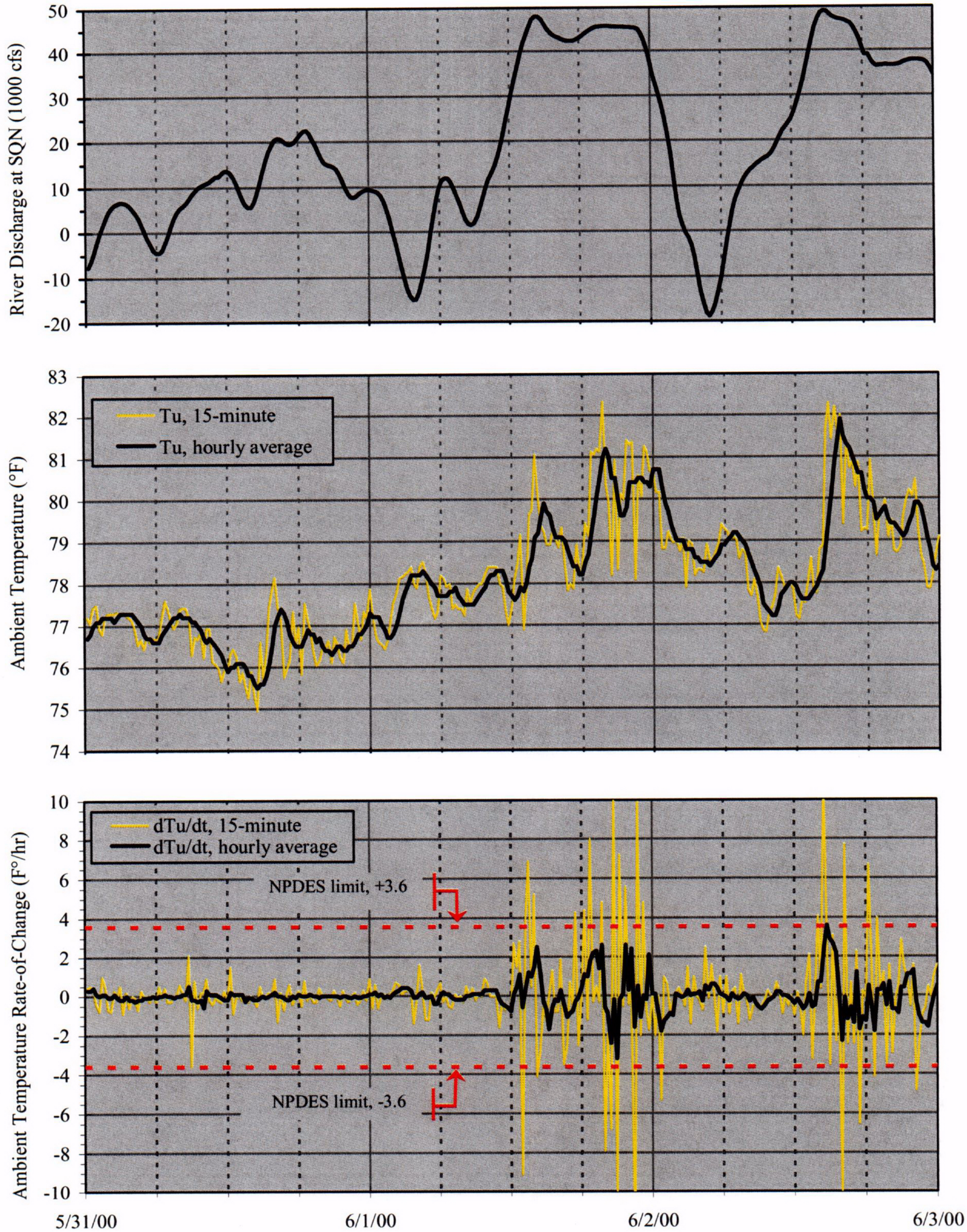

Figure 4. Hydrothermal Event with Spiking in Ambient Temperature at Station 13

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intermittent fluctuations. As shown in Figure 5, shallow overbank areas prevail in the areas surrounding SQN, particularly on the east side of the reservoir across from and upstream of the plant. Both Station 13 and Station 8 are positioned in regions that could potentially be influenced by turbulent interactions between the main channel and overbanks.

Whereas the above processes depend on turbulent interactions, spikes in the ambient temperature might also occur due to advection from different areas by the mean flow. For example, as a part of routine river operations, Chickamauga Reservoir may undergo daily and weekly cycles of drawdown and filling. A common occurrence is for the water level to drop (i.e., drawdown) during afternoon peaking operations and rise (i.e., fill) during early morning periods of low flow. Weekly variations occur for mosquito control. In these processes, water will fill into and drain out of the overbanks, embayment areas, and creeks. In the summer, water from these areas will likely be warmer than that in the main channel, and vice versa in the winter. When parcels of water from these areas are advected past a monitoring station, the temperature, subsequently, will fluctuate. In the summer, Soddy Creek and Opossum Creek, located upstream of SQN, are potential sources for parcels of warm water in Chickamauga Reservoir. Another mean flow process is related to the curvature of the river. Such curvature, which exists in the vicinity of SQN, will cause secondary currents to develop in directions transverse to the centerline of the river. This again can potentially cause the exchange of water between the main channel and overbanks, yielding fluctuations in the ambient temperature.

Overall, depending on the magnitude and extent of these processes, it may be that another more suitable location exists to measure the ambient temperature. However, such a location will need to:

- Remain clear of the navigation channel.
- Provide a good indication of the temperature of water entering the plant as well as that entering the mixing zone.
- Remain free of any thermal discharge that may propagate upstream from the diffusers.
- Be conveniently serviceable.

