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VII. SIC CODES (4-digit, in order of profity)	R SECOND
A FIRST	B. SECOND
	(apeca))
7 4, 9, 1, 1 ELECTRIC SERVICES	7
15 16 - 19	15 16 - 19
C. THIRD	D. FOURTH
C (Specity)	c (specify)
7	
15 16 - 18	15 16 - 19
VIII. OPERATOR INFORMATION	
A, NAME	B. Is the name listed as
	I I I I I I I I I I I I I I I I I I I
TENNESSEE VALLEY AUTHORI	T Y muner?
C STATUS OF OPERATOR /Enter the appropriate letter into the approver b	D PHONE (prop. code & no.)
F = FEDERAL M = PLIBLIC (other than federal or state)	
S = STATE O = OTHER (specify)	
P = PRIVATE	
E. STREET OR P.O. BOX	
	┍╌┰╶┰╼┥
P.O. BOX 2000 OPS 4A.SON	
	<u>national second s</u>
	55
	G. STATE H. ZIP CODE IIX. INDIAN LAND
Hasopy parey	Is the facility located on Indian lands?
	, 1 N 3 7 3 7 9 YES X NO
15 16	40 41 42 47 - 51 52
X. EXISTING ENVIRONMENTAL PERMITS	
A. NPDES (Discharges to Surface Water) D. PSD (Air Emissions from	n Proposed Sources)
	Operating Permit, Cooling Tower, Unit 1
9 N T N 0 0 2 6 4 5 0 9 P 4150-30600701-010	(see next page for other air permits)
15 16 17 18	
B LIIC // Indemound Injection of Eluide)	
	pecny)
15 16 17 18 30 15 16 17 18	30
C. RCRA (Hazardous Wastes) E. OTHER (s	pecify)
	IIIII (specify)
9 R T N 5 6 4 0 0 2 0 5 0 4 9 T N R 0 5 0	0 1 5 Multi-Sector General Permit (stormwater)
15 16 17 18 30 15 16 17 18	30
XI. MAP	
Attach to this application a topographic map of the area extending to at least one mile bey	ond property boundaries. The map must show the outline of the
facility, the location of each of its existing and proposed intake and discharge structures, e	each of its hazardous waste treatment, storage, or disposal
facilities, and each well where it injects fluids underground. Include all springs, nyers and	other surface water bodies in the map area. See instructions
for precise requirements.	
XII. NATURE OF BUSINESS (provide a brief description)	
Contract Musican Plant (CON) and an alastic second the	
Sequoyan Nuclear Plant (SUN) produces electric power by thermonuclear fission.	
	·
XIII. CERTIFICATION (see instructions)	
I Certify under penalty of law that I have personally examined and am families with the	information submitted in this application and all attachments and
that, based on my inquiry of those persons immediately responsible for obtaining the in	nformation contained in the application. I believe that the
information is true, accurate and complete. I am aware that there are significant penal	ties for submitting false information, including the possibility of
fine and imprisonment.	
A. NAME & OFFICIAL TITLE (type or print) IB. SIGNATURE I	IC. DATE SIGNED
John T. Carlin	
Site Vice President, Sequoyah Nuclear Plant	VII. 15/11/2
	MWV [7] [7]
COMMENTS FOR OFFICIAL USE ONLY	
	EF
	55

EPA Form 3510-1 (8-90)

Form 1 - General Section X - Existing Environmental Permits

Chattanooga-Hamilton County Air Pollution Control Bureau

4150-30600701-03C
4150-30700804-06C
4150-10200501-08C
4150-30703099-09C
4150-30703099-09C
4150-30900203-10C
4150-20200102-11C
Operating Permit, Abrasive Blasting Operation
4150-20200102-11C
Operating Permit, Emergency Generators 1A, 1B, 2A, 2B and Blackout Generators 1 and 2



0.75 mi

N

0

TVA Sequoyah Nuclear Plant NPDES Permit No. TN0026450 Hamilton County April 2013

Places print or	huno in the			Ē	PA I.D. N	UMBER (copy from li	tem 1 of Form 1)	Form Ap OMB No	proved. . 2040-0086.	
Please print or	type in the	unshaded a	reas only.			TN50	640020504		Approval	expires 8-31-98	<u>. </u>
FORM 2C NPDES		PA	AF	PLICATI	ON FOR CON	U.S PERMIT IMERCIA	ENVIRON TO DISC AL, MININ Cons	MENTAL PROTECTI HARGE WASTEW G AND SILVICULT colidated Permits Prog	ON AGENCY ATER EXISTING URAL OPERATIC ram	MANUFACTU DNS	RING,
I. OUTFALL	LOCATIO	ON .		·		·	in a contraction	,,,,,,			
For each outf	all, list the	latitude ar	nd longitud	de of its loc	ation to th	e nearest	15 seconds	and the name of the	receiving water.		
A. OUTE	ALL	B.	LATITU	DE	C.	LONGITU	DE				
NUMBE	R	1 DEG	2 MIN	3 SEC	1 DEG	2 MIN	3 SEC	D.	RECEIVING WATE	R (name)	
(list)				0.020.	1.020.	2. 19111	0.020.	:		·	
101		35	12	30	85	5	15	Tennessee River			
101E		35	13	15	85	5	45	Tennessee River		· · · ·	
IMP 10	3	35	8	15	85	8	0	SQN Diffuser Pond		······	
IMP 10	1	35	8	30	85	8	0	SQN LOW VOIUME W	aste Treatment Pond]	
		30	13	30	00	5	15	Topposoo Pivor	_	<u> </u>	
117			13	30	00 95	5	15	Tennessee River			
117		35	13	30	85	5	15	Intake Eorebay	· · · · · · · · · · · · · · · · · · ·		
II. FLOWS S	OURCES		UTION A	ND TREA			OGIES	Intake i Orebay			
A. Attach a li labeled to treatment sources o	ne drawing correspon units, and f water and	showing the d to the more outfalls. If a l any collecti	e water flow e detailed d water bala ion or treatm	/ through the lescriptions ince cannot the nent measur	facility. Inc n Item B. C be determine es.	licate sourc onstruct a v ed (e.g., for	es of intake water balance certain minir	water, operations contribu e on the line drawing by s ng activities), provide a pio	uting wastewater to the howing average flows to ctorial description of the	effluent; and treatr between intakes, o e nature and amou	nent units perations, nt of any
B. For each storm wat	outfall, pro er runoff; (:	vide a descri 2) The avera	iption of: (1) age flow cor	All operation	ns contribut each operati	ing wastewa ion; and (3)	ater to the ef The treatme	fluent, including process v int received by the wastev	wastewater, sanitary wa vater. Continue on add	astewater, cooling litional sheets if ne	water, and cessary.
1. OUT-		2. 01	PERATIO	N(S) CONT	RIBUTING	G FLOW			3. TREATME	NT	
(list)		a. Ol	PERATIO	N (list)	-	b. AVER (inclu	AGE FLO	W a. DES	CRIPTION	b. LIST COI TABLE	DES FROM 2C-1
101	Dischar	ges from D	iffuser Po	nd include:		1490.	854 MGD	Discharge to surfa	ace water	4	A
			<u> </u>		<u> </u>			Sedimentation		1	· U
	(1) Lo	w Volume V ernal Monit	Waste Tre	atment Po	nd (via	(1.23	30 MGD)	pH adjustment / n	eutralization	2	к
	(a)	Discharge 1	from meta	l cleaning v	waste						
		ponds (IMP	P 107)								
	<u>(b)</u>	Turbine bui	ilding sum	p							
	(2) CC	W Dischar	rge Chann	el:		(1447.	014 MGD)				
	<u>(a)</u>	Raw coolin	g water sy	/stem				Disinfection (other	r)	2	Н
	(b)	Diesel fuel	recover tr	ench; high otable wat	or						
	(c)	Condenser	Circulatio	a system	<u> </u>						
	(d)	Stormwater	r Runoff	<u>g 095torn</u>							
	(3) Co	olina towe	r blowdow	n basin		(40.4	36 MGD)				
	(a)	Essential R	Raw Coolir	g Water sy	/stem	<u>``</u>		Disinfection (other	r)	2	́Н
	(b)	Cooling tov	vers (close	ed/helper n	node)			`	· · · · ·		· · · ·
		stormwater	runoff	<u> </u>							
	(c)	Liquid rad v	waste trea	tment syste	em			Ion exchange	·	2	<u> </u>
	(d)	Steam Gen	erator Blo	wdown		(0.4)		Multi-media filtrati	on	1	
	(4) Ya	rd drainage	e pond:			(2.12	25 MGD)	Sedimentation (se	ettling)	1	<u> </u>
	(a) (b)	Constructio	n/Demo la	and fill storr	nwater						
	(D) (Switchyard	runoπ	loodo					<u></u>		
		Various Du	nung nea	n							
	(5) Ne les	t Storm Was s evaporat	ater (Runc tion)	off, precipita	ation,	(0.04	49 MGD)	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
101E	Dischar emerge	ges from D ncy conditi	iffuser Po ons only.	nd during		0	MGD	Discharge to surfa	ace water	4	, A
OFFICIAL US	E ONLY	(effluent g	guidelines	sub-cate	gories)	I			· · ·		

EPA Form 3510-2C (8-90)

Please print or t	type in the unshaded	areas only.	E	EPA I.D. NU	JMBER (d	opy from Item 640020504	1 1 of Form 1)	Form App OMB No. Approval	proved. . 2040-0086. expires 8-31- <u>98</u>	
FORM 2C NPDES	EPA	A	PPLICATI	ON FOR	U.S. Permit Imercia	ENVIRONM TO DISCHA AL, MINING Consoliu	ENTAL PROTECT ARGE WASTEM AND SILVICUL dated Permits Pro	FION AGENCY VATER EXISTING TURAL OPERATIC gram	MANUFACTUI DNS	RING,
I. OUTFALL For each outf	LOCATION all, list the latitude	and longitur	de of its loc	ation to the	e nearest	15 seconds ar	nd the name of the	receiving water.	addalaet	an a
A. OUTF	ALL	B. LATITU	DE	C . I	LONGITU	DE	D	. RECEIVING WATEI	R (name)	
(list)	1. DEG.	2. MIN.	3. 320.	1. DEG.	2. MIN.	3. 320.				·.
See Page									<u></u>	
			<u>+</u>				• <u></u>			
		-					· ·			
			ļ			 				
			<u> </u>	<u> </u>		<u> </u>				
II. FLOWS. S	OURCES OF PO				CHNOLC)GIES				
C. Attach a li labeled to treatment sources o D. For each	ne drawing showing correspond to the m units, and outfalls. I f water and any colle outfall, provide a des	the water flow ore detailed of f a water bala ction or treatr cription of: (1	v through the lescriptions i nce cannot t ment measur) All operatio	facility. Ind n Item B. Co be determine res.	icate source onstruct a w id (e.g., for ng wastews	es of intake wait vater balance or <i>certain mining a</i> ater to the efflue The treatment r	er, operations contril a the line drawing by activities), provide a p ent, including process acceived by the wast	buting wastewater to the showing average flows b pictorial description of the s wastewater, sanitary wa	effluent, and treath setween intakes, op nature and amour astewater, cooling s	vent units perations, it of any
1. OUT-	2.		N(S) CON		G FLOW	rne treatment n		3. TREATME	NT	essary.
FALL NO (list)	a.	OPERATIO	N (list)		b. AVER		a. DE	SCRIPTION		ES FROM
IMP	Discharges from Pond (LVWTP):	Discharges from Low Volume Waste Treatment				30 MGD	Sedimentation (Settling)	1	U
103							pH adjustment /	neutralization	2	К
	(1) Discharges	from metal	cleaning w	aste	(0.00	22 MGD)				
	ponds (IMF	<u>, 107)</u>								
	(2) Turbine Bui	Iding Sump:	/olumo		(1.04	17 MGD)			ł	
	(a) Wiscellar Wastewa	iters	olume		1					
	(b) Turbine b	ouilding floor								
	aroine	9	r and equip	ment	· ·		pH adjustment /	neutralization	2	К
	(c) Condens	ate demin r	r and equip	n waste	· · · · ·		pH adjustment /	neutralization	2	К
·	(c) Condens (d) Seconda	ate demin. r	r and equip regeneratio aks and dr	n waste aindown			pH adjustment /	neutralization	2	К
	(c) Condens (d) Seconda (e) Steam G	ate demin. r ry system le enerator blo	r and equip regeneratio aks and dr wdown	oment n waste aindown			pH adjustment /		2	ĸ
	(c) Condens (d) Seconda (e) Steam G (f) Compone	ate demin. r ry system le enerator blo ant Cooling	r and equip regeneratio aks and dr wdown System wa	oment in waste aindown stewater		· · · · · · · · · · · · · · · · · · ·	pH adjustment /		2	к
	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar	ate demin. r ry system le enerator blo ant Cooling leous equip	r and equip regeneratio aks and dr wdown System wa ment coolir	oment in waste aindown istewater 19			pH adjustment /		2	к
	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde	ate demin. r ry system le enerator blo ant Cooling leous equip anser waste	r and equip regeneratio aks and dr wdown System wa ment coolir	oment in waste raindown istewater ig			pH adjustment /	neutralization	2	К
	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum stur	ate demin. r ry system le enerator blo ant Cooling leous equip anser waste ige ponds (r and equip regeneratio aks and dr wdown System wa ment coolir WTP)	n waste aindown stewater 19			pH adjustment /	neutralization	2 	К U
	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slut (3) Neutral was (4) Net Storm V evaporation	ate demin. r ry system le enerator blo ant Cooling neous equip enser waste dge ponds (ite sump (W Vater (Runc)	r and equip regeneratio aaks and dr wdown System wa ment coolir WTP) TTP) iff, precipita	in waste aindown istewater ig ation, less	(0.17	77 MGD))4 MGD)	pH adjustment / Sedimentation (s Landfill	neutralization	2 	К Q
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation Discharges from	ate demin. r ry system le enerator blo ant Cooling leous equip anser waste dge ponds (' te sump (W Vater (Runc) Metal Clea	r and equip regeneratio aks and dr wdown System wa ment coolir WTP) TP) off, precipita	an waste aindown istewater ng ation, less > Ponds:	(0.17 (0.00	77 MGD))4 MGD) 22 MGD	pH adjustment / Sedimentation (s Landfill Sedimentation (s	neutralization settling) Settling)		K U Q U
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation Discharges from	ate demin. r ry system le enerator blo ant Cooling teous equipi enser waste dge ponds (te sump (W Vater (Runc) Metal Clea	r and equip regeneratio aks and dr wdown System wa ment coolir WTP) TTP) off, precipita ning Waste	aindown aindown istewater ig ation, less > Ponds:	(0.17 (0.00 0.00	77 MGD) 24 MGD) 22 MGD 0 MGD)**	pH adjustment / Sedimentation (s Landfill Sedimentation (s pH adjustment / Chemical precip	neutralization settling) Settling) neutralization itation	2 	К Q К
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation Discharges from (1) Metal clean (2) Net Storm V	ate demin. r ry system le enerator blc ant Cooling heous equip enser waste dge ponds (' te sump (W Vater (Runc) Metal Clea ing waste Vater (Runc	r and equip regeneratio aks and dr wdown System wa ment coolir WTP) TTP) off, precipita ning Waste	oment on waste aindown istewater ng ation, less ≥ Ponds: ation, less	(0.17 (0.00 0.00 (0.00	77 MGD) 04 MGD) 22 MGD 0 MGD)**	pH adjustment / Sedimentation (s Landfill Sedimentation (s pH adjustment / Chemical precip	neutralization settling) Settling) neutralization itation	2 1 5 1 2 2 2 2 2	K U Q U K C
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation Discharges from (1) Metal clean (2) Net Storm V evaporation	ate demin. r ry system le enerator blo ant Cooling leous equipi enser waste dge ponds (ite sump (W Nater (Runc) i Metal Clea ing waste Vater (Runc)	r and equip regeneratic saks and dr wdown System wa ment coolir WTP) TP) off, precipita	oment aindown istewater ng ation, less ⇒ Ponds: ation, less	(0.17 (0.00 0.00 (0.00 (0.00	77 MGD) D4 MGD) 22 MGD 0 MGD)** 22 MGD)	pH adjustment / Sedimentation (s Landfill Sedimentation (s pH adjustment / Chemical precip Chemical oxidat	neutralization settling) Settling) neutralization itation ion	2 1 5 1 2 2 2 2 2	K U Q U K C B
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation (1) Metal clean (2) Net Storm V evaporation	ate demin. r ry system le enerator blo ant Cooling leous equipi enser waste dge ponds (' ste sump (W Vater (Runc) i Metal Clea ing waste Vater (Runc)	r and equip regeneratic eaks and dr wdown System wa ment coolir WTP) TP) wff, precipita	oment aindown istewater ng ation, less ⇒ Ponds: ation, less	(0.17 (0.00 0.00 (0.00 (0.00	77 MGD) 04 MGD) 22 MGD 0 MGD)** 22 MGD)	pH adjustment / Sedimentation (s Landfill Sedimentation (s pH adjustment / Chemical precip Chemical oxidat Flocculation	neutralization settling) Settling) neutralization itation ion	2 1 5 1 2 2 2 2 1	K U Q U K C B G
IMP 107	(c) Condens (d) Seconda (e) Steam G (f) Compone (g) Miscellar (h) Ice conde (i) Alum slue (3) Neutral was (4) Net Storm V evaporation Discharges from (1) Metal clean (2) Net Storm V evaporation ** Influent lines t Last MCWP disc	ate demin. r ry system le enerator blc ant Cooling leous equipi enser waste dge ponds (' ste sump (W Vater (Runc) ing waste Vater (Runc) o MCWP ar charge occu	r and equip regeneratio eaks and dr wdown System wa ment coolir WTP) TTP) off, precipita ning Waste ning Waste e disconne rred on 5/3	oment on waste raindown istewater 1g ation, less ⇒ Ponds: ation, less icted 1/2006	(0.1) (0.00 (0.00 (0.00	77 MGD) 04 MGD) 22 MGD 0 MGD)** 22 MGD)	pH adjustment / Sedimentation (s Landfill Sedimentation (s pH adjustment / Chemical precip Chemical oxidati Flocculation	neutralization settling) Settling) neutralization itation ion	2 1 5 2 2 2 2 1	K U Q U K C B G

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Please print or	type in the	unshaded a	reas only.		EPA I.D. N	UMBER (copy from Iter 640020504	n 1 of Form 1)	Form A OMB N Approv	pproved. lo. 2040-0086. al expires 8-31-98	3
FORM 2C NPDES		EPA	A	PPLICAT	ION FOR CON	US PERMIT IMERCIJ	ENVIRONM TOIDISCH AE MINING Consol	ENTAL PROTECT ARGE WASTEV AND SILVICUL dated Permits Pro	TION AGENCY VATER EXISTING TURAL OPERAT gram	MANUFACTU IONS	RING
I. OUTFALL For each outf	LOCATI all, list th	ON ; e latitude a	nd longitu	de of its lo	cation to th	e nearest	u.S.secondsia	nd the name of the	receiving water	an a	and the second of the second of the second
A OUTF NUMBE (list)	ALL R	B 1. DEG.	LATITUI	DE 3. SEC.	C. 1. DEG.	LONGITU 2. MIN.	IDE 3. SEC.	D	. RECEIVING WAT	ER:(name)	
See Page	e 1a			· ·····				<u> </u>	<u> </u>		
		ļ							·····		
								<u></u>			
					1						
						<u> </u>	<u>├</u>				
II. FLOWS, S	SOURCE	S OF POLI	UTION,	AND TREA			OGIES				
E. Attach a l labeled to treatment sources o	ine drawir correspo units, and of water an	ig showing th nd to the moi l outfalls. If a id any collect	e water flov e detailed water bala ion or treat	v through th descriptions ince cannot ment measu	e facility: Inc in Item B: C be determine res.	licate sourd onstruct av ed <i>(e.g., for</i>	ës ofrintake wa water balance o r certain mining	ter, operations contri n the line drawing by activities), provide a p	buting wastewater to the showing average flow pictorial description of t	e effluentrand treat s between intakes, c he nature and amou	ment units perations int of any
F. For each storm wa	outfall, pro ter runoff;	ovide a descr (2) The avera	iption of: (1 age flow co) All operation of the second se	ons contribut each operati	ing wastew ion; and (3)	ater to the efflue The treatment	ent, including process received by the wast	s wastewater, sanitary ewater. Continue on a	wastewater, cooling dditional sheets if ne	water; and cessary
1. OUT-		2. 0	PERATIO	N(S) CON	TRIBUTING	GFLOW			3. TREATM	ENT	
(list)		a. O	PERATIO	N (list)		b. AVEF	RAGE FLOW	a. DE	SCRIPTION	D.LIST CO	DES FROM
110	Discha	rges includ	e wastewa	ater from:		0.0	58 MGD	Discharge to sur	face waters	4	A
	(1) F	RCW system			·	**					<u> </u>
	(1) <u>C</u>	ooling towe	rs (closed	cycle)		**	0 MGD				<u> </u>
	(3) Li	quid rad wa	ste treatm	nent syster	n	**	0 MGD				
	(4) N le	et Storm W ss evaporat	ater (Rund tion)	off, precipit	ation,	(0.0	58 MGD)				
·	** Rec	ycle cooling	water du	ring closed	mode ope	ration is d	lischarged thro	ugh Outfall 110. C	Dutfall 110 has been	inactive for appro	 oximately
	18 yea	rs, but rema	ains in the	event the	plant goes	into close	ed mode.	· · · · · · · · · · · · · · · · · · ·			
116	CCWI	ntake Trash	n sluice			0.0	06 MGD	Discharge to sur	face waters	4	A
				<u> </u>							<u> </u>
117	Essent straine	ial Raw Co r backwash	oling Wate	er screen a	ind	0.0	14 MGD	Discharge to sur	face waters	4	A
											<u></u>
118	Dredge	Pond				0	MGD	Discharge to sur	face waters	4	A
								Sedimentation (settling)	1	U
	├──			<u> </u>					······································		<u> </u>
	Pond is industr	s not in servial activity in	vice at this n area. If i	time. The n service,	refore outfaithe pond w	all 118 is in ould provi	nactive. Only ide sedimenta	stormwater from s tion during dredge	surrounding vegetate activities and filtrati	ed area discharge on for lower depth	s. No 1 waste
	Waters	·									1
OFFICIAL US	SE ONLY	(effluent g	guideline	s sub-cate	gories)					·	

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CONTINUE ON PAGE 2

CONTINUED FROM PAGE 1c

C. Except	t for storm runoff, leaks, or s X YES (cor	pills, are any nplete the fo	y of the disc llowing tabl	charges descrit /e/	bed in Items II-	A or B intermitt	ent or seasona	1?	
			3. FREQ	UENCY			4. FLOW		
1. OUTFALL NUMBER (list)	2. OPERATION(s) CONTRIBUTING FLC (list)	DW a.	DAYS ER WEEK	b. MONTHS PER YEAR	a. FLOV (in n	V RATE ngd)	b. TOTAL (specify w	VOLUME with units)	c. DURATION
		(ș) av	pecify rerage)	(specify average)	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM, AVERAGE	2. MAXIMUM DAILY	(in days)
IMP 107 110 116 117 118 (a) Last MCW (b) Cooling Te	Metal cleaning waste water Cooling Tower blowdown b CCW Intake Trash Sluice ERCW Traveling Screen ar ERCW Strainer Backwash ERCW Dredge Pond	s asin nd 31/2006. Inf arges recycle	(a) (b) 1 4 3 (c) fluent lines ed cooling v	(a) (b) 12 12 (c) are cut and caj vater through c	(a) (b) 0.0060 0.0100 0.0040 (c) pped. Stormwa	(a) (b) 0.0450 0.0216 0.0096 (c) ater flows only a the plant is in	(a) (b) 0.0060 MG 0.0100 MG 0.0040 MG (c) are discharged closed mode.	(a) (b) 0.0450 MG 0.0216 MG 0.0096 MG (c) from pond. The plant has	(a) (b) < 1 < 1 (c) not entered
closed mo of approxi (c) No dredgi	de for approximately 18 yea mately 1487.4276 MGD. ng operations conducted du	ring current	10 remains permit cycle	inactive until c	losed mode op stated and no ir	eration is necendustrial activit	ssary, which w y in the area.	vill result in a di	scharge flow
	ON.								
A. Does an eff	uent guideline limitation pro	mulgated by nplete Item I	/EPA unde ///-B)	r Section 304 c	of the Clean Wa	ater Act apply t NO (go to Secti	o your facility? on IV)	· · · · · · · · · · · · · · · · · · ·	
B. Are the limit	ations in the applicable effluent of the applicable effluence of the applicable efflue	ient guidelin nplete Item I	e expresse ///-C)	d in terms of pr	oduction (or of	her measure o NO (go to Secti	f operation)? on IV)	•	
C. If you answe units used	ered "yes" to Item III-B, list t in the applicable effluent gui	he quantity v deline, and i	which repre-	sents an actua affected outfa	l measurement lls.	of your level o	f production, e	xpressed in the	e terms and
	······································	1. AVERAG	E DAILY PI	RODUCTION	<u></u>			2. AFFE	CTED
a. QUANTITY	PER DAY b. UNITS OF	MEASURE	, c	: OPERATION	I, PRODUCT, I (specify)	MATERIAL, ET	C.	OUTFA (list outfall r	LLS numbers)
IV. IMPROVEN	IENTS								
A. Are you no wastewater This include court order	w required by any Federal, t treatment equipment or pra es, but is not limited to, pern s, and grant or loan conditio	State or loca actices or an nit conditions ns.	il authority t y other env s, administr	o meet any im ironmental pro ative or enforce	plementation so grams which m ement orders, o	chedule for the ay affect the d enforcement co	construction, t ischarges desc ompliance sche	apgrading or or ribed in this ap dule letters, st	peration of plication? ipulations,
· · ····		YES (comp	olete the foll	lowing table)	·····	🛛 NO (go to Item IV-B	<u>)</u>	
1. IDENTIFIC	ATION OF CONDITION,	2. AFF		JTFALLS	3. BRIEF	DESCRIPTIO	N OF PROJEC		
	EEMENT, ETC.	a. NO.	b. SOURCE (OF DISCHARGE		<u> </u>		QUIRE	D JECTED
B. OPTIONAL may affect	.: You may attach additiona your discharges) you now h	I sheets des ave underwa	cribing any ay or which	additional wate you plan. Indi	r pollution con cate whether e	itrol programs ach program is	(or other enviro now underway	onmental project y or planned, a	<i>ts which</i> nd indicate
		MARK "X"	IF DESCRI	PTION OF AD	DITIONAL CON	TROL PROG	RAMS IS ATTA		
EPA Form 3510-	2C (Rev. 2-85)			PAGE 2 O	F 4			CONTINU	JE ON PAGE 3

