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Tennessee Valley Authority, Sequoyah Nuclear Plant, P.O. Box 2000, Soddy Daisy, TN 37384

August 15, 2023

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Subject: **Sequoyah Nuclear Plant, Discharge Monitoring Report (DMR), July 2023**

Attached is the July 2023 DMR for Sequoyah Nuclear Plant.

Respectfully,

A handwritten signature in black ink, appearing to read 'T. R. Markum', is written above the typed name.

Travis R. Markum  
Environmental Scientist

**DMR Copy of Record**

<b>Permit</b>		<b>Permittee:</b> Tennessee Valley Authority (TVA)		<b>Facility:</b> TVA SEQUOYAH NUCLEAR PLANT (SQN)	
<b>Permit #:</b> TN0026450	<b>Major:</b> Yes	<b>Permittee Address:</b> Sequoyah Access Road, PO Box 2000 Soddy Daisy, TN 37379	<b>Facility Location:</b> SEQUOYAH ACCESS ROAD SODDY DAISY SODDY DAISY, TN 37379		
<b>Permitted Feature:</b> 101 External Outfall	<b>Discharge:</b> 101-G (no description)				

<b>Report Dates &amp; Status</b>					
<b>Monitoring Period:</b> From 07/01/23 to 07/31/23	<b>DMR Due Date:</b> 08/15/23	<b>Status:</b> NetDMR Validated			

**Considerations for Form Completion**  
Primary discharge from Diffuser Pond.

<b>Principal Executive Officer</b>					
<b>First Name:</b> Thomas	<b>Title:</b> Vice President	<b>Telephone:</b> 423-843-7001			
<b>Last Name:</b> Marshall					

**No Data Indicator (NODI)**  
Form NODI: --

Code	Parameter Name	Monitoring Location	Season #	Param. NODI	Quantity or Loading					Quality or Concentration					# of Ex.	Frequency of Analysis	Sample Type						
					Qualifier 1	Value 1	Qualifier 2	Value 2	Units	Qualifier 1	Value 1	Qualifier 2	Value 2	Qualifier 3				Value 3	Units				
00010	Temperature, water deg. centigrade	1 - Effluent Gross	0	--	Sample								=	42.8		04 - deg C	99/99 - Continuous	RC - Recorder (auto)					
					Permit Req.														Req Mon DAILY MX	04 - deg C	99/99 - Continuous	RC - Recorder (auto)	
					Value NODI																		
00010	Temperature, water deg. centigrade	Z - Instream Monitoring	0	--	Sample								=	29.5		04 - deg C	99/99 - Continuous	CA - CALCTD					
					Permit Req.														<=	30.5 DAILY MX	04 - deg C	99/99 - Continuous	CA - CALCTD
					Value NODI																		
00016	Temp. diff. between samp. & upstrm deg. C	1 - Effluent Gross	1	--	Sample								=	2.3		04 - deg C	99/99 - Continuous	CA - CALCTD					
					Permit Req.														<=	3.0 DAILY MX	04 - deg C	99/99 - Continuous	CA - CALCTD
					Value NODI																		
50050	Flow, in conduit or thru treatment plant	1 - Effluent Gross	0	--	Sample	=	1758.3	=	1776.5	03 - MGD								99/99 - Continuous	RC - Recorder (auto)				
					Permit Req.		Req Mon MO AVG		Req Mon DAILY MX	03 - MGD											99/99 - Continuous	RC - Recorder (auto)	
					Value NODI																		
50060	Chlorine, total residual	1 - Effluent Gross	0	--	Sample								<=	0.027 MO AVG				01/07 - Weekly	GR - GRAB				
					Permit Req.												<=			0.047 DAILY MX	19 - mg/L		
					Value NODI															B - Below Detection Limit/No Detection	B - Below Detection Limit/No Detection		
82234	Temperature rate of change deg. C/hr	Z - Instream Monitoring	0	--	Sample			=	1.4	62 - deg C/hr								99/99 - Continuous	CA - CALCTD				
					Permit Req.			<=	2.0 DAILY MX	62 - deg C/hr											99/99 - Continuous	CA - CALCTD	
					Value NODI																		
TRP3B	IC25 Static Renewal 7 Day Chronic Ceriodaphnia dubia	1 - Effluent Gross	0	--	Sample								>	100.0				01/30 - Monthly	CP - COMPOS				
					Permit Req.												>			69.0 MINIMUM	23 - %	01/30 - Monthly	CP - COMPOS
					Value NODI																		
TRP6C	IC25 Static Renewal 7 Day Chronic Chrpimephales	1 - Effluent Gross	0	--	Sample								>	100.0				01/30 - Monthly	CP - COMPOS				
					Permit Req.												>			69.0 MINIMUM	23 - %	01/30 - Monthly	CP - COMPOS
					Value NODI																		

**Submission Note**  
If a parameter row does not contain any values for the Sample nor Effluent Trading, then none of the following fields will be submitted for that row: Units, Number of Excursions, Frequency of Analysis, and Sample Type.