2.3 Mixing Zone

The mixing zone for SQN was proposed by TVA based on a physical model study of the discharge diffusers conducted at the TVA Engineering Laboratory (TVA, 1978). The initial recommendation included a zone 750 feet wide and 1500 feet long, extending downstream from the diffusers over the entire depth of flow. In subsequent discussions with EPA and the State, the extent of the mixing zone was modified to provide for upstream excursions of a thermal wedge on the water surface during low and reverse river flow events. The permit effective July 1979 thus provided an additional zone extending 275 feet upstream of the diffusers with a depth that varied linearly from the water surface at 275 feet to the top of the diffuser pipes. This mixing zone has been certified by the State from 1979 to the NPDES permit effective August 2001. The

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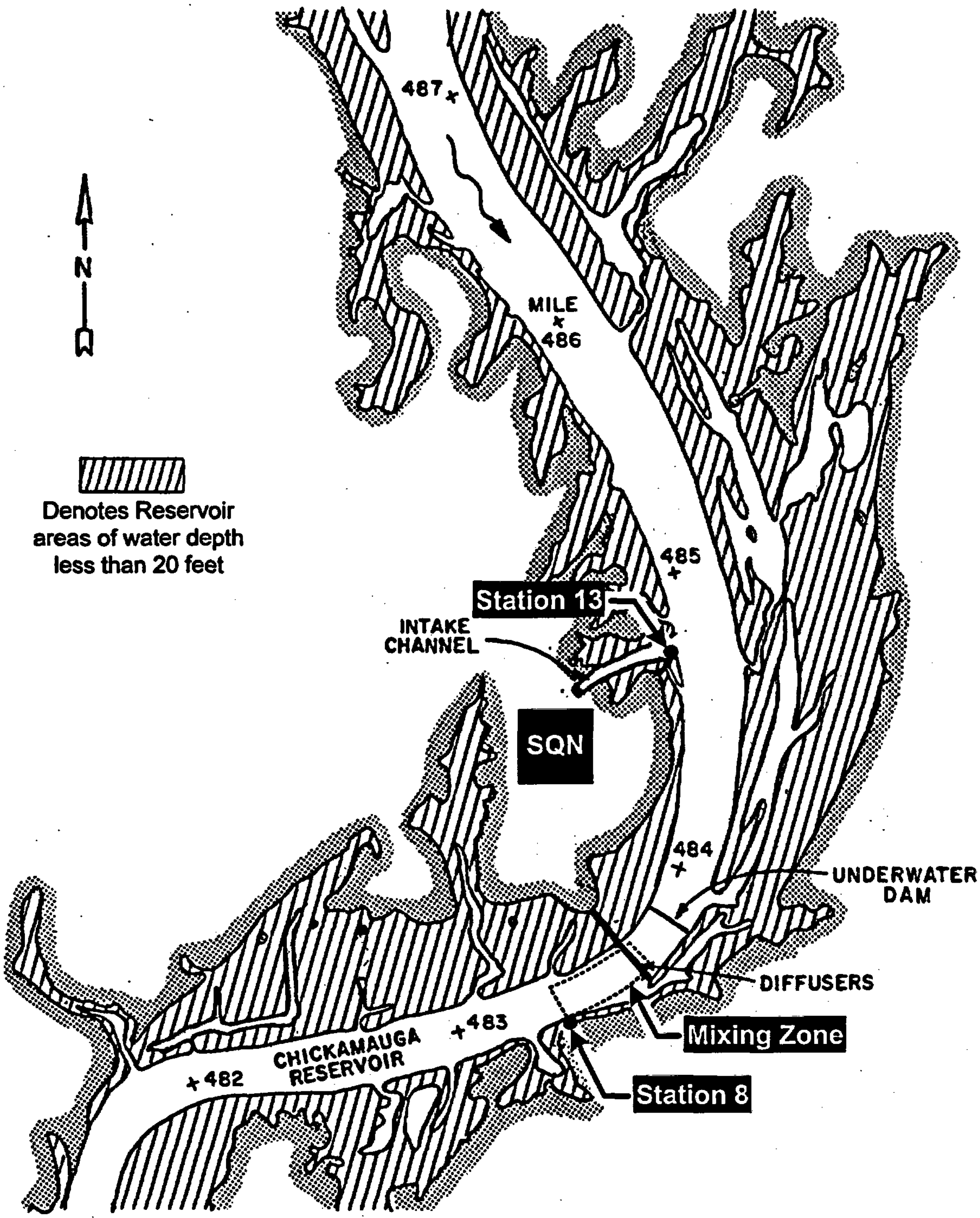

Figure 5. Main Channel and Overbank Areas near SQN (after TVA, 1978)

present permit also specifies that if SQN is operated in closed mode, the mixing zone shall include the intake forebay of the plant (see Figure 3).

In general, prior to the current permit, there have been no issues concerning the definition of the mixing zone for SQN. As summarized later, studies have been performed regularly to evaluate water temperatures in and around the mixing zone. Whereas most of these studies have examined conditions with steady flows, recent concerns are more focused on the behavior of the thermal effluent for unsteady conditions stemming from hydro peaking operations.

3.0 PREVIOUS STUDIES

3.1 Physical Model Study

In general, releasing waste heat through multiport diffusers situated on the bottom of the river hastens mixing of the effluent with the receiving water and significantly reduces the required size of the mixing zone (i.e., compared to side-channel discharges into the surface layer of the river, which were common at that time). The design of the submerged multiport diffusers for SQN was based on experience developed in the design of diffusers for the TVA Browns Ferry Nuclear Plant (BFN). The BFN analyses included a two-dimensional physical model study at the Massachusetts Institute of Technology (Harleman et al., 1968) and a three-dimensional physical model study at the TVA Engineering Laboratory (TVA, 1972).

Despite the confidence of the BFN work, a physical model study also was conducted for the proposed SQN diffusers (TVA, 1978 and TVA, 1979c). The objectives of the SQN model were to evaluate the performance of the diffusers for the specific conditions expected at the site and to determine empirical coefficients required to estimate the ambient entrainment and dilution of the diffuser discharge. The model was constructed at a scale of 1:90 in a 10-foot wide flume at the TVA Engineering Laboratory. The model corresponded to a section of the main channel about 900 feet wide and 6300 feet long. The overbanks were not modeled because it was estimated that they contribute little flow for the dilution of the thermal discharge. Also, because secondary currents were estimated to have only a minor impact on mixing, the model was constructed as a straight section of river rather than a curved channel. The model did include, however, an underwater dam located about 350 feet upstream of the diffusers.