EPA I.D. NUMBER (c	py from Item	10	of Form 1)
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		TN564002050	и			
CONTINUED FROM PAGE 2		110304002030				
A, B, & C: See instructions before p	roceeding - Complete on	e set of tables for eac	h outfall – Annotate	the outfall num	ber in the space pr	ovided.
NOTE: Tables V-A, V-B,	and V-C are included on	separate sheets num	bered V-1 through \	/-9.		
D. Use the space below to list any o may be discharged from any outf data in your possession.	f the pollutants listed in Ta all. For every pollutant yo	able 2c-3 of the instru u list, briefly describe	ctions, which you kr the reasons you be	ow or have rea lieve it to be pre	son to believe is di ssent and report an	scharged or y analytical
1. POLLUTANT	2. SOURCE		1. POLLUTANT		2. SOUR	CE
See site Biocide Corrosion Treatment Plan (B/CTP).						
dimethylamine (The use of dimethylamine will not result in detectible quantities at Outfall 101)	Steam Generator Layup					
						· .
VI. POTENTIAL DISCHARGES NO	COVERED BY ANALYS	51S.				
Is any pollutant listed in Item V-C a se	ubstance or a component	of a substance which	you currently use o	r manufactureva	sanihtermediatev	or final product
	- <i></i>		· -			
	S (list all such pollutants b	elow)	×	NO (go to Iten	n VI-B)	
	<u></u>				<u></u>	
	,				•	
,						
х 1						
				•		
					•	
					·	
			•			

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. TN0026450, IC25 toxicity testing has been conducted on discharges from Outfall 101 once per year when oxidizing biocides are being used and once per year when non-oxidizing biocides are being used. Results are routinely submitted with 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)
GEL Laboratories LLC	PO Box 30712 2040 Savage Road Charleston, SC 29407	(843) 556-8171	All pollutants except for field parameters (temperature, flow, pH, sulfite, and total residual chlorine)

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 property 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 gethering 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.)
John T. Carlin, Site Vice President, Sequoyah Nuclear Plant	(423) 843-7001
C. SIGNATUREA	D. DATE ȘIGNED
	5/1/13

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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

ł	V. INTAKE AND	EFFLUENT CH/	ARACTERISTICS	(continued from	m page 3 of Form 2	?-C)
I		•			- ·	

PARTA - You mus	st nrovi	de the resul	ts of at least one an	alvsis for e	verv pollutan	t in this table (Complete one ta	able for	each outfall. Se	e instructions for	additional	details	· · ·	والمراجع والمحادث	A Manual Sector of the	
	T		to of all reader only all			2. EFFLUENT						3. UNITS		4	INTAKE (optional)	
1. POLLUTANT		a. MAX	MUM DAILY VALUE		b. MAXIMUM	30 DAY VALUE	C. LO	NG TERM	AVRG. VALUE		1 (specify if blar	k)	a. LON	G TERM	
	L				(if ava	ailable)		(if ave	ailable)	d. NO. OF				AVERA	SE VALUE	b. NO. OF
	_ [(1) CONCENTRA	(2) MASS	CON	(1) CENTRATION	(2) MASS	(1) CONCENT	RATION	(2) MASS	ANALYSES	a. CO TRA	NCEN-	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
a. Biochemical Oxygen Demand (<u>B</u> OD)		<2.00								. 1	m	g/L		<2.00		1
b. Chemical Oxygen Demand (COD)		25.8								1	m	g/L		23.4		1
c. Total Organic Carbon (TOC)		2.87								1	m	g/L		2.84		[*] 1
d. Total Suspende Solids (TSS)	bd	4.67							·	1	m	g/L		2.64		1
e. Ammonia (as N	0	0.129								1	m	g/L		0.144	-	1
f. Flow	V	ALUE	1770	VALU	Ë		VALUE	15	527	762	M	GD		VALUE	516	1
g. Temperature (winter)	V	VALUE 34.4 VALUE 43.2			JE .		VALUE	26	6.5	394		°C		VALUE		
h. Temperature (summer)	V	ALUE	43.2	VALU	Ε.		VALUE	30	6.7	354	†	°C		VALUE	5.8	1
. рН	N	43.2 MINIMUM MAXIMUM 7.52 7.68			MUM -	MAXIMUM		>	<	4	STA	NḍARD L	INITS		>	
PART B -	Mark ' either	X" in colum directly, or i	n 2-a for each pollut ndirectly but express	ant you kno sly, in an ef	ow or have re fluent limitati	ason to believe ons guideline, y	is present. Ma ou must provid	ark "X" in e the re	n column 2-b fo sults of at least	r each pollutant yo one analysis for t	L ou believe hat polluta	to be absent. nt. For other	If you mar pollutants f	k column 2a for any or which you mark	pollutant which is lin column 2a, you must	nited.
L	provid	e quantitativ	/e data or an explan	ation of the	ir presence i	n your discharg	e. Complete o	ne table	for each outfall	. See the instruct	ions for ad	ditional detail	s and requi	rements.		
1. POLLUT-	a. BE	b. BE-	a. MAXIMUM	DAILY VALL	JE I	b. MAXIMUM 3	ODAY VALUE		c. LONG TERM	AVRG. VALUE	7	4.			LONG TERM	·
ANT AND	LIEVE	LIEVED				(if avai	lable)		(if ava	lable)	d. NO. OF	a. CONCEN-	b. MAS	s Av	ERAGE VALUE	b. NO. OF
CAS NO. (if available)	PRE SEN	AB-	(1) CONCENTRATION	(2) MA	ASS CO	(1) NCENTRATION	(2) MASS	со	(1) NCENTRATION	(2) MASS	ANAL- YSES	TRATION		(1) CONCENTRAT	(2) MASS	ANAL-
a. Bromide (24959-67-9)	X		<0.200	-							1	mg/L		<0.200		1
b. Chlorine, Total Résidual	x		<0.07				`				1	mg/L		<0.05		1
c. Color	x		20.0								1	PCU		15.0		1
d. Fecal Coliform		x														
e. Fluoride (16984-48-8)	x		<0.100								1	mg/L		<0.100		1
f. Nitrate- Nitrite <i>(as N)</i>	x		0.167								1	mg/L		0.127		1 -

ITEM V-B CONTINUED FROM PAGE V-1														
	2. MA	RK 'X'			3. E	FFLUENT	· ·			4. UN	ITS	5. INTA	KE (optional)	
1. POLLUT-	a. BE-	b. BE-	a. MAXIMUM DAI	LY VALUE	b. MAXIMUM 30 D	AY VALUE	c. LONG TERM AV	RG. VALUE	4 110 05			a. LONG TE	RM	b. NO. OF
CAS NO	PRF-	LIEVED AR-		(2) MASS	(if availabi	0) (2) MASS	(if availab) (1)	(2) MASS	ANAL-	a. CONCEN-	D. MASS	AVERAGE VA	(2) MASS	ANAL- YSES
(if available)	SENT	SENT	CONCENTRATION	(2) 10000	CONCENTRATION	(2) 1000	CONCENTRATION	(2)	YSES			CONCENTRATION	(2) 11/100	10,00
ig. Nitrogen, Total Organic <i>(as N)</i>	x		0.247						1	mg/L		0.314		1
h. Oil and Grease	х		<4.00						1	mg/L	_	<3.95		1
I. Phosphorus (as P), Total (7723-14-0) i. Radioactivity	x		<0.050						1	mg/L	 	<0.050		1
(1) Alpha, Total		X*										· · ·		
(2) Beta, Total		Х*												
(3) Radium, Total		X*	· · ·											•
(4) Radium 226, Total		X*	· · · ·				· ·							
k. Sulfate (as SO₄) (14808-79-8)	x		12.9						1	mg/L		12.9		1
l. Sulfide (as S)	x		<0.100						1	mg/L		<0.100		1
m Sulfite (as SO₄) (14265-45-3)	x		<2.0						1	mg/L		<2.0		1
n. Surfactants	х		<0.050						1	mg/L		<0.050		1
o. Aluminum, Total (7429-90- <u>5)</u>	x		0.050						1	mg/L		<0.050		1
p. Barium, Total (7440-39-3)	x		0.0279						-1	mg/L		0.0280		1
q. Boron, Total (7440-42-8)	x		0.0281						1	mg/L		0.0178		. 1
r. Cobalt, Total (7440-48-4)	x		<0.001						· 1	mg/L	L	<0.001		1
s. Iron, Total (7439-89-6)	х		0.131						1	mg/L		0.0919		1
t: Magnesium, Total (7439-95-4)	. X		6.36						1	mg/L		6.18		1
u. Molybdenum, Total (7439-98-7)	x		0.000564						1	mg/L		0.000584		1
v. Manganese, Total (7439-96-5)	x		0.0630	1					. 1	mg/L		0.0395		1
w. Tin, Total (7440-31-5)	x		<0.005						1	mg/L		<0.005		1
x. Titanium, Total (7440-32-6)	x		<0.005						1	mg/L		<0.005		1

Believed absent other than naturally occurring radioactive materials.

TN5640020504 101 **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 wastewate: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 brovide 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. 3. EFFLUENT 4. UNITS 5. INTAKE (optional) 1. POLLUTANT 2. MARK 'X' b. MAXIMUM 30 DAY VALUE c. LONG TERM AVRG. VALUE a. LONG TERM b. NO. OF AND CAS a. TESTb. BEc. BEa MAXIMUM DAILY VALUE AVERAGE VALUE NUMBER ING LIEVED LIEVED a. CONCENb. MASS (if available) (if available) d. NO. OF ANAL-(2) MASS (2) MASS (if available) RE-PRE-AB-(2) MASS (1) ANAL-TRATION (1) CONCEN-(2) MASS YSES (1) (1) QUIRED SENT SENT CONCENTRATION CONCENTRATION CONCENTRATION YSES TRATION METALS, CYANIDE, AND TOTAL PHENOLS 1M. Antimony, mg/L < 0.002 1 Total (7440-36-0) Х < 0.002 1 2M. Arsenic, Total Х < 0.005 1 mg/L < 0.005 1 (7440-38-2) 3M: Beryllium, mg/L < 0.0005 Total, (7440-41-7) Х <0.0005 1 1 4M. Cadmium, Х < 0.0001 mg/L < 0.0001 Total (7440-43-9) 1 1 5M. Chromium, Total (7440-47-3) Х < 0.003 mg/L < 0.003 1 1 6M. Copper, Total Х mg/L < 0.001 1 (7440-50-8) 0.00109 1 7M. Lead: Total (7439-92-1) Х < 0.002 mg/L < 0.002 1 1 8M. Mercury, Total Х 0.00000278 1 mg/L 0.00000169 1 (7439-97-6) 9M. Nickel, Total mg/L < 0.002 (7440-02-0) Х < 0.002 1 1 10M. Selenium, mg/L < 0.005 Х < 0.005 1 1 Total (7782-49-2) 11M. Silver, Total Х < 0.001 1 mg/L < 0.001 1 (7440-22-4) 12M. Thallium, mg/L Total (7440-28-0) < 0.0005 < 0.0005 1 Х 1 13M. Zinc, Total mg/L < 0.010 (7440-66-6) Х < 0.010 1 1 14M. Cyanide, mg/L < 0.005 Х < 0.005 1 1 Total (57-12-5) 15M Phenols, Х < 0.007 mg/L < 0.005 Total 1 1 DIOXIN DESCRIBE RESULTS 2.3.7.8-Tetra-Х chlorodibenzo-P Dioxin (1764-01-6)

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

OUTFALL NUMBER

CONTINUED FROM F	NUED FROM PAGE V-3														
1. POLLUTANT	1. POLLUTANT 2. MARK 'X' AND CAS a. TEST- b. BE- C. BE- NUMBER ING LIEVED LIEVED					3. EFFLUE	INT				<u>4. UN</u>	<u>iits</u>	5. IN	TAKE (option	al)
	a. TEST-	b. BE-	C. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	VY VALUE	c. LONG TERM AVR	G. VALUE	- NO 05			a LONG	TERM	b, NO. OF
(if available)	ING RF-	PRF.	LIEVED	(1)	(2) MASS	(it available)	/ (2) MASS	(if available)	(2) MASS	0. NU, UF	a. CONCEN-	D. MASS	(1) CONCEN-	ZIMASS	ANAL-
(<i>n</i> aranabib)	QUIRED	SENT	SENT	CONCENTRATION	(2)	CONCENTRATION	(2) 118 100	CONCENTRATION	(2) 11/ 100	YSES		•	TRATION	(2)	
GC/MS FRACTION - '	/OLATILE	COMPO	DUNDS												
1V. Acrolein (107-02-8)	x			<0.005		e .				1	mg/L		<0.005		1
2V. Acrylonitrile (107-13-1)	x			<0.005						1	mg/L		<0.005		1
3V. Benzene (71-43-2)	x			<0.001						1	mg/L		<0.001	· ·	1
4V. Bis (Chloro- methyl) Ether (542-88-1)			X	*									*		
5V. Bromoform (75-25-2)	x			<0.001						. 1	mg/L		<0.001		1
6V. Carbon Tetrachloride (56-23-5)	x			<0.001				-		1	mg/L		<0.001		1
7V. Chlorobenzene (108-90-7)	x			<0.001						. 1	mg/L		<0.001		1
8V. Chlorodi- bromomethane (124-48-1)	x	· ·		<0.001						1	mg/L		<0.001		1
9V. Chloroethane (75-00-3)	x			<0.001						1	mg/L		<0.001		1
10V. 2-Chloro- ethylvinyl Ether (110-75-8)	X			<0.005						1	mg/L		<0.005		1
(67-66-3)	x			<0.001						1	mg/L		<0.001		1
12V. Dichloro- bromomethane (75-27-4)	x			<0.001						1	mg/L		<0.001		1
difluoromethane	X*			<0.001				· · · ·		1	mg/L		<0.001		1
ethane (75-34-3)	x			<0.001						1	mg/L		<0.001		1
15V. 1,2-Dichloro- ethane (107-06-2)	x			<0.001						1	mg/L		<0.001		1
16V. 1,1-Dichloro- ethylene (75-35-4)	x			<0.001						1	mg/L		<0.001		1
17V. 1,2-Dichloro- propane (78-87-5)	x			<0.001						1	mg/L		<0:001		1
18V. 1,3-Dichloro- propylene (542-75-6)	x			<0.002						1	mg/L		<0.002		1
19V. Ethylbenzene (100-41-4)	x			<0.001						1	mg/L		<0.001		1
20V. Methyl Bromide (74-83-9)	x			<0.001						1	mg/L		<0.001		1
21V. Methyl Chloride (74-87-3)	x			<0.001						1	mg/L		<0.001		1

* NOTE: Bis (Chloro-methyl) Ether and Dichloro-difluoromethane were removed as requirements from 40 CFR Part 123 by US EPA in 1995.

					EPA I.D. NUMBER (copy from Ite	m 1 of Form 1)	OUTFALL I	NUMBER		· ·	•			
CONTINUED FROM PA	AGE V-4					j tn	15640020)504		101 [.]					•
1. POLLUTANT	2	MARK	X'	r	<u> </u>	3. EFFLU	ENT		L		4. U	NITS	5. INT	AKE (option	əl)
AND CAS	a. TEST-	b. BE-	c. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE	-			a. LONG	TERM	b. NO. OF
NUMBER	ING	LIEVED	LIEVED			(if available)	(if available)		d. NO. OF	a. CONCEN-	b. MASS	AVERAGE	VALUE	ANAL-
(if available)	RE-	PRE-	AB-		(2) MASS		(2) MASS		(2) MASS	ANAL-	TRATION		(1) CONCEN-	(2) MASS	YSES
COMPERACTION VI		COMPOL	INDE (00	CONCENTRATION	<u> </u>	CONCENTRATION		CONCENTRATION		1000			IRATION		
22V. Methylene	J	I	1 <u>1108/00</u>]		<u> </u>	j	1				<u> </u>	———			
Chloride (75-09-2)	l x	1		<0.002						1	mg/L		<0.002		1
	~									-	L				
23V. 1,1,2,2-Tetra-															
chloroethane				<0.001	1		1			1	mg/∟		<0.001		1
(79-34-5)		ļ			——	·									ļ
24V. Tetrachioro-		l I		~0.001	1					1	mall		-0.001	1	
euryiene (127-10-4)	1 ^			-0.001							ing, L		-0.001		
25V. Toluene	1			· · · · · · · · · · · · · · · · · · ·	t										
(108-88-3)				< 0.001						1	mg/L		< 0.001		1
															
26V. 1.2-Trans-				-0.004	ļ						/		-0.004		1
Dichloroethylene				<0.001	ľ						ing/∟		<0.001		
27V 1 1 1-Tri-															
chloroethane	1 x	Į		<0.001						1	ma/L		< 0.001		1
(71-55-6)		i		0.001							, s		0.001		
28V. 1;1,2-Tri-															
chloroethane				<0.001						1	∣ mg/∟		<0.001		1
(79-00-5)	<u> </u>	<u> </u>			<u> </u>										
29V. (Inchioro-				<0.001	1					1	mo/l		~0.001		1
	1 ^			-0.001						· ·	mg/L				
30V. Trichloro-															
fluoromethane	X*	1		<0.001					· ·	1	mg/L		<0.001		1
(75-69-4)		 			L										
31V. Vinyl				10.004	1		1 1		1		ma/l		10 001		
Chloride (75-01-4)	^			<0.001							тцу́с				
GC/MS FRACTION - A	CID COMF	OUNDS			<u> </u>		l					· · · ·			
1A. 2-Chloropheno		<u> </u>													
(95-57-8)	X	1		<0.010						1	mg/∟		<0.010		1
OA OA Dishlara		 		·	<u> </u>		<u> </u>								
2A, 2,4-Diciji010-	l x			<0.010						1	ma/l		<0.010		1
priorior (120-00-2)	1 ^			~0.010									-0.010		'
3A. 2,4-Dimethyl-															
phenol (105-67-9)				< 0.010						1	mg/L		<0.010		1
		ļ													<u> </u>
4A. 4,6-Dinitro-O-		1	1	-0.010]]	1	mail		-0.010		1
Cresol (534-52-1)	^			<0.010						1	l ma/c				
5A. 2.4-Dinitro-	+		1		<u> </u>										<u> </u>
phenol (51-28-5)	X			< 0.020						1	mg/L		<0.020		1 1
								· · · · · · · · · · · · · · · · · · ·							
6A. 2-Nitrophenol		{		10.040									10.040		
(88-75-5)	1 ^	1		<0.010	1						I mg/L		<0.010	}	
7A 4-Nitrophenol					<u> </u>								· · · ·		<u> </u>
(100-02-7)	X	· ·		<0.010	l					1	l ma/L		<0.010		1
											Ů				·
8A. P-Chloro-M															
Cresol (59-50-7)	X	1		<0.010						1	mg/L		<0.010		1
0A Bestachlara		I		<u> </u>	<u> </u>						— ···		ł		
phenol (97-96-5)	X X			<0.010	ļ		I .	*	· ·	1	ma/l		<0.010		1
				\$0.010	1					1 '			-0.010	1	
10A. Phenol			İ 👘										r		
(108-95-2)		1		< 0.010						1	mg/L		<0.010		1
		 	Ļ		L		<u> </u>		<u> </u>		L	L	· · · · · · · · · · · · · · · · · · ·	L	<u> </u>
11A. 2,4,6-1richloro-	l v	1	1	-0.010	(·	ſ			1	1	ma/l	1	<0.010	1	1
prieriol (88-00-2)	1 ^			0.010						'	l '''g/''		~0.010		'

* NOTE: Trichlorofluoromethane was removed as a requirement from 40 CFR Part 123 by US EPA in 1995.

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CONTINUED FROM	PAGE V-	5					_								
1. POLLUTANT	2	MARK	Χ.			3. EFFLUE	NT	1000 7000 000			<u>4. UI</u>	VITS	5. IN	TAKE (option	al)
AND CAS NUMBER	IA. TEST-	D. BE-	C. BE-		Y VALUE	b. MAXIMUM 30 DA		C. LONG TERM AVRO	J. VALUE		A CONCEN-	h MASS	A. LONG		D. NO. OF
(if available)	RE-	PRE-	AB-	(1)	(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	TRATION	0.14/100	(1) CONCEN-	(2) MASS	YSES
	QUIRED	SENT	SENT	CONCENTRATION		CONCENTRATION		CONCENTRATION		· YSES			TRATION		
GC/MS FRACTION -	BASE/N	UTRAL	COMPOL	JNDS											
1B. Acenaphthene	1														
(83-32-9)			^					1					-		
2B Acenaphtylene														<u> </u>	<u> </u>
(208-96-8)		1	I X ∣												
(200 00 0)		l													
3B. Anthracene															•
(120-12-7)			X												
48 Benzidine		 												· · · ·	
(92-87-5)			I x I												
(
5B. Benzo (a)															
Anthracene,										•					
(30-55-3) 6B Benzo (a)															
Pyrene (50-32-8)			X												
7B. 3,4-Benzo-	ł														
fluoranthene			^												
(200-99-2) 8B Benzo (ahi)									·						
Perviene			I x												
(191-24-2)															
9B. Benzo (k)			V												
Fluoranthene															
(207-08-9) 10B_Bis (2-Chlom-															
ethoxy) Methane	1	1	X												
(111-91-1)															
11B. Bis (2-Chloro-	· ·														
einyi) Einer															
12B. Bis (2-Chloro-															
isopropyl) Ether		1													
(102-60-1)															· · · ·
13B. Bis (2-Ethyl-								、							
(117-81-7)	1													}	
14B. 4-Bromo-															
phenyl Phenyl			X												
Ether (101-55-3)															
15B. Butyl Benzyl	}													}	
Phinalale (05-00-7)															
16B.2-Chloro-				······································				<u> </u>							
naphthalene															
(91-58-7)			 											· · · ·	
17B. 4-Chioro-			x												
Ether (7005-72-3)						-									
18B. Chrysene															
(218-01-9)		1												1	
		I													L
19B. Dibenzo (a,h)								·							
(53-70-3)			^											· ·	•
20B. 1,2-Dichloro-		1													
benzene (95-50-1)	l		X	<0.001				•		1	mg/L		<0.001		1
21P 1 2 Dichloro	 	I	╂												·
2 10. 1.3-Dichiolo-]		l x l	<0.001						1	ma/l		<0.001		1
	J .	1		-0.001								}	1 20.001	J	, ,

