

Scott A. Vance General Counsel and Chief Ethics Officer P.O. Box 968, MD PE13 Richland, WA 99352-0968 Ph. 509.377-4650 | F. 509.372.5330 savance@energy-northwest.com

April 30, 2019 GO2-19-065 DIC 1316.19

Ami Kidder Siting and Compliance Manager Energy Facility Site Evaluation Council P.O. Box 47250 Olympia, WA 98504-7250

CERTIFIED MAIL 7016 3560 0001 0044 2531

Dear Ms Kidder:

#### SUBJECT: ENERGY NORTHWEST COLUMBIA GENERATING STATION APPLICATION FOR RENEWAL OF NPDES PERMIT NO. WA002515-1

- **REFERENCE:** 1. NPDES Permit No. WA002515-1, Condition S6.
  - Letter, GI2-19-005, dated January 10, 2019, from A. Moon (EFSEC) to S. Khounnala (EN) "Columbia Generating Station, Energy Northwest (EN) National Pollutant Discharge Elimination System (NPDES) Permit No. WA002515-1 WQWebDMR Waiver for NPDES Renewal Application."

Condition S6 of the Energy Northwest Columbia Generating Station's (CGS) National Pollutant Discharge Elimination System (NPDES) permit (No. WA002515-1) requires the facility to submit an application for renewal by May 1, 2019. Condition S6 requires the permittee to submit a paper copy and electronic copy of the application. As per Reference 2 above, EFSEC waived the requirement to submit an electronic copy of the application on January 10, 2019.

This renewal application (Enclosure A) has been prepared on forms specified by the Department of Ecology. NPDES Permit Condition S14.A requires CGS to conduct chronic toxicity tests once per quarter in the year prior to submission of this renewal application and submit the results to EFSEC with the renewal application (Enclosure B). The results of the chronic toxicity tests have been uploaded onto Ecology's WQWebDMR website. This NPDES renewal also requires Cooling Water Intake Structure information to be submitted with the application. EPA Form 2-C Supplemental plus additional information required by Section B of EPA Form 2-C Supplement are included (Enclosure C).

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 gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering 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.

If you require any additional information regarding this renewal application, please contact WK Whitehead at (509) 377-8794.

Sincerely,

**Final Approver** 

Scott A. Vance General Counsel

- Attachments: 1. Enclosure A NPDES Permit Renewal Application
  - 2. Enclosure B Chronic Toxicity Test Results
  - 3. Enclosure C EPA Form 2-C Supplemental
- cc: A. Moon (EFSEC) E. Ott (Ecology) K. Hall (Ecology) NRC Region IV Administration

#### SAV/nb

INTERNAL DISTRIBUTION:	FILE COPY
Vance/lb	Columbia Files 964Y
	Docket File PE20

# ENCLOSURE A

# NPDES PERMIT RENEWAL APPLICATION

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

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

FORM		U.S.	ENVIR	ONMENTAL F						EPA I.D.	NU	MBE	<b>२</b>		
	<b>PA</b>	Co	onso	RAL IN	erm	its Progi	ram		s F	WAD9	807	38488		T/A	C D
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II. POLLUTANT CHAR	HARACTERISTICS														
INSTRUCTIONS: Complete questions, you must submit th the supplemental form is atta- excluded from permit requirer	nis form and the supp ched. If you answer	plement "no" to	tal fron each o instruc	n listed in the question, you ctions. See a	e pai l nee	enthesis fo d not subm	llowing th	e questi these fo	ion. I prms.	Mark "X" ir . You may	the ans	box in wer "no	the thi o" if yo	rd colur ur activi	nn if
SPECIFIC QUES	TIONS		MAR	K "X" FORM	-	S	PECIFIC	QUEST	ION	S			MARI	K "X" FOR	2M
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Which results in a discharg U.S.? (FORM 2A)					D.	proposed) feeding productio	include operation n facility w	a <b>con</b> or vhich res	centi aqu sults i	rated anin latic anin in a dischar	nal nal		$\boxtimes$		]
C. Is this facility which c	urrently results in	16	17	18	D.	to waters of Is this prop	osal facility	(other th	han tl	hose descrik	oed	19	20	21	1
C. Is this facility which c discharges to waters of those described in A or B abo	ove? (FORM 2C)	22	23	24	-	to waters of	of the U.S.	? (FORM	12D)	in a <b>discha</b> i	-	25	26	27	/
E. Does or will this facility treat hazardous wastes? (FORM			$\boxtimes$		F.	containing.	effluent be within on	elow the ne quarte	lowe er mi	lity industria ermost strat ile of the v rinking wat	um vell		$\boxtimes$		]
G. Do you or will you inject	at this facility any	28	29	30	H.	(FORM 4) Do you or v						31	32	33	3
produced water other fluids the surface in connection wi natural gas production, in enhanced recovery of oil or fluids for storage of li	which are brought to th conventional oil or ect fluids used for natural gas, or inject					special pro	cesses suc cess, soluti stion of fos	ch as min ion minin sil fuel, o	ning o Ig of r or rec	of sulfer by th minerals. in	ne		$\boxtimes$		]
(FORM 4)	-	34	35	36	1	la della fac	- 114		-4-4			37	38	39	)
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C SKIP Columbia	Generating Stat	tion													
1 15 16-29 30												f	9		
IV. FACILITY CONTAC															
	NAME & TITLE (las	-,,	/			- 4				area code &		,	_		
2	ie K., Principal	Envir	onme	ental Scie	nus		509		377		-	'94			
V. FACILITY MAILING	ADDRESS					45	46 48		49	51	52	55			
	A. STREET OR P	P.O. BO	Х												
C PO Box 968 (Mail	• • •					45	-								
Richland	CITY OR TOWN					STATE	99352	CODE	_						
4 <b>Kicinand</b> 15 16				40	41	42	47	51							
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A. STREET, RO	DUTE NO. OR OTHE	ER SPE	CIFIC	IDENTIFIEF	{										
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6 North of Richland	d					WA		99354	•		05				
15 16				40		41 4	42	47	5′	1 52		54			

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VII. SIC CODES (4-digit, in order of priority)		
A. FIRST		B. SECOND
C 4911 (specify)	7 (specify)	
15 16 17 Electric Services	7	
C. THIRD	13 10 18	D. FOURTH
C (specify)	7 (specify)	
15 16 17	7 15 16 19	
VIII. OPERATOR INFORMATION	10 19	
	AME	B. Is the name listed in Item
C Energy Northwest		VIII-A also the owner?
8 18 19		YES NO
C. STATUS OF OPERATOR (Enter the appropriate letter int	o the answer box: if "Other " specify )	D. PHONE (area code & no.)
F = FEDERAL M = PUBLIC (other than federal or state)	M (specify) C	509 372 5000
S = STATE O = OTHER (specify)	56 A	
P = PRIVATE E. STREET OR PO BOX	56 15	16 18 19 21 22 25
PO Box 968		Contraction and the second second
26	66	and the second s
F. CITY OR TOWN		NDIAN LAND
C Richland		e facility located on Indian lands?
B 15 16 40		YES NO
X. EXISTING ENVIRONMENTAL PERMITS	42 42 47 51	
A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed S	oumool
C T WA-002515-1		ources)
9 N	9 P	
15 16 17 18 30 B. UIC (Underground Injection of Fluids	15 16 17 18 E. OTHER (specify)	30
	C T B See attached sheet	(Specify)
9 0	9	
15 16 17 18 30 C. RCRA (Hazardous Wastes)	15 16 17 18 E. OTHER (specify)	30 (Спорібн)
CTINA	C T 8	(Specify)
9 R	9	
15 16 17 18 30 XI. MAP	15 16 17 18	30
show the outline of the facility, the location of ea hazardous waste treatment, storage, or disposal fa rivers and other surface water bodies in the map are XII. NATURE OF BUSINESS (provide a brief de Construction and operation of electric energy	cilities, and each well where it injects fl a. See instructions for precise requirem scription)	uids underground. Include all springs, nents.
XIII. CERTIFICATION (see instructions)         I certify under penalty of law that I have personally of all attachments and that, based on my inquiry of the the application, I believe that the information is true submitting false information, including the possibility         A. NAME & OFFICIAL TITLE (type or print)         Scott A. Vance,         Vice President/General Counsel         COMMENTS FOR OFFICIAL USE ONLY	ose persons immediately responsible for e, accurate and complete. I am aware	obtaining the information contained in
C		
C 15 16		
10 1 10		65

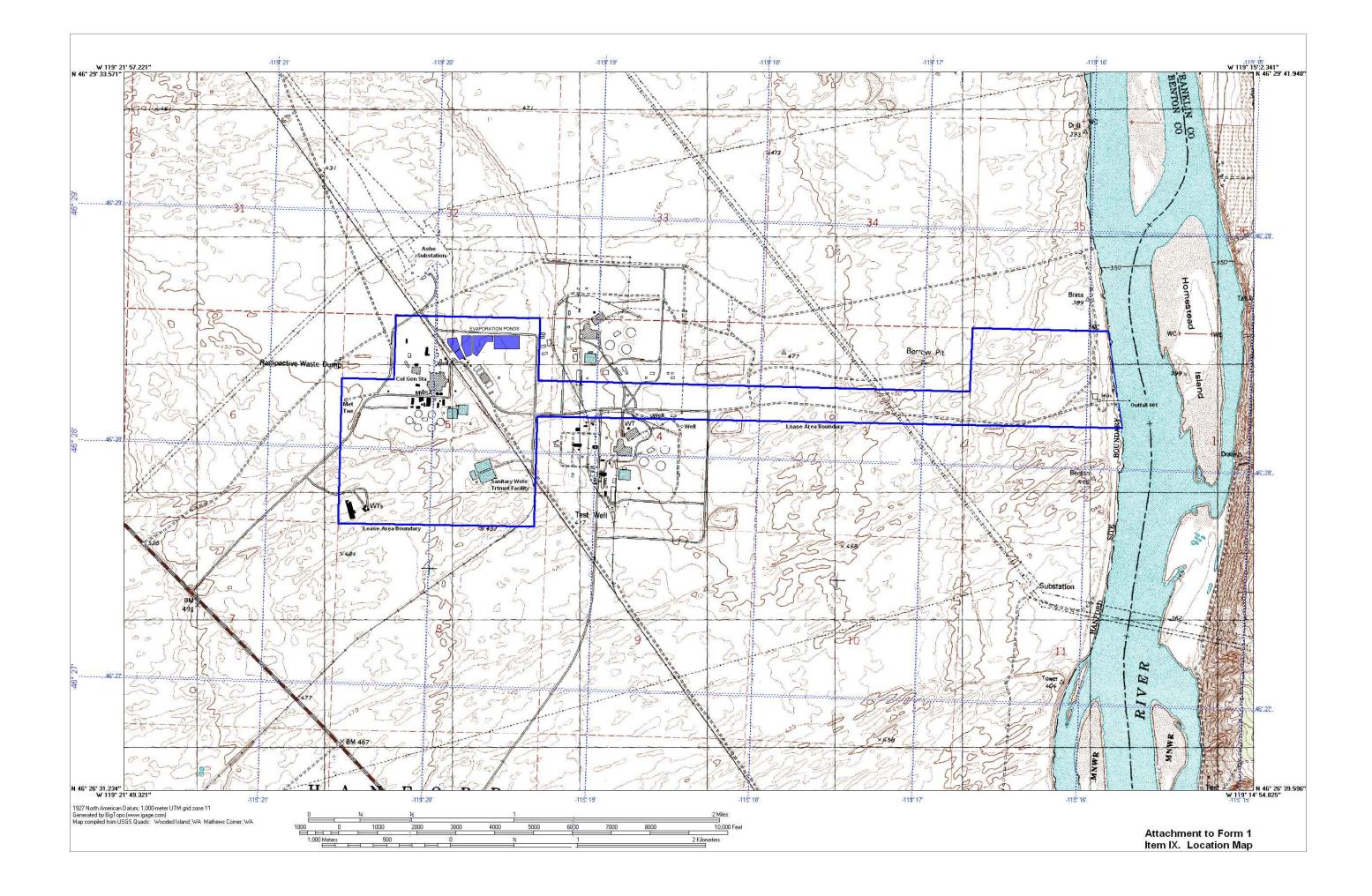
### Attachment to FORM 1

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Authorized	
Washington Energy Facility Site Evaluation Council	RCW 80.50, WAC Title 463	State Permit to construct and operate	N/A	Issued: 05/17/1972	Construction and operation of CGS	
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10CFR50.10	License to operate	NPF-21	Issued: 12/20/1983 Expires: 12/20/2043	Operation of CGS	
Washington Energy Facility Site Evaluation Council	RCW 80.50, WAC Title 463	Resolution	288	Issued: 11/10/1997	Operation of inert waste landfill	
Washington Energy Facility Site Evaluation Council	RCW 80.50, WAC Title 463	Resolution	299	Issued: 08/3/2001	Onsite disposal of cooling system sediment	
Washington Energy Facility Site Evaluation Council	RCW 80.50, WAC Title 463	Resolution	300	Issued: 09/10/2001	Operation of sanitary waste treatment facility <sup>(1)</sup>	
U.S. Army Corps of Engineers	Sec. 10 of Rivers and Harbors Act (33 USC 403), 33 CFR 330	Permit	071-OYC-1- 000221-75-9	lssued: 03/14/1975	Construction and maintenance of river intake and discharge structures	
Washington Department of Natural Resources	RCW 79.90 & 79.96	Easement	51-076659	Issued: 04/02/2005 Expires: 04/01/2035	Use of aquatic lands (riverbed and shoreline) for construction of in- river structures	
Washington Department of Ecology	RCW 90.03, 90.16, & 43.21A, WAC 173-152 & 508-12	Certificate	S3-20141C	Issued: 02/04/1983	Withdrawal and consumption of surface water	

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Authorized	
Washington Department of Ecology	RCW 90.03, 90.16, & 43.21A, WAC 173-152 & 508-12	Certificate	G3-20142C	lssued: 05/02/1979	Withdrawal and consumption of groundwater	
Washington Energy Facility Site Evaluation Council	RCW 70.94 & 80.50, WAC 173- 401-300, 173- 400-091 & 463- 39	Order	873	Issued: 10/08/2014	Air emissions	
Washington Energy Facility Site Evaluation Council	RCW 70.94 & 80.50, WAC 173- 400, 173-460, & 463-39	Order	837	Issued: 02/11/2009	Air emissions from painting and blasting	
Washington Department of Ecology (through Dept of Licensing)	RCW 90.76, WAC 173-360	Registration	034 003 333	Annual registration	Operation of underground storage tanks	
Washington Department of Health	RCW 70.119A, WAC 246-294	Permit	920240	Annual registration	Operation of public water system	
Washington Department of Ecology	RCW 43-200, WAC 173-326	Permit	G1018	Annual permit	Use of commercial low level radwaste disposal facility	
U.S. Nuclear Regulatory Commission and National Marine Fisheries Service	Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) Section 7(a)(2)	License to Operate	NPF-21	Issued: 03/10/2017	Final Biological Opinion and Incidental Take Statement	
Washington Energy Facility Site Evaluation Council	RCW 70.94.331, 70.94.442 & 80.50, WAC 463- 78-070 & Chapter 246-247 WAC.	Order	874	01/21/2015	Manage and Regulate Fugitive Radionuclide Emissions from Evaporation Ponds <sup>(2)</sup>	

Notes:

- (1) Sanitary Waste Treatment Facility (SWTF) Waste Discharge Permit application submitted to EFSEC in 2018. Once issued the Waste Discharge Permit is to supersede Resolution 300.
- (2) Columbia Generating Station Site-Wide Radioactive Air Emissions License application submitted in 2018.



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

Please print or type in the unshaded areas only.

Form Approved. OMB No. 2040-0086. Approval expires 3-31-98.

FORM 2C NPDES	€E	<b>PA</b>	<u></u>	EXISTING		PLICATION F TURING, C	OR PERMIT	L PROTECTION AGENCY TO DISCHARGE WASTEWATER AL, MINING AND SILVICULTURE OF Permits Program					
I. OUTFAL	L LOCATION												
For each of	outfall, list the	latitude and	longitude of i	ts location to	the nearest 1	5 seconds an	d the name of	the receiving water.					
	LL NUMBER		B. LATITUD	Ξ	C	. LONGITUD	E						
(4	list)	1. DEG.	2. MIN.	3. SEC.	1. DEG.	2. MIN.	3. SEC.	D. RECEIVING WATE	R (name)				
II. FLOWS	SOURCES	OF POLLUTI	ION. AND TR	EATMENT T	ECHNOLOGI	ES							
labeled treatme source B. For ea	I to correspond ent units, and s of water and ch outfall, pro orm water ru	d to the mor outfalls. If a any collecti ovide a desci	e detailed de water balanc on or treatme ription of: (1)	scriptions in I e cannot be ent measures All operation	tem B. Constr determined (e s contributing	uct a water b g., for certain wastewater	alance on the <i>mining activi</i> to the effluent	perations contributing wastewater to the e line drawing by showing average flows be ities), provide a pictorial description of the t, including process wastewater, sanitary nent received by the wastewater. Contin	etween intakes, nature and am wastewater, coo	operations, ount of any oling water,			
	, ai ji		RATION(S) C					3. TREATMENT					
1. OUT- FALL		2. OF LF	ATION(3) C					5. INLATMENT					
NO. (list)	а	OPERATION	N (list)	b	. AVERAGE F (include unit			a. DESCRIPTION	b. LIST COD TABLE				
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OFFICIAL	USE ONLY (	effluent guide	lines sub-categ	gories)									

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C. Except for st				of the discharges	described in It			sonal?			
	YES (comple	ete the follov	wing table)		L	NO (go to Sec	ction III)				
						EQUENCY			4. FLOW		
			PERATION(s)		a. DAYS PER WEEK	b. MONTHS	a. FLOW RA	TE (in mgd)	B. TOTA (specify		
1. OUTFALL NUMBER (list)		CONTR	( <i>list</i> )	N	(specify average)	PER YEAR (specify average)	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERI AVERAGE	A 2. MAXIM DAILY	
							, THE I WIGE	D/ III I	THEITIGE	0,1121	
III. PRODUCTIO											
		e limitation	promulgated	I by EPA under S	ection 304 of t	the Clean Water	Act apply to you	ır facility?			
	YES (comple			by El Atunder o		NO (go to Sec					
B. Are the limita	ations in the a	applicable e	effluent guide	eline expressed ir	terms of prod	luction (or other	measure of ope	ration)?			
	YES (comple	ete Item III-0	C)		[	NO (go to Sec	ction IV)				
				ntity which repres fected outfalls.	ents an actual	I measurement	of your level of p	production, exp	pressed in the	terms and	units used in the
	Indent guider			ERAGE DAILY F	RODUCTION	1					
a QUANTITY	a. QUANTITY PER DAY b. UNITS OF MEASURE					ON, PRODUCT,	<ul> <li>2. AFFECTED OUTFALLS (list outfall numbers)</li> </ul>				
u		0.0				(specify)					
IV. IMPROVEM											
											is of wastewater t is not limited to,
permit cond				orders, enforcen	nent compliand	_	•	court orders, a	and grant or lo	an condition	S.
	YES (comple	ete the follov	wing table)		L	NO (go to Iter	m IV-B)				
1. IDENTIFICA	TION OF CO		2. AF	FECTED OUTFA	LLS	3. BRIEF	DESCRIPTION	OF PROJECT	г 4.	FINAL COM	IPLIANCE DATE
AGRE	EIVIENT, ETC	J	a. NO.	b. SOURCE OF D	ISCHARGE				a.	REQUIRED	b. PROJECTED
											may affect your ed schedules for
construction	1. I						2 1	,	, <b>,</b>		
	, mark "X" if	F DESCRIF	PTION OF A	DDITIONAL CON	TROL PROGE	RAMS IS ATTAC	CHED				

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

V. INTAKE AND EFFLUENT CHARACTER			
A, B, & C: See instructions before proceed		outfall Annotate the outfall number in the	
	-C are included on separate sheets number		space provided.
D. Use the space below to list any of the p		tions, which you know or have reason to b	elieve is discharged or may be discharged data in your possession.
1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
	2: 000:002		
VI. POTENTIAL DISCHARGES NOT COVE			
Is any pollutant listed in Item V-C a substan	ice or a component of a substance which yo	ou currently use or manufacture as an inter	mediate or final product or byproduct?
YES (list all such pollutants b	pelow)	NO (go to Item VI-B)	

CONTINUED FROM THE FRONT

VII. BIOLOGICAL TOXICITY TESTING DATA										
relation to your discharge within the last 3 ye	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 a receiving water in relation to your discharge within the last 3 years?									
YES (identify the test(s) and d	escribe their purposes below)	NO (go to Section VIII)								
toxicity were performed to m at the acute mixing zone me acute toxicity detected in t	Whole Effluent Toxicity (WET) testing was performed on the final effluent, quarterly, including the last three years, by Energy Northwest in accordance with Special Condition S13 Acute Toxicity. The WET tests for acute toxicity were performed to meet the requirements of the permit and to verify the concentration of pollutants at the acute mixing zone meets the acute aquatic life criteria. Results of these tests show there was no acute toxicity detected in the test concentration representing the acute critical effluent concentration.									
WET testing for Chronic Toxicity was performed on the final effluent, quarterly during the last calendar year of the permit cycle, to meet Special Condition S14. Chronic toxicity tests were performed to demonstrate that the effluent meets chronic aquatic life criteria and human health criteria. Results of these test show there was no chronic toxicity in test concentrations representing the chronic critical effluent concentration. Chronic Toxicity test results are included as an attachment to this permit application, as required by the permit.										
VIII. CONTRACT ANALYSIS INFORMATION										
Were any of the analyses reported in item V	performed by a contract laboratory or consulting firm	2								
Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?  VES (list the name, address, and telephone number of, and pollutants analyzed by, NO (go to Section IX)										
each such laboratory or fit										
A. NAME	B. ADDRESS	C. TELEPHONE (area code & no.)	D. POLLUTANTS ANALYZED							
		C. TELEPHONE (area code & no.) (856) 786~5974	D. POLLUTANTS ANALYZED ( <i>list</i> )							
A. NAME	B. ADDRESS	(area code & no.)	(list)							
A.NAME EMSL Analytical	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive,	(area code & no.) (856) 786~5974	(ist) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide,							
A.NAME EMSL Analytical Anatek Labs	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive, Moscow, ID 83843 7102 W. Okanogan Place	(area code & no.) (856) 7865974 (208) 883-2839	( <i>list</i> ) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide, total phenols							
A.NAME EMSL Analytical Anatek Labs Benton-Franklin Health District	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive, Moscow, ID 83843 7102 W. Okanogan Place Kennewick, WA 99336 1620 S Walnut St	(area code & no.) (856) 786-5974 (208) 883-2839 (509) 460-4200	( <i>list</i> ) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide, total phenols BOD, fecal coliform							
A. NAME EMSL Analytical Anatek Labs Benton-Franklin Health District Edge Analytical IX. CERTIFICATION I certify under penalty of law that this docum qualified personnel properly gather and evo directly responsible for gathering the inform are significant penalties for submitting false	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive, Moscow, ID 83843 7102 W. Okanogan Place Kennewick, WA 99336 1620 S Walnut St Burlington, WA 98233 ent and all attachments were prepared under my dim aluate the information submitted. Based on my ing aluate the information submitted is, to the best of my information, including the possibility of fine and impris	(area code & no.) (856) 786-5974 (208) 883-2839 (509) 460-4200 (360) 757-1400 (360) 757-1400 entities of the person or persons who introveloge and belief, true, accurate onment for knowing violations.	(list) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide, total phenols BOD, fecal coliform Bromide, color							
A. NAME EMSL Analytical Anatek Labs Benton-Franklin Health District Edge Analytical IX. CERTIFICATION I certify under penalty of law that this docum qualified personnel properly gather and ever directly responsible for gathering the informa are significant penalties for submitting false of A. NAME & OFFICIAL TITLE (type or print)	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive, Moscow, ID 83843 7102 W. Okanogan Place Kennewick, WA 99336 1620 S Walnut St Burlington, WA 98233	(area code & no.) (856) 786-5974 (208) 883-2839 (509) 460-4200 (360) 757-1400 (360) 757-1400	(list) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide, total phenols BOD, fecal coliform Bromide, color							
A. NAME EMSL Analytical Anatek Labs Benton-Franklin Health District Edge Analytical IX. CERTIFICATION I certify under penalty of law that this docum qualified personnel properly gather and evo directly responsible for gathering the inform are significant penalties for submitting false	B. ADDRESS 200 Route 130 North Cinnaminson, NJ 08077 1282 Alturas Drive, Moscow, ID 83843 7102 W. Okanogan Place Kennewick, WA 99336 1620 S Walnut St Burlington, WA 98233 ent and all attachments were prepared under my din aluate the information submitted. Based on my inquisition, the information submitted is, to the best of my in aluate the information submitted is, to the best of my information, including the possibility of fine and impris- eneral Counsel	(area code & no.) (856) 786-5974 (208) 883-2839 (509) 460-4200 (360) 757-1400 (360) 757-1400 entities of the person or persons who introveloge and belief, true, accurate onment for knowing violations.	(list) Asbestos Volatile, semivolatile organics, mercury, boron, TKN, oil & grease, cyanide, total phenols BOD, fecal coliform Bromide, color							

EPA Form 3510-2C (8-90)

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)

OUTFALL NO. V. INTAKE AND EFFLUENT CHARACTERISTICS (continued from page 3 of Form 2-C) PART A -You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details. 4. INTAKE 3. UNITS 2. EFFLUENT (specify if blank) (optional) b. MAXIMUM 30 DAY VALUE c. LONG TERM AVRG. VALUE a. LONG TERM a. MAXIMUM DAILY VALUE (if available) (if available) AVERAGE VALUE a. CONCENb. NO. OF d. NO. OF (1) CONCENTRATION (1) CONCENTRATION (1) CONCENTRATION 1. POLLUTANT ANALYSES TRATION b. MASS ANALYSES (2) MASS (2) MASS (1) CONCENTRATION (2) MASS (2) MASS a. Biochemical Oxygen Demand (BOD) b. Chemical Oxygen Demand (COD) c. Total Organic Carbon (TOC)d. Total Suspended Solids (TSS) e. Ammonia (as N) VALUE VALUE VALUE VALUE f. Flow VALUE VALUE VALUE VALUE g. Temperature °C (winter) VALUE VALUE VALUE VALUE h. Temperature °C (summer) MINIMUM MAXIMUM MINIMUM MAXIMUM i. pH STANDARD UNITS PART B - Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements. 2. MARK "X" 3. EFFLUENT 4. UNITS 5. INTAKE (optional) 1. POLLUTANT b. MAXIMUM 30 DAY VALUE c. LONG TERM AVRG. VALUE a. LONG TERM AVERAGE AND a. MAXIMUM DAILY VALUE (if available) (if available) VALUE a. b. CAS NO. d. NO. OF a. CONCENb. NO. OF BELIEVED BELIEVED (1)(1) (1) (1) ANALYSES TRATION b. MASS ANALYSES (if available) PRESENT ABSENT CONCENTRATION (2) MASS CONCENTRATION (2) MASS CONCENTRATION CONCENTRATION (2) MASS (2) MASS a. Bromide (24959-67-9) b. Chlorine, Total Residual c. Color d. Fecal Coliform e. Fluoride (16984-48-8) f. Nitrate-Nitrite (as N)

ITEM V-B CONT			-											
	2. MA	RK "X"	3. EFFLUENT						4. UNITS			5. INTAKE (optional)		
1. POLLUTANT AND CAS NO.	a.	b.	a. MAXIMUM DA	ALLY VALUE	b. MAXIMUM 30 (if availa	DAY VALUE ble)	c. LONG TERM A (if availa	VRG. VALUE ble)	d. NO. OF	a. CONCEN-		a. LONG TI AVERAGE V	ERM ALUE	b. NO. OF
<i>(if available)</i> g. Nitrogen,	BELIEVED PRESENT	ABSENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANALYSES	TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
g. Nitrogen, Total Organic ( <i>as N</i> )														
h. Oil and Grease														
i. Phosphorus (as P), Total (7723-14-0)														
j. Radioactivity														
(1) Alpha, Total														
(2) Beta, Total														
(3) Radium, Total														
(4) Radium 226, Total														
k. Sulfate (as SO <sub>4</sub> ) (14808-79-8)														
I. Sulfide (as S)														
m. Sulfite (as SO <sub>3</sub> ) (14265-45-3)														
n. Surfactants														
o. Aluminum, Total (7429-90-5)														
p. Barium, Total (7440-39-3)														
q. Boron, Total (7440-42-8)														
r. Cobalt, Total (7440-48-4)														
s. Iron, Total (7439-89-6)														
t. Magnesium, Total (7439-95-4)														
u. Molybdenum, Total (7439-98-7)														
v. Manganese, Total (7439-96-5)														
w. Tin, Total (7440-31-5)														
x. Titanium, Total (7440-32-6)														

				E	PA I.D. NUM	IBER (copy from Iter	m 1 of Form 1)	OUTFALL NUM	BER						
CONTINUED FROM	/ PAGE 3 O	F FORM 2-	с												
PART C - If you a fraction: fraction: provide discharg pollutan	re a primary s that apply s), mark "X" the results ged in conce its which yo	v industry ar to your ind in column of at least o entrations of u know or h	nd this outfaustry and f 2-b for eac ne analysis f 10 ppb or ave reasor	or ALL toxic metal h pollutant you knows for that pollutant. greater. If you man to believe that yo	s, cyanides, ow or have r If you mark k column 2b u discharge	and total phenols. eason to believe is column 2b for any o for acrolein, acryle in concentrations of	If you are no s present. Ma pollutant, you politrile, 2,4 di of 100 ppb or	ot required to mark rk "X" in column 2- must provide the r nitrophenol, or 2-m greater. Otherwise	c column 2- -c for each results of at ethyl-4, 6 d e, for polluta	a ( <i>secondary</i> pollutant you least one an initrophenol, <u>y</u> ints for which	industries, nor believe is abse alysis for that p you must provid you mark colu	process was ent. If you m ollutant if yo de the result mn 2b, you i	stewater outfalls, a ark column 2a for u know or have rea s of at least one an must either submit	nd nonrequi any pollutan ason to belie alysis for ea at least one	red GC/MS t, you must ve it will be ich of these analysis or
	lescribe the al details ar			is expected to be	discharged.	Note that there a	re / pages to	this part; please	review each	n carefully. C	omplete one ta	ible ( <i>all 7 pa</i>	ages) for each outf	all. See inst	ructions for
	2	2. Mark "X'	,			-	FFLUENT			1	4. UN	ITS		KE (optiona	l)
1. POLLUTANT AND	a.	b.	с.	a. MAXIMUM DA	ILY VALUE	b. MAXIMUM 30 ( <i>if availa</i>		c. LONG TERM VALUE (if ava					a. LONG T AVERAGE \		
CAS NUMBER (if available)		BELIEVED PRESENT	BELIEVED ABSENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	a. CONCEN- TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
METALS, CYANIDI	E, AND TOT	AL PHENO	LS	•				L					•		
1M. Antimony, Total (7440-36-0)															
2M. Arsenic, Total (7440-38-2)															
3M. Beryllium, Total (7440-41-7)															
4M. Cadmium, Total (7440-43-9)															
5M. Chromium, Total (7440-47-3)															
6M. Copper, Total (7440-50-8)															
7M. Lead, Total (7439-92-1)															
8M. Mercury, Total (7439-97-6)															
9M. Nickel, Total (7440-02-0)															
10M. Selenium, Total (7782-49-2)															
11M. Silver, Total (7440-22-4)															
12M. Thallium, Total (7440-28-0)															
13M. Zinc, Total (7440-66-6)															
14M. Cyanide, Total (57-12-5)															
15M. Phenols, Total															
DIOXIN															
2,3,7,8-Tetra- chlorodibenzo-P- Dioxin (1764-01-6)				DESCRIBE RESU	JLTS										

		2. MARK "X'	9			3 F	FFLUENT				4. UN	ITS	5. INTA	AKE (optiona	<i>ul</i> )
1. POLLUTANT	-					b. MAXIMUM 30 I	DAY VALUE	c. LONG TERM	1 AVRG.		1. 011		a. LONG T	ERM	.,
AND CAS NUMBER	a. TESTING	b. BELIEVED		a. MAXIMUM DA	ILY VALUE	(if availat	ble)	VALUE (if ava	iilable)	d NO OF	a. CONCEN-		AVERAGE V	ALUE	b. NO. OF
(if available)	REQUIRED	PRESENT	ABSENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANALYSES	TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
GC/MS FRACTION	I – VOLATIL	E COMPO	JNDS												
1V. Accrolein (107-02-8)															
2V. Acrylonitrile (107-13-1)															
3V. Benzene (71-43-2)															
4V. Bis ( <i>Chloro-</i> <i>methyl</i> ) Ether (542-88-1)															
5V. Bromoform (75-25-2)															
6V. Carbon Tetrachloride (56-23-5)															
7V. Chlorobenzene (108-90-7)															
8V. Chlorodi- bromomethane (124-48-1)															
9V. Chloroethane (75-00-3)															
10V. 2-Chloro- ethylvinyl Ether (110-75-8)															
11V. Chloroform (67-66-3)															
12V. Dichloro- bromomethane (75-27-4)															
13V. Dichloro- difluoromethane (75-71-8)															
14V. 1,1-Dichloro- ethane (75-34-3)															
15V. 1,2-Dichloro- ethane (107-06-2)															
16V. 1,1-Dichloro- ethylene (75-35-4)															
17V. 1,2-Dichloro- propane (78-87-5)															
18V. 1,3-Dichloro- propylene (542-75-6)															
19V. Ethylbenzene (100-41-4)															
20V. Methyl Bromide (74-83-9)															
21V. Methyl Chloride (74-87-3)															

#### CONTINUED FROM THE FRONT

		2. MARK "X	9			3. E	FFLUENT				4. UN	TS	5. INTA	KE (optiona	l)
1. POLLUTANT AND						b. MAXIMUM 30 I		c. LONG TERM					a. LONG T		
CAS NUMBER	a. TESTING	b. BELIEVED PRESENT	c. BELIEVED	a. MAXIMUM DAI	LY VALUE	(if availat		VALUE (if ava		d. NO. OF	a. CONCEN-		AVERAGE V		b. NO. OF
(if available)				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANALYSES	TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
GC/MS FRACTION	I – VOLATIL		JNDS (cont	inued)									1		
22V. Methylene Chloride (75-09-2)															
23V. 1,1,2,2- Tetrachloroethane (79-34-5)															
24V. Tetrachloro- ethylene (127-18-4)															
25V. Toluene (108-88-3)															
26V. 1,2-Trans- Dichloroethylene (156-60-5)															
27V. 1,1,1-Trichloro- ethane (71-55-6)															
28V. 1,1,2-Trichloro ethane (79-00-5)															
29V Trichloro- ethylene (79-01-6)															
30V. Trichloro- fluoromethane (75-69-4)															
31V. Vinyl Chloride (75-01-4)															
GC/MS FRACTION		MPOUNDS	6			I							1		
1A. 2-Chlorophenol (95-57-8)															
2A. 2,4-Dichloro- phenol (120-83-2)															
3A. 2,4-Dimethyl- phenol (105-67-9)															
4A. 4,6-Dinitro-O- Cresol (534-52-1)															
5A. 2,4-Dinitro- phenol (51-28-5)															
6A. 2-Nitrophenol (88-75-5)															
7A. 4-Nitrophenol (100-02-7)															
8A. P-Chloro-M- Cresol (59-50-7)															
9A. Pentachloro- phenol (87-86-5)															
10A. Phenol (108-95-2)															
11A. 2,4,6-Trichloro- phenol (88-05-2)															

EPA Form 3510-2C (8-90)

CONTINUED FROM PAGE V-4

CONTINUE ON REVERSE

CONTINUED FRO	M THE FRO	DNT													
	2	2. MARK "X	"				EFFLUENT				4. UN	ITS		AKE (optiona	<i>l</i> )
1. POLLUTANT AND CAS NUMBER	a.	b.	С.	a. MAXIMUM DA	ILY VALUE	b. MAXIMUM 30 (if availa		c. LONG TERN VALUE ( <i>if ava</i>			a. CONCEN-		a. LONG T AVERAGE \	ERM /ALUE	b. NO. OF
(if available)	REQUIRED	BELIEVED PRESENT	ABSENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANALYSES	TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
GC/MS FRACTION	- BASE/NE	EUTRAL CO	DMPOUND	S											
1B. Acenaphthene (83-32-9)															
2B. Acenaphtylene (208-96-8)															
3B. Anthracene (120-12-7)															
4B. Benzidine (92-87-5)															
5B. Benzo ( <i>a</i> ) Anthracene (56-55-3)															
6B. Benzo ( <i>a</i> ) Pyrene (50-32-8)															
7B. 3,4-Benzo- fluoranthene (205-99-2)															
8B. Benzo (ghi) Perylene (191-24-2)															
9B. Benzo (k) Fluoranthene (207-08-9)															
10B. Bis (2-Chloro- ethoxy) Methane (111-91-1)															
11B. Bis (2-Chloro- ethyl) Ether (111-44-4)															
12B. Bis (2- Chloroisopropyl) Ether (102-80-1)															
13B. Bis (2-Ethyl- hexyl) Phthalate (117-81-7)															
14B. 4-Bromophenyl Phenyl Ether (101-55-3)															
15B. Butyl Benzyl Phthalate (85-68-7)															
16B. 2-Chloro- naphthalene (91-58-7)															
17B. 4-Chloro- phenyl Phenyl Ether (7005-72-3)															
18B. Chrysene (218-01-9)															
19B. Dibenzo ( <i>a</i> , <i>h</i> ) Anthracene (53-70-3)															
20B. 1,2-Dichloro- benzene (95-50-1)															
21B. 1,3-Di-chloro- benzene (541-73-1)															

#### EPA Form 3510-2C (8-90)

		2. MARK "X'	,			3. E	FFLUENT				4. UN	TS	5. INTA	KE (optiona	l)
1. POLLUTANT AND						b. MAXIMUM 30	DAY VALUE	c. LONG TERM	AVRG.				a. LONG T	ERM	
CAS NUMBER	a. TESTING	b. BELIEVED	c. BELIEVED	a. MAXIMUM DA	LY VALUE	(if availat	ble)	VALUE (if ava	iilable)	d. NO. OF	a. CONCEN-		AVERAGE V	ALUE	b. NO. OF
(if available)	REQUIRED	PRESENT	ABSENT	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	ANALYSES	TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	ANALYSES
GC/MS FRACTION	N – BASE/N	EUTRAL CO	OMPOUND	S (continued)		1				1			1		
22B. 1,4-Dichloro- benzene (106-46-7)															
23B. 3,3-Dichloro- benzidine (91-94-1)															
24B. Diethyl Phthalate (84-66-2)															
25B. Dimethyl Phthalate (131 -11-3)															
26B. Di-N-Butyl Phthalate (84-74-2)															
27B. 2,4-Dinitro- toluene (121-14-2)															
28B. 2,6-Dinitro- toluene (606-20-2)															
29B. Di-N-Octyl Phthalate (117-84-0)															
30B. 1,2-Diphenyl- hydrazine ( <i>as Azo-</i> <i>benzene</i> ) (122-66-7)															
31B. Fluoranthene (206-44-0)															
32B. Fluorene (86-73-7)															
33B. Hexachloro- benzene (118-74-1)															
34B. Hexachloro- butadiene (87-68-3)															
35B. Hexachloro- cyclopentadiene (77-47-4)															
36B Hexachloro- ethane (67-72-1)															
37B. Indeno ( <i>1,2,3-cd</i> ) Pyrene (193-39-5)															
38B. Isophorone (78-59-1)															
39B. Naphthalene (91-20-3)															
40B. Nitrobenzene (98-95-3)															
41B. N-Nitro- sodimethylamine (62-75-9)															
42B. N-Nitrosodi- N-Propylamine (621-64-7)															

#### CONTINUED FROM PAGE V-6

EPA Form 3510-2C (8-90)

		2. MARK "X'	,				FFLUENT				4. UN	ITS	5. INTA	KE (optional	l)
1. POLLUTANT AND				a. MAXIMUM DA		b. MAXIMUM 30 I (if availat		c. LONG TERN VALUE ( <i>if ava</i>	AVRG.				a. LONG T AVERAGE V		
CAS NUMBER	a. TESTING	b. BELIEVED	c. BELIEVED	(1) CONCENTRATION	ILT VALUE	(1) CONCENTRATION		(1) CONCENTRATION		d. NO. OF ANALYSES	a. CONCEN-	F MACO	(1) CONCENTRATION		b. NO. OF
( <i>if available</i> ) GC/MS FRACTION					(2) MASS	CONCENTRATION	(2) MASS	CONCENTRATION	(2) MASS	ANALISES	TRATION	D. MASS	CONCENTRATION	(2) MASS	ANALYSES
43B. N-Nitro-	N - BASE/IN	EUTRAL CC		5 (continuea)						1					1
sodiphenylamine (86-30-6)															
44B. Phenanthrene (85-01-8)															
45B. Pyrene (129-00-0)															
46B. 1,2,4-Tri- chlorobenzene (120-82-1)															
GC/MS FRACTION	N – PESTIC	IDES	-						-	_		-			
1P. Aldrin (309-00-2)															
2P. α-BHC (319-84-6)															
3P. β-BHC (319-85-7)															
4Ρ. γ-BHC (58-89-9)															
5Ρ. δ-BHC (319-86-8)															
6P. Chlordane (57-74-9)															
7P. 4,4'-DDT (50-29-3)															
8P. 4,4'-DDE (72-55-9)															
9P. 4,4'-DDD (72-54-8)															
10P. Dieldrin (60-57-1)															
11P. α-Enosulfan (115-29-7)															
12P. β-Endosulfan (115-29-7)															
13P. Endosulfan Sulfate (1031-07-8)															
14P. Endrin (72-20-8)															
15P. Endrin Aldehyde (7421-93-4)															
16P. Heptachlor (76-44-8)															

EPA Form 3510-2C (8-90)

CONTINUED FROM THE FRONT

					EPA I.	.D. NUMBEI	R (copy from Item 1	of Form 1)	OUTFALL NUM	BER						
CONTINUED FRO	M PAGE V-8	3														
	2	. MARK "X	9				3. E	FFLUENT				4. UN	ITS	5. INTA	AKE (optiona	ıl)
1. POLLUTANT AND	a.	b.	C.	a. MAXIMU	JM DAI	LY VALUE	b. MAXIMUM 30 (if availa		c. LONG TERN VALUE ( <i>if ave</i>					a. LONG T AVERAGE \		
CAS NUMBER (if available)	TESTING REQUIRED	BELIEVED PRESENT		(1) CONCENTR	ATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	a. CONCEN- TRATION	b. MASS	(1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION	I – PESTICI	DES (contin	ued)													
17P. Heptachlor Epoxide (1024-57-3)																
18P. PCB-1242 (53469-21-9)																
19P. PCB-1254 (11097-69-1)																
20P. PCB-1221 (11104-28-2)																
21P. PCB-1232 (11141-16-5)																
22P. PCB-1248 (12672-29-6)																
23P. PCB-1260 (11096-82-5)																
24P. PCB-1016 (12674-11-2)																
25P. Toxaphene (8001-35-2)																

EPA Form 3510-2C (8-90)

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#### Table II.B (continued)

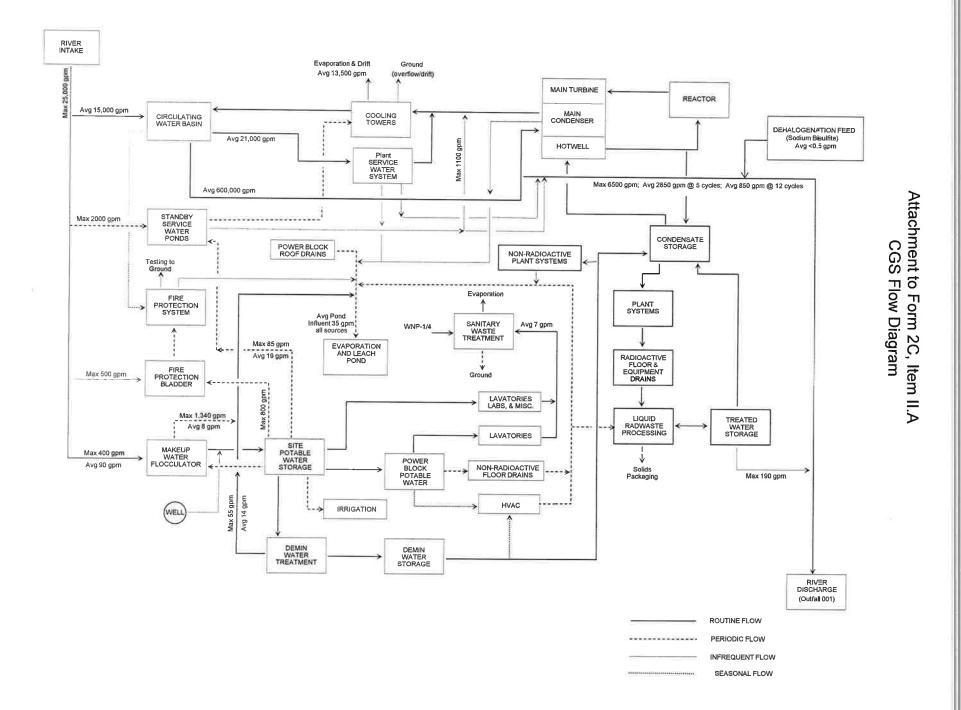
1.	2. OPERATION(S) C	ONTRIBUTING FLOW	3. TREATMENT		
OUT- FALL NO. ( <i>list</i> )	a. OPERATION (list)	b. AVERAGE FLOW (include units)	a. DESCRIPTION		DES FROM E 2C-1
	Building Roof Drains	0.002 MGD	Intermittent stormwater collection	1-F	
NA		(estimate)	in double-lined evaporation ponds		
(g)			To be determined sediment disposal location	5-Q	
	HVAC Airwash Drains	0.006 MGD	Seasonal collection in double-lined	1-F	
NA		(estimate)	evaporation ponds		
(h)					
	Sanitary Waste	0.010 MGD	Aerated lagoons	3-B	
NA			Stabilization ponds	3-G	1-F
(i)			Intermittent discharge to percolation beds	3-F	
	Fire Protection System	0.003 MGD	Intermittent discharge to soil	3-F	
NA	Flushes, & other misc.	(estimate)			
(j)	Hydrotesting, Maintenance				
	and Construction Activities				

#### Table II.C

		3	. FREQUENCY			4. FLOW		
		a. DAYS PER		a. FLOW RATE	(in mgd)	B. TOTAL VOLUM (specify with units)	E	
1. OUTFALL NUMBER (list)	2. OPERATION(s) CONTRIBUTING FLOW (list)	WEEK (specify average)	b. MONTHS PER YEAR (specify average)	1. LONG TERM AVERAGE	2. MÁXIMUM DAILY	1. LONG TERM AVERAGE	2. Maximum Daily	C. DURATION (in days)
001	Radioactive Waste Treatment System Effluent	No discharge during permit period	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge	NA
001	Standby Service Water	No discharge during permit period	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge	NA
Evaporation Ponds	Potable Water Treatment	5	12	0.011	0.201	11,000 gal	201,000 gal	<1
Evaporation Ponds	Nonrad Plant Equipment	1	4	<0.002 (estimate)	0.3 (estimate)	2000 gal (estimate)	300,000 gal	<1
Evaporation Ponds	HVAC Airwash	7	7	0.006 (estimate)	0.007 (estimate)	6000 gal (estimate)	7000 gal (estimate)	1
NA	Fire Protection System Flushed, & other misc. Hydrotesting, Maintenance, and Construction Activities	1	9	<0.001 (estimate)	0.015 (estimate)	1000 gal (estimate)	15,000 gal (estimate)	<1

#### Section IV. IMPROVEMENTS B. Optional

1. IDENTIFICATION OF	2. AFFECTED OUT	FALLS	3. BRIEF DESCRIPTION OF PROJECT
CONDITION, AGREEMENT, ETC.	a. NO.	b. SOURCE OF DISCHARGE	
Permit modification request dated 10/9/2018 for dehalogenation system	001	Circulating Cooling Water Blowdown	The modification will add a continuous halogenation with a dehalogenation system to the existing batch halogenation process. Anticipated implementation summer 2019.



## WASTEWATER SOURCE DESCRIPTIONS

Columbia Generating Station (CGS) April 2019

#### **Circulating Cooling Water Blowdown**

The main steam condenser and miscellaneous heat exchangers (plant service water system) are cooled by the non-contact circulating water (CW) system. The recirculating flow is typically about 600,000 gallons per minute (gpm). The heat is rejected to the atmosphere by the evaporative process in six (6) mechanical draft cooling towers. The evaporated water and that lost through drift and blowdown is replenished from the Columbia River at an average rate of about 15,000 gpm. Evaporation of the cooling water results in the concentration of dissolved solids. To limit the buildup of dissolved salts, a portion of the cooling water is released to the river as blowdown (to Outfall 001).

Although the blowdown stream is intended to be a relatively constant discharge, several factors can cause variation in the chemical composition of the discharge. The most important factor is the adjustable blowdown rate that determines the concentration factor for dissolved material in the circulating water. Columbia Generating Station (CGS) has typically operated between 5 cycles of concentration (about 2,850 gpm blowdown) and 12 cycles of concentration (about 850 gpm blowdown).

The chemical composition of the blowdown is also affected by the circulating water treatment regime. Sulfuric acid is added to help maintain pH in the range of 8.2 to 8.6 for optimal reduction of biofouling and scale. The water is also treated with DVS3A002 which is a HEDP (1 hydroxy-ethylidne-1, 1, diphosphonate) and AMPs (amino-trimethylene-phosphonate) copolymer blend that functions as a calcium scale inhibitor and a dispersant. Sodium tolyltriazole, which is a halogen-resistant azole (HRA), is added separately for copper alloy corrosion control.

On March 19, 2019 EFSEC modified CGS' NPDES permit to improve the inhibition of biological fouling of the circulating water and plant service water systems. This improvement involves changing from a batch to a continuous halogenation process, with continuous injection of the same halogenation agents (sodium hypochlorite and sodium bromide). CGS will add two additional chemicals to assist the effectiveness of the halogenation, a biodispersant (surfactant) and an antifoaming agent. To prevent the discharge of elevated halogen (i.e., chlorine and bromine derivatives) to Outfall 001, the dehalogenation agent sodium bisulfite will be continuously added to the blowdown in a controlled manner.

The current batch process for microbiocidal treatment will be retained as a backup procedure in the event of a problem with the effluent total residual halogen (TRH) analyzer or other problem with the continuous halogenation/dehalogenation system. The batch microbiocidal process involves additions of sodium hypochlorite and sodium bromide two or three times per week. Upsets in these batch treatments can result in variations in the amount of plant component material that becomes corroded or eroded into the cooling water. Also, concentrations of dissolved material can increase slightly during batch biocide treatment because blowdown is terminated for approximately 10 to 24 hours to allow the halogen residual to decay.

Another factor causing short-term increases in metal concentrations in the cooling water is the periodic dewatering and mechanical cleaning of the condenser tubes during maintenance outages. Online cooling tower cleaning to remove silt and organic matter can cause some of the material to become re-suspended such that the solids concentration in the blowdowm is slightly higher than normal. CW (and blowdown) suspended solids concentrations are also increased during dust storms because the towers act like large air scrubbers. Seasonal increase in makeup water turbidity also results in higher CW suspended solids.

Also affecting the composition of the waste stream at point of entry to the river are the streams that may be introduced into the blowdown line. One of these is processed liquid radwaste which is relatively pure, low conductivity water that is released in batches of about 15,000 gallons at rates of up to 190 gpm. These releases are necessary if the plant storage inventory is full or if the total organic content of the water is too high to be used in the plant. There have been no releases from the liquid radwaste system since September 19, 1998.

During Plant Service Water (TSW) system outages approximately 110,000 of TSW water is drained via the blowdown line. The TSW system maintenance is infrequent and occurs approximately every ten years.