It is emphasized that in all likelihood the model assumptions regarding the overbanks and river curvature are true in terms of the overall dilution of the SQN thermal discharge. Although perhaps small, interactions resulting in the exchange of water between the main channel and overbanks, as previously discussed, are problematic only in terms of their impacts on monitoring. Compared to the model, secondary motions stemming from main channel/overbank interactions and river curvature will distort the prototype appearance of the SQN thermal discharge; however, the diffuser performance and entrainment coefficients should be roughly the same. Predictions from the model, though, will include bias due to measurement error and scale effects in the model.

The SQN model included tests for prototype river flows varying between -5000 cfs (reverse flow) to 30,000 cfs and diffuser discharges corresponding to both one- and two-unit operation of the plant. Effluent temperatures were tested at 10 F°, 20 F°, 30 F° above the ambient (upstream) temperature (5.56 C°, 11.11 C°, 16.67 C°). Roughly 100 thermistors were used to measure water temperatures in the model. The major findings from the model include the following:

- For the cases examined, the initial temperature difference between the ambient and SQN effluent is quickly reduced by the action of the diffuser jets to values below the thermal criteria (i.e., 3.0 C°/5.4 F°).
- A stratified surface layer is formed in nearly all the cases tested and extends upstream of the diffusers.
- The major portion of the jet mixing occurs within 500 feet downstream of the diffusers.
- The thermal criteria could be threatened for reverse flows of duration in excess of two hours, and may require cooling tower operation to prevent exceedances of the temperature limits. (Note: this finding is based on the thermal criteria of 1979, which included hourly averaging for the temperature rise.)
- The underwater dam does not adversely affect diffuser mixing.
- The underwater dam limits the thickness of stratified layers (thermal wedge) that may propagate upstream for low and reverse flow conditions.
- The experimentally determined entrainment coefficients yield mixed temperatures that are slightly conservative (i.e., lower) than those of the design theory.

Overall, the model study supports the adequacy of the diffuser design for efficiently mixing the thermal effluent in the receiving water. The model study also provided a good basis for defining the mixing zone. Although a large amount of the mixing occurs in the first 500 feet downstream of the diffuser, a length of about 1500 feet is needed, based on the overall design of the SQN heat dissipation system, to provide adequate dilution for the State thermal criteria. Confirmation of the diffuser performance and mixing zone, at least for the type of conditions examined in the model, is found in field studies, discussed in the following.

3.2 Field Studies

Field studies of the SQN thermal discharge have been ongoing since the plant began releasing heat to Chickamauga Reservoir. The NPDES permit effective July 1979 stated that the *"permittee shall implement a field program to verify model predictions and document the three-dimensional extent and configuration of the thermal plumes in the intake basin, diffuser pond, and Tennessee River."* The permit required studies for both one-unit and two-unit operation and specified that subsequent reports shall be submitted annually, if necessary.

Commercial operation of Unit 1 began in early July 1981. Subsequently, on July 24, TVA conducted the first hydrothermal study for the diffuser discharge (TVA, 1982). A summary of river conditions and plant conditions for the test is given in Table 1. The river discharge was about 27,000 cfs with an ambient water temperature of 81.1°F (27.3°C) and about 0.5 F° (0.3 C°) of stratification. SQN was operating in open mode, discharging about 1240 cfs through the upstream diffuser at a temperature about 20.9 F° (11.6 C°) above the ambient (5-foot) temperature. The study included measurements of water temperature in and around the diffuser mixing zone, allowing the development of isothermal plots to examine the three-dimensional extent of the thermal plumes. Example plots are given in Figure 6. In general, it was found that:

- The measured dilution of the thermal discharge was greater than that predicted by theory based on physical model tests.
- Intense initial mixing occurred with the cool bottom water in the immediate vicinity of the diffuser.
- Further mixing occurs at shallower depths, with the thermal plume emerging at the water surface about 660 feet downstream of the diffusers.
- After breaching the surface, the plume continued to spread, extending over a substantial depth at the downstream end of the mixing zone.
- A thermal wedge extended upstream of the diffuser about 300 feet.
- Water temperatures at the boundary of the mixing zone were well within NPDES limits.

As required by the permit, the hydrothermal study also included the diffuser pond, where it was found that the water temperature was fairly uniform and not significantly different from the temperature of that exiting the plant. This is because:

- The pond is small compared to the volume of water passing through the pond.
- The turbulence in the flow is strong enough to produce well-mixed conditions with little stratification.
- The surface area of the pond is small, resulting in very little heat loss to the atmosphere.

Because of these properties, it was concluded that the water temperature in the pond during helper mode operation, when the cooling towers are in service, would likely exhibit the same basic characteristics. Hence, no further hydrothermal studies were conducted for the pond. The diffuser pond, although part of the treatment system for SQN waste heat, is not naturally connected to Chickamauga Reservoir. As such, beginning with the NPDES permit effective September 1993, the diffuser pond is no longer recognized as waters of the State and is not included as part of the mixing zone.

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Table 1. Field Studies for Sequoyah Nuclear Plant