**Edit Check Errors**

No errors.

**Comments**

Method Detection Limit for Total Residual Chlorine is 0.05 mg/L.

**Attachments**

Name	Type	Size
SQN_WET_Biomonitoring_Report_July_2023.pdf	pdf	6326609.0

**Report Last Saved By**

**Tennessee Valley Authority (TVA)**

User: TRMARKUM  
Name: Travis Markum  
E-Mail: trmarkum@tva.gov  
Date/Time: 2023-08-14 15:19 (Time Zone: -05:00)

**Report Last Signed By**

User: TMCMUTUA  
Name: Tony McMutuary  
E-Mail: tmcmutuary@tva.gov  
Date/Time: 2023-08-15 06:55 (Time Zone: -05:00)

## DMR Copy of Record

<b>Permit</b>	
<b>Permit #:</b> TN0026450	<b>Permittee:</b> Tennessee Valley Authority (TVA)
<b>Major:</b> Yes	<b>Permittee Address:</b> Sequoyah Access Road, PO Box 2000 Soddy Daisy, TN 37379
<b>Permitted Feature:</b> 103 Internal Outfall	<b>Discharge:</b> 103-G (no description)
<b>Facility:</b> TVA SEQUOYAH NUCLEAR PLANT (SQN)	
<b>Facility Location:</b> SEQUOYAH ACCESS ROAD SODDY DAISY SODDY DAISY, TN 37379	
<b>Report Dates &amp; Status</b>	
<b>Monitoring Period:</b> From 07/01/23 to 07/31/23	<b>DMR Due Date:</b> 08/15/23
<b>Status:</b> NetDMR Validated	
<b>Considerations for Form Completion</b>	
Internal Monitoring Point for various flows from Low Volume Waste Treatment Pond to Diffuser Pond, which eventually discharges through Outfall 101.	
<b>Principal Executive Officer</b>	
<b>First Name:</b> Thomas	<b>Title:</b> Vice President
<b>Last Name:</b> Marshall	<b>Telephone:</b> 423-843-7001
<b>No Data Indicator (NODI)</b>	
<b>Form NODI:</b> --	

Code	Parameter Name	Monitoring Location	Season #	Param. NODI	Quantity or Loading					Quality or Concentration						# of Ex.	Frequency of Analysis	Sample Type	
					Qualifier 1	Value 1	Qualifier 2	Value 2	Units	Qualifier 1	Value 1	Qualifier 2	Value 2	Qualifier 3	Value 3				Units
00400	pH	IM - Internal Monitoring Point	0	--	Sample	=	7.2				=	7.2				12 - SU	01/30 - Monthly	GR - GRAB	
					Permit Req.	>=	6.0 MINIMUM				<=	9.0 MAXIMUM		12 - SU					
					Value NODI														
00530	Solids, total suspended	IM - Internal Monitoring Point	0	--	Sample						=	13.0			=	13.0	19 - mg/L	01/30 - Monthly	GR - GRAB
					Permit Req.						<=	30.0 MO AVG		<=	100.0 DAILY MX	19 - mg/L			
					Value NODI														
00556	Oil & Grease	IM - Internal Monitoring Point	0	--	Sample						<	4.9			<	4.9	19 - mg/L	01/30 - Monthly	GR - GRAB
					Permit Req.						<=	15.0 MO AVG		<=	20.0 DAILY MX	19 - mg/L			
					Value NODI														
50050	Flow, in conduit or thru treatment plant	IM - Internal Monitoring Point	0	--	Sample	=	0.852	=	0.852	03 - MGD								01/30 - Monthly	IN - INSTAN
					Permit Req.		Req Mon MO AVG		Req Mon DAILY MX	03 - MGD									
					Value NODI														

**Submission Note**  
If a parameter row does not contain any values for the Sample nor Effluent Trading, then none of the following fields will be submitted for that row: Units, Number of Excursions, Frequency of Analysis, and Sample Type.