Another source of water discharged to the blowdown line is the standby service water (SSW) system (discussed in more detail in the SSW section below). The primary reason for discharging service water is to reduce the concentration of sulfur or chlorides that have the potential to induce corrosion. Other reasons for discharging include the need to perform maintenance on the submerged components in the spray ponds, the need to clean out accumulations of sediments in the ponds, or to reduce suspended solids in the ponds. Infrequently, several million gallons of standby service water might be released to the blowdown line or to the CW system over a period of a couple days to multiple weeks. This water tends to be of lower cycles of concentration than the circulating cooling water.

Periodically the main condenser becomes scaled, reducing plant efficiency to the point that chemical cleaning of the main condenser becomes necessary. Blowdown to the river will be secured and a cleaning agent, Ferroquest<sup>™</sup> or equivalent, will be added to the circulating water system. Sodium tolyltriazole will be added for copper metal corrosion protection. After the treated water has circulated a sufficient time to remove most of the scale (estimated to be one or two hours), sodium hydroxide will be added for pH adjustment. At the completion of the cleaning process, if any permit condition is not met, circulating water will be pumped to a storage location using temporary pumps and piping. During this pumping process, the concentration of constituents in the circulating water will be reduced by the addition of

makeup water from the river. When the circulating water meets all conditions for discharge, blowdown to the river will be initiated. After the condenser cleaning process is completed, the stored water will be treated as necessary to meet discharge requirements. Following achievement of discharge limits, the water will be pumped back to the circulating water basin at Columbia Generating Station. Sediment from the cleaning process will be analyzed and disposed in accordance with our solid waste control plan.

#### **Stormwater and Miscellaneous Wastes**

Runoff from the power block building roofs is routed through the stormwater system to Evaporation Ponds 3 and 4 located approximately 1500 feet northeast of the plant. Stormwater collected in the bermed area around the Diesel Fuel Polishing Building is collected in a sump and periodically discharged to Evaporation Ponds 3 and 4.

Also routed to the Evaporation Ponds are several wastewater streams. The most significant non-rainfall sources are the water treatment systems. Site potable water is prepared by flocculation and filtration of river water. The mixed media filter is periodically cleaned by backwashing with approximately 12,000-33,000 gallons of potable water. This backwash water is discharged through the storm drain system. A side stream of potable water is provided with additional treatment to produce high purity plant process water. The demineralized water treatment system consists of a reverse osmosis unit and has a maximum reject stream of about 55 gpm and an average reject stream of approximately 14 gpm, when it is producing water, with a feed flow rate of 70 gpm. It also has continuous 5 gpm flow through monitoring instrumentation. Both of these streams are routed to Evaporation Ponds 1A, 1B and 2.

Other sources of water discharges to Evaporation Ponds 3 and 4 are the sump in the plant General Services Bldg (GSB) basement and floor drains in the Diesel-Generator Bldg (DGB). The GSB sump collects water from building equipment drains and area floor drains. Examples of water sources directed to the sump include HVAC units, pump and valve leakage, demineralized water storage tank overflows, and floor washings. A level switch activates the sump pump and causes the collected water to be discharge to the Evaporation Ponds. The DGB floor drains are connected directly to the stormwater pipe. Among the few sources of water in the DGB are the diesel engine cooling jackets from which approximately 3,800 gallons of water treated with a nitrite-based corrosion inhibitor are drained about once per year.

The Turbine-Generator Bldg (TGB) has three non-radioactive sumps that are directed to radwaste processing. The sumps are receiving points for equipment and floor drains in the TGB. The sumps are no longer physically connected to the storm drainage system. The Radwaste and Reactor buildings have air wash units on the fresh air intakes that operate during warm weather months and discharge to Evaporation Ponds 3 and 4.

Operation and testing of the fire protection system is another source of water discharges to the Evaporation Ponds. Periodically portions of the system are removed from service for flushing and flow-rate tests. These batches or several thousand gallons may also be routed to the

sanitary waste system or directly to the ground depending on the location and system configuration.

Other discharges to ground may include hydrotesting, maintenance, and construction wastewater discharges. Hydrotesting discharges such as system and component testing, maintenance discharges such as drainage, flushing, and wash down activities, and construction discharges such as compaction, demolition, vacuum truck digging, dust control watering, concrete curing, concrete cutting, including rinsate and etching solutions, and pressure washing activities. Additionally, discharges to ground may also include condensate discharges from heating, ventilation, and air conditioning systems, air compressors, and engines; potable water system testing and flushing, water tank overflows; other miscellaneous discharges such as well sampling purge water, eyewash and safety shower testing, and incidental releases from facilities.

Stormwater runoff from parking lots, support buildings, and other impervious surfaces around CGS are managed by multiple underground injection control (UIC) wells.

#### **Standby Service Water**

The SSW system removes reactor decay heat during normal shutdown conditions and provides a heat sink for emergency equipment during a plant transient or accident. The SSW system is a closed-loop circulating water system that draws cooling water from, and returns heated water to an onsite reservoir. This reservoir consists of an interconnected pair of concrete basins (or spray ponds) with a total capacity of 12 million gallons. Water lost to evaporation, drift, and discharges is replenished from the river or from the site potable water system. Dissolved constituents in the SSW are typically 2½ times river concentrations. Microbiological growth is currently controlled with periodic batch additions of 50% hydrogen peroxide. In the past, Busan 77 has been used to control microbiological growth and may be used in the future. The service water is also treated with sodium silicate for corrosion inhibition.

On an infrequent basis, the SSW ponds must be drained down for cleaning or for equipment maintenance. Sediments can also be vacuumed from the bottom of the ponds without draining the ponds. The sediments removed from the ponds are placed in the sediment disposal cells in accordance with EFSEC Resolution No. 299. As discussed above, the ponds can also be dewatered by direct discharge to the blowdown line (Outfall 001) or routed to the CW system.

#### Sanitary Waste

Sanitary waste from CGS, WNP-1/4, and the support facilities is piped to a treatment system that uses aeration lagoons and facultative stabilization ponds. This wastewater treatment facility is located about ½ mile southeast of CGS. Influent averages about 10,000 gallons per day with the higher flows being coincident with the biannual CGS maintenance outage. When the stabilization ponds are full, the treated wastewater is discharged to percolation beds. These discharges occur once every few years in accordance with EFSEC Resolution No. 300. In

2018 CGS submitted a Waste Discharge Permit application to EFSEC to supersede Resolution No. 300.

#### Chemical Usage

Water treatment additives used in the systems discussed above and in other water systems is summarized in the attached table.

# Columbia Generating Station Chemical Usage

System and Chemical	Frequency	/ 111/001 030	e (Ib/year)	Description of Use
	. ,	Average	Maximum	
Circulating Water/Plant	Service Water	0 -		
Sulfuric Acid (93%	Continuous	2,500,000	2,700,000	pH control
Electrolyte)				
Sodium Hypochlorite	Continuous or	940,000	1,100,000	Biocide
(10-16%)	Batch ~2-3 times/wk			
Sodium Bromide	Continuous or Batch ~2-3 times/wk	340,000	360,000	Biocide
AMPs Copolymer & Polyphosphate Blend (DVS3A002)	Continuous	230,000	250,000	Dispersant and Corrosion Control
Sodium Tolyltriazole – 50% (CWT4543)	Periodic	40,000	40,000	Corrosion Control
Ferroquest ™	Periodic	As needed <sup>1</sup>	140,000	Condenser Cleaning
Sodium Hydroxide	Periodic	As needed <sup>1</sup>	13,000	pH control following chemical
(>95%)				cleaning
Spectrus BD1500	Continuous	30,000	45,000	Biodispersant (surfactant)
Foamtrol AF1090	Continuous	13,000	25,000	Antifoaming Agent
Spectrus DT1404 (sodium bisulfite)	Continuous	92,000	150,000	Dehalogenation Agent
Standby Service Water				
Hydrogen Peroxide (50%)	Batch – seasonal	490,000	510,000	Biocide
Busan 77	Batch - Seasonal	10,000	22,000	Biocide
N Sodium Silicate	Batch	35,000	70,000	Corrosion Control
Potable Water				
Sodium Hypochlorite (10-16%)	Semi-continuous	9,400	16,000	Disinfectant
Poly Aluminum Chloride	Continuous	4000	4100	Coagulant Aid
Polymer	Continuous	6	6	Filter Aid
Demineralized Water				
Amino Acid F	Semi-continuous	76	80	Silica Analyzer Reagent
Citric Acid/Surfactant Reagent	Semi-continuous	82	85	Silica Analyzer Reagent
Molybdate 3 Reagent	Semi-continuous	91	100	Silica Analyzer Reagent
Silica Standard	Semi-continuous	76	80	Silica Analyzer Reagent
Solution				
Closed Cooling Loops				
Nalco 39M	Batch as required	1100	2800	Corrosion Inhibition – Diesel Jacket Water
Sodium Nitrite	Batch as required	As needed <sup>1</sup>	As needed	Corrosion Inhibition – HVAC Chiller & Heater Systems
Sodium Hydroxide	Batch as required	As needed <sup>1</sup>	As needed	pH Control – HVAC Chiller & Heater Systems
Standby Liquid Control				
Enriched Sodium Pentaborate	Batch as required	110	400	Reactivity Control (Backup)

<sup>&</sup>lt;sup>1</sup> Chemicals used on an "As Needed" basis do not have routine or scheduled usage determined by procedures

# ENCLOSURE B CHRONIC TOXICITY TEST RESULTS

## **BIOASSAY REPORT**

CHRONIC BIOASSAYS CONDUCTED January 30 through February 6, 2018 and February 27 through March 6, 2018

Prepared for

ENERGY NORTHWEST RICHLAND, WASHINGTON

Prepared by



ASL

1100 NE Circle Boulevard, Suite 310 Corvallis, Oregon 97330 541-207-0995

NELAC #OR100022 State of Washington Department of Ecology (WDOE), Lab ID C1233 California State Environmental Laboratory Accreditation Program, Certificate No.: 1726

> Report Date: March 20, 2018 Lab I.D. Nos. B3934-ch and B3954

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#### **INTRODUCTION**

TestAmerica ASL (TA-ASL) – Bioassay Laboratory conducted chronic bioassays using the *Pimephales promelas* (fathead minnow) and the water flea (*Ceriodaphnia dubia*), on samples provided by Energy Northwest, Richland, Washington. The tests were conducted from January 30 through February 6, 2018.

Due to high Percent Minimum Significant Differences (PMSD) values above the upper bounds listed in the protocol, the *C. dubia* chronic testing initiated on January 30 was deemed "not reliable" as per USEPA guidance. The *C. dubia* chronic test was successfully repeated using freshly collected samples from February 27 through March 6, 2018. All data is summarized below.

Note: Acute testing using the *Pimephales promelas* (fathead minnow) was also initiated during this time. As per client request, the acute results will be reported separately.

#### **OVERVIEW OF REGULATORY GUIDANCE**

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from TA-ASL's reading of the NPDES permit for Energy Northwest's Columbia Generating Station in Richland, WA (permit #WA002515-1, effective Nov 1, 2014, expires Oct 31, 2019, modified Feb 8, 2016).

#### **Chronic toxicity:**

Testing:

- "Conduct chronic toxicity testing ... once per quarter in the year prior to submission of the application for permit renewal."
- o "The CCEC equals 1% effluent."

The following is taken from the WDOE guidance (WQ-R-95-80, June 2016 revision):

"To reduce WET limit violations (and anomalous concentration-response relationships) due to statistical significance that is a Type I error [false positive], we lower alpha when differences in test organism response are small."

"Alpha will be lowered from 0.05 to 0.01 if a ... 20% difference in a chronic test is significant."

#### **SUMMARY OF TEST RESULTS**

Exhibit 1 provides a summary of the final test results.

#### EXHIBIT 1 Summary of Chronic Test Results

Species	<b>NOEC</b> (%)	LOEC (%)	IC <sub>25</sub> (%)
C. dubia (Jan 30)	33.0 <sup>a</sup>	100 <sup>a</sup>	< 1 <sup>a</sup>
<i>C. dubia</i> (Feb 27)	11.0	33.0	35.1
P. promelas (Jan 30)	100	> 100	> 100

<sup>a</sup> Indicates the upper PMSD bound was exceeded indicating unusually high and unacceptable amounts of variability in the test. USEPA guidance states that this testing should be repeated. Note: acronyms are as defined below.

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

More detailed information is provided in the Results and Discussion section.

#### **ACRONYM DEFINITIONS (from EPA guidance):**

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).

LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).

 $IC_{25} = Inhibition Concentration (25\%)$ : A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.

## **SAMPLE INFORMATION**

Exhibit 2 provides a summary of the sample conditions as received.

## EXHIBIT 2 Sample Conditions on Receipt

Sample ID			
TA-ASL SDG		B3934	
+ suffix	-01	-02	-03
Collection - Date and Time	01/29/2018 05:05	01/31/2018 05:00	02/02/2018 05:10
Receipt - Date and Time	01/30/2018 10:15	02/01/2018 10:00	02/03/2018 09:25
Temperature (°C)	0.6	0.7	0.6
Dissolved Oxygen (mg/L)	12.1	11.8	11.4
pH	8.3	8.2	8.2
Conductivity (S/cm)	1422	1390	1434
Total Residual Chlorine (mg/L)	< 0.02	0.03 <sup>a</sup>	< 0.02
Ammonia (mg/L as NH <sub>3</sub> -N)	< 0.10	< 0.10	< 0.10
Total Hardness (mg/L as CaCO <sub>3</sub> )	814	813	848
Total Alkalinity (mg/L as CaCO <sub>3</sub> )	134	138	138
<sup>a</sup> Indicates the observed total Residua thiosulfate addition. Observed readin	-		h sodium

Exhibit 3 provides a summary of the sample conditions as received for the retest.

## EXHIBIT 3 Sample Conditions on Receipt

Sample ID			
TA-ASL SDG		B3954	
+ suffix	-01	-02	-03
Collection - Date and Time	02/26/2018	02/28/2018	03/02/2018
	05:30	05:27	05:29
Receipt - Date and Time	02/27/2018	03/01/2018	03/03/2018
	11:15	10:30	09:15
Temperature (°C)	3.1	0.3	1.1
Dissolved Oxygen (mg/L)	8.2	8.9	8.0
pH	7.4	7.5	8.3
Conductivity (S/cm)	1330	1350	1392
Total Residual Chlorine (mg/L)	0.04 <sup>a</sup>	0.03 <sup>a</sup>	< 0.02
Ammonia (mg/L as NH <sub>3</sub> -N)	< 0.10	< 0.10	< 0.10
Total Hardness (mg/L as CaCO <sub>3</sub> )	738	766	752
Total Alkalinity (mg/L as CaCO <sub>3</sub> )	114	118	118
<sup>a</sup> Indicates the observed total Residua	Ũ		
sodium thiosulfate addition. Observe	ed reading may be o	due to an interferen	nt.

Water quality measurements during testing remained within test design limits as prescribed by EPA and WDOE, except as noted with the individual test results. (see the Results and Discussion section)

#### **METHODS AND MATERIALS**

#### **TEST METHODS**

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (2002), EPA-821-R-02-013.

Additional guidance was provided by:

Whole Effluent Toxicity Testing Guidance and Test Review Criteria, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

#### **DEVIATIONS FROM PROTOCOLS**

Deviations from required procedures in the test methods:

None noted.

Deviations from recommended procedures in the test methods:

EPA-821-R-02-013, Section 10.2.8 discusses test variability. Specifically, use of Percent Minimum Significant Differences (PMSD) limits is discussed.

When the test PMSD exceeds the upper bound, the variability among replicates is unusually large for the test method.

When the PMSD exceeds the upper bound and no toxicity is found at the level of regulatory concern, then the "no toxicity" result <u>should not</u> be considered reliable and the test rerun.

This is the case for the *C. dubia* chronic test initiated on January 30, 2018.

The *C. dubia* chronic retest initiated on February 27, 2018, showed PMSD values below the upper bound (not a deviation).

The pH meter calibration on Jan. 30, 2018 showed a slope value out of the recommended specification. Second source check was within tolerance. Therefore all pH measurements collected on Jan. 30, 2018 have been flagged with a "R30" QA code and while likely accurate, should be interpreted with care.

#### **TEST DESIGN**

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

Chronic tests: 1.0, 3.3, 11.0, 33.0, and 100 percent sample + dilution water for the control.

#### Test Organism Conditions:

All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002).

The test organisms appeared vigorous and in good condition prior to testing.

#### C. dubia chronic test:

Source: TA-ASL's in-house cultures

Age: Less than 24 hours old and within an 8-hour age range, with blocking by known parentage

Design: Ten test vessels per concentration, one organism per vessel

Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival and neonate production (with brood determination)
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- o Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination:

- Survival: @ after 7 days.
- Reproduction: When 60% + of surviving control organisms produce a  $3^{rd}$  brood. Endpoints: Survival (at termination) and Reproduction (through first 3 broods)

#### <u>P. promelas chronic test:</u>

Source: Aquatox Inc., Hot Springs, Arkansas

Age: Less than 48 hours old and within an 24 hour age range

Design: Four test vessels per concentration, ten organisms per vessel

Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival
- Daily: DO and pH in pre and post-renewal solutions, all concentrations
- o Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination: 7 days after test initiation.

Endpoints: Survival and Growth (average dry weight per organism added @ initiation)

## **DILUTION WATER**

The dilution water used was the standard culture water used by TA-ASL:

Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as CaCO<sub>3</sub> and an alkalinity of 60 to 70 mg/L as CaCO<sub>3</sub>.

#### SAMPLE COLLECTION AND STORAGE

Samples were collected by Energy Northwest personnel. The samples were accepted as scheduled by TA-ASL. Chain of Custody and Sample Receipt Records are provided in Appendix C.

All samples were received within the EPA recommended 0 to 6 °C range. All samples were received within the WDOE required 0 to 6 °C range. All samples were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection. All subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample. All subsequent uses of a sample occurred within the WDOE recommended maximum holding time of 72 hours past the time of sample collection. Following receipt, the samples were stored in the dark at 0 to 6 °C range.

#### SAMPLE PREPARATION

Samples used during these tests were:

Temperature adjusted prior to test initiation and each daily renewal.

Dechlorination with sodium thiosulfate was performed.

#### **DATA ANALYSIS**

The statistical analyses performed for the chronic tests were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, USEPA Office of Water, Fourth Edition (EPA 2002), EPA-821-R-02-013, using CETIS.

Additional guidance was provided by *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A. If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

#### **RESULTS AND DISCUSSION**

The raw data sheets are presented in Appendix A.

#### **CHRONIC BIOASSAYS**

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test initiated on January 30, 2018.

Su	Table 1 mmary of Chronic Res <i>C. dubia</i>	sults					
Sample Concentration (%)	Percent Survival	Mean Number of Young Per Adult					
Control	90	19.0					
1.0	80	13.2					
3.3	70	12.6					
11.0	80	13.2					
33.0	80	10.9					
100 70 2.9 <sup>a</sup>							

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

 $\begin{array}{rll} \text{NOEC} &=& 33.0 \ \% \\ \text{LOEC} &=& 100 \ \% \\ \text{IC}_{25} &<& 1.00 \ \% \end{array}$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

EPA-821-R-02-013, Section 10.2.8 discusses test variability. Specifically, use of Percent Minimum Significant Differences (PMSD) limits is discussed.

When the test PMSD exceeds the upper bound, the variability among replicates is unusually large for the test method.

When the PMSD exceeds the upper bound and no toxicity is found at the level of regulatory concern, then the "no toxicity" result <u>should not</u> be considered reliable and the test rerun.

This is the case for the C. dubia chronic test initiated on January 30, 2018.

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. However, due to the unacceptably high PMSD value, this testing should be considered "anomalous".

Su	mmary of Chronic Res <i>C. dubia</i>	ults				
Sample Concentration (%)Percent Percent 						
Control	90	30.5				
1.0	100	31.1				
3.3	100	31.4				
11.0	100	33.3				
33.0	100	24.8 <sup>a</sup>				
100	60	4.0 <sup>a</sup>				

Table 2 summarizes the survival and reproduction data for the *C. dubia* chronic retest initiated on February 27, 2018.

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

NOEC = 
$$11.0 \%$$
  
LOEC =  $33.0 \%$   
IC<sub>25</sub> =  $35.1 \%$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Sı	Table 3 Immary of Chronic Re <i>P. promelas</i>	sults
Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Organism Added (mg)
Control	100	0.784
1.0	92.5	0.702
3.3	97.5	0.738
11.0	100	0.766
33.0	95.0	0.796
100	100	0.868

Table 3 summarizes the survival and growth data for the *P. promelas* chronic test initiated on January 30, 2018.

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

 $\begin{array}{rll} NOEC &=& 100 \ \% \\ LOEC &>& 100 \ \% \\ IC_{25} &>& 100 \ \% \end{array}$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *P. promelas* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

## **REFERENCE TOXICANT TESTS**

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* chronic reftox test was conducted using sodium chloride. The *P. promelas* chronic reftox test was conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Tal Chronic Reference	ole 4 Toxicant Tests	(g/L)
Species	IC <sub>25</sub>	Cusum Chart Limits
C. dubia (survival) - January	1.67	1.08 to 2.36
C. dubia (reproduction) - January	0.58	0.26 to 1.33
C. dubia (survival) - February	1.68	1.06 to 2.37
C. dubia (reproduction) - February	0.68	0.16 to 1.33
<i>P. promelas</i> (survival)	0.62	0.56 to 0.64
P. promelas (growth)	0.57	0.44 to 0.72

Table 4 summarizes the reference toxicant test results and Cusum chart limits.

# **APPENDIX A**

# **RAW DATA SHEETS**

filtered? organism " - " = sample not dechlorinated, or analyte not collected/needed. 60 um noted) From EPA manual (EPA-821-R-02-013, 8.8.7): 0.025 ml of a 26.8 g/L stock of sodium thiosulfate will reduce 0.10 mg/L TRC in a 1L sample. na ちの  $\frac{1}{2} = \frac{1}{2} \frac{$ 122347 1-30-18 Nas 1422 300 as Rc'vd 104 Cond. (sn) -30-2018 na 2-6-201 8 2 2.8 Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page. as Rc'vd 2.2 μd na (for example: 4L of sample at 0.10 mg/L TRC needs 0.10 ml of 26.8g/L sodium thiosulfate stock to be dechlorinated) **DO NOT** add more sodium thiosulfate if "after Dechlor" TRC reading is not reduced to < 0.02 mg/L. Leave as is. 11-8 Dechlorination is REQUIRED if Total Residual Chlorine (TRC) is detected (i.e. TRC is 0.02 mg/L or greater). (mg/L) as Rc'vd 1.21 11.41 QQ na Lot Fest Termination: Date Test Initiation: Date 38 Alkalinity 138 34 mg/l as CaCO<sub>3</sub> 5 mg/L as Rc'vd 0 report that the pH meter slope # 848 Hardness N mg/l as CaCO<sub>3</sub> 5 mg/L 118 as Rc'vd  $\infty$ # (1 Conductivity 20.10 20.10 Ammonia 0.10 mg/L NH<sub>3</sub>-N as Rc'vd 01.07 mg/l 3939 10.03 Dechlorination allowed Hardness Alkalinity Comments:  $\blacksquare$  Indicates the action was taken, ( $\square$ = action not taken): / after Dechlor. Chlorine (mg/l) Total Residual 0.02 mg/L SDG# B Ηď FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA Lo.02 E9-0 20:0 N=131-18 as Rc'vd Dissolved Oxygen # i1 Temp 0.6 as Rc'vd 2.0 ç) na C 00:01 51:01 25 ( Pacific Zone) Time 213/18/5 \* Note in final range Received 18 Reporting Limits: 1 130118 (mm/dd/yy) Date Water Quality Meters Used/ID#: 2 5 20:20 8118110 Jane LaPage (509) 377-4061 (mm/dd/yy) ( Pacific 01:50 1/3/1/5/05:00 Time Zone) Energy Northwest Collected 811212 mg/l as CaCO<sub>3</sub> X 0 00 P. Date ð 9 mg/l as CaCO<sub>3</sub> t p Q 54 J 18 U767-02 4608 46A94 4612 50-282081 10-282081 Ë Hel Field ID Recon MH (FHM) 9 -03 -0 TestAmerica Dilution Water Sample ID Number 133934 Contact 1 Client

Energy NW - FHM acute + chronics (use in 2018).xlsm Doc Control ID: ASL899-0917

filtered? organism " - " = sample not dechlorinated, or analyte not collected/needed. noted) From EPA manual (EPA-821-R-02-013, 8.8.7): 0.025 ml of a 26.8 g/L stock of sodium thiosulfate will reduce 0.10 mg/L TRC in a 1L sample. 60 um na -01 sample Calc:  $(4.15 \text{ L sample}) \times (0.64 \text{ mg/L TRC}) \times 0.25 = 0.0 425 \text{ ml of } 26.8 \text{ g/L sodium thiosulfate to add (D: 25065 - 67)}$ -02 sample Calc:  $(4.28 \text{ L} \text{ sample}) \times (0.03 \text{ mg/L TRC}) \times 0.25 = 0.032 \text{ M}$  of 26.8 g/L sodium thiosulfate to add (ID:20 o6 5.07) 1350 1392 1330 Cond. (Sn) as Rc'vd na 01-1-18 ml of 26.8 g/L sodium thiosulfate to add (ID: V as Rc'vd 1.4 Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page. m is Ηd na (for example: 4L of sample at 0.10 mg/L TRC needs 0.10 ml of 26.8g/L sodium thiosulfate stock to be dechlorinated) 2-2 15 **DO NOT** add more sodium thiosulfate if "after Dechlor" TRC reading is not reduced to < 0.02 mg/L. Leave as is. ふ as Rc'vd Dechlorination is REQUIRED if Total Residual Chlorine (TRC) is detected (i.e. TRC is 0.02 mg/L or greater) (mg/L) 8,9 0 Q 00 na 65 Test Termination: Date Date Alkalinity 5 mg/L mg/l as CaCO<sub>3</sub> 114 as Rc'vd 2000 Test Initiation: 118 С # Hardness mg/l as CaCO<sub>3</sub> 252 0.10 mg/L 5 mg/L as Rc'vd 766 738 Conductivity Ammonia NH<sub>3</sub>-N 21'02 as Rc'vd 21'02 01/2/10 mg/l SDG# B 3954 0.07 Dechlorination allowed / after Dechlor. Hardness Alkalinity Comments:  $\Box$  Indicates the action was taken, ( $\Box$ = action not taken): mg/L TRC) x 0.25 = # 11 ł Chlorine (mg/l) Total Residual 0.02 mg/L 0 Hq FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA 0.03 20.00 0.04 as Rc'vd Dissolved Oxygen #U 0.3 Temp as Rc'vd 1.5 ŝ N. na L sample) x ( 51:60 ( Pacific 0:30 Zone) N HS Time Received Reporting Limits: 2/26/18/05:30 2 /27/18 (mm/dd/yy) 18 811 Date -03 sample Calc: ( S/S Water Quality Meters Used/ID#: 3/1 Jane LaPage (509) 377-4061 (mm/dd/yy) (Pacific \$2:50 81/82/21 31211805:23 Time Zone) Energy Northwest Collected mg/l as CaCO<sub>3</sub> 0 Date 9 mg/l as CaCO<sub>3</sub> 26 00 00 0 .20 1622 4624 150571-03 B3954 -02 180871-02 Field ID 9# 10-11-0081 à Recon MH (FHM) õ -03 Dilution Water Sample ID Number **G3954** Contact Client

Energy NW - Cerio acute + chronics (use in 2018).xlsm Doc Control ID: ASL899-0917

#### <u>TestAmerica</u>

## FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

Client

# **Energy Northwest**

Sample Designation (SDG): B 3434

			N	
	Cd#3394	FHM # 1965	FHM # 1965	
Test Species Information	Ceriodaphnia dubia	Pimephales promelas	Pimephales promelas	
	Chronic	Chronic	Acute	
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window	Days, within a 24 hour window	
Test Container Size	30 ml	800 ml	400 ml	
Test Volume	15 ml	500 ml	250 ml	
Feeding: Type and	0.10 ml Algae and	0.15 ml Artemia,	0.15 ml Artemia,	
Amount	0.10 ml YCT daily	2 x Daily	@ 48 hrs	
Aeration:	None None	X None	X None	
	Prior to use	Prior to use	Prior to use	
In Test Chambers via Slow Bubble :		[] @hrs	🛛 @hrs	
Acclimation Period	<24 hrs	<24 hrs	<24 hrs	
Organism Source	In-House	Algator	Aquator	
Size	-	-	-	
Loading Rate	-	-	-	

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): 
All

Date:

Comments:

	FRESHW	ATER TOXICITY 1	EST:	TEST (	RGANIS	'M INFOI	RMATION	<i>,</i>	
Client	E	nergy Northwest			_		Designation (		3954
Test Spe	cies Information	Cd # 22112 Ceriodaphnid dubia Chronic							
Organism	Age at Initiation	<24 hrs, all within an 8 hr window							
Test C	Container Size	30 ml							
Те	st Volume	15 ml							
Feeding:	Type and Amount	0.10 ml Algae and 0.10 ml YCT daily							
Aeration: In Test Chamb	ers via Slow Bubble :	<ul><li>None</li><li>Prior to use</li></ul>	_						
Acclin	nation Period	<24 hrs							
Organ	nism Source	In-House							
	Size	-							
Loa	ding Rate	-							

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): All Date:

Comments:

1

**Test Solution Preparation and Dilution Record** 

Client: Energy Northwest

Note: 🗆 Indicates task not done, 🗹 Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp Ditto marks ( ' ' ) indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used.

	Ceriodanhuia duhia - Chronic	1 duhia - t	Chroni	c							men en a fam a fam and a fam	משאג לחזות ה	noen.
		and have a		2									
	Test	Sample		Final	Test	Sample ID	Daily Samula Drannerican	D31-47- 201 -					
	Concentration	Volume		Volume	Day	IJsed	(prior to dilution)	Ullution Water	YCTID	Algae ID	Date	Time	Initia
	(%)	(mls)		(mls)	0 (Initiation)	B39	Tenn adi 🗌 Acortad	Used	Used	Used	-		
	Control	0.00	1	200		B - 5/	Temn adi 🗖 Ametad	0091 #m	# 120	#112.7	اسر	<u>년</u> 것	A
	1.0	2.00	î	200	5	B . M	There are and the Actaled	D# 4600	#1152	#1152	15118	08-25	29
	3.3	6.60	↑	200	rn	B	The Truth and, Characted		9HI #	# 115 2		SH O	Z
	11.0	22.0	↑	200	4	B B	Trans all a Acrated	DIAH #m	29 1 1 1 1	#1152	<b>.</b> .	01:15	A
	33.0	66.0	<b>↑</b>	200	S.	B	Theme of: D Actaled	1.192 #M	#c/2 3	# 1152	SU1 812	00:00	0
	100	200	↑	200	9	B B	Tramp ad; D Anated	10# 2012	#05		"/5/2	0335	R
Τ	Total Sample volume needed per day =	e needed per	day =	297 mls	2	B - B	□ Temp adj, □ Aerated	10# J///	90. #	# //2/2	2/2/20	No ilo	11
	Fathead minnow - Chronic	ow - Chro	nic						=	#			
	Test	Sample		Final	Test	Sample ID	Daily Samule Prenamion	Dilation West	6				
	Concentration	Volume		Volume	Day	Used	(prior to dilution)	Ulution water Used	Date	Time	Initials		

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Initials

AND

	Timo.	OTHIT	20	52: 80	2H 01	5012	10:00	2	0H 90	
	Date		1 80/2018 10	1 21 12	31177	V. 7. 77.	UNSTI .	24	2/5/16	
	Dilution Water	Used	10 × 100 ×	10#4608		1		E = 202	10 # m	
	Daily Sample Preparation	(prior to dilution)	Trunp adj, L' Aerated	Tamp ad, T Astated	Town od: D America	There are a contracted to the second se	Tramp au), C Acrated	Temp ad; T Amerated	Letup auj, L. Acrated	
	Sample ID	Used D2G72L	B 10-101-01	B		8	R R			
	Test	Day 0 (Initiation)		5	en	4	ŝ	9		
	Final	Volume (mls)	2000	2000	2000	2000	2000	2000	2966 mls	
onic			↑	Î	î	î	1	↑	- day =	
ow - Chi	Sample	voume (mls)	0.00	20.0	66.0	220	660	2,000	e needed per	- V
Fathcad minnow - Chronic	Test		Control	1.0	3.3	11.0	33.0	100	Total Sample volume needed per day =	Fotheod mission
10									Tot	

Dili	1# CII	# D
Daily Sample Preparation (prior to dilution)	□ Temp adj, □ Aerated	🗖 Temp adj, 🔲 Aerated
Sample ID Used	tion) B3434-01	B _01
	tion)	

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nonna - Gan dia		
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1		

Date Time Initials 1000 1802018 10:45 DM 4609 241,268 08:202 lution Water

Total Sample volume needed per day = 1923 mls

Test Solution Preparation and Dilution Record

Client: Energy Northwest

Note: 🗆 Indicates task not done, 🗹 Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp Ditto marks ('') indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used.

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	Daily Sample Preparati (prior to dilution)	L Temp adj, D Aerated	└└ Temp adj, □ Aerated	□ Temp adj, □ Aerated	L Temp adj, C Aerated	L Temp adj, 🗌 Aerated	□ Temp adj, □ Aerated	□ Temp adj, □ Aerated □ Temp adj, □ Aerated
	Test Sample ID Day Used	1 D - L CLC T Innonnin		10.	70- a			7 B V - US
lic	Final Volume (mls) 0	Г	200	200	200	200	200	297 mls
Ceriodaphnia dubia - Chronic	Sample Volume (mls)	0:00	2.00 →	6.60 →	22.0 →	€66.0 →	200 →	needed per day =
Leriodaphnia	Test Concentration (%)	Control	1.0	3.3	11.0	33.0	100	Total Sample volume needed per day =

Initials	MARIA MAR
Time	11 55 01 25 01 25 00 100 00 100 00 100 00 100
Date	22-12016 21/1/18 21/1/18 31/1/18 31/1/18
Algae ID Used	# 1155 # 1155 # 1155 # 1155 # 1155 # 1155 # 1155
YCT ID Used	#1151 #1157 #1153 #1153 #1153 #1153 #1153 #
Dilution Water	D# 4620 D# 4620 D# 4624 D# 4624 D# 4624 D# 4624 D# 4624 D# 4624
nation n)	ted ted ted ted ted ed



THE LEADER IN ENVIRONMENTAL TESTING

# *Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client		H	Energy N	orthwes	t		Test St	art Date	1-1	30-20	SIG	
Sample Descrip	otion						Initial S	Sample ID		3934		
Data summarize	ed by		DW							010		
Percent or Concentration	A	В	Total Li	ve Young	Produced	l in First 3			te		# Alive	Total Live
Control	14 AD?	24 AD?	23	28	е 29	F	G 5	н 27	125	15	Adults	Young
1.0 %		AD? 15 AD?	AD?	AD? 26	AD?	AD? V 24	AD?	AD?	AD?	ad?	8	132
3.3 %	10 AD?	14 AD?	29 AD?	25 AD?	AD?	AD?	AD?	AD? V 25	AD? V	AD?	7	126
11.0 %	13 AD?	15 AD?	29 AD?	23 AD?	AD?	AD?	AD?	AD? 25	AD?	AD? V	8	132
33.0 %	AD?	12 AD?	AD?	25 AD?	33 AD?	3	AD? V	9	O	AD?	8	109
100 %	3 AD?	3 AD?	5 AD?	11	2	O	0	4	0	AD?	7	29
								nu;	AD? 1	AD?		· ·

Survival data summarized through Day 7. 60%+ of surviving controls with 3+ broods first observed on Day \_\_\_\_\_.

Test Organism Mortality (Adult dead) = AD?

Test Organism identified as Male =

AD? M

# of Alive Adults = Number of test organism alive at termination
 (for WDOE only, = Number of test organisms alive at Day 7)

Test Organism Injured during test =

	***
AD2	T T
nu:	1

 $\checkmark$ 

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of <u>eight</u> days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

			CERIO	DAPHN	IA CHR	ONIC SU	RVIVA	L AND	REPRO	DUCTIC				
	otained fi		B	C	D	E	F	G	H					1
Cultur	re Board Slo		7 BSH	( BSH	( BSK	( BSI	K D	D	D	T	D		r Used: <u>#</u> Template	2
<u></u>	310			6	H	T	7	32	11	56		Used:	6 conc #	1
Client				Energy N	lorthwest				Те	est Initiation: D	ate: 130	2018 Ti	me: [] . [	5
Sample I	Descripti	on			Ini	itial Sample ID	# B393	10-4	1	Fermination: D	ate: 216	120 18 Ti	me: 08.	20
Time	an Day Day	O DW D	ay 1 DN 1	Day 2 /20 1	Day 3	Day 4 8~	Day 5 3m	Day 6 M	3 Day 7	Day 8	E			
	Day	o III DD		Day 2 1 Leo I	Day 3 Lers	Day 4 1195	Day 5 1115	_ Day 6 12	Day 7 Of	8-30Day 8		cd	3394	-
Percen	it Da	A A	В	С	Daily N D	Number of Live						No. Live		
	1	-	C		O	E	F O	G	Н	I	J	Adults	Live You	
1	2		Ũ	0	0	0	0	0	- O	0	0	10		_
Ģ	3		0	ð	Ø	0	OAD	0	0	0	0	9	0	-
Control	4	-	4	4	4	6		2	4	3	4	9	35	-
0	6	10	10	13	19	11		0	10	3	11	9		
1	7	15	0	0	19	12		3	13	14	0	9	66	
	8		0		0			100	0	O O	(17)	9	0	144
	1	0	O	0	0	0	0	0	0	0	0	LE		_
	2	0	0	0	0	0	0	0	0	0	0	10	0	-
~	3	0	0	0	8	8	0	0	0	0	0	10	0	-
1.0 %	5		4	6	5	5	6	0	UNP	ONO	0	8	28	-
	6	8	<u> </u>	12	10	R	8	2		1	D	8	52	
	7	0	(14)	0	0	0	0	0			2	8	52	
	8		2				0	10			0	8	0	14
	1	0	0	0	0	0	0	0	0	D	Ø	10	0	-
	2	10	0	0	0	0	0	0	0	0		10	0	-
~	3	4	0	0	3	0	OAD	OAD	0	0	3	8	0	-
3.3 %	5	6		4	5	3	1		4	Ч	0	8	29	
	6	Ő	0	10	12	12			10	4	0	8	59	
	7	Q4D	(15)	0	0	(15)			-11	0	OAD	1	38	
	8					w	V		0	(15)		-7	0	59
	1	0	0	0	0	0	0	D	0	0	Ó	01	0	
	2	0	0	0	0	0	0	0	0	0	0	10	0	4
%	3	0	P	4	0	0	0	OAD	0	CAD)	0	8	0	
11.0 %	5	3	G	11	8	6	3		3		0	8	35	
_	6	()		14	15	12	0		12		0	8	52	
	7	16	(15)	0	0	(FD)	a		8		3	8	45	
	8					-	60	V	0		8	8	0	64
	1	0	0	0	0	0	0	0	0	0	0	10	0	4 1
	2	0	0	0	0	0	6	0	6	0	0	10	0	1
%	4	04	5	04	0	0	0	0+0	0	OM	0	8	0	1
33.0 %	5	6	7	4	4	6	2	040	27	OAD	0	8	27	1
	6	-	Q	d	12	17	7				0	3 0	43	
	7	Ó	(15)	(12)	0	0	Ó		(a)		20	8	39	
	8	71						V	U	V		0	0	36
	1	0	0	0	0	0	0	0	0	0	0	10	0	
	3	0	0	0	0	0	0	0	0	0	0	10	0	
100 %	4	3	3	2	2	0	0	OAD	0	0	0	9	0	
100	5	Ö	0	3	3	0	040		3	O HO	0	7	15	
	6	2	Q	OAY	6	DAY			OAY		0	7	7	
-	7 8	$(\bigcirc)$	(2)	(3)	Ô	(H)			ONT		0	7	7	15
				= male organism			(						~	15

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, "/" = split brood ( carry-over brood / current day brood ), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood Footnote: As per WDOE, C. dubia test reproduction should be when 60% of the surviving control organisms have produced their third brood (Days 6, 7, or 8). Survival is at seven days.

Energy NW - FHM acute + chronics (use in 2018).xlsmDoc Control ID: ASL899-0917

Adults Isolated Date $1 \frac{29}{2018}$ Time $23 : 00$ Neo's Collected Date $1 \frac{20}{302018}$ Time $25 : 00$ Day 6 $MG$ Day 7 $\overline{NA}$ Day 6 $\overline{L}$ $\overline{OD}$ $\overline{OB}$ Day 6 $\overline{L}$ $\overline{OD}$ $\overline{DB}$ Day 6 $\overline{L}$ $\overline{OD}$ $\overline{DB}$ Day 6 $\overline{L}$ $\overline{DB}$ $\overline{DB}$ Day 7 $\overline{DB}$ $\overline{DB}$ $\overline{B}$ Day 8 $\overline{M}$ $\overline{DB}$ Day 9 $\overline{DB}$ $\overline{DB}$ <t< th=""><th><math display="block">\begin{array}{c c c c c c c c c c c c c c c c c c c </math></th><th>= Temp out of recom. range</th></t<>	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	= Temp out of recom. range
CERIODAPHINIA WA7InitiatedDate $1/3$ C/Initial Sample ID # $B/3$ C $Day 4$ Day 3 $1 \cdot : \cdot x$ Day 4Day 3 $1 \cdot : \cdot x$ Day 4Day 3 $25 / Day 4$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	crator represents pre-renewal conditions, denominator represents post-r
BestArmerica       Client     Energy Northwest       Client     Energy Northwest       Sample Description     Energy Northwest       Tech:     Day 0     Day 1       Time     Day 0     II       Therm.     Day 0     II       %     Dissolved Oxygen (mg/l)	0         1         2         3         4         5         6         7           R         8         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7         9         7	Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

Energy NW - FHM acute + chronics (use in 2018). AlsmDoo Control ID: ASL 893-0917

Sample Date:         29 Jan-18 05:05 Receive Date:         Material:         Unknown         Project:           Receive Date:         30 Jan-18 10:15 Sample Age:         30 Jan-18 10:15 Source:         Energy Northwest (WA 0025151)         Project:           Comparison Summary         Analysis ID         Endpoint         NOEL         LOEL         TOEL         PMSD         TU         Method           06-0351-0275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate         Summary         Level         %         95% LCL         95% UCL         TU         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Feet Acceptability         Attribute         Test Stat         TAC Limits         Overlap         Decision           Notayisis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           Notayisi ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Passes Acceptability Criteria           Nalysis ID         Endpoint         Control Resp	CETIS Su	mmary Rep	ort						Report Date Test Code:			0:47 (p 1 of 2 16-5062-2460
Start Date:         30 Jan-18 11:15         Protocol:         EPA/02/R-02-013 (2002)         Diluent:         Mod-Hard Synthetic Water           Ending Date:         06 Feb-18 08:30         Species:         Ceriodaphnia dubia         Brine:         Brine:         Material:         Mod-Hard Synthetic Water           Sample Date:         29 Jan-18 00:05         Material:         Unknown         Project:         Project:         Project:         Sample Age:         00 (0.6°C)         Station:           Comparison Summary         Material:         Unknown         Project:         Project:         Project:         Sample Age:         00 (0.6°C)         Station:           Comparison Summary         NOEL         LOEL         TOEL         PMSD         TU         Method           08-3161-1845         7d Survival Rate         100         >100         N/A         NA         1         Pisher Exact/Bonferroni-Holm Test           06/0351-0275         Reproduction         33         100         57.45         3.03         Dumet Multiple Comparison Test           Point Estimate Summary         Lovel         %         95% UCL         95% UCL         10         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13 <td< th=""><th>Ceriodaphnia</th><th>a 7-d Survival a</th><th>nd Rep</th><th>roduction T</th><th>est</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>	Ceriodaphnia	a 7-d Survival a	nd Rep	roduction T	est							
Ending Date:         0.06 Feb-18 08:30         Species:         Certodphnia dubia         Dirustion:         Mode-Hard Synthetic Water           Sample Date:         06 2.1h         Source:         In-House Culture         Age:         <24h           Sample Date:         20 Jan-18 08:50         Material:         Unknown         Project:           Bample Date:         20 Jan-18 10:15         Source:         Energy Northwest (WA 0025151)         Project:           Sample Date:         30 h(0.°C)         Station:         Code:         50.00         Synthetic Water           Composition Summary         Analysis ID         Endpoint         NOEL         LOEL         TOL         PMSD         TU         Method           05:0351:0275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate Summary         Level         %         95% LCL         95% UCL         TU         Method           10:4982:24204         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Fest Acceptability         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria	Batch ID:	08-5023-3729	)	Test Type:	Reproduction	-Survival (70	) (t		Analyst:			
Ending Date:         06 Feb-18 08:30         Species:         Cardodphnia dubla         Brine:           Duration:         6d 21h         Source:         In-House Culture         Age:         <24h	Start Date:	30 Jan-18 11:	15	Protocol:	EPA/821/R-0	2-013 (2002	)		Diluent:	Mod-Hard Sy	nthetic Wate	er
Sample ID:         15-0881-8956         Code:         B3934-01         Client: Project:           Sample Date:         29 Jan-18 06:05         Materiat:         Unknown         Project:           Sample Date:         30 Jan-18 10:15         Source:         Energy Northwest (WA 0025151)         Project:           Sample Age:         30h (o * C)         Station:         Comparison Summary         Image:	Ending Date:	06 Feb-18 08:	30	Species:	Ceriodaphnia	dubia				,		
Sample Date:         29 Jan.18 05:05         Material:         Unknown         Project:           Receive Date:         30 Jan.18 10:15         Source:         Energy Northwest (WA 0025151)         Project:           Sample Age:         30h (0.8 °C)         Station:         Energy Northwest (WA 0025151)         Project:           Comparison Summary         Analysis ID         Endpoint         NOEL         LOEL         TOEL         PMSD         TU         Method           08-3151-1845         7d Survival Rate         100         >100         N/A         N/A         1         Fisher Exact/BonferronI-Holm Test           05-0351-0275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate Summary         Level         %         95% LCL         95% UCL         TU         Method           71-4992-204/L Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Fest Acceptability         Attribute         Test Stat         TAC Limits         Overlap         Decision           70-4992-2040         Control Resp         9.9         0.8 - NL         Yes         Passes Acceptability Criteria <t< td=""><td>Duration:</td><td>6d 21h</td><td></td><td>Source:</td><td>In-House Cult</td><td>ture</td><td></td><td></td><td>Age:</td><td>&lt;24h</td><td></td><td></td></t<>	Duration:	6d 21h		Source:	In-House Cult	ture			Age:	<24h		
Project:           Source:         Energy Northwest (WA 0025151)           Source:         TOEL         PMSD         TU         Method           Comparison Summary           Analysis ID         Endpoint         LOEL         TOEL         PMSD         TU         Method           Source:         Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan= 6"Colspan="6">Colspan= 6"Colspan="6">Colspan= 6"Colspan="6">Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"Colspan="6">Colspan= 6"Colspan= 6"	Sample ID:	15-0881-8956		Code:	B3934-01				Client:			
Source: Energy Northwest (WA 0025151)           Sample Age: 30h (0.6 °C)         Source: Station:           Comparison Summary           Analysis ID         Endpoint         NOEL         TOEL         PMSD         TU         Method           05-0351-0275         Reproduction         33         100         >100         N/A	Sample Date:	: 29 Jan-18 05:	05	Material:	Unknown				Project:			
Sample Age:         30h (0.8 °C)         Station:           Comparison Summary           Analysis ID         Endpoint         NOEL         LOEL         TOEL         PMSD         TU         Method           08-3151-1845         7d Survival Rate         100         >7100         N/A         N/A         1         Fisher Exact/Bonferroni-Holm Test           06-3151-1845         7d Survival Rate         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate Summary           Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           Orter Summary           Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           NOTEL         Level         %         95% LCL         95% UCL         97%         Passes Acceptability Criteria           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           93-3151-1845         7d Survival Rate         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria	<b>Receive Date</b>	: 30 Jan-18 10:	15	Source:	Energy North	west (WA 00	25151)					
Analysis ID         Endpoint         NOEL         LOEL         TOEL         PMSD         TU         Method           08-3151-1845         7d Survival Rate         100         >100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           06-03510-275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate         Summary         ∠Level         %         95% LCL         95% UCL         TU         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Fast Acceptability         Attribut         Test Stat         TAC Limits         Overlap         Decision           11-4992-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         10         0.9         0.7819         0         1         0.1333         0.4216         52.7%         11.11%	Sample Age:	30h (0.6 °C)		Station:								
D8-3151-1845         7d Survival Rate         100         N/A         1/A         1         Fisher Exact/Bonferroni-Holm Test           05-0351-0275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate Summary           Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           On 492-2404 Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (iCPIN)           Test Acceptability           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           Stati TAS Limits         Overlap         Decision           Division Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           PMSD         0.5438	Comparison	Summary								-		
Obs-0351-0275         Reproduction         33         100         107         1         Institute         Print         Exact/Point         Test           Point Estimate Summary         Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Fest Acceptability         Analysis ID         Endpoint         Attribute         Test Stat         TAC         Limits         Overlap         Decision           08-3151-1845         7d Survival Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           15-0351-0275         Reproduction         Control Resp         19         0.5 - NL         Yes         Passes Acceptability Criteria           15-0351-0275         Reproduction         Control Resp         19         0.1         0.1         0.3162         35.1%           164         Univowal Rate         Summary         Summary         Std Err	Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τu	Metho	d		
05-0351-0275         Reproduction         33         100         57.45         54.4%         3.03         Dunnett Multiple Comparison Test           Point Estimate Summary         Lavel         %         95% LCL         95% UCL         TU         Method           Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decison           93-3151-1845         7d Survival Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         0.9         0.7618         0.13 - 0.47         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Mass         0.6426         0.9574         0         1         0.3162         35.14%         0.0%           100         0.	08-3151-1845		ite	100	>100	N/A	N/A	1	Fisher	Exact/Bonfer	roni-Holm T	est
Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Test Acceptability         Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           D8-3151-1845         7d Survival Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           D6-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         0.5438         0.13 - 0.47         Yes         Above Acceptability Criteria           Dilution Water         10         0.9         0.7819         1         0         1         0.133         0.4216 <td>05-0351-0275</td> <td>Reproduction</td> <td></td> <td>33</td> <td>100</td> <td>57.45</td> <td>54.4%</td> <td>3.03</td> <td></td> <td></td> <td></td> <td></td>	05-0351-0275	Reproduction		33	100	57.45	54.4%	3.03				
Analysis ID         Endpoint         Level         %         95% LCL         95% UCL         TU         Method           01-4992-2404         Reproduction         IC25         0.7641         0.402         44.13         130.9         Linear Interpolation (ICPIN)           Test Acceptability           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           08-3151-1845         7d Survival Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           01-4992-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Above Acceptability Criteria           05-0351-0275         Reproduction         0.48a         0.133         0.4216         52.7%         11.11%           05-0351-0275         Reproduction         10         0.9         0.7819         1         0.1         0.1333         0.4216         <	Point Estimat	e Summary			21.D	a lalis						
Test Acceptability         Attribute         Test Stat         TAC Limits         Overlap         Decision           Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           Bo-3151-1845         7d Survival Rate         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           95-0351-0275         Reproduction         Control Resp         19         0.13 - 0.47         Yes         Above Acceptability Criteria           95-0351-0275         Reproduction         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           95000-%         Control Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std D	Analysis ID	Endpoint		Level			95% UCL	τυ	Metho	1		
Analysis ID         Endpoint         Attribute         Test Stat         TAC Limits         Overlap         Decision           D8-3151-1845         7d Survival Rate         Control Resp         0.9         0.8 - NL         Yes         Passes Acceptability Criteria           D1-4992-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           D5-0351-0275         Reproduction         Different         Mass         0.42         0.43         0.42         0.40         0.41         0.3162         35.14%         0.0%           D5-0351-0275         Reproduction         Mean         95% LCL         95% UCL         Min         Mass         Std Err         Std Dev         CV%         %Effect           Conc-%         Control Type         Count         Mean         0.6	01-4992-2404	Reproduction		IC25	0.7641	0.402	44.13	130.9	Linear	nterpolation (	(ICPIN)	
Data         District and Section         Description         Description         Description           28-3151-1845         7d Survival Rate Reproduction         Control Resp         0.8 - NL         Yes         Passes Acceptability Criteria           01-4992-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           05-0351-0275         Reproduction         0.9         0.7819         1         0         1         0.1333         0.4216         52.7%         11.11%           0.3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216	Test Acceptab	oility			1							-
11-4992-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           7d Survival Rate         Survival         Control Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           200         Dilution Water         10         0.9         0.7819         1         0         1         0.1333         0.4216         52.7%         11.11%           1.3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%         0.22.22%	Analysis ID			Attribu	ite	Test Stat	TAC Lim	its	Overla	Decision	1	
17-492-2404         Reproduction         Control Resp         19         15 - NL         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           05-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Above Acceptability Criteria           05-0351-0275         Reproduction         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           06         Ontrol Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           0.1         0.1333         0.4216         52.7%         11.11%         0.333         0.4216         52.7%         11.11%           3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           00         10         0.7         <			te	Contro	Resp	0.9	0.8 - NL		Yes	Passes /	Acceptability	Criteria
D5-0351-0275         Reproduction         PMSD         0.5438         0.13 - 0.47         Yes         Passes Acceptability Criteria           20nc-%         Control Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           0         Dilution Water         10         0.9         0.7819         1         0         1         0.1333         0.4216         52.7%         11.11%           3.3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           3.3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           3.3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           3.00         10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           3.00         10         0.7         0.5196         0.8804         0         1         0.1528 <td></td> <td></td> <td></td> <td></td> <td></td> <td>19</td> <td>15 - NL</td> <td></td> <td>Yes</td> <td></td> <td></td> <td></td>						19	15 - NL		Yes			
Interview         Number of the production         Number of the producti		•			Resp				Yes	Passes A	Acceptability	Criteria
Conc-%         Control Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           Dilution Water         10         0.9         0.7819         1         0         1         0.1         0.3162         35.14%         0.0%           10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           .3         10         0.7         0.5196         0.8804         0         1         0.1528         0.483         69.01%         22.22%           1         10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           3         10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           00         10         0.7         0.5196         0.8804         0         1         0.1528         0.483         69.01%         22.22%           conc-%         Control Type         Count         Mean         95% LCL         95% UCL         Min <thm< td=""><td>05-0351-0275</td><td>Reproduction</td><td>_</td><td>PMSD</td><td></td><td>0.5438</td><td>0.13 - 0.4</td><td>7</td><td>Yes</td><td>Above A</td><td>cceptability</td><td>Criteria</td></thm<>	05-0351-0275	Reproduction	_	PMSD		0.5438	0.13 - 0.4	7	Yes	Above A	cceptability	Criteria
Dilution Water         10         0.9         0.7819         1         0         1         0.1         0.3162         35.14%         0.0%           10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           1.3         10         0.7         0.5196         0.8804         0         1         0.1528         0.483         69.01%         22.22%           1         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           3         10         0.7         0.5196         0.8804         0         1         0.1333         0.4216         52.7%         11.11%           3         10         0.8         0.6426         0.9574         0         1         0.1333         0.4216         52.7%         11.11%           00         10         0.7         0.5196         0.8804         0         1         0.1528         0.483         69.01%         22.22%           teproduction         Std Err         Std Dev         CV%         KEffect           Dilution Water         10         19 <t< td=""><td></td><td>ate Summary</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		ate Summary										
10       0.8       0.6426       0.9574       0       1       0.11       0.3162       35.14%       0.0%         1.3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         1.3       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         1       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         30       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         00       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         teproduction       Wmmary       Mean       95% LCL       95% UCL       Min       Max       Std Err       Std Dev       CV%       %Effect         Dilution Water       10       19       15.22       22.78									Std Err	Std Dev	CV%	%Effect
1.3       10       0.7       0.5196       0.8804       0       1       0.1333       0.4216       52.7%       11.11%         1.3       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         1       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         3       10       0.7       0.5196       0.8804       0       1       0.1333       0.4216       52.7%       11.11%         00       0.7       0.5196       0.8804       0       1       0.1333       0.4216       52.7%       11.11%         00       0.7       0.5196       0.8804       0       1       0.1333       0.4216       52.7%       11.11%         00       0.7       0.5196       0.8804       0       1       0.1528       0.48	-	Dilution Water					0	1	0.1	0.3162	35.14%	0.0%
1       10       0.8       0.6426       0.9574       0       1       0.1326       0.483       69.01%       22.22%         3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         30       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         00       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         teproduction Summary         tonc-%       Control Type       Count       Mean       95% LCL       95% UCL       Min       Max       Std Err       Std Dev       CV%       %Effect         Dilution Water       10       19       15.22       22.78       0       29       3.197       10.11       53.21%       0.0%         .3       10       13.2       8.783       17.62       0       29       3.741       11.83       89.62%       30.53%         .3       10       12.6       8.494       16.71       0       29       3.478       11       87.28%       33.68% <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> <td>0.1333</td> <td>0.4216</td> <td>52.7%</td> <td>11.11%</td>	1						0	1	0.1333	0.4216	52.7%	11.11%
3       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         00       10       0.8       0.6426       0.9574       0       1       0.1333       0.4216       52.7%       11.11%         00       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         teproduction Summary         Control Type       Count       Mean       95% LCL       95% UCL       Min       Max       Std Err       Std Dev       CV%       %Effect         Dilution Water       10       19       15.22       22.78       0       29       3.197       10.11       53.21%       0.0%         .3       10       13.2       8.783       17.62       0       29       3.741       11.83       89.62%       30.53%         .3       10       12.6       8.494       16.71       0       29       3.478       11       87.28%       33.68%         1       10       13.2       9.233       17.17       0       29       3.359       10.62       80.48%       30.53%         3 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> <td>0.1528</td> <td>0.483</td> <td>69.01%</td> <td>22.22%</td>							0	1	0.1528	0.483	69.01%	22.22%
00       10       0.0       0.0120       0.0120       0.0120       0.01333       0.4216       52.7%       11.11%         00       10       0.7       0.5196       0.8804       0       1       0.1528       0.483       69.01%       22.22%         teproduction Summary         conc-%       Control Type       Count       Mean       95% LCL       95% UCL       Min       Max       Std Err       Std Dev       CV%       %Effect         Dilution Water       10       19       15.22       22.78       0       29       3.197       10.11       53.21%       0.0%         .3       10       13.2       8.783       17.62       0       29       3.741       11.83       89.62%       30.53%         .3       10       12.6       8.494       16.71       0       29       3.478       11       87.28%       33.68%         1       10       13.2       9.233       17.17       0       29       3.359       10.62       80.48%       30.53%         3       10       10.9       6.74       15.06       0       33       3.523       11.14       102.2%       42.63%         00							0	1	0.1333	0.4216	52.7%	11.11%
Control Type         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           Dilution Water         10         19         15.22         22.78         0         29         3.197         10.11         53.21%         0.0%           10         13.2         8.783         17.62         0         29         3.741         11.83         89.62%         30.53%           3.3         10         12.6         8.494         16.71         0         29         3.478         11         87.28%         33.68%           1         10         13.2         9.233         17.17         0         29         3.359         10.62         80.48%         30.53%           3         10         10.9         6.74         15.06         0         33         3.523         11.14         102.2%         42.63%					0.6426	0.9574	0	1	0.1333	0.4216	52.7%	11.11%
Conc-%         Count         Mean         95% LCL         95% UCL         Min         Max         Std Err         Std Dev         CV%         %Effect           Dilution Water         10         19         15.22         22.78         0         29         3.197         10.11         53.21%         0.0%           3         10         13.2         8.783         17.62         0         29         3.741         11.83         89.62%         30.53%           3         10         12.6         8.494         16.71         0         29         3.478         11         87.28%         33.68%           1         10         13.2         9.233         17.17         0         29         3.359         10.62         80.48%         30.53%           3         10         10.9         6.74         15.06         0         33         3.523         11.14         102.2%         42.63%			10	0.7	0.5196	0.8804	0	1	0.1528	0.483	69.01%	22.22%
Dilution Water         10         19         15.22         22.78         0         29         3.197         10.11         53.21%         0.0%           10         13.2         8.783         17.62         0         29         3.741         11.83         89.62%         30.53%           .3         10         12.6         8.494         16.71         0         29         3.478         11         87.28%         33.68%           1         10         13.2         9.233         17.17         0         29         3.359         10.62         80.48%         30.53%           3         10         10.9         6.74         15.06         0         33         3.523         11.14         102.2%         42.63%		-										
$\begin{array}{cccccccccccccccccccccccccccccccccccc$										Std Dev	CV%	%Effect
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		ulution water								10.11	53.21%	0.0%
1         10         13.2         9.233         17.17         0         29         3.359         10.62         80.48%         30.53%           3         10         10.9         6.74         15.06         0         33         3.523         11.14         102.2%         42.63%	0								3.741	11.83	89.62%	30.53%
3         10         10.9         6.74         15.06         0         33         3.523         11.14         102.2%         42.63%           10         10         2.0         1.45         1.45         1.14         102.2%         42.63%							0	29	3.478	11	87.28%	33.68%
10 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10	1						0		3.359	10.62	80.48%	30.53%
JU 10 2.9 1.65 4.15 0 11 1.059 3.348 115.5% 84.74%							0	33	3.523	11.14	102.2%	42.63%
	00		10	2.9	1.65	4.15	0	11	1.059	3.348	115.5%	84.74%