Date	River Conditions [A]			Sequoyah Conditions [A]							Measured NPDES Thermal Compliance [A]	
				Generation			Diffuser Operation					
	Discharge (cfs)	Ambient Temp [B] (°F)	Stratification [C] (F°)	Units	Total MWe	Mode	Legs [D]	Total Discharge (cfs)	Discharge Temp (°F)	Discharge Temp Rise [E] (F°)	Downstream Temperature [F] (°F)	Temperature Rise [G] (F°)
Jul 24, 1981	26,700	81.1	0.5	1	1100	Open	U/S	1240	102.0	20.9	84.0	2.9
Apr 4, 1982	20,000	57.2	0.9	1 & 2	2290	Open	U/S&D/S	2580	81.4	24.2	61.3	4.1
May 14, 1982	8,000	73.7	11.8	1 & 2	1460	Open	U/S&D/S	2550	80.5	6.8	72.6	-1.1
Sep 2, 1982	38,000	77.9	0.4	1 & 2	2260	Open	U/S&D/S	2550	102.8	24.9	80.4	2.5
Nov 10, 1982	35,000	59.0	0.2	1	1150	Open	U/S	1287	93.2	34.2	60.7	1.7
Mar 31, 1983	9,000	51.5	1.8	1 & 2	2100	Helper	U/S	2580	65.9	14.4	54.6	3.1
May 11, 1983	25,000	64.4	3.3	1 & 2	2350	Open	U/S&D/S	2580	88.0	23.6	68.7	4.3
Mar 1, 1996 [H]	20,000 to 43,000	46.0	-0.1	1 & 2	2300	Open	U/S&D/S	2490	73.2	27.2	Unsteady	Unsteady
Jul 24, 1997	40,000	83.9	3.6	1 & 2	2310	Open	U/S&D/S	2470	107.3	23.4	84.6	0.7
Mar 24, 1999	35,000	51.8	0.0	1 & 2	2080	Open	U/S&D/S	2490	76.0	24.2	53.8	2.0
Aug 2, 2000	9,000	82.1	0.2	1 & 2	2300	Helper	U/S&D/S	2480	100.2	18.1	85.6	3.5
Jul 27, 2002 [I]	17,000	84.0	1.7	1 & 2	2290	Helper	U/S&D/S	2610	99.3	15.3	86.1	2.1
Apr 23, 2003 [I]	30,000	63.2	1.1	1	1180	Open	U/S&D/S	1260	88.3	25.1	64.6	1.4

Notes:
(A) Approximate average values throughout duration of field study. Hourly conditions often vary throughout the study depending on the diurnal changes in meteorology, turbulent fluctuations, and perhaps other unsteady undulations in the mean flow.
(B) Ambient water temperature measured at 5-foot depth at Station 13 (SQN intake skimmer wall).
(C) Stratification computed as the difference in water temperature between the 5-foot depth and skimmer wall bottom opening.
(D) U/S = upstream diffuser leg and D/S = downstream diffuser leg.
(E) Diffuser discharge temperature rise computed as the difference between the diffuser discharge water temperature and the ambient water temperature.
(F) Downstream temperature as given by the average of field measurements at the 5-foot depth across the downstream edge of mixing zone.
(G) Temperature rise computed as the difference between the measured downstream water temperature and the ambient water temperature.
(H) Field study of March 1, 1996, conducted with unsteady river flows to evaluate temperature rate-of-change.
(I) Field studies of July 27, 2002, and April 23, 2003, included temperature measurements only at the downstream end of mixing zone.

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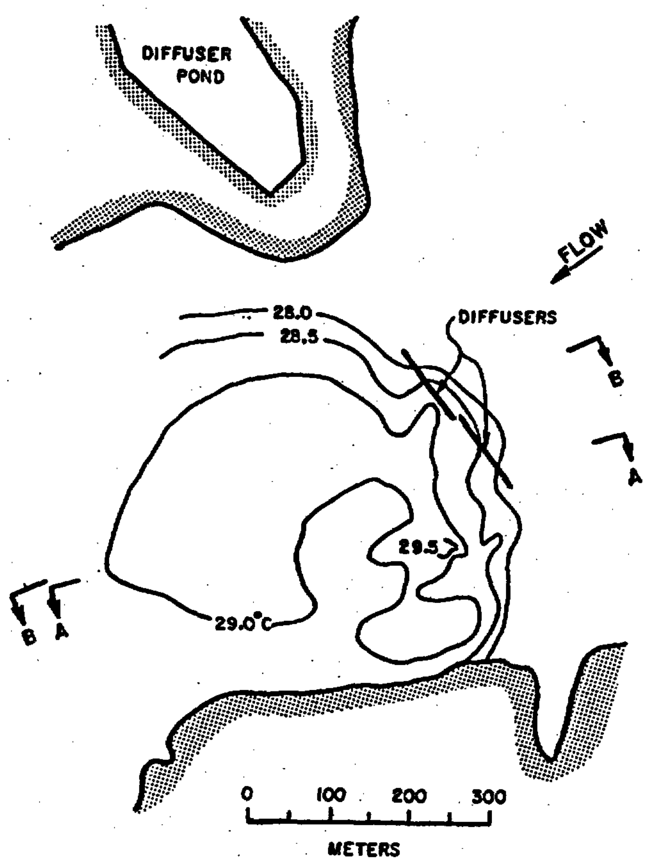
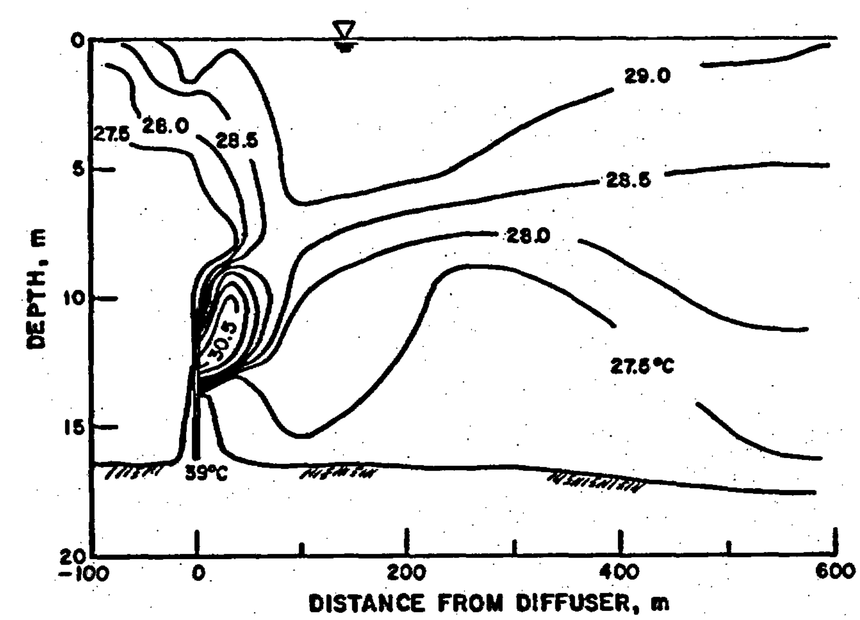


(a) Water Temperature Distribution at 5-Foot Depth



(b) Water Temperature Distribution along Section B-B

Figure 6. Water Temperature Measurements from Field Study of July 24, 1981
(after TVA, 1982)