**Edit Check Errors**  
No errors.

**Comments**

**Attachments**  
No attachments.

**Report Last Saved By**  
Tennessee Valley Authority (TVA)

User: TRMARKUM  
Name: Travis Markum  
E-Mail: tmarkum@tva.gov  
Date/Time: 2023-08-14 14:58 (Time Zone: -05:00)

**Report Last Signed By**

User: TMCMUTUA  
Name: Tony McMutuary  
E-Mail: tmcmutuary@tva.gov  
Date/Time: 2023-08-15 06:55 (Time Zone: -05:00)

## DMR Copy of Record

<b>Permit</b>																			
<b>Permit #:</b> TN0026450		<b>Permittee:</b> Tennessee Valley Authority (TVA)				<b>Facility:</b> TVA SEQUOYAH NUCLEAR PLANT (SQN)													
<b>Major:</b> Yes		<b>Permittee Address:</b> Sequoyah Access Road, PO Box 2000 Soddy Daisy, TN 37379				<b>Facility Location:</b> SEQUOYAH ACCESS ROAD SODDY DAISY SODDY DAISY, TN 37379													
<b>Permitted Feature:</b> 107 Internal Outfall		<b>Discharge:</b> 107-G (no description)																	
<b>Report Dates &amp; Status</b>																			
<b>Monitoring Period:</b> From 07/01/23 to 07/31/23				<b>DMR Due Date:</b> 08/15/23				<b>Status:</b> NetDMR Validated											
<b>Considerations for Form Completion</b>																			
Metal Cleaning Waste Pond discharge. No monitoring required for stormwater decanting. Daily monitoring required only during dewatering events.																			
<b>Principal Executive Officer</b>																			
<b>First Name:</b> Thomas		<b>Title:</b> Vice President				<b>Telephone:</b> 423-843-7001													
<b>Last Name:</b> Marshall																			
<b>No Data Indicator (NODI)</b>																			
<b>Form NODI:</b> --																			
Code	Parameter Name	Monitoring Location	Season #	Param. NODI	Quantity or Loading					Quality or Concentration					# of Ex.	Frequency of Analysis	Sample Type		
					Qualifier 1	Value 1	Qualifier 2	Value 2	Units	Qualifier 1	Value 1	Qualifier 2	Value 2	Qualifier 3				Value 3	Units
00400	pH	IM - Internal Monitoring Point	0	--	Sample						>=	6.0 MINIMUM			<=	9.0 MAXIMUM	12 - SU	01/01 - Daily	GR - GRAB
					Permit Req.														
					Value NODI							C - No Discharge				C - No Discharge			
00530	Solids, total suspended	IM - Internal Monitoring Point	0	--	Sample						<=	30.0 MO AVG			<=	100.0 DAILY MX	19 - mg/L	01/01 - Daily	CP - COMPOS
					Permit Req.														
					Value NODI							C - No Discharge				C - No Discharge			
00556	Oil & Grease	IM - Internal Monitoring Point	0	--	Sample						<=	15.0 MO AVG			<=	20.0 DAILY MX	19 - mg/L	01/01 - Daily	GR - GRAB
					Permit Req.														
					Value NODI							C - No Discharge				C - No Discharge			
01042	Copper, total [as Cu]	IM - Internal Monitoring Point	0	--	Sample						<=	1.0 MO AVG			<=	1.0 DAILY MX	19 - mg/L	01/01 - Daily	CP - COMPOS
					Permit Req.														
					Value NODI							C - No Discharge				C - No Discharge			
01045	Iron, total [as Fe]	IM - Internal Monitoring Point	0	--	Sample						<=	1.0 MO AVG			<=	1.0 DAILY MX	19 - mg/L	01/01 - Daily	CP - COMPOS
					Permit Req.														
					Value NODI							C - No Discharge				C - No Discharge			
<b>Submission Note</b>																			
If a parameter row does not contain any values for the Sample nor Effluent Trading, then none of the following fields will be submitted for that row: Units, Number of Excursions, Frequency of Analysis, and Sample Type.																			
<b>Edit Check Errors</b>																			
No errors.																			
<b>Comments</b>																			
<b>Attachments</b>																			
No attachments.																			
<b>Report Last Saved By</b>																			
<b>Tennessee Valley Authority (TVA)</b>																			
<b>User:</b> TRMARKUM		<b>Name:</b> Travis Markum				<b>E-Mail:</b> tmarkum@tva.gov													
<b>Date/Time:</b> 2023-08-14 14:51 (Time Zone: -05:00)																			
<b>Report Last Signed By</b>																			
<b>User:</b> TMCMUTUA		<b>Name:</b> Tony McMutuary				<b>E-Mail:</b> tmcmutuary@tva.gov													
<b>Date/Time:</b> 2023-08-15 06:55 (Time Zone: -05:00)																			