CETIS	Summary	Report
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Report Date:	09 Feb-18
Test Code:	B393401cdc

# Ceriodaphnia 7-d Survival and Reproduction Test

TestAmerica - ASL

#### 7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	0	1	1	1	1
1		1	1	1	1	1	1	1	0	0	1
3.3		1	1	1	1	1	0	0	1	1	0
11		1	1	1	1	1	1	0	1	0	1
33		1	1	1	1	1	1	0	1	õ	1
100		1	1	1	1	1	0	0	1	0	1

#### **Reproduction Detail**

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	14	24	23	28	29	0	5	27	25	15
1		10	15	29	26	24	24	2	0	0	2
3.3		10	14	29	25	15	0	0	25	8	2
11		13	15	29	23	18	6	0	25	0	2
33		17	12	8	25	33	3	n	9	0	3
100		3	3	5	11	2		0		0	4
100		5	3	5	11	2	0	0	4	0	

 Report Date:
 09 Feb-18 10:47 (p 1 of 1)

 Test Code:
 B393401cdc | 16-5062-2460

								Test Coo	de: B	393401cdc	16-5062-2
Ceriodaphnia	7-d Survival a	and Rep	roduction To	est						Test	America - /
Analysis ID: Analyzed:	08-3151-184 09 Feb-18 10		Endpoint: Analysis:	7d Survival   STP 2x2 Co		Tables		ETIS Versi Official Res	ion: CETI ults: Yes	Sv1.8.1	
Batch ID:	08-5023-3729	9	Test Type:	Reproductio	n-Survival (	(7d)	A	nalyst:			
Start Date:	30 Jan-18 11	:15	Protocol:	EPA/821/R-0	02-013 (200	02)		-	Mod-Hard S	vnthetic Wa	ter
Ending Date:		:30	Species:	Ceriodaphnia	a dubia		B	rine:		,	
Duration:	6d 21h		Source:	In-House Cu	lture		Α	ge:	<24h		
Sample ID:	15-0881-8956		Code:	B3934-01			С	lient:			
Sample Date:				Unknown			Р	roject:			
Receive Date: Sample Age:		15	Source: Station:	Energy North	west (WA	0025151)					
	the second second second		Station:				-	1. Mar 1. Mar 1			
Data Transforn Untransformed	-	Zeta	Alt Hy	-		NOEL	LOEL	TOEL	TU		
			С > Т	Not Run	}	100	>100	N/A	1		
Fisher Exact/E		m Test									
Control Dilution Water	vs Conc-%			at P-Value	Decisio						
Junion water	1 3.3		0.5	1.0000		nificant Effect					
	3.3 11		0.291 0.5	1.0000 1.0000		nificant Effect nificant Effect					
	33		0.5	1.0000	-	nificant Effect					
	100		0.291	1.0000		nificant Effect					
Data Summary											
Conc-%	Control Type	No-Res	sp Resp	Total							
) [	Dilution Water	9	1	10							_
		8	2	10							
.3		7	3	10							
1		8	2	10							
3		8	2	10							
00	_	7	3	10							
d Survival Rat											
	ontrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
L	vilution vvater	1	1	1	1	1	0	1	1	1	1
.3		1 1	1 1	1	1	1	1	1	0	0	1
1		1	1	1	1	1	0	0	1	1	0
3		1	1	1	1	1	1	0	1	0	1
00		1.	1	1	1	1	0	0 0	1	0 0	1 1
raphics										0	
1.0 0.9 0.8 92 0.7 100 0.6 0.5 0.4	•	0	• •	e							
0.3 0.2 0.1 0.0 0 0 -092-181-1	1	3.3 Conc-%	11 33	100	 CETIS™ v1				Analyst: T		

#### **CETIS Analytical Report** Report Date: 09 Feb-18 10:47 (p 1 of 2) **Test Code:** B393401cdc | 16-5062-2460 Ceriodaphnia 7-d Survival and Reproduction Test **TestAmerica - ASL** Analysis ID: 05-0351-0275 Endpoint: Reproduction **CETIS Version:** CETISv1.8.1 Analyzed: 09 Feb-18 10:46 Analysis: Parametric-Control vs Treatments Official Results: Yes **Batch ID:** 08-5023-3729 Test Type: Reproduction-Survival (7d) Analyst: Start Date: 30 Jan-18 11:15 Protocol: EPA/821/R-02-013 (2002) **Diluent:** Mod-Hard Synthetic Water Ending Date: 06 Feb-18 08:30 Species: Ceriodaphnia dubia Brine: Duration: 6d 21h Source: In-House Culture Age: <24h Sample ID: 15-0881-8956 Code: B3934-01 Client: Sample Date: 29 Jan-18 05:05 Material: Unknown **Project:** Receive Date: 30 Jan-18 10:15 Source: Energy Northwest (WA 0025151) Sample Age: 30h (0.6 °C) Station: **Data Transform** Zeta Alt Hyp **MC** Trials NOEL LOEL TU TOEL PMSD Untransformed 0 C > T Not Run 33 100 57.45 3.03 54.4% **Dunnett Multiple Comparison Test** Control vs Conc-% **Test Stat** Critical DF MSD **P-Value** Decision(a:5%) **Dilution Water** 1 1.285 2.289 18 10.33 Non-Significant Effect 0.2953 3.3 1.418 2.289 18 10.33 0.2454 Non-Significant Effect 11 1.285 2.289 18 10.33 0.2953 Non-Significant Effect 33 1.794 2.289 18 10.33 0.1335 Non-Significant Effect 100\* 3.567 2.289 18 10.33 0.0018 Significant Effect **Auxiliary Tests** Attribute Test Test Stat Critical **P-Value** Decision(a:5%) Extreme Value 0 2.289 3.2 1.0000 No Outliers Detected **ANOVA** Table Source Sum Squares Mean Square DF F Stat **P-Value** Decision(a:5%) Between 1362.533 272,5067 5 2.675 0.0313 Significant Effect Error 5501.4 101.8778 54 Total 6863.933 374.3844 59 Distributional Tests Attribute Test Test Stat Critical **P-Value** Decision(a:1%) Variances Bartlett Equality of Variance 12.21 15.09 0.0321 Equal Variances Distribution Shapiro-Wilk W Normality 0.9707 0.9459 0.1574 Normal Distribution **Reproduction Summary** Conc-% **Control Type** Count Mean 95% LCL 95% UCL Min Мах Std Err Std Dev CV% %Effect 0 **Dilution Water** 10 19 15.15 22.85 0 29 3.197 10.11 53.21% 0.0% 1 10 13.2 8.7 17.7 0 29 3.741 11.83 89.62% 30.53% 3.3 10 12.6 8.417 16.78 0 29 3.478 11 87.28% 33.68% 11 10 13.2 9.159 17.24 0 29 3.359 10.62 80.48% 30.53%

Analyst: DN QA:

33

100

10

10

10.9

2.9

6.663

1.626

15.14

4.174

0

0

33

11

3.523

1.059

11.14

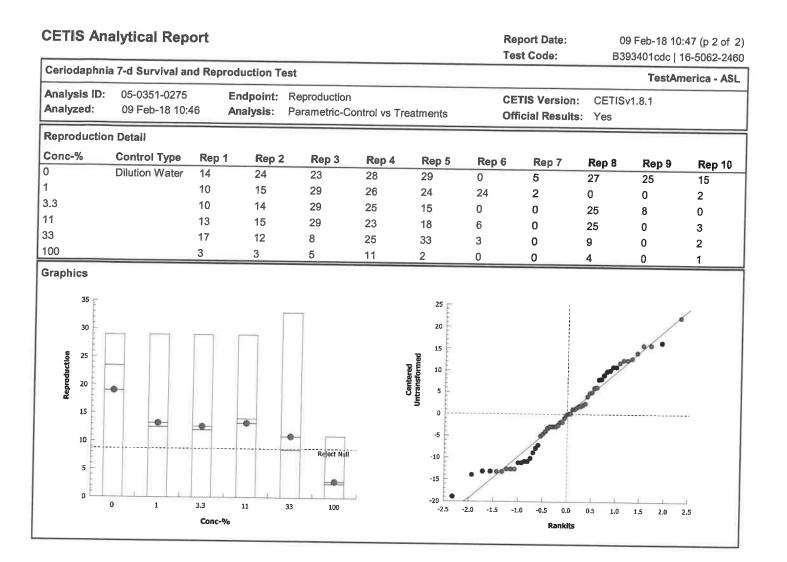
3.348

102.2%

115.5%

42.63%

84.74%



Analyst: DW QA:\_\_\_\_

09 Feb-18 10:47 (p 1 of	2)
B303/01cdo   16 5063 34	60

Report Date:

								est Code:			10:47 (p 1 ol   16-5062-2
Ceriodaph	nnia 7-d Survival	and Reprod	uction T	est							merica - A
Analysis I Analyzed:	D: 01-4992-240 09 Feb-18 10	-	idpoint: alysis:	Reproduction Linear Interpo		N)		ETIS Versio			
Batch ID: Start Date: Ending Da Duration:	rt Date:     30 Jan-18 11:15     Protocol:     EPA       ling Date:     06 Feb-18 08:30     Species:     Ceri       ation:     6d 21h     Source:     In-H				Reproduction-Survival (7d) EPA/821/R-02-013 (2002) Ceriodaphnia dubia In-House Culture				/lod-Hard Syl	nthetic Wa	ter
Receive Da	: 15-0881-8956 Ite: 29 Jan-18 05 Ite: 30 Jan-18 10 Ite: 30h (0.6 °C)	:05 Ma :15 So	de: terial: urce: tion:	B3934-01 Unknown Energy Northv	vest (WA 00	025151)	С	lient: roject:			
	rpolation Options	3									
X Transfor				Resamples	Exp 95%	6 CL Met	hod				
Log(X+1)	Linear	1.49	98E+09	200	Yes	Two	-Point Inte	erpolation			
Residual A Attribute	nalysis Method			Test Stat	Critical	P-Value	Dealair				
Extreme Va	lue Grubbs E	xtreme Valu	е	2.289	3.2	1.0000		on(α:5%) liers Detected	d		
Point Estim .evel % C25 0.7	95% LCL 641 0.402	. <b>95% UCL</b> 44.13	<b>TU</b> 130.9	<b>95% LCL</b> 2.266	<b>95% UCL</b> 248.8						
eproductio	on Summary				Ca	culated Va	riate				
Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect		
.3 1 3 00	Dilution Water	10 10 10 10 10 10	19 13.2 12.6 13.2 10.9 2.9	0 0 0 0 0 0	29 29 29 29 33 11	3.197 3.741 3.478 3.359 3.523 1.059	10.11 11.83 11 10.62 11.14 3.348	53.21% 89.62% 87.28% 80.48% 102.2% 115.5%	0.0% 30.53% 33.68% 30.53% 42.63% 84.74%		
eproductio	on Detail										
onc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Bor 9	Der A	<b>D</b> 16
	Dilution Water	14 10	24 15	23 29	28 26	29	0	5	27	<b>Rep 9</b> 25	<b>Rep 10</b> 15
		10	13	29 29	25	24 15	24 0	2 0	0	0	2
3		10				10	v	v	25	8	0
3 1		13	15	29	23	18	6	0	25	~	•
			15 12	29 8	23 25	18 33	6 3	0 0	25 9	0 0	3 2

Analyst: DN QA:\_\_\_\_

Casiadanhula	lytical Report			Report Date: Test Code:	09 Feb-18 10:47 (p 2 of B393401cdc   16-5062-24
	7-d Survival and Re	production T	est		TestAmerica - AS
Analysis ID: Analyzed:	01-4992-2404 09 Feb-18 10:47	Endpoint: Analysis:	Reproduction Linear Interpolation (ICPIN)	CETIS Version: Official Results:	CETISv1.8.1 Yes
Graphics					
15 No to					



*Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client		F	Energy N	lorthwest			Test Sta	art Date	2-	27-18	2	
Sample Descript	tion						Initial S	ample ID#	# <u>B</u>	3954	-	
Data summarized	d by	M	155									
Percent												-
or			Total Li	ive Young F	Produced	in First 3	Broods ne	- Penlicat	h			Total
Concentration	Α	B	C	D	E	F	G	H	I	J	# Alive	Live
Control	33	36	33	29	33	33	3	35	35	3.5	Adults	Young
	AD?	AD?	AD?	AD?	AD?	AD?	AD? X	AD?	AD?	AD?	$\left\{ L \right\}$	305
1.0 %	32	33	28	35	27	33	29	33	29	32	10	
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10	311
3.3 %	32	30	32	29	32	30	34	36	29	30	10	
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	1	314
11.0 %	34	39	32	29	31	37	36	34	29	32	10	222
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	. ~	333
33.0 %	13	30	ale	15	14	33	25	29	30	29	10	21/4
		AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10 0	248
100 %	5	10	0	0	0	3	)	7	2	1.	1	

Survival data summarized through Day 7. 60%+ of surviving controls with 3+ broods first observed on Day \_\_\_\_\_

X AD?

AD?

AD?

AD?

Test Organism Mortality (Adult dead) =

AD?

AD?

AD?

Test Organism identified as Male =

AD? M

I

 $\checkmark$ 

AD?

AD?

AD?

# of Alive Adults = Number of test organism alive at termination
 (for WDOE only, = Number of test organisms alive at Day 7)

5

AD?

6

AD?

6

40

Test Organism Injured during test =

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of <u>eight</u> days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

	-	Ö Tiko	CERIO	DAPHN	IA CHRO	ONIC SU	JRVIVA	L AND I	REPROI	DUCTIO			
Neo's obt		om A	В	, C	D	E	F	G	Н		J		Used: <u>#</u> 6
Culture	e Board I Slot	1	5		15	X	Y	X	Y	Y	X	Random T	
Client				Energy N		16	18	25	27	33	38		5 conc # 10
Sample D	escriptio	n		Lifergy IV		itial Comula II	- P 20.	11 21		t Initiation: Da			12:45
Technicia	n Day	0 L Da	yIND D	ay 2 1	Day 3MB	itial Sample II	Day 5 DI	Dave	Te	ermination: Da	ite: 3/6/	20 18 Time	08:20
Time	Day	0 1245 Da	y108400	ay 2 i 3 to 1	Day 3 1010	Day 4 1050	Day 5 1015	Day 6 137	Day 7 51	200ay 8		CA.	3402
Percent			В	С		Jumber of Live			Н			No. Live	Daily Total
	1	0	0	0	0	0	0	0	0	0	1	Adults	Live Young
	2	(C)	8	5	0	100	0	0	0	0	0	10	0
Control	4	6	6	0	No	5	0	3 AT		4	Q	10	26
Cor	5	ji	12	10	9	12	10		0	2/0	6	9	27
	6	16	18	18	5	16	17		16	18	17	9	101
	7				_						1 1	9	
	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	8	0	8	P	0	0	0	0	0	0	10	0
1.0 %	4	5	G	5	6	4	2	50	2	4	02	10	19
1.0	5	12	14	9	12	9	- n	10	13	9	12	10	32
	6	IS	13	14	17	14	14	14	15	16	15	10	ilia
	8											10	
	1	0	0	0	0	0	0	0	0	0	0	10	-
	2	8	è	0	0	0	0	D	0	0	0	10	8
%	4	0	0	4	4	50	5	6	0	6	0	10	39
3.3 %	5	13	9	12	2/0	0	13	12	63	0	5	10	30
	6	15	16	16	14	17	12	16	17	14	14	18	134
	7 8								- 1 - 1	111		10	
	1	0	0	0	0	0	0	0	0	-			
	2	0	0	0	Ó	0	0	C.	0	0	0	10	0
%	3	5	0	6	3	3	6	(0	0	5	0	10	29
11.0 %	4	12	15	0	20	10	0	0	6	0	5		25
Π	6	17	18	15	15	16	12	14	11	10	11	10	116
	7			1.0		1.6		10		14	16	18	163
	8	0	0	0								10	
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	3	4	0	2	3	0	U U	0	0	8	(0)	20
33.0 %	4	1/0	Ó	4	1/0	Vo	5	0	0	6	5	10	23
33	5	19	12	12	0	0	13	9	11	12	10		88
	6 7	0	14	10	11	14	15	(2	13	12	14	10	115
	8										,	10	
	1	0	0	0	0	0	0	0	0	0	0	10	0
ł	3	2	0	0	GAD	0	0	0	0	0	0	10	0
100 %	4	0	0	0	Uno	OAD	03	8	0	0	0	8	2
10(	5	3	4	O/AD			5	Ĭ	2	0	03	8	4
ŀ	6	OAY	le	1			GAY	0	5	2AY	3	4	16
	8			+	1	-L-		°/AD				6	
D'' = Adult	Dead #A	V" = Abouted	voung. "M" =			N							

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, "/" = split brood ( carry-over brood / current day brood ), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood Footnote: As per WDOE, C. dubia test reproduction should be when 60% of the surviving control organisms have produced their third brood (Days 6, 7, or 8). Survival is at seven days.

88	(ylu)	∞						tt of
*	Temperature (°C) / Conductivity (µS) (1 <sup>st</sup> use of each sample only) Day	1	23	L'ST	to to	12:32		= Temp out of recom. range
- 11 20 - 10 - 10 - 61	e of each	94. V	ann2	20.012	4/1:32	h:SZ	28:1/2	
10200	S) (1 <sup>st</sup> us	25.34	L'H	A-T-T-	15tra	h5:3	125.2	
1# M M H	ctivity (µ Day	a a a a a a a a a a a a a a a a a a a	~	124-5	2	Mar. 9	724.8	
ated Date Steed Date Day 7	/ Condu	2 3 2-2 24 522	250/2 22	k nd - z	253	Ma Si	chill & M	
Adults Isolated Date Neo's Collected Date MS Day 7 14:00 Day 7 # 261 Day 7	ture (°C)		R.	24-42	257 25.9	and the second	14.9 2.0	nditions.
Ad Nec Day 6 Day 6	Tempera	Zecont	Sur She	1.38		t EN	15%1	newal co
2121-		~			~		3	ts post-re
PHNIA WATER QUALITY DATADate $2/27/20/8$ Time $i 2 : -4.5$ Date $2/27/20/8$ Time $i 2 : -4.5$ Day $B = 3954 - 01 - 503$ $Day 5$ SDay 4DMDay 5 $: 40$ Day 4 $10 : 50$ Day 5 $51$ Day 4 $10 : 50$ Day 5 $I = 10$ Day 4 $10 : 50$ Day 5 $I = 10$ $Day 4$ $10 : 50$ Day 5 $I = 10$ $I = 251$ Day 5 $10 : 10$		B-2/6	1.1	8.1	bill -	20	1.8	stivity taken following organism transfer. Pre-tenewal conditions, denominator represents post-renewal conditions.
ALITY I le i 2 Day 5 Day 5 Day 5 Day 5		002 L	112 A	2 4	PT 1	81/1	0/10	nism tran
R QUAJ 71ime 54 - 0 DAA 251	н љ	8.2 8.	826	22	L C	2 4	8.78.	ving orga tions, der
A WATER ( 2.727/2018 B 3954 Day 4 D Day 4 10 Day 4 40		8.0 × T	8 i R	2	8178°	2 00	8 38	cen follov wal condi
	c		6.2 6.2	5.4	2.2	5.5	8.0	ctivity tal
IODA Sample	-	15 / 8	75/	8.17 17.8	7.6/	79	24	d Condu
	-++-	¢. s	t-2	6 8	5.)	7.0	7.0	DO, pH, and Conductivity taken following organism transfer. numerator represents pre-renewal conditions, denominator rep
25 - 25	0		De.	8.		6.		ewals. D
Day 2	4		100	122	2/52	12.8	8.08	All other
thwest 10 1 51 1	en (mg/l)	D M	122	127	18:1	N 100	48/	o test sol
Energy Northwest Day 1 DIN Day 1 OS: 40 Day 1 # 251	Dissolved Oxygen (mg/l) Day	20 1	2:8	L'14	100	8°.	R L	List prior (
Eneri Eneri Day 1	Dissolv				132	62/3	129	s taken ju
00 12:45	c	15-C 23-C	3.4/2	t:t/2!	7 4.6		3.4 B.	I emperatures taken just prior to <b>test solution</b> renewals. data represents conditions at initiation. All other days:
iti 1 = 1	0	12 ×	12 / t.t.	7.6	12 9.E	8.7 F.F		Day 0 dat
TestAmerica Client Sample Descrip Tech: Day 0, Time Day 0 Therm. Day 0	%	Control	% 0.1	% £'E	% 0.11 / c	% 0°EE	۲ ۲ ۱00 %	COMMENDS: 1 emperatures taken just prior to <b>test solution</b> renewals. DO, pH, and Condu- Note: All Day 0 data represents conditions at initiation. All other days: numerator represents

Energy NW - Cerio acute + chronics (use in 2018). xIsmDoc Control ID: ASL 899-0917

	nmary Rep							Test Code:	B3	95401cdc	07-6175-327	
Ceriodaphnia	7-d Survival a	nd Reprod	uction Te	est							nerica - ASI	
Batch ID:	21-4708-4877	Te	est Type:	Reproduction	-Survival (7c	l)		Analyst:				
Start Date:	27 Feb-18 12:	45 <b>Pr</b>	otocol:	EPA/821/R-02	2-013 (2002)	)	1	Diluent: Mod-Hard Synthetic Water				
Ending Date:	06 Mar-18 08:	20 <b>S</b> p	pecies:	Ceriodaphnia	dubia		1	Brine:				
Duration:	6d 20h	Sc	ource:	In-House Cult	ure			Age: <2	4h			
Sample ID:	13-0055-0816		ode:	B3954-01			(	Client:				
Sample Date:			aterial:	Unknown			F	Project:				
Receive Date:			urce:	Energy Northv	vest (WA 00	25151)						
Sample Age:	31h (3.1 °C)	Sta	ation:									
Comparison S	ummary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method				
	2d Survival Ra		100	>100	N/A	N/A	1		xact/Bonferr			
	6d Survival Ra	- (~	100	>100	N/A	N/A	1		xact/Bonferr		est	
04-2022-1814	Reproduction	· ···		33	19.05	12.8%	9.091	Wilcoxor	I/Bonferroni	Adj Test		
Point Estimate	Summary											
	Endpoint		Level	%	95% LCL	95% UCL	TU	Method				
	2d Survival Ra	te	EC50		N/A	N/A	<1	Linear In	terpolation (	(ICPIN)		
17-4848-1303	Reproduction	C	IC25	35.05	21.34	41.69	2.853	Linear In	erpolation (ICPIN)			
Test Acceptabi	lity											
Analysis ID	Endpoint		Attribu	te	Test Stat	TAC Limi	its	Overlap	Decision	1		
04-2022-1814	Reproduction		Control	Resp	33.56	15 - NL		Yes	Passes A	Acceptability	/ Criteria	
	Reproduction	Control Resp			30.5 15 - NL			Yes Passes Acceptability Criteria				
04-2022-1814	Reproduction		PMSD		0.1282 0.13 - 0.47			Yes	Below Ac	ceptability		
2d Survival Rat	te Summary											
	Control Type	Count	Mean	95% LCL		Min	Max	Std Err	Std Dev	CV%	%Effect	
	Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%	
		10	1	1	1	1	1	0	0	0.0%	0.0%	
3.3		10	1	1	1	1	1	0	0	0.0%	0.0%	
1		10	1	1	1	1	1	0	0	0.0%	0.0%	
33		10	1	1	1	1	1	0	0	0.0%	0.0%	
00		10	1	1	1	1	1	0	0	0.0%	0.0%	
id Survival Rate	-											
	Control Type	Count	Mean		95% UCL		Max	Std Err	Std Dev	CV%	%Effect	
, D	ilution Water	10	0.9	0.7819	1	0	1	0.1	0.3162	35.14%	0.0%	
.3		10	1	1	1	1	1	0	0	0.0%	-11.11%	
		10 10 V V	1	1	1	1	1	0	0	0.0%	-11.11%	
1			1	1	1	1	1	0	0	0.0%	-11.11%	
3 00		10	1	1	1	1	1	0	0	0.0%	-11.11%	
		10	0.6	0.4072	0.7928	0	1	0.1633	0.5164	86.07%	33.33%	
eproduction S	ontrol Type	Count	Maar	05% 1.01	0.60/ 11.01							
onc-%	ilution Water	Count 10	Mean 30.5	95% LCL 26.82	95% UCL		Max	Std Err	Std Dev	CV%	%Effect	
	INVIOL ANDIO	10	50.5	20.02	34.18		36	3.117	9.857	32.32%	0.0%	
Di		10	31.1	20.11	22.00	27	25	0 000	0.011	0 = 0 /	4 6 8 6 1	
Di		10	31.1 31.4	30.11	32.09		35	0.836	2.644	8.5%	-1.97%	
.3		10 v	31.4	30.55	32.25	29	36	0.718	2.271	7.23%	-2.95%	
Di						29 29						

## **CETIS Summary Report**

MIGINE	<b>v</b> .4	o	4	0

Ceriodaph	nia 7-d Survival ar	nd Reprod	uction Test							TestAmerica - ASL		
2d Surviva	d Survival Rate Detail											
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	
0	Dilution Water	1	1	1	1	1	1	1	1	1	1	
1		1	1	1	1	1	1	1	1	1	1	
3.3		1	1	1	1	1	1	1	1	1	1	
11		1	1	1	1	1	1	1	1	1	1	
33		1	1	1	1	1	1	1	1	1	1	
100		1	1	1	1	1	1	1	1	1	1	

#### 6d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	0	1	1	1
1		1	1	1	1	1	1	1	1	1	1
3.3		1	1	1	1	1	1	1	1	1	1
11		1	1	1	1	1	1	1	1	1	1
33		1	1	1	1	1	1	1	1	1	1
100		1	1	0	0	0	1	0	1	1	1

#### **Reproduction Detail**

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	<b>Dilution Water</b>	33	36	33	29	33	33	3	35	35	35
1		32	33	28	35	27	33	29	33	29	32
3.3		32	30	32	29	32	30	34	36	29	30
11		34	39	32	29	31	37	36	34	29	32
33		13	30	26	15	18	33	25	29	30	29
100		5	10	0	0	0	8	1	7	3	6

Report Date:

**Test Code:** 

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

Ceriod								Те	st Code:	B39	)5401cdc	07-6175-32
	laphnia	7-d Survival a	nd Repro	duction T	est						TestA	merica - AS
Analys Analyz				ndpoint: nalysis:	2d Survival Rate Linear Interpolation (ICPIN)				TIS Vers	ion: CETISv sults: Yes	1.8.1	
Batch ID:         21-4708-4877           Start Date:         27 Feb-18 12:45           Ending Date:         06 Mar-18 08:20           Duration:         6d 20h		45 P 20 S	est Type: rotocol: pecies: ource:	Reproduction-Survival (7d) EPA/821/R-02-013 (2002) Ceriodaphnia dubia In-House Culture			Dil Bri	Analyst: Diluent: Mod-Hard Synthetic Brine: Age: <24h			er	
Sample ID:         13-0055-0816           Sample Date:         26 Feb-18 05:30           Receive Date:         27 Feb-18 11:15           Sample Age:         31h (3.1 °C)		80 M 15 So	ode: aterial: ource: ation:	B3954-01 Unknown Energy Northwest (WA 0025151)			ent: oject:					
Linear I	Interpol	ation Options										
X Transform Y Transform			ed	Resamples	Exp 95%		fethod					
Log(X+1	-	Linear	1.'	136E+09	200	Yes	Т	wo-Point Inter	polation			
	stimate	-										
	%	95% LCL	95% UC		95% LCL						_	
EC50	>100	N/A	N/A	<1	N/A	N/A						
		e Summary				Calcu	ulated Va	ariate(A/B)				
onc-%		ntrol Type	Count	Mean	Min	Мах	Std Er	r Std Dev	CV%	%Effect	Α	в
	Dili	ution Water	10 10	1 1	1	1	0	0	0.0%	0.0%	10	10
.3			10	1	1 1	1 1	0 0	0	0.0% 0.0%	0.0%	10	10
1			10	1	1	1	0	0	0.0%	0.0% 0.0%	10 10	10 10
3			10	1	1	1	0 0	0	0.0%	0.0%	10	10
00			10	1	1	1	0	0	0.0%	0.0%	10	10
d Survi	ival Rate	e Detail										
onc-%	Co	ntrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
	Dilu	tion Water	1	1	1	1	1	1	1	1	1	1
			1	1	1	1	1	1	1	1	1	1
			1	1	1	1	1	1	1	1	1	1
.3 1			1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
1 3				•	1 1 1		1 1 1	1 1 1	•		' 1 1 1	1 1 1
1	\$		1	1	•	1	1 1 1 1	1 1 1 1	•		1 1 1 1	1 1 1
1 3 oo araphics	1.0       0.9       0.8       0.7       0.6       0.7       0.6       0.7       0.6       0.7       0.6       0.7       0.7       0.6       0.7       0.7       0.1       0.0	••	1	1 1 1	1 1 	1	1 1 1	1 1 1	1	1 1	1 1 1 1	1
1 3 00 raphics	1.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1	1 1	1	1	1 1 1	1 1 1	1	1 1	1 1 1 1	1

 Report Date:
 07 Mar-18 12:08 (p 2 of 2)

 Test Code:
 B395401cdc | 07-6175-3278

								Test Co	de: E	3395401cdc	07-6175-3	
Ceriodaphnia	7-d Survival a	and Rep	roduction T	est						Test/	America - A	
Analysis ID: Analyzed:	11-3431-2249 07 Mar-18 12		Endpoint: Analysis:	2d Survival Rate STP 2x2 Contingency Tables				ETIS Ver		ISv1.8.1		
Batch ID: Start Date: Ending Date: Duration:	tart Date: 27 Feb-18 12:45 nding Date: 06 Mar-18 08:20			Reproduction-Survival (7d) EPA/821/R-02-013 (2002) Ceriodaphnia dubia In-House Culture				nalyst: Piluent: Prine: ge:	Mod-Hard S	Hard Synthetic Water		
Receive Date:	ID:       13-0055-0816         Date:       26 Feb-18 05:30         Date:       27 Feb-18 11:15         Age:       31h (3.1 °C)		Code: Material: Source: Station:	B3954-01 Unknown Energy Nor	thwest (WA	0025151)	С	lient: roject:				
Data Transform	n	Zeta	Alt Hy	/р МСТг	iale	NOEL	LOEL	TOP	711			
Untransformed			C > T	Not Ru		100	>100	TOEI N/A	- TU 1			
Fisher Exact/B	onferroni-Hol	m Test										
-	vs Conc-%		Test St	at P-Value	e Decisio	n(0.05)						
Dilution Water 1			1	1.0000		nificant Effec	t					
	3.3		1	1.0000		nificant Effec						
	11		1	1.0000	-	nificant Effec						
	33 100		1 1	1.0000		nificant Effec						
		<u> </u>		1.0000	Non-Sig	nificant Effect	t					
Data Summary												
	Control Type	No-Res		Total								
	Dilution Water	10	0	10								
1 3.3		10	0	10								
11		10	0	10								
33		10	0	10								
100		10 10	0 0	10 10								
				10								
2d Survival Rat												
	ontrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	
_	ilution Water	1	1	1	1	1	1	1	1	1	1	
9.3		1 1	1	1	1	1	1	1	1	1	1	
1		1	1	1	1	1	1	1	1	1	1	
3		1	1	1	1	1	1	1	1	1	1	
00		1	1	1 1	1	1	1	1	1	1	1	
raphics								1	1		1	
1.0 <b>(</b>	•	0	• •	0								
0.5 0.8 22 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0												
0	1	3.3 Conc-%	11 33	100								
)-092-181-1					CETIS™ v1	.8.1.2			Analyst	0/0/0	Δ.	

 Report Date:
 07 Mar-18 12:08 (p 1 of 2)

 Test Code:
 B395401cdc | 07-6175-3278

Ceriodaphnia	7-d Survival a	and Rep	roduction T	est						395401cdc Test4	merica - /	
Analysis ID:	16-7093-8134				Pata							
Analyzed:	07 Mar-18 12		Endpoint: 6d Survival Rate Analysis: STP 2x2 Contingency Tables					ETIS Vers	ion: CETI: ults: Yes	Sv1.8.1		
Batch ID:	21-4708-4877	7	Test Type: Reproduction-Survival (7d)					nalyst:				
Start Date:	27 Feb-18 12	:45	Protocol:	EPA/821/R-0					Mod-Hard Sy	nthetic Wa	er	
Ending Date:	06 Mar-18 08	:20	Species: Ceriodaphnia dubia					Brine:				
Duration:	6d 20h		Source: In-House Culture				A	ge:	<24h			
Sample ID:	13-0055-0816		Code:	B3954-01			С	lient:				
Sample Date:			Material:	Unknown	nknown			roject:				
Receive Date:		15	Source:	Energy North	west (WA	0025151)						
Sample Age:	31h (3.1 °C)		Station:									
Data Transform	n	Zeta	Alt Hy			NOEL	LOEL	TOEL	τυ			
Intransformed			C > T	Not Run		100	>100	N/A	1			
Fisher Exact/B	onferroni-Hol	m Test										
	vs Conc-%			at P-Value	Decisio							
Dilution Water	1		1	1.0000		nificant Effect						
	3.3 11		1 1	1.0000		nificant Effect						
	33		1	1.0000 1.0000		nificant Effect nificant Effect						
	100		0.1517	0.7585		nificant Effect						
ata Summary											_	
-	Control Type	No-Re:	sp Resp	Total								
	Dilution Water	9	1	10								
		10	0	10								
.3		10	0	10								
1		10	0	10								
3		10	0	10								
00		6	4	10								
d Survival Rat	e Detail											
	ontrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	
D	ilution Water	1	1	1	1	1	1	0	1	1	1	
<u> </u>		1	1	1	1	1	1	1	1	1	1	
.3 1		1	1	1	1	1	1	1	1	1	1	
3		1	1	1	1	1	1	1	1	1	1	
00		1	1	1 0	1 0	1 0	1	1	1	1	1	
raphics								0	1	1	1	
1.0 F		٠	• •									
0.9												
A A												
> 0.6 ⊨				~								
0.6 S D D 0.5												
8 0.5												
0.4												
0.4												
0.4 0.3 0.2												
0.4 0.3 0.2 0.1	1											
0.4 0.3 0.2	1	3.3	11 33	100								
0.4 0.3 0.2 0.1 0.0	1	3.3 Conc-%	11 33	100								
0.4 0.3 0.2 0.1 0.0	1		11 33	100					Analyst:_2			

#### **CETIS Analytical Report** Report Date: 07 Mar-18 12:08 (p 1 of 2) Test Code: B395401cdc | 07-6175-3278 Ceriodaphnia 7-d Survival and Reproduction Test **TestAmerica - ASL** Analysis ID: 04-2022-1814 Endpoint: Reproduction **CETIS Version:** CETISv1.8.1 Analyzed: 07 Mar-18 12:08 Analysis: Nonparametric-Multiple Comparison Official Results: Yes **Batch ID:** 21-4708-4877 Test Type: Reproduction-Survival (7d) Analyst: Start Date: 27 Feb-18 12:45 Protocol: EPA/821/R-02-013 (2002) **Diluent:** Mod-Hard Synthetic Water Ending Date: 06 Mar-18 08:20 Species: Ceriodaphnia dubia Brine: Duration: 6d 20h Source: In-House Culture Age: <24h Sample ID; 13-0055-0816 Code: B3954-01 **Client:** Sample Date: 26 Feb-18 05:30 Material: Unknown **Project:** Receive Date: 27 Feb-18 11:15 Source: Energy Northwest (WA 0025151) Sample Age: 31h (3.1 °C) Station: **Data Transform** Zeta Alt Hyp **MC Trials** NOEL LOEL TOEL TU PMSD Untransformed 0 C > T Not Run 11 33 19.05 9.091 12.8% Wilcoxon/Bonferroni Adj Test Control VS Conc-% Test Stat Critical DF Ties **P-Value** Decision(a:5%) **Dilution Water** 1 73.5 17 3 Non-Significant Effect 0.0698 3.3 75.5 17 2 0.1087 Non-Significant Effect 11 95.5 17 2 1.0000 Non-Significant Effect 33\* 61 17 2 0.0016 Significant Effect 3.00 100\* 55 17 0 < 0.0001 Significant Effect **ANOVA** Table Source Sum Squares Mean Square DF P-Value F Stat Decision(a:5%) Between 6449.456 1289.891 5 84.69 < 0.0001 Significant Effect Error 807.2222 15.23061 53 Total 7256.678 1305.122 58 **Distributional Tests** Attribute Test **Test Stat** Critical **P-Value** Decision(a:1%) Variances Bartlett Equality of Variance 19.31 15.09 0.0017 Unequal Variances Distribution Shapiro-Wilk W Normality 0.9716 0.9451 0.1816 Normal Distribution **Reproduction Summary** Conc-% **Control Type** Count Mean 95% LCL 95% UCL Min Max Std Err Std Dev CV% %Effect 0 **Dilution Water** 9 33.56 32.77 34.34 29 36 0.6894 2.068 6.16% 0.0% 1 10 31.1 30.09 32.11 27 35 0.836 2.644 8.5% 7.32% 3.3 10 31.4 30.54 32.26 29 36 0.718 2.271 7.23% 6.42% 11 10 33.3 32.03 34.57 29 39 1.055 3.335 10.02% 0.76% 33 10 24.8 22.14 27.46 13 33 2.21 6.989 28.18% 26.09% 100 10 4 2.588 5.412 0 10

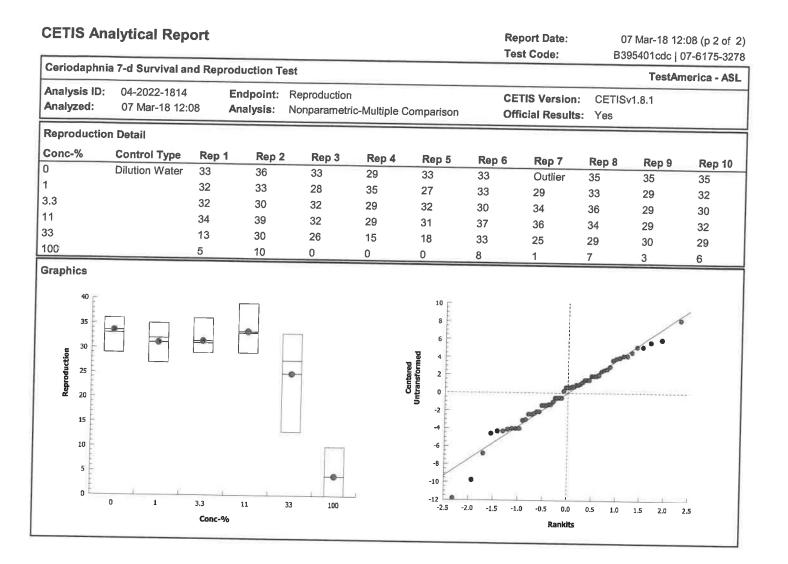
Analyst: DN QA:

1.174

3.712

92.8%

88.08% 2





Analyst: DW QA:\_\_\_\_

### **CETIS Analytical Report**

Report Date:	07 Mar-18 12:08 (p 1 of 2)
Test Code:	B395401cdc   07 6175 2270

7-d Survival an 17-4848-1303 07 Mar-18 12:: 21-4708-4877 27 Feb-18 12:2 06 Mar-18 08:2 6d 20h 13-0055-0816 26 Feb-18 05:3 27 Feb-18 11:1 31h (3.1 °C) ation Options Y Transform Linear s 95% LCL 21.34 Summary ntrol Type	En 08 An Tes 45 Pro 20 Sp Sor 5 Sor 5 Sor 5 Sor 5 Sor	dpoint: alysis: st Type: otocol: ecies: urce: de: terial: urce: tion: ed 473660	Reproduction Linear Interp Reproduction EPA/821/R-(C Ceriodaphnia In-House Cul B3954-01 Unknown Energy North Resamples	olation (IC n-Survival ( )2-013 (20) a dubia (ture west (WA <u>Exp 9</u> Yes	(7d) 02) 0025151 5% CL		Brine: Age: Client: Project:		v1.8.1	America - A
07 Mar-18 12:: 21-4708-4877 27 Feb-18 12:4 06 Mar-18 08:2 6d 20h 13-0055-0816 26 Feb-18 05:3 27 Feb-18 11:1 31h (3.1 °C) ation Options Y Transform Linear s 95% LCL 21.34 Summary	08 An Tes 45 Pro 20 Sp Sou 30 Mat 15 Sou 55 Sou 55 Sta 95% UCL	st Type: ptocol: ecies: urce: de: terial: urce: tion: ed 473660 TU	Linear Interp Reproduction EPA/821/R-C Ceriodaphnia In-House Cul B3954-01 Unknown Energy North Resamples 200 95% LCI	olation (IC Survival ( )2-013 (20) a dubia (ture west (WA Exp 9: Yes - 95% U(	(7d) 02) 0025151 5% CL	) Method	Official Res Analyst: Diluent: Brine: Age: Client: Project:	ults: Yes Mod-Hard Syr		ter
27 Feb-18 12:4 06 Mar-18 08:2 6d 20h 13-0055-0816 26 Feb-18 05:3 27 Feb-18 11:1 31h (3.1 °C) ation Options Y Transform Linear s 95% LCL 21.34	45 Prc 20 Sp Son 30 Mat 15 Son 55 Son 55 Sta 786 786	terial: urce: de: terial: urce: tion: dd 473660	EPA/821/R-( Ceriodaphnia In-House Cul B3954-01 Unknown Energy North Resamples 200 95% LCI	02-013 (200 a dubia liture west (WA <u>Exp 9</u> Yes 95% U0	02) 0025151 <b>5% CL</b>	) Method	Diluent: Brine: Age: Client: Project:	-	nthetic Wa	ter
26 Feb-18 05:3 27 Feb-18 11:1 31h (3.1 °C) ation Options Y Transform Linear s 95% LCL 21.34	30 Mat 15 Sou Star 786- 95% UCL	terial: urce: tion: ed 473660 TU	Unknown Energy North Resamples 200 95% LCI	Exp 9 Yes - 95% U(	5% CL	) Method	Project:			
Y Transform Linear s 95% LCL 21.34	786 95% UCL	473660 TU	200 95% LCI	Yes - 95% U(			nterpolation			
Linear s 95% LCL 21.34 Summary	786 95% UCL	473660 TU	200 95% LCI	Yes - 95% U(			terpolation			
95% LCL 21.34	95% UCL	TU	95% LCI	_ 95% U(	CL					
95% LCL 21.34					CL					
				_	alculate	d Variate				
	Count	Mean	Min	Max	Std I		C)/0/	0/ E.C		
ution Water	10	30.5	3	36				%Effect		
	10	31.1	27	35	0.836		8.5%	-1.97%		
			29	36			7.23%	-2.95%		
							10.02%			
	10	24.0 4	0	33 10						
etail										
ntrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep {	Rep 6	Ren 7	Rep 8	Pop 0	Dan 40
tion Water	33	36	33	29	33	33	3			Rep 10 35
	32	33	28	35	27	33	29	33		32
			32	29	32	30	34	36	29	30
				29	31	37	36	34	29	32
						33	25	29	30	29
	5	10	0	0	0	8	1	7	3	6
R	60									
6	etail trol Type ion Water	10 10 10 10 10 10 etail trol Type Rep 1 ion Water 33 32 32 34 13 5	10 31.1 10 31.4 10 33.3 10 24.8 10 4 trol Type Rep 1 Rep 2 ion Water 33 36 32 33 32 30 34 39 13 30 5 10	10       31.1       27         10       31.4       29         10       33.3       29         10       24.8       13         10       4       0	10       31.1       27       35         10       31.4       29       36         10       33.3       29       39         10       24.8       13       33         10       4       0       10	10       31.1       27       35       0.836         10       31.4       29       36       0.718         10       33.3       29       39       1.055         10       24.8       13       33       2.21         10       4       0       10       1.174         etail       trol Type       Rep 1       Rep 2       Rep 3       Rep 4       Rep 5         ion Water       33       36       33       29       33         32       33       28       35       27         32       30       32       29       31         13       30       26       15       18         5       10       0       0       0	10       31.1       27       35       0.836       2.644         10       31.4       29       36       0.718       2.271         10       33.3       29       39       1.055       3.335         10       24.8       13       33       2.21       6.989         10       4       0       10       1.174       3.712         troi Type       Rep 1       Rep 2       Rep 3       Rep 4       Rep 5       Rep 6         ion Water       33       36       33       29       33       33       33         32       33       28       35       27       33         32       30       32       29       31       37         13       30       26       15       18       33         5       10       0       0       8	10       31.1       27       35       0.836       2.644       8.5%         10       31.4       29       36       0.718       2.271       7.23%         10       33.3       29       39       1.055       3.335       10.02%         10       24.8       13       33       2.21       6.989       28.18%         10       4       0       10       1.174       3.712       92.8%         etail       32       33       28       35       27       33       29         32       30       32       29       32       30       34         34       39       32       29       31       37       36         13       30       26       15       18       33       25         5       10       0       0       8       1 <td>10       31.1       27       35       0.837       32.32%       0.0%         10       31.4       29       36       0.718       2.271       7.23%       2.95%         10       33.3       29       39       1.055       3.335       10.02%       -9.18%         10       24.8       13       33       2.21       6.989       28.18%       18.69%         10       4       0       10       1.174       3.712       92.8%       86.89%         trol Type       Rep 1       Rep 2       Rep 4       Rep 5       Rep 6       Rep 7       Rep 8         ion Water       33       36       33       29       33       33       3       35         322       30       32       29       32       30       34       36         34       39       32       29       31       37       36       34         33       30       26       15       18       33       25       29         5       10       0       0       8       1       7</td> <td>10       31.1       27       35       0.836       2.644       8.5%       -1.97%         10       31.4       29       36       0.718       2.271       7.23%       -2.95%         10       33.3       29       39       1.055       3.335       10.02%       -9.18%         10       24.8       13       33       2.21       6.989       28.18%       18.69%         10       4       0       10       1.174       3.712       92.8%       86.89%         trol Type       Rep 1       Rep 2       Rep 3       Rep 4       Rep 5       Rep 6       Rep 7       Rep 8       Rep 9         ion Water       33       36       33       29       33       33       3       35       35         32       33       28       35       27       33       29       33       29         34       39       32       29       31       37       36       34       29         34       39       32       29       31       37       36       34       29         35       10       0       0       8       1       7</td>	10       31.1       27       35       0.837       32.32%       0.0%         10       31.4       29       36       0.718       2.271       7.23%       2.95%         10       33.3       29       39       1.055       3.335       10.02%       -9.18%         10       24.8       13       33       2.21       6.989       28.18%       18.69%         10       4       0       10       1.174       3.712       92.8%       86.89%         trol Type       Rep 1       Rep 2       Rep 4       Rep 5       Rep 6       Rep 7       Rep 8         ion Water       33       36       33       29       33       33       3       35         322       30       32       29       32       30       34       36         34       39       32       29       31       37       36       34         33       30       26       15       18       33       25       29         5       10       0       0       8       1       7	10       31.1       27       35       0.836       2.644       8.5%       -1.97%         10       31.4       29       36       0.718       2.271       7.23%       -2.95%         10       33.3       29       39       1.055       3.335       10.02%       -9.18%         10       24.8       13       33       2.21       6.989       28.18%       18.69%         10       4       0       10       1.174       3.712       92.8%       86.89%         trol Type       Rep 1       Rep 2       Rep 3       Rep 4       Rep 5       Rep 6       Rep 7       Rep 8       Rep 9         ion Water       33       36       33       29       33       33       3       35       35         32       33       28       35       27       33       29       33       29         34       39       32       29       31       37       36       34       29         34       39       32       29       31       37       36       34       29         35       10       0       0       8       1       7

THE LEADER IN EN	NIPOKMENTAL 1	ESTING	FA	THEAD MIN	NOW 7-DAY	SURVIVAL	AND WATE	R QUALITY I	DATA		
Ra	ndom T	emplate Used:	6 conc. x 4 r	eps. # 2	Wat	erbath/incuba	tor Used:	Date Initiate	ed 1 30	72018 1	ime <u>12:50</u>
Initial sa	mple ID	в 393	ч	- 01	_	# 4	1	Date Terminate	ed 2/6	/2018 1	ime 09 : 20
Client				gy Northwes			San	nple Descriptio	n		
Tech:	Day 0	MB Day	16am D	ay 2 <u>3</u> ~	Day 3 MB	Day 4	Bu Day 5	Zan Day 6	CALL Day	7 80.00	
Time	Day 0	1250 Day	11150 D	ay 2 1310	Day 3 0945	Day 4 121	5 Day 5 $7$	255 Day 6	120 Day	70920	
Conc.	1	1		Live Organisms			solved O <sub>2</sub>	1		Temp.	* Conductivity
or	Day		1			(	mg/l)		pH	(°C)	Ξ (μS)
Percent	0	A 10	B 10	C	D	Pre	Post	Pre	Post	Pre	
	1	10	10	10 10	10	6.8	7.4	7.4	8.0		54 318
	2	(0	10	10	10	67	7.8		8.2		54 7.14
Control	3	0	10	10	(0	7.1	7.8	7.6	8.2	25.1 2	54
රී	4 5	10	10	10	10	6.9	7.2	7.5	8.3	24.6	19 318
	6	10	10	10	10	6.5	7.9	7.4	83		54
	7	10	10	10	10	6,6	2.0	1.6	0,0		22
	0	10	10	10	10		7.5		8.1	Fost: 74.T	320
	1 2	10	10	10	10	6.8	7.9	7.4	8.1	24.7	
%	3	10	10	10	10	6.8	7.8	7.6	8.2	24.6	333
1.0 %	4	10	G	10	10	6.7	7.5	7.5	8.2	24.6	335
	5	10	9	10	10	6.5	7.9	7.4	8.3	24.3	
	6 7	10	8	10	10	6.9 6.8	8.0	7.5	8.2	25.1	
	0	10	10	10	10	6.0	7.7	1.0	8.1	25.0 Post: 24.9	349
	1	10	10	10	10	6.3	8.0	7.4	8.1	24.8	5-()
%	2 3	10	0	10	10	6.5	7.9	7.5	8.2	24.8	361
3.3	4	10	10	10	10	7.2	7.9	7.6	8.1	24.9	500
	5	10	10	9	10	6.5	3.0	74	82	24.9	362
	67	10	10	9	10	6.9	82	7.5	8.2	25.0	
	0	10	10	<u>q</u> 10	10	6.9	7.5	7.6	0	24.9	
t	1	10	10	10	10	6.3		7.4	8.1	Post: 24.8 24.6	424
~	2	10	10	10	10	6.4	8.1	7.6	9.2	24.0	458
1.0%	3	10	10	0	10	7.1	7.9	7.6	8.1	24.8	
=	5	10	01 []	10 10		6.6	7.7	7.6	8:3 9.2		443
	6	10	10	10	10	7.0	8.2	7.5	8.2	24.9	<u> </u>
	7	10	10	10	10	6.8		7.6		25.0	
ŀ	0	10	10	10 10	10	/ 18	7.8		8.0	Post: 24.7	676
	2	10	10	9	10	6.4	8.2	7.4	8.1	24.8	117
33.0 %	3	D	10	ý	10	7.2	8.1	76	8.1	25.0	667
33.	4 5	10	10	G	10	7.0	8.2	7.6	8.3	24.5	687
F	6	10	10	9	9	62	7.9	7.5	8.2	24.8	
	7	10	10	ġ	9	6.8	010	7.6	8.1	24.8	
	0	10	10	10	10		811			Post: 74.3	1339
H	1 2	0	10	10	10	6.5	8.3	7.9	8.1	24.8	
%	3	10	10	10	10	7.2	83	7.9	8.2	24.5	1330
100 %	4	112	10	10	10		27-880	7.7	8.2	25.0	1351
-	5	16	10	10	10	6,3	8.1	7.9	8.2	24.8	/
F	6	10	10	10	10	7.1	8.2	7.8	5.1	25,1	
/ Indicate		and and the second s	artently noured		10 1	6.7		7.9		25.0	

Indicates one organism inadvertently poured off during solution renewal, replaced into container. "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

**TestAmerica** 

Aeration in test chambers begun @\_\_\_\_\_ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions. Day 0 Temperatures = Post-renewals

Therm ID# = Thermometer ID used for all measurements that day. = Temp. out of recommended range (23.8)

### FATHEAD MINNOW 7-DAY GROWTH DATA

Client	Energy NW		Tins Labeled As:	Energy
Lab ID:	B3934		Start Date:	1/30/2018
Sample Description:				
	Technician:	MB	MB	_
	Date:	2/7/2018	2/2/2018	
	Balance Serial #:	B328543647	B328543647	_
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
	A	1104.25	1096.42	10
Control	В	1092.64	1085.75	10
	C	1119.28	1110.52	10
	D	1097.84	1089.98	10
	A	1111.87	1104.89	10
1.0 %	B	1110.15	1104.37	7
200 /0	C	1114.48	1104.37	10
	D	1120.24	1112.66	10
		1120.24	1112.00	10
	A	1095.45	1088.46	10
3.3 %	В	1124.88	1116.57	10
	С	1113.30	1106.81	9
	D	1100.89	1093.18	10
	Α	1104.67	1097.08	10
11 %	В	1110.36	1101.67	10
	C	1094.35	1087.02	10
	D	1121.24	1114.22	10
	A	1123.69	1115.85	10
33 %	В	1106.01	1098.00	10
	С	1105.92	1097.39	9
	D	1103.21	1095.77	9
	Α	1101 56	1002.07	10
100 %	B	1101.56	1093.96	10
100 /0	C	1088.87 1113.43	1080.62	10
	C	1113.43	1103.91 1105.79	10
			1105.17	10
	<u>A</u>			
ŀ	B			
ŀ	С			
	D			

weigh to 0.01 mg

Client	Energy NW		Tins Labeled As:	Energy
Lab ID:	B3934		Start Date:	1/30/2018
Sample Description:				
	Technician: Date: Balance Serial #:	B328543647	MB 2/2/2018 B328543647	
Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A B C D		1096.42 1085.75 1110.52 1089.98	10 10 10
1.0 %	A B C D		1104.89 1104.37 1106.74 1112.66	10 7 10 10
3.3 %	A B C D		1088.46 1116.57 1106.81 1093.18	10 10 9
11 %	A B C D		1097.08 1101.67 1087.02 1114.22	10 10 10
33 %	A B C D		1115.85 1098.00 1097.39 1095.77	10 10 10 9 9
100 %	A B C D		1093.96 1080.62 1103.91 1105.79	10 10 10 10
	A B C D			

### FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

	mmary Rep	ποι						Report Date:			0:53 (p 1 of
Fathead Minr	now 7-d Larval	Surviva	and Growt	h Toet				Test Code:	B3		04-6144-242
										TestA	merica - ASI
Batch ID:	08-0704-4629	-		Growth-Survi	```			Analyst:			
Start Date:	30 Jan-18 12		Protocol:	EPA/821/R-0		)		Diluent: M	od-Hard Syr	nthetic Wat	er
Ending Date:		:20	Species:	Pimephales p	promelas			Brine:			
Duration:	6d 21h		Source:	Aquatox, AR				Age: <4	8h		
Sample ID:	15-0881-8956	3	Code:	B3934-01				Client:			
Sample Date:	29 Jan-18 05:	05	Material:	Unknown				Project:			
Receive Date:	: 30 Jan-18 10:	15	Source:	Energy North	west (WA 00	25151)		, <b>.</b>			
Sample Age:	32h (0.6 °C)		Station:			,					
Comparison S	Summary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τU	Method			
04-8701-0464	7d Survival Ra		100	>100	N/A	10.4%	1	Steel Ma	ny-One Rar	k Test	
11-4303-9384	Mean Dry Bior	nass-mg	100	>100	) N/A	16.8%	1		Multiple Cor		est
Point Estimate	e Summary				5						
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	. ти	Method			
3-5518-0232	Mean Dry Bior	nass-mg	IC25	>100	N/A	N/A	<1		terpolation (	ICPIN)	
Test Acceptab	ility										
Analysis ID	Endpoint		Attribu	te	Test Stat	TAC Lim	its	Overlap	Decision		
4-8701-0464	7d Survival Ra	te	Control	Resp	1	0.8 - NL		Yes		cceptability	Criteria
1-4303-9384	Mean Dry Bion	nass-mg	Control	Resp	0.7835	0.25 - NL		Yes		cceptability	
3-5518-0232	Mean Dry Bion	nass-mg	Control	Resp	0.7835	0.25 - NL		Yes		cceptability	
1-4303-9384	Mean Dry Biom	nass-mg	PMSD		0.1677	0.12 - 0.3		Yes		cceptability	
d Survival Ra	te Summary										
onc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Мах	Std Err	Std Dev	CV%	%Effect
[	Dilution Water	4	1	1	1	1	1	0	0	0.0%	0.0%
		4	0.925	0.869	0.981	0.7	1	0.075	0.15	16.22%	7.5%
.3		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	2 5%
1		4	1	1	1	1	1	0	0	0.0%	0.0%
3		4	0.95	0.9284	0.9716	0.9	1	0.02887	0.05774	6.08%	5.0%
00		4	1	1	1	1	1	0	0	0.0%	0.0%
ean Dry Biom	ass-mg Summ	агу									
	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
C	Dilution Water	4	0.7835	0.755	0.812	0.689	0.876	0.03818	0.07636	9.75%	0.0%
•		4	0.702	0.6688	0.7352	0.578	0.774	0.04445	0.0889	12.66%	10.4%
3		4	0.7375	0.7076	0.7674	0.649	0.831	0.03998	0.07996	10.84%	5.87%
		4	0.7658	0.7386	0.7929	0.702	0.869	0.03633	0.07267	9.49%	2.27%
			0 7055	0 ==00							//
3 )0		4	0.7955	0.7786	0.8124	0.744	0.853	0.02259	0.04517	5.68%	-1.53%

### **CETIS Summary Report**

Report Date: 09 Feb-18 10:53 (p 2 of 2) B393401ppc | 04-6144-2426

TestAmerica - ASL

.

Test Code:

Fathead Minnow 7-d Larv	al Survival and Growth Test
I deficad milliow I-d Laiv	a Survival and Growth rest

#### 7d Survival Rate Detail

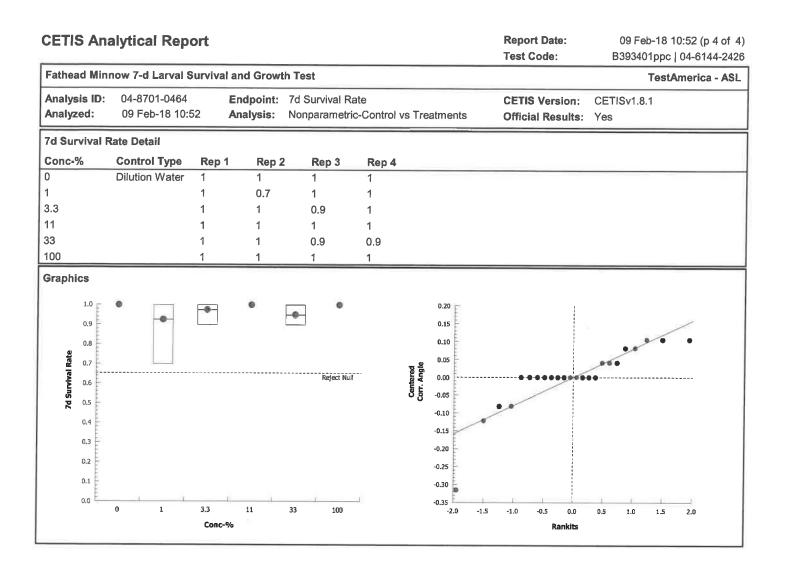
ra Surviva	Rate Detail					
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	1	1	1	1	
1		1	0.7	1	1	
3.3		1	1	0.9	1	
11		1	1	1	1	
33		1	1	0.9	0.9	
100		1	1	1	1	

#### Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.783	0.689	0.876	0.786
1		0.698	0.578	0.774	0.758
3.3		0.699	0.831	0.649	0.771
11		0.759	0.869	0.733	0.702
33		0.784	0.801	0.853	0.744
100		0.76	0.825	0.952	0.934

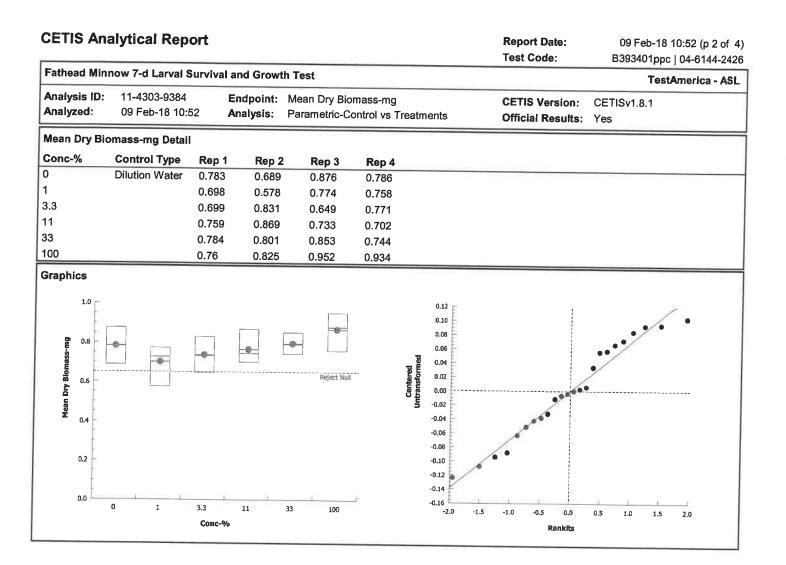
CETIS Ana	lytical Rep	ort					•	ort Date: Code:			52 (p 3 of 4) 4-6144-2426
Fathead Minn	ow 7-d Larval S	urvival	and Growth	Test						TestAm	erica - ASL
Analysis ID: Analyzed:	04-8701-0464 09 Feb-18 10:5			d Survival Rat Ionparametric		Treatments		IS Version: cial Results		1.8.1	
Batch ID: Start Date: Ending Date: Duration:	08-0704-4629 30 Jan-18 12:5 06 Feb-18 09:2 6d 21h	0 I 20 S	Protocol: E Species: P	Frowth-Surviva PA/821/R-02- Pimephales pro equatox, AR	013 (2002)		Ana Dilu Brin Age	ent: Mo e:	d-Hard Synt	hetic Water	
	15-0881-8956 29 Jan-18 05:0 30 Jan-18 10:1 32h (0.6 °C)	5 I 5 S	Material: U	3934-01 Inknown Inergy Northwo	est (WA 002	25151)	Clie Proj				
Data Transform	m	Zeta	Alt Hyp	MC Trials		NOEL	LOEL	TOEL	TU	PMSD	
Angular (Corre	cted)	0	C > T	Not Run		100	>100	N/A	1	10.4%	
Steel Many-Or	ne Rank Test										
Control	vs Conc-%		Test Sta	at Critical	DF	Ties	P-Value	Decision	(a:5%)		
Dilution Water	1 3.3 11 33 100		16 16 18 14 18	10 10 10 10 10 10	6 6 6 6 6	1 1 1 1	0.6105 0.6105 0.8333 0.3451 0.8333	Non-Sign Non-Sign Non-Sign	ificant Effect ificant Effect ificant Effect ificant Effect ificant Effect	t t	
Auxiliary Tests Attribute Extreme Value	Test			Test Stat 3.575	Critical 2.802	<b>P-Value</b> 0.0004	Decision Outlier De				
ANOVA Table											
Source	Sum Squ	ares	Mean S	quare	DF	F Stat	P-Value	Decision	(a:2%)		
Between	0.0429930		0.00859		5	0.8631	0.5245		ificant Effect		
Error	0.1793209	)	0.00996		18						
Total	0.222314		0.01856	089	23						
Distributional	Tests										
Attribute	Test			Test Stat		P-Value	Decision				
Variances Distribution	Mod Leve Shapiro-V		ality of Variand	ce 1.013 0.7721	4.248 0.884	0.4386 0.0001	Equal Var	iances al Distributi	on		
			lonnanty	0.7721	0.004	0.0001					
7d Survival Ra	-	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
	Control Type Dilution Water	4	1	95% LCL	1	1	1	0	0	0.0%	0.0%
1		4	0.925	0.8679	0.9821	0.7	1	0.075	0.15	16.22%	7.5%
3.3		4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	2.5%
11		4	1	1	1	1	1	0	0	0.0%	0.0%
33		4	0.95	0.928	0.972	0.9	1	0.02887	0.05773	6.08%	5.0%
100		4	1	1	1	1	1	0	0	0.0%	0.0%
Angular (Corre	ected) Transfor	med Su	mmary								
Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
1		4	1.307	1.227	1.387	0.9912	1.412	0.1052	0.2104	16.1%	7.45%
3.3		4	1.371	1.34	1.402	1.249	1.412	0.04074	0.08149	5.94%	2.89%
11		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
33		4	1.331	1.295	1.366	1.249	1.412	0.04705	0.09409	7.07% 0.0%	5.77% 0.0%
100		4	1.412	1.412	1.412	1.412	1.412	0	0	Ų.U70	0.070

Analyst:\_\_\_\_\_QA:\_\_\_\_\_



Analyst: <u>DW</u> QA:

	alytical Repo	FL.						port Date: st Code:			0:52 (p 1 of 04-6144-24
Fathead Min	now 7-d Larval Su	rvival an	d Growth	Test							merica - AS
Analysis ID: Analyzed:	11-4303-9384 09 Feb-18 10:52			lean Dry Bio Parametric-C		eatments		TIS Versio icial Resul		/1.8.1	
Batch ID: Start Date: Ending Date: Duration:	08-0704-4629 30 Jan-18 12:50 06 Feb-18 09:20 6d 21h	Pro Spe	tocol: E ecies: P	Frowth-Surviv PA/821/R-02 imephales p quatox, AR	2-013 (2002	)		ne:	od-Hard Syn 18h	thetic Wat	er
	15-0881-8956 29 Jan-18 05:05 30 Jan-18 10:15 32h (0.6 °C)	Sou	erial: U	3934-01 nknown nergy Northv	vest (WA 00	)25151)	Clie Pro	ent: ject:			
Data Transfor		Zeta	Alt Hyp	MC Trial	S	NOEL	LOEL	TOEL	TU	PMSD	
Untransformed	1	0	C > T	Not Run		100	>100	N/A	1	16.8%	
Dunnett Multi	iple Comparison T	est									
Control	vs Conc-%		Test Stat	t Critical	DF	MSD	P-Value	Decisio	n(a:5%)		
Dilution Water	1		1.493	2.407	6	0.1314	0.2302		nificant Effect	t	
	3.3		0.8427	2.407	6	0.1314	0.4927		nificant Effect		
	11		0.3252	2.407	6	0.1314	0.7204	-	nificant Effect		
	33		-0.2198	2.407	6	0.1314	0.8899	-	nificant Effect		
	100		-1.543	2.407	6	0.1314	0.9964	-	ificant Effect		
Auxiliary Tests	s										
Attribute	Test			Test Stat	Critical	P-Value	Decision	a:5%)			
Extreme Value	0			1.816	2.802	1.0000		s Detected			
ANOVA Table											
Source	Sum Square	s	Mean Squ	uare	DF	F Stat	P-Value	Desision	(0) 50/)		
Between	0.06366271		0.0127325		5	2.137	0.1076	Decision	ificant Effect		
Error	0.1072697		0.0059594	125	-		0.1070	- NULL-OIGH	meant Enect		
Catal			0.0059594	720	18						
otal	0.1709324		0.0059592		18 23	-					
Distributional 1					23	-	Decision(	a:1%)			
Fotal Distributional 1 Attribute /ariances	Tests Test Bartlett Equa		0.0186919 iance	97			Decision( Equal Vari				
Distributional 1 Attribute	Tests Test		0.0186919 iance	97 Test Stat	23 Critical	-	Decision( Equal Vari Normal Dis	ances			
Distributional 1 Attribute /ariances Distribution	Tests Test Bartlett Equa	W Norma	0.0186919 iance	97 <b>Test Stat</b> 1.407	23 Critical 15.09	<b>P-Value</b> 0.9236	Equal Vari	ances			
Distributional 1 Attribute /ariances Distribution Mean Dry Biom	Tests Test Bartlett Equa Shapiro-Wilk	W Norma	0.0186919 iance	97 <b>Test Stat</b> 1.407	23 Critical 15.09	<b>P-Value</b> 0.9236	Equal Vari Normal Dis	ances stribution		CV%	%Effort
Distributional T Attribute /ariances Distribution Iean Dry Biom Conc-% C	Tests Test Bartlett Equa Shapiro-Wilk nass-mg Summary	W Norma / ount	0.0186919 iance ality	97 Test Stat 1.407 0.9542	23 Critical 15.09 0.884 95% UCL	P-Value 0.9236 0.3325 Min	Equal Vari Normal Dis Max	ances stribution Std Err	Std Dev	CV%	%Effect
Distributional T Attribute /ariances Distribution lean Dry Biom Conc-% C	Tests Test Bartlett Equa Shapiro-Wilk nass-mg Summary Control Type Co	W Norma / ount	0.0186919 iance ality <b>Mean</b>	97 Test Stat 1.407 0.9542 95% LCL	23 Critical 15.09 0.884 95% UCL 0.8125	P-Value 0.9236 0.3325 Min 0.689	Equal Vari Normal Dis Max 0.876	ances stribution Std Err 0.03818	<b>Std Dev</b> 0.07636	9.75%	0.0%
Distributional T Attribute /ariances Distribution lean Dry Biom conc-% C	Tests Test Bartlett Equa Shapiro-Wilk nass-mg Summary Control Type Co Dilution Water 4	W Norma / ount	0.0186919 iance ality Mean 0.7835	97 Test Stat 1.407 0.9542 95% LCL 0.7545 0.6682	23 Critical 15.09 0.884 95% UCL 0.8125 0.7358	P-Value 0.9236 0.3325 Min 0.689 0.578	Equal Vari Normal Dis Max 0.876 0.774	ances stribution Std Err 0.03818 0.04445	<b>Std Dev</b> 0.07636 0.0889	9.75% 12.66%	0.0% 10.4%
Distributional 1 Attribute /ariances Distribution Mean Dry Biom Conc-% C E	Tests Test Bartlett Equa Shapiro-Wilk nass-mg Summary Control Type C Dilution Water 4 4	W Norma / ount	0.0186919 iance ality Mean 0.7835 0.702 0.7375	97 Test Stat 1.407 0.9542 95% LCL 0.7545 0.6682 0.7071	23 Critical 15.09 0.884 95% UCL 0.8125 0.7358 0.7358 0.7679	P-Value 0.9236 0.3325 Min 0.689 0.578 0.649	Equal Vari Normal Dis <b>Max</b> 0.876 0.774 0.831	ances stribution <b>Std Err</b> 0.03818 0.04445 0.03998	<b>Std Dev</b> 0.07636 0.0889 0.07996	9.75% 12.66% 10.84%	0.0% 10.4% 5.87%
Distributional T Attribute /ariances Distribution Mean Dry Biom Conc-% C	Tests Test Bartlett Equa Shapiro-Wilk nass-mg Summary Control Type Co Dilution Water 4 4	W Norma / ount	0.0186919 iance ality Mean 0.7835 0.702	97 Test Stat 1.407 0.9542 95% LCL 0.7545 0.6682	23 Critical 15.09 0.884 95% UCL 0.8125 0.7358	P-Value 0.9236 0.3325 Min 0.689 0.578	Equal Vari Normal Dis Max 0.876 0.774	ances stribution Std Err 0.03818 0.04445	<b>Std Dev</b> 0.07636 0.0889	9.75% 12.66%	0.0% 10.4%





Analyst: <u>DW</u> QA:\_\_\_\_\_

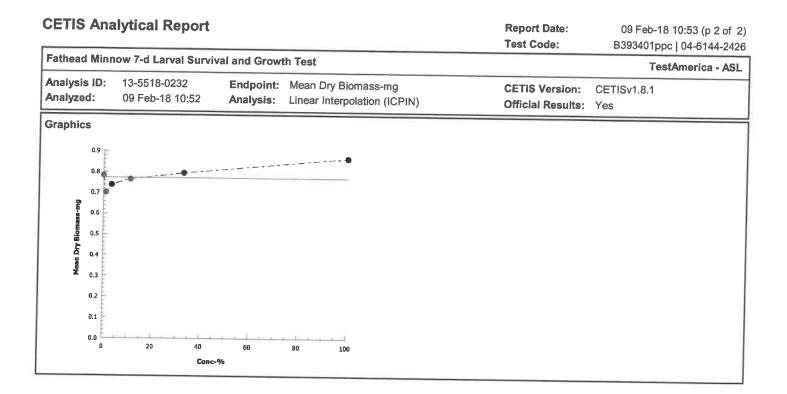
### **CETIS Analytical Report**

 Report Date:
 09 Feb-18 10:53 (p 1 of 2)

 Test Code:
 B393401ppc | 04-6144-2426

Fathe													
	ad Minn	ow 7-d Larval	Survival an	d Growt	h Test							Test	America - A
Analy Analy	sis ID: zed:	13-5518-0232 09 Feb-18 10		dpoint: alysis:	Mean Dry Bio Linear Interpo	0	N)		TIS Versio		CETISv1 Yes	.8.1	
Batch Start I Endin Durati	Date: g Date:	08-0704-4629 30 Jan-18 12: 06 Feb-18 09: 6d 21h	50 Pro 20 Sp	st Type: otocol: ecies: urce:	Growth-Surviv EPA/821/R-02 Pimephales pr Aquatox, AR	2-013 (2002)		Dil	ne:	vlod-⊢ ≎48h	lard Synti	netic Wa	iter
Receiv	le Date:	15-0881-8956 29 Jan-18 05:( 30 Jan-18 10:1 32h (0.6 °C)	05 Mai 15 Sou	terial:	B3934-01 Unknown Energy Northw	vest (WA 00	25151)		ent: iject:				
Linear	Interpol	ation Options											
X Tran	sform	Y Transform	n See	d	Resamples	Exp 95%	CL Met	hod					
Log(X+	-1)	Linear	185	691299	200	Yes	Two	-Point Inter	polation				
Residu	al Analy	sis										_	
Attribu	te	Method			Test Stat	Critical	P-Value	Decision	(a. E0/)				
	• \/=L					ondoal	r-value	Decision	i(u:5%)				
Extrem			xtreme Valu	e	1.816	2.802	1.0000	No Outlie	ers Detecte	ed			
Point E Level	e value stimate % >100		xtreme Valu 95% UCL N/A	e TU <1	1.816 95% LCL N/A		1.0000	No Outlie	ers Detecte	ed			
Point E Level IC25	stimate % >100	s 95% LCL	<b>95% UCL</b> N/A	TU	95% LCL	95% UCL N/A	1.0000 culated Va		ers Detecte	ed			
Point E Level IC25 Mean E Conc-%	Estimate % >100 Dry Biom % Co	s 95% LCL N/A ass-mg Summ ntrol Type	95% UCL N/A hary Count	TU	95% LCL	95% UCL N/A			ers Detecte		Effect		
Point E Level IC25	Estimate % >100 Dry Biom % Co	s 95% LCL N/A ass-mg Summ	95% UCL N/A hary	<b>TU</b> <1	<b>95% LCL</b> N/A	95% UCL N/A Cal	culated Va	riate		% 0. 1( 5. 2. -1	Effect 0% 0.4% 87% 27% .53% 0.75%		
Point E Level IC25 Mean E Conc-% 0 1 3.3 11 33 100	Stimate % >100 Dry Biom 6 Co Dil	s 95% LCL N/A ass-mg Summ ntrol Type	<b>95% UCL</b> N/A <b>Dary</b> <b>Count</b> 4 4 4 4 4 4	TU <1 Mean 0.7835 0.702 0.7375 0.7658 0.7955	95% LCL N/A Min 0.689 0.578 0.649 0.702 0.744	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		
Point E Level IC25 Mean E Conc-% 0 1 3.3 100 Mean D Conc-%	Estimate: % >100 Dry Biom 6 Co Dil Dil	s 95% LCL N/A ass-mg Summ ntrol Type ution Water	<b>95% UCL</b> N/A <b>Dary</b> <b>Count</b> 4 4 4 4 4 4	TU <1 Mean 0.7835 0.702 0.7375 0.7658 0.7955	95% LCL N/A Min 0.689 0.578 0.649 0.702 0.744	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		
Point E Level IC25 Mean E Conc-% 0 1 3.3 11 33 100 Mean D Conc-%	Estimate: % >100 Dry Biom 6 Co Dil Dil Pry Biom	s 95% LCL N/A ass-mg Summ ntrol Type ution Water	<b>95% UCL</b> N/A hary Count 4 4 4 4 4 4	TU <1 Mean 0.7835 0.702 0.7375 0.7658 0.7955 0.8678	95% LCL N/A Min 0.689 0.578 0.649 0.702 0.744 0.76 Rep 3 0.876	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853 0.952 Rep 4 0.786	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		
Point E Level IC25 Mean E Conc-% 0 1 3.3 100 Mean D Conc-%	Estimate: % >100 Dry Biom 6 Co Dil Dil Pry Biom	s 95% LCL N/A ass-mg Summ ntrol Type ution Water ass-mg Detail ntrol Type	95% UCL N/A Count 4 4 4 4 4 4 4 4 4 8 6 7 8 8 9 0.783	TU <1 Mean 0.7835 0.702 0.7375 0.7658 0.7955 0.8678 Rep 2 0.689	95% LCL N/A Min 0.689 0.578 0.649 0.702 0.744 0.76 Rep 3	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853 0.952 Rep 4	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		
Point E Level IC25 Mean E Conc-% 0 1 3.3 11 33 100	Estimate: % >100 Dry Biom 6 Co Dil Dil Pry Biom	s 95% LCL N/A ass-mg Summ ntrol Type ution Water ass-mg Detail ntrol Type	95% UCL N/A Count 4 4 4 4 4 4 4 4 4 0.783 0.698	TU <1 Mean 0.7835 0.702 0.7375 0.7658 0.7955 0.8678 0.8678 Rep 2 0.689 0.578	95% LCL N/A 0.689 0.578 0.649 0.702 0.744 0.76 Rep 3 0.876 0.774	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853 0.952 Rep 4 0.786 0.758	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		
Point E Level IC25 Mean D Conc-% 0 1 3.3 11 33 100 Mean D Conc-% 0 1 3.3	Estimate: % >100 Dry Biom 6 Co Dil Dil Pry Biom	s 95% LCL N/A ass-mg Summ ntrol Type ution Water ass-mg Detail ntrol Type	95% UCL N/A Count 4 4 4 4 4 4 4 4 0.783 0.698 0.699	TU <1 0.7835 0.702 0.7375 0.7658 0.7955 0.8678 <b>Rep 2</b> 0.689 0.578 0.831	95% LCL N/A 0.689 0.578 0.649 0.702 0.744 0.76 <b>Rep 3</b> 0.876 0.774 0.649	95% UCL N/A Cal Max 0.876 0.774 0.831 0.869 0.853 0.952 Rep 4 0.758 0.758 0.771	culated Var Std Err 0.03818 0.04445 0.03998 0.03633 0.02259	riate Std Dev 0.07636 0.0889 0.07996 0.07267 0.04517	<b>CV%</b> 9.75% 12.66% 10.84% 9.49% 5.68%	% 0. 1( 5. 2. -1	0% ).4% 87% 27% .53%		

Analyst:\_\_\_\_\_QA:\_\_\_\_\_



Analyst: DN QA:\_\_\_\_

000-092-181-1

### **APPENDIX B**

# **REFERENCE TOXICANT DATA SHEETS**

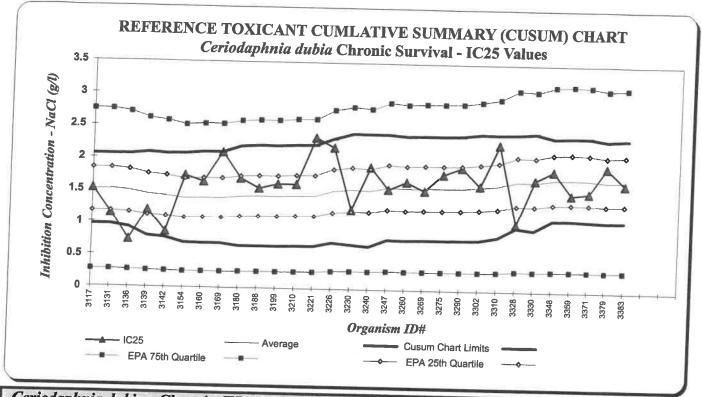
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### *Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client			QA /	QC			Test St	art Date	1-	9-18		
Sample Descript	ion		Na	Cl			Initial S	Sample ID			3-06	2
Data summarize	d by		ME	>								
Percent or Concentration	A	В	Total Li	ve Young	Produced E	l in First 3	Broods p	er Replica H	te I	1 1	# Alive Adults	Total Live Young
Control	25 AD?	24 AD?	AD? M	32 AD?	36 AD?	32 AD?	3Z AD?	33 AD?	30 AD?	3   AD?	9/9	275
0.25 g/L	AD? M	19 AD?	28 AD?	30 AD?	28 AD?	29 AD?	29 AD?	32 AD?	32 AD?	12 AD?	9/9	239
0.50 g/L	2 AD?	22 AD?	24 AD?	30 AD?	22 AD?	25 AD?	25 AD?	ZLe AD?	32 AD?	AD?	10	243
1.0 g/L		14 AD?	10 AD?	22 AD?	AD?	19 AD?	ZY AD?	13 AD?	15 AD?	AD?	16	168
1.5 g/L	AD?	15 AD?	AD?	) <b>8</b> AD?	AD?	AD?	1(0 AD?	20 AD?	ZO AD?	AD?	10	139
2.0 g/L		H AD?	3 AD?	AD?	AD? X	AD? X	AD? X	AD?	AD?		3	-7
4.0 g/L		D? 🗡	O AD? 🗶		AD? ×	0	0	6	0		0	0
Test Organism Mo	rtality (Ad	ult dead)	= AD?	$\checkmark$		# of Alive	Adults =	Number o	the second se	the second se	at terminati	on
Test Organism ider	ntified as N	Male =	AD?	Μ	,	Total Line		<b>T</b> (1				
Test Organism Inju	red during	g test =	AD?	Ι		I OTAL LIVE	Young =	Total neo	nates prod	uced in firs	st 3 broods	
Footnote: As per E surviving control or	PA-600-4 ganisms h	-91-002 a ave produ	und EPA-8	21-R-02-0 third broo	13, <i>Ceric</i> d, or at th	<i>daphnia d</i> le end of <u>e</u>	<i>lubia</i> test ight days,	should be whicheve	terminate	d when 609 rst.	% of the	
Also as per EPA-82 and should not be in	1-R-02-01	3 (13.10.	9.1), "In tl	nis three-b	rood test	offspring	from four				be counted	

Endpoint	<u>IC25</u>	Cusum Chart Limits
Survival	1.67	1.08 to 2.36
Reproduction	0.58	0.26 to 1.33

Task Manager / B
Project Manager Long Ninn
QA Officer Linger Collins
0



# Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = 0.07

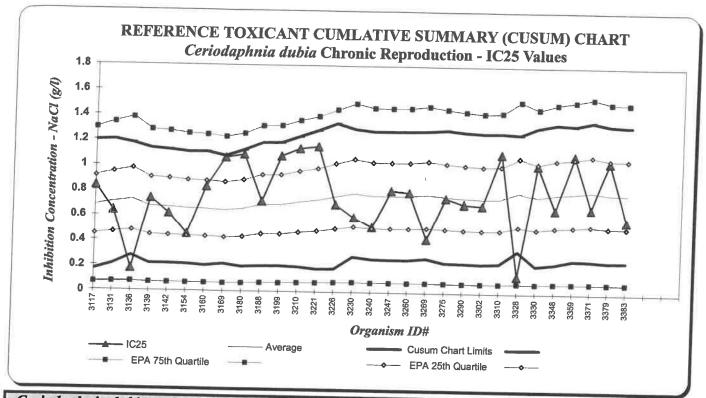
25th Quartile CV (warning limit) = 0.11

75th Quartile CV (warning limit) = 0.41

90th Quartile CV (control limit) = 0.81

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event Cerio # ID #		Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD   AVG+2SD		Intralat	
316	3328	07/20/17	1.04	1.70	0.36			CV	
317	3330	08/01/17				0.98	2.43	0.22	
318			1.73	1.70	0.37	0.95	2.45	0.18	
	3348	09/07/17	1.87	1.74	0.32	1.10	2.38	0.18	
319	3359	10/03/17	1.51	1.75	0.32	1.11			
320	3371	11/07/17	1.54	1.74			2.39	0.19	
321	3379	12/12/17			0.32	1.09	2.39	0.18	
322			1.93	1.71	0.32	1.08	2.34	0.19	
	3383	01/09/18	1.67	1.72	0.32	1.08	2.36	0.18	
323								0.10	
324									



# Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Reproduction

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = 0.08

25th Quartile CV (warning limit) = 0.17

75th Quartile CV (warning *limit*) = 0.45

90th Quartile CV (control limit) = 0.62

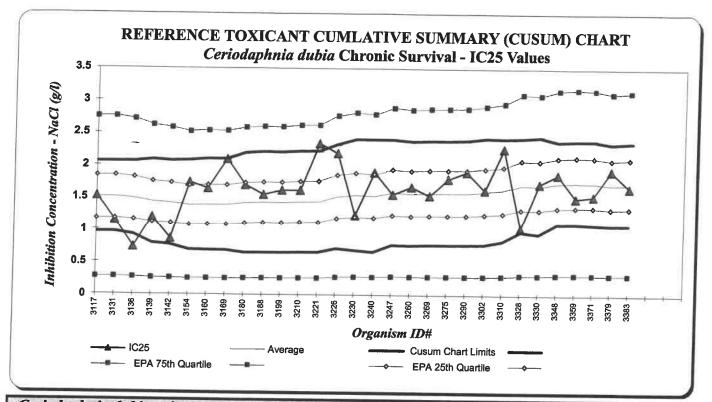
Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event Cerio # ID #		Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	art Limits AVG+2SD	Intralab CV
318	3348	9/7/2017	0.67	0.79	0.28	0.24	1.35	and the second se
319	3359	10/3/2017	1.10	0.80	0.27	0.27	1.34	0.33
320	3371	11/7/2017	0.68	0.82	0.27	0.27		0.34
321	3379	12/12/2017	1.05	0.80	0.23	0.25	1.37	0.34
322	3383	1/9/2018	0.58	0.79	0.27		1.34	0.34
323			0.00	0.73	0.27	0.26	1.33	0.35
324			_	1 1				S. F. F. F. S.

### *Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client			QA /	QC			Test Sta	art Date		2-27-	2018	
Sample Descrip	ption		Na	Cl			Initial S	ample ID	# _2	28063	-06	
Data summariz	ed by		DW									
Percent or Concentration	A	В	Total Li	ve Young	Produced E	in First 3	Broods pe	er Replica H	te I	JJ	# Alive	Total Live
Control	32 AD?	- 14 AD?	31	31 AD?	36 AD?	31 AD?	32 AD?	25 AD?	31 AD?	30 AD?	Adults	Young 293
0.25 g/L	28 AD?	28 AD?	35 AD?	24 AD?	28 AD?	28 AD?	30 AD?	30 AD?	AD?	AD?	10	278
0.50 g/L	26 AD?	30 AD?	29 AD?	30 ad?	22 AD?	27 AD?	26 AD?	29 AD?	23 AD?	22 AD?	10	264
1.0 g/L	18 AD?	AD?	22 AD?	23 AD?	AD? V	2) AD?	16 AD?	15 AD?	19 AD?	AD?	9	153
1.5 g/L	AD?	AD?	AD?	2AD?	2_ AD?	AD?	AD? V	AD?	۱Ô AD?	8 AD?	9	67
2.0 g/L	AD?	AD? V	AD?	AD?	AD?	AD?	AD? V	AD?	AD?	AD?	5	3
4.0 g/L	AD? V		AD? V				AD?	O AD?	0	AD?	0	$\bigcirc$
Test Organism M			= AD?	$\checkmark$	#	f Alive	Adults = 1	Number of	f test orga	nism alive	at terminati	on
Test Organism ide Test Organism Inj			AD?		Т	Total Live	Young = 7	Total neor	nates prod	uced in firs	st 3 broods	
Footnote: As per l surviving control of	EPA-600-4 organisms l	-91-002 a	nd EPA-82 aced their	21-R-02-0 third brood	13, <i>Cerio</i> d, or at the	<i>daphnia a</i> e end of <u>e</u>	<i>lubia</i> test s ight days, v	should be whichever	terminated	d when 609 rst.	% of the	
Also as per EPA-8 and should not be i	21-R-02-03	3 (13.10.	9.1), "In th	us three-b	rood test.	offspring	from four				be counted	

<u>Endpoint</u>	<u>IC25</u>	Cusum Chart Limits	Task Manager Doug Woom
Survival	1.68	1.06pto 2.37	Project Manager
Reproduction	0.68	0.16 to 1.33	QA Officer Stringer Cours



### Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = 0.07

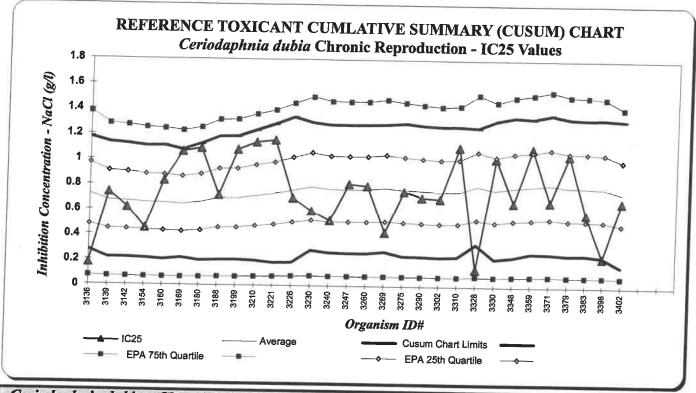
25th Quartile CV (warning limit) = 0.11

75th Quartile CV (warning *limit*) = 0.41

90th Quartile CV (control limit) = 0.81

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits	Intralab
316	3328	07/20/17	1.04	1.70	0.36		AVG+2SD	CV
317	3330	08/01/17	1.73	-		0.98	2.43	0.22
318				1.70	0.37	0.95	2.45	0.18
	3348	09/07/17	1.87	1.74	0.32	1.10	2.38	0.18
319	3359	10/03/17	1.51	1.75	0.32	1.11	2.39	0.19
320	3371	11/07/17	1.54	1.74	0.32	1.09	2.39	0.18
321	3379	12/12/17	1.93	1.71	0.32	1.08	2.34	0.19
322	3383	01/09/18	1.67	1.72	0.32	1.08	2.36	0.18
323	3398	02/06/18	1.36	1.73	0.32	1.10	2.36	0.19
324	3402	02/27/18	1.68	1.72	0.33	1.06	2.37	0.19



### Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Reproduction

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.08
- 25th Quartile CV (warning limit) = 0.17

75th Quartile CV (warning limit) = 0.45

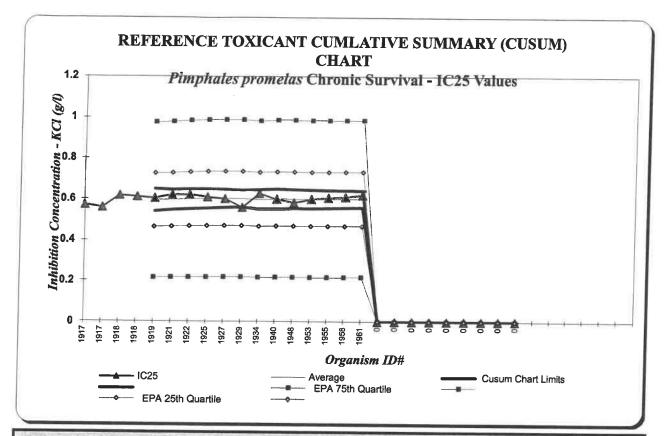
90th Quartile CV (control limit) = 0.62

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
318	3348	9/7/2017	0.67	0.79	0.28	0.24	1.35	0.33
319	3359	10/3/2017	1.10	0.80	0.27	0.27	1.34	0.33
320	3371	11/7/2017	0.68	0.82	0.28	0.26	1.34	0.34
321	3379	12/12/2017	1.05	0.80	0.27	0.25	1.37	
322	3383	1/9/2018	0.58	0.79	0.27	0.25	1.34	0.34
323	3398	2/6/2018	0.23	0.79	0.27	0.24		0.35
324	3402	2/27/2018	0.68	0.75	0.27	0.24	1.33 1.33	0.39