It should be emphasized that the same is not true of the intake forebay, which consists of an embayment connected to the main channel of the river. As previously indicated, during closed mode operation, the intake forebay is considered part of the mixing zone. SQN has operated in closed mode only once, about ten days in January 1985. This event occurred when severe cold weather entered the Southeast coincident with a period of low river flow. Due to the need for power, it was undesirable to derate the plant. Thus, to prevent violation of the temperature rise criterion, SQN initiated closed mode operation (i.e., at that time the ΔT limit included a maximum hourly average of 3.0 C°/5.4 F°). Due to the unexpected nature of the event and the harsh winter conditions, it was not possible to perform a hydrothermal study of the forebay. It also is worth noting that in this event ice created about $1.2 million in damage to the cooling towers (1985 dollars). With the current thermal criteria and monitoring requirements, SQN should never again need to enter closed mode operation. However, if this were to change, and if sufficient time is available, TVA would perform appropriate studies of the intake forebay to determine the characteristics of the thermal discharge, per the intent of the NPDES permit of 1979, and to monitor indigenous populations of shellfish, fish, and wildlife.

Because not all the studies required by the 1979 permit were completed, the NPDES permit effective April 1983 again stated that the *"permittee shall implement a field program to verify model predictions and document the three-dimensional extent and configuration of the thermal plumes in the intake basin, diffuser pond, and Tennessee River."* In addition, to support the validity of implementing a computed compliance, the 1983 permit also specified *"field tests shall be conducted to establish the diffuser performance characteristics to be used in the numerical model."* These requirements were satisfied by six field studies conducted between April 1982 and May 1983 and summarized in a report dated August 1983 (TVA, 1983). The basic conditions of these tests again are given in Table 1. They include springtime studies conducted on April 4, 1982; May 14, 1982; March 31, 1983; and May 11, 1983; and fall studies conducted on September 2, 1982, and November 10, 1982. Depending on the specific study, the river discharge varied between about 8,000 cfs and 35,000 cfs and the ambient water temperature between about 51.5°F and 77.9°F (10.8°C and 25.5°C). In one case, stratification was essentially nonexistent (i.e., study of November 10, 1982) and in another it was as large as 11.8 F° (6.6 C°, May 14, 1982). SQN operation also varied among the studies, including both one-unit and two-unit operation, open and helper mode operation, and single and dual diffuser leg operation. The diffuser discharge temperatures varied between 6.8 F° (3.8 C°, May 14, 1982) and 34.2 F° (19.0 C°, November 10, 1982) above the ambient (5-foot) temperature. The studies included measurements of water temperature at depths of 3 feet, 5 feet, and 7 feet (1.0 meter, 1.5 meters, and 2.0 meters) along several cross sections, including:

- Longitudinal sections along the left and right sides of the mixing zone, and along the centerline of the mixing zone (looking downstream).
- Lateral sections at the downstream end of the mixing zone.
- Lateral sections along three transects within the mixing zone (March 31, 1983, and May 11, 1983, only).

The temperatures at the three depths were averaged to produce plots of the temperature at the 5-foot depth. An example for the study of May 11, 1983, is provided in Figure 7. This information, subsequently, was used to examine the three-dimensional extend of the thermal plumes. From the 1982 and 1983 tests it was found that:

- When hydrothermal conditions allow the thermal plumes to reach the surface, it usually does so very close to the diffusers.
- In some cases, the plumes extend upstream of the diffusers as a thermal wedge, the extent of which depends on the prevailing flow conditions.
- For studies conducted at higher river flows, 35,000 cfs and above, the thermal plumes are forced downstream (i.e., no thermal wedge extending upstream).
- For conditions with strong stratification, the thermal plumes can be diluted by cool bottom water before reaching the water surface, causing the plumes to remain submerged at depths perhaps greater than the 5-foot compliance depth (May 14, 1982).
- The thermal plumes are often asymmetric relative to the center of the mixing zone, with cooler water residing on the right side of the plume (facing downstream).
- The region where the thermal discharge raises the water temperature above ambient extends beyond the NPDES-defined mixing zone, and can be as much as 1500 feet wide at the downstream end of the mixing zone with both diffusers in operation.
- If the plume is defined by contours depicting the thermal criteria (e.g., for T_d, the locations where the downstream temperature is 30.5°C/86.9°F; for ΔT, the locations where the temperature rise is 3.0 C°/5.4 F°), the plume always remains within the NPDES-defined mixing zone.

Regarding the computed compliance, it was found that the hydrothermal model performed better in reproducing the measured temperature at the downstream end of the mixing zone than that of the Station 8 and Station 11 monitors (recall locations in Figure 1). The average discrepancy of the monitoring stations was about 0.72 F° (0.40 C°), whereas that of the numerical model was only 0.40 F° (0.22 C°).

Based on the results of the above field studies in March 1984, the State granted approval for SQN to use the numerical model to monitor compliance with the NPDES requirements, provided *"TVA verify that the measurement of the temperature of the water at the skimmer wall is not effected by the presence of the underwater dam and that this underwater dam has negligible effect upon the computed compliance model."* Later, in June 1984, TVA provided a short report containing measurements from a field test that included water temperature at the skimmer wall and the underwater dam (TVA, 1984). The measurements showed that the skimmer wall and underwater dam temperatures usually agree within 1 C°. The report also pointed out that any impact of the underwater dam would be properly incorporated into the computed compliance