**DMR Copy of Record**

<b>Permit</b>			
<b>Permit #:</b>	<b>TN0026450</b>	<b>Permittee:</b>	Tennessee Valley Authority (TVA)
<b>Major:</b>	Yes	<b>Permittee Address:</b>	Sequoyah Access Road, PO Box 2000 Soddy Daisy, TN 37379
<b>Permitted Feature:</b>	110 External Outfall	<b>Discharge:</b>	<b>110-G</b> (no description)
<b>Facility:</b>	TVA SEQUOYAH NUCLEAR PLANT (SQN)		
<b>Facility Location:</b>	SEQUOYAH ACCESS ROAD SODDY DAISY SODDY DAISY, TN 37379		

**Report Dates & Status**

<b>Monitoring Period:</b>	<b>From 07/01/23 to 07/31/23</b>	<b>DMR Due Date:</b>	<b>08/15/23</b>	<b>Status:</b>	<b>NetDMR Validated</b>
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**Considerations for Form Completion**

Outfall 110 is closed. Only active in the event the plant goes into closed mode.

**Principal Executive Officer**

<b>First Name:</b>	Thomas	<b>Title:</b>	Vice President	<b>Telephone:</b>	423-843-7001
<b>Last Name:</b>	Marshall				

**No Data Indicator (NODI)**

Form NODI: --

Code	Parameter Name	Monitoring Location	Season #	Param. NODI	Quantity or Loading					Quality or Concentration					# of Ex.	Frequency of Analysis	Sample Type	
					Qualifier 1	Value 1	Qualifier 2	Value 2	Units	Qualifier 1	Value 1	Qualifier 2	Value 2	Qualifier 3				Value 3
00010	Temperature, water deg. centigrade	1 - Effluent Gross	0	--	Sample Permit Req.			Req Mon DAILY MX	04 - deg C								99/99 - Continuous	CA - CALCTD
					Value NODI			C - No Discharge										
00010	Temperature, water deg. centigrade	Z - Instream Monitoring	0	--	Sample Permit Req.							<=	30.5 DAILY MX	04 - deg C		99/99 - Continuous	CA - CALCTD	
					Value NODI			C - No Discharge										
00016	Temp. diff. between samp. & upstrm deg. C	1 - Effluent Gross	1	--	Sample Permit Req.							<=	3.0 DAILY MX	04 - deg C		99/99 - Continuous	CA - CALCTD	
					Value NODI			C - No Discharge										
50050	Flow, in conduit or thru treatment plant	1 - Effluent Gross	0	--	Sample Permit Req.		Req Mon MO AVG	Req Mon DAILY MX	03 - MGD							99/99 - Continuous	RC - Recorder (auto)	
					Value NODI		C - No Discharge	C - No Discharge										
50060	Chlorine, total residual	1 - Effluent Gross	0	--	Sample Permit Req.					<=	0.027 MO AVG		<=	0.047 DAILY MX	19 - mg/L	05/WK - Five Per Week	GR - GRAB	
					Value NODI			C - No Discharge										
82234	Temperature rate of change deg. C/hr	Z - Instream Monitoring	0	--	Sample Permit Req.							<=	30.5 DAILY MX	62 - deg C/hr		99/99 - Continuous	CA - CALCTD	
					Value NODI			C - No Discharge										
TRP3B	IC25 Static Renewal 7 Day Chronic Ceriodaphnia dubia	1 - Effluent Gross	0	--	Sample Permit Req.					>=	69.0 MINIMUM				23 - %	01/30 - Monthly	GR - GRAB	
					Value NODI			C - No Discharge										
TRP6C	IC25 Static Renewal 7 Day Chronic Chrpimephales	1 - Effluent Gross	0	--	Sample Permit Req.					>=	69.0 MINIMUM				23 - %	01/30 - Monthly	GR - GRAB	
					Value NODI			C - No Discharge										

**Submission Note**

If a parameter row does not contain any values for the Sample nor Effluent Trading, then none of the following fields will be submitted for that row: Units, Number of Excursions, Frequency of Analysis, and Sample Type.

**Edit Check Errors**

No errors.

**Comments**

**Attachments**

No attachments.