						EPA I.D. NUMBER (conv from Ite	am 1 of Form 1)	OUTFALL	NUMBER					
	CONTINUED FROM PAGE V-6					TN	15640020)504		101					
CONTINUED FROM P	AGE V-6	MADIC	171	· · · · · · · · · · · · · · · · · · ·		2 666111	NT								-0
AND CAS	a. TEST-	b. BE-	C. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 D/		c. LONG TERM AVR	G VALUE	r——	4. 0		a. LONG	S TERM	b. NO. OF
NUMBER	ING	LIEVED	LIEVED			(if evailable	ə)	(if available))	d. NO. OF	a. CONCEN-	b. MASS	AVERAG	E VALUE	ANAL-
(if available)	RE-	PRE-	AB-	(1)	(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	TRATION		(1) CONCEN-	(2) MASS	YSES
	QUIRED	ISENI	ISENI	CONCENTRATION	├ ────	CONCENTRATION	f	CONCENTRATION	f	YSES		├ ───		{	F
22B. 1 4-Dichloro-	SASE/NEL	TIRAL C		NDS (continued)							<u> </u>				
benzene (106-46-7)		1	l x	<0.001			I .			1	mg/L		< 0.001	1	1
					_					· ·	ů.				
23B. 3,3'-Dichloro-									_						
benzidine															
(91-94-1) 248 Diethul	<u> </u>	<u> </u>	<u> </u>		<u> </u>	·····		·	<u> </u>	<u> </u>		<u> </u>		·	
24D. Dietinyi Phtholoto	1					1		•							
(84-66-2)			1 ^ .				ł		ļ						
25B. Dimethyl	<u> </u>	t—	1						t	<u> </u>				1	
Phthalate			I X												
(131-11-3)															
26B. Di-N-Butyl													•		
Phthalate															
(84-74-2) 27B 2 4-Dinitro-		<u> </u>											<u>+-</u>		
toluene (121-14-2)			l x				· ·							1	
															·
28B. 2,6-Dinitro-										_					
toluene (606-20-2)			X												
29B DLN-Octvl	 	<u> </u>	<u> </u>		<u> </u>					<u> </u>			<u> </u>	l	
Phthalate		ļ	X X				1 · ·							ł	
(117-84-0)			1 ^	1						}				1	
30B. 1,2-Diphenyl-	1														
hydrazine (as Azo-									•		1				
benzene) (122-66-7)	I			[[(ļ	<u> </u>			[·	f
(206 44 0)														ļ	
(200-44-0)			^							ļ				1	
32B. Fluorene															
(86-73-7)			X	•											· ·
22D Haveshlersherzes			<u> </u>		<u> </u>			· · · · · · · · · · · · · · · · · · ·	ł	<u> </u>			l	ļ	<u> </u>
(118-74-1)		1							1			· ·		1.	
(110-74-1)			^												
34B. Hexa-															
chlorobutadiene	1		X			· ·					1		1	1	
(87-68-3) 35B Hoverblorn										<u> </u>			<u> </u>		
cyclopentadiene			X I											1	
(77-47-4)		1					.								
36B. Hexachloro-							1								
ethane (67-72-1)	1	1	X	· ·				•		1				1	1
378 Indono		<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>		ļ				<u> </u>	<u> </u>	
(1.2.3-cd) Pyrene			l x												
(193-39-5)															
38B. Isophorone	1													<u> </u>	
(78-59-1)	1	1	(X	[1	1			[Í	ſ	[[[
20D Nembthalana			<u> </u>				·			<u> </u>				<u> </u>	ł
(01 20 2)															
(81-20-3)			1 ^										1	ł	
40B. Nitrobenzene	1	T	1	1	1	1	1		1	<u> </u>			1	1	
(98-95-3)	. [*]			1					l.			1			
44D 31 NB		L			Ļ	ļ	ļ		L	<u> </u>		 	 	ļ	
4 (BYN-NILTO-	ł	1			I		ł							1	
(62.75.9)	1	1	1 ^				1						1		
42B, N-Nitrosodi-	1	<u> </u>	1	1	i	i	1		1				1	1	1
Propylamine			X	1							ľ				
(621-64-7)	I	L	1	i	L	1	1	·			I	I	1	L	L

CONTINUED FROM PA	GE V-/	NA DIZ										1950			
1. POLLUIANI	2	MARK	<u>X</u>		·	3. EFFLUE	:N I				4. UI	115	<u>5. INI</u>	AKE (optiona	a//
AND CAS	a TEST-	b. BE-	c. BE-	a. MAXIMUM DAILY	VALUE	b. MAXIMUM 30 DA	Y VALUE	C. LONG TERM AVR	G. VALUE				a. LONG	TERM	b. NO. OF
NUMBER	ING	LIEVED	LIEVED			(if available)	(if available)	l	d. NO, OF	a. CONCEN-	b. MASS	AVERAGE	VALUE	ANAL-
(if available)	RE-	PRE-	AB-	(1)	(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	TRATION		(1) CONCEN-	(2) MASS	YSES
1		SENT	SENT	CONCENTRATION	, -,	CONCENTRATION	1-7	CONCENTRATION		VSES			TRATION	·-/	
	CONCED					CONCENTION		001102111011011	····						
GC/MS FRACTION - B/	ASE/NEU		MPOUNI	<u>is (continuea)</u>						· ·					
438. N-Nitro-		1								1					()
sodiphenvlamine		1	IX												1 1
(86.30.6)	l														
(00-30-0)		l		·											
44B. Phenanthrene		J							j]		
(85-01-8)			IXI												
. ,	1	1 .													1
165 8	<u> </u>	<u> </u>	I												
45B. Pyrene	l ·														
(129-00-0))	1													
105 101 7	 _														
468. 1,2,4 - Tri-															
chlorobenzene			I X	<0.001						1	mg/L		I <0.001		1
(120.82.1)	1	1					i i		(Ŭ				
		<u> </u>													
GCIMS FRACTION - PE		3													
1P. Aldrin															
(309-00-2)	J	J	IXI]]
(
0.0 0110		 													
2P. α-BHC	1	1													1 1
(319-84-6)	1	1	·X												1
	1	I .	1						1						1 1
SP. n -BHC															
(319-85-7)															
-														1	1
4F. F DITO			1 🗸												
(58-89-9)			^									•			
															·
5P δ- BHC	_														
(210 96 9)			I v												
(319-00-0)			^												
													_		
6P. Chlordane		1													
(57-74-9)			X												
(0)-14-0)			1 ^.												
	·														
7P. 4,4'-DDT		I .													
(50-29-3)	1	}							ļ	J .] .] .]
()															
	<u> </u>	L	<u> </u>							<u> </u>					
8P. 4,4-DDE	1														1
(72-55-9)	1	•	IX							1					
	1	1					1		·						
	<u> </u>														
51 4,4-000	ļ		v '												
(72-54-8)	1		X												
· · ·							1								
10P. Dieldrin														•	
(60.67.4)	1														
(00-57-1)			· ^							í					1 1
				•					_						
11P. α-Endosulfan		T	I												
(115.29.7)		1	I V												!
(113-25-1)			^												
12P. B-Endosulfan	1	1								1					
(115-29-7)	í	1	(X						í	í I					()
(110.2017)															1
	<u> </u>	L	Į			<u> </u>			·	<u> </u>					I
13P. Endosulfan															
Sulfate	1	1			1		1		1		Į .) I
(1031.07.8)	1	1										l .			
11031-07-01								<u></u>							
14P: Endrin										1					[
(72-20-8)	1	1	IX						l	· .	1				1
	1	1							1	1	1 ·				1 1
15D: Federa		 	 												
10PMEnurin	1	1							1	Į !				ł	
Aldehyde	1	1	I X I		l I					1					4 I
(7421-93-4)	J	1	ļ	· · · ·					l	J	ł		J		J I
16D Honto-blog	<u> </u>	<u> </u>	1												t – – – – –
	l	1	I						1						L I
(76-44-8)	1	1	I X						I						1 1
				•						1	1		1		

EPA I.D. NUMBER (copy from Item 1 of Form 1; OUTFALL NUMBER

		R				· TN	5640020	504		101					
1. POLLUTANT		MARK	'X'			3. EFFLUE	NT				4. U	NITS	5 IN	TAKE (ontion	nal)
AND CAS	a. TEST-	b. BE-	c. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE	<u> </u>	a. LONC	TERM	a. LONG	TERM	b. NO. OF
NUMBER	ING	LIEVED	LIEVED			(if available) .	(if available)	1	d. NO, OF	AVERAG	E VALUE	AVERAGE	E VALUË	ANAL-
. (if available)	RE-	PRE-	AB-	(1)	(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	a. CONCEN-	b. MASS	(1) CONCEN-	(2) MASS	YSES
	QUIRED	SENT	SENT	CONCENTRATION		CONCENTRATION		CONCENTRATION		YSES ·	TRATION		TRATION	l	
GC/MS FRACTION -	PESTICI	DES (cor	tinued)												
17B. Heptachlor						- ·			Γ						
Epoxide		1 ·	I X I		[ſ					1	[[
(1024-57-3)	l I														
18P. PCB-1242						·		· · · · · · · · · · · · · · · · · · ·						<u> </u>	
(53469-21-9)	1 .	i i	X				{		ł	ł				i	
(,							1							1	
19P. PCB-1254													I	h	
(11097-69-1)		ļ	I X			•			ļ	ļ				1	
(Í	1
20P. PCB-1221			<u> </u>	· · · · · · · · · · · · · · · · · · ·										<u> </u>	
(11104-28-2)			X												
(1	1			((1.	1	
21P. PCB-1232		<u> </u>				<u> </u>									
(11141-16-5)			I X											1	
(· ·					· ·						1	1	
22P. PCB-1248	· · · ·			· · · · · · · · · · · · · · · · · · ·								·····			
(12672-29-6)			X											i i	
							1			·				i .	
23P. PCB-1260	i														
(11096-82-5)			X						·					l i	
· · ·								•						Í	
24P. PCB-1016											÷				
(12674-11-2)	1		X											1	
,		1											•	1	
25P. Toxaphene		1													
(8001-35-2)					1		1					•		1	
······································														1	1

Page V-9

PLEASE PRINT OF this information on SEE INSTRUCTIO	separa NS	te sheets (u	ISHADED AREAS	t) instead of comp	eport some or all of leting these pages.		EPA 1.0. NUMBEN	TN5640020	504	<u> </u>				
V. INTAKE AND E	FFLVE	NT CHARA	CTERISTICS (conti	inued from page 3	of Form 2-C)								OUTFAI	L NO. 103
PART A - You mus	t provid	le the result	ts of at least one an	alysis for every po	lutant in this table,	Complete one table	for each outfall. S	ee instructions for	additional	details.	addan y ya	· · · · · · · · · · · · · · · · · · ·		
1. POLLUTANT		a. MAXII	MUM DAILY VALUE	b. MAXI	2. EFFLUENT MUM 30 DAY VALUE (if available)	C. LONG 1	TERM AVRG. VALUE (if available)	d. NO. OF	· ·	3. UNITS specify if blank	k)	4. IN a LONG T AVERAGE	FAKE (optional) ERM /ALUE	b. NO. OF
		(1) ONCENTRA	(2) MASS	(1) CONCENTRA	(2) MASS	(1) CONCENTRAT	(2) MASS	ANALYSES	a. CO	NCEN- 6	. MASS		(2) MASS	ANALYSES
a. Biochemical Oxygen Demand (BOD)		. 2.91						1	m	g/L		<2.00		1
b. Chemical Oxygen Demand . (COD)		28.3						1	m	g/L		23.4		·1
c. Total Organic Carbon (TOC)		4.73					· · ·	1,	m	g/L		2.84		1
d. Total Suspended Solids (TSS)		16.0*				<9.1		54	m	g/L		2.64		1
e. Ammonia <i>(as N)</i>		0.170						1	m	g/L		0.144		1
f. Flow	. V/	VALUE VALUE 2.06 VALUE VALUE				VALUE	1.06	762	M	GD	. VA	LUE 161	6	1
g. Temperature (winter)	V#	VALUE VALUE V				VALUE				4		LUE		
h. Temperature (summer)	~~/	IUE	34.8	VALUE		VALUE		4		°C	. VA	LUE 25.8	3	1
I. pH	M	NIMUM 6.73	MAXIMUM 8.35	MINIMUM	MAXIMUM		\sim	72	STA	NDARD U	NITS			
PART B -	Mark "2 either o provide	(" in column lirectly, or in quantitativ	1 2-a for each pollutandirectly but expressive data or an explan	ant you know or ha sly, in an effluent li- ation of their prese	ave reason to believe mitations guideline, ence in your dischard	e is present. Mark ' you must provide th ge. Complete one to	"X" in column 2-b fo ne results of at least able for each outfal	or each pollutant yo one analysis for the instruct	ou believe hat polluta ions for ad	to be absent. nt. For other p Iditional details	If you mark collutants for vand requirer	olumn 2a for any po which you mark colu nents.	llutant which is limit mn 2a, you must	ed -
4 0011117	2.1	ARK 'X'			3.	EFFLUENT				4. U	INITS	5.	NTAKE (optional)	
ANT AND	a. BE- LIEVED	LIEVED	a. MAXIMUM	DAILY VALUE	D. MAXIMUM 3 (if ava	ilable)	ç. LONG TERM (if ava	ilable)	d. NO. OF	a. CONCEN-	b. MASS	a. LQ AVER		b. NO. OF
CAS NO. (if available)	PRE- SENT	AB- SENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANAL- YSES	TRATION		(1) CONCENTRATION	(2) MASS	ANAL- YSES
a. Bromide (24959-67-9)	X		<0.20						1	mg/L		<0.200		1
b. Chlorine, Total Residual	x		<0.06						1	mg/L		<0.05		1
c. Color	x		40.0					_	1	PCU		15.0		1
d. Fecal Coliform		x												
e. Fluoride (16984-48-8)	x		0.104						1	mg/L		<0.100		1
f.:Nitrate- Nitrite (as N)	х		0.301						1	mg/L		0.127		1

* Value based on historical TSS data from routine grab samples collected as required by the permit and does not include the composite sample result of 7.20 mg/L TSS.

ITEM V-B CONT	TINUED FR	OM PAGE	V-1											
	2. MA	RK 'X'		-	3. E	FFLUENT		<u>.</u>		4. UN	IITS	5. INT/	KE (optional)	
1. POLLUT-	a: BE-	b. BE-	a, MAXIMUM DAI	LY VALUE	b. MAXIMUM 30 E		c. LONG TERM AV	/RG. VALUE			h MASS	a. LONG TE	RM	b. NO. OF
CAS NO. (if available)	PRE- SENT	AB- SENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MÁSS	(1) CONCENTRATION	(2) MASS	ANAL- YSES	TRATION	D. MA33	(1) CONCENTRATION	(2) MASS	YSES
g. Nitrogen, Total Organic (as N)	x		0.740						1	mg/L		0.314		1
h. Oil and Grease	x		17.0				<5.7		55	mg/L		<3.95		1
I. Phosphorus (as P), Total (7723-14-0) i. Badioactivity	x		0.0696						1	mg/L		<0.050		1
(1) Alpha, Total		X*												,
(2) Beta. Total		X*												
(3) Radium, Total		X*												
(4) Radium 226, Total		X*							·					
k. Sulfate (as SO₄) (14808-7 <u>9-</u> 8)	x		23.7						1	mg/L		12.9		1
l. Sulfide (as S)	x		<0.100						1	mg/L		<0.100		1
m Sulfite (as SO₄) (14265-45-3)	X		2.0						1	mg/L		<2.0		1
n. Surfactants	×		<0.050						1	mg/L		<0.050		1
o. Aluminum, Total (7429-90-5)	x		0.0968						1	mg/L		<0.050		1
p. Barium, Total (7440-39-3)	x		0.0312					×	1	mg/L		0.0280		, 1 ,
q. Boron, Total (7440-42-8) ⁻	x		0.0287						1	mg/L		0.0178		1
r. Cobalt, Total (7440-48-4)	x		<0.001						. 1	mg/L		<0.001		1
s. Iron,Total (7439-89-6)	x		0.221						1	mg/L		0.0919		1
t. Magnesium, Total (7439-95-4)	. X		6.33						1	mg/L		6.18		1
u. Molybdenum, Total (7439-98-7)	х		0.00092						1	mg/L		0.000584		1
v. Manganese, Total (7439-96-5)	x		0.0966						1	mg/L		0.0395		1
w. Tin, Total (7440-31-5)	. X		<0.005						1	mg/L		<0.005		1
x. Titanium, Total (7440-32-6)	X		<0.005						1	mg/L		<0.005		1

* Believed absent other than naturally occurring radioactive materials.

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

CONTINUED FRO	M PAGE 3	OF FORM	A 2-C			TN	15640020)504		103					
PART C - If y	ou are a prir	nary indu	stry and t	this outfall contains pro	ocess waster	water, refer to Table 2	c-2 in the ins	structions to determine	which of the	GC/MS fr	actions you mi	ust test for.	Mark "X" in colu	imn 2-a for al	1
suc	h GC/MS fr	actions th	at apply I	to your industry and fo	r ALL toxic n	netals, cvanides, and	total phenols	. If you are not require	d to mark co	olumn 2-a	(secondary ind	tustries, non	process waster	vater outfalls.	and
nor	mauimd G	CMS frac	tions) m	nark "X" in column 2-b	for each pol	lutant you know or ha	ve reason to	believe is present. Ma	rk "X" in col	imn 2-c fo	r each nollutai	nt vou heliev	e is absent. If y	ou mark colu	mn
20	for any polly	tont you	muct or o	wide the results of at k		lucia for that pollutant	If you mod	column 2h for any not	lutant you n		o the regulte of	f at least on	o no obcolini. Il j	at pollutoot if	
20			must pro					Column 20 for any por					e analysis ior u	at postant n	you
KNC	ow or nave re	eason to I	Delleve II	will be discharged in o	concentration	is of 10 ppb or greate	r. Ir you mar	K column 20 for acrolel	n, acryionith	ie, 2,4 aini	ropnenol, or 2	-meinyi-4, t	anitrophenoi,	you must pro	/ide
the	results of a	least on	e analysis	s for each of these pol	lutants which	n you know or have re	ason to belie	ive that you discharge i	n concentral	tions of 10	0 ppb or great	er. Otherwis	se for pollutants	for which you	u mark
col	umn 2b, you	must eith	ner submi	it at least one analysis	or briefly de	escribe the reasons the	e pollutant is	expected to be dischar	rged. Note t	hat there a	ire 7 pages to	this part; ple	ease review eac	h carefully.	
Co	mplete one t	able (all i	7 pages) -	for each outfall. See i	instructions f	or additional details a	nd requireme	ents.			_				
1. POLLUTAN	r 2	. MARK	'X'			3. EFFLUE	ENT				4. UI	VITS	5. IN	TAKE (option	ial)
AND CAS	a TEST-	b. 8E-	c. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA		C. LONG TERM AVR	G. VALUE				a LONG	TERM	b. NO. OF
NIMBER	ING					/if available		/if pygilablo				h MASS	AVERAGE		ANAL
						(Il deanable	//////////////////////////////////////	(* 4)	(0) 111 00			D. MAGO .		(0) 11100	NOTO
(Il available)	RE-	PRE-	AB-		(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	TRATION	1	(I) CONCEN-	(2) MASS	TSES
		ISENT	SENT	CONCENTRATION	[CONCENTRATION	[CONCENTRATION		YSES	{	<u> </u>			f
METALS, CYANIE	DE, AND TO	TAL PHE	NOLS	· ·									<u> </u>	·	
1M. Antimony,															1 .
Total (7440-36-0)		X		< 0.002						1	_ mg/∟		<0.002		1 1
OM Annual Trial					l	L					<u> </u>		<u> </u>		
2M. Arsenic, Total	1		1	-0.005	1	1	l .				mail		-0.005		
(7440-38-2)				<0.005			1				i nig/i		<0.005		
3M Bendlium							<u> </u>								
Total (7440-41-7)		1 Y -		<0.0005			•			1	ma/l		<0.0005		1
10(21, (1440-41-1)		1 ^		~0.0000						'	g/ E		~0.0003		1 '
4M. Cadmium.			1	·····	1		· .								
Total (7440-43-9)		l x		<0.0001	1					1	l ma/L		<0.0001		1 1
											Ŭ.				· · ·
5M. Chromium,															
Total (7440-47-3)		X		< 0.003						1	mg/L		< 0.003		1
															L
6M. Copper, Total											1				
(7440-50-8)		X		0.00224						1	mg/∟	l	<0.001		1
The Labor Tetal				<u> </u>			<u></u>				<u> </u>	<u> </u>	<u> </u>		
/M. Lead, Total				-0.000		·					mall		<0.000		1 4
(7439-92-1)		· ^		<0.002							mg/L		<0.002		1 1
8M Mercury Tota				· · · · · · · · · · · · · · · · · · ·									<u> </u>		i
(7/39-97-6)	'	l v		0.00000103						1	ma/l		0 0000016	a	1 1
(1403-01-0)	1	1 ^		0.00000103							ing, _		0.0000010	ŀ	1 '
9M. Nickel, Total		1			t						1		· ·		
(7440-02-0)		I X		< 0.002						1	mg/L		< 0.002		1 1
· · · · ·				0.002							Ŭ				
10M. Selenium,															Г — —
Total (7782-49-2)		X		< 0.005						1	mg/L		< 0.005		1
		ļ													
11M. Silver, Total			1.		1										
(7440-22-4)		X		<0.001	1		ł		1	1	mg/L		< 0.001		1
	_	<u> </u>					l	···	···				<u> </u>		I
12M. Thallium,				-0.0005							mall		-0.0005		
10tal (7440-28-0)		^		<0.0005						1	là.r		<0.0005		
12M Zine Total			<u> </u>				l						<u> </u>	· · · ·	i
(7440 GE E)			· ·	-0.010	J]	ļ]	4	mail		-0.010		
(/440-00-0)		I ^ ∣		NO.010							I mg/L				l '
14M Cyanida		<u> </u>											<u> </u>	· · · · · · · · · · · · · · · · · · ·	
Total (57-12-5)		l x		<0.005	1					1	ma/L		<0.005		1 1
				~0.005		· ·							-0.005		1 '
15M Phenols.		<u> </u>	1	<u> </u>	l		1		<u> </u>						
Total	[I X		<0.005	Í					1	ma/L		<0.005		1
						·				<u> </u>					
DIOXÌN															
2,3,7,8-Tetra-				DESCRIBE RESULT	S										
chlorodibenzo-P		1	X												
Dioxin (1764-01-6)		í	I	L									· _		

.

CONTINUED FROM	AGE V-3				_										
1. POLLUTANT	2	MARK	'X'			3. EFFLUE	NT			-	4. UI	IITS	5. IN	TAKE (option	al)
	a. TEST-	b. BE-	C. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE	1 10 01		L 1400	a. LONG	TERM	b. NO. OF
(if available)	ING BE	DEVED		(1)	(2) MASS	(If available	(2) MASS	(ii available) (1)	(2) MASS	O. NO. OF	a. CONCEN-	D. MASS	AVERAGE (1) CONCEN	(2) MASS	ANAL-
(QUIRED	SENT -	SENT	CONCENTRATION	(2)1100	CONCENTRATION	(2) 10/100	CONCENTRATION	(2) 11/100	YSES	indition		TRATION	(2) (((A))	1020
GC/MS FRACTION -	OLATILE	COMPO	DUNDS												
1V. Acrolein (107-02-8)	x			<0.005						1	mg/L		<0.005		1
2V. Acrylonitrile (107-13-1)	x			<0.005						1	mg/L		<0.005		1
3V. Велzene (71-43-2)	x			<0.001						1	mg/L		<0.001		1 .
4V. Bis (Chloro- methyl) Ether (542-88-1)	[×	*				· · ·					*		
5V. Bromoform (75-25-2)	x			<0.001						1	mg/L		<0.001		1
6V. Carbon Tetrachloride (56-23-5)	х			<0.001						1	mg/L	-	<0.001		1
7V: Chlorobenzene (108-90-7)	x			<0.001						1	mg/L		<0.001		1
8V. Chlorodi- bromomethane (124-48-1)	x			<0.001			•			1 ·	mg/L		<0.001		1
9V. Chloroethane (75-00-3)	x			<0.001						1	mg/L		<0.001		1
10V. 2-Chloro- ethylvinyl Ether (110-75-8)	х			<0.005						1	mg/L		<0.005		1
11V Chloroform (67-66-3)	x			<0.001						1	mg/L		<0.001		1
12V. Dichloro- bromomethane (75-27-4)	x			<0.001						1	[.] mg/L		<0.001		1
13V. Dichloro- difluoromethane (75-71-8)	X*			<0.001						1	mg/L		<0.001		1
14V. 1,1-Dichloro- ethane (75-34-3)	x			<0.001						1	mg/L′		<0.001		1
15V. 1,2-Dichloro- ethane (107-06-2)	x			<0.001		·				1	mg/L _.		<0.001		1
16V. 1,1-Dichloro- ethylene (75-35-4)	x			<0.001						1	mg/L		<0.001		1
17V. 1,2-Dichloro- propane (78-87-5)	x			<0.001						1	mg/L		<0.001		1
18V. 1,3-Dichloro- propylène (542-75-6)	x			<0.002						1	mg/L		<0.002		1
197. Ethylbenzene (100-41-4)	x			<0.001						1	mg/L		<0.001		1
20V. Methyl Bromide (74-83-9)	x			<0.001						1	mg/L		<0.001		1
21V. Methyl Chloride (74-87-3)	x			<0.001						1	mg/L		<0.001		1

* NOTE: Bis (Chloro-methyl) Ether and Dichloro-difluoromethane were removed as requirements from 40 CFR Part 123 by US EPA in 1995.