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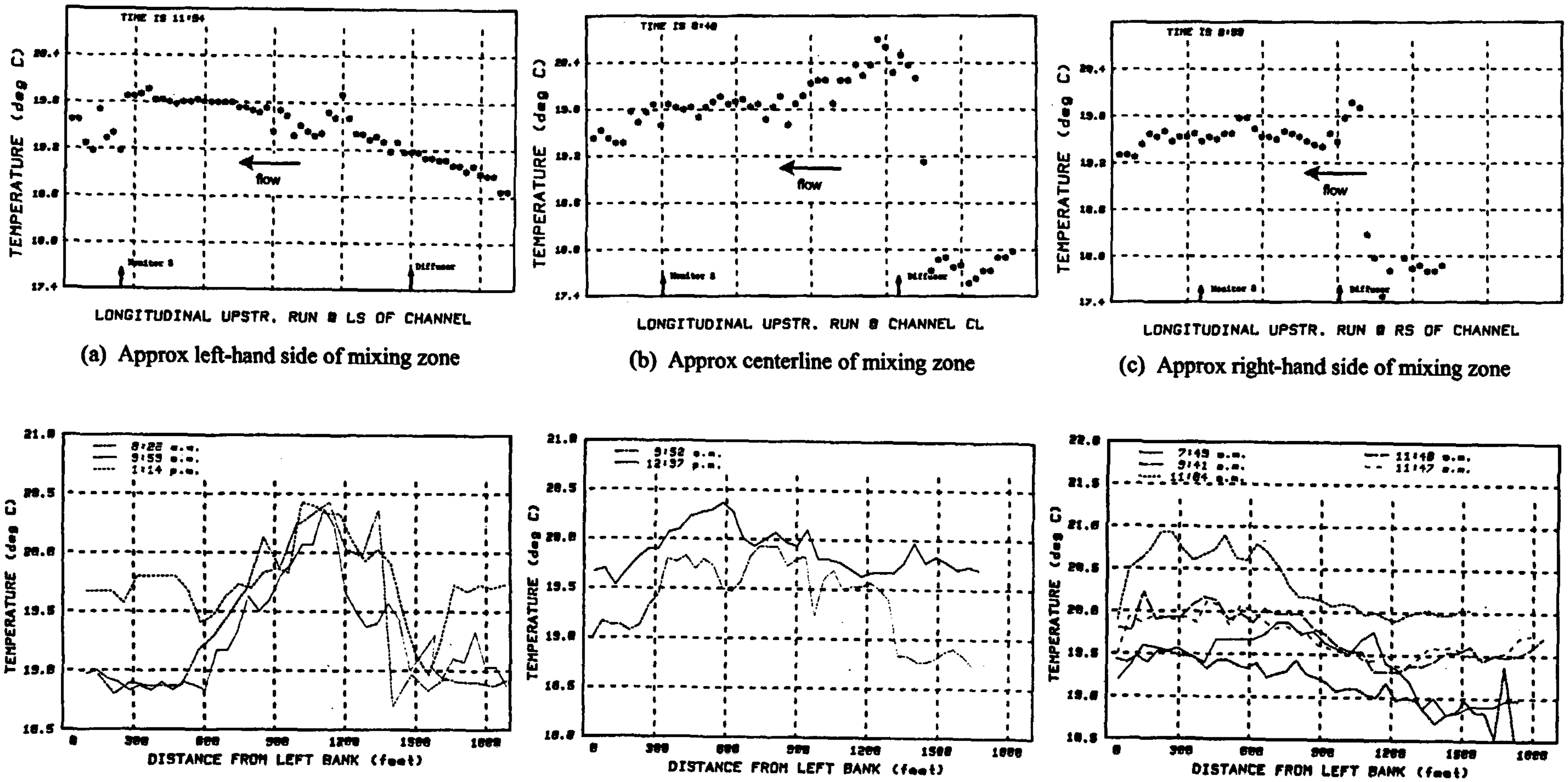


(a) Approx left-hand side of mixing zone

(b) Approx centerline of mixing zone

(c) Approx right-hand side of mixing zone

(d) Approx 500 feet downstream of diffusers

(e) Approx 1000 feet downstream of diffusers

(f) Approx 1500 feet downstream of diffusers (downstream end of mixing zone)

Figure 7. Water Temperature Measurements from Field Study of May 11, 1983
(after TVA, 1983; plots a, b, c based on facing northern side of main channel; plots d, e, f based on facing downstream)

because the numerical model is validated based on data from field studies that include the effects of the dam on the mixing of the thermal discharge.

The next concern prompting requirements for field studies arose out of a meeting between TVA and the State in November 1986 (TVA, 1986 and TDWPC, 1987). The purpose of the meeting was to discuss reservoir dynamics, hydrothermal processes, power plant operation, and other factors influencing compliance with thermal water quality standards. In the meeting, it was agreed that TVA develop a quality assurance (QA) program consisting of field verification tests to ensure that the plant-induced effects on water temperature were being determined accurately and consistently. In response to this agreement, TVA issued a QA program in September 1987 calling for verification studies to be performed for a variety of river and plant conditions (TVA, 1987). These conditions are summarized in Table 2. Briefly, conditions for river flow Q_R were divided into four ranges, $Q_R<10{,}000$ cfs; 10,000 cfs $\leq Q_R<25{,}000$ cfs; 25,000 cfs $\leq Q_R<35{,}000$ cfs; and $Q_R\geq 35{,}000$ cfs. For each range it was desirable to perform a study for each season of the year. The largest release of heat will include SQN operation with two units. The original plan called for a winter study at low flow with one rather than two units, but the recommendation for this case has since shifted to a two-unit study. The QA program also provided a description of the proposed field testing, which included measurements at depths and locations somewhat similar to those of previous studies. In the QA program some of the recommended field studies were already fulfilled by previous tests, as summarized above.

Table 2. Field Studies by TVA QA Plan of 1987

Season		Spring (Mar ~ May)		Summer (June ~ Aug)		Fall (Sept ~ Nov)		Winter (Dec ~ Feb)	
SQN Operation		1-Unit	2-Unit	1-Unit	2-Unit	1-Unit	2-Unit	1-Unit	2-Unit
River Discharge (cfs)	<10,000		5/14/82[B] 3/31/83[B]					Neglect	Add
	10,000 to 25,000		4/4/82[B] 5/11/83[B]		8/2/00[C]				
	25,000 to 35,000		3/1/96[C]	7/24/81[A]	7/24/97[C]	11/10/82[B]			
	>35,000		3/24/99[C]				9/02/82[B]		