Backet:         Date:         Aug.         Description:         Description: <thdescription:< th="">         Description:         <thdescr< th=""><th></th><th></th><th></th><th></th><th>FATHEAD</th><th>MINNOW 7-1</th><th>DAY SURVIVA</th><th>AL AND WATE</th><th>R QUALITY DA</th><th>ТА</th><th></th><th></th></thdescr<></thdescription:<>					FATHEAD	MINNOW 7-1	DAY SURVIVA	AL AND WATE	R QUALITY DA	ТА		
Image: Second		Rando	om Template Use	ed: $6 \operatorname{conc.} x 4_{\mathrm{II}}$	eps. # Z.						2/2018	Time (1 :====
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Percent         Day         Number of Lev Organisms         Descrived of the percent of the	-	Day	0_1125 Da	1 1150 D	ay 2 1250 D	ay 3 1310	Day 4 1335	Day 5 147 8	Day 6 LISY	Day 7 198	35	
Prevent         No         B         C         D         Prevent			1	Number of	f Live Organisms		D	issolved O <sub>2</sub>				* Conductivity
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$5$ $6$ $7$ $7$ $\checkmark$ Indicates one organism inadvertently poured off during solution renewal, replaced into container.       Day 0 Temperatures = Post-renewals         "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.       Day 0 Temperatures = Post-renewals         "F" = fungus noted on dead organisms.       Pre =Pre-renewal solutions. Post =Post-renewal solutions.       Day 0 Temperatures = Post-renewals         Endpoint       IC25       Cusum Chart Limits       Task Manager         Survival $0.622$ $0.556$ to $0.644$ Project Manager         Orget Manager $0.627$ $0.624$ $0.644$	٦,										1	
$5$ $6$ $7$ $7$ $\checkmark$ Indicates one organism inadvertently poured off during solution renewal, replaced into container.       Day 0 Temperatures = Post-renewals         "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.       Day 0 Temperatures = Post-renewals         "F" = fungus noted on dead organisms.       Pre =Pre-renewal solutions. Post =Post-renewal solutions.       Day 0 Temperatures = Post-renewals <b>Endpoint</b> IC25       Cusum Chart Limits       Task Manager         Survival $0.622$ $0.556$ to $6-64$ Project Manager         Orget Logic Manager $0.627$ $0.626$ $0.664$	-1- 0-1-											
7       Day 0 Temperatures = Post-renewals $M''' = organism inadvertently poured off during solution renewal, replaced into container.       Day 0 Temperatures = Post-renewals         M''' = organism missing, start count reduced. "Inj" = organism injured, remove from stats.       Day 0 Temperatures = Post-renewals         F'' = fungus noted on dead organisms.       Pre = Pre-renewal solutions. Post = Post-renewal solutions.       Day 0 Temperatures = Post-renewals         F'' = fungus noted on dead organisms.       Pre = Pre-renewal solutions. Post = Post-renewal solutions.       Day 0 Temperatures = Post-renewals         Survival       0.622 0.566 to 0.664       Task Manager         Survival       0.627 0.566 to 0.664       Project Manager   $		5										
✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container. "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats. "F" = fungus noted on dead organisms. FF" = fungus noted on dead organisms. Endpoint IC25 Cusum Chart Limits Survival 0.62 0.56 to 0.64 Project Manager Task Manager Project Manager	-							+		+		
$\frac{I}{F''} = fungus noted on dead organisms.  Fr'' = fungus noted on dead organisms.  Survival 0.62 0.56 to 0.64 0.56 0.64 0.56 0.64 0.56 0.64 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.664 0.56 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.66 0.$	V 1-1:	· .			+		+		1		<	
Endpoint       IC25       Cusum Chart Limits       Task Manager         Survival $0.62$ $0.56$ to $6-64$ Project Manager	M" = orga	es one or	gamsm madverte ssing, start count	ntly poured off d	uring solution rene	wal, replaced in	nto container.			Dav	0 Temperatures =	- Post-renewals
Endpoint       IC25       Cusum Chart Limits       Task Manager         Survival $0.62$ $0.56$ to $6-64$ Project Manager	'F" = funø	15 noted	on dead organien	~~чиносц. щј = ( 18				Т		mometer ID use	d for all measurer	nents that day.
Survival $0.62$ $0.56$ to $0.64$ Project Manager			orne erBennon							23.8 = T	emp. out of recon	amended range
A ST		- sout			9	Jusum Chai	rt Limits	Та	sk Manager 👱	K		
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	G	rowth	0	.57	6		M.T.		4	Mi	- Cut	_

QA Officer Annow Collins REFTOX - FHM chronic (KCI) ASL1282-(017 xism Date Control ID: ASL1282-1017



#### Pimephales promelas - Chronic (EPA Test Method 1000.0)

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

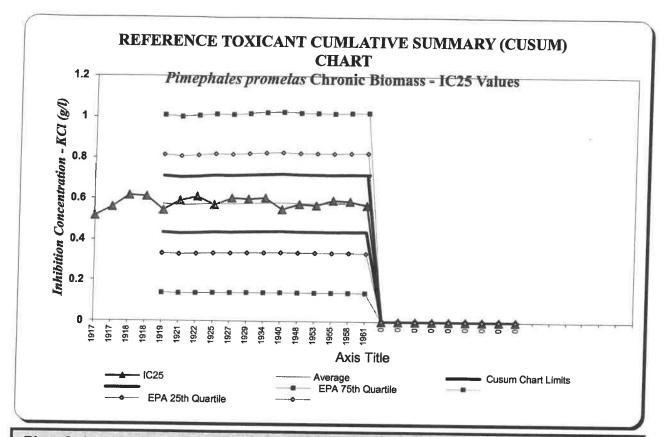
Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.03
- 25th Quartile CV (warning limit) = 0.11
- 75th Quartile CV (warning limit) = 0.32
- 90th Quartile CV (control limit) = 0.52

Intralab CV is compared to EPA	Varning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),
If lab CV is outside	EPA Control limits, the EPA Control limits are used to set Cusum chart limits

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
6	1919	03/28/17	0.60	0.60	0.03	0.54	0.65	0.05
7	1921	04/04/17	0.62	0.6	0.02	0.55	0.65	0.04
8	1922	04/11/17	0.62	0.6	0.02	0.55	0.65	0.04
9	1925	05/09/17	0.61	0.60	0.02	0.56	0.65	0.04
10	1927	06/13/17	0.60	0.6	0.02	0.56	0.65	0.04
11	1929	06/20/17	0.56	0.6	0.02	0.56	0.64	0.03
12	1934	07/20/17	0.63	0.6	0.02	0.55	0.65	0.04
13	1940	08/01/17	0.60	0.6	0.02	0.55	0.65	0.04
14	1948	09/12/17	0.58	0.6	0.02	0.56	0.65	0.04
15	1953	10/10/17	0.60	0.6	0.02	0.56	0.65	0.04
16	1955	11/07/17	0.61	0.6	0.02	0.56	0.64	0.04
17	1958	12/12/17	0.61	0.6	0.02	0.56	0.64	0.04
18	1961	01/17/18	0.62	0.6	0.02	0.56	0.64	0.03
19							1	No. Sel
20								THE STAT



### **Pimephales promelas - Chronic (EPA Test Method 1000.0)**

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.12
- 25th Quartile CV (warning limit) = 0.21
- 75th Quartile CV (warning limit) = 0.38
- 90th Quartile CV (control limit) = 0.45

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
7	1921	4/4/2017	0.59	0.6	0.04	0.43	0.71	0.07
8	1922	4/11/2017	0.61	0.6	0.04	0.43	0.71	0.06
9	1925	5/9/2017	0.57	0.58	0.04	0.44	0.72	0.06
10	1927	6/13/2017	0.60	0.58	0.03	0.44	0.71	0.06
11	1929	6/20/2017	0.60	0.58	0.03	0.44	0.72	0.06
12	1934	7/20/2017	0.61	0.58	0.03	0.44	0.72	0.06
13	1940	8/1/2017	0.55	0.58	0.03	0.44	0.72	0.05
14	1948	9/12/2017	0.58	0.58	0.03	0.44	0.72	0.05
15	1953	10/10/2017	0.57	0.58	0.03	0.44	0.72	0.05
16	1955	11/7/2017	0.59	0.58	0.03	0.44	0.72	0.05
17	1958	12/12/17	0.59	0.58	0.03	0.44	0.72	0.05
18	1961	01/17/18	0.57	0.58	0.03	0.44	0.72	0.05
19								La state of
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21								
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FHM Chronic Growth (KCI), 1/28/2018

ASL912-0711

#### **APPENDIX C**

### **CHAIN OF CUSTODY**

THE LEADER IN ENVIRONMENTAL TESTING	Sample Receipt Recor
Batch Number: <u>B3934</u> Client/Project: <u>Energy Northwest</u>	Date Received: 1/30/18 Received By:
Were custody seals intact?	Yes No N/A
Packing Material:	Ice Blue Ice Box
Temp OK? (<6C) Therm ID: TH173 Exp. 4/13/18	0-6 °C X Yes No N/A
Was a Chain of Custody (CoC) Provided?	Yes No N/A
Was the CoC correctly filled out (If No, document below)	Yes No N/A
Were the sample containers in good condition (not broken or leak	ing)?
Are all samples within 36 hours of collection?	Yes No N/A
	FedEx UPS Greyhound Other: N/A
	and the second
- HO	7373 829L

CH2MHILL Applied Sciences Laboratory (ASL)

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137	Concentration and/or Comments	Sec attached secret from permits Reichronic tests. Reichronic tests. Reichronic tests. Reichronic tests. Reichronic tests. Reichronic tests. Reichronic tests. Reichronic tests. Batelline Datelline Datelline Datelline Datelline Shipping # COC Bioassay
EstAmerica       CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING         Mater and Market       North west       NPDES# WA CO25 15-1       Ship Samples to:       TestAmerica         Address       PC BSS 9C BSS 9C BSS       PO#       NPDES# WA CO25 15-1       Ship Samples to:       TestAmerica         Address       PC BSS 9C BSS 9C BSS       PO#       NPDES# WA CO25 15-1       Ship Samples to:       TestAmerica         Address       PC BSS 9C BSS 9C BSS       PO#       Volume/Sample       PO#       Attention: Aq         Address       PC BSS 9C BSS 9C BSS       Composite Sample Information       Po#       PO#       PO#         Address       PC BSS 9C BSS 9C BSS       Composite Sample Information       Po#       Po#       PO#         Address       PC BSS 9C BSS 9C BSS       Composite Sample Information       PO#       PO#       PO#         Address       Positie Bio       Point       Po#       Po#       Po#       Pitention: Aq         Phone:       So 9S 373 40.5       Date       Point       Pitention       Po       Phone: 541.2         Phone:       So 9S 373 40.5       Date       Point       Point       Point       Point       Pitent       Point       Pitent       Point       Pitent       Point <td>Mage     Mage       Mage     Mage    <t< td=""><td>Please sign and print name) (Please sign and print name)</td></t<></td>	Mage     Mage       Mage     Mage <t< td=""><td>Please sign and print name) (Please sign and print name)</td></t<>	Please sign and print name) (Please sign and print name)

TestAmerica	Sample Receipt Record
Batch Number: <u>B3934</u> Client/Project: <u>Enlygy</u> NW	Date Received: <u>2/1/18</u> Received By:
Were custody seals intact?	Yes 🗌 No 🛄 N/A
Packing Material:	Ice Blue Ice Box
Temp OK? (<6C) Therm ID: TH173 Exp. 객 \\영\\영	O.7°C X Yes No N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, document below)	Yes No N/A
Were the sample containers in good condition (not broken or leaking)?	📈 Yes 🗌 No 🗍 N/A
Are all samples within 36 hours of collection?	Yes 🗌 No 🔲 N/A
Method of Shipment: Hand Delivered FedEx	UPS Greyhound Other: N/A

#### Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:	
Resolution to Exception:		

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137	Concentration and/or Comments Chron 2 A Stanple for Chron 2 A Stanple for Chron 2 A Stanple for	Date/Time Date/Time Date/Time Date/Time Date/Time Date/Time Date/Time
IestAmerica       CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING         Intervent manuary       Main of the state of the stat	A contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Contrainers Con	Sampled By & Title     Please sign and print name)     Date/Time     Relinquished By     Please sign and print name)       Received By     Cov     Cov     Cov     Cov     Cov     Cov       Received By     Clease sign and print name)     Date/Time     Relinquished By     Please sign and print name)       Received By     Clease sign and print name)     Date/Time     Relinquished By     Please sign and print name)       Received By     (Please sign and print name)     Date/Time     Relinquished By     (Please sign and print name)       Received By     (Please sign and print name)     Date/Time     Relinquished By     (Please sign and print name)       Nork Authorized By     (Please sign and print name)     Date/Time     Shipped Via     Interest       Work Authorized By     (Please sign and print name)     Date/Time     Shipped Via     Interest       Work Authorized By     (Please sign and print name)     Scalas     Scalas     Scalas     Scalas

Client/Project: $f_{1}$ Were custody seals intact? $f_{2}$ Packing Material: $f_{2}$ Temp OK? (<6C)       Therm ID:         TH173 Exp. $f_{1} < f_{2}$ Was a Chain of Custody (CoC) Provided? $f_{2} < f_{2}$ Was the CoC correctly filled out (If No, document below) $f_{2}$ Were the sample containers in good condition (not broken or leaking)? $f_{2}$ Are all samples within 36 hours of collection? $f_{2}$	Batch Number: B 3930	4-03			Sample Re		
Packing Material:       Ice Blue Ice         Temp OK? (<6C) Therm ID: TH173 Exp. $\dot{c}/ - (\xi' - c\xi)$ 0.6 °C       Yes No         Was a Chain of Custody (CoC) Provided?       Yes No       Image: Container Single Containers in good condition (not broken or leaking)?       Yes No         Ware the sample containers in good condition (not broken or leaking)?       Yes No       Yes No         Are all samples within 36 hours of collection?       Yes No       Yes No         Wethod of Shipment:       Hand Delivered       FedEx       UPS       Greyhound       Other:       Image: Container Single Con				By:	2		
Temp OK? (<6C)       Therm ID: TH173 Exp. $4 - (8 - 18)$ 0.6 °C       Yes       No         Was a Chain of Custody (CoC) Provided?       Image: State and the sta	Were custody seals intact?				Yes 🗌	No 🗌	] N/A
Was a Chain of Custody (CoC) Provided? Image: Second State   Was the CoC correctly filled out (If No, document below) Image: Second State   Were the sample containers in good condition (not broken or leaking)? Image: Second State   Were all samples within 36 hours of collection? Image: Second State   Method of Shipment: Image: Hand Delivered FedEx UPS   Greyhound Other: Image: Second State	Packing Material:					llue Ice 🗌	Вох
Was the CoC correctly filled out (If No, document below)   Yes   No   Were the sample containers in good condition (not broken or leaking)?   Yes   No	Temp OK? (<6C) Therm ID: TI	H173 Exp. 4~18 ~18		0 6 °C	Yes	No 🗌	N/A
Vere the sample containers in good condition (not broken or leaking)?       Yes       No         Inve all samples within 36 hours of collection?       Yes       No         Idethod of Shipment:       Hand Delivered       FedEx       UPS       Greyhound       Other:	Vas a Chain of Custody (CoC) F	Provided?			Yes 🗌	No 📋	N/A
Image: Arre all samples within 36 hours of collection?       Image: Yes       No         Image: Arre all samples within 36 hours of collection?       Image: Hand Delivered       FedEx       UPS       Greyhound       Other:       Image: Hand Delivered       FedEx       UPS       Greyhound       Other:       Image: Hand Delivered       Image: Hand Delivered       FedEx       UPS       Greyhound       Other:       Image: Hand Delivered       Image: Hand Delivere <t< td=""><td>Vas the CoC correctly filled out (</td><td>If No, document below)</td><td></td><td></td><td>🗋 Yes 🗌</td><td>No 🗌</td><td>N/A</td></t<>	Vas the CoC correctly filled out (	If No, document below)			🗋 Yes 🗌	No 🗌	N/A
lethod of Shipment: Hand Delivered FedEx UPS Greyhound Other:	Vere the sample containers in g	ood condition (not broken or leaking)	?		🖄 Yes 🗌	No 🗌	N/A
	re all samples within 36 hours o	f collection?			Yes 🗌	No 🗌	N/A
	lethod of Shipment:	Hand Delivered Fed	x UPS Grey	hound Oth	her:		N/A
ient was notified on: Client contact: esolution to Exception:		Client contact:					

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137	Concentration and/or Bra Sam de Jur Chronic Tox test. EPA. 824 R. 02.013	Date/Time Date/Time Date/Time Date/Time Date/Time Shipping # COC_Bioassay
CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING         Nav Huest       NPDES# WA 002515-1       Ship Samples to:         Base 96.8       VA 002515-1       Ship Samples to:         Post       Composite Sample Information       Po#         Post       Composite Sample Information       Po#         Post       Composite Samples/Hour       Volume/Sample         Post       Samples/Hour       Volume/Sample         Post       Total Hours       Total Volume         Part LePase       Initiated:       Date         Part LePase       Ended:       Date       Date         Part LePase       Chilled During Collection       Time       Date         Con hard       Bate       02.0218       Time       Check Ammonia (YN)         Analysis Required       Particled       Particled       Date       Date         Con hard       Bate       02.0218       Time       Check Ammonia (YN)         Analysis Required       Particled       Particled       Particled       Particled         Part Scource       Part Part Part Particled       Particled       Particled       Particled       Particled         Part Part Part Part Part Part Part Part	Image: Sector of the sector	By & Title       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Inclusion of the sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         By       (Please sign and print name)       Date/Time       Relinquished Via       (Please sign and print name)         Norized By       (Please sign and print name)       Date/Time       Shipped Via       (Please sign and print name)         Norized By       (Please sign and print name)       Remarks       2/3/1/5       09.25       UPS       Bis       Fed-Ex       Hand
Project #	Sample ID 1 &0.78.1 .03	Sampled By & Title Received By Received By Work Authorized By



TestAmerica	
THE LEADER IN ENVIRONMENTAL TESTING ROL MB 2-27-18	Sample Receipt Record
Batch Number: <u>B3954 BA (-61)</u> Client/Project: <u>Energy MU</u>	Date Received: PC Received By: 3/3-9/18
Were custody seals intact?	Yes 🗌 No 🗌 N/A
Packing Material:	
Temp OK? (<6C) Therm ID: TH173 Exp. 4/18/18	3.1 °C 🛛 Yes 🗌 No 🗌 N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 📄 N/A
Was the CoC correctly filled out (If No, document below)	Yes No N/A
Were the sample containers in good condition (not broken or leaking)?	Yes No N/A
Are all samples within 36 hours of collection?	Yes 🗌 No 🔲 N/A
Method of Shipment:	UPS Greyhound Other: N/A

#### Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:	
Resolution to Exception:		

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137 Dechlorinated (Y/N)	Concentration and/or Comments	Chronic toxicity test	EPA-921-12-02-013		Date/Time © 22618 Date/Time	Date/Time	Shipping #	Dec Cantral 12: ASL 612-0717
Istancia       Composite Sample Information       Ship Samples to:       TestAmerica         Address       PO       Samples/Hour       Volume/Sample         Address       PO       Samples/Hour       Volume/Sample         Address       PO       Total Hours       Total Volume         Romact Person:       Jost       Total Hours       Total Volume         Project #       Check Chlorine (YN)       Temp. Upon Arrival (°C)       De         Analysis Required (YN)       De       Analysis Required (Commonia       De	Fathead Acute Fathead Chronic Cerio Chronic Cerio Chronic SHM Acute SHM Acute SHM Acute				Jane Le Park Environmental Sei e (Please sign and print name)	(Frease sign and print name) Date/Time	ted By (Please sign and print name) Remarks	AB ILL ODS' 2.4'C PRIV

# <u>TestAmerica</u>

THE LEADER IN ENVIRONMENTAL TESTING

F

#### Sample Receipt Record

Batch Number: <u>B 3954 B</u> Client/Project: <u>Erlergy IW</u>	Date Received: 3/1/18 Received By: PC
Were custody seals intact?	Yes No N/A
Packing Material:	Ice 🗌 Blue Ice 🗌 Box
Temp OK? (<6C) Therm ID: TH173 Exp. 4/18/18	0.3°C Pres No N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 🗌 N/A
Was the CoC correctly filled out (If No, document below)	Yes 🗌 No 🗌 N/A
Were the sample containers in good condition (not broken or leaking)?	Yes 🗌 No 🗌 N/A
Are all samples within 36 hours of collection?	Yes 🗌 No 🗌 N/A
Method of Shipment: Hand Delivered FedEx	UPS Greyhound Other: N/A

#### Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:
Resolution to Exception:	

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137	Decriformated (Y/N) Concentration and/or Comments	Date/Time 0.22313 1230 Date/Time Date/Time	her Shipping # Or pur man boc control 10. ASL 612-0717
TestAmerica       CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING         Matterser memonenese memonenese memonenese memonenese memonenese memonenes and the memonenese memonenes and the memonenese memonenes memonenes mem	Image: Discrete state     Comments       1     Sample Discrete       1     Sample Discrete       1     Sample Comments       1	284	Zed By (Please sign and print name) Date/Time Shipped Via Zed By (Please sign and print name) Remarks Sed a coulor dullvered to shipped or Sed a coulor dullvered to shipped

TestAmerica		Samula Ressint Ressul					
Batch Number: <u>B3954-03</u> Client/Project: <u>Energy</u> NW	Date Received: Received By:	Sample Receipt Record 3-3-18 @ 0915 D. WINN					
Were custody seals intact?		Yes No N/A					
Packing Material:		X Ice Blue Ice Box					
Temp OK? (<6C) Therm ID: THAT'S Exp. Therm	# 257	C Yes No N/A					
Was a Chain of Custody (CoC) Provided?		X Yes No N/A					
Was the CoC correctly filled out (If No, document below	v)	Yes 🗌 No 🗌 N/A					
Were the sample containers in good condition (not brol	(en or leaking)?	X Yes 🗌 No 🗌 N/A					
Are all samples within 36 hours of collection?		X Yes No N/A					
Method of Shipment: Hand De	livered FedEx UPS Greyhound	Other: N/A					
Sample Exception Report (The following exceptions were noted)							

Client was notified on:

Client contact:

Resolution to Exception:

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137 Phone: 541.243.6137	Concentration and/or Comments	12°27	Date/Time ວິ3ວ21 ຈິ ວິຊັບນ Date/Time		37
DES COMPLIANCE BIOMONITORING         0025/5 - /       Ship Samples to:         01 Information       PO#         10 Infortion       Pom Arrival (°C)         10 Infortion       Temp. Upon Arrival (°C)         10 Infortion       Panalysis Bornino	A     A     A     A     A       A     A     A     A       B     A     A     A       Containers     A     A       Containers     A       Containers     A       Containers     A       Containers     A       Cerio Acute     A       Cerio Acute     A       A     Cerio Acute       A     Cerio Chronic       A     Cerio Chronic       A     A       A     A       A     Cerio Chronic       A     A       A     A       A     A       A     A       A     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B     A       B	03 Martines ENW-Reg CW grab-3 CW grab-3	e)     Date/Time     Relinquished By     (Please sign and print name)       e)     030218     0529     Relinquished By     (Please sign and print name)       e)     Date/Time     Relinquished By     (Please sign and print name)       e)     Date/Time     Relinquished By     (Please sign and print name)	Date/Time Shipped Via <u>UPS</u> Bis Fed-Ex Hand Other Scale & Cac/er de Wire to cl	3954-03
Initiated: Chain of CUSTODY RECORD FOR NP Matter and Address Po RX PU A PASS Composite Samp Client Energy Navhuest NPDES# WA Address Po RX Pu A PASS Composite Samp Richland WA PASS Samples/Hour Contact Person: Jane Lelas Samples/Hours Contact Person: Jane Lelas Date Phone: Fag. Stryour Project # Contract 34476 Chilled During Co	Sample Sample ID Date Time Comp. G	<b>180871-C</b> <b>180871-C</b> Customer #: Site: CW Date: 63021	Received By Stritle (Please sign and print name) Received By (Please sign and print name) Received By (Please sign and print name) Received By (Please sign and print/name)	Received By (Please sign and print name) Work Authorized By (Please sign and print name)	



# **BIOASSAY REPORT**

CHRONIC BIOASSAYS CONDUCTED May 1 through May 10, 2018

Prepared for

ENERGY NORTHWEST RICHLAND, WASHINGTON

Prepared by



THE LEADER IN ENVIRONMENTAL TESTING

ASL

1100 NE Circle Boulevard, Suite 310 Corvallis, Oregon 97330 541-207-0995

NELAC #OR100022 State of Washington Department of Ecology (WDOE), Lab ID C1233 California State Environmental Laboratory Accreditation Program, Certificate No.: 1726

> Revision 1 Report Date: June 6, 2018 Original Report Date: May 25, 2018 Lab I.D. No. B3990-chr

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## **INTRODUCTION**

TestAmerica ASL (TA-ASL) – Bioassay Laboratory conducted chronic bioassays using the *Pimephales promelas* (fathead minnow) and the water flea (*Ceriodaphnia dubia*), on samples provided by Energy Northwest, Richland, Washington. The tests were conducted from May 1 through May 10, 2018.

Please note that the *P. promelas* scheduled to be used on May 1 did not arrive as planned (shipping issue). New organisms were ordered and the *P. promelas* test was initiated with the May 2 sample on May 3, 2018.

Also note that acute testing using the *Ceriodaphnia dubia* (water flea) was also initiated at this time. As per client request, the acute results will be reported separately.

The original report was issued on May 25, 2018. Revision 1 of the report was issued to address editorial comments made of the original report.

## **OVERVIEW OF REGULATORY GUIDANCE**

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from TA-ASL's reading of the NPDES permit for Energy Northwest's Columbia Generating Station in Richland, WA (permit #WA002515-1, effective Nov 1, 2014, expires Oct 31, 2019, modified Feb 8, 2016).

### **Chronic toxicity:**

Testing:

- "Conduct chronic toxicity testing ... once per quarter in the year prior to submission of the application for permit renewal."
- "Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 11% effluent. The series of dilutions should also contain the CCEC of 1% effluent."
- o "The CCEC equals 1% effluent."

Sampling and Reporting Requirements:

- $\circ$  "The permittee must collect grab samples ... must cool the samples to 0-6 degrees Celsius during collection and send them to the lab immediately upon completion."
- "The lab must begin the toxicity testing ... no later than 36 hours after sampling was completed."
- "The Permittee must chemically dechlorinate final effluent ... with sodium thiosulfate just prior to test initiation. Do not add more sodium thiosulfate than is necessary to neutralize the chlorine. Provide in the test report the calculations to determine the amount of sodium thiosulfate necessary ..."

The following is taken from the WDOE guidance (WQ-R-95-80, June 2016 revision):

"To reduce WET limit violations (and anomalous concentration-response relationships) due to statistical significance that is a Type I error [false positive], we lower alpha when differences in test organism response are small."

"Alpha will be lowered from 0.05 to 0.01 if a ... 20% difference in a chronic test is significant."

#### **SUMMARY OF TEST RESULTS**

Exhibit 1 provides a summary of the final test results.

#### EXHIBIT 1 Summary of Chronic Test Results

Species	<b>NOEC (%)</b>	LOEC (%)	IC <sub>25</sub> (%)	
C. dubia	33.0	100	53.6	
P. promelas	100	> 100	> 100	

Note: acronyms are as defined below.

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

More detailed information is provided in the Results and Discussion section.

### **ACRONYM DEFINITIONS (from EPA guidance):**

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).

LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).  $IC_{25} =$  Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.

### **SAMPLE INFORMATION**

Exhibit 2 provides a summary of the sample conditions as received.

#### EXHIBIT 2 Sample Conditions on Receipt

Sample ID				
TA-ASL SDG		B3	990	
+ suffix	-01	-02	-03	-04
Collection - Date and Time	04/30/2018 05:27	05/02/2018 05:20	05/04/2018 05:15	05/07/2018 05:15
Receipt - Date and Time	05/01/2018 10:30	05/03/2018 10:30	05/05/2018 12:20	05/08/2018 10:35
Temperature (°C)	2.7	2.2	3.1	3.6
Dissolved Oxygen (mg/L)	8.4	10.0	9.5	8.4
pH	7.2	7.8	7.9	8.0
Conductivity (S/cm)	1430	1392	1415	1436
Total Residual Chlorine (mg/L)	0.04 <sup>a</sup>	0.06 <sup>a</sup>	0.04 <sup>a</sup>	0.04 <sup>a</sup>
Ammonia (mg/L as NH <sub>3</sub> -N)	< 0.10	< 0.10	< 0.10	< 0.10
Total Hardness (mg/L as CaCO <sub>3</sub> )	354	760	795	830
Total Alkalinity (mg/L as CaCO <sub>3</sub> )	110	104	135	120

Water quality measurements during testing remained within test design limits as prescribed by EPA and WDOE, except as noted with the individual test results. (see the Results and Discussion section)

#### **METHODS AND MATERIALS**

#### **TEST METHODS**

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (2002), EPA-821-R-02-013.

Additional guidance was provided by:

Whole Effluent Toxicity Testing Guidance and Test Review Criteria, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

#### **DEVIATIONS FROM PROTOCOLS**

Deviations from required procedures in the test methods:

None noted.

Deviations from recommended procedures in the test methods:

EPA guidance recommends the DO concentration and pH should be checked at the beginning of each test and daily throughout the test period. Due to analyst error, the pH was not measured on Day 1 of testing for the pre-measurements on the *P. promelas* chronic test.

#### **TEST DESIGN**

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

#### Overall Test Design:

Chronic tests: 1.0, 3.3, 11.0, 33.0, and 100 percent sample + dilution water for the control.

#### Test Organism Conditions:

All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002).

The test organisms appeared vigorous and in good condition prior to testing.

#### C. dubia chronic test:

Source: TA-ASL's in-house cultures

Age: Less than 24 hours old and within an 8-hour age range, with blocking by known parentage

Design: Ten test vessels per concentration, one organism per vessel Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival and neonate production (with brood determination)
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- o Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination:

• Survival: @ after 7 days.

• Reproduction: When 60%+ of surviving control organisms produce a  $3^{rd}$  brood. Endpoints: Survival (at Day 7) and Reproduction (through first 3 broods)

P. promelas chronic test:

Source: Aquatox Inc., Hot Springs, Arkansas

Age: Less than 48 hours old and within an 24 hour age range

Design: Four test vessels per concentration, ten organisms per vessel

Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination: 7 days after test initiation.

Endpoints: Survival and Growth (average dry weight per organism added @ initiation)

## **DILUTION WATER**

The dilution water used was the standard culture water used by TA-ASL:

Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as CaCO<sub>3</sub> and an alkalinity of 60 to 70 mg/L as CaCO<sub>3</sub>.

## SAMPLE COLLECTION AND STORAGE

Samples were collected by Energy Northwest personnel. The samples were accepted as scheduled by TA-ASL. Chain of Custody and Sample Receipt Records are provided in Appendix C.

All samples were received within the EPA recommended 0 to 6 °C range.

All samples were received within the WDOE required 0 to 6 °C range.

All samples were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection.

All subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample.

All subsequent uses of a sample occurred within the WDOE recommended maximum holding time of 72 hours past the time of sample collection.

Following receipt, the samples were stored in the dark at 0 to 6 C until test solutions were prepared and tested.

#### SAMPLE PREPARATION

Samples used during these tests were:

Temperature adjusted prior to test initiation and each daily renewal. Dechlorination with sodium thiosulfate <u>was</u> performed.

### **DATA ANALYSIS**

The statistical analyses performed for the chronic tests were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, USEPA Office of Water, Fourth Edition (EPA 2002), EPA-821-R-02-013, using CETIS.

Additional guidance was provided by *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A. If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

#### **RESULTS AND DISCUSSION**

The raw data sheets are presented in Appendix A.

#### **CHRONIC BIOASSAYS**

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test initiated on May 1, 2018.

Su	Table 1 mmary of Chronic Res <i>C. dubia</i>	sults
Sample Concentration (%)	Percent Survival	Mean Number of Young Per Adult
Control	100	26.4
1.0	100	28.6
3.3	100	26.8
11.0	100	26.7
33.0	100	23.5
100	100	16.9 <sup>a</sup>

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

$$\begin{array}{rll} \text{NOEC} &=& 33.0 \ \% \\ \text{LOEC} &=& 100 \ \% \\ \text{IC}_{25} &=& 53.6 \ \% \end{array}$$

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival and	d growth data for the I	P. promelas chronic test initiated on
May 3, 2018.		

S	Table 2 Summary of Chronic Res <i>P. promelas</i>	ults
Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Organism Added (mg)
Control	100	0.783
1.0	100	0.706
3.3	97.5	0.695
11.0	97.5	0.787
33.0	100	0.799
100	100	0.859

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

 $\begin{array}{rll} NOEC &=& 100 \ \% \\ LOEC &>& 100 \ \% \\ IC_{25} &>& 100 \ \% \end{array}$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *P. promelas* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

## **REFERENCE TOXICANT TESTS**

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* chronic reftox test was conducted using sodium chloride. The *P. promelas* chronic reftox test was conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

T Chronic Reference	able 3 e Toxicant Tests	; (g/L)
Species	IC <sub>25</sub>	Cusum Chart Limits
C. dubia (survival)	1.41	1.10 to 2.27
<i>C. dubia</i> (reproduction)	0.54	0.18 to 1.21
<i>P. promelas</i> (survival)	0.62	0.57 to 0.64
P. promelas (growth)	0.53	0.45 to 0.73

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

## **APPENDIX A**

# **RAW DATA SHEETS**

filtered? organism " - " = sample not dechlorinated, or analyte not collected/needed. noted) 60 um From EPA manual (EPA-821-R-02-013, 8.8.7): 0.025 ml of a 26.8 g/L stock of sodium thiosulfate will reduce 0.10 mg/L TRC in a 1L sample. na 1 -01 sample Calc: (**20** L sample) x (**0.03** mg/L TRC) x 0.25 = **0.030** ml of 26.8 g/L sodium thiosulfate to add (ID: **2 6065-01**) ml of 26.8 g/L sodium thiosulfate to add (ID: 23065.01) ml of 26.8 g/L sodium thiosulfate to add (ID: 23065 .0 ( 0 36 242 as Rc'vd Cond. 5 1405 (Su) na 00 14 5-1-18 1 0:0 5-10 7.7 as Rc'vd Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page. Hd 22 19 na (for example: 4L of sample at 0.10 mg/L TRC needs 0.10 ml of 26.8g/L sodium thiosulfate stock to be dechlorinated) **DO NOT** add more sodium thiosulfate if "after Dechlor" TRC reading is not reduced to < 0.02 mg/L. Leave as is. (mg/L) 5 Dechlorination is REQUIRED if Total Residual Chlorine (TRC) is detected (i.e. TRC is 0.02 mg/L or greater). as Rc'vd 5 かい 0 DQ na N 00 Ĩ, Date Test Termination: Date Alkalinity mg/l as 5 mg/L CaCO3 as Rc'vd Test Initiation: 28 (20 110 104 ۲ # Hardness CaCO<sub>3</sub> mg/l as 5 mg/L as Rc'vd 254 795 630 092 Conductivity 0.10 mg/L Ammonia NH<sub>3</sub>-N as Rc'vd 20:10 へのい 0.20 <010> ×0.10 mg/l 02.0 likely whetherence. 3990 0.01 Dechlorination allowed 10.00 × / after Dechlor. A Did not recluce. 11 # 000 Hardness Alkalinity Comments:  $\square$  Indicates the action was taken, ( $\square$ = action not taken): L sample) x ( $\partial$ .  $\omega d$  mg/L TRC) x 0.25 = -03 sample Calc:  $(20 \text{ L sample}) \times (0, 0.4 \text{ mg/L TRC}) \times 0.25 =$ 200 Chlorine (mg/l) Total Residual 0.02 mg/L 81-1-5 mag SDG # B μH 0,03 FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA as Rc'vd 0.04 0.04 40:0 2 # 2.2 З.С as Rc'vd Temp 2.7 (C) Ň na Dissolved Oxygen 10:30 0:30 ( Pacific Zone) 12:20 Time 1035 Received Reporting Limits: -02 sample Calc: (20 02:27 05/01/18 81/20/20 02:50 81/20/20 (mm/dd/yy) 05 105 118 05/02/14 Date Water Quality Meters Used/ID#: Jane LaPage (509) 377-4061 ( Pacific Time 51.50 Zone) 05/04/12 15 15 Energy Northwest Collected 21/10/50 04/30 /18 (mm/dd/yy) mg/l as CaCO<sub>3</sub> M 64 sf. Date 5 0 mg/l as CaCO<sub>3</sub> 2 25 R G 4662 181063-02 4655 121063 -03 181063-01 04 5 Ë Field ID 23 ł 18/063 Recon MH (FHM) TestAmerica 10-099223 -02 -03 2 Dilution Water Sample ID Number Contact Client 1

Or OCI my/L TAL & O'25 - C.22 Wel or 2.13 of Srof Backy NW - Cerio acute + chronics (use in 2018). xlsm Doo Control 12: AS1 899-0917

X 7

21.52

= the tho-

TestAmerica

## FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

Client

# **Energy Northwest**

Sample Designation (SDG): B 3990

	Cd # 3422	FHM # 555 W6 Pimephates 5241	Cd # 3422	
<b>Test Species Information</b>	Ceriodaphnia dubia	Pimephates <sup>574</sup> 1 promelas	Ceriodaphnia dubia	
	Chronic	Chronic	Acute	
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window	< 24 hrs	
Test Container Size	30 ml	800 ml	30 ml	
Test Volume	15 ml	500 ml	25 ml	
Feeding: Type and Amount	0.10 ml Algae and 0.10 ml YCT daily	0.15 ml <i>Artemia</i> , 2 x Daily	Algae and YCT during acclimation	
Aeration: In Test Chambers via Slow Bubbl	None Prior to use	<ul> <li>None</li> <li>Prior to use</li> <li>(a) hrs</li> </ul>	<ul><li>None</li><li>Prior to use</li></ul>	
Acclimation Period	<24 hrs	<24 hrs	<24 hrs	
Organism Source	In-House	Agustar	In-House	
Size	-	=	-	
Loading Rate	-	-	and a second sec	

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): 
All
Date:

Comments:

								4									3 325															
	1		23		<	1		91- 7-5 5- 9 and	_	1	_	H			3-18	~	Trish gid not	•														
est temp sed.			Initials	2020	SHW	1	240	3	MAR		MAS				5 22		ر دکر															
mbient or t ntry was us		į	lime	Où - M	21-10	1.95	1.50	0	00		6				R068AM 5-3-18	١	H															
ture adjusted to a e previous day's e		ĥ	Date	V/ / 2018	<u>ا</u> ر		0 0 0 V	2 2 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1		1111			Initiale	CIDINITY	- CANA	SAW .	0	R. Du.		R Qui	ANC -	-p			Initials	Com						
= Tempera r food as the		A loss H	Algae ID	# N.C.	# 1127	# 11 CA	60" / L	10:1	- 10r	= = 2 l	1 1 1 1 1 1 1 1 1		Time		14	11:29	03:20	2014	N N N	01	2	9260		Ē	TILLE	V.						
one. Temp adj. dilution water, o		CT TOV	Used		1	0	150	1-		   2	al I		Date		Stort 15	5 131"18	81=121 S	SI 2/2	-1-11-2	01/4/2	5/8/10			Data	Date	NOV 2018 11 50 001						
a, ∐ Indicates task was d the same SDG, batch of		Dilution Water	Used	D# 46 S<	D# 1655	D# 4 6 547	D# L/ CP	D# (165%	2		D#		Dilution Water	Used		D# 4657	D# 46 58	1D# 46.58		D# 4KSG	1D# 4/ 40	4662		Dilution Wotor	Used	リキュー						385 mls
Note: $\Box$ Indicates task not done, $\overrightarrow{\Delta}$ Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp Ditto marks (''') indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used.		Daily Sample Prenaration	(prior to dilution)	🗆 Temp adj, 🗆 Aerated	🗆 Temp adj, 🗆 Aerated	🗆 Temp adj, 🗖 Aerated	🗖 Temp adj, 🗍 Aerated	Temp adi, [	🗆 Temp adj, 🗌 Aerated				Daily Sample Preparation	(prior to dilution)	🗖 Tomp adj, 🗖 Acrated 🗕	🗖 Temp adj, 🗖 Aerated	🗖 Temp adj, 🔲 Aerated	🗖 Temp adj, 🗖 Aerated	🗆 Temp adj, 🗖 Aérated	🗖 Temp adj, 🗖 Aerated	🔲 Temp adj, 🔲 Aerated	2000 13-2-2-1 R		Dailv Samnle Prenaration	(prior to dilution)	🗆 Temp adi. 🗖 Aerated						Total Sample volume needed per day = 385 mls
		Sample ID	Used	0 (Initiation) B3690 - 01	B -01	B .02	B -C2	B .03	B 41 - U3	B -03	B		Sample ID	Used	10-01/10	B3940-07	B 02	B -03	B -U3	B   -03	B -034	FO T		Sample ID	Used	0 (Initiation) B3990 - 01						Total Sar
cord		Test	Day	0 (Initiation)	1	2	3	4	5	9	7		Test	Day	-0 (Initiation)	0.	17	4	5	5	N	9		Test	Day	0 (Initiation)						
ution R		Final	Volume	(mls)	200	200	200	200	200	200	297 mls		Final	Volume	(mls)	2000	2000	2000	2000	2000	2000	2966 mls		Final	Volume	(mls)	200	200	200	200	200	200
nd Dil	Chronic				î	↑	↑	↑	1	î		nic		*		↑	↑	↑	↑	<b>↑</b>	î		Acute		-		Ŷ	¢	¢	î	î	î
ration a /est	dubia - (	Sample	Volume	(mls)	0.00	2.00	6.60	22.0	66.0	200	needed per (	w - Chronic	Sample	Volume	(mls)	0.00	20.0	66.0	220	660	2,000	needed per o	tubia - A	Sample	Volume	(mls)	0.00	12.5	22.0	50.0	100	200
Test Solution Preparation and Dilution Record Client: Energy Northwest	Ceriodaphnia dubia - Chronic	Test	Concentration	(%)	Control	1.0	3.3	11.0	33.0	100	Total Sample volume needed per day =	Fathead minnow	Test	Concentration	(%)	Control	1.0	3.3	11.0	33.0	100	Total Sample volume needed per day =	Ceriodaphnia dubia - Acute	Test	Concentration	(%)	Control	6.25	11.0	25.0	50.0	100
Test S. Client:											É											Ĭ										

192

Energy NW - Cerio acute + chronics (use in 2018).xlsm Doc Control I2: ASL 3890-0917



Ceriodaphnia dubia **Survival and Reproduction Test Data Summary** 

Client		Eı	nergy No	orthwest			Test Star	rt Date	<u></u>	5-1-12	5	
Sample Descripti	on						Initial Sa	ample ID#	B	3990-	0(	
Data summarized	l by -		Br									
Percent												Total
or			Total Liv	e Young	Produced	in First 3	Broods pe	r Replicate	e		# Alive	Live
Concentration	A	B	C	D	E	F	G	H	I	J	Adults	Young
Control	14	28	29	31	29	27	33	25	35	13	JD	264
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10	
1.0 %	30	29	30	30	23	31	35	3(	33	14	10	286
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10	00
3.3 %	26	32	31	36	24	28	31	31	19	10		268

AD?

AD?

AD?

22

AD?

28

28

AD?

AD?

AD?

AD?

32

29

23

AD?

AD?

AD?

AD?

29

33

10

Survival data summarized through Day 7. 60%+ of surviving controls with 3+ broods first observed on Day  $_{-}$ 

Test Organism Mortality (Adult dead) =

AD?

AD?

AD?

AD?

14

16

16

AD?

AD?

AD?

AD?

31

25

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AD?

AD?

AD?

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AD?

30

27

AD?

AD?

AD?

AD?

32

20

16

AD?

AD?

29

AD?

15

AD?

26

AD?  $\checkmark$ 

> AD? Μ

AD?

Ι

Test Organism identified as Male =

11.0 %

33.0 %

100 %

Test Organism Injured during test =

# of Alive Adults = Number of test organism alive at termination (for WDOE only, = Number of test organisms alive at Day 7)

12

AD?

AD?

AD? 12

AD?

13

4

AD?

AD?

AD?

AD?

33

15

218

D

١D

 $\bigcirc$ 

D

267

235

169

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, Ceriodaphnia dubia test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

o's obtained f	from	A	В	C	D	E	F	G	H	I	J	Incubator I	Jsed: # 🍫
Culture Board	HID:	J	J	J	J	J	2	5	J	5	5	Random Te	
Sl	ot #:	12	17	18	23	32	34	36	37	43	48		conc #7
ent			1	Energy No	orthwest				Test I	nitiation: Dat	te: 5111	2013 Time	14.75
nle Descript	tion			511418) 110	Initi	al Sample ID	# B 2090	- 01	Tom	mination. Dat	5.9.1	2019 Time	19.30
nician Da	wo 3	~ Dow	1 Day	2 Zor Do			m _ Jiv	David Sind	Davi 7 Kino	Deri 9	<u></u>	20 0 1100	01:00
e Da	ay 0 143	Day Day	1095¢ Day	2 1225 Da	y 3 <sup>1</sup> 375 Da	ay 4 ( <b>470</b> )	Day 5 1955	Day 6 <u>1155</u>	Day 7 Day 7	_ Day 8 Day 8		20 <b>18</b> Time	
ercent	Day	A	В	l c	Daily Nu D	mber of Live E	Young for each		н	T	т	No. Live	Daily Tota
	1	0	0	0	0	0	I O	G	п U		J	Adults	Live Youn
-	2	D	0	0	0	0	0	0	0	0	0	10	0
	3	0	3	0	5	0	0	0	0	0	0	10	8
Control	4		0	6	0	6	4	6	5	7	3	10	42
	5	500	11	10	()	10	9	11	9	13	10	10	103.
	6	0	14	13	15	13	14	14	<u>li</u>	15	0	10	1241
	7	រេះ	-	-	$\bigcirc$	-	-	-	-	-	15	10	-
	8	_										1.1.1.1.2	
	1 2	0	0	0	0	D	0	0	0	0	ø	10	0
	3	0	0	0	3	0	0	6	0	0	0	10	0
	4	6	04	0	5	6	0	0	Q Q	5	0	10	33
	5	12	- ú	10	11	8	ic	11	12	13	59	10	108
	6	12	14	14	16	9	15	18	13	15	0	10	126
	7		_	-	-	-	(1)	(V)	-	-	17	10	-
	8											1.5	
	1	D	0	Ō	0	0	6	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	3	Ц	0	0	3	0	5	2	0	0	10	17
m —	4	0	0	7	5 13	0	4	0	0	6	3	10	25
	5	9	12	10	13	9	10	11	11	13	7	10	105
-	6	14	14	14	(2)	12	14	15	18	2	0	10	121
_	7 8		-			~	-			15	15	10	
	1	0	0	0	0	Ø	0	0	0	0	0	10	0
2	2	O	0	0	0	D	0	0	Ü	0	0	10	0
	3	0	5	3	0	2	c1	0	3	0	0	10	17
	4	4	0	0	6	0	0	5	110	6	4	10	26
	5	10	11	10	10	10	10	11	11	<u>(</u>	3	10	102
-	6	0	15	17	16	14	14	16	14	16	0	10	122
	7	10	-	-	-	-	$\bigcirc$		0	Tablan .	15	10	
		0	0	0	0	0	0	Ø	0	0	0	10	0
_	_	0	0	0	0	0	0	0	0	0	0	10	0
3	-	0	2	4	D	0	0	2	S	0	0	10	13
% <b>0.05</b>		le l	0	0	4	4	3	0	0	5	ч	10	21
r 5	5	10	12	9	10	10	12	11	10	10	9	10	103 P 90.93
6	5	0	11	14	6	15	13	16	18	0	0	10	<b>HS</b> :93
_	7	10	()	$\bigcirc$	-	~	-	$(\mathcal{V})$		16	15	1D	
	3						-76			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		-	
1	_	0	0	0	0	0	0	0	0	0	0	10	0
2		0	0	0		0	0	0	0	0	0	10	0
e 3		0	0	0	0	0	2	C	0	0	A B	10	0
% 001 5		7	9	7	0	7	7	<u> </u>	10	5	6	10	12
	_	0	14	13	10	8	13	15		12	4	10	72 85
7		14	-	-	12	-0	-15	- 15	2		-	10	05
8													

 $^{"}AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, "/" = split brood ( carry-over brood / current day brood ), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood$ 

Footnote: As per WDOE, C. dubia test reproduction should be when 60% of the surviving control organisms have produced their third brood (Days 6, 7, or 8). Survival is at seven days. V= near test percent, not a civrately civrately control on PAY 7 - not needed 3~ 5-B-TS

(estAn	(estAmerica	CERIODAPHNIA WATER QUALITY DATA	
Client	Client Energy Northwest Sample Description	Initiated Date $\frac{5}{1}$ i / 2016 Time $14$ :35 Initial Sample ID # $B 3 29 0$ - $01$	Adults Isolated Date $\frac{1/2}{\sqrt{3}e/20}$ is Time $\overline{13}:0.3$ Neo's Collected Date $\frac{1/3e/20}{\sqrt{3}e/20}$ is Time $23:4$
Tech:	Day 2	Day 4 See Day 5 Sec	Day 6 3 Day 7 0 Day 8
Time	$Day 0 \frac{ \mathcal{M}:\mathcal{AO} }{ \mathcal{M}:\mathcal{AO} } Day 1 \frac{ \mathcal{L} :\langle S }{ \mathcal{D} } Day 2 \frac{\mathcal{U}}{ \mathcal{D} }$	14:25 Day 4 14:38 Day 5 12:10	16:30 Day 7 09:50 Day 8
Therm.	Day 0 # • • • •	So Day 5 # 200	Day 6 # 25 C Day 7 # 43 Day 8 #
%	Dissolved Oxygen (mg/l) Dav	pH Dav	Temperature (°C) / Conductivity (μS) (1 <sup>st</sup> use of each sample only) Dav
	2 3 4	2 3	
Control	76 7. 2.5/ 7.5/ 2.0/ 2.0/ 2.3/ 2.2/ 8.0 0.2 18.0 12.2 19 12.	12/ 2'8 0'2 1'8 2 12'8 L'4 0'3	22. 6 244 24. 6 242 28 2 242 242 24
9	1.2/ 62/ 4/ 22/ 6.2/ 40/ 8.2	/22/23/22/02/5.12/00/K.E	12:1/24.3/m2/24.3/2.2/22/22/22/22/22/22/22
6 O.I	0/002	7.5 /2.5 /2.5 /2.1 /2 /2.2 /	1/// brs// set / hes
% ε	/200/ 20 / 34/ 44/ 3. 6/ 3. 6 2.2	/82/23/22/0ra/6.4/em/4.4 82	22/24.17 25.6/24.6/25.8/28.2.12 25.2 /2.12 /2.22
·£	10,3	C'0/5	1 1 1 Jave 1 200 1 1 1
% 0.11	10/ 50/ 54/ 18/ Etc/ L'M / 2.2	/ 22 / 2 3/ 2 / 0°6 / 5-2 / 2 / E-2 32	/ 22/ 2. 12/ 2. 2/ 2. 2/ 2. 2/ 2. 2/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/ 1. 22/
ī	a land to lan lair lais	12 4.8 / 2,0 /12 /22	s/ hor her/
% 0*	23/20/20/20/20/20/20/20/20/202/202	12/22/23/23/08/2.2/22/22/22	21/ 1/22/22/22/1/22/22/22/22/22/22/22/22/22/
88	0:0	643	A38 / Me/ /201 / / / /
% (	10° - 12- 10° - 10°	12 / 1a/ Lu/03/8.4 /24 / 2.4	22:3/ 22.3/ 24.3/ 24.0/ SAP / 24.0/ 24.0/ 24.0/ 24.2/
100	1 -1 / 24 / 3- 3/ 31 / 1/2 / 22 /	1 2.6 his 18:0 hs 18 130 1	/1/ /392 / 1380 / / / /
COM	COMMENTS: Temperatures taken just prior to test solution renewals. DO,	DO, pH, and Conductivity taken following organism transfer.	(23.8)
			= Temp out of
Note:	Note: All Day 0 data represents conditions at initiation. All other days: numerator represe	nerator represents pre-renewal conditions, denominator represents post-renewal conditions.	enewal conditions.

Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

CETIS Sum	nmary Repo	rt							port Date: st Code:			54 (p 1 of 2) 0-7951-0576
Ceriodaphnia	7-d Survival an	d Rep	roduc	tion Te	est						TestAm	erica - ASL
Batch ID: Start Date: Ending Date: Duration:	14-0029-3205 01 May-18 14:3 08 May-18 09:2 6d 19h			ocol: cies:	Reproduction-S EPA/821/R-02-0 Ceriodaphnia du In-House Cultur	013 (2002) ubia		Dil	uent: Mo ine:	chelle Benne od-Hard Synt 4H		
	08-6195-8425 30 Apr-18 05:2 01 May-18 10:3 33h (2.7 °C)		Code Mate Sour Stati	erial: rce:	B3990-01 🗸 Unknown Energy Northwe	est (WA 002	5151) 🗸		ent: oject:			
Comparison S	Summary											
Analysis ID 06-6062-3441 01-6798-9167	Endpoint 7d Survival Rate Reproduction	e	(	<b>NOEL</b> 100 33	LOEL >100 100	TOEL NA 57.45	PMSD NA 27.1%	<b>TU</b> 1 3.03		act/Bonferro		
Point Estimate	e Summary											
Analysis ID 13-2991-5185	Endpoint Reproduction		(-	Level IC25	% 53.63	95% LCL 20.19	95% UCL 81.06	<b>TU</b> 1.865	Method Linear Int	terpolation (I	CPIN)	
Test Acceptab			<						<u> </u>	D. I.I.		
Analysis ID 06-6062-3441 01-6798-9167 13-2991-5185 01-6798-9167	Endpoint 7d Survival Rate Reproduction Reproduction Reproduction	9		Contro	ol Resp ol Resp ol Resp	Test Stat           1           26.4           26.4           0.2705	<b>TAC Limi</b> 0.8 - NL 15 - NL 15 - NL 0.13 - 0.47		Overlap Yes Yes Yes Yes	Passes A Passes A	cceptability cceptability cceptability cceptability	Criteria 🛩
7d Survival Ra	te Summary											
0 1 3.3	Control Type Dilution Water	<b>Cour</b> 10 10 10		<b>Mean</b> 1 1	95% LCL 1 1 1	95% UCL 1 1	Min 1 1 1	Max 1 1 1	<b>Std Err</b> 0 0 0	<b>Std Dev</b> 0 0 0	0.0% 0.0% 0.0%	%Effect 0.0% 0.0% 0.0%
11 33 100		10 10 10 10	2J	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	0 0 0	0 0 0	0.0% 0.0% 0.0%	0.0% 0.0% 0.0%
33	Summary	10 V 10	3	1	1	1	1	1	0	0	0.0%	0.0%
33 100 Reproduction C-%	Summary Control Type Dilution Water	10 10 10 <b>Coun</b> 10 10		1	1	1	1 1	1	0	0	0.0%	0.0%

Sgy

Analyst: MB QA: 3-

CETIS	Summary Repo	ort			Report Date: Test Code:		22 May-18 11:54 (p 2 of 3 B399001cdc   00-7951-057				
Ceriodap	hnia 7-d Survival ar	nd Reprod	uction Test	:						TestAm	nerica - ASL
7d Surviv	/al Rate Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
1		1	1	1	1	1	1	1	1	1	1
3.3		1	1	1	1	1	1	1	1	1	1
11		1	1	1	1	1	1	1	1	1	1
33		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1
Reproduc	ction Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	14	28	29	31	29	27	33	25	35	13
1		30	29	30	30	23	31	35	31	33	14
3.3		26	32	31	36	24	28	31	31	19	10
11		14	31	30	32	26	28	32	29	33	12
33		16	25	27	20	29	28	29	33	15	13
100		16	24	21	16	15	22	23	10	18	4
7d Surviv	al Rate Binomials										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
3.3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
11		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
33		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Analyst: UB QA:\_\_\_\_\_

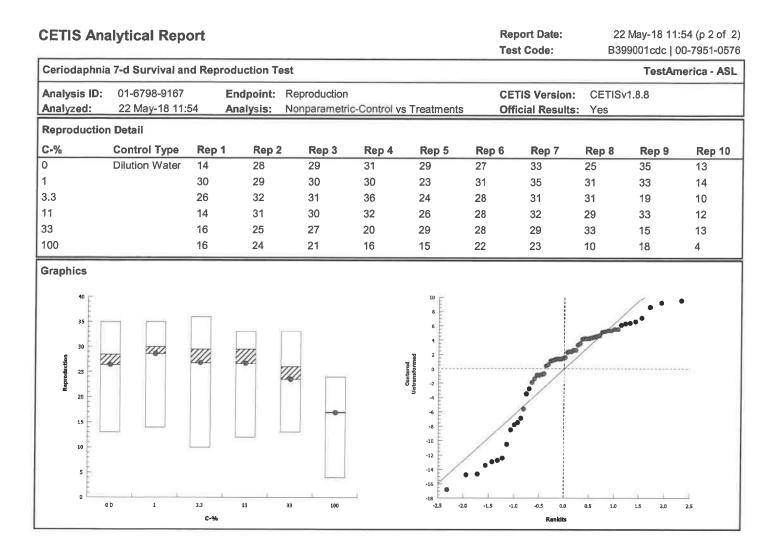
#### **CETIS Analytical Report Report Date:** 22 May-18 11:54 (p 1 of 2) **Test Code:** B399001cdc | 00-7951-0576 Ceriodaphnia 7-d Survival and Reproduction Test **TestAmerica - ASL** Analysis ID: 06-6062-3441 Endpoint: 7d Survival Rate **CETIS Version:** CETISv1.8.8 Analyzed: 22 May-18 11:54 Analysis: STP 2x2 Contingency Tables **Official Results:** Yes Batch ID: 14-0029-3205 Test Type: Reproduction-Survival (7d) Analyst: **Michelle Bennett** Start Date: 01 May-18 14:35 Protocol: EPA/821/R-02-013 (2002) **Diluent:** Mod-Hard Synthetic Water Ending Date: 08 May-18 09:20 Species: Brine: Ceriodaphnia dubia **Duration:** 6d 19h Source: In-House Culture Age: <24H Sample ID: 08-6195-8425 Code: B3990-01 **Client:** Sample Date: 30 Apr-18 05:27 Material: Unknown **Project:** Receive Date: 01 May-18 10:30 Source: Energy Northwest (WA 0025151) 33h (2.7 °C) Sample Age: Station: **Data Transform** Zeta Alt Hyp Trials Seed NOEL LOEL TOEL TU Untransformed C > T NA NA 100 >100 NA 1 Fisher Exact/Bonferroni-Holm Test Control C-% **Test Stat P-Value** P-Type Decision(a:5%) vs **Dilution Water** 1.0000 Non-Significant Effect 1 1 Exact 3.3 1 1.0000 Exact Non-Significant Effect 11 1 1.0000 Exact Non-Significant Effect 33 Non-Significant Effect 1 1.0000 Exact 100 1.0000 Exact Non-Significant Effect 1 **Test Acceptability Criteria** Attribute Test Stat TAC Limits Overlap Decision Control Resp 0.8 - NL Yes Passes Acceptability Criteria 1 **Data Summary** C-% **Control Type** NR R NR + R **Prop NR** Prop R %Effect **Dilution Water** 0 10 0 10 1 0 0.0% 1 10 0 10 1 0 0.0% 3.3 10 0 10 1 0 0.0% 11 10 0 10 0 0.0% 1 33 0 10 10 1 0 0.0% 100 10 0 10 1 0 0.0% 7d Survival Rate Detail C-% **Control Type** Rep 2 Rep 1 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 9 Rep 10 Rep 8 **Dilution Water** 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 3.3 1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1 1 1 33 1 1 1 1 1 1 1 1 1 1 100 1 1 1 1 1 1 1 1 1 1 7d Survival Rate Binomials C-% **Control Type** Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Rep 9 Rep 10 0 Dilution Water 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/11/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1 3.3 1/1 1/1 1/1 1/1 1/1 1/11/11/1 1/11/1 11 1/1 1/11/1 1/11/11/11/11/11/11/133 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1100 1/11/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1

CETIS Analytical Report	Report Date:	22 May-18 11:54 (p 2 of 2)
	Test Code:	B399001cdc   00-7951-0576

Ceriodaphnia	7-d Survival and Re	production T	est		TestAmerica - ASL
Analysis ID: Analyzed:	06-6062-3441 22 May-18 11:54	Endpoint: Analysis:	7d Survival Rate STP 2x2 Contingency Tables	CETIS Version: Official Results:	CETISv1.8.8 Yes
Graphics 1.0 0.9 0.8 0.7 0.6 0.7 0.5 0.4 0.3 0.2 0.1 0.2 0.1 0.2		•••	• •		
0	D 1 3.3 C-1	11 33 %	100 100		

Ceriodaphnia	a 7-d Survival ar	nd Repro	duction Te	st						TestAn	nerica - AS
Analysis ID: Analyzed:	01-6798-9167 22 May-18 11:			Reproduction Nonparametric	c-Control ve	s Treatments	-	TIS Version		1.8.8	
Batch ID: Start Date: Ending Date: Duration:	14-0029-3205 01 May-18 14: 08 May-18 09: 6d 19h	35 P 20 S	est Type: Protocol: Species:	Reproduction-3 EPA/821/R-02 Ceriodaphnia o In-House Cultu	Survival (70 -013 (2002 dubia	d)	Ana	ient: Mo ne:	ichelle Benne od-Hard Synt 24H		r
	08-6195-8425 30 Apr-18 05:2 : 01 May-18 10:: 33h (2.7 °C)	27 M 30 S	laterial:	B3990-01 Unknown Energy Northw	vest (WA 00	025151)	Clie Pro	ent: ject:			
Data Transfor		Zeta	Alt Hy		Seed		PMSD	NOEL	LOEL	TOEL	TU
Untransformed	l	NA	C > T	NA	NA		27.1%	33	100	57.45	3.03
Steel Many-O Control Dilution Water	ne Rank Sum Te vs C-% 1 3.3 11 33 100*	<b>∍st</b>	<b>Test S</b> 118.5 107 109 92.5 71	tat Critical 75 75 75 75 75 75	5 1 2 1 5 1 6 1	<b>P-Value</b> 8         0.9860           8         0.8746           8         0.9082           8         0.4393           8         0.0214	P-Type Asymp Asymp Asymp Asymp Asymp	Non-Sigi Non-Sigi	nificant Effect nificant Effect nificant Effect nificant Effect	:	
Fest Acceptab	oility Criteria										
Attribute	Test Stat	TAC Lin	nits	Overlap	Decisior	1					
Control Resp	26.4	15 - NL		Yes	Passes A	Acceptability	Criteria				
PMSD	0.2705	0.13 - 0.	.47	Yes		Acceptability					
Auxiliary Test	s										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:5%)			
Extreme Value		xtreme Va		2.517	3.2	0.5945	No Outlie	rs Detected			
Control Trend	Mann-Kei	ndall Tren	d	2.517	1.96	0.0575		Foont Trong	d in Controls		
				2.017		0.8575	Non-signi				
ANOVA Table				2.011		0.8575	Non-signi				
ANOVA Table Source	Sum Squa	ires	Mean S	Square	DF	0.8575	Non-signi P-Value	Decision			
Source Between	887.0833	ares	<b>Mean S</b> 177.416	Square 67	<b>DF</b> 5				ı(α:5%)		
Source Between Error	887.0833 2627.9	ares	Mean S	Square 67	<b>DF</b> 5 54	F Stat	P-Value	Decision	ı(α:5%)		
Source Between Error Fotal	887.0833 2627.9 3514.983	1765	<b>Mean S</b> 177.416	Square 67	<b>DF</b> 5	F Stat	P-Value	Decision	ı(α:5%)		
Source Between Error Total Distributional	887.0833 2627.9 3514.983 Tests	ares	<b>Mean S</b> 177.416	<b>Square</b> 67 81	<b>DF</b> 5 54 59	F Stat 3.646	<b>P-Value</b> 0.0065	Decision Significar	ı(α:5%)		
Source Between Error Total Distributional Attribute	887.0833 2627.9 3514.983 Tests Test		Mean S 177.41( 48.664{	Square 67 81 Test Stat	<b>DF</b> 5 54 59 <b>Critical</b>	F Stat 3.646 P-Value	P-Value 0.0065 Decision(	Decision Significar	ı(α:5%)		
Source Between Error Total Distributional Attribute Variances	887.0833 2627.9 3514.983 Tests Test Bartlett Ed	quality of <sup>1</sup>	Mean S 177.416 48.6648 Variance	Square 67 81 <b>Test Stat</b> 0.8538	DF 5 54 59 Critical 15.09	F Stat 3.646 P-Value 0.9735	P-Value 0.0065 Decision( Equal Var	Decision Significar (a:1%) iances	ı <b>(α:5%)</b> nt Effect		
Source Between Error Total Distributional Attribute /ariances Distribution	887.0833 2627.9 3514.983 <b>Tests</b> <b>Test</b> Bartlett Ed Shapiro-V	quality of <sup>1</sup>	Mean S 177.416 48.6648 Variance	Square 67 81 Test Stat	<b>DF</b> 5 54 59 <b>Critical</b>	F Stat 3.646 P-Value	P-Value 0.0065 Decision( Equal Var	Decision Significar	ı <b>(α:5%)</b> nt Effect		
Source Between Error Total Distributional Attribute Variances Distribution Reproduction	887.0833 2627.9 3514.983 Tests Test Bartlett Ec Shapiro-W Summary	quality of <sup>v</sup> Vilk W Nor	Mean S 177.416 48.6648 Variance rrmality	Square 67 81 <b>Test Stat</b> 0.8538 0.8844	DF 5 54 59 Critical 15.09 0.9459	<b>F Stat</b> 3.646 <b>P-Value</b> 0.9735 <0.0001	P-Value 0.0065 Decision( Equal Var Non-norm	Decision Significar (a:1%) iances al Distributi	n <b>(α:5%)</b> nt Effect	CV%	%Effort
Source Between Error Total Distributional Attribute /ariances Distribution Reproduction C-%	887.0833 2627.9 3514.983 Tests Test Bartlett Ec Shapiro-W Summary Control Type	quality of <sup>v</sup> Vilk W Nor <b>Count</b>	Mean S 177.416 48.6648 Variance rrmality Mean	Square 67 81 Test Stat 0.8538 0.8844 95% LCL	DF 5 54 59 Critical 15.09 0.9459 95% UCL	F Stat 3.646 P-Value 0.9735 <0.0001 Median	P-Value 0.0065 Decision( Equal Var Non-norm Min	Decision Significar (a:1%) iances al Distributi Max	n(α:5%) nt Effect ion Std Err	CV%	%Effect
Source Between Error Fotal Distributional Attribute /ariances Distribution Reproduction C-%	887.0833 2627.9 3514.983 Tests Test Bartlett Ec Shapiro-W Summary	quality of V Vilk W Nor Count 10	Mean S 177.416 48.6648 Variance rmality Mean 26.4	Square 67 81 Test Stat 0.8538 0.8844 95% LCL 21.12	DF 5 54 59 Critical 15.09 0.9459 95% UCL 31.68	F Stat 3.646 P-Value 0.9735 <0.0001 Median 28.5	P-Value 0.0065 Decision( Equal Var Non-norm Min 13	Decision Significar (a:1%) iances al Distributi Max 35	n(α:5%) nt Effect ion Std Err 2.334	27.96%	0.0%
Source Between Error Total Distributional Attribute Variances Distribution Reproduction C-%	887.0833 2627.9 3514.983 Tests Test Bartlett Ec Shapiro-W Summary Control Type	quality of V Vilk W Nor Count 10 10	Mean S 177.416 48.6648 Variance rmality Mean 26.4 28.6	Square 67 81 Test Stat 0.8538 0.8844 95% LCL 21.12 24.32	DF 5 54 59 Critical 15.09 0.9459 95% UCL 31.68 32.88	F Stat         3.646         P-Value         0.9735         <0.0001	P-Value 0.0065 Decision( Equal Var Non-norm Min 13 14	Decision Significar (a:1%) iances al Distributi Max 35 35	i(α:5%) Int Effect ion Std Err 2.334 1.893	27.96% 20.93%	0.0% -8.33%
Source Between Error Total Distributional Attribute Variances Distribution Reproduction C-%	887.0833 2627.9 3514.983 Tests Test Bartlett Ec Shapiro-W Summary Control Type	quality of V Vilk W Nor Count 10 10 10	Mean S 177.416 48.6648 Variance rmality Mean 26.4 28.6 26.8	Square 67 81 Test Stat 0.8538 0.8844 95% LCL 21.12 24.32 21.38	DF 5 54 59 Critical 15.09 0.9459 95% UCL 31.68 32.88 32.22	F Stat         3.646         P-Value         0.9735         <0.0001	P-Value 0.0065 Decision( Equal Var Non-norm Min 13 14 10	Decision Significar (α:1%) iances al Distributi Max 35 35 35 36	i(α:5%) Int Effect Ion Std Err 2.334 1.893 2.398	27.96% 20.93% 28.3%	0.0% -8.33% -1.52%
Source Between Error Total Distributional Attribute Variances Distribution Reproduction C-% ) 1 3.3	887.0833 2627.9 3514.983 Tests Test Bartlett Eo Shapiro-W Summary Control Type	quality of V Vilk W Nor Count 10 10	Mean S 177.416 48.6648 Variance rmality Mean 26.4 28.6	Square 67 81 Test Stat 0.8538 0.8844 95% LCL 21.12 24.32	DF 5 54 59 Critical 15.09 0.9459 95% UCL 31.68 32.88	F Stat         3.646         P-Value         0.9735         <0.0001	P-Value 0.0065 Decision( Equal Var Non-norm Min 13 14	Decision Significar (a:1%) iances al Distributi Max 35 35	i(α:5%) Int Effect ion Std Err 2.334 1.893	27.96% 20.93%	0.0% -8.33%





Analyst: MB QA:

0         Dilution Water         14         28         29         31         29         27         33         25         35         13           1         30         29         30         30         23         31         35         31         33         14	CETIS Ana	lytical Rep	ort						port Date: st Code:		-	:54 (p 1 of 2 )0-7951-057
Analyzed:       22 May-18 11:54       Analyzes:       Linear Interpolation (ICPIN)       Offfielal Results:       Yes         Batch ID:       14-0029-3205       Test Type:       Reproduction-Survival (7d)       Analyst:       Michelle Bennett       Michelle	Ceriodaphnia	7-d Survival ar	id Reprodu	ction Te	əst						TestAn	nerica - ASL
Start Date:         01 May-18 14:35 ending Date:         Protocol:         EPA/821/R-02-013 (2002)         Diluonit:         Mod-Hard Synthetic Water Brine:           Duration:         6d 19h         Species:         Ceriodaphnia dubia         Brine:         Brine:           Sample Date:         00 May-18 09:20         Species:         Ceriodaphnia dubia         Age:         <24H	-					ation (ICPIN	1)				1.8.8	
Sample Date:         30 Apri-18 05:27 Baceive Date:         Material:         Unknown         Project:           Receive Date:         01 May-18 10:30 Bample Age:         33 h (2 + 0°)         Source:         Energy Northwest (WA 0025151)           Sample Age:         33 h (2 + 0°)         Station:             Linear/Lerg/x-1/         Linear         Seed         Resamples         Exp 95% CL         Method           Log(X+1)         Linear         117755         200         Yes         Two-Point Interpolation           Test Acceptability Criteria         Innear         TAC Linits         Overlap         Decision           Control Resp         26.4         15 - NL         Yes         Passes Acceptability Criteria           Residual Analysis         Attribute         Method         Test Stat         Critical         P-Value         Decision(c:5%)           Extreme Value         Grubbs Extreme Value         2.517         3.2         0.5945         No Outliers Detected           Control Trop         Grubbs Extreme Value         2.517         3.86         0.8675         Non-significant Trend         Controls           Extreme Value         %         95% LCL         95% LCL         95% UCL         1.086         1.234         4.953	Start Date: Ending Date:	01 May-18 14:3 08 May-18 09:2	35 <b>Pro</b> 20 <b>Spe</b>	tocol: cies:	EPA/821/R-02 Ceriodaphnia c	-013 (2002) Iubia		Dil Br	luent: Mo ine:	d-Hard Syn		r
X Transform         Y Transform         Seed         Resamples         Exp 95% CL         Method           Log(X+1)         Linear         1177555         200         Yes         Two-Point Interpolation           Test Acceptability         Criteria         Test Stat         TAC Limits         Overiap         Decision           Control Resp         26.4         15 - NL         Yes         Passes Acceptability Criteria           Residual Analysis         Method         Test Stat         Critical         P-Value         Decision(α:5%)           Extreme Value         Grubbs Extreme Value         2.517         3.2         0.5945         No Outliers Detected           Control Trend         Mann-Kendall Trend         1.865         1.234         4.953         Non-significant Trend in Controls           Point Estimates         Evel         %         95% LCL         95% UCL         10         95% UCL         95% UCL           Control Trend         Mann-Kendall Trend         1.865         1.234         4.953             Control Trend         95% LCL         95% UCL         10         26.4         13         35         2.334         7.382         27.96%         0.0%           C25         53.63         20.19	Sample Date: Receive Date:	30 Apr-18 05:2 01 May-18 10:3	7 Mat 30 Sou	erial: rce:	Unknown	est (WA 00	25151)					
Test Acceptability Criteria           Attribute         Test Stat         TAC Limits         Overlap         Decision           Control Resp         26.4         15 - NL         Yes         Passes Acceptability Criteria           Residual Analysis         Attribute         Method         Test Stat         Critical         P-Value         Decision(α:5%)           Extreme Value         Grubbs Extreme Value         C.517         3.2         0.5945         No Outliers Detected           Control Trend         Mann-Kendall Trend         2.517         1.96         0.8575         Non-significant Trend in Controls           Point Estimates         Eavent         95% LCL         95% LCL         95% LCL         95% UCL         53.3         20.19         81.06         1.865         1.234         4.953           Reproduction         Summary         Calculated Variate         Control Type         Count         Mean         Min         Max         Std Err         Std Dev         CV%         %Effect           0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           1         0         26.5         13         35         2.384         7.52%	X Transform	Y Transform							radiation			
Attribute         Method         Test Stat         Critical         P-Value         Decision(α:5%)           Extreme Value Control Trend         Grubbs Extreme Value Mann-Kendall Trend         2.517         3.2         0.5945         No Outliers Detected           Control Trend         Mann-Kendall Trend         2.517         1.96         0.8575         Non-significant Trend in Controls           Point Estimates         Evel         %         95% LCL         95% UCL         TU         95% LCL         95% UCL           IC25         53.63         20.19         81.06         1.865         1.234         4.953           Reproductor Summary         Calculated Variate         Std Dev         CV%         %Effect           0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           1         10         26.6         14         35         1.893         5.985         20.93%         -8.33%           3.3         10         26.7         12         33         2.381         7.528         28.2%         -1.14%           33         10         26.7         12         33         2.202         6.964         29.63%         10.98% <td>Test Acceptab Attribute</td> <td>ility Criteria Test Stat</td> <td>TAC Limit</td> <td></td> <td>Overlap</td> <td>Decision</td> <td></td> <td></td> <td>Pointort</td> <td></td> <td></td> <td></td>	Test Acceptab Attribute	ility Criteria Test Stat	TAC Limit		Overlap	Decision			Pointort			
Extreme Value Control Trend         Grubbs Extreme Value Mann-Kendall Trend         2.517         3.2         0.5945         No Outliers Detected 0.8575         No Outliers Detected           Point Estimates         2.517         1.96         0.8575         Non-significant Trend in Controls           Point Estimates         2.517         1.96         0.8575         Non-significant Trend in Controls           Reproduction Summary         Point Estimates         2.517         1.96         0.5945         No Outliers Detected           C-%         Control Type         Count         Mean         Min         Max         Std Err         Std Dev         CV%         %Effect           0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           11         10         26.7         12         33         2.334         7.382         27.96%         0.0%           13         35         1.893         5.985         20.93%         -1.52%           11         10         26.7         12         33         2.002         6.964         29.63%         10.98%           100         26.7         12         33         2.002         6.964         29.	Residual Analy	/sis										
IC25         53.63         20.19         81.06         1.865         1.234         4.953           Reproduction Summary         Calculated Variate           C-%         Control Type         Count         Mean         Min         Max         Std Err         Std Dev         CV%         %Effect           0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           1         10         28.6         14         35         1.893         5.985         20.93%         -8.33%           3.3         10         26.7         12         33         2.381         7.528         28.2%         -1.14%           33         10         26.7         12         33         2.202         6.964         29.63%         10.98%           100         23.5         13         33         2.202         6.964         29.63%         10.98%           100         16.9         4         24         1.975         6.244         36.95%         35.98%           C-%         Control Type         Rep 1         Rep 2         Rep 3         Rep 4         Rep 5         Rep 6	Extreme Value Control Trend	Grubbs Ex Mann-Ken		9	2.517	3.2	0.5945	No Outli	ers Detected	in Controls		
C-%         Control Type         Count         Mean         Min         Max         Std Err         Std Dev         CV%         %Effect           0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           1         10         28.6         14         35         1.893         5.985         20.93%         -8.33%           3.3         10         26.7         12         33         2.381         7.528         28.2%         -1.14%           33         10         23.5         13         33         2.202         6.964         29.63%         10.98%           100         16.9         4         24         1.975         6.244         36.95%         35.98%           Ce-%         Control Type         Rep 1         Rep 2         Rep 3         Rep 4         Rep 5         Rep 6         Rep 7         Rep 8         Rep 9         Rep           0         Dilution Water         14         28         29         31         29         27         33         25         35         13           1         30         29         30         30         23												
0         Dilution Water         10         26.4         13         35         2.334         7.382         27.96%         0.0%           1         10         28.6         14         35         1.893         5.985         20.93%         -8.33%           3.3         10         26.8         10         36         2.398         7.584         28.3%         -1.52%           11         10         26.7         12         33         2.381         7.528         28.2%         -1.14%           33         10         23.5         13         33         2.202         6.964         29.63%         10.98%           100         16.9         4         24         1.975         6.244         36.95%         35.98%           Reproduction Detail           C-%         Control Type         Rep 1         Rep 2         Rep 3         Rep 4         Rep 5         Rep 6         Rep 7         Rep 8         Rep 9         Re           0         Dilution Water         14         28         29         31         29         27         33         25         35         13           1         30         29         30	Reproduction	Summary				Cal	culated Va	riate				
Reproduction Detail           C-%         Control Type         Rep 1         Rep 2         Rep 3         Rep 4         Rep 5         Rep 6         Rep 7         Rep 8         Rep 9         Re           0         Dilution Water         14         28         29         31         29         27         33         25         35         13           1         30         29         30         30         23         31         35         31         33         14           3.3         26         32         31         36         24         28         31         31         19         10	C-% C( 0 Di 1 3.3 11 33	ontrol Type	10 10 10 10 10	26.4 28.6 26.8 26.7 23.5	13 14 10 12 13	35 35 36 33 33	2.334 1.893 2.398 2.381 2.202	7.382 5.985 7.584 7.528 6.964	27.96% 20.93% 28.3% 28.2% 29.63%	0.0% -8.33% -1.52% -1.14% 10.98%		
C-%         Control Type         Rep 1         Rep 2         Rep 3         Rep 4         Rep 5         Rep 6         Rep 7         Rep 8         Rep 9		Detail										
1302930302331353133143.326323136242831311910	С-% Сс	ontrol Type		Rep 2	Rep 3	Rep 4			Rep 7	Rep 8	Rep 9	Rep 10
33         16         25         27         20         29         28         29         33         15         13           100         16         24         21         16         15         22         23         10         18         4	1 3.3 11 33	lution Water	30 26 14 16	29 32 31 25	30 31 30 27	30 36 32 20	23 24 26 29	31 28 28 28	35 31 32 29	31 31 29 33	33 19 33 15	

Analyst: MR QA:\_\_\_\_

	Te CETIS Version: CETISv1.8.8 Official Results: Yes	estAmerica - ASI
Analyzed: 22 May-18 11:54 Analysis: Linear Interpolation (ICPIN) Of Graphics		
30 20 13		
5 0 0 20 40 60 80 100		

Analyst: MB\_ QA:\_\_\_\_\_

THE LEADER IN EN			FAT	THEAD MINN	NOW 7-DAY S	SURVIVAL A	ND WATER	QUALITY DA	АТА			
Ran	idom Te	mplate Used:	6 conc. x 4 rep	os. # 9	Water	rbath/incubato		Date Initiated		2018	Time	15:15
Initial sar	nple ID	в 34	990	-02		<u># 4</u>	_ D	ate Terminated	51101	2018	Time	09:50
Client			Energ	y Northwest			Sam	ole Description				
Tech:	Day 0	Br/BAMDay	1 BAM Day	y2 BAM I	Day 3 BAU	Day 4 Ban	Day	2/6Am Day 6_	S/Bm Day 7	BAM		
Time	Day 0	1515 Day	1 1400 Day	y2 1400 I	Day 3 550	Day 4 14.50	Day 5 16	00 Day 6 🥂	120 Day 7	0950		
Conc.				ive Organisms		Disso	lved O <sub>2</sub>	1	H	Temp.	D#	Conductivity
or Percent	Day	A	В	С	D	Pre (m	ng/l) Post	Pre	Post	(°C) Pre	Therm, ID #	(µS) Post (1 <sup>st</sup> use)
Tercent	0	10 A	10	10	10	TIC	2.1	110	4,0		250	334
	1	10	10	10	10	6.5	7.8	×	8,2		251	2.011
ē	2	10	10	10	10	6.3	8.1 8.2	7.6	8.1		252	304
Control	3	10	10	10	10	6.8	8.1	7.3	8.0		252	
	5	10	10	10	10	7.1	8.1	7.5	8:0		257	362
	6	10	10	10	10	6.4	7.8	7.5	8.0	24.0	251	
<u> </u>	0	10	10	10	10	DIT	2.2	112	8,0	1ºost: 24.4	All and an and a state of the local division	359
	1	10	10	10	10	6.5	7,9	*	8.2	24.4		
	2	10	10	10	10	6.3	8.2	7.6	8.1	24.5		317
1.0 %	3	10	10	10	10	6.5	8.2	7.8	8.1	24.5	-	
	5	10	10	10	10	7.3	8.0	7.5	8.0	24.2		376
	6	10	10	10	10	6.4	7-9	7.5	8.0	24.1		
<u> </u>	7	10	10	10	10	6.4	2.3	1.5	2.0	Post: 24.4	-	365
	1	10	10	10	10	6.6	7.9	×	8.1	24.3		
	2	9	16	10	10	6.2	8.1 8.2	7.5	8.1	24.5	-	356
3.3 %	3	q. q	10	10	10	6.5	8.3	7.7	8.1	24.3	_	
ri M	4	9	10	10	(0	7.1	811	7.4	8.1	24.2		386
	6	9	10	10	10	6.2	7.9	7.5	8.0	24.0		
	7	9	10	0	10	6.4	0 in	1.3	8.0	25.4 Post: 24 4	$\neg$	1.201
	0	10	10	10	10 10	6.5	9.2	ð.	8.0	Post: 24.4 24.3	-	424
	2	10	10	10	10	6.1	8.2	7.5	8.0	24.6		463
% 0	3	10	10	0	10	6.5	8.3	7.6	8.1	24.4		
11.0	4	10	10	9	10	7.2	8.3	7.5	8.0	24.5		501
	5	10	10		10	6.1	7.5	7.4	8.0	221.1	-	- 201
	7	10	10	9	10	6.2		7.3		25.5		
	0	10	10	10	10	//	23	*	7.9	Post: 24,4	_	741
	1 2	10	10	10	10	6.6	8.1	7.5	8.0	24.4		733
% (	3	10	10	10	10	6.6	8.2	7.6	8.0	24.5		
33.0 %	4	10	10	10	10	7.1	8.3	7.5	8.0	24.5		2.00
	5	10	10	10	10	7.0	8.3	7.4	8:0	24.2	-	753
	7	10	10	10	10	6.2	0	7.3	-//-	25.6		
	0	10	10	10	10		2,3		7.9	Post: 24.4		1393
	1	10	10	01	(0)	6.7	8.2	# 7.5	7.8	24.3	_	14.00
%	2	10	10	10	10.0	6.4	8.3	7.6	7.9	24.4		1415
100 %	4	10	10	10	16	7.2	8.3	7.5	7.9	24.3	_	
	5	10	10	io	10	7.0	8.3	7.4	7.8	24.2		1425
	6	0	10	10	10	6.1	8.0	7.4	7.8	24.0	_	
✓ Indice			vertently poured				container.		newal solution		-rene	wal solutions.

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container. "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

\* Measurement missed by analyst. BAIN 5-\$18

**TestAmerica** 

□ Aeration in test chambers begun @\_\_\_\_

(Note observations on Test Organism Info sheet)

Day 0 Temperatures = Post-renewals Therm ID# = Thermometer ID used for all measurements that day.

= Temp. out of recommended range

23.8)

Energy NW - Cerio acute + chronics (use in 2018).xlsm Doc Control ID: ASL899-0917

Client	Energy NW		Tins Labeled As:	E. NW
Lab ID:	B3990		Start Date:	5/3/2018
Sample Description:	-			
	Technician:		PC	-
	Date:		5/9/2018	-
<u>,                                     </u>	Balance Serial #:	B328543647	B328543647	_
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
Ittent	Kepiteate	weight (mg)	(ing)	101
			-	
			1110.07	1.60
Control	AB		11105.44	10
Control	C		1098.64	10
	D		1091.77	10
	A		1067.12	10
1 %	B		1082.97	10
1 /0	C		1089.00	10
	D		1089.99	10
	D		1009.99	10
	A		1087.96	9
3.3 %	B		1116.27	10
3.5 70	C		1088.51	10
	D		1077.23	10
			1077120	
	A		1108.93	10
11 %	В		1091.80	10
	С		1095.87	9
	D		1103.82	10
	A		1107.51	10
33 %	В		1090.42	10
	С		1102.79	10
	D		1114.10	10
	A		1079.37	10
100 %	В		1108.95	10
	С		1078.77	10
	D		1107.06	10
	A			
	B			
	C			
	D			

#### FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

Client	Energy NW		Tins Labeled As:	E. NW
Lab ID:	B3990		Start Date:	5/3/2018
Sample Description:	<i>a</i>			
	Technician:	MB	PC	
	Date: Balance Serial #:	5/21/2018 B328543647	5/9/2018 B328543647	
r	Balance Serial #:	B328343047		_
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
		8 ( 6/		
	A	1118.03	1110.07	10
Control	B	1113.22	1105.44	10
	C	1105.75	1098.64	10
	D	1100.23	1091.77	10
	A	1074.62	1067.12	10
1 %	В	1089.73	1082.97	10
	C	1095.99	1089.00	10
	D	1096.96	1089.99	10
	A	1094.44	1087.96	9
3.3 %	В	1123.75	1116.27	10
	C	1094.99	1088.51	10
	D	1084.59	1077.23	10
		111681	1100.00	10
11.0/	A	1116.74	1108.93	10
11 %	B	1099.91	1091.80	10
	C	1103.66	1095.87	10
	D	1111.59	1103.82	10
	A	1115.52	1107.51	10
33 %	B	1098.16	1090.42	10
5570	C	1110.85	1102.79	10
	D	1122.23	1114.10	10
	A	1087.79	1079.37	10
100 %	В	1118.06	1108.95	10
	C	1087.77	1078.77	10
	D	1114.87	1107.06	10
	A			
	В			
	С			
	D			

## FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

CETIS Sur	nmary Repo	ort						Report Date: Test Code:			:09 (p 1 of 2 9-8062-0775
Fathead Minn	now 7-d Larval S	Survival a	nd Growt	h Test						TestAm	nerica - ASL
Batch ID: Start Date: Ending Date: Duration:	14-2778-4926 03 May-18 15: 10 May-18 09: 6d 19h	15 P 50 S	est Type: rotocol: pecies: ource:	Growth-Surviva EPA/821/R-02 Pimephales pro Aquatox, AR	-013 (2002)				helle Benne I-Hard Synt		r
	08-6195-8425 30 Apr-18 05:2 : 01 May-18 10:: 82h (2.7 °C)	7 M	ode: aterial: ource: tation:	B3990-01 V Unknown Energy Northw		<sup>25151)</sup> i⁄	-	Client: Project:			
Comparison \$	Summary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
15-6990-4151	7d Survival Ra	te /	100	>100	NA	5.6%	1	Steel Man	y-One Ran	k Sum Tes	t
00-2707-9796	Mean Dry Bion	nass-mg	100	>100	NA	9.4%	1	Dunnett N	lultiple Corr	parison Te	st
Point Estimat	e Summary	(									
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	TU	Method			
01-4016-7937	Mean Dry Bion	nass-mg	/IC25	>100	N/A	N/A	<1	Linear Inte	erpolation (I	CPIN)	
Test Acceptat	oility										
Analysis ID	Endpoint		Attrib	ute	Test Stat	TAC Limi	its	Overlap	Decision		
15-6990-4151	7d Survival Rat	e	Contro	ol Resp	1	0.8 - NL		Yes	Passes A	cceptability	Criteria 🗸
00-2707-9796	Mean Dry Biom	nass-mg	Contro	ol Resp	0.7828	0.25 - NL		Yes			/ Criteria 🛩
01-4016-7937				ol Resp	0.7828	0.25 - NL		Yes			Criteria
00-2707-9796	Mean Dry Biom	lass-mg	PMSD	)	0.09399	0.12 - 0.3	_	Yes	Below Ac	ceptability (	Criteria 💰
7d Survival R	ate Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1	1	1	1	1	0	0	0.0%	0.0%
1		4	1	1	1	1	1	0	0	0.0%	0.0%
3.3		نىي كى 4 ئىرى كى 4	0.975	0.8954	1	0.9	1	0.025	0.05	5.13%	2.5%
11		4 4	0.975	0.8954	1	0.9	1	0.025	0.05	5.13% 0.0%	2.5% 0.0%
33 100		4 4	1 1	1	1 1	1 1	1 1	0	0 0	0.0%	0.0%
	0	<u>.</u>		1		-	-	0	0	0.070	0.0%
	mass-mg Sumn	-						0.15	01-1 D	01/0/	0/ 55
C-%	Control Type	Count	Mean	95% LCL	95% UCL		Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.7828 0.7055		0.8716 0.7555	0.711 0.676	0.846	6 0.02791 0.01572	0.05582 0.03144	7.13% 4.46%	0.0% 9.87%
		A		i U.0000	0.7000	0.070	0.70				0.0170
1		4			0 7817	0 648	0 7/9	ξ 0.02725	0 05440	7 84%	11 21%
1 3.3		4	0.695	0.6083	0.7817 0.8126	0.648	0.748		0.05449 0.01608	7.84% 2.04%	11.21% -0.54%
1 3.3 11 33				0.6083 0.7614	0.7817 0.8126 0.8256	0.648 0.777 0.774	0.748 0.811 0.813	0.008041	0.05449 0.01608 0.01706	7.84% 2.04% 2.14%	11.21% -0.54% -2.01%

8N

Analyst: MB\_QA: 3

# **CETIS Summary Report**

Fathead	Minnow 7-d Larval S	Survival an	d Growth T		TestAmerica - ASL	
7d Surviv	val Rate Detail					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	1	1	1	1	
1		1	1	1	1	
3.3		0.9	1	1	1	
11		1	1	0.9	1	
33		1	1	1	1	
100		1	1	1	1	
Mean Dry	/ Biomass-mg Detail					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	0.796	0.778	0.711	0.846	
1		0.75	0.676	0.699	0.697	
3.3		0.648	0.748	0.648	0.736	
11		0.781	0.811	0.779	0.777	
33		0.801	0.774	0.806	0.813	
100		0.842	0.911	0.9	0.781	
7d Surviv	al Rate Binomials					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	10/10	10/10	10/10	10/10	
1		10/10	10/10	10/10	10/10	
3.3		9/10	10/10	10/10	10/10	
11		10/10	10/10	9/10	10/10	
33		10/10	10/10	10/10	10/10	
100		10/10	10/10	10/10	10/10	

Report Date: Test Code:

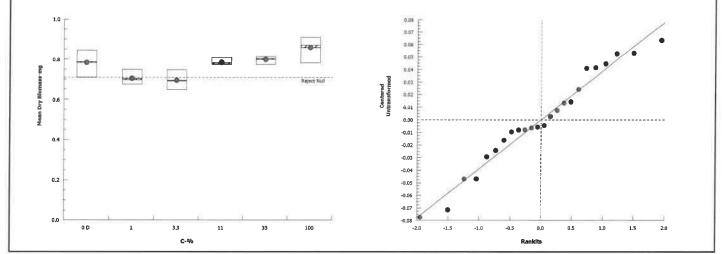
								Rep Test	Code:	B399	002ppc   1	9-8062-077
Fathead Minne	ow 7-d Larval S	urvival a	nd Growth	Test							TestAm	erica - AS
Analysis ID: Analyzed:	15-6990-4151 22 May-18 12:0		Automatical Address of the Automatical	7d Survival Rat Nonparametric-		vs T	reatments		IS Version		.8.8	
Batch ID: Start Date: Ending Date: Duration:	14-2778-4926 03 May-18 15:1 10 May-18 09:5 6d 19h	15 Pi 50 Si	rotocol: pecies:	Growth-Surviva EPA/821/R-02- Pimephales pro Aquatox, AR	013 (200	02)		Ana Dilu Brin Age	ent: Mo e:	chelle Benne od-Hard Syntl		r
Receive Date:	08-6195-8425 30 Apr-18 05:2 01 May-18 10:3 82h (2.7 °C)	7 M 30 Se	aterial:	33990-01 Jnknown Energy Northwe	est (WA	002	5151)	Clie Proj				
Data Transform	n	Zeta	Alt Hy	p Trials	Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Correc	cted)	NA	C > T	NA	NA			5.6%	100	>100	NA	1
Steel Many-On	e Rank Sum Te	est										
Control	vs C-%		Test St	at Critical	Ties	DF	P-Value	P-Type	Decisior	ı(α:5%)		
Dilution Water	1		18	10	1	6	0.8333	Asymp	Non-Sigr	ificant Effect		
	3.3		16	10	1	6	0.6105	Asymp	Non-Sigr	ificant Effect		
	11		16	10	1	6	0.6105	Asymp	Non-Sigr	ificant Effect		
	33		18	10	1	6	0.8333	Asymp	Non-Sigr	ificant Effect		
	100		18	10	1	6	0.8333	Asymp	Non-Sigr	ificant Effect		
Test Acceptabl	ility Criteria											
Attribute	Test Stat	TACLE	nite	Overlap	Decisi	0.0						
Control Resp	1	0.8 - NL		Yes		-	ceptability	Criteria				
Auxiliary Tests	}											
Attribute	Test			Test Stat	Critica	l.	P-Value	Decision	(a:5%)			
Control Trend									,	in Controls		
	IVIQUUI-INÇI	ndall Tren	d				1.0000	Non-signi	iicant frent			
ANOVA Table	Mann-rea	ndall Tren	id				1.0000	Non-signi				
				auare	DF							
Source	Sum Squa	ares	Mean S	-	DF		F Stat	P-Value	Decision	(α:5%)		
Source Between	<b>Sum Squa</b> 0.0088531	ares	<b>Mean S</b> 0.00177	70622	5				Decision			
Source Between Error	Sum Squa 0.0088531 0.039839	ares 1	Mean S	70622	5 18		F Stat	P-Value	Decision	(α:5%)		
<b>Source</b> Between Error Total	Sum Squa 0.0088531 0.039839 0.0486921	ares 1	<b>Mean S</b> 0.00177	70622	5		F Stat	P-Value	Decision	(α:5%)		
Source Between Error Total Distributional	Sum Squa 0.0088531 0.039839 0.0486921 Tests	ares 1	<b>Mean S</b> 0.00177	13278	5 18 23		<b>F Stat</b> 0.8	<b>P-Value</b> 0.5640	Decision Non-Sign	(α:5%)		
Source Between Error Total Distributional <sup>-</sup> Attribute	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test	ares 1 1	Mean S 0.00177 0.0022	70622  3278 Test Stat	5 18 23 Critica	ł	F Stat 0.8 P-Value	P-Value 0.5640 Decision	Decision Non-Sign (α:1%)	(α:5%)		
ANOVA Table Source Between Error Total Distributional Attribute Variances	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve	ares 1 1 ene Equali	Mean S 0.00177 0.0022	Test Stat	5 18 23 <b>Critica</b> 4.248	ł	<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640	P-Value 0.5640 Decision Equal Var	Decision Non-Sign (α:1%) iances	(α:5%)		
Source Between Error Total Distributional Attribute Variances Variances	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E	ares 1 1 ene Equali quality of	Mean S 0.00177 0.0022 ity of Variar Variance	70622  3278 Test Stat	5 18 23 Critica	ł	F Stat 0.8 P-Value	P-Value 0.5640 Decision Equal Var Unequal V	Decision Non-Sign (α:1%) iances	(α:5%) ificant Effect		
Source Between Error Total Distributional Attribute Variances Variances Distribution	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E Shapiro-V	ares 1 1 ene Equali quality of	Mean S 0.00177 0.0022 ity of Variar Variance	Test Stat 7.2	5 18 23 <b>Critica</b> 4.248 4.248		F Stat 0.8 P-Value 0.5640 0.0007	P-Value 0.5640 Decision Equal Var Unequal V	Decision Non-Sign (α:1%) iances /ariances	(α:5%) ificant Effect		
Source Between Error Total Distributional Attribute Variances Variances Distribution 7d Survival Ra	Sum Squa           0.0088531           0.039839           0.0486921           Tests           Mod Leve           Levene E           Shapiro-V           te Summary	ares 1 1 ene Equali quality of Vilk W No	Mean S 0.00177 0.00221 ity of Variar Variance prmality	Test Stat ice 0.8 7.2 0.6154	5 18 23 <b>Critica</b> 4.248 4.248 0.884		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001	P-Value 0.5640 Decision Equal Var Unequal V Non-norm	Decision Non-Sign (a:1%) iances /ariances al Distributi	ificant Effect		U/ Effort
Source Between Error Total Distributional Attribute Variances Variances Distribution 7d Survival Ra C-%	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E Shapiro-V te Summary Control Type	ares 1 1 ene Equali quality of Vilk W No Count	Mean S 0.00177 0.00221 ity of Variar Variance ormality Mean	Test Stat Test Stat ace 0.8 7.2 0.6154 95% LCL	5 18 23 Critica 4.248 4.248 0.884 95% U		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001 <b>Median</b>	P-Value 0.5640 Decision Equal Var Unequal V Non-norm Min	Decision Non-Sign (a:1%) iances /ariances al Distributi	ificant Effect	CV%	
Source Between Error Total Distributional Attribute Variances Distribution 7d Survival Ra C-% (0)	Sum Squa           0.0088531           0.039839           0.0486921           Tests           Mod Leve           Levene E           Shapiro-V           te Summary	ares 1 1 ene Equali quality of Vilk W No Count 4	Mean S 0.00177 0.00224 ity of Variar Variance ormality Mean 1	Test Stat Test Stat ace 0.8 7.2 0.6154 95% LCL 1	5 18 23 Critica 4.248 4.248 0.884 95% U0 1		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001 <b>Median</b> 1	P-Value 0.5640 Decision Equal Var Unequal V Non-norm Min 1	Decision Non-Sign (a:1%) iances /ariances al Distributi Max 1	ificant Effect	<b>CV%</b> 0.0%	%Effect
Source Between Error Total Distributional Attribute Variances Distribution 7d Survival Ra C-% 0 0 1	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E Shapiro-V te Summary Control Type	ares 1 1 ene Equali quality of Vilk W No Count 4 4	Mean S 0.00177 0.00224 ity of Variar Variance ormality Mean 1 1	Test Stat Test Stat ice 0.8 7.2 0.6154 95% LCL 1 1	5 18 23 <b>Critica</b> 4.248 4.248 0.884 <b>95% U</b> 1 1		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001 <b>Median</b> 1 1	P-Value 0.5640 Decision Equal Var Unequal V Non-norm Min 1 1	Decision Non-Sign (α:1%) iances /ariances al Distributi Max 1 1	ificant Effect	<b>CV%</b> 0.0% 0.0%	0.0% 0.0%
Source Between Error Total Distributional Attribute Variances Variances Distribution 7d Survival Ra C-% (0) 1 3.3	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E Shapiro-V te Summary Control Type	ares 1 1 ene Equali quality of Vilk W No Count 4	Mean S 0.00177 0.0022 <sup>-</sup> ity of Variar Variance rrmality Mean 1 1 0.975	Test Stat Test Stat ice 0.8 7.2 0.6154 95% LCL 1 1 0.8954	5 18 23 <b>Critica</b> 4.248 4.248 0.884 <b>95% U</b> 1 1 1		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001 <b>Median</b> 1 1 1	P-Value 0.5640 Decision Equal Var Unequal V Non-norm Min 1 1 0.9	Decision Non-Sign (a:1%) iances /ariances al Distributi Max 1 1 1	ificant Effect	<b>CV%</b> 0.0% 0.0% 5.13%	0.0% 0.0% 2.5%
Source Between Error Total Distributional Attribute Variances Variances Distribution 7d Survival Ra C-%	Sum Squa 0.0088531 0.039839 0.0486921 Tests Test Mod Leve Levene E Shapiro-V te Summary Control Type	ares 1 1 ene Equali quality of Vilk W No Count 4 4	Mean S 0.00177 0.00224 ity of Variar Variance ormality Mean 1 1	Test Stat Test Stat ice 0.8 7.2 0.6154 95% LCL 1 1	5 18 23 <b>Critica</b> 4.248 4.248 0.884 <b>95% U</b> 1 1		<b>F Stat</b> 0.8 <b>P-Value</b> 0.5640 0.0007 <0.0001 <b>Median</b> 1 1	P-Value 0.5640 Decision Equal Var Unequal V Non-norm Min 1 1	Decision Non-Sign (α:1%) iances /ariances al Distributi Max 1 1	ificant Effect	<b>CV%</b> 0.0% 0.0%	0.0% 0.0%

CETIS And	alytical Rep	οπ					-	ort Date: : Code:		002ppc   1	09 (p 2 of 9-8062-07
Fathead Min	now 7-d Larval \$	Survival an	d Growtl	h Test						TestAm	erica - AS
Analysis ID: Analyzed:	15-6990-4151 22 May-18 12:			7d Survival Rat Nonparametric		Freatments		IS Version: cial Results:	CETISv1 Yes	.8.8	
	rected) Transfo										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
1	Dilution water	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
3.3		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	2.89%
11		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	2.89%
33		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
100		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
7d Survival R	Rate Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
0	Dilution Water	1	1	1	1						
1		1	1	1	1						
3.3		0.9	1	1	1						
11		1	1	0.9	1						
33		1	1	1	1						
100		1	1	1	1						
Angular (Cori	rected) Transfor	med Detail									
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
)	Dilution Water	1.412	1.412	1.412	1.412						
1		1.412	1.412	1.412	1.412						
3.3		1.249	1.412	1.412	1.412						
11		1.412	1.412	1.249	1.412						
33		1.412	1.412	1.412	1.412						
100		1.412	1.412	1.412	1.412						
7d Survival R	ate Binomials										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
D	Dilution Water	10/10	10/10	10/10	10/10						
1		10/10	10/10	10/10	10/10						
3.3		9/10	10/10	10/10	10/10						
11		10/10	10/10	9/10	10/10						
33		10/10	10/10	10/10	10/10						
100		10/10	10/10	10/10	10/10						
Braphics											
1.0	• •		~~~	• •		0.06		1		/	
0.9	•	•	•			0.04			•••		•
-						0.02					
0.8						0.00			· · · ·		
0.7					et.						
o.7 0.7 0.5					Centered	-0.02 -	/				
0.5						0 -0.04	/				
-						-0.05					
0.4						-0.08					
0.3						-0.10					
0.2						-0.12	•				
0.1						E	-				
1.1	N N		3		2	-0.14	2 B			12	ų.
0.0	0D 1	3.3	11	33 100	8 0	-0.16 -2.0	-1.5 -1.0	-0.5 0.0	0.5 1.0	1.5	2.0
		C-%						Rankits			