						EPAT.D. NUMBER (copy from Ite	m 1 of Form 1)	OUTFALL	NUMBER					
CONTINUED FROM PA	GE V-4					TN	15640020)504		103					
1. POLLUTANT		MARK	X			3. EFFLUE	NT		·		4. U	NITS	5. INT	AKE (option)	al)
AND CAS	a. TEST	b. BE-	c. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE				a. LONG	TERM	b. NO, OF
NUMBER (if available)	ING RE-	LIEVED PRE-	LIEVED AB-		(2) MASS	(if available (1)) (2) MASS	(if available) (1)	(2) MASS	d. NO. OF ANAL-	a. CONCEN- TRATION	b. MASS	AVERAGE (1) CONCEN-	(2) MASS	ANAL- YSES
GC/MS ERACTION - V		COMPOL	INDS (co	ntinuedi		CONCENTRATION		CONCENTRATION		1363	-		INATION		
22V. Methylene		1		1	1		·								
Chloride (75-09-2)	_ X			<0.002						1	mg/L		<0.002		1
23V. 1,1,2,2-Tetra- chloroethane (79-34-5)	x			<0.001		·		· · ·		1	mg/L		<0.001		1
24V. Tetrachioro- ethylene (127-18-4)	x			<0.001						1	mg/L		<0.001		1
25V. Toluene (108-88-3)	x			<0.001						1	mg/L		<0.001		1
26V. 1,2-Trans- Dichloroethylene (156-60-5)	x			<0.001						1	mg/L		<0.001		1
27V. 1,1,1-Tri- chloroethane	x			<0.001						1	mg/L		<0.001		1
28V. 1,1,2-Tri- chloroethane (70,00,5)	x			<0.001						1	mg/L		<0.001		1
29V. Trichloro- ethylene (79-01-6)	x			<0.001			· · ·			1	mg/L		<0.001		1
30V. Trichloro- fluoromethane (75-69-4)	X*			<0.001						1	mg/L		<0.001		1
31V. Vinyl Chloride (75-01-4)	x			<0.001						1	mg/L		<0.001		1
GC/MS FRACTION - A	CID COMP	POUNDS													
1A. 2-Chloropheno (95-57-8)	x			<0.010	·. ·					1	mg/L		<0.010		1
2A. 2.4-Dichloro- phenol (120-83-2)	x			<0.010						1	mg/L		<0.010		1
3A. 2,4-Dimethyl- phenol (105-67-9)	x			<0.010					1	1	mg/L		<0.010		1
4A. 4,6-Dinitro-O- Cresol (534-52-1)	x	·		<0.010						1	mg/L		<0.010		1
5A. 2,4-Dinitro- phenol (51-28-5)	×			<0.020						[·] 1	mg/L		<0.020		1
6A. 2-Nitrophenol (88-75-5)	x			<0.010						1	mg/L		<0.010		1
7A. 4-Nitrophènol (100-02-7)	x			<0.010						1	mg/L		<0.010		1
8A. P-Chloro-M Cresol (59-50-7)	• X			<0.010						1	mg/L		<0.010		1
9A. Pentachloro- phenol (87-86-5)	X			<0.010						1	mg/L		<0.010		1
10A: Phenol (108-95-2)	x			<0.010						1	mg/L		<0.010		1
11A 2,4,6-Trichloro- phenol (88-06-2)	x			<0.010						1	mg/L		<0.010		1

NOTE: Trichlorofluoromethane was removed as a requirement from 40 CFR Part 123 by US EPA in 1995.

CONTINUED FROM	PAGE V-	5						·							
1. POLLUTANT	2	MARK	X'			<u>3. EFFLUE</u>	NT				<u>4. UI</u>	NITS	5. IN	TAKE (option	ial)
AND CAS	a. TEST- ·	b. BE-	c. BE-	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE	م مد ا			a, LONG	TERM	b. NO. OF
lif evailable)	DE.	DOF.		(1)	12) MASS	(11 available	(2) MASS	(11 available)	(2) MASS		TRATION	D. MASS	(1) CONCEN	1/2) MASS	ANAL-
(แลงละสมเสบเอ)	OUIRED	SENT	SENT	CONCENTRATION	(2) 10/00	CONCENTRATION	(2) 101/100	CONCENTRATION	(2) 112 100	YSES	normon		TRATION	(2) 102/00	
GC/MS FRACTION -	BASE/NE	UTRAL	COMPOL	JNDS											
1B. Acenaphthene															
(83-32-9)			X												
2B. Acenaphtylene		1													
(208-96-8)		. ·											·		
2P Anthraceno						·									
(120-12-7)			X			· •									
4B. Benzidíne															
(92-87-5)	•		X												
58. Benzo <i>(a</i>)															
Anthracene	[ſ	^		· ·										
(56-55-3)															
68. Berizo (a) Pyrene (50-32-8)) .	x												
7B. 3.4-Benzo-				·····					i						
fluoranthene		·													
(205-99-2)								· <u>· · _</u>							
8B. Benzo (ghi)															
Perylene															
(191-24-2)						· · _ ·	_								
9B. Benzo (k)															
Fluoranthene															
(207-08-9)			· ·	·											
10B Bis (2-Chloro-															
ethoxy) Methane		J	^	•								ļ			
(111-91-1)			 										·		
11B. Bis /2-Chloro-			l x l												
		1										•			
12B Bis (2-Chlom-															
isonmovil) Ether	1		X												
(102-60-1)		Į											Į		
13B Bis (2-Ethyl-	<u> </u>	1											(
bervi) Phthalate			X											ł	
(117-81-7)		l													
14B. 4-Bromo-		1												r	
phenyl Phenyl															
Ether (101-55-3)	L	l										Ĺ		L	
15B. Butyl Benzyl															
Phthalate (85-68-7)			X								•				
16B. 2-Chloro-														1	
naphthalene													ł		
(91-58-7)			L			<u>`</u>			•						
17B.4-Chloro- phenyl Phenyl			x											Ì	
Ether (7005-72-3)	·												<u> </u>		
18B. Unrysene															
(218-01-9):	1	ł							1	· ·		ł	l '	1	
		 	<u> </u>				·	· · ·		┝───	<u> </u>		<u> </u>	├ ───	
198. DiDenzo (a.h)	1			1					, i						
	1	l -			1							l	l		
20B 1 2-Dichloro-	<u> </u>	[· · · · · · · · · · · · · · · · · · ·						<u> </u>		<u> </u>	†	<u> </u>	
benzene (95-50-1)	1			<0.001	· · ·			_	l	1	ma/L		<0.001		1
										· .					
21B. 1,3-Dichloro-															
benzene (541-73-1)		1		<0.001						1	mg/L	ļ	<0.001		1

EPA I.D	. NUMBER (c	opy fri	om item	1 of Form 1)	OUTFALL NUMBER	
· ·		· ·				

AGNENNED FROM						TN5640020504 103									
1. POLLUTANT	AGE V-6	MARK	·X'	<u></u>		3. EFFLUE	NT				4. U	VITS	5 INT		el)
AND CAS	a. TEST-	b. BE-	C. BE-	a. MAXIMUM DAIL	YVALUE	b. MAXIMUM 30 DA	Y VALUE	c. LONG TERM AVR	G. VALUE		a CONCEN-	6 MASS	a LONG	TERM	b, NO. OF
(if available)	RE-	PRE-	AB- SENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANAL- YSES	TRATION		(1) CONCEN- TRATION	(2) MASS	YSES _
GC/MS FRACTION -	BASE/NEI	TRAL C	OMPOU	NDS (continued)											·
22B. 1,4-Dichloro- benzene (106-46-7)	1	ł	x	<0.001						1	mg/L		<0.001		1
23B. 3.3'-Dichloro- benzidine	†		x												
(91-94-1)															┢───┨
Phthalate (84-66-2)			x												
25B: Dimethyl														······	
Phihalate (131-11-3) 26B_ Di N.Butu	<u> </u>	[·										ļ	<u> </u>
Phthalate (84-74-2)			X												
27B. 2,4-Dinitro- toluene (121-14-2)	Ī		x												
28B. 2,6-Dinitro-	<u>†</u>														
29B. Di-N-Octvl		<u> </u>													└───┤
Phthalate (117-84-0)			х								N				
30B. 1,2-Diphenyl- hydrazine (as Azo-			x								_				
henzene) (122-66-7) 31B. Fluoranthene (206-44-0)															h
(200-44-0) 32B. Fluorene	<u> </u>	· ·				· · · · · · · · · · · · · · · · · · ·									k
(86-73-7)			X												
33B. Hexachlorobenzene (118-74-1)			X												
34B. Hexa- chlorobutadiene	1		x	·											
(87-68-3) 35B. Hexachloro-	<u> .</u>	<u> </u>					• •				<u> </u>				
cyclopentadiene (77-47-4) 268 Herechlere	 														ļ
ethane (67-72-1)			X										}		
37B. Indeno (1,2,3-cd) .Pyrene			x									-			
(195-39-5) 388: [sophorone (78-59-1)	1		x											}	
39B. Naphthalene															<u> </u>
(91-20-3)			X								L	L			
408: Nitrobenzene (98-95-3)			x			· .									
41B. N-Nitro- sodimethylamine	1	1	X												
102-70-9) 42B. N-Nitrosodi- Propylamine			x					- <u> </u>							
(621-64-7)	1						· _					L	L	I	J

1.

		THA OLD I									2.10	1120			
1. POLLUIANI		MARK	<u>X</u>			3. EFFLUE					<u>4. U</u>	NI 15	<u>5. IN L</u>	AKE (optiona	1 <u>) </u>
AND CAS	a. TEST-	b. BE-	C. BE-	a. MAXIMUM DAIL)	VALUE	b. MAXIMUM 30 DA	Y VALUE	C. LONG TERM AVRO	3. VALUE		•		a. LONG	TERM	b, NO, OF
NUMBER	ING	LIEVED	LIEVED			(if available))	(if available)		d. NO. OF	a. CONCEN-	b. MASS	AVERAGE	VALUE	ANAL-
(if available)	RE-	PRE-	AB-	(1)	(2) MASS	(1)	(2) MASS	(1)	(2) MASS	ANAL-	TRATION]	(1) CONCEN-	(2) MASS	YSES
<u> </u>	QUIRED	SENT	SENT	CONCENTRATION		CONCENTRATION	•	CONCENTRATION		YSES			TRATION	1	
GC/MS FRACTION - B/	ASE/NEU	TRAL CC	MPOUN	DS (continued)									· · ·		
43B. N-Nitro-			T												
sodinhenvlamine			l v l												
			1											1 1	1
(86-30-6)	L								•					↓	
44B. Phenanthrene				·										1	
(85-01-8)		1	I X		•										
(,															
AFP Durana	<u> </u>	<u> </u>													
45b. Pyrene														1	
(129-00-0)	1														
1		1												ŧ l	
46B 124 - Tri-	1														
chlore hannand		1		<0.001							ma/i	1	-0.001	 	
Gilloroberizerie				~0.001							ing/L			. !	
(120-82-1)		L												L	
GC/MS FRACTION - PI	<u>ESTICIDE</u>	S												L	
1P. Aldrin			-							_					
(309-00-2)	ł	1	I X											1 1	
(000 00 2)	· ·													. !	
		<u> </u>		· · · · · · · · · · · · · · · · · · ·											
2P. α-BHC								-							
(319-84-6)															
		1		•										1 !	
3D R BUC		1												[
													1	1 1	
(319-85-7)														. !	
4P. v- BHC														1	
(58-89-9)			I X I							•				1	
(00 00 0)	1													1 1	
5P. δ- BHC					•									. !	
(3,19-86-8)	1	1												1 1	1
														1 1	
6P. Chlordane															
(67 74 0)														. !	
(51-14-9)			· ^											. !	
														L	
7P. 4,4'-DDT															
(50-29-3)			I X										1	1	
		i												1	
	<u> </u>	 		····											
	1	1										1			
(72-55-9)	l.														
				•				·						L	
9P. 4,4'-DDD															
(72-54-8)			Ιx												
(12:01:0)		1										1		1	1
10D District					· · ·									h	
10P. Dielarin													ļ		
(60-57-1)			X									i .		1	
		1													
11P. α-Endosulfan														(
(115 20 7)						-									
(115-25-11)						_									
					·									h	
12P 8-Endosulfan															1
(115-29-7)	1	1	IXI									1.		1 1	1 1
	1										•				
13D Endosulfan			_												
iors, Eliquosullan														1 '	1
Sullate	1	1	X									1		1	
(1031-07-8)	1	1										(L	
14P. Endrin															
(72-20-8)	i	1	l v						l	1				1	i
(12-20-0)	1	1												1	
	<u> </u>	<u> </u>	ļ				ļ	· · · · · · · · · · · · · · · · · · ·				<u> </u>		h	
15P: Endrin	1	1	1									í .	(I	1 7	1
Aldehyde	I I	1	IX											1	I
(7421-93-4)	I	i i												1	
16D Hoptochion	<u> </u>	<u> </u>							·	·	·	<u> </u>		┟───── [↓]	
IOF. Replacitor														i '	1
(76-44-8)	1	1										([1 1	
	1	1	I	1									1	1	1

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

				TN	103										
CONTINUED FROM	PAGE V-		<u>.</u>	· —			NT				X 10		E 141	TAKE (antion	
AND CAS NUMBER	B. TEST-	b. BE- LIEVED	c. BE- LIEVED	a. MAXIMUM DAIL	Y VALUE	b. MAXIMUM 30 DA (if available		c. LONG TERM AVR (if available)	G. VALUE	d. NO. OF	a. LONG AVERAGE	TERM VALUE	a. LONG AVERAG	TERM VALUE	b. NO. OF ANAL-
(if available)	RE- QUIRED	PRE- SENT	AB SENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANAL- YSES	a. CONCEN- TRATION	b. MASS	(1) CONCEN- TRATION	(2) MASS	YSES
GC/MS FRACTION -	PESTICI	DES (con	tinued)									_			
17B. Héptachlor Epoxide (1024-57-3)			x												
18P. PCB-1242 (53469-21-9)			х												
19P. PCB-1254 (11097-69-1)			х												
20P. PCB-1221 (11104-28-2)		·	x												
21P. PCB-1232 (11141-16-5)			х												
22P. PCB-1248 (12672-29-6)			х												
23P PCB-1260 (11096-82-5)			х												
24P. PCB-1016 (12674-11-2)			x			·									
25P. Toxaphene (8001-35-2)			X												

Tennessee River



DP **Diffuser** Pond Tennessee Department of Environment and Conservation Division of Water Pollution Control 401 Church Street, 6th Floor L & C Annex Nashville, TN 37243-1534 Phone: (615)532-0625

PERMIT CONTACT INFORMATION

Please complete all sections. If one person serves multiple functions, please repeat this information in each section.

PERMIT NUMBER: TN0026450

DATE: April 2013

COUNTY: Hamilton

PERMITTED FACILITY: TVA Sequoyah Nuclear Plant

OFFICIAL PERMIT CONTACT: (The permit signatory authority, e.g. responsible corporate officer, principle executive officer or ranking elected official)

Official Contact:	John T. Carlin	Title or	Position: Site Vice Pre	sident			
Mailing Address:	Sequoyah Acess Road, PO Box 2000	City:	Soddy Daisy	State:	TN	Zip:	37379
Phone number(s):	(423) 843-7001	E-mail:	jtcarlin@tva.gov	- -		L	

PERMIT BILLING	ADDRESS (where invoices should be sent):		
Billing Contact:	Brad M. Love	Title or Position: Environmental Scientist	
Mailing Address:	Sequoyah Acess Road, PO Box 2000	City: Soddy Daisy State: TN Zip:	37379
Phone number(s):	(423) 843-6714	E-mail: bmlove@tva.gov	·

FACE ITY LOCATION (actual location	of permit site and local contact f	or site activ	ity):		
Facility Location Contact:	Brad M. Love	Title or	Position: Environme	ntal Scientis	st
Facility Location (physical street address):	Seqouyah Access Road	City:	Soddy Daisy	State: T	N Zip: 37379
Phone number(s):	(423) 843-6714	E-mail:	bmlove@tva.gov		<u>_</u>
Alternate Contact (if desired):,		Title or 1	Position:		
Mailing Address:		City:	<u> </u>	State:	Zip:
Phone number(s):		E-mail:		<u>_</u>	L

FACILITY REPORTING (Discharge Monitoring Report (DMR) or other reporting):

Cognizant Official authorized for permit reporting:	Title or Position:		
Facility Location (physical street address):	City:	State:	Zip:
Phone number(s):	E-mail:		
Fax number for reporting:	Does the facility have in electronic DMR r	terest in starting reporting?*	Yes No*

RDAs 2352 AND 2366

TENNESSEE VALLEY AUTHORITY (TVA) – SEQUOYAH NUCLEAR PLANT (SQN) -NPDES PERMIT NO. TN0026450 – WET REASONABLE POTENTIAL

Current Whole Effluent Toxicity (WET) Requirements:

Outfall 101 -

7-day or 3-brood IC_{25} Hard Trigger = 43.2% [IWC = 43.2% effluent (2.3 TUc)]

Monitoring Frequency Governed by B/CTP: 1/year when oxidizing biocides used 1/year when non-oxidizing biocides used

Proposed WET Requirements:

Outfall 101 -

7-day or 3-brood IC₂₅ Hard Trigger = 42.8%[IWC = 42.8% effluent (2.3 TUc)]

Monitoring Frequency Governed by B/CTP: 1/year when oxidizing biocides used 1/year when non-oxidizing biocides used

Background:

The current permit, effective March 1, 2011, requires chronic toxicity biomonitoring at a frequency governed by the B/CTP and with a monitoring limit ($IC_{25} \ge 43.2\%$) that serves as a hard trigger for accelerated biomonitoring. Previous to the issuance of the current permit, Outfall 101 demonstrated No Reasonable Potential for excursions above the ambient water quality chronic (CCC) criterion using historical effluent data. This demonstration of No Reasonable Potential has been maintained throughout the current permit cycle as evidenced in the accompanying historical effluent data for the last 20 studies.

Based on guidance in EPA's Technical Support Document (TSD) for Water Qualitybased Toxics Control (EPA/505/2-90-001), a permit limit is not required when No Reasonable Potential exists for excursions above the CCC. In this situation, the TSD recommends that biomonitoring be conducted at a frequency of once every 5 years as part of the permit renewal process.

Proposed Changes:

1. TVA requests that the current permit's requirement for the B/CTP to govern the frequency of biomonitoring remain (i.e., once per year when oxidizing biocides are used, and once per year when non-oxidizing biocides are used).

2. TVA requests that the current monitoring limit be replaced with an IC_{25} = 42.8%, which is based on revised effluent flow, and is consistent with the TSD guidance for effluents demonstrating No Reasonable Potential. Toxicity at the instream wastewater concentration (IWC) would serve only as a hard trigger for accelerated biomonitoring, as stated in the current permit.

3. TVA requests changes to the Serial Dilutions table as follows:

_	Serial Dilution	ons for Whole Effluer	t Toxicity (W	ET) Testing	
100% Effluent	(100+ML)/2	Monitoring Limit (ML)	0.5 X ML	0.25 X ML	Control
		% effluen	t	·	
100	71.4	42.8	21.4	10.7	0

Page 22 of 28, table following paragraph 3:

4. TVA also requests that all other text in Section E of the permit remain unchanged.

Dilution and Instream Waste Concentration Calculations

Outfall 101:

Average Discharge = 1491 MGD

Tennessee River 1Q10 = 3483 MGD

Dilution Factor (DF): $DF = \frac{Qs}{Qw} = \frac{3483}{1491} = 2.34$

Instream Wastewater Concentration (IWC): IWC = $\frac{Qw}{Qs} = \frac{1491}{3483} \times 100 = 42.8\%$

Reasonable Potential Determination:

The last 20 studies for Outfall 101 were used for determining Reasonable Potential, with all studies resulting in no observed toxicity (<1.0 TUc) and a coefficient of variation equal to zero. This outcome demonstrates that no Reasonable Potential for excursions above the CCC exists, based on data obtained from testing conducted under the current operating conditions.

Historical data for the last 20 studies follows, and is followed thereafter with documentation of chemical additions which occurred during sampling for toxicity tests for Outfall 101.

2

SQN Documentation:

Summary of SQN Outfall 101 WET Biomonitoring Results **

Test Date Test Species Study In Undiluted Results 64. Feb 8-15, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 65. Jun 7-14, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 66. Jul 19-26, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 67. Nov 1-8, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 68. Nov 16-23, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 68. Nov 16-23, 2005 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 69. Nov 14-21, 2006 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 70. Nov 28 - Dec 5, 2006 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 71. May 30- Jun 6, 2007 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 74. Oct 28- Nov 4, 2008 Ceriodaphnia dubia Pimephales promelas 100 <1.0 <1.0 75. Feb 10-17, 2009 Ceriodaphnia dubia Pimephales promelas 100	· · · · · · · · · · · · · · · · · · ·	·	Acute F	Results	Chronic	
Test Date Test Species Study Undiluted Sample Study Toxicity Units 64. Feb 8-15, 2005 Ceriodaphnia dubia Pimephales promelas 93 <1.0			(96-h Si	urvival)	Results	
In Toxicity Units Study Units Study Units <th< td=""><td></td><td></td><td>% Survival</td><td>Study</td><td></td></th<>			% Survival	Study		
Test Date Test Species Sample (TUa) Units 64. Feb 8-15, 2005 Ceriodaphnia dubia 100 <1.0			in	Toxicity	Tovicity	
Test Date Test Species Sample (TUa) Offici (TUa) 64. Feb 8-15, 2005 Ceriodaphnia dubia 100 <1.0			Undiluted	Units	Lipite (Tille)	
64. Feb 8-15, 2005 Ceriodaphnia dubia Primephales promelas 100 <1.0 <1.0 65. Jun 7-14, 2005 Ceriodaphnia dubia Primephales promelas 100 <1.0	Test Date	Test Species	_Sample	(TU <u>a</u>)		
Pimephales promelas 93 C1.0 C1.0 65. Jun 7-14, 2005 Ceriodaphnia dubia 100 <1.0	64. Feb 8-15, 2005	Ceriodaphnia dubia	100	<1.0	<1.0	
65. Jun 7-14, 2005 Ceriodaphnia dubia Pirmephales promelas 100 <1.0	•	Pimephales promelas	93	~1.0	N 1.0	
Pimephales promelas 100 11.0 11.0 66. Jul 19-26, 2005 Ceriodaphnia dubia 100 <1.0	65. Jun 7-14, 2005	Ceriodaphnia dubia	100	<10	<10	
66. Jul 19-26, 2005 Ceriodaphnia dubia 100 <1.0		Pimephales promelas	. 100	\$1.0	\$1.0	
Pimephales promelas 100 11.0 11.0 67. Nov 1-8, 2005 Ceriodaphnia dubia 100 <1.0	66. Jul 19-26, 2005	Ceriodaphnia dubia	100	<10	<1.0	
67. Nov 1-8, 2005 Ceriodaphnia dubia 100 <1.0	·	Pimephales promelas	100	-1.0	41.0	
Pimephales promelas 100 11.0 11.0 68. Nov 16-23, 2005 Ceriodaphnia dubia 100 <1.0	67. Nov 1-8, 2005	Ceriodaphnia dubia	100	<10	<10	
68. Nov 16-23, 2005 Ceriodaphnia dubia Pimephales promelas pomelas promelas 100 100 <1.0 <1.0 69. Nov 14-21, 2006 Ceriodaphnia dubia Pimephales promelas 100 <1.0		Pimephales promelas	100	1.0	1.0	
Primephales promelas 98 no. no. 69. Nov 14-21, 2006 Ceriodaphnia dubia 100 <1.0	68. Nov 16-23, 2005	Ceriodaphnia dubia	100	<1.0	<1.0	
69. Nov 14-21, 2006 Ceriodaphnia dubia 100 <1.0		Pimephales promelas	98			
Pimephales promelas 100 100 70. Nov 28 - Dec 5, 2006 Ceriodaphnia dubia 100 <1.0	69. Nov 14-21, 2006	Ceriodaphnia dubia	100	<1.0	<1.0	
70. Nov 28 - Dec 5, 2006 Ceriodaphnia dubia 100 <1.0		Pimephales promelas	100			
Pimephales promelas 98 71. May 30- Jun 6, 2007 Ceriodaphnia dubia 100 <1.0	70. Nov 28 - Dec 5, 2006	Ceriodaphnia dubia	100	<1.0	<1.0	
71. May 30- Jun 6, 2007 Ceriodaphnia dubia 100 <1.0		Pimephales promelas	98			
Pimephales promeias 100 72. Dec 4-11, 2007 Ceriodaphnia dubia 100 <1.0	71. May 30- Jun 6, 2007	Ceriodaphnia dubia	100	<1.0	<1.0	
72. Dec 4-11, 2007 Ceriodaphnia dubia 100 <1.0		Pimephales promeias	100			
Primephales prometas 100 73. Apr 15-22, 2008 Ceriodaphnia dubia 100 74. Oct 28- Nov 4, 2008 Ceriodaphnia dubia 100 74. Oct 28- Nov 4, 2008 Ceriodaphnia dubia 100 75. Feb 10-17, 2009 Ceriodaphnia dubia 100 76. May 12-19, 2009 Ceriodaphnia dubia 100 76. May 12-19, 2009 Ceriodaphnia dubia 100 77. Nov 17-24, 2009 Ceriodaphnia dubia 100 78. May 11-18, 2010 Ceriodaphnia dubia 100 79. Nov 2-9, 2010 Ceriodaphnia dubia 100 79. Nov 2-9, 2010 Ceriodaphnia dubia 100 79. Nov 2-9, 2010 Ceriodaphnia dubia 100 70. May 3-10, 2011 Ceriodaphnia dubia 100 70. Nay 3-10, 2011 Ceriodaphnia dubia 100 70. Nov 8-15, 2011 Ceriodaphnia dubia 100 70. Nay 8-15, 2012 Ceriodaphnia dubia 100 70. Nov 8-15, 2012 Ceriodaphnia dubia 100 70. Nov 8-15, 2012 Ceriodaphnia dubia 100 70. Pimephales promelas	72. Dec 4-11, 2007	Ceriodaphnia dubia	100	<1.0	<1.0	
73. Apr 15-22, 2008 Ceriodaphnia dubia 100 <1.0		Pimephales promelas	100			
Primephales promeias 93 74. Oct 28- Nov 4, 2008 Ceriodaphnia dubia 100 <1.0	73. Apr 15-22, 2008	Ceriodaphnia dubia	100	<1.0	<1.0	
74. Oct 28- Nov 4, 2008 Ceriodaphnia dubia 100 <1.0	74 0 100 No. 4 0000	Pimephales promeias	93			
Primephales promelas 98 75. Feb 10-17, 2009 Ceriodaphnia dubia 100 <1.0	74. Oct 28- Nov 4, 2008	Ceriodaphnia dubia	100	<1.0	<1.0	
75. Feb 10-17, 2009 Cenodaphnia dubia 100 <1.0	75 E-1 40 47 0000 '	Pimephales promeias	98	-11.0	-11.0	
76. May 12-19, 2009 Ceriodaphnia dubia 100 <1.0	75. Feb 10-17, 2009	Ceriodaphnia dubia	100	<1.0	<1.0	
76. May 12-19, 2009 Ceriodaphnia dubia 100 <1.0	76 May 12 10 2000	Pimephales prometas	100	-10	-10	
77. Nov 17-24, 2009 Ceriodaphnia dubia 100 <1.0	76. May 12-19, 2009	Ceriodaprinia dubia	100	<1.0	<1.0	
77: Nov 17-24, 2009 Ceniddaphnia dubia 100 <1.0	77. Nov 17 24 2000		90	~10	~1.0	
78. May 11-18, 2010 Ceriodaphnia dubia 100 <1.0	77. 1100 17-24, 2009	Dimonholos prometos	100	\$1.0	N 1.0	
70. May 11-10, 2010 Ceriodaphila dubia 100 1.0 11.0 79. Nov 2-9, 2010 Ceriodaphnia dubia 100 <1.0	78 May 11-18 2010	Ceriodentinia dubia	100	<10	<10	
79. Nov 2-9, 2010 Ceriodaphnia dubia 100 <1.0	70. Way 11-10, 2010	Pimenhales promelas	100	51.0	1.0	
73. Nov 2-9, 2010 Cenodaphina dubia 100 <1.0	79 Nov 2-9 2010	Ceriodenhnia dubia	100	<10	<10	
80. May 3-10, 2011 Ceriodaphnia dubia 100 <1.0	73. 1100 2-3, 2010	Dimenhales promelas	100	\$1.0	\$1.0	
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81. Nov 8-15, 2011 Ceriodaphnia dubia 100 <1.0	00. Way 3-10, 2011	Pimenhales promelas	100	\$1.0	\$1.0	
01. Hove rol, 2011 Pimephales promelas 98 82. May 8-15, 2012 Ceriodaphnia dubia 100 <1.0	81 Nov 8-15 2011	Ceriodaphnia dubia	100	<10	<10	
82. May 8-15, 2012 Ceriodaphnia dubia 100 <1.0		Pimenhales promelas	98	1.0	1.0	
Number of the prime Prime Prime Prime 83. Aug 12-17, 2012 Ceriodaphnia dubia 100 <1.0	82 May 8-15 2012	Ceriodaphnia dubia	100	<1.0	<1.0	
83. Aug 12-17, 2012 Ceriodaphnia dubia Pimephales promelas 100 <1.0	01: may 0 10, 2012	Pimephales promelas	100			
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n 40 20 20 Maximum 100 <1.0	,	Pimephales promelas	100			
Maximum 100 <1.0 <1.0 Minimum 93 <1.0	n		40	20	20	
Minimum93<1.0<1.0Mean99<1.0	Maximum		100	<1.0	<1.0	
Mean99<1.0<1.0CV0.020.000.00	Minimum		93	<1.0	<1.0	
CV 0.02 0.00 0.00	Mean		99	<1.0	<1.0	
	CV		0.02	0.00	0.00	