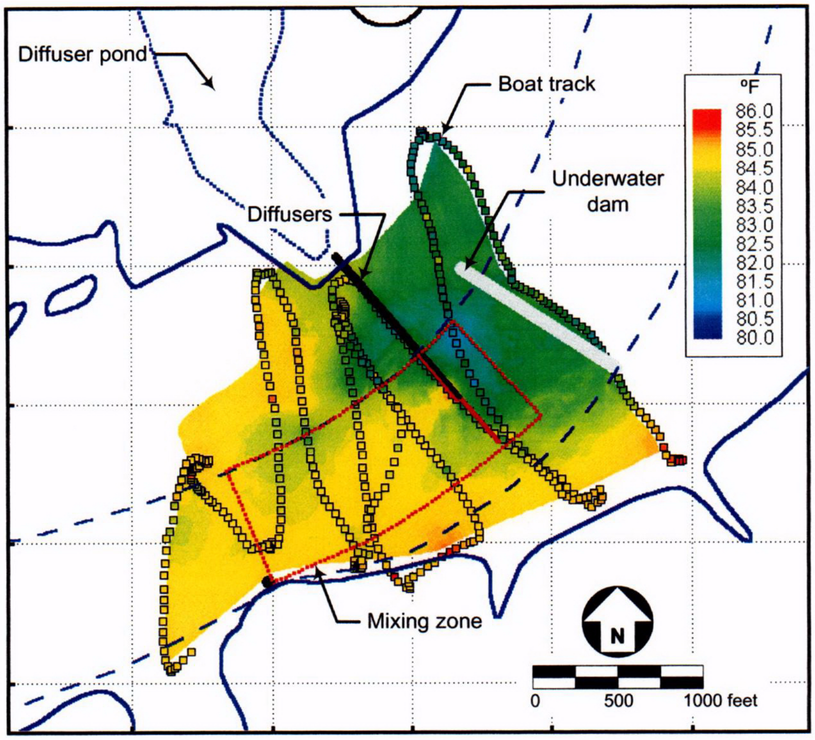
Notes
A. Field study summarized in report by TVA (1982).
B. Field studies summarized in report by TVA (1983).
C. Field studies not documented in formal TVA reports.

It is important to note that the NPDES permit effective April 1983 was designated to expire in March 1988. However, in late 1986, both units at Sequoyah were removed from service due to nuclear safety concerns. Unit 2 did not return to service until May 1988 and Unit 1 did not return to service until November 1988. Due to this, and due to ongoing studies and negotiations related to the 316(a) variance request of 1989, the plant continued to operate under the NPDES permit of 1983. The next permit was finally issued in September 1993. The 1993 permit did not reference the TVA QA program of 1987, but did require that *"the permittee shall perform instream surveys for the plume volume and area during November to March of 1992-1993 and 1993-1994 when the temperature rise is within the range of 3 C° to 5 C°."* In this statement, the period *November to March of 1992-1993* must have been a misprint because it preceded the effective date of the permit (i.e., September 1993). As such, this requirement was interpreted to include November to March of 1993-1994 and 1994-1995.

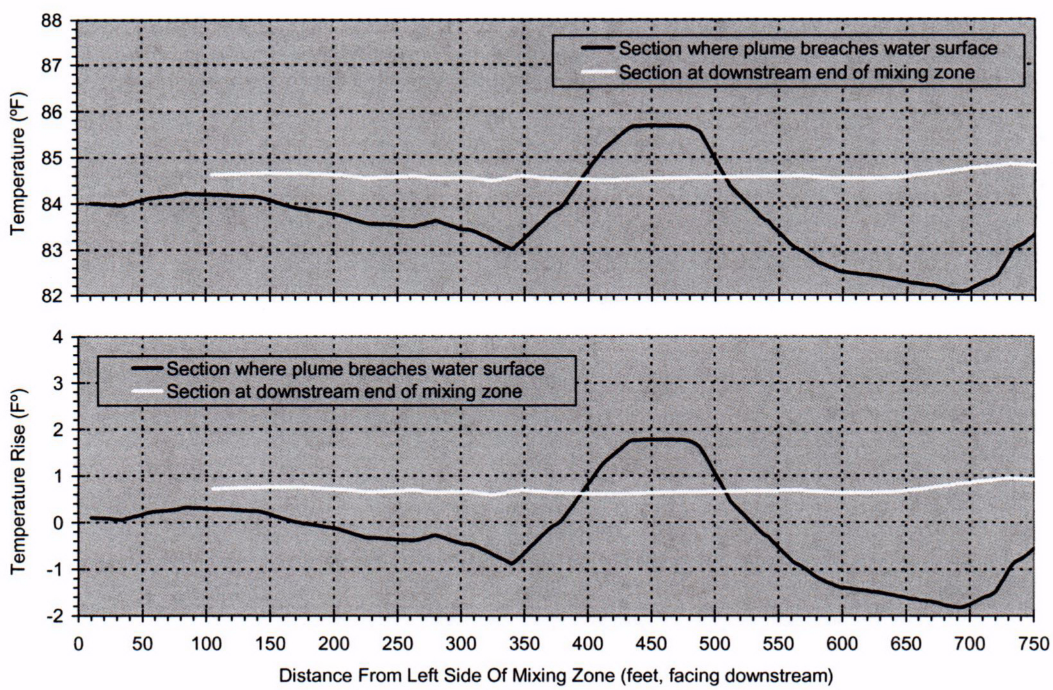
In the ensuing periods (i.e., November to March of 1993-1994 and 1994-1995), the river flow and water temperature did not reach conditions suitable for a field study to be performed for a temperature rise in the range of 3.0 C° to 5.0 C°/5.4 F° to 9.0 F°. Short-term spikes in temperature rise occurred, but did not persist for a period long enough to mobilize equipment and personnel for field measurements. Under these conditions, TVA moved forward to perform field studies as summarized by the QA program summarized in Table 2. Note that this program yet recommends wintertime studies at low river discharge, which produces a large temperature rise of the type stipulated for study in the NPDES permit of September 1993.

The field tests conducted during the tenure of the NPDES permit effective September 1993 are given in Table 1. They include spring studies on March 1, 1996, and March 24, 1999, and summer studies on July 24, 1997, and August 2, 2000. The study of March 1, 1996, was conducted in support of the supplemental 316(a) demonstration of 1996. The purpose of the study was to determine the zone of impact for the temperature rate-of-change. To create a rate-of-change event, the river discharge was altered in a short period from a flow of about 43,000 cfs to a flow of 20,000 cfs. The focus of the study was to examine the longitudinal (i.e., downriver) extent of the temperature rise created by the event. In this manner, the study did not include detailed measurements of the three-dimensional configuration of the thermal discharge, but only temperature profiles along the center of the river. The study found that although the longitudinal extent of the mixing zone (i.e., 1500 feet) was sufficient for maintaining the wintertime criteria for instream temperature rise (i.e., 5.0 C°/9.0 F°), changes at levels below the NPDES criteria can extend for a distance of at least two miles downstream of the diffuser.