Fathead Minn	ow 7-d Larval S	urvival	and Growt	h Test						TestAr	nerica - A
Analysis ID: Analyzed:	00-2707-9796 22 May-18 12:0		Endpoint: Analysis:	Mean Dry Bior Parametric-Co	-	atments		ris Version cial Result		1.8.8	
Batch ID:	14-2778-4926	1	est Type:	Growth-Surviv	al (7d)		Ana	lyst: Mi	chelle Benne	tt.	
Start Date:	03 May-18 15:1		Protocol:	EPA/821/R-02	. ,				d-Hard Synt		or.
Ending Date:	10 May-18 09:5		Species:	Pimephales pr			Brir		a-nara oyna	neac wate	21
Duration:	6d 19h		Source:	Aquatox, AR	011101000		Age		<b>`</b>		
Duration.				Aquatox, AIX			Aye	·			
Sample ID:	08-6195-8425		ode:	B3990-01			Clie	nt:			
Sample Date:	30 Apr-18 05:23	7 N	laterial:	Unknown			Proj	ject:			
Receive Date:	01 May-18 10:3	30 <b>S</b>	ource:	Energy Northw	est (WA 00	25151)					
Sample Age:	82h (2.7 °C)	S	itation:								
Data Transforr	m	Zeta	Alt H	p Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Untransformed		NA	C > T	NA	NA		9.4%	100	>100	NA	1
Dunnett Multir	ole Comparison	Test									
Control	vs C-%		Test S	tat Critical	MSD DI	P-Value	Р-Туре	Decision	(a:5%)		
Dilution Water	1*		2.528	2.407	0.074 6	0.0397	CDF	Significar			
	3.3*		2.871	2.407	0.074 6	0.0200	CDF	Significa			
	11		-0.139		0.074 6	0.8710	CDF	-	ificant Effect	ł	
	33		-0.515		0.074 6	0.9417	CDF		ificant Effect		
	100		-2.479	2.407	0.074 6	0.9998	CDF		ificant Effect		
MSD	0.09399	0.12 - 0	.3	Yes		cceptability ceptability C					
	,			-							
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a·5%)			
	Test Mann-Ken	Idall Trei	nd	Test Stat	Critical	P-Value 1.0000	Decision Non-signi		in Controls		
Control Trend		idall Trei	nd	Test Stat	Critical				in Controls		
Control Trend ANOVA Table	Mann-Ken				Critical			ficant Trend			
Control Trend ANOVA Table Source		ires		Square		1.0000	Non-signi		(α:5%)		
Control Trend ANOVA Table Source Between	Mann-Ken Sum Squa	ires	Mean	Square 986	DF	1.0000 F Stat	Non-signit	ficant Trend	(α:5%)		
Control Trend ANOVA Table Source Between Error	Mann-Ken Sum Squa 0.0754930	ires	<b>Mean</b>	Square 986	<b>DF</b>	1.0000 F Stat	Non-signit	ficant Trend	(α:5%)		
Control Trend ANOVA Table Source Between Error Total	Mann-Ken Sum Squa 0.0754930 0.03362753 0.1091206	ires	<b>Mean</b>	Square 986	<b>DF</b> 5 18	1.0000 F Stat	Non-signit	ficant Trend	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional T	Mann-Ken Sum Squa 0.0754930 0.03362753 0.1091206	ires	<b>Mean</b>	Square 986	<b>DF</b> 5 18 23	1.0000 F Stat	Non-signit	Decision Significar	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional T Attribute	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests	ires 1 5	Mean 5 0.0150 0.0018	Square 986 68197	<b>DF</b> 5 18 23	1.0000 F Stat 8.082	Non-signit	Decision Decision Significar	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional T Attribute Variances	Mann-Ken Sum Squa 0.0754930 0.0336275 0.1091206 Tests Test	res 1 5 quality of	Mean 3 0.0150 0.0018 Variance	Square 986 68197 Test Stat	DF 5 18 23 Critical	1.0000 F Stat 8.082 P-Value	P-Value 0.0004	Decision Decision Significar	(α:5%)		
Control Trend ANOVA Table Source Between Fror Fotal Distributional T Attribute /ariances Distribution	Mann-Ken Sum Squa 0.0754930 0.03362755 0.1091206 Tests Test Bartlett Ec	rres 1 5 quality of /ilk W No	Mean 3 0.0150 0.0018 Variance	Square 986 68197 <b>Test Stat</b> 7.56	DF 5 18 23 Critical 15.09	1.0000 F Stat 8.082 P-Value 0.1822	P-Value 0.0004 Decision( Equal Var	Decision Decision Significar	(α:5%)		
Control Trend ANOVA Table Source Between Error Fotal Distributional T Attribute /ariances Distribution Mean Dry Biom	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests Test Bartlett Ec Shapiro-W	rres 1 5 quality of /ilk W No	Mean 3 0.0150 0.0018 Variance	Square 986 68197 <b>Test Stat</b> 7.56	DF 5 18 23 Critical 15.09	1.0000 F Stat 8.082 P-Value 0.1822	P-Value 0.0004 Decision( Equal Var	Decision Decision Significar	(α:5%)	CV%	%Effec
Control Trend ANOVA Table Source Between Error Fotal Distributional T Attribute /ariances Distribution Mean Dry Biom C-% C	Mann-Ken Sum Squa 0.0754930 0.0336275 0.1091206 Tests Test Bartlett Eq Shapiro-W	rres 1 5 quality of /ilk W No	Mean 3 0.0150 0.0018 Variance ormality	Square 986 68197 Test Stat 7.56 0.9638 95% LCL	DF 5 18 23 Critical 15.09 0.884	1.0000 <b>F Stat</b> 8.082 <b>P-Value</b> 0.1822 0.5200	Non-signi P-Value 0.0004 Decision( Equal Var Normal Di	Decision Significar	(α:5%) It Effect	<b>CV%</b> 7.13%	%Effec 0.0%
Control Trend ANOVA Table Source Between Error Total Distributional T Attribute Variances Distribution Mean Dry Biom C-% C	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests Test Bartlett Ec Shapiro-W nass-mg Summa Control Type	ures 1 5 juality of /ilk W No ary Count	Mean 3 0.0150 0.0018 Variance prmality Mean	Square 986 68197 Test Stat 7.56 0.9638 95% LCL 0.6939	DF 5 18 23 Critical 15.09 0.884 95% UCL	1.0000 <b>F Stat</b> 8.082 <b>P-Value</b> 0.1822 0.5200 <b>Median</b>	Non-signi P-Value 0.0004 Decision( Equal Var Normal Di Min	Cant Trend Decision Significar (α:1%) iances istribution Max	(α:5%) It Effect Std Err		
Control Trend ANOVA Table Source Between Error Total Distributional T Attribute Variances Distribution Mean Dry Biom C-% C D E 1	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests Test Bartlett Ec Shapiro-W nass-mg Summa Control Type	ures 1 5 //ilk W No ary Count 4	Mean 3 0.0150 0.0018 Variance prmality Mean 0.7828	Square 986 68197 Test Stat 7.56 0.9638 95% LCL 0.6939	DF 5 18 23 Critical 15.09 0.884 95% UCL 0.8716	1.0000 <b>F Stat</b> 8.082 <b>P-Value</b> 0.1822 0.5200 <b>Median</b> 0.787	Non-signi P-Value 0.0004 Decision( Equal Var Normal Di Min 0.711	Cart Trend Decision Significar (α:1%) iances stribution Max 0.846	(α:5%) t Effect Std Err 0.02791	7.13%	0.0% 9.87%
Control Trend ANOVA Table Source Between Error Total Distributional T Attribute Variances Distribution Mean Dry Biom C-% 0 1 3.3	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests Test Bartlett Ec Shapiro-W nass-mg Summa Control Type	ures 1 5 /ilk W No ary Count 4 4	Mean 3 0.0150 0.0018 Variance ormality Mean 0.7828 0.7055	Square 986 68197 <b>Test Stat</b> 7.56 0.9638 <b>95% LCL</b> 0.6939 0.6555	DF 5 18 23 Critical 15.09 0.884 95% UCL 0.8716 0.7555	1.0000 <b>F Stat</b> 8.082 <b>P-Value</b> 0.1822 0.5200 <b>Median</b> 0.787 0.698	Non-signi P-Value 0.0004 Decision( Equal Var Normal Di Min 0.711 0.676	Cant Trend Decision Significar (α:1%) iances stribution Max 0.846 0.75	(α:5%) t Effect Std Err 0.02791 0.01572	7.13% 4.46%	0.0% 9.87%
C-% (	Mann-Ken Sum Squa 0.0754930 0.03362754 0.1091206 Tests Test Bartlett Ec Shapiro-W nass-mg Summa Control Type	ures 1 5 /ilk W No ary Count 4 4 4	Mean 3 0.0150 0.0018 Variance ormality Mean 0.7828 0.7055 0.695	Square 986 68197 <b>Test Stat</b> 7.56 0.9638 <b>95% LCL</b> 0.6939 0.6555 0.6083	DF 5 18 23 Critical 15.09 0.884 95% UCL 0.8716 0.7555 0.7817	1.0000 <b>F Stat</b> 8.082 <b>P-Value</b> 0.1822 0.5200 <b>Median</b> 0.787 0.698 0.692	Non-signi P-Value 0.0004 Decision( Equal Var Normal Di Min 0.711 0.676 0.648	Cant Trend Decision Significar (α:1%) iances stribution Max 0.846 0.75 0.748	(α:5%) tt Effect <b>Std Err</b> 0.02791 0.01572 0.02725	7.13% 4.46% 7.84%	9.87% 11.21%



Fathead Minnow 7-d Larval Survival and Growth Test							
Analysis ID: Analyzed:	00-2707-9796 22 May-18 12:0		Endpoint: Analysis:	,		CETIS Version: Official Results:	CETISv1.8.8 Yes
Mean Dry Bio	omass-mg Detail						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Dilution Water	0.796	0.778	0.711	0.846		
1		0.75	0.676	0.699	0.697		
3.3		0.648	0.748	0.648	0.736		
11		0.781	0.811	0.779	0.777		
33		0.801	0.774	0.806	0.813		
100		0.842	0.911	0.9	0.781		



CETIS Ana	alytical Rep	ort						leport Date: est Code:		22 May-18 12:09 (p 1 of 2 B399002ppc   19-8062-077
Fathead Minn	now 7-d Larval S	Survival an	d Growt	h Test						TestAmerica - ASI
Analysis ID: Analyzed:	01-4016-7937 22 May-18 12:		dpoint: alysis:	Mean Dry Biomass-mg Linear Interpolation (ICPIN)			-	ETIS Versio	****	FISv1.8.8
Batch ID: Start Date: Ending Date: Duration:	14-2778-4926 03 May-18 15: 10 May-18 09: 6d 19h	15 Pro 50 Spe	t Type: tocol: cies: urce:	Growth-Surviva EPA/821/R-02- Pimephales pro Aquatox, AR	-013 (2002)		D	viluent:	Michelle Be Mod-Hard \$	ennett Synthetic Water
-	08-6195-8425 30 Apr-18 05:2 01 May-18 10:3 82h (2.7 °C)	30 <b>So</b> u	de: erial: irce: tion:	B3990-01 Unknown Energy Northw	est (WA 00	25151)	-	lient: roject:		
Linear Interpo	plation Options									
X Transform	Y Transforn	n See	d	Resamples	Exp 95%	CL Meth	nod			
Log(X+1)	Linear	121	324	200	Yes	Two-	Point Int	erpolation		
Test Acceptat Attribute Control Resp	Dility Criteria Test Stat 0.7828	<b>TAC Limi</b> 0.25 - NL	ts	Overlap Yes	Decision Passes A	cceptability	Criteria			
<b>Residual Anal</b> Attribute Control Trend	i <b>ysis</b> Method Mann-Ken	dali Trend		Test Stat	Critical	<b>P-Value</b>		on(α:5%) gnificant Tre	nd in Cont	rols
Point Estimat Level % IC25 >100	es 95% LCL N/A	95% UCL	<b>TU</b> <1	95% LCL NA	95% UCL					
Mean Dry Bio	mass-mg Summ	ary			Cal	culated Va	riate			
	ontrol Type ilution Water	Count 4 4 4 4 4 4 4	Mean 0.7828 0.7055 0.695 0.787 0.7985 0.8585	0.676 0.648 0.777 0.774	Max 0.846 0.75 0.748 0.811 0.813 0.911	Std Err 0.02791 0.01572 0.02725 0.008041 0.008529 0.02994	Std De 0.0558 0.0314 0.05449 0.01608 0.01700 0.05989	2 7.13% 4 4.46% 9 7.84% 8 2.04% 5 2.14%	%Effe 0.0% 9.87% 11.21 -0.549 -2.019 -9.689	5 % %
Mean Drv Bior	nass-mg Detail						_			
с-% с	ontrol Type	Rep 1	Rep 2	Rep 3	Rep 4					
D D 1 3.3 11 33	ilution Water	0.796 0.75 0.648 0.781 0.801	0.778 0.676 0.748 0.811 0.774	0.711 0.699 0.648 0.779 0.806	0.846 0.697 0.736 0.777 0.813					
100		0.842	0.911	0.9	0.781					

Analyst:\_MB\_ QA:\_\_\_\_\_

CETIS Ana	alytical Report			Report Date: Test Code:	22 May-18 12:09 (p 2 of 2 B399002ppc   19-8062-077	
Fathead Minn	now 7-d Larval Survi	val and Grow	th Test		TestAmerica - ASL	
Analysis ID: Analyzed:	01-4016-7937 22 May-18 12:07	Endpoint: Analysis:	Mean Dry Biomass-mg Linear Interpolation (ICPIN)	CETIS Version: Official Results:	CETISv1.8.8 Yes	
Graphics 0.9 0.8 0.7 0.6 0.5 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	<b>.</b>					
0.0	20 40 C-44	60	80 100			

Analyst: MB\_\_\_\_QA:\_\_\_\_\_

# **APPENDIX B**

**REFERENCE TOXICANT DATA SHEETS** 

# Ceriodaphnia dubia **Survival and Reproduction Test Data Summary**

Client			QA /	QC			Test Sta	art Date		5-1-	18	
Sample Descript	ion		Na	C1			Initial S	ample ID#	#	B068	-06	
Data summarized	d by		I	s~								
Percent or				ve Young	-	in First 3	Broods po	er Replicat	te		# Alive	Total Live
Concentration	A	В	C	D	E	F	G	H	I	J	Adults	Young
Control	30	34	32	34	26	31	28	31	33	30	10	309
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.25 g/L	32	15	28	28	25	31	26	31	34	30	10 250	
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10	000
0.50 g/L	32	19	52	14	22	29	25	22	28	22	10	240
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		2-10
1.0 g/L	25	14	10	20	8	15	17	23	18	8	10	158
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		_
1.5 g/L	l	12	7	0	5	14	3	(	9	18	7	05
	AD?	AD?	AD?	AD? 🗸	AD?	AD?	AD? 🗸	AD? V	AD?	AD?		
2.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD?	AD? 🗸	AD? 🗸	AD? 🗸	AD? 🗸	AD? 🗸	AD? 🗸	AD?	AD? 🗸	AD? 🖌		
4.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD? 🗸	AD? 🖌	AD?	AD? 🗸	AD? 🗸	AD? 🗸	AD? 🗸	AD? 🗸	AD?	AD?		
Test Organism Mo	ortality (A	dult dead)	) = AD?	$\checkmark$		# of Alive	e Adults =	Number o	of test orga	nism alive	at terminat	ion

Test Organism identified as Male =

AD? M

Test Organism Injured during test =

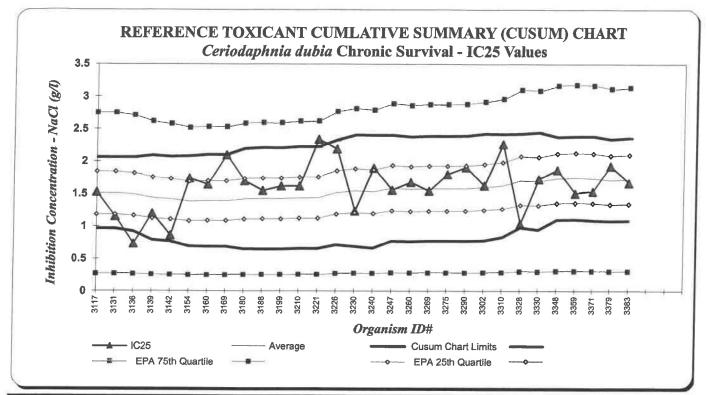
AD? I

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, Ceriodaphnia dubia test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test." i In

<u>Endpoint</u>	<u>IC25</u>	Cusum Chart Limits	Task Manager	
Survival	1.41	1.10 to 2.27	Project Manager	
Reproduction	0.54	0.18 to 1.21	QA Officer 5-10-18	



# Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

### SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

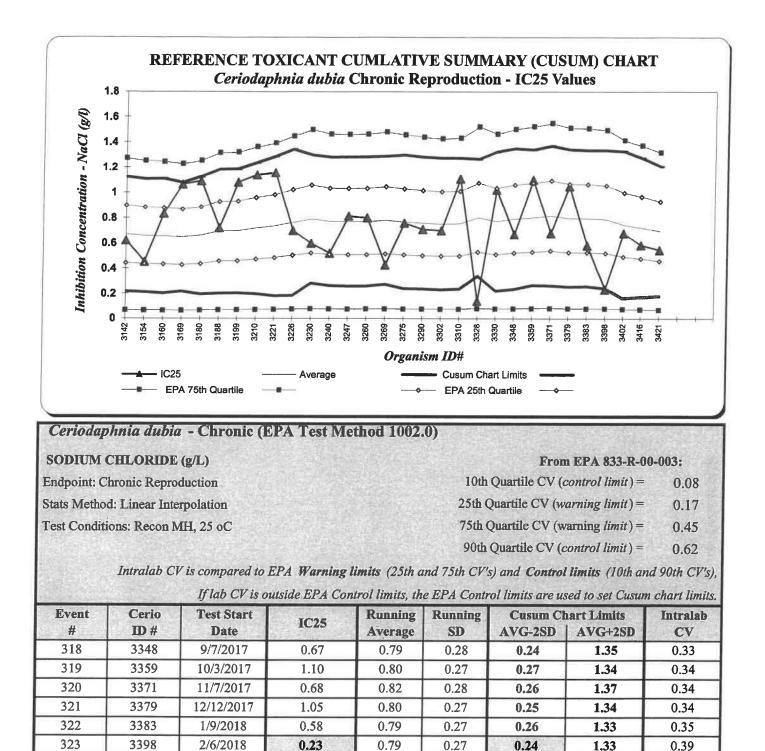
Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.07
- 25th Quartile CV (warning limit) = 0.11
- 75th Quartile CV (warning *limit*) = 0.41
- 90th Quartile CV (control limit) = 0.81

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
316	3328	07/20/17	1.04	1.70	0.36	0.98	2.43	0.22
317	3330	08/01/17	1.73	1.70	0.37	0.95	2.45	0.18
318	3348	09/07/17	1.87	1.74	0.32	1.10	2.38	0.18
319	3359	10/03/17	1.51	1.75	0.32	1.11	2.39	0.19
320	3371	11/07/17	1.54	1.74	0.32	1.09	2.39	0.18
321	3379	12/12/17	1.93	1.71	0.32	1.08	2.34	0.19
322	3383	01/09/18	1.67	1.72	0.32	1.08	2.36	0.18
323	3398	02/06/18	1.36	1.73	0.32	1.10	2.36	0.19
324	3402	02/27/18	1.68	1.72	0.33	1.06	2.37	0.19
325	3416	04/10/18	1.62	1.72	0.33	1.07	2.37	0.17
326	3421	05/01/18	1.41	1.68	0.29	1.10	2.27	0.17
327								State and

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.



0.75

0.72

0.69

0.68

0.58

0.54

0.29

0.28

0.26

0.16

0.17

0.18

1.33

1.27

1.21

3402

3416

3421

2/27/2018

4/10/2018

5/1/2018

324

325

326

327

0.38

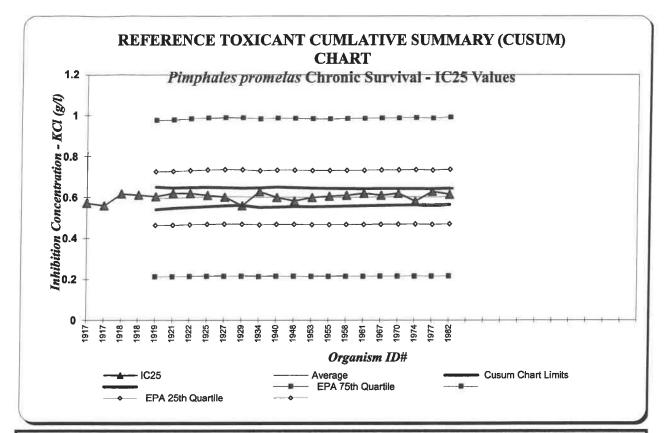
0.37

0.38

			6 conc. x 4 rep		/ @	aterbath/incubate	or Used:	Date Initiate	d 5/2		ime / S
Stock	Sol. ID	2B 068 FHM (9	82	. 02	- 4mour	# 7	on S-7-18	Date Terminate	<u>a S/9</u>		ime <u>((</u> :
lient	sur iD.			– QC - Ref						olution Volume / r	-
	Day 0_	l Davi				D 4 D 1044		Sample Description		KCl (50 g/L sto	ck)
ime	Day 0 _ Day 0 _	1 Ŝ 0 0 Day	1 104 0 Day	2 <u>1520</u> D	ay 3 1154	Day 4 1215	Day 5 1350	Day 6 300	Day 7 <u>الإن</u> Day 7 <u>الإن</u>		
Conc. or	Day		Number of I	ive Organisms			olved O <sub>2</sub> (mg/l)	1	рН	Temp. (°C)	Condu
Percent	0	A 10	B	C	D	Pre	Post	Pre	Post	Pre	Post (
	0	10	10	10 C 0	10	7.4	7.5	٦.3	7.1	24.5 25	
_ [	2	10	10	9	10	7.4	8.1	7.6	-7.9	34.4 25	
Control	3	10	10	9	10	7.0	7.9	7.3	7.9	24.525	2 30
ຽ	4	10	19	9	10	6.4	8.1	7,3	7.8	24.7 25	
ŀ	5	10	10	q	10	6.6	7.8	7.3	78	24.7 25	
ł	7	10	10	q	10		-4-4	1.4	7.8	14 1 5	2 36
	0	10	10	10	10	12.	7.7		7.3	Post Zep. 8	800
H	1	10	10	10	10	6.9	8.2	7.4	2.9	24.6	81
g/L	2 3	10	10	10	10	7.1	9.2	7.6	7.9	24.3	823
0.25 §	4	18	10	18	10	6.5	7.9	7.4	7.9	24.5	741
° [	5	q	10	10	9	0.1	8.0	7.3	7.9	24.5	803
Ļ	6	9	10	10	9	7.1	8.0	7.4	7.8	24.3	840
$\rightarrow$	7	5	10	10	9	And the second second	-7 -5			7445	
F	0	10	10	10 10	10	7.0	7.7	7.5	7.3	24.8	124
J	2	10	10	10	10	7.0	8.0	7.6	8,0	24.5	126
1/a (	3	10	10	0	9	6.6	8.0	7.5	7.9	24.4	126
0.50	4	0	16	10	19	6.5	8.2	7.4	7.9	24.6	124
H	5	10	9	10	9	7.	8.0	7.4	7.9	24.5	128
	7	10	9	10	4	73	0	7-1		M-0	1 307
	0	10	10	10	10		7.8		7.3	Post: ZCI - 8	2130
-	1	2	4	6	5	7.1	8,2	7.6	8,0	24.1	214
	2 3	5	3	2	5	6.6	79	7.6	e. 0 8.0	24.6	2150
3°1	4	3	2	4	5	6.6	8.2	75	8.0	24.8	23
	5	2	2	4	5	7.2	8.1	7.6	8.0	24.8	224
-	6	2				7.1	8.2	7.4	7.9	24:0	221.
	0	10	10	10	<u>/1</u> 10		7.7		7.4	Post: 24,7	3.20
Ľ	1	0	0	0	0	7.0	$\overline{1}$	7.6		24.4	1 7
_ [	2					T					
7/0 g/L	3								1		+-
~i  -	4 5										++
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H	1 2	0	0		1		T	7.1	T	67,1	T
	3					(		(			
	4										
	5										$\rightarrow$
	6 7	1				-/		-/	·	)	

= fungus noted on dead	organisms.	Pre=Pre-renewal solutions. Post=Post-renewal solutions			
<u>Endpoint</u>	<u>IC25</u>	Cusum Chart Limits			
Survival	D.62	0.57 to 0.64			
Growth	0.53	0.45 to 0.73			

(23.8) = Temp. out of recommended range Task Manager 111 Um Project Manager ¢ IG QA Officer 325 REFTOX - FHM changing (KCI) ASL1282-1017.stsm Doc Control ID: ASL1282-1017 5-



# Pimephales promelas - Chronic (EPA Test Method 1000.0)

### POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

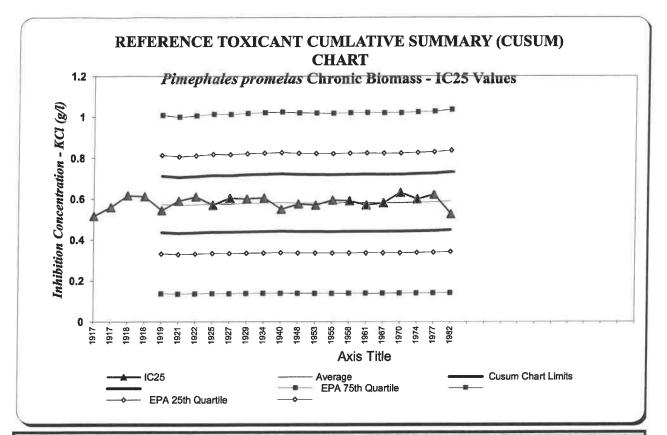
Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.03
- 25th Quartile CV (warning limit) = 0.11
- 75th Quartile CV (warning limit) = 0.32
- 90th Quartile CV (control limit) = 0.52

Intralab CV is compared to EPA	Warning limits	(25th and 75th	CV's) and	<b>Control limits</b>	(10th and 90th CV's),

Event	FHM	Test Start	IC25	Running			nart Limits	Intralab
#	D#	Date	in the second second	Average	SD	AVG-2SD	AVG+2SD	CV
8	1922	04/11/17	0.62	0.6	0.02	0.55	0.65	0.04
9	1925	05/09/17	0.61	0.60	0.02	0.56	0.65	0.04
10	1927	06/13/17	0.60	0.6	0.02	0.56	0.65	0.04
11	1929	06/20/17	0.56	0.6	0.02	0.56	0.64	0.03
12	1934	07/20/17	0.63	0.6	0.02	0.55	0.65	0.04
13	1940	08/01/17	0.60	0.6	0.02	0.55	0.65	0.04
14	1948	09/12/17	0.58	0.6	0.02	0.56	0.65	0.04
15	1953	10/10/17	0.60	0.6	0.02	0.56	0.65	0.04
16	1955	11/07/17	0.61	0.6	0.02	0.56	0.64	0.04
17	1958	12/12/17	0.61	0.6	0.02	0.56	0.64	0.04
18	1961	01/17/18	0.62	0.6	0.02	0.56	0.64	0.03
19	1967	02/06/18	0.61	0.6	0.02	0.56	0.64	0.03
20	1970	02/27/18	0.62	0.6	0.02	0.56	0.64	0.03
21	1974	03/20/18	0.58	0.6	0.02	0.56	0.64	0.03
22	1977	04/03/18	0.63	0.6	0.02	0.56	0.64	0.03
23	1982	05/02/18	0.62	0.6	0.02	0.57	0.64	0.03

FHM Chronic Surv. (KCl), 5/24/2018



# Pimephales promelas - Chronic (EPA Test Method 1000.0)

### POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.12
- 25th Quartile CV (warning limit) = 0.21
- 75th Quartile CV (warning limit) = 0.38
- 90th Quartile CV (control limit) = 0.45

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),

Event	FHM	Test Start	IC25	Running	Running	Cusum Cl	nart Limits	Intralab
#	ID #	Date	IC45	Average	SD	AVG-2SD	AVG+2SD	CV
8	1922	4/11/2017	0.61	0.6	0.04	0.43	0.71	0.06
9	1925	5/9/2017	0.57	0.58	0.04	0.44	0.72	0.06
10	1927	6/13/2017	0.60	0.58	0.03	0.44	0.71	0.06
11	1929	6/20/2017	0.60	0.58	0.03	0.44	0.72	0.06
12	1934	7/20/2017	0.61	0.58	0.03	0.44	0.72	0.06
13	1940	8/1/2017	0.55	0.58	0.03	0.44	0.72	0.05
14	1948	9/12/2017	0.58	0.58	0.03	0.44	0.72	0.05
15	1953	10/10/2017	0.57	0.58	0.03	0.44	0.72	0.05
16	1955	11/7/2017	0.59	0.58	0.03	0.44	0.72	0.05
17	1958	12/12/17	0.59	0.58	0.03	0.44	0.72	0.05
18	1961	01/17/18	0.57	0.58	0.03	0.44	0.72	0.05
19	1967	02/06/18	0.58	0.58	0.03	0.44	0.72	0.05
20	1970	02/27/18	0.63	0.58	0.03	0.44	0.72	0.05
21	1974	03/20/18	0.60	0.58	0.03	0.44	0.72	0.05
22	1977	04/03/18	0.62	0.58	0.03	0.44	0.72	0.04
23	1982	05/02/18	0.53	0.59	0.02	0.45	0.73	0.05

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

# **APPENDIX C**

# **CHAIN OF CUSTODY**

TestAmerica			Sample Receipt Record
Batch Number: 153990-01 Client/Project: Evergy Nh	)	Date Received:	5-1-18
Were custody seals intact?			Yes No N/A
Packing Material:			☐ Ice Blue Ice Box
Temp OK? (<6C) Therm ID: TH173 Exp	7-18-18	2.7	°C 🗹 Yes 🗌 No 🗌 N/A
Was a Chain of Custody (CoC) Provided?			🎽 Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, doc	ument below)		Yes 🗌 No 🛄 N/A
Were the sample containers in good condi	ion (not broken or leaking)?		🔀 Yes 🗌 No 🗌 N/A
Are all samples within 36 hours of collectio	n?		Yes No N/A
Method of Shipment:	Hand Delivered FedEx	UPS Greyhound	Other: N/A

### Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:
Resolution to Exception:	

Q

CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING	いった・ NPDES# いんのくろいろ~1 Ship Samples to: TestAmerica ASL	e Sample Information PO#	Samples/HourVolume/Sample	Total Hours Total Volume ~ 2 し らった Phone: 541.243.6137	Fraction Date Time	Chilled During Collection Tame 0522 Check Chlorine (Y/N)	Check	d / Comme	T Vaste Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comments Comment	D C D D D D D D D D D D D D D	520 X X X				The second	n and print name) Date/Time Relinquished By (P	lease sign and print name) Date/Time Relinquished By (Please sign and print name) Date/Time	lease sign and print name) Date/Time Shipped Via	
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TestAmerica CHA	<	PO By	11		Person:	2	Project #			Sample ID Date	181263.02 050218				Sampled By & Title	Received By	Received By	Received By	Work Authorized Bv

	ING			ecol
Batch Number: <u>B3990</u>	B	Date Received:	3/18	
Client/Project: <u>Energy</u>	Northwest	Received By:	PC	
Were custody seals intact?			Yes No	N/A
Packing Material:			Ice Blue Ice	Box
Temp OK? (<6C) Therm ID: T	H173 Exp. 7/18/18	Dod .	C Yes No	N/A
Was a Chain of Custody (CoC) F	Provided?		Yes 🗌 No 📋	N/A
Was the CoC correctly filled out	(If No, document below)		Yes 🗌 No 🗌	N/A
Were the sample containers in g	ood condition (not broken or leaking)?		Yes 🗌 No 🗍	N/A
Are all samples within 36 hours of	of collection?		Yes 🗌 No 🗌	N/A
Method of Shipment:	Hand Delivered FedEx		Other:	N/A
Client was notified on: Resolution to Exception:	Client contact:			

	Sample Receipt Record
Batch Number: B3990 R Client/Project: FNW	Date Received: 5 - 5 - (§ Received By:
Were custody seals intact?	1 Yes 🗌 No 🗌 N/A
Packing Material:	· Ice 🗌 Blue Ice 🗍 Box
Temp OK? (<6C) Therm ID: TH173 Exp. 7 - 18 - 18	3.1 °C K Yes No N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, document below)	Yes No N/A
Were the sample containers in good condition (not broken or leaking)?	Yes No N/A
Are all samples within 36 hours of collection?	Yes No N/A
Method of Shipment: Hand Delivered FedEx	UPS Greyhound Other: N/A

# Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:
Resolution to Exception:	



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THE LEADER IN ENVIRONMENTAL LEST	ING		Sample Receipt Reco
Batch Number: 3992 Client/Project: <u>Enercy</u>	0-04	Date Received:	5-2-18
Client/Project: 5nery7	AW	Received By:	g~-
Were custody seals intact?			Yes No N/A
Packing Material:			Ice Blue Ice Box
Temp OK? (<6C) Therm ID: TI	H173 Exp.	3.6	, °C ∕ E Yes □ No □ N/A
Was a Chain of Custody (CoC) F	Provided?		Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out	(If No, document below)		Yes No N/A
Were the sample containers in g	ood condition (not broken or leaking)?		Yes 🗌 No 🗌 N/A
Are all samples within 36 hours of	of collection?	_	Yes No N/A
Method of Shipment:	Hand Delivered FedEx	UPSGreyhound	Other: N/A
	Sample Exception Report (The follo		ited)
Client was notified on:	Client contact:		
Resolution to Exception:			

# **BIOASSAY REPORT**

CHRONIC BIOASSAYS CONDUCTED July 26 through August 2, 2018

Prepared for

ENERGY NORTHWEST RICHLAND, WASHINGTON

Prepared by



THE LEADER IN ENVIRONMENTAL TESTING

ASL

1100 NE Circle Boulevard, Suite 310 Corvallis, Oregon 97330 541-207-0995

NELAC #OR100022 State of Washington Department of Ecology (WDOE), Lab ID C1233 California State Environmental Laboratory Accreditation Program, Certificate No.: 1726

> Revised Report Date: September 6, 2018 Original Report Date: August 22, 2018 Lab I.D. No. B4049-chr

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## INTRODUCTION

TestAmerica ASL (TA-ASL) – Bioassay Laboratory conducted chronic bioassays using the *Pimephales promelas* (fathead minnow) and the water flea (*Ceriodaphnia dubia*), on samples provided by Energy Northwest, Richland, Washington. The tests were conducted from July 26 through August 2, 2018.

Also note that acute testing using the *Pimephales promelas* (fathead minnow) was also initiated at this time. As per client request, the acute results will be reported separately.

Revision 1 of this report was to address typographical errors (testing dates) and to clarify the amount of sodium thiosulfate added to the sample collected on July 30 (twice as much as needed due to lab error – see Deviation section).

### **OVERVIEW OF REGULATORY GUIDANCE**

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from TA-ASL's reading of the NPDES permit for Energy Northwest's Columbia Generating Station in Richland, WA (permit #WA002515-1, effective Nov 1, 2014, expires Oct 31, 2019, modified Feb 8, 2016).

### **Chronic toxicity:**

Testing:

- "Conduct chronic toxicity testing ... once per quarter in the year prior to submission of the application for permit renewal."
- "Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 11% effluent. The series of dilutions should also contain the CCEC of 1% effluent."
- o "The CCEC equals 1% effluent."

Sampling and Reporting Requirements:

- $\circ\,$  "The permittee must collect grab samples ... must cool the samples to 0-6 degrees Celsius during collection and send them to the lab immediately upon completion."
- "The lab must begin the toxicity testing ... no later than 36 hours after sampling was completed."

• "The Permittee must chemically dechlorinate final effluent ... with sodium thiosulfate just prior to test initiation. Do not add more sodium thiosulfate than is necessary to neutralize the chlorine. Provide in the test report the calculations to determine the amount of sodium thiosulfate necessary ..."

The following is taken from the WDOE guidance (WQ-R-95-80, June 2016 revision):

"To reduce WET limit violations (and anomalous concentration-response relationships) due to statistical significance that is a Type I error [false positive], we lower alpha when differences in test organism response are small." "Alpha will be lowered from 0.05 to 0.01 if a ... 20% difference in a chronic test is significant."

### SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

### EXHIBIT 1 Summary of Chronic Test Results

Species	<b>NOEC (%)</b>	LOEC (%)	IC <sub>25</sub> (%)	
C. dubia	11.0	33.0	19.8	
P. promelas	100	> 100	> 100	

Note: acronyms are as defined below.

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

More detailed information is provided in the Results and Discussion section.

### **ACRONYM DEFINITIONS (from EPA guidance):**

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).

LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).

 $IC_{25} =$  Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.

### **SAMPLE INFORMATION**

Exhibit 2 provides a summary of the sample conditions as received.

### EXHIBIT 2 Sample Conditions on Receipt

Sample ID		190086	
TA-ASL SDG		B4049	
+ suffix	-01	-02	-03
Collection - Date and Time	07/25/2018 03:18	07/27/2018 03:35	07/30/2018 13:45
Receipt - Date and Time	07/26/2018 10:55	07/28/2018 11:20	07/31/2018 10:30
Temperature (°C)	3.2	3.2	2.2
Dissolved Oxygen (mg/L)	8.0	8.8	8.1
pH	7.9	8.0	7.6
Conductivity (S/cm)	1176	1125	878
Total Residual Chlorine (mg/L)	0.04	0.04	0.02
Ammonia (mg/L as NH <sub>3</sub> -N)	< 0.10	< 0.10	< 0.10
Total Hardness (mg/L as CaCO <sub>3</sub> )	510	630	650
Total Alkalinity (mg/L as CaCO <sub>3</sub> )	75	105	95

Water quality measurements during testing remained within test design limits as prescribed by EPA and WDOE, except as noted with the individual test results. (see the Results and Discussion section)

### **METHODS AND MATERIALS**

### **TEST METHODS**

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (2002), EPA-821-R-02-013.

Additional guidance was provided by:

Whole Effluent Toxicity Testing Guidance and Test Review Criteria, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

### **DEVIATIONS FROM PROTOCOLS**

Deviations from required procedures in the test methods:

None noted.

Deviations from recommended procedures in the test methods:

The amount of Sodium Thiosulfate (dechlorinating agent) added to the sample collected on July 30 was based off of the initial Total Residual Chlorine reading of 0.04 mg/L. This reading was later corrected to 0.02 mg/L. As a result of this lab error, twice the specified amount of sodium thiosulfate was added to the sample prior to use. During interpretation of the impact of this deviation, it should be noted that the dosage amount of Sodium Thiosulfate used in the July 30 sample was the same dosage as used during sample preparation steps for the July 25 and 27 samples. It is TA-ASL's professional opinion that this deviation had minimal or no significant effect on testing results.

### **TEST DESIGN**

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

Chronic tests: 1.0, 3.3, 11.0, 33.0, and 100 percent sample + dilution water for the control.

### Test Organism Conditions:

All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002).

The test organisms appeared vigorous and in good condition prior to testing.

C. dubia chronic test:

Source: TA-ASL's in-house cultures

Age: Less than 24 hours old and within an 8-hour age range, with blocking by known parentage

Design: Ten test vessels per concentration, one organism per vessel Test Solution Renewal: Daily

Monitoring:

- Daily: Survival and neonate production (with brood determination)
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination:

• Survival: @ after 7 days.

• Reproduction: When 60%+ of surviving control organisms produce a  $3^{rd}$  brood. Endpoints: Survival (at Day 7) and Reproduction (through first 3 broods)

### P. promelas chronic test:

Source: Aquatox Inc., Hot Springs, Arkansas Age: Less than 48 hours old and within an 24 hour age range Design: Four test vessels per concentration, ten organisms per vessel Test Solution Renewal: Daily Monitoring:

- o Daily: Survival
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination: 7 days after test initiation.

Endpoints: Survival and Growth (average dry weight per organism added @ initiation)

### **DILUTION WATER**

The dilution water used was the standard culture water used by TA-ASL:

Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as CaCO<sub>3</sub> and an alkalinity of 60 to 70 mg/L as CaCO<sub>3</sub>.

### SAMPLE COLLECTION AND STORAGE

Samples were collected by Energy Northwest personnel. The samples were accepted as scheduled by TA-ASL. Chain of Custody and Sample Receipt Records are provided in Appendix C.

All samples were received within the EPA recommended 0 to 6 °C range.

All samples were received within the WDOE required 0 to 6 °C range. All samples were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection. All subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample. All subsequent uses of a sample occurred within the WDOE recommended maximum holding time of 72 hours past the time of sample collection. Following receipt, the samples were stored in the dark at 0 to 6 C until test solutions were prepared and tested.

### SAMPLE PREPARATION

Samples used during these tests were:

Temperature adjusted prior to test initiation and each daily renewal. Dechlorination with sodium thiosulfate was performed.

### **DATA ANALYSIS**

The statistical analyses performed for the chronic tests were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, USEPA Office of Water, Fourth Edition (EPA 2002), EPA-821-R-02-013, using CETIS.

Additional guidance was provided by *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A. If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

### **RESULTS AND DISCUSSION**

The raw data sheets are presented in Appendix A.

### **CHRONIC BIOASSAYS**

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test initiated on July 26, 2018.

Su	Table 1         mmary of Chronic Rest         C. dubia	ults
Sample Concentration (%)	Percent Survival	Mean Number of Young Per Adult
Control	100	26.9
1.0	100	24.4
3.3	100	28.3
11.0	100	26.5
33.0	60	14.6 <sup>a</sup>
100	30 <sup>a</sup>	1.5

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

$$\begin{array}{rl} \text{NOEC} &=& 11.0 \ \% \\ \text{LOEC} &=& 33.0 \ \% \\ \text{IC}_{25} &=& 19.8 \ \% \end{array}$$

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival and growth data for the P. promelas chronic test in	nitiated on
July 26, 2018.	

Sı	Table 2 Immary of Chronic Re <i>P. promelas</i>	sults
Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Organism Added (mg)
Control	95.0	1.003
1.0	95.0	0.944
3.3	95.0	1.024
11.0	100	0.970
33.0	97.5	0.950
100	95.0	1.024

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

 $\begin{array}{rll} NOEC &=& 100 \ \% \\ LOEC &>& 100 \ \% \\ IC_{25} &>& 100 \ \% \end{array}$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *P. promelas* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

### **REFERENCE TOXICANT TESTS**

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* chronic reftox test was conducted using sodium chloride. The *P. promelas* chronic reftox test was conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

T Chronic Reference	able 3 e Toxicant Tests	s (g/L)
Species	IC <sub>25</sub>	Cusum Chart Limits
C. dubia (survival)	1.54	1.15 to 2.17
<i>C. dubia</i> (reproduction)	0.79	0.17 to 1.25
<i>P. promelas</i> (survival)	0.61	0.57 to 0.64
P. promelas (growth)	0.53	0.44 to 0.73

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

# **APPENDIX A**

# **RAW DATA SHEETS**

FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA

TestAmerica

organism filtered? " - " = sample not dechlorinated, or analyte not collected/needed. 60 um noted) From EPA manual (EPA-821-R-02-013, 8.8.7): 0.025 ml of a 26.8 g/L stock of sodium thiosulfate will reduce 0.10 mg/L TRC in a 1L sample. na -01 sample Calc:  $(\lambda \sigma L \text{ sample}) \ge (\sigma, \sigma q \text{ mg/L TRC}) \ge 0.25 = 0.20$  ml of 26.8 g/L sodium thiosulfate to add (ID: 28070.04) -03 sample Calc: (10 L sample) x (0.04 mg/L TRC) x 0.25 = 0.70 ml of 26.8 g/L sodium thiosulfate to add (ID: 76 010-04) -02 sample Calc: ( $\mathcal{P}'$  L sample) x ( $\mathcal{O} \cdot \mathcal{O} \cdot I$  mg/L TRC) x 0.25 =  $\mathcal{O} \cdot \mathcal{P} I$  ml of 26.8 g/L sodium thiosulfate to add (ID;  $\mathcal{A} \circ \mathcal{O} \mathcal{P} = \mathcal{O} \circ \mathcal{O}$ ) 87800 3 as Rc'vd Cond. 52.1 (Sn) U.JC W na 8-2-8 31-92-2 -28 m Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page. as Rc'vd ANHO Hq 19 na (for example: 4L of sample at 0.10 mg/L TRC needs 0.10 ml of 26.8g/L sodium thiosulfate stock to be dechlorinated) Ţ **DO NOT** add more sodium thiosulfate if "after Dechlor" TRC reading is not reduced to < 0.02 mg/L. Leave as is. 3 as Rc'vd (mg/L) Dechlorination is **REQUIRED** if Total Residual Chlorine (TRC) is detected (i.e. TRC is 0.02 mg/L or greater) 8 1 g 00 na 3,0 Test Initiation: Date Test Termination: Date Hardness Alkalinity mg/l as 0.10 mg/L 5 mg/L 5 mg/L CaCO<sub>3</sub> as Rc'vd 105 25 25 # 650 mg/l as 30 CaCO<sub>3</sub> as Rc'vd 510 # 1/ Conductivity 60.07 Ammonia 20.10 NH<sub>3</sub>-N 01.07 as Rc'vd mg/l Dechlorination allowed 0.0 270.0 SDG# B Jorg / after Dechlor. Hardness Alkalinity Comments:  $\Box$  Indicates the action was taken, ( $\Box$ = action not taken): 120.01 120.0 10'0 / ho'o Rec Barros Chlorine (mg/l) Total Residual 0.02 mg/L Hq as Rc'vd Dissolved Oxygen # 4 as Rc'vd l'emp (°C) 2.2 3 3.2 na ( Pacific 0:30 Time Zone) 10 88 Received Reporting Limits: 81421£ 13 :45To7 /31 /18 (mm/dd/yy) B11 72 160 Date Water Quality Meters Used/ID#: ( Pacific Jane LaPage (509) 377-4061 3:50 55.25 Time Zone) Energy Northwest Collected (win/dd/yy) CaCO<sub>3</sub> 7 127-118 81/02/20 mg/l as BIJRICS 2 5 Date 9 mg/l as CaCO<sub>3</sub> 60 00 5 00 41,94 5 190086-03 201 19-920061 Field ID Ð# 190086 Recon MH (FHM) 9 -03 -01 Sample ID Number Dilution Water Broug Contact Client

Energy NW - FHIM acute + chronics (use in 2018).xlsm Doc Control (D: ASL899-0917

**TestAmerica** 

# FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

Client

# **Energy Northwest**

Sample Designation (SDG): B 4044

		Cd # 3448	FHM # 1995	FHM # 1995	
Test Specie	s Information	Ceriodaphnia dubia	Pimephales	Pimephales	
			promelas	promelas	
		Chronic	Chronic	Acute	
Organism A	ge at Initiation	<24 hrs, all within an	<48 hrs, all within a	Days, within a	
	ge at intration	8 hr window	24 hour window	24 hour window	
Test Con	tainer Size	30 ml	800 ml	400 ml	
Test	Volume	15 ml	500 ml	250 ml	
Feeding:	Type and	0.10 ml Algae and	0.15 ml Artemia,	0.15 ml Artemia,	
	Amount	0.10 ml YCT daily	2 x Daily	@ 48 hrs	
Aeration:		None None	🗣 None	P None	
		D Prior to use	□ Prior to use	Prior to use	
In Test Chambers	s via Slow Bubble :		□ @hrs	□ @ hrs	
Acclimat	ion Period	<24 hrs	<24 hrs	<24 hrs	
Organis	m Source	In-House	AGIRTOX	Aguitox	
Si	ize	-			
Loadir	ng Rate		-	-	

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): 
All

Date:

Comments:

# **Test Solution Preparation and Dilution Record**

Client: Energy Northwest

Note: 🗆 Indicates task not done, 🗹 Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp Ditto marks ( ' ' ) indicate that the same SDG, batch of dilutic

									I UL SALIE SUUC, DAICH OT	dilution water	or food on the	a second s		
Cer	"iodaphnia	Ceriodaphnia dubia - Chronic	hronic						A LOUI AN HIG PICATORS CAN'S CHILD AND AN AND AN AN AND AN	· Imm	VIII CE POOT IO	e previous day	's entry was	used.
L	Tant													
	TCSL	Sample	Final	al	Test	Sample ID		ily Comula Dama						
ວິ	Concentration	Volume	Volume	me	Dav	Tread		variable rieparanon	Dilution Water	YCTID	Algae ID	Date	Time	Tuitiala
	(%)	(mls)	(mls)	(8)	0 (Initiation)	20		(prior to dilution)	Used	Used			2007	SIBUUL
	Control	0.00	→ 200	0			1	L Iemp adj, L Aerated	17 ふ92,#田	#1168	1	7 76/208	1 5 -	C
	1.0	2.00	→ 200	0		R HAND OF	0	La Lemp adj, La Aerated	D# 4695	# 1161	#Illain	2 27/ "18	02.20	E DC
	3.3	6.60	→ 200		1 00	- HOL	(m	Lemp adj, 🗆 Aerated	ID# 41695	# MT57	# 11.60	81 /82/ L	12:12	242
	11.0	22.0	→ 200		4	, a		L temp adj, L Aerated	ID# UB/0	#1157	# ))("("	712115	0 . 10	27
	33.0	66.0	→ 200		· v	+		Lemp adj, 🗆 Aerated	ID# **	# 468	# 166	7764	all of	2ml
	100	200	→ 200		, ve	+		Lemp ady, LI Acrated		#1176	# 11/6	81.11212	2	2 QWA
Total Sa	mple volume	Total Sample volume needed per day =	y = 297  mls	lls	7	+	8	□ 1emp adj, □ Acrated □ Tenn adi □ Aemted	ID# 4696 115		7911#	8/1/1/8	59 50	SAN
Fath	read minno	Fathead minnow - Chronic	0					name in the second	۳.# 	#	#	u/ /		
	Test	Sample	Final		Test	Samla ID		-						
Cor	Concentration	Volume	Volume	ne	Dav	I lead		Lauy Sample Preparation	Dilution Water	Date	Time	Initials		
	(%)	(mls)	(mls)		0 (Initiation)	(Initiation) R 64049 0	~	(prior to dilution)	Used					
	Control	0.00	→ 2000	Г		alloug C	1.	Lemp adj, 🗆 Aerated		7 1-6/20 8 1150	1150	9		
	1.0	20.0	→ 2000		. 6	D-1LN/ R	1	L temp adj, L Aerated	ID# 4695	SI 12/ 1	04:30	1-40		
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	11.0	220 -	→ 2000		- <del>-</del>	-		- 1 temp adj, LI Aerated	D# 4696	21"129"18	10:45	<b>BAN</b>		
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	100	2,000 -	→ 2000		9			T T T T T T T T T T T T T T T T T T T	ID# 4696	731/18	11:30	3 are		
Total San	uple volume i	Total Sample volume needed per day =	/ = 2966 mls	] slr	5			🖵 remp ady, 너 Aerated	D#4696 S	0 81 1/ 1/ 8	09:50	SAW		

1.0	20.0	î	2000
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11.0	220	<b> </b> ↑	2000
33.0	660	↑	2000
100	2,000	1	2000
Total Sample volume needed per day =	ne needed per o	lay =	2966 mls

Initials

Time

A ..... Fathead minnow

Final Test Volume Day	, T	1000	1000	1000	1000	
	1	1	<b> </b> ↑	1	1	ŀ
Sample Volume (mls)	0.00	62.5	110	250	500	1 000
Test Concentration (%)	Control	6.25	11.0	25.0	50.0	100

Daily Sample Preparation (prior to dilution)	🗖 Temp adj, 🗖 Aerated
Test Sample ID Day Used itiation) Brach d l	B+ 21
fest Day itiation)	2

Date	7 76 1268	7 28/263
Dilution Water Used	10#11694	53917 #11
Daily Sample Preparation (prior to dilution)	🗆 Temp adj, 🗖 Aerated	🗖 Temp adj, 🗋 Aerated

Total Sample volume needed per day = 1923 mls



*Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client	Energy Northwest	Test Start Date	7-26-13	
Sample Description		Initial Sample ID#	в 4049	
Data summarized by	S~~			

Percent												Total
or			Total Liv	ve Young l	Produced	in First 3	Broods pe	r Replicat	е		# Alive	Live
Concentration	A	B	C	D 🥪	n"E	F	G	H	I	J	Adults	Young
Control	24	26	28	328	27	31	26	23	23	26	10	269
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.0 %	21	23	19	23	26	23	27	29	27	26	10	244
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		- • (
3.3 %	25	24	25	31	31	28	29	33	25	32	10	283
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
11.0 %	20	25	31	z7	27	32	25	26	27	25	10	265
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
33.0 %	21	24	10	27	15	4	18	6	16	5	1	146
	AD?	AD?	AD? 🗸	AD?	AD?	AD? V	AD?	AD? V	AD?	AD? 🖌	6	1.14
100 %	0	0	0	5	0	0	0	5	0	5	3	15
	AD? 🗸	AD? 🗸	AD?	AD?	AD? 🖌	AD? 🗸	AD? 🖌	AD?	AD? 🗸	AD? 🗸		

Survival data summarized through Day 7. 60%+ of surviving controls with 3+ broods first observed on Day  $\langle \varphi \rangle$ .

Test Organism Mortality (Adult dead) = AD?

Test Organism identified as Male =

Test Organism Injured during test =

AD? M

AD?