**Last 20 studies only were included for determining RP. Shaded area includes data collected under the current permit.

Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL-363	Cuprostat-	H-130M	Nalco	H-150M
	Hypochlorite	mg/L	mg/L	mg/L	mg/L	PF mg/L	mg/L Quat	73551	mg/L
	mg/L	TRC	Phosphate	Copolymer	DMAD	Azole		mg/L	Quat
	TŘC				· · ,			EO/PO	
11/07/2004	-	<0.0187	0:000	0.014	_	-			-
11/08/2004		<0.0192	0.047	0.030		-	-	-	- 1
11/09/2004		<0.0233	0.048	0.016		-	0.041	-	. -
11/10/2004	-	<0.0149	0.047	0.016		-	0.041	-	-
11/11/2004		<0.0149	0.049	0.017	-	-	0.043	-	
11/12/2004		< 0.0253	0,048	0.017	S. Salar is	-	0.042 .		antan Antana terratu
02/06/2005	a geographic de	< 0.0042	0.028	0.010	1. 4. 8 %	_	-		2 - C
02/07/2005	_	<0.0116	0.028	0.010		-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-		-	-
02/09/2005	<u> </u>	0.0199	0.028	0.010	-	-		-	-
02/10/2005	-	<0.0042	0.028	0.010		-	_	-	· · -
02/11/2005	_	0.0155	0.028	0.010	-	-	÷	0.007	. <u></u> .
06/05/2005		0.0063	-	_·	1 an 12 an an	-		-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005		0.0103	-	_	-	-	-	-	0.037
06/08/2005		0.0295	-	-	-	-		-	0.037
06/09/2005	-	0.0129	-	-	-	-	9 -	-	-
06/10/2005	-	0.0184				-	<u>-</u> ,	-	, - ·
07/17/2005	-	0.0109	0.026	0.009		-	-	-	· -
07/18/2005	-	0.0150	0.026	0.009	· -	-	_	-	0.036
07/19/2005	-	0.0163	0.026	0.009	· · _ ·	-	-	-	0.036
07/20/2005		0.0209	0.026	0.009	·	-	- •	0.014	0.036
07/21/2005		0.0242	0.026	0.009	· -	-	-	-	
07/22/2005	-	0.0238	0.054	0.018	-			0.014	5. - 5
10/30/2005		0.0068		-	-			-	-
10/31/2005	-	0.0112	-	-		-		-	-
11/01/2005	-	0.0104	-	-	-	-	_		0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	· -	- 14 T	-	0.036
11/04/2005		0.0165		-	i i - -	-		-	0.035
11/14/2005	_	0.0274	•	-	-	-		-	-
11/15/2005	-	0.0256	· · · ·	-	-	-	1	-	-
11/16/2005	<u> </u>	0.0234	-	-	-	-	-	-	· · · ·
11/17/2005	-	0.0231	-	- 1	-	-	-	- ·	-
11/18/2005	· -	0.0200	-	-	1-1	-		-	· -
11/19/2005	<u> </u>	0.0116	-	_		-		-	_

4

Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL-363	Cuprostat-	H-130M	Nalco	H-	MSW
	Hypochlorite	mg/L	mg/L	mg/L	mg/L	PF mg/L	mg/L Quat	73551	150M	101
	mg/L	TRC	Phosphate	Copolymer	DMAD	Azole	•	mg/L	mg/L	mg/L
ł	TRC		- - -					EO/PO	Quat	Phosphate
11/12/2006	-	0.0055	•	-	-	-	-	-	-	-
11/13/2006		0.0068	-	-	-	-	-	-	0.037	-
11/14/2006		0.0143	-	-	-	-		-	0.037	-
11/15/2006	-	0.0068		-		-		-	0.037	-
11/16/2006	-	0.0267	-	-	-	-	-	-	0.037	-
11/17/2006	-	0.0222	-		-	-	-	-	-	-
11/26/2006	-	0.0188	-	-	-		-	-	-	-
11/27/2006	-	0.0138	-	-	-	-	-	-	· -	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	- ¹	-	-	-	-	-	-	
11/30/2006	-	0.0376	-	-	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-			-	-	
05/28/07	-	-	-	-	-	-	- ·	-	-	0.015
05/29/07	-	- ·	-	-	-	-	-	- ,	0.036	0.015
05/30/07	-	0.0084	-	-	-	-	-	0.017	0.036	0.015
05/31/07	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/07	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/07	-	0.0305	· -	-	· -	-	-	-	-	0.015
12/02/07		0.0241	_	-	-	-		-	-	-
12/03/07	<u> </u>	0.0128	-	-	- 1	-	-	-	-	· -
12/04/07	-	0.0238	·	-	-	-	-	-	-	-
12/05/07	-	0.0158	-	-	-	-	-	-		-
12/06/07	-	0.0162	-	-	-	-	-	-	-	-
12/07/07	. –	0.0175	-	-	-	-		-	-	
04/13/08		0.0039	-	-	-	-	· _	-	-	-
04/14/08	-	0.0124	-	-	-	-	-	-	-	-
04/15/08	-	0.0229	-	-	-	-	-	-	-	-
04/16/08	-	0.0143	-	-	-	-	-	-	-	-
04/17/08	-	0.0120	-	- .	-	-	-	-	-	-
04/18/08	_	0.0149	_	-	-	-	-	-	<u> </u>	-
10/26/08	-	0.0260		- ·	· -	-	-	-	-	-
10/27/08	-	0.0151	-	-	-	-	-	0.017	-	- 1
10/28/08	-	0.0172	-	-	-	-	-	-	0.041	-
10/29/08	-	0.0154	-	-	-	-	-	0.018	0.041	0.030
10/30/08	-	-	-	-	-	-		-	0.041	0.030
10/31/08	-	0.0086	-	-	-	-	-	-	0.041	0.030

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Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL	Cuprostat-	H-130M	Nalco	Spectrus	H-150M	MSW
[Hypochlorite	mg/L	mg/L	mg/L	363	PF mg/L	∖mg/L	73551	CT1300	mg/L	101
	mg/L	TRC	Phosphate	Copolymer	mg/L	Azole	Quat	mg/L	mg/L	Quat	mg/L
	TRC				DMAD			EO/PO	Quat		Phosphate
02/08/09	/·•	0.0197	-	-	-	-		0.017			-
02/09/09	87	0.0237	-	-	-	-	- 4.1	0.017		-	-
02/10/09		0.0104	-	-	-	-	- 19	0.021	n Sinch sijM Sint state	- 18	-
02/11/09		0.0155	-	-	-	-		0.017		-	-
02/12/09		0.0106	_	-	-	-		0.017		-	-
02/13/09	an da an an Arriente Menore de la A rri to de La Arriente Arriente de la Arriente de la Arrient		-	-	-	-		-			-
05/10/09		0.0129	-	-	-			· -	4	net a	-
05/11/09		0.0415	-	-	-	-		-		0.0446	-
05/12/09		0.0053		-	-	-		-		0.0396	-
05/13/09		0.0049	-	-	_	-	- 11-11-11-11-11-11-11-11-11-11-11-11-11	-		0.0396	-
05/14/09		< 0.0141	-	-	_	-		-		0.0397	- 1
05/15/09	-	< 0.0160	-	-	-	-		-		-	-
11/15/09		0.025		-			$[2^{n}T] = [2^{n} - 1]$	-	19 1 - 10 1 - 10	- A	-
11/16/09	-	0.0152		-	-	-		-		-	-
11/17/09	$\omega_{d_1, \delta}$	0.0255	· -	-	- .	-	-	-		- -	-
11/18/09	Station (General Norman Station	0.0306	· _	-		-	-	-		<u></u>	- 1
11/19/09	-	0.0204	_	-		-	-	· -		Dir yan eta Nasia ina ang	-
11/20/09		0.0093	-	-	-	-		-			-
05/09/10	- 0	0.0192				-		-		_	-
05/10/10		0.0055		-	-	-		-		Ra 2 Mai 1970 - 1	-
05/11/10		0.0100		· _	-	-		-	0:039	-	-
05/12/10	_	0.0171	y 🚽 🤅			_		-	0.039	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	-
05/13/10	4	0.0041	_	-		-	- B	-	0.039	i de la constance de la constan Constance de la constance de la Constance de la constance de la	-
05/14/10	_	0.0099	. · .	-	-	-	_	-	0.039	_	-
	1									hi vi	
Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL- 222 mg/L Phos- phate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat- PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	Spectrus CT1300 mg/L Quat	H-150M mg/L Quat	MSW 101 mg/L Phosphate	Floguard MS6236 mg/L Phosphate
10/31/10 11/01/10 11/02/10 11/03/10 11/04/10 11/05/10	 - - - -	0.0122 0.0112 0.0163 0.0107 0.0132		- - - - -	- - - - -			-	-		- - - - -	- - - - -
05/01/2011 05/02/2011 05/03/2011 05/04/2011 05/05/2011 05/06/2011	-	- 0.0155 0.0179 0.0089	- - - 		-	- - - - -			- 0.04 0.04 0.04 0.04 -	-	- - - - -	- - - - -
11/06/2011 11/07/2011 11/08/2011 11/09/2011 11/10/2011 11/11/2011	- - - - - -	0.0168 0.0225 0.0141 0.0239 0.0242 0.0231	· - - - - - -	- - - - - -		- - - - - - -	-		-	-	- - - - -	- - - - -
05/06/2012 05/07/2012 05/08/2012 05/09/2012 05/10/2012 05/11/2012	- - - - - -	0.0145 0.0298 0.0174	- - - - -	- - - - -		-	-	-	0.041 0.041 0.041		- - - - -	- - - - -
08/12/2012 08/13/2012 08/14/2012 08/15/2012 08/16/2012 08/17/2012		0.0256 0.0209 0.0279 0.0076 0.0446			-	-	-	0.028	0.037 0.037 - - -	-		0.029 0.029 0.029 0.029 0.029 0.029 0.032



Study Plan for Evaluation of the TVA Sequoyah Nuclear Plant Discharge in Support of an Alternate Thermal Limit

Soddy Daisy, Hamilton County, Tennessee



Tennessee Valley Authority

June 8, 2011



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EXECUTIVE SUMMARY

This document sets forth a revised Study Plan, which the Tennessee Valley Authority (TVA) plans to implement for the purpose of evaluating the Sequoyah Nuclear Plant (SQN) thermal discharge in support of compliance with the National Pollutant Discharge Elimination System (NPDES) permit for the facility and continuance of the associated Alternate Thermal Limit (ATL) for Outfall 101 as authorized under Section 316(a) of Clean Water Act and Tennessee Department of Environment and Conservation rules.

As required by the NPDES permit, the Study Plan was first submitted to the Tennessee Department of Environment and Conservation (TDEC) on December 20, 2010 and subject to review by TDEC and the U. S. Environmental Protection Agency (EPA), Region 4. Comments and suggested revisions were provided to TVA by TDEC in a meeting held on April 7, 2011 and have been incorporated herein.

The Study Plan provides regulatory background for the work; information about SQN operations; a brief description of the receiving waterbody; a summary of previous §316(a) and more recent monitoring studies conducted at the plant; and a detailed Scope of Work proposing the collection of new data to evaluate the potential impact of the Sequoyah Nuclear thermal discharge on the aquatic life and other classified uses of the Tennessee River/Chickamauga Reservoir in the vicinity of the plant. Specifically, studies are proposed to:

- 1. Collect the temperature data needed to delineate and map the spatial boundaries of the thermal discharge plume;
- 2. Characterize the aquatic and wildlife habitat in the study area;
- 3. Sample the fish, macroinvertebrate, and plankton communities;
- 4. Survey potentially affected wildlife;
- 5. Evaluate maintenance of a balanced indigenous population (BIP) by performing traditional and multi-metric analyses of collected data, as appropriate; and
- 6. Evaluate the reasonable potential for impairment of non-aquatic life uses of the receiving waterbody as they relate to the thermal discharge.

Field sampling activities are scheduled to begin in the summer and autumn of 2011. Resultant information will be used to support renewal of the facility's NPDES permit set to expire October 31, 2013.

1.0 INTRODUCTION

This document sets forth a revised Study Plan, which the Tennessee Valley Authority (TVA) plans to implement for the purpose of evaluating the Sequoyah Nuclear Plant (SQN) thermal discharge in support of compliance with the National Pollutant Discharge Elimination System (NPDES) permit for the facility (NPDES Permit No.: TN0026450). The Study Plan includes a review and discussion of applicable regulatory requirements for the thermal discharge and presents specific work elements for the re-verification of the existing Alternate Thermal Limit (ATL) for Outfall 101 in accordance with Clean Water Act (CWA) Section (§) 316(a). As required by the NPDES permit, the Study Plan was first submitted to the Tennessee Department of Environment and Conservation (TDEC) on December 20, 2010 and subject to review by TDEC and the U. S. Environmental Protection Agency (EPA), Region 4. Comments and suggested revisions were provided to TVA by TDEC in a meeting held on April 7, 2011 and have been incorporated herein.

1.1 Facility Information

Unit 1 and 2 were placed in operation in 1981 and 1982, respectively. Both units can produce more than 2,400 megawatts of electricity. SQN is located on the right descending bank of the Tennessee River (Chickamauga Reservoir) near Chattanooga, Tennessee (Figure 1). The facility withdraws cooling water from Chickamauga Reservoir via an intake channel and skimmer wall at river mile (TRM) 484.8. The cooling water intake structure (supporting six circulator pumps) provides the units a nominal flow of 1.11×10^6 gallons per minute (gpm) or 1,602 million gallons per day (mgd). The facility employs a once-through (open cycle) condenser cooling water system and can also operate with cooling towers in helper mode. The plant discharges heated effluent to Chickamauga Reservoir via Outfall 101 located at TRM 483.6 as authorized by the NPDES permit (Figure 2).

1.2 Regulatory Basis

1.2.1 Applicable Thermal Criteria

TDEC has specified "use classifications" for the state's surface waters and developed temperature criteria intended to support those uses (TDEC Rule 1200-4-4 and 1200-4-3-.03, respectively). The Tennessee River at the location of SQN has been classified for the following uses: Municipal, Industrial, and Domestic Water Supply, Industrial Water Supply, Fish and Aquatic Life, Recreation, Irrigation, Livestock Watering and Wildlife, and Navigation. Except for Irrigation and Livestock Watering and Wildlife (qualitative criteria), temperature criteria relevant to warm-water conditions of the Tennessee River at SQN specify that:

"The maximum water temperature change shall not exceed 3°C [5.4°F] relative to an upstream control point. The temperature of the water shall not exceed 30.5°C [86.9°F] and the maximum

rate of change shall not exceed 2°C [3.6°F] per hour. The temperature of impoundments where stratification occurs will be measured at a depth of 5 feet, or mid-depth whichever is less, and the temperature in flowing streams shall be measured at mid-depth." [Rule 1200-4-3-.03]

The SQN plant's "once-through" cooling water system design utilizing cooling towers in helper mode provides for the most thermodynamically efficient method of generating electricity and as a result produces a heated discharge. As such, the thermal discharge typically exceeds TDEC's established temperature criteria, therefore, multiport diffusers with mixing zone are used to adequately mix the thermal effluent to meet the state water quality standard at the end of the mixing zone. In such cases, the TDEC rules specific to the Fish and Aquatic Life use classification provide that:

"A successful demonstration as determined by the state conducted for thermal discharge limitations under Section 316(a) of the Clean Water Act, (33 U.S.C. §1326), shall constitute compliance... [with the temperature criteria]."

TVA has previously made such successful demonstration for the SQN thermal discharge in support of mixing zone criteria as further discussed below.

1.2.2 Permitted Conditions

Currently permitted thermal discharge limitations for SQN specify that the daily maximum temperature is not to exceed 30.5°C (86.9°F) at the end of the mixing zone (Page 1 of 28), NPDES permit TN0026450). This mixing zone criteria are based on a previous demonstration by TVA, in accordance with CWA §316(a) and TDEC Rule 1200-4-3-.03 noted above, that a balanced indigenous population (BIP) of fish, shellfish, and wildlife is supported in the Tennessee River potentially affected by the thermal discharge. The mixing zone criteria, as supported by the biological studies, also encompass other components of the TDEC temperature criteria, specifically the change in temperature from ambient/upstream conditions and rate of change in temperature. SQN has maintained a good compliance record with its mixing zone criteria throughout each NPDES permit term since first authorized in the late-1980s; ongoing biological monitoring has consistently demonstrated the mixing zone criteria are protective of aquatic communities in the river near the facility.

1.2.3 Criteria for Alternate Thermal Limits Under §316(a)

The regulatory provisions that implement CWA §316(a) provide limited guidance on precisely what the demonstration study must contain to be considered adequate and do not identify precise criteria against which to measure whether a "balanced and indigenous" aquatic community is protected and maintained. Instead, the regulations provide broad guidelines.

Under the broad regulatory guidelines, the discharger must show that the ATL desired, "considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected," will "assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the

discharge is to be made (40 CFR §125.73). Critical to the demonstration is the meaning of the term "balanced indigenous community". The rules provide the following definition:

"The term "balanced indigenous community" is synonymous with the term balanced, indigenous population (i.e., BIP) in the Act and means a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications" (40 CFR §125.73).

Pursuant to this regulatory definition, a successful demonstration must show that under the desired ATL, and in light of the cumulative impact of the thermal discharge together with all other significant impacts on the species affected, the following characteristics, which are indicative of a BIP, will continue to exist: (1) diversity, (2) the capacity of the community to sustain itself through cyclic seasonal changes, (3) presence of necessary food chain species, and (4) a lack of domination by pollution tolerant species.

There are several methodologies a discharger may pursue in making a \$316(a) demonstration. Under the regulations, <u>new dischargers</u> must use predictive methods (e.g., laboratory studies, literature surveys, or modeling) to estimate an appropriate ATL that will assure the protection and propagation of a balanced, indigenous community prior to commencing the thermal discharge. However, <u>existing dischargers</u>, such as SQN, need not use predictive methods. For such dischargers, \$316(a) demonstrations may be based upon the "absence of prior appreciable harm" to a balanced, indigenous community (see 40 CFR \$125.73(c)(1)(i) and (ii)). Such demonstrations must show either that:

- i) No appreciable harm has resulted from the thermal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge has been made; or
- ii) Despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made.

Furthermore, in determining whether or not prior appreciable harm has occurred, the regulations provide that the permitting agency consider the length of time during which the applicant has been discharging and the nature of the discharge. The regulations do not define "*prior appreciable harm*." However, using the definition of "balanced, indigenous community," mixing zone criteria are generally granted under either of the following circumstances:

- 1. When a discharger shows that the characteristics of a BIP (i.e., diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species, and a lack of domination by pollution tolerant species) exist. Stated another way, the existence of such characteristics essentially prove that the aquatic community has not been appreciably harmed; or
- 2. Despite any evidence of previous harm, the characteristics of a BIP, as stated above, will nevertheless be protected and assured under the alternate limit.

1.2.4 Mixing Zone Requirements in Tennessee Rule 1200-4-3-0.5

As noted above, §316(a) pertains to the Fish and Aquatic Life use classification and provides NPDES-permitted facilities a regulatory compliant means of demonstrating that promulgated temperature criteria may be more stringent than necessary to support a BIP. In such cases, less stringent thermal criteria (i.e., ATLs) are justified. However, other use classifications such as Domestic Water Supply and Recreation must be protected as well. Compliance with TDEC temperature criteria for these uses is typically determined after the discharge has had the opportunity to mix with the receiving water; that is, an allowable mixing zone is determined.

TDEC rules define the mixing zone as:

"That section of a flowing stream or impounded waters in the immediate vicinity of an outfall where an effluent becomes dispersed and mixed." [1200-4-3-.04(8)]

The rules [1200-4-3-.05(2)] further provide that mixing zones are to be restricted in area and length and not:

- 1. prevent the free passage of fish or cause aquatic life mortality in the receiving waters;
- 2. contain materials in concentrations that exceed acute criteria beyond the zone immediately surrounding the outfall;
- 3. result in offensive conditions;
- 4. produce undesirable aquatic life or result in dominance of a nuisance species;
- 5. endanger the public health or welfare; or
- 6. adversely affect the reasonable and necessary uses of the area;
- 7. create a condition of chronic toxicity beyond the edge of the mixing zone;
- 8. adversely affect nursery and spawning areas; or
- 9. adversely affect species with special state or federal status.

While TVA's proposed §316(a) demonstration study plan fully examines the effects of the thermal discharge on the aquatic life components of the mixing zone requirements, the potential effects to other non-aquatic life use classifications (items 3, 5, and 6 above) are generally not evaluated. Therefore, this plan has been revised herein to incorporate and/or collect additional

information needed to address the reasonable potential for impairment of other non-aquatic life uses in the Tennessee River near the facility.

1.3 Study Plan Organization

This Study Plan is organized into the following sections:

- 1. Introductory information, including regulatory basis and rationale for the study;
- 2. Background information, including a summary of the findings of the previous \$316(a) investigation and subsequent biological monitoring; and,
- 3. The proposed design and implementation schedule for the SQN §316(a) demonstration Study Plan.

2.0 STUDY BACKGROUND

2.1 Sequoyah Nuclear Plant

The SQN facility is operated to produce base-load electric power throughout the year. When operating at design (nameplate) capacity (2,400 MW), the units requires approximately 1,602 million gallons per day of condenser cooling water. Waste heat increases the temperature of the cooling water by approximately 16.4°C (29.5°F) before it is discharged into the river. The actual condenser flow, and hence the ΔT , may vary somewhat with the circulating water pump head and the condenser efficiency.