**Report Last Saved By**

**Tennessee Valley Authority (TVA)**

User: TRMARKUM  
Name: Travis Markum  
E-Mail: trmarkum@tva.gov  
Date/Time: 2023-08-14 14:55 (Time Zone: -05:00)

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Date/Time: 2023-08-15 06:55 (Time Zone: -05:00)

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<b>Permit</b>			
<b>Permit #:</b>	<b>TN0026450</b>	<b>Permittee:</b>	Tennessee Valley Authority (TVA)
<b>Major:</b>	Yes	<b>Permittee Address:</b>	Sequoyah Access Road, PO Box 2000 Soddy Daisy, TN 37379
<b>Permitted Feature:</b>	118 External Outfall	<b>Discharge:</b>	<b>118-G</b> (no description)
<b>Facility:</b> TVA SEQUOYAH NUCLEAR PLANT (SQN)			
<b>Facility Location:</b> SEQUOYAH ACCESS ROAD SODDY DAISY SODDY DAISY, TN 37379			
<b>Report Dates &amp; Status</b>			
<b>Monitoring Period:</b>	<b>From 07/01/23 to 07/31/23</b>	<b>DMR Due Date:</b>	<b>08/15/23</b>
<b>Considerations for Form Completion</b>		<b>Status:</b>	<b>NetDMR Validated</b>
<b>Principal Executive Officer</b>			
<b>First Name:</b>	Thomas	<b>Title:</b>	Vice President
<b>Last Name:</b>	Marshall	<b>Telephone:</b>	423-843-7001
<b>No Data Indicator (NODI)</b>			
<b>Form NODI:</b>	--		

Code	Parameter Name	Monitoring Location	Season #	Param. NODI	Quantity or Loading					Quality or Concentration					# of Ex.	Frequency of Analysis	Sample Type		
					Qualifier 1	Value 1	Qualifier 2	Value 2	Units	Qualifier 1	Value 1	Qualifier 2	Value 2	Qualifier 3				Value 3	Units
00300	Oxygen, dissolved [DO]	1 - Effluent Gross	0	--	Sample														
					Permit Req.						>=	2.0 MINIMUM				19 - mg/L		02/07 - Twice Every Week	GR - GRAB
					Value NODI							C - No Discharge							
00530	Solids, total suspended	1 - Effluent Gross	0	--	Sample														
					Permit Req.							<=	100.0 DAILY MX		19 - mg/L		02/07 - Twice Every Week	GR - GRAB	
					Value NODI							C - No Discharge							
00545	Solids, settleable	1 - Effluent Gross	0	--	Sample														
					Permit Req.							<=	1.0 DAILY MX		25 - mL/L		01/30 - Monthly	GR - GRAB	
					Value NODI							C - No Discharge							
50050	Flow, in conduit or thru treatment plant	1 - Effluent Gross	0	--	Sample														
					Permit Req.		Req Mon MO AVG		Req Mon DAILY MX	03 - MGD							01/BA - Once Per Batch	ES - ESTIMA	
					Value NODI		C - No Discharge		C - No Discharge										

**Submission Note**  
If a parameter row does not contain any values for the Sample nor Effluent Trading, then none of the following fields will be submitted for that row: Units, Number of Excursions, Frequency of Analysis, and Sample Type.

**Edit Check Errors**  
No errors.

**Comments**

**Attachments**  
No attachments.

**Report Last Saved By**  
Tennessee Valley Authority (TVA)

User: TRMARKUM  
Name: Travis Markum  
E-Mail: tmarkum@tva.gov  
Date/Time: 2023-08-14 14:56 (Time Zone: -05:00)

**Report Last Signed By**

User: TCMUTUA  
Name: Tony McMutuary  
E-Mail: tmcmutuary@tva.gov  
Date/Time: 2023-08-15 06:55 (Time Zone: -05:00)



**TENNESSEE VALLEY AUTHORITY  
TOXICITY TEST REPORT**

**INTRODUCTION / EXECUTIVE SUMMARY**

Report Date: July 31, 2023

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 1,579
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,456
8. Outfall Tested: 101
9. Dates Sampled: July 09 – 14, 2023
10. Average Flow on Days Sampled (MGD): 1754.651, 1756.935, 1760.914
11. Pertinent Site Conditions: Production / operation data will be provided upon request.
12. Test Dates: July 11 – 18, 2023
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)  
Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%):  
*Pimephales promelas*: UV treated Outfall 101: 17.25, 34.5, 69, 84.5, 100  
UV treated Intake: 100  
  