In contrast, the studies of July 24, 1997, March 24, 1999, and August 2, 2000, were designed to evaluate the three-dimensional extent and configuration of the thermal discharge, as specified in the TVA QA program of 1987. Results of these studies are shown in Figure 8 through Figure 11. Each figure contains: (a) a plot of the water temperature distribution at the 5-foot compliance depth, and (b) plots of the water temperature and water temperature rise along transects across the mixing zone at the sections about where the thermal plumes breach the water surface and at the downstream end of the mixing zone, again at the 5-foot depth. It is important to note that these measurements were made by trolling temperature sensors through the water from a boat. The boat tracks are shown in the figures. The temperatures were measured with sensors having



(a) Water Temperature Distribution at 5-Foot Depth



(b) Water Temperatures Across Mixing Zone at 5-Foot Depth

Figure 8. Water Temperature Measurements from Field Study of July 24, 1997

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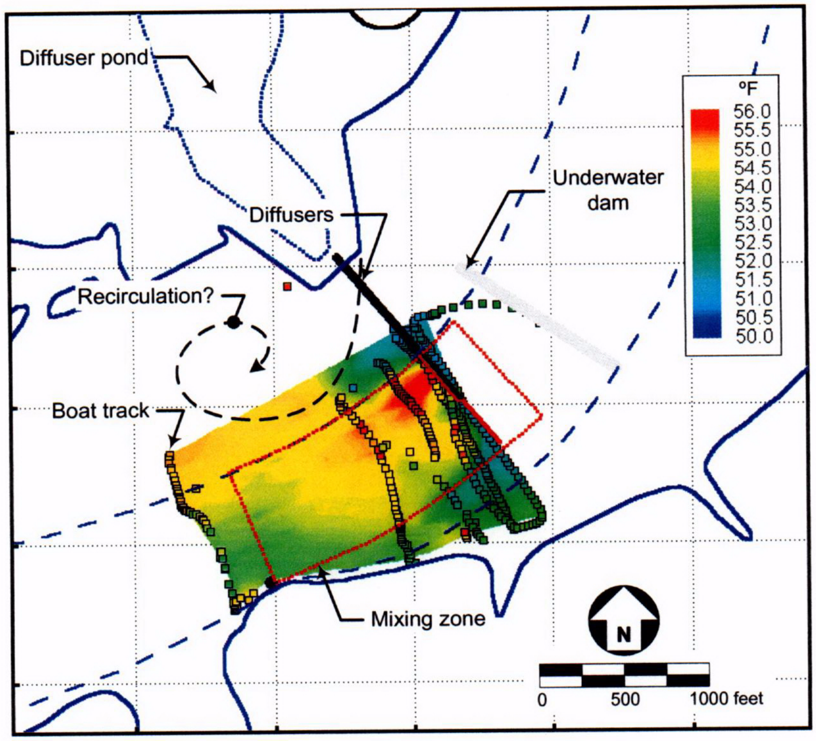
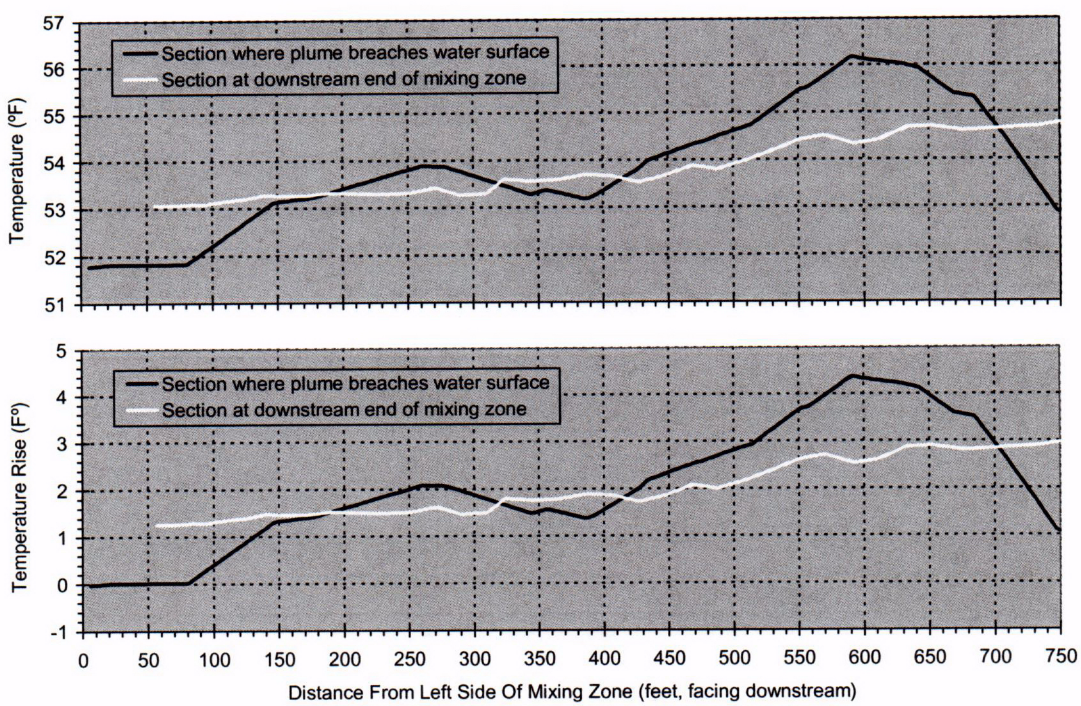


(a) Water Temperature Distribution at 5-Foot Depth



(b) Water Temperatures Across Mixing Zone at 5-Foot Depth

Figure 9. Water Temperature Measurements from Field Study of March 24, 1999

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