2.2 Description of the Receiving Waterbody

Sequoyah Nuclear is located on the right descending bank of Chickamauga Reservoir (TRM 484.5) approximately 18 miles northeast of Chattanooga, Tennessee, and 7 miles southwest of Soddy-Daisy, Tennessee (Figure 1). Chickamauga Reservoir was impounded in 1940 and at full pool covers approximately 36,240 acres.

The topography of the reservoir in the vicinity of the discharge outlet consists of a shallow overbank area on the plant side which extends from TRM 484 downstream to TRM 481.8 and varies in depth from 2 to 20 ft and from 500 to 3,100 ft in width. This shallow area is bordered by a main river channel which is about 900 feet (ft) wide and approximately 60 ft deep. Along this reach there are several small, shallow embayments.

The Tennessee River flow in the vicinity of SQN is controlled by releases from Watts Bar and Chickamauga Dams, and to a lesser extent Hiwassee River. SQN is situated on Chickamauga Reservoir approximately 54.5 river miles downstream from Watts Bar Dam and 13.5 river miles upstream from Chickamauga Dam.

2.3 **Previous §316(a) Demonstration Study**

TVA conducted comprehensive §316(a) demonstration-related studies of the SQN thermal effluent in the mid-1980s to support establishment of the current mixing zone criteria for the plant discharge (TVA, 1989). The minimum average daily flow for the Tennessee River near SQN at the time of the early studies was 6,000 cfs.

The mid-1980s studies included extensive sampling of the aquatic community including:

- Phytoplankton,
- Periphyton,
- Aquatic macrophytes,
- Zooplankton,
- Benthic macroinvertebrates; and
- Fish populations.

Hydrothermal, water quality and other parameters also were evaluated.

Major findings of these studies included:

- Average dissolved concentration in the water column was similar immediately upstream and downstream of SQN.
- Analysis of the data indicate that the assemblages of phytoplankton, zooplankton, and macroinvertebrates were diverse and, in general, relatively abundant.
- Dominance of blue-green algae was similar upstream and downstream of SQN.
- The phytoplankton and zooplankton communities were found to be similar, or if different, not impacted by SQN operation, at all stations during 20 of the 27 survey months when the plant was in operation.
- Species richness in the benthic macroinvertebrate communities during pre-operational and operational monitoring was similar.
- No changes were documented in the aquatic macrophyte community that reflected effects of the thermal effluent.
- Fish species occurrence and abundance data indicated insignificant impacts. Avoidances of the plume could not be detected for any species of fish. One study found that sauger (*Sander canadensis*) were not concentrated in the thermal plume during winter months nor inhibited from movement past SQN. Results of gonadal inspections indicate that the heated discharge did not adversely affect fish reproduction.

- Other fisheries studies indicated that the thermal discharge resulted in no discernible increase in parasitism.
- No mortalities of threadfin shad due to cold shock following shutdown of SQN were observed or reported, and none are anticipated to occur in the future.

2.4 Contemporary Studies

Monitoring of the thermal effects of the SQN discharge on the aquatic community of the receiving waterbody has been more recently conducted by TVA after an agreement was reached with TDEC in 2001. TVA's "Vital Signs" monitoring program also provides useful information for evaluating reservoir-wide effects. Monitoring has included sampling of the fish and macroinvertebrate communities and associated collection of temperature and other water quality parameters. Results of the permit monitoring work and TVA's ongoing Vital Signs monitoring (TVA, 2011) have consistently demonstrated that fish and macroinvertebrate assemblages of Chickamauga Reservoir within and downstream of the SQN thermal discharge are similar to those of upstream locations, as well as to established mainstem reservoir reference conditions for the area.

Results of the above studies notwithstanding, TVA plans to implement this Study Plan for the purpose of further evaluating the SQN thermal discharge to support continuance of the ATL for the facility discharge in accordance with CWA §316(a) and TDEC Rule 1200-4-3-.03(e).

3.0 STUDY PLAN

This §316(a) demonstration Study Plan is informed by communications with TDEC and EPA, the study design of the previous demonstration study, and TVA's ongoing river/reservoir biological monitoring programs.

3.1 Study Timing

As reasonably practicable, TVA sampling crews will coordinate with SQN facility operations staff to schedule field studies to coincide with representative conditions of maximum generation for the time period to be sampled as dictated by seasonal power demand. The additional field studies will be conducted during the period of critical environmental (thermal) conditions in summer (mid-July – August) when plant operations and ambient reservoir temperatures are at expected seasonal maximums. Summer monitoring will be conducted once during the SQN permit cycle. Data collection during this period will focus on characterization/delineation of the thermal plume and biological field investigations inclusive of thermally affected and unaffected areas. TVA will also conduct monitoring in autumn (October – mid-December) as has been occurring in previous study years.

3.2 Study Scope

The following tasks will be conducted for the SQN §316(a) demonstration Study:

Task 1 - Evaluate Plant Operating Conditions

During the course of the study, SQN operational data will be recorded, compiled, and analyzed to assist in the interpretation of thermal plume characteristics and biological community information. Available historical operational data will also be compiled and analyzed to evaluate and identify any material changes in SQN operations over the most recent 5-year period that might affect the thermal plume characteristics. Parameters to be recorded during the proposed study and evaluated historically include, but are not limited to:

- Cooling water intake flow and water temperature;
- Discharge flow and water temperature; and
- Power generation statistics.

The data will be presented in tabular and graphical formats to describe SQN operational conditions during the current study.

Task 2 – Thermal Plume Monitoring and Mapping

Physical measurements will be taken to characterize and map the SQN thermal plume concurrent with biological field sampling during the sampling events. In this manner, it is expected that the plume will be characterized under representative thermal maxima and seasonally-expected low flow conditions. Measurements will be collected during periods of high power production from SQN, as reasonably practicable, to capture maximum extent of the thermal plume under existing river flow/reservoir elevation conditions. This effort will allow general delineation of the "Primary Study Area" per the EPA (1977) draft guidance defined as the: "*entire geographic area bounded annually by the locus of the 2°C above ambient surface isotherms as these isotherms are distributed throughout an annual period*"); ensure placement of the biological sampling locations within thermally influenced areas; and inform the evaluation of potential impacts on recreation and water supply uses.

However, it is important to emphasize that the $\geq 2^{\circ}$ C isopleth boundary is not a bright line; it is dynamic, changing geometrically in response to changes in ambient river flows and temperatures and SQN operations. As such, samples collected outside of, but generally proximate to the Primary Study Area boundary should not be discounted as non-thermally influenced. Every effort will be made to collect biological samples in thermally affected areas as guided by the Primary Study Area definition.

Field activities will include measurement of surface to bottom temperature profiles along transects across the plume. One transect will be located proximate to the thermal discharge point; subsequent downstream transects will be concentrated in the near field area of the plume where the change in plume temperature is expected to be most rapid. The distance between transects in the remainder of the Primary Study Area will increase with distance downstream or away from the discharge point. The farthest downstream transect will be just outside of the Primary Study Area. A transect upstream of the discharge that is not affected by the thermal plume will be included for determining ambient temperature conditions. The total number of transects needed to fully characterize and delineate the plume will be determined in the field.

Temperature profile measurement (surface to bottom) points along a given transect will begin at or near the shoreline from which the discharge originates and continue across the plume until ambient background temperature conditions (based on surface (0.1 meters (m)/0.3 ft depth) measurements) or the far shore is reached. The number of measurement points along transects will generally be proportional to the width of the plume and the magnitude of the temperature change across a given transect. The distances between transects and measurement points will depend on the size of the discharge plume.

The temperature measurement instrument (Hydrolab® or equivalent) will be calibrated to a thermometer whose calibration is traceable to the National Institute of Standards and Technology.

Temperature data will be compiled and analyzed to present the horizontal and vertical dimensions of the SQN thermal plume using spatial analysis techniques to yield plume cross-sections, which can be used to demonstrate the existence of a zone of passage under and/or around the plume.

Task 3 – Establishment of Biological Sampling Stations

Water temperature data from Task 2 will define the relationships between the biological sampling zone and thermally affected areas as informed by the EPA (1977) draft guidance, which identifies the Primary Study Area as having water temperatures of $>2^{\circ}C$ (3.6°F) above ambient temperature. The thermally affected sampling location will be referred to as the "downstream zone;" the non-thermally-affected sampling location will be referred to as the "upstream zone." If it is determined, based on the plume temperature measurements/mapping that the currently used biological sampling zone downstream of SQN is not fully within the EPA guidance-defined Primary Study Area, that sampling zone will be re-established within the EPA Primary Study Area.

Figure 3 depicts the downstream biological sampling zone; Figure 4 includes the location of the ambient biological sampling zone upstream of SQN.

Task 4 – Shoreline and River Bottom Habitat Characterization

Informed by the results of Tasks 2 and 3, habitat characterization will be conducted at each selected sampling location to evaluate potential for bias in the results due to habitat differences between the thermally affected area and the ambient sampling locations, and to support interpretation of the biological data. Eight line-of-sight transects will be established across the width of Chickamauga Reservoir downstream and upstream of SQN to assess the quality of shoreline habitat (Figure 5). An integrative multi-metric index (Shoreline Aquatic Habitat Index or SAHI), including several habitat parameters important to resident fish species, will be used to measure the existing fish habitat quality. Using the SAHI, individual metrics are scored through comparison of observed conditions with reference conditions and assigned a corresponding value.

River bottom habitat characterization for both the upstream and downstream study zones will consist of eight transects each collected perpendicular to the shoreline. Each transect will evaluate substrate by collecting 10 equally spaced Ponar® dredge samples across the width of the reservoir. Each sample will be visually estimated to define substrate and then sieved to define percent makeup of substrate. At each sample location, depth, and sediment type encountered will be recorded. Sediment categories include bedrock, boulder, cobble, gravel, sand, fines, and detritus. Each site will be assigned one of three habitat categories to reduce the amount of assessment variability. Habitat categories are as follows: A) areas with presence of large substrates such as cobble and boulders, B) areas dominated by sand or fine substrates and C) areas with a presence of a mixture of both A and B (small and large) habitat types.

Task 5 – Supporting Water Quality Measurements

In addition to the thermal plume measurements, additional water quality profiles will be collected as necessary in conjunction with the field studies to: (i) support interpretation of the biological data; and (ii) evaluate potential impacts to water supply and recreational uses. Using a Hydrolab®, or equivalent unit, three water column profiles at one-meter increments will be collected near the left descending bank, right descending bank and mid-channel at the upstream and downstream ends of each sample zone, and other areas as needed (e.g., at water supply intakes). Each profile collected will include temperature, dissolved oxygen concentration, pH, and conductivity.

Task 6 - Biological Evaluations

The biological evaluations will focus on major representative species of the aquatic and wildlife community that could potentially be affected by the SQN thermal discharge. Sampling will be conducted during the summer months (mid-July – August) once during the SQN permit cycle to evaluate "worst case" conditions. Autumn monitoring (October – mid-December) will be conducted as a measure of potential manifested effects to the aquatic community from summer-long exposure to the thermal discharge and other stressors (basis for existing multi-metric assessments).

The biological communities to be sampled and collection methodologies are provided in the following sections.

Reservoir Fish Community Monitoring

Informed by the habitat characterization and temperature measurements, the fish community will be sampled during sample events at two locations: downstream within the thermal influence of the power plant (Figure 3); and upstream and beyond thermal influence of SQN (centered at TRM 489.5) (Figure 4). Sampling will be conducted by boat electrofishing and gill netting (Hubert 1996; Reynolds, 1996).

The electrofishing methodology is based on existing monitoring programs and consists of 15 shoreline-oriented boat electrofishing runs in the upstream sampling zone and 15 shoreline runs in the downstream zone. Each run is 300 m (984 ft) long and electrofishing is conducted for a duration of approximately 15 minutes each. The total near-shore linear area sampled will be approximately 4,500 m (15,000 ft) per zone (Jennings, et al., 1995; Hickman and McDonough, 1996; McDonough and Hickman, 1999). Should the size of the SQN thermal plume (i.e., Primary Study Area) be too small to allow collection of all replicate electrofishing runs, the needed remaining replicate runs will be conducted as close as practicable to the Primary Study Area and be identified in the data analyses. As indicated previously, the $\geq 2^{\circ}$ C isopleth boundary that defines the Primary Study Area is not a rigid boundary; rather, its geometry changes in response to ambient river flows and temperatures and SQN operations (discharge flow). As such, samples collected outside of, but generally proximate to the Primary Study Area boundary should not be discounted as non-thermally influenced.

Experimental gill nets (so called because of their use for research as opposed to commercial fishing) are used as an additional gear type to collect fish from deeper habitats not effectively sampled by electrofishing. Each experimental gill net consists of five-6.1 m (20 ft) panels for a total length of 30.5 m (100 ft). The distinguishing characteristic of experimental gill nets is mesh size that varies between panels. For this application, each net has panels with mesh sizes of 2.5 (1 inch (in)), 5.1 (2 in), 7.6 (3 in), 10.2 (4 in), and 12.7 (5 in) centimeters (cm). Experimental gill nets are typically set perpendicular to river flow extending from near-shore to the main channel of the reservoir. Ten overnight experimental gill net sets will be used at each area.

Fish collected will be identified by species, counted, and examined for anomalies (such as disease, deformities, or hybridization).

Reservoir Benthic Macroinvertebrate Community Monitoring

Benthic macroinvertebrates will be sampled with benthic grab samplers at ten equally-spaced points along the upstream (ambient) and downstream (mid-plume) sampling zones (Figures 3 and 4). A Ponar® sampler (area per sample 0.06 m^2) will be used for most samples. When heavier substrates are encountered, a Peterson sampler (area per sample 0.11 m^2) will be used. Bottom sediments will be washed on a 533 micron (μ) screen; organisms will be picked from the screen and from any remaining substrate. Organisms will be sent to an independent laboratory for identification to the lowest practicable taxonomic level.

Reservoir Plankton Community Monitoring

At the request of TDEC, phytoplankton samples will be obtained from a photic zone¹ composite water sample collected at two locations each in the main channel area of the downstream sampling zone (Primary Study Area: mid-plume and plume downstream boundary; see Figure 3) and the upstream zone (Figure 4). This will be accomplished by lowering the intake end of a peristaltic pump sample tube to the bottom of the photic zone; and with the pump activated, slowly retrieving the sample tubing at a constant rate until the reservoir surface is reached. The phytoplankton data will be used to compare potential algal community response to thermal influence based on high-level taxonomy (i.e., Chrysophyta, Chlorophyta, Cyanophyta).

Zooplankton samples will be collected with a plankton net (300 millimeter (1 ft) diameter with 153 μ mesh) towed at two locations each in the main channel area of the downstream sampling zone (Primary Study Area: mid-plume and plume downstream boundary) and the upstream zone (Figures 3 and 4). Tows will consist of a vertical pull (tow) of the entire water column from 2 m off the bottom to the surface of the reservoir. Comparative analysis of zooplankton data from the two locations will be used to evaluate potential thermal influence on community structure.

¹ For the purposes of this study, the photic zone is defined as twice the Secchi disk transparency depth or 4 meters, whichever is greater.

Plankton sampling will be conducted once during the sampling events utilizing established TVA procedures. Among other criteria, these procedures specify replicate sampling, proper sample preservation, and data processing requirements.

Wildlife Community Evaluation

The wildlife community will be evaluated via implementation of visual encounter (observational) wildlife survey methodology and supported through review of the available literature, and communications with natural resource agency contacts. The effort will focus on the more water dependent species of the herpetofaunal, avian, and mammalian communities. These activities will assist in identifying the wildlife species expected for the ecoregion, establish the presence/absence of a BIP of wildlife in the study area, and support evaluation of potential direct effects of temperature on sensitive life stages and any indirect effects such as increased predation.

A review of available resources to identify any threatened or endangered species potentially occurring in the study area will also be conducted.

For the visual encounter surveys, two permanent transects will be established both upstream and downstream of the SQN thermal effluent. The midpoint of the upstream transect will be positioned at TRM 489.5 and span a distance of 2,100 m within this transect. The downstream transect will be located in the field based on sampling event and likewise span a distance 2,100 m. The beginning and ending point of each transect will be marked with GPS for relocation. Transects will be positioned approximately 30 m offshore and parallel to the shoreline occurring on both right and left descending banks. Basic inventories will be conducted to provide a representative sampling of wildlife present during summer (mid-July – August) and late autumnearly winter (October – December).

Each transect will be surveyed by steadily traversing the length by boat and simultaneously recording observations of wildlife. Sampling frame of each transect will generally follow the strip or belt transect concept with all individuals enumerated that crossed the center-line of each transect landward to an area that included the shoreline and riparian zone (i.e., belt width generally averages 60 m where vision is not obscured). Information recorded will include wildlife identification (to the lowest taxonomic trophic level) that is observed visually and/or audibly and a direct count of individuals observed per trophic level. If flocks of a species or mixed flock of a group of species are observed, an estimate of the number of individuals present will be generated. Time will be recorded at the starting and ending point of each transect to provide a general measure of effort expended. However, times may vary among transects primarily due to the difficulty in approaching some wildlife species without inadvertently flushing them from basking or perching sites. To compensate for the variation of effort expended per transect for the variation of effort expended per transect for the variation of effort expended is standardized to numbers per minute or numbers per hectare in preparation for analysis.

The principal objective and purpose behind the wildlife surveys are to provide a preliminary set of observations to verify trophic levels of birds, mammals, amphibians and reptiles present that might be affected by thermal effects of the power plant (i.e., the ATL). If trophic levels are not represented, further investigation will be used to target specific species and/or species groups (guilds) that will determine the cause.

Task 7 -Water Supply and Recreational Use Support Evaluation

Water temperature data collected as part of the thermal mapping (Task 2) and collection of supporting water quality information (Task 5) will be used to evaluate potential thermal impacts to water supply and recreational uses in the vicinity of SQN. Locations of any public water supply intakes and/or established public recreational areas will be determined and their position(s) mapped relative to the SQN thermal plume. We are aware of one domestic water supply intake located within approximately 10 river miles downstream of the SQN thermal discharge (Figure 1). The existence of any relevant water temperature data collected by the owners of these water supply intake(s) will be determined; and if available, requested to augment the field-collected data. As necessary (limited or no available owner-supplied temperature data), direct measurements of water temperature may also be conducted specifically at these locations to evaluate potential thermal effects of the SQN discharge.

3.3 Data Contribution to the Analysis/Demonstration

The analysis of fish, macroinvertebrate, and plankton community data will include traditional analyses whereby community attributes for the thermally affected areas will be compared to the non-thermally affected ambient location. For the purposes of the demonstration (within river/reservoir comparisons), the composition of fish and macroinvertebrate assemblages collected at the upstream station, uninfluenced by the SQN thermal discharge, is expected to set the baseline for evaluating the presence of a BIP in the downstream thermally influenced area. In that regard, a BIP is the expected determination for the thermally uninfluenced area.

3.3.1 Traditional Analyses

As applicable, biological community data will be compiled into tables providing a listing of species collected and their status with regard to expected occurrence in the ecoregion. Reference materials such as: "*The Fishes of Tennessee*" (Etnier and Starnes, 1993); similarly applicable publications; and best professional judgment by experienced aquatic biologists will be used for this determination. The dataset will be further evaluated with regard to the following:

- Life stages represented,
- Food chain species present (e.g., predator and prey species),
- Thermally-tolerant or -sensitive species present (based on Yoder et al., 2006),
- Representative Important Species (commercially and/or recreationally); and
- Other community attributes (fish and macroinvertebrates)

To evaluate similarity with the downstream thermally influenced area, traditional species diversity indices will be used. Diversity indices provide important information about community composition and take the relative abundances of different species into account as well as species richness (i.e., number of individual species). Two diversity indices will be calculated for each sample location; such as: the Shannon-Weiner diversity index (H') (Levinton, 1982) and Simpson's Index of Diversity (D_s) (Simpson, 1949). Of the many biological diversity indices, these two indices are the most commonly reported in the scientific literature and will be evaluated for use in determining if community structure is similar between the thermally influenced and non-thermally influenced sampling locations. Other methods/indices for evaluating similarity between sampling sites will also be considered.

Based on the BIP baseline for the thermally uninfluenced ambient (upstream) location, comparative statistical analysis of the diversity indices and/or other measures of biological community status such as: species richness, relative abundance, pollution tolerance, trophic guilds, indigenousness, and thermal sensitivity (each pending sufficient sample size) will be used to confirm the presence/absence of a BIP in the thermally influenced study area.

3.3.2 Supporting Multi-metric Bioassessment

Upon review of the species listings and establishment that the fish and macroinvertebrate populations are appropriate to the aquatic systems of the ecoregion, sample data also will be analyzed using TVA's Reservoir Fish Assemblage Index (RFAI) methodology (McDonough and Hickman 1999) and Reservoir Benthic Index to further evaluate if the SQN thermal discharge has materially changed ecological conditions in the receiving water body (Tennessee River – Chickamauga Reservoir).

<u>Reservoir Fish Assemblage Index</u>

The RFAI uses 12 fish assemblage metrics from four general categories: Species Richness and Composition (8 metrics); Trophic Composition (two metrics); Abundance (one metric); and Fish Health (absence of anomalies) (one metric). Individual species can be utilized for more than one metric.

Each metric is assigned a score based on "expected" fish assemblage characteristics in the absence of human-induced impacts other than impoundment of the reservoir. Individual metric scores for a sampling area (i.e., upstream or downstream) will be summed to obtain the RFAI score for each sample location and comparatively analyzed. The maximum RFAI score is 60. Ecological health ratings (12-21 "Very Poor", 22-31 "Poor", 32-40 "Fair", 41-50 "Good", or 51-60 "Excellent") are then applied to scores.

Based on statistical analysis of multiple RFAI datasets, RFAI scores between sites (e.g., downstream vs. upstream) will need to differ by 6 points or more to be considered to have different fish assemblages based on documented variability in the sampling methodology.

Regardless of the scores, a metric-by-metric examination will be conducted; this review will be helpful in evaluating potential metric-specific impacts that may be thermally related.

Reservoir Benthic Macroinvertebrate Index

The RBI is similarly calculated as the RFAI except that it uses seven metrics specific to the macroinvertebrate assemblage. Each metric is assigned a score based on reference conditions and then summed to produce an overall RBI score for each sample site. The maximum RBI score is 35. Ecological health ratings (7-12 "Very Poor", 13-18 "Poor", 19-23 "Fair", 24-29 "Good", or 30-35 "Excellent") will then be applied to scores.

Based on statistical analysis of multiple RBI datasets, RBI scores between sites (e.g., downstream vs. upstream) that differ by 4 points or more will be considered to have different macroinvertebrate assemblages. A metric-by-metric examination will also be conducted, regardless of the scores, to evaluate potential thermally-related impacts on specific metrics.

3.3.4 Reasonable Potential Evaluation

Based on existing information and temperature data collected/obtained during the study, the reasonable potential for the thermal discharge to impair current and future water supply and recreational (water contact) uses will be evaluated. The measured temperatures at the water supply intake location and location of any named recreational areas or areas where recreational users are known to congregate within the thermally influenced area (if any), will form the basis for determining reasonable potential for use impairment. Should reasonable potential be indicated, TVA will discuss with TDEC; and as necessary, submit a revised scope of work (study design) for this task (Task 7) proposing additional data collections and/or analysis to focus the evaluation.

3.4 Reporting

A final Project Report will be prepared providing a description of the study design, data collection methods, SQN operational data, thermal plume mapping results, water quality monitoring data, and aquatic and wildlife community information. Raw data and associated field collection parameters will be appended to the report.

Results and conclusions regarding the §316(a) demonstration (maintenance of a BIP) and support of other use classifications (recreation and water supply) will be presented.

3.5 Study Schedule Summary

Field sampling will be conducted during summer (mid-July – August) once during the SQN permit cycle and autumn (October – mid-December); each event will include sampling of the Primary Study Area/downstream zone and upstream/ambient zone.

TVA will provide TDEC with an interim progress report of the summer 2011 sampling results in spring of 2012. Final report will be completed and submitted with the SQN NPDES permit renewal package.

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FIGURES

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Figure 1. Vicinity map for Sequoyah Nuclear plant depicting Chickamauga and Watts Bar Dam locations and water supply intakes downstream of the plant thermal discharge



Figure 2. Site map for Sequoyah Nuclear plant showing condenser cooling water intake structure, skimmer wall, and NPDES-permitted discharge Outfall No. 101



Figure 3. Biological monitoring zone downstream of Sequoyah Nuclear plant



Study Plan for Evaluation of the TVA Sequoyah Nuclear Plant Discharge in Support of an Alternate Thermal Limit

Soddy Daisy, Hamilton County, Tennessee



Tennessee Valley Authority

June 8, 2011



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EXECUTIVE SUMMARY

This document sets forth a revised Study Plan, which the Tennessee Valley Authority (TVA) plans to implement for the purpose of evaluating the Sequoyah Nuclear Plant (SQN) thermal discharge in support of compliance with the National Pollutant Discharge Elimination System (NPDES) permit for the facility and continuance of the associated Alternate Thermal Limit (ATL) for Outfall 101 as authorized under Section 316(a) of Clean Water Act and Tennessee Department of Environment and Conservation rules.

As required by the NPDES permit, the Study Plan was first submitted to the Tennessee Department of Environment and Conservation (TDEC) on December 20, 2010 and subject to review by TDEC and the U. S. Environmental Protection Agency (EPA), Region 4. Comments and suggested revisions were provided to TVA by TDEC in a meeting held on April 7, 2011 and have been incorporated herein.