*Ceriodaphnia dubia*: Non-treated Outfall 101: 17.25, 34.5, 69, 84.5, 100  
Non-treated Intake: 100
16. Permit Limit Endpoint (%): Outfall 101: IC<sub>25</sub> = 69%
17. Test Results: Outfall 101: *Pimephales promelas*: IC<sub>25</sub> > 100%  
*Ceriodaphnia dubia*: IC<sub>25</sub> > 100%



18. Facility Contact: Travis Markum Phone #: (865) 748-3294

19. Consulting / Testing Lab: Environmental Testing Solutions, Inc.

20. Lab Contact: Jim Sumner Phone #: (828) 350-9364

21. TVA Contact: Rick Sherrard Phone #: (423) 987-2250

22. Notes: Exposures to samples collected July 09 – 14, 2023 from Outfall 101 resulted in no toxic effects to fathead minnows or daphnids. The resulting IC<sub>25</sub> values, for both species, were >100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant differences from the controls during this study period.



## METHODS SUMMARY

### Samples:

1. Sampling Point: Outfall 101, Intake
2. Sample Type: Composite
3. Sample Information:

Sample ID	Date (MM-DD-YY) Time (ET) Collected	Date (MM-DD-YY) Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM-DD-YY) Time (ET) Last Used By
101	07-09-23 / 0700 to 07-10-23 / 0600	07-10-23 / 1322	2.7	<0.10	07-11-23 / 0806 07-12-23 / 0757
Intake	07-09-23 / 0700 to 07-10-23 / 0600	07-10-23 / 1322	1.9	<0.10	07-11-23 / 0806 07-12-23 / 0757
101	07-11-23 / 0700 to 07-12-23 / 0600	07-12-23 / 1218	1.7	<0.10	07-13-23 / 0805 07-14-23 / 0747
Intake	07-11-23 / 0700 to 07-12-23 / 0600	07-12-23 / 1218	1.3	<0.10	07-13-23 / 0805 07-14-23 / 0747
101	07-13-23 / 0700 to 07-14-23 / 0600	07-15-23 / 1012	2.1, 1.8 <sup>†</sup>	<0.10	07-15-23 / 1226 <sup>††</sup> 07-16-23 / 0834 07-17-23 / 0737
Intake	07-13-23 / 0700 to 07-14-23 / 0600	07-15-23 / 1012	2.3	<0.10	07-15-23 / 1226 <sup>††</sup> 07-16-23 / 0834 07-17-23 / 0737

\*TRC = Total Residual Chlorine

<sup>†</sup>Samples were collected in two 2.5 gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

<sup>††</sup>Due to a courier delay, tests were not renewed within  $\pm 2$  hours of test initiation.

4. Sample Manipulation: Samples from Outfall 101 and intake were warmed to test temperature ( $25.0 \pm 1.0^\circ\text{C}$ ) in a warm water bath.

Aliquots of Outfall 101 and Intake samples were UV-treated through a 40-watt Smart® UV Sterilizer (manufactured by Emperor Aquatics, Inc.) for 2 minutes.



	<i>Pimephales promelas</i>	<i>Ceriodaphnia dubia</i>
<u>Test Organisms:</u>		
1. Source:	<u>In-house Cultures</u>	<u>In-house Cultures</u>
2. Age:	<u>&lt; 24-hours old</u>	<u>&lt; 24-hours old</u>
<u>Test Method Summary:</u>		
1. Test Conditions:	<u>Static, Renewal</u>	<u>Static, Renewal</u>
2. Test Duration:	<u>7 days</u>	<u>Until at least 60% of control females have 3 broods</u>
3. Control / Dilution Water:	<u>Moderately Hard Synthetic</u>	<u>Moderately Hard Synthetic</u>
4. Number of Replicates:	<u>4</u>	<u>10</u>
5. Organisms per Replicate:	<u>10</u>	<u>1</u>
6. Test Initiation: (Date/Time):	<u>07-11-23 0726 ET</u>	<u>07-11-23 0806 ET</u>
7. Test Termination: (Date/Time):	<u>07-18-23 0629 ET</u>	<u>07-18-23 0713 ET</u>
8. Test Temperature: Outfall 101:	<u>Mean = 24.7°C</u> <u>(24.3 – 25.0°C)</u>	<u>Mean = 24.9°C</u> <u>(24.7 – 25.2°C)</u>
9. Physical / Chemical Measurements:	<u>Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.</u>	
10. Statistics:	<u>Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).</u>	