The Study Plan provides regulatory background for the work; information about SQN operations; a brief description of the receiving waterbody; a summary of previous §316(a) and more recent monitoring studies conducted at the plant; and a detailed Scope of Work proposing the collection of new data to evaluate the potential impact of the Sequoyah Nuclear thermal discharge on the aquatic life and other classified uses of the Tennessee River/Chickamauga Reservoir in the vicinity of the plant. Specifically, studies are proposed to:

- 1. Collect the temperature data needed to delineate and map the spatial boundaries of the thermal discharge plume;
- 2. Characterize the aquatic and wildlife habitat in the study area;
- 3. Sample the fish, macroinvertebrate, and plankton communities;
- 4. Survey potentially affected wildlife;
- 5. Evaluate maintenance of a balanced indigenous population (BIP) by performing traditional and multi-metric analyses of collected data, as appropriate; and
- 6. Evaluate the reasonable potential for impairment of non-aquatic life uses of the receiving waterbody as they relate to the thermal discharge.

Field sampling activities are scheduled to begin in the summer and autumn of 2011. Resultant information will be used to support renewal of the facility's NPDES permit set to expire October 31, 2013.

1.0 INTRODUCTION

This document sets forth a revised Study Plan, which the Tennessee Valley Authority (TVA) plans to implement for the purpose of evaluating the Sequoyah Nuclear Plant (SQN) thermal discharge in support of compliance with the National Pollutant Discharge Elimination System (NPDES) permit for the facility (NPDES Permit No.: TN0026450). The Study Plan includes a review and discussion of applicable regulatory requirements for the thermal discharge and presents specific work elements for the re-verification of the existing Alternate Thermal Limit (ATL) for Outfall 101 in accordance with Clean Water Act (CWA) Section (§) 316(a). As required by the NPDES permit, the Study Plan was first submitted to the Tennessee Department of Environment and Conservation (TDEC) on December 20, 2010 and subject to review by TDEC and the U. S. Environmental Protection Agency (EPA), Region 4. Comments and suggested revisions were provided to TVA by TDEC in a meeting held on April 7, 2011 and have been incorporated herein.

1.1 Facility Information

Unit 1 and 2 were placed in operation in 1981 and 1982, respectively. Both units can produce more than 2,400 megawatts of electricity. SQN is located on the right descending bank of the Tennessee River (Chickamauga Reservoir) near Chattanooga, Tennessee (Figure 1). The facility withdraws cooling water from Chickamauga Reservoir via an intake channel and skimmer wall at river mile (TRM) 484.8. The cooling water intake structure (supporting six circulator pumps) provides the units a nominal flow of 1.11×10^6 gallons per minute (gpm) or 1,602 million gallons per day (mgd). The facility employs a once-through (open cycle) condenser cooling water system and can also operate with cooling towers in helper mode. The plant discharges heated effluent to Chickamauga Reservoir via Outfall 101 located at TRM 483.6 as authorized by the NPDES permit (Figure 2).

1.2 Regulatory Basis

1.2.1 Applicable Thermal Criteria

TDEC has specified "use classifications" for the state's surface waters and developed temperature criteria intended to support those uses (TDEC Rule 1200-4-4 and 1200-4-3-.03, respectively). The Tennessee River at the location of SQN has been classified for the following uses: Municipal, Industrial, and Domestic Water Supply, Industrial Water Supply, Fish and Aquatic Life, Recreation, Irrigation, Livestock Watering and Wildlife, and Navigation. Except for Irrigation and Livestock Watering and Wildlife (qualitative criteria), temperature criteria relevant to warm-water conditions of the Tennessee River at SQN specify that:

"The maximum water temperature change shall not exceed 3°C [5.4°F] relative to an upstream control point. The temperature of the water shall not exceed 30.5°C [86.9°F] and the maximum

rate of change shall not exceed 2°C [3.6°F] per hour. The temperature of impoundments where stratification occurs will be measured at a depth of 5 feet, or mid-depth whichever is less, and the temperature in flowing streams shall be measured at mid-depth." [Rule 1200-4-3-.03]

The SQN plant's "once-through" cooling water system design utilizing cooling towers in helper mode provides for the most thermodynamically efficient method of generating electricity and as a result produces a heated discharge. As such, the thermal discharge typically exceeds TDEC's established temperature criteria, therefore, multiport diffusers with mixing zone are used to adequately mix the thermal effluent to meet the state water quality standard at the end of the mixing zone. In such cases, the TDEC rules specific to the Fish and Aquatic Life use classification provide that:

"A successful demonstration as determined by the state conducted for thermal discharge limitations under Section 316(a) of the Clean Water Act, (33 U.S.C. §1326), shall constitute compliance... [with the temperature criteria]."

TVA has previously made such successful demonstration for the SQN thermal discharge in support of mixing zone criteria as further discussed below.

1.2.2 Permitted Conditions

Currently permitted thermal discharge limitations for SQN specify that the daily maximum temperature is not to exceed 30.5°C (86.9°F) at the end of the mixing zone (Page 1 of 28), NPDES permit TN0026450). This mixing zone criteria are based on a previous demonstration by TVA, in accordance with CWA §316(a) and TDEC Rule 1200-4-3-.03 noted above, that a balanced indigenous population (BIP) of fish, shellfish, and wildlife is supported in the Tennessee River potentially affected by the thermal discharge. The mixing zone criteria, as supported by the biological studies, also encompass other components of the TDEC temperature criteria, specifically the change in temperature from ambient/upstream conditions and rate of change in temperature. SQN has maintained a good compliance record with its mixing zone criteria throughout each NPDES permit term since first authorized in the late-1980s; ongoing biological monitoring has consistently demonstrated the mixing zone criteria are protective of aquatic communities in the river near the facility.

1.2.3 Criteria for Alternate Thermal Limits Under §316(a)

The regulatory provisions that implement CWA §316(a) provide limited guidance on precisely what the demonstration study must contain to be considered adequate and do not identify precise criteria against which to measure whether a "*balanced and indigenous*" aquatic community is protected and maintained. Instead, the regulations provide broad guidelines.

Under the broad regulatory guidelines, the discharger must show that the ATL desired, "considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected," will "assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the

discharge is to be made (40 CFR §125.73). Critical to the demonstration is the meaning of the term "balanced indigenous community". The rules provide the following definition:

"The term "balanced indigenous community" is synonymous with the term balanced, indigenous population (i.e., BIP) in the Act and means a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications" (40 CFR §125.73).

Pursuant to this regulatory definition, a successful demonstration must show that under the desired ATL, and in light of the cumulative impact of the thermal discharge together with all other significant impacts on the species affected, the following characteristics, which are indicative of a BIP, will continue to exist: (1) diversity, (2) the capacity of the community to sustain itself through cyclic seasonal changes, (3) presence of necessary food chain species, and (4) a lack of domination by pollution tolerant species.

There are several methodologies a discharger may pursue in making a §316(a) demonstration. Under the regulations, <u>new dischargers</u> must use predictive methods (e.g., laboratory studies, literature surveys, or modeling) to estimate an appropriate ATL that will assure the protection and propagation of a balanced, indigenous community prior to commencing the thermal discharge. However, <u>existing dischargers</u>, such as SQN, need not use predictive methods. For such dischargers, §316(a) demonstrations may be based upon the "*absence of prior appreciable harm*" to a balanced, indigenous community (see 40 CFR §125.73(c)(1)(i) and (ii)). Such demonstrations must show <u>either</u> that:

- i) No appreciable harm has resulted from the thermal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge has been made; or
- ii) Despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made.

Furthermore, in determining whether or not prior appreciable harm has occurred, the regulations provide that the permitting agency consider the length of time during which the applicant has been discharging and the nature of the discharge. The regulations do not define "*prior appreciable harm*." However, using the definition of "balanced, indigenous community," mixing zone criteria are generally granted under either of the following circumstances:

- 1. When a discharger shows that the characteristics of a BIP (i.e., diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species, and a lack of domination by pollution tolerant species) exist. Stated another way, the existence of such characteristics essentially prove that the aquatic community has not been appreciably harmed; or
- 2. Despite any evidence of previous harm, the characteristics of a BIP, as stated above, will nevertheless be protected and assured under the alternate limit.

1.2.4 Mixing Zone Requirements in Tennessee Rule 1200-4-3-0.5

As noted above, §316(a) pertains to the Fish and Aquatic Life use classification and provides NPDES-permitted facilities a regulatory compliant means of demonstrating that promulgated temperature criteria may be more stringent than necessary to support a BIP. In such cases, less stringent thermal criteria (i.e., ATLs) are justified. However, other use classifications such as Domestic Water Supply and Recreation must be protected as well. Compliance with TDEC temperature criteria for these uses is typically determined after the discharge has had the opportunity to mix with the receiving water; that is, an allowable mixing zone is determined.

TDEC rules define the mixing zone as:

"That section of a flowing stream or impounded waters in the immediate vicinity of an outfall where an effluent becomes dispersed and mixed." [1200-4-3-.04(8)]

The rules [1200-4-3-.05(2)] further provide that mixing zones are to be restricted in area and length and not:

- 1. prevent the free passage of fish or cause aquatic life mortality in the receiving waters;
- 2. contain materials in concentrations that exceed acute criteria beyond the zone immediately surrounding the outfall;
- 3. result in offensive conditions;
- 4. produce undesirable aquatic life or result in dominance of a nuisance species;
- 5. endanger the public health or welfare; or
- 6. adversely affect the reasonable and necessary uses of the area;
- 7. create a condition of chronic toxicity beyond the edge of the mixing zone;
- 8. adversely affect nursery and spawning areas; or
- 9. adversely affect species with special state or federal status.

While TVA's proposed §316(a) demonstration study plan fully examines the effects of the thermal discharge on the aquatic life components of the mixing zone requirements, the potential effects to other non-aquatic life use classifications (items 3, 5, and 6 above) are generally not evaluated. Therefore, this plan has been revised herein to incorporate and/or collect additional

information needed to address the reasonable potential for impairment of other non-aquatic life uses in the Tennessee River near the facility.

1.3 Study Plan Organization

This Study Plan is organized into the following sections:

- 1. Introductory information, including regulatory basis and rationale for the study;
- 2. Background information, including a summary of the findings of the previous §316(a) investigation and subsequent biological monitoring; and,
- 3. The proposed design and implementation schedule for the SQN §316(a) demonstration Study Plan.

2.0 STUDY BACKGROUND

2.1 Sequoyah Nuclear Plant

The SQN facility is operated to produce base-load electric power throughout the year. When operating at design (nameplate) capacity (2,400 MW), the units requires approximately 1,602 million gallons per day of condenser cooling water. Waste heat increases the temperature of the cooling water by approximately 16.4°C (29.5°F) before it is discharged into the river. The actual condenser flow, and hence the ΔT , may vary somewhat with the circulating water pump head and the condenser efficiency.

2.2 Description of the Receiving Waterbody

Sequoyah Nuclear is located on the right descending bank of Chickamauga Reservoir (TRM 484.5) approximately 18 miles northeast of Chattanooga, Tennessee, and 7 miles southwest of Soddy-Daisy, Tennessee (Figure 1). Chickamauga Reservoir was impounded in 1940 and at full pool covers approximately 36,240 acres.

The topography of the reservoir in the vicinity of the discharge outlet consists of a shallow overbank area on the plant side which extends from TRM 484 downstream to TRM 481.8 and varies in depth from 2 to 20 ft and from 500 to 3,100 ft in width. This shallow area is bordered by a main river channel which is about 900 feet (ft) wide and approximately 60 ft deep. Along this reach there are several small, shallow embayments.

The Tennessee River flow in the vicinity of SQN is controlled by releases from Watts Bar and Chickamauga Dams, and to a lesser extent Hiwassee River. SQN is situated on Chickamauga Reservoir approximately 54.5 river miles downstream from Watts Bar Dam and 13.5 river miles upstream from Chickamauga Dam.
2.3 **Previous §316(a) Demonstration Study**

TVA conducted comprehensive §316(a) demonstration-related studies of the SQN thermal effluent in the mid-1980s to support establishment of the current mixing zone criteria for the plant discharge (TVA, 1989). The minimum average daily flow for the Tennessee River near SQN at the time of the early studies was 6,000 cfs.

The mid-1980s studies included extensive sampling of the aquatic community including:

- Phytoplankton,
- Periphyton,
- Aquatic macrophytes,
- Zooplankton,
- Benthic macroinvertebrates; and
- Fish populations.

Hydrothermal, water quality and other parameters also were evaluated.

Major findings of these studies included:

- Average dissolved concentration in the water column was similar immediately upstream and downstream of SQN.
- Analysis of the data indicate that the assemblages of phytoplankton, zooplankton, and macroinvertebrates were diverse and, in general, relatively abundant.
- Dominance of blue-green algae was similar upstream and downstream of SQN.
- The phytoplankton and zooplankton communities were found to be similar, or if different, not impacted by SQN operation, at all stations during 20 of the 27 survey months when the plant was in operation.
- Species richness in the benthic macroinvertebrate communities during pre-operational and operational monitoring was similar.
- No changes were documented in the aquatic macrophyte community that reflected effects of the thermal effluent.
- Fish species occurrence and abundance data indicated insignificant impacts. Avoidances of the plume could not be detected for any species of fish. One study found that sauger (*Sander canadensis*) were not concentrated in the thermal plume during winter months nor inhibited from movement past SQN. Results of gonadal inspections indicate that the heated discharge did not adversely affect fish reproduction.

- Other fisheries studies indicated that the thermal discharge resulted in no discernible increase in parasitism.
- No mortalities of threadfin shad due to cold shock following shutdown of SQN were observed or reported, and none are anticipated to occur in the future.

2.4 Contemporary Studies

Monitoring of the thermal effects of the SQN discharge on the aquatic community of the receiving waterbody has been more recently conducted by TVA after an agreement was reached with TDEC in 2001. TVA's "Vital Signs" monitoring program also provides useful information for evaluating reservoir-wide effects. Monitoring has included sampling of the fish and macroinvertebrate communities and associated collection of temperature and other water quality parameters. Results of the permit monitoring work and TVA's ongoing Vital Signs monitoring (TVA, 2011) have consistently demonstrated that fish and macroinvertebrate assemblages of Chickamauga Reservoir within and downstream of the SQN thermal discharge are similar to those of upstream locations, as well as to established mainstem reservoir reference conditions for the area.

Results of the above studies notwithstanding, TVA plans to implement this Study Plan for the purpose of further evaluating the SQN thermal discharge to support continuance of the ATL for the facility discharge in accordance with CWA §316(a) and TDEC Rule 1200-4-3-.03(e).

7.

3.0 STUDY PLAN

This §316(a) demonstration Study Plan is informed by communications with TDEC and EPA, the study design of the previous demonstration study, and TVA's ongoing river/reservoir biological monitoring programs.

3.1 Study Timing

As reasonably practicable, TVA sampling crews will coordinate with SQN facility operations staff to schedule field studies to coincide with representative conditions of maximum generation for the time period to be sampled as dictated by seasonal power demand. The additional field studies will be conducted during the period of critical environmental (thermal) conditions in summer (mid-July – August) when plant operations and ambient reservoir temperatures are at expected seasonal maximums. Summer monitoring will be conducted once during the SQN permit cycle. Data collection during this period will focus on characterization/delineation of the thermal plume and biological field investigations inclusive of thermally affected and unaffected areas. TVA will also conduct monitoring in autumn (October – mid-December) as has been occurring in previous study years.

3.2 Study Scope

The following tasks will be conducted for the SQN §316(a) demonstration Study:

Task 1 – Evaluate Plant Operating Conditions

During the course of the study, SQN operational data will be recorded, compiled, and analyzed to assist in the interpretation of thermal plume characteristics and biological community information. Available historical operational data will also be compiled and analyzed to evaluate and identify any material changes in SQN operations over the most recent 5-year period that might affect the thermal plume characteristics. Parameters to be recorded during the proposed study and evaluated historically include, but are not limited to:

- Cooling water intake flow and water temperature;
- Discharge flow and water temperature; and
- Power generation statistics.

The data will be presented in tabular and graphical formats to describe SQN operational conditions during the current study.

Task 2 – Thermal Plume Monitoring and Mapping

Physical measurements will be taken to characterize and map the SQN thermal plume concurrent with biological field sampling during the sampling events. In this manner, it is expected that the plume will be characterized under representative thermal maxima and seasonally-expected low flow conditions. Measurements will be collected during periods of high power production from SQN, as reasonably practicable, to capture maximum extent of the thermal plume under existing river flow/reservoir elevation conditions. This effort will allow general delineation of the "Primary Study Area" per the EPA (1977) draft guidance defined as the: "*entire geographic area bounded annually by the locus of the 2°C above ambient surface isotherms as these isotherms are distributed throughout an annual period*"); ensure placement of the biological sampling locations within thermally influenced areas; and inform the evaluation of potential impacts on recreation and water supply uses.

However, it is important to emphasize that the $\geq 2^{\circ}$ C isopleth boundary is not a bright line; it is dynamic, changing geometrically in response to changes in ambient river flows and temperatures and SQN operations. As such, samples collected outside of, but generally proximate to the Primary Study Area boundary should not be discounted as non-thermally influenced. Every effort will be made to collect biological samples in thermally affected areas as guided by the Primary Study Area definition.

Field activities will include measurement of surface to bottom temperature profiles along transects across the plume. One transect will be located proximate to the thermal discharge point; subsequent downstream transects will be concentrated in the near field area of the plume where the change in plume temperature is expected to be most rapid. The distance between transects in the remainder of the Primary Study Area will increase with distance downstream or away from the discharge point. The farthest downstream transect will be just outside of the Primary Study Area. A transect upstream of the discharge that is not affected by the thermal plume will be included for determining ambient temperature conditions. The total number of transects needed to fully characterize and delineate the plume will be determined in the field.

Temperature profile measurement (surface to bottom) points along a given transect will begin at or near the shoreline from which the discharge originates and continue across the plume until ambient background temperature conditions (based on surface (0.1 meters (m)/0.3 ft depth) measurements) or the far shore is reached. The number of measurement points along transects will generally be proportional to the width of the plume and the magnitude of the temperature change across a given transect. The distances between transects and measurement points will depend on the size of the discharge plume.

The temperature measurement instrument (Hydrolab® or equivalent) will be calibrated to a thermometer whose calibration is traceable to the National Institute of Standards and Technology.

Temperature data will be compiled and analyzed to present the horizontal and vertical dimensions of the SQN thermal plume using spatial analysis techniques to yield plume cross-sections, which can be used to demonstrate the existence of a zone of passage under and/or around the plume.

Task 3 – Establishment of Biological Sampling Stations

Water temperature data from Task 2 will define the relationships between the biological sampling zone and thermally affected areas as informed by the EPA (1977) draft guidance, which identifies the Primary Study Area as having water temperatures of $>2^{\circ}C$ (3.6°F) above ambient temperature. The thermally affected sampling location will be referred to as the "downstream zone;" the non-thermally-affected sampling location will be referred to as the "upstream zone." If it is determined, based on the plume temperature measurements/mapping that the currently used biological sampling zone downstream of SQN is not fully within the EPA guidance-defined Primary Study Area, that sampling zone will be re-established within the EPA Primary Study Area.

Figure 3 depicts the downstream biological sampling zone; Figure 4 includes the location of the ambient biological sampling zone upstream of SQN.

Task 4 – Shoreline and River Bottom Habitat Characterization

Informed by the results of Tasks 2 and 3, habitat characterization will be conducted at each selected sampling location to evaluate potential for bias in the results due to habitat differences between the thermally affected area and the ambient sampling locations, and to support interpretation of the biological data. Eight line-of-sight transects will be established across the width of Chickamauga Reservoir downstream and upstream of SQN to assess the quality of shoreline habitat (Figure 5). An integrative multi-metric index (Shoreline Aquatic Habitat Index or SAHI), including several habitat parameters important to resident fish species, will be used to measure the existing fish habitat quality. Using the SAHI, individual metrics are scored through comparison of observed conditions with reference conditions and assigned a corresponding value.

River bottom habitat characterization for both the upstream and downstream study zones will consist of eight transects each collected perpendicular to the shoreline. Each transect will evaluate substrate by collecting 10 equally spaced Ponar® dredge samples across the width of the reservoir. Each sample will be visually estimated to define substrate and then sieved to define percent makeup of substrate. At each sample location, depth, and sediment type encountered will be recorded. Sediment categories include bedrock, boulder, cobble, gravel, sand, fines, and detritus. Each site will be assigned one of three habitat categories to reduce the amount of assessment variability. Habitat categories are as follows: A) areas with presence of large substrates such as cobble and boulders, B) areas dominated by sand or fine substrates and C) areas with a presence of a mixture of both A and B (small and large) habitat types.

Task 5 – Supporting Water Quality Measurements

In addition to the thermal plume measurements, additional water quality profiles will be collected as necessary in conjunction with the field studies to: (i) support interpretation of the biological data; and (ii) evaluate potential impacts to water supply and recreational uses. Using a Hydrolab®, or equivalent unit, three water column profiles at one-meter increments will be collected near the left descending bank, right descending bank and mid-channel at the upstream and downstream ends of each sample zone, and other areas as needed (e.g., at water supply intakes). Each profile collected will include temperature, dissolved oxygen concentration, pH, and conductivity.

Task 6 – Biological Evaluations

The biological evaluations will focus on major representative species of the aquatic and wildlife community that could potentially be affected by the SQN thermal discharge. Sampling will be conducted during the summer months (mid-July – August) once during the SQN permit cycle to evaluate "worst case" conditions. Autumn monitoring (October – mid-December) will be conducted as a measure of potential manifested effects to the aquatic community from summer-long exposure to the thermal discharge and other stressors (basis for existing multi-metric assessments).

The biological communities to be sampled and collection methodologies are provided in the following sections.

Reservoir Fish Community Monitoring

Informed by the habitat characterization and temperature measurements, the fish community will be sampled during sample events at two locations: downstream within the thermal influence of the power plant (Figure 3); and upstream and beyond thermal influence of SQN (centered at TRM 489.5) (Figure 4). Sampling will be conducted by boat electrofishing and gill netting (Hubert 1996; Reynolds, 1996).

The electrofishing methodology is based on existing monitoring programs and consists of 15 shoreline-oriented boat electrofishing runs in the upstream sampling zone and 15 shoreline runs in the downstream zone. Each run is 300 m (984 ft) long and electrofishing is conducted for a duration of approximately 15 minutes each. The total near-shore linear area sampled will be approximately 4,500 m (15,000 ft) per zone (Jennings, et al., 1995; Hickman and McDonough, 1996; McDonough and Hickman, 1999). Should the size of the SQN thermal plume (i.e., Primary Study Area) be too small to allow collection of all replicate electrofishing runs, the needed remaining replicate runs will be conducted as close as practicable to the Primary Study Area and be identified in the data analyses. As indicated previously, the $\geq 2^{\circ}$ C isopleth boundary that defines the Primary Study Area is not a rigid boundary; rather, its geometry changes in response to ambient river flows and temperatures and SQN operations (discharge flow). As such, samples collected outside of, but generally proximate to the Primary Study Area boundary should not be discounted as non-thermally influenced.

Experimental gill nets (so called because of their use for research as opposed to commercial fishing) are used as an additional gear type to collect fish from deeper habitats not effectively sampled by electrofishing. Each experimental gill net consists of five-6.1 m (20 ft) panels for a total length of 30.5 m (100 ft). The distinguishing characteristic of experimental gill nets is mesh size that varies between panels. For this application, each net has panels with mesh sizes of 2.5 (1 inch (in)), 5.1 (2 in), 7.6 (3 in), 10.2 (4 in), and 12.7 (5 in) centimeters (cm). Experimental gill nets are typically set perpendicular to river flow extending from near-shore to the main channel of the reservoir. Ten overnight experimental gill net sets will be used at each area.

Fish collected will be identified by species, counted, and examined for anomalies (such as disease, deformities, or hybridization).

Reservoir Benthic Macroinvertebrate Community Monitoring

Benthic macroinvertebrates will be sampled with benthic grab samplers at ten equally-spaced points along the upstream (ambient) and downstream (mid-plume) sampling zones (Figures 3 and 4). A Ponar® sampler (area per sample 0.06 m^2) will be used for most samples. When heavier substrates are encountered, a Peterson sampler (area per sample 0.11 m^2) will be used. Bottom sediments will be washed on a 533 micron (μ) screen; organisms will be picked from the screen and from any remaining substrate. Organisms will be sent to an independent laboratory for identification to the lowest practicable taxonomic level.

Reservoir Plankton Community Monitoring

At the request of TDEC, phytoplankton samples will be obtained from a photic zone¹ composite water sample collected at two locations each in the main channel area of the downstream sampling zone (Primary Study Area: mid-plume and plume downstream boundary; see Figure 3) and the upstream zone (Figure 4). This will be accomplished by lowering the intake end of a peristaltic pump sample tube to the bottom of the photic zone; and with the pump activated, slowly retrieving the sample tubing at a constant rate until the reservoir surface is reached. The phytoplankton data will be used to compare potential algal community response to thermal influence based on high-level taxonomy (i.e., Chrysophyta, Chlorophyta, Cyanophyta).