**TOXICITY TEST RESULTS** (see Appendix C for Bench Sheets)

1. Results of a *Pimephales promelas* Chronic/ 7-day Toxicity Test.  
 (Genus species) (Type / Duration)

Conducted July 11 – 18, 2023 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control, UV-treated	100	100	100	100	100	100	100
17.25%	100	100	100	100	100	100	100
34.5%	100	100	100	100	100	100	100
69%	100	100	100	100	100	100	100
84.5%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100
Control, Non-treated	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control, UV-treated	0.659	0.890	0.717	0.756	0.756
17.25%	0.779	0.800	0.829	0.716	0.781
34.5%	0.811	0.780	0.656	0.716	0.741
69%	0.719	0.784	0.732	0.832	0.767
84.5%	0.709	0.783	0.705	0.771	0.742
100.0%	0.708	0.724	0.726	0.811	0.742
Intake	0.808	0.728	0.747	0.678	0.740
Control, Non-treated	0.849	0.817	0.793	0.800	0.815

IC <sub>25</sub> Value: <u>&gt; 100%</u> Permit Limit: <u>69%</u>  95% Confidence Limits: Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>	Calculated TU Estimates: <u>&lt; 1.0 TU<sub>c</sub>*</u>  Permit Limit: <u>1.4 TU<sub>c</sub></u>
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\*TU<sub>a</sub> = 100/LC<sub>50</sub>; TU<sub>c</sub> = 100/ IC<sub>25</sub>



**TOXICITY TEST RESULTS** (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.  
 (Genus species) (Type / Duration)

Conducted July 11 – 18, 2023 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
17.25%	100	100	100	100	100	100	100
34.5%	100	100	100	100	100	100	100
69%	100	100	100	100	100	100	100
84.5%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	29	29	32	29	27	31	28	27	29	30	29.1
17.25%	33	30	32	29	35	33	36	34	29	34	32.5
34.5%	30	33	36	30	33	36	33	33	34	34	33.2
69%	31	32	36	36	38	35	31	33	32	33	33.7
84.5%	32	35	35	35	37	36	37	35	34	36	35.2
100.0%	36	35	34	31	33	33	31	35	33	33	33.4

IC<sub>25</sub> Value: > 100%

Permit Limit: 69%

95% Confidence Limits:

Upper Limit: NA

Lower Limit: NA

Calculated TU Estimates: < 1.0 TU<sub>c</sub>\*

Permit Limit: 1.4 TU<sub>c</sub>

\*TU<sub>a</sub> = 100/LC<sub>50</sub>; TU<sub>c</sub> = 100/ IC<sub>25</sub>



TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.  
 (Genus species) (Type / Duration)

Conducted July 11 – 18, 2023 using water from Intake

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	27	30	32	30	31	30	33	32	30	32	30.7
Intake	34	32	32	33	35	38	36	33	35	37	34.5
IC <sub>25</sub> Value: > 100% Permit Limit: <u>N/A</u>						Calculated TU Estimates: < 1.0 TUc*					
95% Confidence Limits: Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>						Permit Limit: <u>N/A</u>					

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC <sub>25</sub> )
<i>Pimephales promelas</i>	July 11 – 18, 2023	0714	7 days	KCl	0.74 g/L
<i>Ceriodaphnia dubia</i>	July 11 – 18, 2023	0756	7 days	NaCl	1.10 g/L