Zooplankton samples will be collected with a plankton net (300 millimeter (1 ft) diameter with 153 μ mesh) towed at two locations each in the main channel area of the downstream sampling zone (Primary Study Area: mid-plume and plume downstream boundary) and the upstream zone (Figures 3 and 4). Tows will consist of a vertical pull (tow) of the entire water column from 2 m off the bottom to the surface of the reservoir. Comparative analysis of zooplankton data from the two locations will be used to evaluate potential thermal influence on community structure.

¹ For the purposes of this study, the photic zone is defined as twice the Secchi disk transparency depth or 4 meters, whichever is greater.

Plankton sampling will be conducted once during the sampling events utilizing established TVA procedures. Among other criteria, these procedures specify replicate sampling, proper sample preservation, and data processing requirements.

Wildlife Community Evaluation

The wildlife community will be evaluated via implementation of visual encounter (observational) wildlife survey methodology and supported through review of the available literature, and communications with natural resource agency contacts. The effort will focus on the more water dependent species of the herpetofaunal, avian, and mammalian communities. These activities will assist in identifying the wildlife species expected for the ecoregion, establish the presence/absence of a BIP of wildlife in the study area, and support evaluation of potential direct effects of temperature on sensitive life stages and any indirect effects such as increased predation.

A review of available resources to identify any threatened or endangered species potentially occurring in the study area will also be conducted.

For the visual encounter surveys, two permanent transects will be established both upstream and downstream of the SQN thermal effluent. The midpoint of the upstream transect will be positioned at TRM 489.5 and span a distance of 2,100 m within this transect. The downstream transect will be located in the field based on sampling event and likewise span a distance 2,100 m. The beginning and ending point of each transect will be marked with GPS for relocation. Transects will be positioned approximately 30 m offshore and parallel to the shoreline occurring on both right and left descending banks. Basic inventories will be conducted to provide a representative sampling of wildlife present during summer (mid-July – August) and late autumnearly winter (October – December).

Each transect will be surveyed by steadily traversing the length by boat and simultaneously recording observations of wildlife. Sampling frame of each transect will generally follow the strip or belt transect concept with all individuals enumerated that crossed the center-line of each transect landward to an area that included the shoreline and riparian zone (i.e., belt width generally averages 60 m where vision is not obscured). Information recorded will include wildlife identification (to the lowest taxonomic trophic level) that is observed visually and/or audibly and a direct count of individuals observed per trophic level. If flocks of a species or mixed flock of a group of species are observed, an estimate of the number of individuals present will be generated. Time will be recorded at the starting and ending point of each transect to provide a general measure of effort expended. However, times may vary among transects primarily due to the difficulty in approaching some wildlife species without inadvertently flushing them from basking or perching sites. To compensate for the variation of effort expended per transect, observations will be standardized to numbers per minute or numbers per hectare in preparation for analysis.

The principal objective and purpose behind the wildlife surveys are to provide a preliminary set of observations to verify trophic levels of birds, mammals, amphibians and reptiles present that might be affected by thermal effects of the power plant (i.e., the ATL). If trophic levels are not represented, further investigation will be used to target specific species and/or species groups (guilds) that will determine the cause.

Task 7 -Water Supply and Recreational Use Support Evaluation

Water temperature data collected as part of the thermal mapping (Task 2) and collection of supporting water quality information (Task 5) will be used to evaluate potential thermal impacts to water supply and recreational uses in the vicinity of SQN. Locations of any public water supply intakes and/or established public recreational areas will be determined and their position(s) mapped relative to the SQN thermal plume. We are aware of one domestic water supply intake located within approximately 10 river miles downstream of the SQN thermal discharge (Figure 1). The existence of any relevant water temperature data collected by the owners of these water supply intake(s) will be determined; and if available, requested to augment the field-collected data. As necessary (limited or no available owner-supplied temperature data), direct measurements of water temperature may also be conducted specifically at these locations to evaluate potential thermal effects of the SQN discharge.

3.3 Data Contribution to the Analysis/Demonstration

The analysis of fish, macroinvertebrate, and plankton community data will include traditional analyses whereby community attributes for the thermally affected areas will be compared to the non-thermally affected ambient location. For the purposes of the demonstration (within river/reservoir comparisons), the composition of fish and macroinvertebrate assemblages collected at the upstream station, uninfluenced by the SQN thermal discharge, is expected to set the baseline for evaluating the presence of a BIP in the downstream thermally influenced area. In that regard, a BIP is the expected determination for the thermally uninfluenced area.

3.3.1 Traditional Analyses

As applicable, biological community data will be compiled into tables providing a listing of species collected and their status with regard to expected occurrence in the ecoregion. Reference materials such as: *"The Fishes of Tennessee"* (Etnier and Starnes, 1993); similarly applicable publications; and best professional judgment by experienced aquatic biologists will be used for this determination. The dataset will be further evaluated with regard to the following:

- Life stages represented,
- Food chain species present (e.g., predator and prey species),
- Thermally-tolerant or -sensitive species present (based on Yoder et al., 2006),
- Representative Important Species (commercially and/or recreationally); and
- Other community attributes (fish and macroinvertebrates)

To evaluate similarity with the downstream thermally influenced area, traditional species diversity indices will be used. Diversity indices provide important information about community composition and take the relative abundances of different species into account as well as species richness (i.e., number of individual species). Two diversity indices will be calculated for each sample location; such as: the Shannon-Weiner diversity index (H') (Levinton, 1982) and Simpson's Index of Diversity (D_s) (Simpson, 1949). Of the many biological diversity indices, these two indices are the most commonly reported in the scientific literature and will be evaluated for use in determining if community structure is similar between the thermally influenced and non-thermally influenced sampling locations. Other methods/indices for evaluating similarity between sampling sites will also be considered.

Based on the BIP baseline for the thermally uninfluenced ambient (upstream) location, comparative statistical analysis of the diversity indices and/or other measures of biological community status such as: species richness, relative abundance, pollution tolerance, trophic guilds, indigenousness, and thermal sensitivity (each pending sufficient sample size) will be used to confirm the presence/absence of a BIP in the thermally influenced study area.

3.3.2 Supporting Multi-metric Bioassessment

Upon review of the species listings and establishment that the fish and macroinvertebrate populations are appropriate to the aquatic systems of the ecoregion, sample data also will be analyzed using TVA's Reservoir Fish Assemblage Index (RFAI) methodology (McDonough and Hickman 1999) and Reservoir Benthic Index to further evaluate if the SQN thermal discharge has materially changed ecological conditions in the receiving water body (Tennessee River – Chickamauga Reservoir).

Reservoir Fish Assemblage Index

The RFAI uses 12 fish assemblage metrics from four general categories: Species Richness and Composition (8 metrics); Trophic Composition (two metrics); Abundance (one metric); and Fish Health (absence of anomalies) (one metric). Individual species can be utilized for more than one metric.

Each metric is assigned a score based on "expected" fish assemblage characteristics in the absence of human-induced impacts other than impoundment of the reservoir. Individual metric scores for a sampling area (i.e., upstream or downstream) will be summed to obtain the RFAI score for each sample location and comparatively analyzed. The maximum RFAI score is 60. Ecological health ratings (12-21 "Very Poor", 22-31 "Poor", 32-40 "Fair", 41-50 "Good", or 51-60 "Excellent") are then applied to scores.

Based on statistical analysis of multiple RFAI datasets, RFAI scores between sites (e.g., downstream vs. upstream) will need to differ by 6 points or more to be considered to have different fish assemblages based on documented variability in the sampling methodology.

Regardless of the scores, a metric-by-metric examination will be conducted; this review will be helpful in evaluating potential metric-specific impacts that may be thermally related.

Reservoir Benthic Macroinvertebrate Index

The RBI is similarly calculated as the RFAI except that it uses seven metrics specific to the macroinvertebrate assemblage. Each metric is assigned a score based on reference conditions and then summed to produce an overall RBI score for each sample site. The maximum RBI score is 35. Ecological health ratings (7-12 "Very Poor", 13-18 "Poor", 19-23 "Fair", 24-29 "Good", or 30-35 "Excellent") will then be applied to scores.

Based on statistical analysis of multiple RBI datasets, RBI scores between sites (e.g., downstream vs. upstream) that differ by 4 points or more will be considered to have different macroinvertebrate assemblages. A metric-by-metric examination will also be conducted, regardless of the scores, to evaluate potential thermally-related impacts on specific metrics.

3.3.4 Reasonable Potential Evaluation

Based on existing information and temperature data collected/obtained during the study, the reasonable potential for the thermal discharge to impair current and future water supply and recreational (water contact) uses will be evaluated. The measured temperatures at the water supply intake location and location of any named recreational areas or areas where recreational users are known to congregate within the thermally influenced area (if any), will form the basis for determining reasonable potential for use impairment. Should reasonable potential be indicated, TVA will discuss with TDEC; and as necessary, submit a revised scope of work (study design) for this task (Task 7) proposing additional data collections and/or analysis to focus the evaluation.

3.4 Reporting

A final Project Report will be prepared providing a description of the study design, data collection methods, SQN operational data, thermal plume mapping results, water quality monitoring data, and aquatic and wildlife community information. Raw data and associated field collection parameters will be appended to the report.

Results and conclusions regarding the §316(a) demonstration (maintenance of a BIP) and support of other use classifications (recreation and water supply) will be presented.

3.5 Study Schedule Summary

Field sampling will be conducted during summer (mid-July – August) once during the SQN permit cycle and autumn (October – mid-December); each event will include sampling of the Primary Study Area/downstream zone and upstream/ambient zone.

TVA will provide TDEC with an interim progress report of the summer 2011 sampling results in spring of 2012. Final report will be completed and submitted with the SQN NPDES permit renewal package.

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FIGURES

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Figure 1. Vicinity map for Sequoyah Nuclear plant depicting Chickamauga and Watts Bar Dam locations and water supply intakes downstream of the plant thermal discharge



Figure 2. Site map for Sequoyah Nuclear plant showing condenser cooling water intake structure, skimmer wall, and NPDES-permitted discharge Outfall No. 101



Figure 3. Biological monitoring zone downstream of Sequoyah Nuclear plant



Figure 4. Biological monitoring zone upstream of Sequoyah Nuclear plant thermal discharge



Figure 5. Anticipated transects to be established for conduct of the integrative multi-metric aquatic shoreline habitat assessment

TENNESSEE VALLEY AUTHORITY (TVA) – SEQUOYAH NUCLEAR PLANT (SQN) -NPDES PERMIT NO. TN0026450 – WET REASONABLE POTENTIAL

Current Whole Effluent Toxicity (WET) Requirements:

Outfall 101 - 7-day or 3-brood IC_{25} Hard Trigger = 43.2% . [IWC = 43.2% effluent (2.3 TUc)]

> Monitoring Frequency Governed by B/CTP: 1/year when oxidizing biocides used 1/year when non-oxidizing biocides used

Proposed WET Requirements:

Outfall 101 - 7-day or 3-brood IC_{25} Hard Trigger = 42.8%

[IWC = 42.8% effluent (2.3 TUc)] Monitoring Frequency Governed by B/CTP:

1/year when non-oxidizing biocides used 1/year when non-oxidizing biocides used

Background:

The current permit, effective March 1, 2011, requires chronic toxicity biomonitoring at a frequency governed by the B/CTP and with a monitoring limit ($IC_{25} \ge 43.2\%$) that serves as a hard trigger for accelerated biomonitoring. Previous to the issuance of the current permit, Outfall 101 demonstrated No Reasonable Potential for excursions above the ambient water quality chronic (CCC) criterion using historical effluent data. This demonstration of No Reasonable Potential has been maintained throughout the current permit cycle as evidenced in the accompanying historical effluent data for the last 20 studies.

Based on guidance in EPA's Technical Support Document (TSD) for Water Qualitybased Toxics Control (EPA/505/2-90-001), a permit limit is not required when No Reasonable Potential exists for excursions above the CCC. In this situation, the TSD recommends that biomonitoring be conducted at a frequency of once every 5 years as part of the permit renewal process.

Proposed Changes:

1. TVA requests that the current permit's requirement for the B/CTP to govern the frequency of biomonitoring remain (i.e., once per year when oxidizing biocides are used, and once per year when non-oxidizing biocides are used).

2. TVA requests that the current monitoring limit be replaced with an IC_{25} = 42.8%, which is based on revised effluent flow, and is consistent with the TSD guidance for effluents demonstrating No Reasonable Potential. Toxicity at the instream wastewater concentration (IWC) would serve only as a hard trigger for accelerated biomonitoring, as stated in the current permit.

3. TVA requests changes to the Serial Dilutions table as follows:

Contal Dilutions for Whole Effluent Toxisity /	
Page 22 of 28, table following paragraph 3:	

Serial Dilutions for Whole Effluent Toxicity (WET) Testing										
100% Effluent	(100+ML)/2	Monitoring Limit (ML)	0.5 X ML	0.25 X ML	Control					
% effluent										
100	71.4	42.8	21.4	10.7	0					

4. TVA also requests that all other text in Section E of the permit remain unchanged.

Dilution and Instream Waste Concentration Calculations

Outfall 101:

Average Discharge = 1491 MGD

Tennessee River 1Q10 = 3483 MGD

Dilution Factor (DF): $DF = \frac{Qs}{Qw} = \frac{3483}{1491} = 2.34$

Instream Wastewater Concentration (IWC): IWC = $\frac{Qw}{Qs} = \frac{1491}{3483} \times 100 = 42.8\%$

Reasonable Potential Determination:

The last 20 studies for Outfall 101 were used for determining Reasonable Potential, with all studies resulting in no observed toxicity (<1.0 TUc) and a coefficient of variation equal to zero. This outcome demonstrates that no Reasonable Potential for excursions above the CCC exists, based on data obtained from testing conducted under the current operating conditions.

Historical data for the last 20 studies follows, and is followed thereafter with documentation of chemical additions which occurred during sampling for toxicity tests for Outfall 101.

SQN Documentation:

Summary of SQN Outfall 101 WET Biomonitoring Results **

		Acute R	esults	Chronic
		(96-h Su	urvival)	Results
		% Survival	Study	Ctudu
	· ·	in	Toxicity	Tovicity
		Undiluted	Units	I Unite (TILIe)
Test Date	Test Species	Sample	(TUa)	Units (TUC)
64. Feb 8-15, 2005	Ceriodaphnia dubia	100	<10	
	Pimephales promelas	93	N1.0	<1.0
65. Jun 7-14, 2005	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	100	N 1.0	\$1.0
66. Jul 19-26, 2005	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	100	\$1.0	\$1.0
67. Nov 1-8, 2005	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	100	\$1.0	N 1.0
68. Nov 16-23, 2005	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	98	\$1.0	\$1.0
69. Nov 14-21, 2006	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	100	\$1.0	51.0
70. Nov 28 - Dec 5, 2006	Ceriodaphnia dubia	100	<1.0	<10
	Pimephales promelas	98	\$1.0	\$1.0
71. May 30- Jun 6, 2007	Ceriodaphnia dubia	100	<10	<10
	Pimephales promelas	100	\$1.0	\$1.0
72. Dec 4-11, 2007	Ceriodaphnia dubia	100	<10	<1.0
	Pimephales promelas	100	\$1.0	\$1.0
73. Apr 15-22, 2008	Ceriodaphnia dubia	100	<10	<1.0
	Pimephales promelas	93	-1.0	1.0
74. Oct 28- Nov 4, 2008	Ceriodaphnia dubia	100	<10	<1.0
	Pimephales promelas	98	1.0	
75、Feb 10-17, 2009	Ceriodaphnia dubia	100	<1.0	<1.0
	Pimephales promelas	100		
76. May 12-19, 2009	Ceriodaphnia dubia	100	<1.0	<1.0
	Pimephales promelas	98		
77、Nov 17-24, 2009	Ceriodaphnia dubia	100	<1.0	<1.0
	Pimephales promelas	100		
78. May 11-18, 2010	Ceriodaphnia dubia	100	<1.0	<1.0
70 11 0 0 0040	Pimephales promelas	100	4.0	
79. Nov 2-9, 2010	Ceriodaphnia dubia	100	<1.0	<1.0
·	Pimephales promeias	100	.1.0	.1.0
80. May 3-10, 2011	Ceriodapinia dubia	100	<1.0	<1.0
04 Nov 0 45 0044	Pimephales promeias	100		.1.0
81. NOV 8-15, 2011	Ceriodaprinia dubia	100	<1.0	<1.0
90 May 9 45 0040	Pimephales prometas	98	-1.0	-10
02. Way 0-15, 2012	Ceriodaprinia dubia	100	<1.0	<1.0
00 Aug 10 17 0010	Pimephales prometas	100	-10	-11.0
83. Aug 12-17, 2012	Ceriodaprinia dubia	100	<1.0	<1.0
· · · · · · · · · · · · · · · · · · ·	Pimephales prometas	100	······	
n		40	20	20
Maximum		100	<1.0	<1.0
Minimum		93	<1.0	<1.0
Mean		99	<1.0	<1.0
CV		0.02	0.00	0.00

**Last 20 studies only were included for determining RP. Shaded area includes data collected under the current permit.

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Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL-363	Cuprostat-	H-130M	Nalco	H-150M
	Hypochlorite	mg/L	mg/L	mg/L	mg/L	PF mg/L	mg/L Quat	73551	mg/L
	mg/L	TŘC	Phosphate	Copolymer	DMAD	Azole		mg/L	Quat
1	TRC		-				1 1	EO/PO	
11/07/2004	-	<0.0187	0.000	0.014	-	•	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	- 1	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-		0.042	-	-
02/06/2005	-	< 0.0042	0.028	0.010	-	-		-	-
02/07/2005	-	<0.0116	0.028	0.010	-	-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-	-	-	-
02/09/2005	-	0.0199	0.028	0.010	-	-	-	-	-
02/10/2005	-	<0.0042	0.028	0.010	-	-		-	-
02/11/2005	-	0.0155	0.028	0.010	-	-	-	0.007	-
06/05/2005	-	0.0063	-	-	-	-	-	_	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	- 1	-	-	1	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	- 1	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	<u> </u>	-	-	<u> </u>		
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	- 1	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	~
07/22/2005	-	0.0238	0.054	0.018		-	-	0.014	-
10/30/2005	-	0.0068	-	-	-	-	-	-	-
10/31/2005	-	0.0112	-	-	-	-	-	-	-
11/01/2005	. -	0.0104	-	- 1	-	-	-	-	0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	-	-	-	0.036
11/04/2005	-	0.0165	-	-				-	0.035
11/14/2005	-	0.0274	-	-	-	-	-	-	~
11/15/2005	-	0.0256	-	-	-	-	-	-	-
11/16/2005	-	0.0234	-	-	-	-	-	-	-
11/17/2005	- 1	0.0231	-	-	-	-	-	-	-
11/18/2005	-	0.0200	-	-	-	-	-	-	-
11/19/2005	-	0.0116	-] -	-	-	-	-	-

Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals
Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling
November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL-363	Cuprostat-	H-130M	Nalco	H-	MSW
	Hypochlorite	mg/L	mg/L	mg/L	mg/L	PF mg/L	mg/L Quat	73551	150M	101
	mg/L	TRC	Phosphate	Copolymer	DMAD	Azole		mg/L	mg/L	mg/L
	TRC							EO/PO	Quat	Phosphate
11/12/2006	-	0.0055	-	-	-	-	-	_	-	-
11/13/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/14/2006	-	0.0143	-	-	-	-	-	-	0.037	-
11/15/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/16/2006	-	0.0267	-	-	-	- .	-	-	0.037	-
11/17/2006	-	0.0222	-		-	<u> </u>			-	
11/26/2006	_	0.0188	-	-	-	-	-	-	-	-
11/27/2006	-	0.0138	-	-	-] -	- J	-	-	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	-	-	-	-	-	-	-	-
11/30/2006	-	0.0376	-	_	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-		-	-	-	-
05/28/07	-	-	-	-	-	-	-	-	-	0.015
05/29/07	-	-	-	-	-	-	-	-	0.036	0.015
05/30/07	-	0.0084	-	-	-	-		0.017	0.036	0.015
05/31/07	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/07	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/07		0.0305	-	-	-		-		-	0.015
12/02/07	-	0.0241	-	-	-	-	- 1	-	-	-
12/03/07	-	0.0128	-	-	-	- .	-	-	-	-
12/04/07	-	0.0238	-	-	-] -	- 1	-	-	-
12/05/07	-	0.0158	-	-	-	-	-	-	-	
12/06/07	-	0.0162	-	-	-	-	-	-	-	-
12/07/07	-	0.0175	-		-	· _	-	-	-	
04/13/08	-	0.0039	-	-	-	-	-	-	-	-
04/14/08	-	0.0124	-	-	-	-	-	-	-	-
04/15/08	-	0.0229	-	-	-	-	-	-	-	-
04/16/08	· _	0.0143	-	-	-	` -	-	-	-	-
04/17/08	-	0.0120	-	-	-	-	-	-		-
04/18/08	-	0.0149					-	-	-	
10/26/08	-	0.0260	-		-	-	-	-	-	-
10/27/08	-	0.0151	-	-	-	-	-	0.017	-	-
10/28/08	-	0.0172	-	-	-	-	-	-	0.041	-
10/29/08	-	0.0154	-	-	-	-	-	0.018	0.041	0.030
10/30/08	-	-	-	· -	-	-	-	-	0.041	0.030
10/31/08		0.0086	-	-	-	-	-	-	0.041	0.030

Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals
Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling
November 7, 2004 – August 17, 2012

Date	Sodium	Towerbrom	PCL-222	PCL-401	CL-	Cuprostat-	H-130M	Nalco	Spectrus	H-150M	MSW
	Hypochlorite	mg/L	mg/L	mg/L	363	PF mg/L	mg/L	73551	CT1300	mg/L	101
ĺ	mg/L	TŘC	Phosphate	Copolymer	mg/L	Azole	Quat	mg/L	mg/L	Quat	mg/L
	TRC		•		DMAD			EO/PO	Quat		Phosphate
02/08/09	- 1	0.0197	-	-	-	-	-	0.017	-	-	-
02/09/09	-	0.0237	-	-	-	-	-	0.017	-	-	-
02/10/09	-	0.0104	-	-	-	-	-	0.021	-	-	-
02/11/09	-	0.0155	-	-	-	-	-	0.017	-	-	-
02/12/09	-	0.0106	-	-	-	-	-	0.017	-	-	-
02/13/09	-	-	-	-	-		-	-	-	-	- 1
05/10/09	-	0.0129	-	_	-	-	-	-	-	-	-
05/11/09		0.0415	-	-	-	-	-	-	-	0.0446	-
05/12/09	-	0.0053		-	-	-	-	-	-	0.0396	-
05/13/09	-	0.0049	- '	-	-	-	-	-	-	0.0396	-
05/14/09	-	< 0.0141	-	-	-	-	-	-	-	0.0397	-
05/15/09	-	< 0.0160	-	-	-	-	-	-	-	-	-
11/15/09	-	0.025	-	-	-	-	-	-	-	-	-
11/16/09	-	0.0152	-	-	-	-	- 1	-	-	-	-
11/17/09	-	0.0255	-	-	-	-	-	-	-	-	-
11/18/09	-	0.0306		-	-	-	-	-	-	-	-
11/19/09	-	0.0204	-	-		-	-	-	-	-	-
11/20/09	-	0.0093	-	-	-	-	-	-	-	-	-
05/09/10	-	0.0192	-	-	-	-	-	-	-	-	-
05/10/10	-	0.0055	-	-	-	-	-	-	-	-	-
05/11/10	-	0.0100	-	-	-	-	-	-	0.039	-	-
05/12/10	-	0.0171	-	-	-	-	-	-	0.039	-	-
05/13/10	-	0.0041	-	-		-	~	-	0.039	-	- 1
05/14/10	-	0.0099	-	-	-	-	~	-	0.039	-	-

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Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling November 7, 2004 – August 17, 2012

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL- 222 mg/L Phos- phate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat- PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	Spectrus CT1300 mg/L Quat	H-150M mg/L Quat	MSW 101 mg/L Phosphate	Floguard MS6236 mg/L Phosphate
10/31/10 11/01/10 11/02/10 11/03/10 11/04/10 11/05/10	- - - - - -	0.0122 0.0112 0.0163 0.0107 0.0132			-		- - - - -	- - - - - - -	-		- - - -	- - - - - -
05/01/2011 05/02/2011 05/03/2011 05/04/2011 05/05/2011 05/06/2011	- - - - - -	- 0.0155 0.0179 0.0089	- - - - -	- - - - - -	-	- - - - - -	-	- - - - - -	0.04 0.04 0.04 0.04 -		- - - - -	- - - - - -
11/06/2011 11/07/2011 11/08/2011 11/09/2011 11/10/2011 11/11/2011	- - - - -	0.0168 0.0225 0.0141 0.0239 0.0242 0.0231		- - - - -	-	- - - - -		-	-		- - - - -	- - - - - -
05/06/2012 05/07/2012 05/08/2012 05/09/2012 05/10/2012 05/11/2012	- - - - -	- 0.0145 0.0298 0.0174	- - - - -	- - - - -		- - - -	-	- - - - -	0.041 0.041 0.041	- - - - -		
08/12/2012 08/13/2012 08/14/2012 08/15/2012 08/16/2012 08/17/2012		0.0256 0.0209 0.0279 0.0076 0.0446	-	- - - - - -	- - - - - -			0.028	0.037 0.037 - - -	- - - - -	- - - - - - -	0.029 0.029 0.029 0.029 0.029 0.029 0.032