**PHYSICAL/CHEMICAL SUMMARY**

Water Chemistry Mean Values and Ranges for UV-treated *Pimephales promelas* and Non-treated *Ceriodaphnia dubia*. Sequoyah Nuclear Plant (SQN), Effluent Outfall 101 and Intake performed July 11-18, 2023.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO <sub>3</sub> )	Hardness (mg/L CaCO <sub>3</sub> )	*Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control, Non-treated	24.7	24.5	7.9	7.1	7.85	7.69	312	61	86	-
		24.7 - 24.8	24.4 - 24.7	7.7 - 8.0	6.3 - 7.8	7.73 - 7.99	7.57 - 7.81	291 - 325	61 - 62	84 - 88	-
	Control, UV-treated	24.7	24.5	7.8	7.3	7.92	7.74	310	60	85	-
		24.7 - 24.8	24.3 - 24.7	7.6 - 8.0	5.9 - 8.1	7.84 - 8.02	7.62 - 7.87	293 - 327	59 - 61	84 - 86	-
	17.25%	24.8	24.5	7.8	7.2	7.91	7.71	286	-	-	-
		24.7 - 24.9	24.3 - 24.7	7.7 - 8.0	6.0 - 8.1	7.82 - 8.02	7.60 - 7.82	273 - 301	-	-	-
	34.5%	24.8	24.5	7.8	7.2	7.88	7.67	260	-	-	-
		24.7 - 24.9	24.3 - 24.7	7.7 - 8.0	5.8 - 8.1	7.72 - 7.96	7.55 - 7.78	249 - 272	-	-	-
69%	24.9	24.6	7.9	7.1	7.86	7.64	207	-	-	-	
	24.8 - 24.9	24.4 - 24.8	7.7 - 8.0	5.8 - 8.0	7.63 - 7.96	7.52 - 7.76	198 - 220	-	-	-	
84.5%	24.9	24.5	7.9	7.1	7.83	7.63	182	-	-	-	
	24.8 - 25.0	24.4 - 24.8	7.7 - 8.1	5.8 - 8.1	7.59 - 7.91	7.57 - 7.74	170 - 194	-	-	-	
100%	25.0	24.5	7.9	7.2	7.82	7.61	155	58	61	< 0.10	
	25.0 - 25.0	24.4 - 24.6	7.5 - 8.1	5.9 - 8.2	7.53 - 7.91	7.48 - 7.73	140 - 164	57 - 61	57 - 65	< 0.10 - < 0.10	
Intake	25.0	24.5	7.9	7.1	7.85	7.67	166	66	68	< 0.10	
	24.8 - 25.0	24.4 - 24.6	7.6 - 8.2	5.8 - 8.1	7.62 - 7.96	7.49 - 7.78	153 - 174	65 - 67	65 - 71	< 0.10 - < 0.10	
<i>Ceriodaphnia dubia</i>	Control, Non-treated	24.8	25.0	7.9	7.9	7.85	7.91	312	61	86	-
		24.7 - 24.9	24.8 - 25.2	7.7 - 8.0	7.7 - 8.0	7.73 - 7.99	7.86 - 7.98	291 - 325	61 - 62	84 - 88	-
	17.25%	24.8	25.0	7.9	7.9	7.91	7.90	286	-	-	-
		24.7 - 24.9	24.9 - 25.2	7.6 - 8.0	7.7 - 8.0	7.86 - 7.99	7.86 - 7.98	275 - 296	-	-	-
	34.5%	24.8	25.0	7.9	7.9	7.90	7.89	260	-	-	-
		24.7 - 25.0	24.7 - 25.2	7.6 - 8.0	7.8 - 8.0	7.80 - 7.98	7.85 - 7.95	250 - 273	-	-	-
	69%	24.9	25.0	7.9	7.9	7.86	7.88	206	-	-	-
	24.8 - 25.0	24.7 - 25.2	7.6 - 8.0	7.8 - 8.0	7.64 - 7.96	7.82 - 7.95	197 - 215	-	-	-	
84.5%	24.9	24.9	8.0	7.9	7.81	7.86	181	-	-	-	
	24.8 - 25.0	24.7 - 25.1	7.7 - 8.1	7.7 - 8.1	7.56 - 7.93	7.81 - 7.92	173 - 191	-	-	-	
100%	25.0	24.9	8.0	8.0	7.79	7.85	153	58	63	< 0.10	
	24.9 - 25.0	24.8 - 25.0	7.6 - 8.2	7.7 - 8.1	7.49 - 7.90	7.80 - 7.90	144 - 163	57 - 61	57 - 69	< 0.10 - < 0.10	
Intake	25.0	25.0	8.0	7.9	7.84	7.89	166	66	67	< 0.10	
	24.9 - 25.0	24.8 - 25.1	7.6 - 8.2	7.7 - 8.1	7.58 - 7.97	7.83 - 7.95	160 - 176	63 - 67	65 - 69	< 0.10 - < 0.10	

\*Note: Total residual chlorine was performed on non-treated Outfall 101 and Intake samples

Overall temperature (°C)	Average	Minimum	Maximum
<i>Pimephales promelas</i>	24.7	24.3	25.0
<i>Ceriodaphnia dubia</i>	24.9	24.7	25.2



## SUMMARY / CONCLUSIONS

Exposures to samples collected July 09 – 14, 2023 from Outfall 101 resulted in no toxic effects to fathead minnows or daphnids. The resulting IC<sub>25</sub> values, for both species, were >100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant differences from the controls during this study period.