 $\checkmark$ 

Ι

# of Alive Adults = Number of test organism alive at termination
 (for WDOE only, = Number of test organisms alive at Day 7)

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of <u>eight</u> days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

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	_	JAV	OHV	OAY	PAY	UND	UNU	On	02	UMP	OAD	3	3
	/			PHO	HM				-		(),MD	2	2

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, " / " = split brood ( carry-over brood / current day brood ), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood Footnote: As per WDOE, C. dubia test reproduction should be when 60% of the surviving control organisms have produced their third brood (Days 6, 7, or 8). Survival is at seven days.

TestAmerica	terico	CERIODAPHNIA WATER QUALITY DATA	
Client	Energy Northwest	Initiated Date 72U 201 & Time 12 : 20	Adults Isolated Date 7/252018 Time 3:00
Sample		Initial Sample ID # B 4049 - 61	20 (S Time 19 :
Tech:	Day 0 MS Day 1 UC Day 2 CO	Day 3 MS Day 4 MS Day 5 MS	Day 6 NIQ & Day 7 B Day 8
Time	Day 0 2:50 Day 1 12:55 Day 2 14:10	Day 3 13 :00 Day 4 12 :00 Day 5 15 : 20	Day 7
Therm.	. Day 0 # 252 Day 1 # 252 Day 2 # 252	Day 3 # 252 Day 4 # 252 Day 5 # 252	Day 6 # 25 \ Day 7 # 25 \ Day 8 #
	Dissolved Oxygen (mg/l)	Hq	Temperature ( $^{\circ}$ C) / Conductivity ( $\mu$ S) (1 <sup>st</sup> use of each sample only)
%	Day	Day	Day
	2 5 4 5 5 0 C 4 5 5	2 3 4	0 1 2 3 4 5 6 7 8
Control	7.5 7.6 7.5 7.6 7.0 75 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7.5 / 7	7.00 7.01 5.11 5.11 5.12 8.3 7.2 7.01 A. A. A. 1. 1. 1. 5.1. 1. 2.24	24.1/25.2/24.4/75.1/26.2/25.2/25.1/35.8/
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% 0.55	122 22 4.24 1-3 8.14 8.4 P.2 P.2 P.2 P.2 P.2	29 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	12.42 hr. hz. hz. hz.
% 00 I	8.0 7.8/7.9/1.9/1.9/7.2/7.6/23/ B.0 h.8/7.8/1.9/8.2/1.3/22	7. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	4 2. 32/5 mile 12 / 9/11
COMP	COMMENTS: Temperatures taken just prior to test solution renewals. DO,	DO, pH, and Conductivity taken following organism transfer.	
			= Temp out of
Note:	All Day 0 data represents conditions at initiation. All other days: num	Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.	renewal conditions.

Energy NW - FHM acute + chronics (use in 2018).xlsmDoc Control ID: ASL899-0917

							100	st Code:			9-6273-581
Ceriodaphnia	7-d Survival a	nd Reproc	luction Te	est				-		TestAm	erica - ASL
Batch ID:	03-5016-1143	T	est Type:	Reproduction-S	Survival (7d)		An	alyst: Bre	tt Muckey		
Start Date:	26 Jul-18 12:2	0 <b>P</b> r	rotocol:	EPA/821/R-02-	-013 (2002)		Dil	uent: Moo	d-Hard Synt	hetic Water	r
Ending Date:	02 Aug-18 11:	40 <b>S</b>	pecies:	Ceriodaphnia d	lubia		Bri	ne:			
Duration:	6d 23h		ource:	In-House Cultu	ire		Ag	e:			
Sample ID:	13-9857-8979	C	ode:	B4049-01 🛩	/		Cli	ent:			
Sample Date:	25 Jul-18 03:1	8 <mark>M</mark>	aterial:	POTW Effluent	t		Pro	oject:			
Receive Date:	: 26 Jul-18 10:5	5 <b>S</b> e	ource:	Energy Northw	est (WA 002	25151) 🐓	,				
Sample Age:	33h	St	ation:								
Test Note:	As per WDOE	, survival d	ata throug	h Day 7, reproc	luction data	through whe	n 60%+ o	f the controls	had 3 broo	ds (Day 6).	
Comparison \$	Summary										
Analysis ID	Endpoint		NOEL		TOEL	PMSD	TU	Method			
02-4011-2136	7d Survival Ra	te	33	-100	57.45	NA	3.03		act/Bonferro		
15-4589-1688	Reproduction	$\sim$	11	33	19.05	17.5%	9.091	Steel Mar	y-One Rank	k Sum Test	
Point Estimat	e Summary										
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	TU	Method			
04-4201-9022	Reproduction	<	IC25	19.79	215.47	26.68	5.054	Linear Inte	erpolation (I	CPIN)	
			IC50	36.41	25.67	46.65	2.746				
Test Acceptab	oility										
Analysis ID	Endpoint		Attribu	ute	Test Stat	TAC Limit	ts	Overlap	Decision		
02-4011-2136	7d Survival Ra	te	Contro	Resp	1	0.8 - NL		Yes	Passes A	cceptability	Criteria
04-4201-9022	Reproduction		Contro	l Resp	26.9	15 - NL		Yes	Passes A	cceptability	Criteria
15-4589-1688	Reproduction		Contro	l Resp	26.9	15 - NL		Yes	Passes A	cceptability	Criteria
15-4589-1688	Reproduction		PMSD		0.1751	0.13 - 0.47		Yes	Passes A	cceptability	Criteria
7d Survival Ra	ate Summary										
i a vai intai na							Max	Std Err	Std Dev	CV%	%Effect
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min				n n0/	D D0/
<b>C-%</b> 0	Control Type Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%
<b>C-%</b> D 1		10 10	1	1 1	1 1	1 1	1 1	0	0	0.0%	0.0%
<b>C-%</b> 0 1 3.3		10 10 10	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	0 0	0 0	0.0% 0.0%	0.0% 0.0%
<b>C-%</b> 0 1 3.3 11		10 10 10 10	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	0 0 0	0 0 0	0.0% 0.0% 0.0%	0.0% 0.0% 0.0%
<b>C-%</b> 0 1 3.3 11 33		10 10 10 10 10	1 1 1 1 0.6	1 1 1 1 0.2306	1 1 1 1 0.9694	1 1 1 1 0	1 1 1 1 1	0 0 0 0.1633	0 0 0 0.5164	0.0% 0.0% 0.0% 86.07%	0.0% 0.0% 0.0% 40.0%
C-% D 1 3.3 11 33		10 10 10 10	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	0 0 0	0 0 0	0.0% 0.0% 0.0%	0.0% 0.0% 0.0%
C-% D 1 3.3 11 33 100 Reproduction	Dilution Water	10 10 10 10 10 10	1 1 1 0.6 0.3	1 1 1 0.2306 0	1 1 1 0.9694 0.6456	1 1 1 1 0 0	1 1 1 1 1	0 0 0.1633 0.1528	0 0 0.5164 0.483	0.0% 0.0% 0.0% 86.07% 161.0%	0.0% 0.0% 0.0% 40.0% 70.0%
C-% D 1 3.3 11 33 100 Reproduction C-%	Dilution Water Summary Control Type	10 10 10 10 10 10 <b>Count</b>	1 1 1 0.6 0.3 Mean	1 1 1 0.2306 0 <b>95% LCL</b>	1 1 1 0.9694 0.6456 <b>95% UCL</b>	1 1 1 0 0 <b>Min</b>	1 1 1 1 1 1 <b>Max</b>	0 0 0.1633 0.1528 Std Err	0 0 0.5164 0.483 Std Dev	0.0% 0.0% 86.07% 161.0%	0.0% 0.0% 40.0% 70.0%
C-% 0 1 3.3 11 33 100 Reproduction C-% 0	Dilution Water	10 10 10 10 10 10 10 <b>Count</b> 10	1 1 1 0.6 0.3 Mean 26.9	1 1 1 0.2306 0 <b>95% LCL</b> 24.24	1 1 1 0.9694 0.6456 <b>95% UCL</b> 29.56	1 1 1 0 0 <b>Min</b> 23	1 1 1 1 1 1 <b>Max</b> 35	0 0 0.1633 0.1528 <b>Std Err</b> 1.178	0 0 0.5164 0.483 <b>Std Dev</b> 3.725	0.0% 0.0% 86.07% 161.0% <b>CV%</b> 13.85%	0.0% 0.0% 40.0% 70.0% %Effect 0.0%
C-% D 1 3.3 11 33 100 Reproduction C-% D 1	Dilution Water Summary Control Type	10 10 10 10 10 10 10 <b>Count</b> 10 10	1 1 1 0.6 0.3 Mean 26.9 24.4	1 1 1 0.2306 0 <b>95% LCL</b> 24.24 22.18	1 1 1 0.9694 0.6456 <b>95% UCL</b> 29.56 26.62	1 1 1 0 0 0 <b>Min</b> 23 19	1 1 1 1 1 1 1 <b>Max</b> 35 29	0 0 0.1633 0.1528 <b>Std Err</b> 1.178 0.9798	0 0 0.5164 0.483 <b>Std Dev</b> 3.725 3.098	0.0% 0.0% 86.07% 161.0% <b>CV%</b> 13.85% 12.7%	0.0% 0.0% 40.0% 70.0% %Effect 0.0% 9.29%
C-% 0 1 3.3 11 33 100 Reproduction C-% 0 1 3.3	Dilution Water Summary Control Type	10 10 10 10 10 10 10 10 10 10	1 1 1 0.6 0.3 <b>Mean</b> 26.9 24.4 28.3	1 1 1 0.2306 0 <b>95% LCL</b> 24.24 22.18 (25.89	1 1 1 0.9694 0.6456 <b>95% UCL</b> 29.56 26.62 30.71	1 1 1 0 0 <b>Min</b> 23 19 24	1 1 1 1 1 1 1 35 29 33	0 0 0.1633 0.1528 <b>Std Err</b> 1.178 0.9798 1.065	0 0 0.5164 0.483 <b>Std Dev</b> 3.725 3.098 3.368	0.0% 0.0% 86.07% 161.0% <b>CV%</b> 13.85% 12.7% 11.9%	0.0% 0.0% 40.0% 70.0% <b>%Effect</b> 0.0% 9.29% -5.2%
C-% 0 1 3.3 11 33 100 Reproduction C-% 0 1 3.3 11	Dilution Water Summary Control Type	10 10 10 10 10 10 10 10 10 10 10	1 1 1 0.6 0.3 <b>Mean</b> 26.9 24.4 28.3 26.5	1 1 1 0.2306 0 95% LCL 24.24 22.18 25.89 24.11	1 1 1 0.9694 0.6456 <b>95% UCL</b> 29.56 26.62 30.71 28.89	1 1 1 0 0 <b>Min</b> 23 19 24 20	1 1 1 1 1 1 1 <b>Max</b> 35 29 33 32	0 0 0.1633 0.1528 <b>Std Err</b> 1.178 0.9798 1.065 1.057	0 0 0.5164 0.483 <b>Std Dev</b> 3.725 3.098 3.368 3.342	0.0% 0.0% 86.07% 161.0% <b>CV%</b> 13.85% 12.7% 11.9% 12.61%	0.0% 0.0% 40.0% 70.0% %Effect 0.0% 9.29% -5.2% 1.49%
C-% 0 1 3.3 11 33 100 Reproduction C-% 0 1 3.3	Dilution Water Summary Control Type	10 10 10 10 10 10 10 10 10 10	1 1 1 0.6 0.3 <b>Mean</b> 26.9 24.4 28.3	1 1 1 0.2306 0 <b>95% LCL</b> 24.24 22.18 (25.89	1 1 1 0.9694 0.6456 <b>95% UCL</b> 29.56 26.62 30.71	1 1 1 0 0 <b>Min</b> 23 19 24	1 1 1 1 1 1 1 35 29 33	0 0 0.1633 0.1528 <b>Std Err</b> 1.178 0.9798 1.065	0 0 0.5164 0.483 <b>Std Dev</b> 3.725 3.098 3.368	0.0% 0.0% 86.07% 161.0% <b>CV%</b> 13.85% 12.7% 11.9%	0.0% 0.0% 40.0% 70.0% <b>%Effect</b> 0.0% 9.29% -5.2%

Analyst:\_ & QA:\_ MB

## **CETIS Summary Report**

### Report Date: Test Code:

17 Aug-18 11:15 (p 2 of 2) B404901cdc | 09-6273-5810

Ceriodaphnia 7-d Survival and Reproduction Test

	-	-	
Test/	America	1 -	ASL

7d Surviv	al Rate Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
1		1	1	1	1	1	1	1	1	1	1
3.3		1	1	1	1	1	1	1	1	1	1
11		1	1	1	1	1	1	1	1	1	1
33		1	1	0	1	1	0	1	0	1	0
100		0	0	1	1	0	0	0	1	0	0

#### **Reproduction Detail**

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	24	26	28	35	27	31	26	23	23	26
4	Dilution water										
1		21	23	19	23	26	23	27	29	27	26
3.3		25	24	25	31	31	28	29	33	25	32
11		20	25	31	27	27	32	25	26	27	25
33		21	24	10	27	15	4	18	6	16	5
100		0	0	0	5	0	0	0	5	0	5

#### 7d Survival Rate Binomials

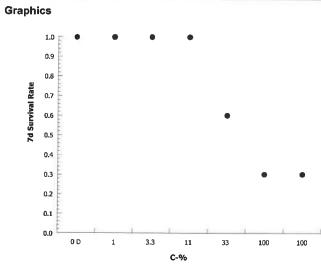
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
3.3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
11		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
33		1/1	1/1	0/1	1/1	1/1	0/1	1/1	0/1	1/1	0/1
100		0/1	0/1	1/1	1/1	0/1	0/1	0/1	1/1	0/1	0/1

# **CETIS Analytical Report**

							16	st Gode:	D	404901000	09-0213-3
Ceriodaphnia	7-d Survival a	nd Rep	roduction Te	est						TestAr	nerica - A
Analysis ID: Analyzed:	02-4011-2136 17 Aug-18 11:	14	Endpoint: Analysis:	7d Survival STP 2x2 Co	Rate Intingency Tat	oles		TIS Vers		Sv1.8.8	
Batch ID:	03-5016-1143				on-Survival (7d		An	alyst:	Brett Mucke	/	
Start Date:	26 Jul-18 12:2	0	Protocol:		02-013 (2002)	-				, ynthetic Wate	ər
Ending Date:	02 Aug-18 11:4	40	Species:	Ceriodaphn	, ,	<b>,</b>	Br	ine:	···· - · · · · · - · ,	,	
Duration:	6d 23h		Source:	In-House C			Ag	e:			
Sample ID:	13-9857-8979		Code:	B4049-01			Cli	ent:			
Sample Date:	25 Jul-18 03:18	8	Material:	POTW Efflu	ent		Pre	oject:			
Receive Date:	26 Jul-18 10:5	5	Source:	Energy Nort	hwest (WA 00	25151)					
Sample Age:	33h		Station:								
Test Note:	As per WDOE,	surviva	al data throug	h Day 7, rep	roduction data	through w	hen 60%+ (	of the cont	trols had 3 br	oods (Day 6)	
Data Transform	m	Zeta	Alt Hy	/p Trials	Seed			NOEL	LOEL	TOEL	τυ
Untransformed			C > T	NA	NA			33	100	57.45	3.03
Fisher Exact/E	Bonferroni-Holr	n Test									
Control	vs C-%		Test S	tat P-Valu	e P-Type	Decisio	n(α:5%)				
Dilution Water	1		1	1.0000	Exact	Non-Sig	nificant Effe	ct			
	3.3		1	1.0000	Exact	Non-Sigi	nificant Effe	ct			
	11		1	1.0000	Exact	Non-Sigi	nificant Effe	ct			
	33		0.0433	4 0.1734	Exact	Non-Sigi	nificant Effe	ct			
	100		0.0015	48 0.0077	Exact	Significa	nt Effect				
Data Summary	/										
	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect				
0	Dilution Water	10	0	10	1	0	0.0%				
1		10	0	10	1	0	0.0%				
3.3		10	0	10	1	0	0.0%				
11		10	0	10	1	0	0.0%				
33		6	4	10	0.6	0.4	40.0%				
100		3	7	10	0.3	0.7	70.0%				
7d Survival Ra	te Detail										
	Control Type	Rep 1		Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
	Dilution Water	1	1	1	1	1	1	1	1	1	1
 		1	1	1	1	1	1	1	1	1	1
3.3		1	1	1	1	1	1	1	1	1	1
1		1	1	1	1	1	1	1	1	1	1
33		1	1	0	1	1	0	1	0	1	0
00		0	0	1	1	0	0	0	1	0	0
d Survival Ra	te Binomials										
-% (	Control Type	Rep 1		Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
	Dilution Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
) [			1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
		1/1	17.1								
3.3		1/1 1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
I 3.3					1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1
) [ ] ]3.3 ]1 ]33		1/1	1/1	1/1							

CETIS Analytical Report	Report Date:	17 Aug-18 11:15 (p 2 of 2)
	Test Code:	B404901cdc   09-6273-5810

Ceríodaphnia	7-d Survival and Re	eproduction To	est		TestAmerica - ASL
Analysis ID:	02-4011-2136	Endpoint:	7d Survival Rate	CETIS Version:	CETISv1.8.8
Analyzed:	17 Aug-18 11:14	Analysis:	STP 2x2 Contingency Tables	Official Results:	Yes
				emolar results.	105



## **CETIS Analytical Report**

											09-6273-5
Ceriodaphnia	1 7-d Survival a	ind Repr	roduction Te	st						TestAr	nerica - A
Analysis ID:	15-4589-1688		-	Reproduction				TIS Versio	n: CETIS	/1.8.8	
Analyzed:	17 Aug-18 11	:14	Analysis:	Nonparametric	c-Control v	/s Treatments	Off	icial Resul	ts: Yes		
Batch ID:	03-5016-1143	ł	Test Type:	Reproduction-	Survival (7	7d)	Ana	alyst: Bi	ett Muckey		
Start Date:	26 Jul-18 12:2	20	Protocol:	EPA/821/R-02	-013 (200	2)	Dilu	uent: M	od-Hard Syr	thetic Wate	r
Ending Date:	02 Aug-18 11	:40	Species:	Ceriodaphnia d	dubia		Brii				
Duration:	6d 23h		Source:	In-House Cultu	Ire		Age	):			
Sample ID:	13-9857-8979	1	Code:	B4049-01			Clie	ent:			
•	25 Jul-18 03:1		Material:	POTW Effluen	t		Рго	ject:			
Receive Date:	: 26 Jul-18 10:5	55	Source:	Energy Northw	est (WA 0	025151)					
Sample Age:	33h		Station:								
Test Note:	As per WDOE	i, surviva	I data through	h Day 7, reproc	duction da	ta through wh	en 60%+ of	f the contro	ls had 3 broo	ods (Day 6).	
Data Transfor		Zeta	Alt Hy	p Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Untransformed	l	NA	C > T	NA	NA	_	17.5%	11	33	19.05	9.091
Steel Many-Or	ne Rank Sum T	est									
Control	vs C-%		Test St	tat Critical	Ties	DF P-Value	Р-Туре	Decisio	n(α:5%)		
Dilution Water	1		88	76	3	18 0.2575	Asymp	-	nificant Effect		
	3.3		117	76		18 0.9722	Asymp	Non-Sigi	nificant Effect	rt	
	11		105.5	76		18 0.8122	Asymp	-	nificant Effect	t	
	33*		64	76	2	18 0.0036	Asymp	Significa	nt Effect		
ANOVA Table											
Source	Sum Squ	ares	Mean S	quare	DF	F Stat	P-Value	Decisior			
Between	1215.72		303.93		4	13.54	<0.0001	Significa	nt Effect		
Error Total	1010.3		22.4511	1	45						
					49						
	lests										
					-						
	Test			Test Stat		P-Value	Decision				
/ariances	Test Bartlett E		of Variance	14.04	13.28	0.0072	Unequal \	/ariances			
/ariances Distribution	Test Bartlett E Shapiro-							/ariances			
/ariances Distribution Reproduction	Test Bartlett E Shapiro-1 Summary	Wilk W N	Normality	14.04 0.9857	13.28 0.9367	0.0072 0.8002	Unequal \ Normal Di	/ariances istribution		01/1/	0/ 1= **
/ariances Distribution Reproduction	Test Bartlett E Shapiro- Summary Control Type	Wilk W N	Normality t <b>Mean</b>	14.04 0.9857 <b>95% LCL</b>	13.28 0.9367 <b>95% UC</b>	0.0072 0.8002 L Median	Unequal \ Normal Di <b>Min</b>	/ariances istribution Max	Std Err	<b>CV%</b>	
/ariances Distribution Reproduction C-%	Test Bartlett E Shapiro-1 Summary	Wilk W N Count	Normality t <u>Mean</u> 26.9	14.04 0.9857 <b>95% LCL</b> 24.24	13.28 0.9367 <b>95% UC</b> 29.56	0.0072 0.8002 L Median 26	Unequal N Normal Di Min 23	Variances istribution Max 35	1.178	13.85%	0.0%
/ariances Distribution Reproduction C-% ()	Test Bartlett E Shapiro- Summary Control Type	Wilk W N Count 10 10	Normality t <u>Mean</u> 26.9 24.4	14.04 0.9857 95% LCL 24.24 22.18	13.28 0.9367 <b>95% UC</b> 29.56 26.62	0.0072 0.8002 L Median 26 24.5	Unequal N Normal Di Min 23 19	Variances istribution Max 35 29	1.178 0.9798	13.85% 12.7%	0.0% 9.29%
/ariances Distribution Reproduction C-% () 1 .3	Test Bartlett E Shapiro- Summary Control Type	Count 10 10 10	Normality t Mean 26.9 24.4 28.3	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71	0.0072 0.8002 L Median 26 24.5 28.5	Unequal N Normal Di Min 23 19 24	Variances istribution Max 35 29 33	1.178 0.9798 1.065	13.85% 12.7% 11.9%	0.0% 9.29% -5.2%
/ariances Distribution Reproduction C-% () .3 1	Test Bartlett E Shapiro- Summary Control Type	Wilk W N Count 10 10	Normality t <u>Mean</u> 26.9 24.4	14.04 0.9857 95% LCL 24.24 22.18	13.28 0.9367 <b>95% UC</b> 29.56 26.62	0.0072 0.8002 L Median 26 24.5	Unequal N Normal Di Min 23 19	Variances istribution Max 35 29	1.178 0.9798	13.85% 12.7%	0.0% 9.29%
/ariances Distribution Reproduction % () .3 1 3	Test Bartlett E Shapiro- Summary Control Type Dilution Water	Count 10 10 10 10 10	Normality t Mean 26.9 24.4 28.3 26.5	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89 24.11	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89	0.0072 0.8002 L Median 26 24.5 28.5 26.5	Unequal N Normal Di Min 23 19 24 20	Variances istribution Max 35 29 33 32	1.178 0.9798 1.065 1.057	13.85% 12.7% 11.9% 12.61%	0.0% 9.29% -5.2% 1.49%
/ariances Distribution Reproduction C-% () 3.3 1 3 Reproduction	Test Bartlett E Shapiro- Summary Control Type Dilution Water	Count 10 10 10 10 10	Normality 26.9 24.4 28.3 26.5	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89 24.11	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89	0.0072 0.8002 L Median 26 24.5 28.5 26.5	Unequal N Normal Di Min 23 19 24 20	Variances istribution Max 35 29 33 32	1.178 0.9798 1.065 1.057	13.85% 12.7% 11.9% 12.61%	0.0% 9.29% -5.2% 1.49% 45.72%
/ariances Distribution Reproduction C-% () 3.3 1 3 Reproduction I C-% ()	Test Bartlett E Shapiro-1 Summary Control Type Dilution Water Dilution Water	Count           10           10           10           10           10           10           10	Normality 26.9 24.4 28.3 26.5 14.6	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89 24.11 8.777	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89 20.42	0.0072 0.8002 L Median 26 24.5 28.5 26.5 15.5	Unequal N Normal Di Min 23 19 24 20 4	Max 35 29 33 32 27	1.178 0.9798 1.065 1.057 2.574	13.85% 12.7% 11.9% 12.61% 55.76%	0.0% 9.29% -5.2% 1.49% 45.72%
/ariances Distribution Reproduction % () 3.3 1 3 Reproduction I % ()	Test Bartlett E Shapiro-V Summary Control Type Dilution Water Dilution Water	Wilk W N Count 10 10 10 10 10 10 Rep 1	Normality 26.9 24.4 28.3 26.5 14.6 <b>Rep 2</b>	14.04 0.9857 95% LCL 24.24 22.18 25.89 24.11 8.777 Rep 3	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89 20.42 <b>Rep 4</b>	0.0072 0.8002 L Median 26 24.5 28.5 26.5 15.5 Rep 5	Unequal N Normal Di 23 19 24 20 4 <b>Rep 6</b>	Max 35 29 33 32 27 Rep 7	1.178 0.9798 1.065 1.057 2.574 <b>Rep 8</b>	13.85% 12.7% 11.9% 12.61% 55.76% <b>Rep 9</b>	0.0% 9.29% -5.2% 1.49% 45.72% <b>Rep 1</b> 0
/ariances Distribution Reproduction 3.3 1 3.3 Reproduction I 5-% (0)	Test Bartlett E Shapiro-V Summary Control Type Dilution Water Dilution Water	Count           10           10           10           10           10           10           24	Normality 26.9 24.4 28.3 26.5 14.6 <b>Rep 2</b> 26	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89 24.11 8.777 <b>Rep 3</b> 28	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89 20.42 <b>Rep 4</b> 35	0.0072 0.8002 L Median 26 24.5 28.5 26.5 15.5 Rep 5 27	Unequal N Normal Di 23 19 24 20 4 <b>Rep 6</b> 31	Variances istribution 35 29 33 32 27 Rep 7 26	1.178 0.9798 1.065 1.057 2.574 <b>Rep 8</b> 23	13.85% 12.7% 11.9% 12.61% 55.76% <b>Rep 9</b> 23	0.0% 9.29% -5.2% 1.49% 45.72% <b>Rep 10</b> 26
)     3.3  1 33 Reproduction   \$-% (	Test Bartlett E Shapiro-V Summary Control Type Dilution Water Dilution Water	Count           10           10           10           10           10           24           21	Normality 26.9 24.4 28.3 26.5 14.6 Rep 2 26 23	14.04 0.9857 <b>95% LCL</b> 24.24 22.18 25.89 24.11 8.777 <b>Rep 3</b> 28 19	13.28 0.9367 <b>95% UC</b> 29.56 26.62 30.71 28.89 20.42 <b>Rep 4</b> 35 23	0.0072 0.8002 L Median 26 24.5 28.5 26.5 15.5 Rep 5 27 26	Unequal N Normal Di 23 19 24 20 4 <b>Rep 6</b> 31 23	Variances istribution 35 29 33 32 27 <b>Rep 7</b> 26 27	1.178 0.9798 1.065 1.057 2.574 <b>Rep 8</b> 23 29	13.85% 12.7% 11.9% 12.61% 55.76% <b>Rep 9</b> 23 27	9.29% -5.2% 1.49% 45.72% <b>Rep 10</b> 26 26

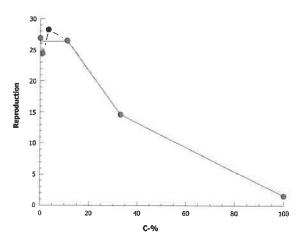
CETIS™ v1.8.8.3

CETIS Ana	alytical Report			Report Date: Test Code:	17 Aug-18 11:14 (p 2 of 2) B404901cdc   09-6273-5810
Ceriodaphnia	a 7-d Survival and R	eproduction Te	est		TestAmerica - ASL
Analysis ID: Analyzed:	15-4589-1688 17 Aug-18 11:14	Endpoint: Analysis:	Reproduction Nonparametric-Control vs Treatme	CETIS Version: nts Official Results:	CETISv1.8.8 Yes
Fraphics					
35 30 25 20 20 15 10			14 12 10 8 8 6 9 10 10 10 10 10 10 10 10 10 10 10 10 10	0.120ma	and the second of the second s
5	0 D 1	3.3 11	-6 -8 -10 -12 -12 -33 -2.5	-2.0 -1.5 -1.0 -0.5 0.0	0.5 1.0 1.5 2.0 2.5
		C-%		Rankits	

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# **CETIS Analytical Report**

Ceriod												
001100	laphnia	7-d Survival an	nd Reprodu	ction Te	est						TestAn	nerica - AS
Analys Analyz		04-4201-9022 17 Aug-18 11:		lpoint: lysis:	Reproduction Linear Interpol	ation (ICPI	N)		TIS Version		/1.8.8	
Batch	ID:	03-5016-1143	Tes	t Type:	Reproduction-	Survival (70	d)	Ana	alyst: Br	ett Muckey		
Start D	)ate:	26 Jul-18 12:20		tocol:	EPA/821/R-02	•			•	od-Hard Syn	thetic Wate	r
Ending	g Date:	02 Aug-18 11:4	40 <b>Spe</b>	cies:	Ceriodaphnia d	dubia	-	Bri	ne:			
Duratio	on:	6d 23h	Sou	rce:	In-House Cultu	ire		Age	e:			
Sample	e ID:	13-9857-8979	Coc	e:	B4049-01			Clie	ent:			
Sample	e Date:	25 Jul-18 03:18	B Mat	erial:	POTW Effluen	t		Pro	ject:			
Receiv	e Date:	26 Jul-18 10:58	5 <b>Sou</b>	rce:	Energy Northw	est (WA 00	025151)					
Sample	e Age:	33h	Stat	ion:								
Test No	ote:	As per WDOE,	survival dat	a throug	h Day 7, reproc	duction data	a through wh	nen 60%+ o	f the control	s had 3 broc	ods (Day 6).	
.inear	Interpol	lation Options										
K Tran		Y Transforn	n See	d	Resamples	Exp 95%	% CL Met	hod				
.og(X+	1)	Linear	131	1741	200	Yes	Two	-Point Inter	polation			
Point E	stimate	s										
.evel	%	95% LCL	95% UCL	TU	95% LCL	95% UCI						
C25	19.79	15.47	00.00	E OF A	0.740							
		10.47	26.68	5.054	3.748	6.465						
	36.41	25.67	46.65	5.054 2.746	3.748 2.144	6.465 3.895						
C50	36.41					3.895	alculated Va	ariate				
C50 Reprod	36.41	25.67				3.895	alculated Va Std Err	ariate Std Dev	CV%	%Effect		
C50 Reprod	36.41 Iuction S	25.67 Summary	46.65	2.746	2.144	3.895 Ca			<b>CV%</b> 13.85%	%Effect 0.0%	_	
C50 Reprod	36.41 Iuction S	25.67 Summary	46.65 Count	2.746 Mean	2.144 Min	3.895 Ca Max	Std Err	Std Dev				
C50 Reprod	36.41 Iuction S	25.67 Summary	46.65 Count 10	2.746 Mean 26.9	2.144 Min 23	3.895 Ca Max 35	<b>Std Err</b> 1.178	<b>Std Dev</b> 3.725	13.85%	0.0%		
C50 <b>Reprod</b> -%	36.41 Iuction S	25.67 Summary	46.65 Count 10 10	2.746 Mean 26.9 24.4	2.144 Min 23 19	3.895 Ca Max 35 29	<b>Std Err</b> 1.178 0.9798	<b>Std Dev</b> 3.725 3.098	13.85% 12.7%	0.0% 9.29%	-	
C50 Reprod -%	36.41 Iuction S	25.67 Summary	46.65 Count 10 10 10	2.746 Mean 26.9 24.4 28.3	2.144 Min 23 19 24	3.895 Ca Max 35 29 33	<b>Std Err</b> 1.178 0.9798 1.065	<b>Std Dev</b> 3.725 3.098 3.368	13.85% 12.7% 11.9%	0.0% 9.29% -5.2%	-	
C50 Reprod % 3.3 1 3	36.41 Iuction S	25.67 Summary	46.65 Count 10 10 10 10 10	2.746 Mean 26.9 24.4 28.3 26.5	2.144 Min 23 19 24 20	3.895 Ca Max 35 29 33 32	<b>Std Err</b> 1.178 0.9798 1.065 1.057	<b>Std Dev</b> 3.725 3.098 3.368 3.342	13.85% 12.7% 11.9% 12.61%	0.0% 9.29% -5.2% 1.49%		
C50 Reprod % 3.3 1 3 00	36.41 Iuction S	25.67 Summary ontrol Type lution Water	46.65 Count 10 10 10 10 10 10	2.746 Mean 26.9 24.4 28.3 26.5 14.6	2.144 Min 23 19 24 20 4	3.895 Ca Max 35 29 33 32 27	<b>Std Err</b> 1.178 0.9798 1.065 1.057 2.574	<b>Std Dev</b> 3.725 3.098 3.368 3.342 8.14	13.85% 12.7% 11.9% 12.61% 55.76%	0.0% 9.29% -5.2% 1.49% 45.72%	-	
C50 Reprod 3.3 1 33 00 Reprod	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water Detail ontrol Type	46.65 Count 10 10 10 10 10 10 10 10 Rep 1	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 <b>Rep 2</b>	2.144 Min 23 19 24 20 4 0 8 Rep 3	3.895 Ca Max 35 29 33 32 27 5 7 8 8 8 8 9 8 8 9 8 8 8 8 8 8 8 8 8 8 8	Std Err 1.178 0.9798 1.065 1.057 2.574 0.7638 Rep 5	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415           Rep 6	13.85% 12.7% 11.9% 12.61% 55.76% 161.0%	0.0% 9.29% -5.2% 1.49% 45.72% 94.42%	Rep 9	Rep 10
C50 Reprod 3.3 1 33 00 Reprod	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water	46.65 Count 10 10 10 10 10 10 10 10 24	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 Rep 2 26	2.144 Min 23 19 24 20 4 0	3.895 Ca Max 35 29 33 32 27 5	<b>Std Err</b> 1.178 0.9798 1.065 1.057 2.574 0.7638	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415	13.85% 12.7% 11.9% 12.61% 55.76% 161.0%	0.0% 9.29% -5.2% 1.49% 45.72% 94.42%	<b>Rep 9</b> 23	<b>Rep 10</b> 26
C50 Reprod 3.3 1 3 00 Reprod 5-%	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water Detail ontrol Type	46.65 Count 10 10 10 10 10 10 10 10 24 24 21	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 <b>Rep 2</b>	2.144 Min 23 19 24 20 4 0 8 Rep 3	3.895 Ca Max 35 29 33 32 27 5 7 8 8 8 8 9 8 8 9 8 8 8 8 8 8 8 8 8 8 8	Std Err 1.178 0.9798 1.065 1.057 2.574 0.7638 Rep 5	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415           Rep 6	13.85% 12.7% 11.9% 12.61% 55.76% 161.0%	0.0% 9.29% -5.2% 1.49% 45.72% 94.42%		
C50 Reprod 3.3 1 3 00 Reprod 5-%	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water Detail ontrol Type	46.65 Count 10 10 10 10 10 10 10 10 24	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 Rep 2 26	2.144 Min 23 19 24 20 4 0 Rep 3 28	3.895 Ca Max 35 29 33 32 27 5 5 <b>Rep 4</b> 35	Std Err           1.178           0.9798           1.065           1.057           2.574           0.7638           Rep 5           27	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415           Rep 6           31	13.85% 12.7% 11.9% 12.61% 55.76% 161.0% <b>Rep 7</b> 26	0.0% 9.29% -5.2% 1.49% 45.72% 94.42% <b>Rep 8</b> 23	23	26
C50 Reprod 3.3 1 3 00 Reprod 5-%	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water Detail ontrol Type	46.65 Count 10 10 10 10 10 10 10 10 24 24 21	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 Rep 2 26 23	2.144 Min 23 19 24 20 4 0 Rep 3 28 19	3.895 Ca Max 35 29 33 32 27 5 5 <b>Rep 4</b> 35 23	Std Err           1.178           0.9798           1.065           1.057           2.574           0.7638           Rep 5           27           26	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415           Rep 6           31           23	13.85% 12.7% 11.9% 12.61% 55.76% 161.0% <b>Rep 7</b> 26 27	0.0% 9.29% -5.2% 1.49% 45.72% 94.42% <b>Rep 8</b> 23 29	23 27	26 26
C50 Reprod .3 1 3 00 Reprod .3	36.41 Iuction 1 Di	25.67 Summary ontrol Type lution Water Detail ontrol Type	46.65 Count 10 10 10 10 10 10 10 10 24 24 21 25	2.746 Mean 26.9 24.4 28.3 26.5 14.6 1.5 <b>Rep 2</b> 26 23 23 24	2.144 Min 23 19 24 20 4 0 Rep 3 28 19 25	3.895 Ca Max 35 29 33 32 27 5 5 <b>Rep 4</b> 35 23 31	Std Err           1.178           0.9798           1.065           1.057           2.574           0.7638           Rep 5           27           26           31	Std Dev           3.725           3.098           3.368           3.342           8.14           2.415           Rep 6           31           23           28	13.85% 12.7% 11.9% 12.61% 55.76% 161.0% <b>Rep 7</b> 26 27 29	0.0% 9.29% -5.2% 1.49% 45.72% 94.42% <b>Rep 8</b> 23 29 33	23 27 25	26 26 32



		and the second se	FA	THEAD MIN	NOW 7-DAY S	URVIVAL A	ND WATER	QUALITY D	ATA		
				3						1001% T	IE AF
		B 401	$\frac{6 \text{ conc. x 4 re}}{19}$	- 01	wate	rbath/incubato	r Used:	Date Initiated Date Terminated	812	/ 20 18 Time / 20 18 Time	16 : ZO
Client			Energ	gy Northwes	st			ple Description			
Tech:	Day 0	3-MB Day	1EBS/L Da	ay 2535 / e	Day 3 BAM	Day 4 BAM	- I Devic <sup>(3</sup> )		Auto Devel	7 BAM	
Time	Day 0	1505 Day	1 1150 Da	ay 2 1330	Day 3 1650	Day 4 1610	) Day 5 3	Day 6	1655 Day	1620	
Conc.				ive Organism		Disso	lved O <sub>2</sub> lg/l)		оH		Conductivity (µS)
or Percent	Day	A	В	С	D	Pre	Post	Pre	Post	Iemp.   #     (°C)   #     Pre   #	Post (1 <sup>st</sup> use)
	0	10	10	10	10		9,0	1.20	7.7	Post: 25.0 250	324
	1 2	10	10	10	10	7.4	7.4	7.2	7.4	25.0 251	316
Control	3	9	10	10	10	6.6	7.7	7.6	19	25.0 250	
l lo	4	q	10	10	10	6.4	7.6	7.2	7.7	24.9 30	
Ŭ	5	0	10	9	10	4.4	7.5	7.1	7.7	24.9 30	347
	6	9'	10	9	10	5,1	6.8	7.4	7,8	24.1 252	
	0	10	10	10	10	6.7	51	1 21	7.8	24.8 250 Post: 25. j	723
	1	ie	10	10	10	6.4	2,9	7.4	7.7	25.0	929
	2	9	10	10	10	10.4	7.9	7.5	8.0	24.9	321
1.0%	3	9	10	10	10	6.8	7.8	7.5	8.0	24.9	
1.	4	g	10	9	16	6.4	7.8	7.2	7.8	24.7	
	5	a	10	9	10	6.7	7.9	7.2	7.8	24.9	357
	7	q	10	9	10	6.9	1.0	7.5	1.1	24,8	
	0	10	10	10	10	011	6.1		7.8	Pint: 23.2	356
	1	(0	Lo	10	60	6.6	7.7	7.5	7.7	25.1	351
%	2	(2	3	10	10	6.7	8.0	7.4	8.0	25.0	372
3.3 %	3	10	9	9	10	6.7	7.9	7.5	8.0	24.9	
3	5	10	4	9	10	6.2	7.4	7.2	7.8	24.6	367
	6	10	ġ	9	10		2.0	7.9	7.9	24.1	501
	7	10	9	9	10	5,6		2,1		24,9	
	0	10	10	10	10		8.1		7.8	Post: 24.8	448
1	1	10	10	10	10	6.5	0.6	7.5	7,7	25,0	431
%	2	10	10	10	10	6.7	7.9	7.7	8.0	24.8	439
11.0	4	10	10	10	10	6.2	1.9	7.2	7.8	24.9	
	5	10	10	10	()	6.0	7.4	7.2	7.8	249	429
1	6	10	0	10	10	5,6	7.0	1.4	7.9	24.2	
	7	10	10	10	10	6.7	ي ام	7.1		24.8 Post: 262	
	1	10	(0)	10	10	6.3	8.2	7.5	7.7	Post: 25.2 25.0	639
	2	10	10	10	10	6.7	8.3	7.7	1.0	24.8	619
%0	3	1.0	a	9	10	6.7	7.9	7.4	7.9	24.8	- P. I.
33.0 %	4	10	10	9	10	6.2	7.9	7.2	7.8	24.8	
	5	10	10	9	10	6.4	7.6	7.2	7.8	24.3	574
-	6	10 h0	10	9	10	5,6	7.1	7.4	7.9	24.1	
	0	10	10	10	10	0,1	2:2	116	7.7	Post: 25.1	(148
l	1	10	10	10	10	6.9	7.9 aftershare	den 7.6	7.7	25.0	128
	2	10	11	10	9	6.8 50	2.2.5.7.8	to red. 7.7	7.8	24.8	1120
% 00	3	10	10	10	9	6.7 71	21188.2	7.5	7.8	24.9	
100	4	10	9	0	9	6.2	8.3	7.2	1.7	24.8	921
ŀ	6	10	9	10	9	5,6	7.5	7.4	7.3	24.8	986
	7	18	9	10	9	6.6		7.4	<u> </u>	24.8	
	and the second second					and the same second	and the second se				and the second se

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container. "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

Aeration in test chambers begun @\_\_\_\_\_ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions. Day 0 Temperatures = Post-renewals Therm ID# = Thermometer ID used for all measurements that day.

= Temp. out of recommended range

TO BATH "10 C Days Dat 3-

23.8)

ient	Energy Northwest		Tins Labeled As:	ENW
b ID:			Start Date:	
nple Description:				
	Technician:		MB	
	Date:		8/2/2018	
	Balance Serial #:	B328543647	<u>B328543647</u>	
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
	A		1089.94	q
Control	В		1113.30	10
	C		1085.59	9
	D		1100.77	10
	A		1105.70	9
1.0 %	B		1086.71	10
	C		1088.54	q
	D		1095.19	10
	A		1090.74	10
3.3 %	B		1079.82	9
5.5 70	C		1069.79	9
	D		1088.39	10
			1104.04	
11.07	A		1104.94	10
11 %	BC		1092.06	16
	D		1126.74	10
	D		1066.55	10
	A		1114.91	10
33 %	В		1070.33	10
	C		1079.11	9
	D		1089.08	10
	A		1084.75	10
100 %	B		1090.37	9
100 /0	C		1090.37	10
	D		1096.77	9
				,
	A		-	
	B C			
	D			

## FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

Client	Energy Northwest		Tins Labeled As:	ENW
Lab ID:	B4049		Start Date:	7/26/2018
Sample Description:				
	Technician:	MB	MB	_
	Date:	8/9/2018	8/2/2018	_
	Balance Serial #:	B328543647	B328543647	_
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
rercent	Replicate	weight (ing)	weight (mg)	I ISH
		1000.07	1000.04	0
	A	1099.97	1089.94	9 10
Control	B	1123.51	1113.30	9
	C	1095.87	1085.59	-
	D	1110.37	1100.77	10
		1115.30	1105.70	9
1.0 %	AB	1096.48	1086.71	10
1.0 %	C	1090.48	1088.54	9
				10
	D	1104.65	1095.19	10
			1000 54	10
	A	1101.77	1090.74	10
3.3 %	В	1089.66	1079.82	9
	С	1078.67	1069.79	9
	D	1099.59	1088.39	10
			1104.04	10
	A	1115.41	1104.94	10
11 %	В	1101.65	1092.06	10
	С	1136.15	1126.74	10
	D	1075.89	1066.55	10
		1104 40	1114.01	10
	A	1124.42	1114.91	10
33 %	В	1079.50	1070.33	10
	С	1087.72	1079.11	9
	D	1099.78	1089.08	10
		1005.15	1004.75	10
	A	1095.15	1084.75	10
100 %	B	1100.63	1090.37	9
	С	1102.31	1091.91	10
	D	1106.66	1096.77	9
	A			
	B			
	С			
	D			

# FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

							Te	st Code:	D404	490 thhe l i	1-0108-6553
Fathead Minn	ow 7-d Larval S	Survival a	nd Growth	Test						TestAm	erica - ASL
Batch ID:	06-1927-0410	Т	est Type: (	Growth-Surviva	al (7d)		Ал	alyst: Bre	tt Muckey		
Start Date:	26 Jul-18 15:0	5 <b>P</b> i	rotocol: l	EPA/821/R-02-	013 (2002)		Dil	uent: Mo	d-Hard Synt	hetic Water	•
Ending Date:	02 Aug-18 16:2	20 <b>S</b> I	pecies: F	Pimephales pro	omelas		Br	ine:			
Duration:	7d 1h	S	ource: A	Aquatox, AR			Ag	e:			
Sample ID:	13-9857-8979	C	ode: E	34049-01	V		Cli	ent:			
Sample Date:	25 Jul-18 03:18	в М	aterial: F	POTW Effluent			Pro	oject:			
Receive Date:	26 Jul-18 10:5	5 <b>S</b>	ource: E	Energy Northw	est (WA 002	:5151) 🗸					
Sample Age:	36h	S	tation:								
Comparison S	ummary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
12-3767-9667	7d Survival Rat	te	100	>100	NA	9.42%	1		ny-One Ranl		
16-8141-4904	Mean Dry Bion	nass-mg	100	>100	NA	11.0%	1	Dunnett N	/lultiple Com	parison Te	st
Point Estimate	e Summary										
Analysis ID	Endpoint	THOMAS OF A RANK	Level	%	95% LCL	95% UCL		Method			
08-0066-5278	Mean Dry Biom	nass-mg	IC25	>100	)N/A	N/A	<1	Linear Int	erpolation (I	CPIN)	
Test Acceptab	ility			111/14							
Analysis ID	Endpoint		Attribut	te	Test Stat	TAC Limi	ts	Overlap	Decision		
12-3767-9667	7d Survival Rat	te	Control	Resp	0.95	0.8 - NL		Yes		cceptability	
08-0066-5278	Mean Dry Biom	nass-mg	Control		1.003	0.25 - NL		Yes		cceptability	
16-8141-4904	Mean Dry Biom	_	Control	Resp	1.003	0.25 - NL		Yes		cceptability	
16-8141-4904	Mean Dry Biom	nass-mg	PMSD		0.1099	0.12 - 0.3		Yes	Below Ac	ceptability C	Criteria
7d Survival Ra	ate Summary										
	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Ŧ	Dilution Water	4	0.95	0.8581	1	0.9	1	0.02887	0.05774	6.08%	0.0%
1		4	0.95	0.8581	1	0.9	1	0.02887	0.05774 0.05774	6.08% 6.08%	0.0% 0.0%
3.3		4 4	0.95 1	0.8581 1	1	0.9 1	1 1	0.02887 0	0.05774	0.08%	-5.26%
11 33		4	0.975	0.8954	1	0.9	1	0.025	0.05	5.13%	-2.63%
33 100		4	0.975	0.8581	1	0.9	1	0.02887	0.05774	6.08%	0.0%
			0.00	0,0001							
mean Dry Blor	nass-mg Sumn Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
<b>C-</b> %		4	1.003	0.9544	1.052	0.96	1.028	0.01527	0.03054	3.05%	0.0%
	Dilution water				1.001	0.894	0.977	0.01791	0.03582	3.79%	5.86%
0	Dilution Water	4	0.9443	0.8873	1.001						
0 1	Dilution water	4 4	0.9443 1.024	0.8873	1.197	0.888	1.12	0.05443	0.1089	10.63%	-2.07%
0 1 3.3	Dilution water		0.9443 1.024 0.9703				1.12 1.047	0.05443 0.02612	0.1089 0.05224	10.63% 5.39%	-2.07% 3.27%
	Dilution Water	4	1.024	0.8505	1.197	0.888					

Analyst:\_\_\_\_\_\_\_\_\_QA:\_\_\_\_\_\_

## **CETIS Summary Report**

7d Survival Rate Detail

#### Fathead Minnow 7-d Larval Survival and Growth Test

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	0.9	1	0.9	1	
1		0.9	1	0.9	1	
3.3		1	0.9	0.9	1	
11		1	1	1	1	
33		1	1	0.9	1	
100		1	0.9	1	0.9	
Mean Dry	Biomass-mg Detail					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Motor	4.000	4.004	4.000	0.06	

		<b>·</b>			
0	Dilution Water	1.003	1.021	1.028	0.96
1		0.96	0.977	0.894	0.946
3.3		1.103	0.984	0.888	1.12
11		1.047	0.959	0.941	0.934
33		0.951	0.917	0.861	1.07
100		1.04	1.026	1.04	0.989

#### 7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	9/10	10/10	9/10	10/10
1		9/10	10/10	9/10	10/10
3.3		10/10	9/10	9/10	10/10
11		10/10	10/10	10/10	10/10
33		10/10	10/10	9/10	10/10
100		10/10	9/10	10/10	9/10

Report Date: Test Code:

CETIS Ana									Test	Code:	B404	1901bbc	11-0108-6
Fathead Minn	ow 7-d Larval	Surviva	I and Growt	n Test								TestAn	nerica - A
Analysis ID: Analyzed:	12-3767-9667 17 Aug-18 11:	16	Endpoint: Analysis:	7d Surviva Nonparam		ontrol	vs 1	reatments	+	IS Versior cial Result		1.8.8	
Batch ID:	06-1927-0410		Test Type:	Growth-Su	rvival (	(7d)			Ana	l <b>yst:</b> Br	ett Muckey		
Start Date:	26 Jul-18 15:0	5	Protocol:	EPA/821/R	-02-01	13 (20	02)		Dilu	ent: Mo	od-Hard Synt	hetic Wate	Г
Ending Date:	02 Aug-18 16:	20	Species:	Pimephale	s prom	nelas			Brin	e:			
Duration:	7d 1h		Source:	Aquatox, A	R				Age				
Sample ID:	13-9857-8979		Code:	B4049-01					Clie	nt:			
Sample Date:	25 Jul-18 03:1	8	Material:	POTW Eff	uent				Proj	ect:			
Receive Date:	26 Jul-18 10:5	5	Source:	Energy No	thwes	t (WA	002	5151)					
Sample Age:	36h		Station:										
Data Transfor	m	Zeta	Alt Hy	p Trials	1	Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	cted)	NA	C > T	NA	I	NA			9.42%	100	>100	NA	1
Steel Many-O	ne Rank Sum T	est											
Control	vs C-%		Test S	tat Critic	al	Ties	DF	P-Value	Р-Туре	Decisio			
Dilution Water	1		18	10		3	6	0.8333	Asymp	-	nificant Effec		
	3.3		18	10		3	6	0.8333	Asymp	-	nificant Effec		
	11		22	10		2	6	0.9908	Asymp	•	nificant Effec		
	33		20	10		3	6	0.9516	Asymp	-	nificant Effect		
	100	-	18	10		3	6	0.8333	Asymp	Non-Sigi	nificant Effect		
ANOVA Table								E 04+4	D Value	Decision	(~~ 50/)		
Source	Sum Squ			Square		DF 5		F Stat 0.6632	P-Value 0.6560	Decision	nificant Effect		
Between Error	0.023239		0.0046		-	18		0.0032	0.0000	NUII-Sigi		L	
Total	0.149396		0.0070	00713		23		-					
Distributional						D. 141		DValue	Desision				
Attribute	Test			Test S			1	P-Value	Decision				
Variances		-	ality of Varia			4.248 4.248		0.0105 <0.0001	Equal Var Unequal \				
Variances Distribution			of Variance Normality	15.4 0.8224		+.∠40 ).884		0.0007		al Distribut	ion		
7d Survival Ra													
	Control Type	Cour	t Mean	95% L	CI 9	95% U	CI	Median	Min	Max	Std Err	CV%	%Effec
	Dilution Water	4	0.95	0.858		1		0.95	0.9	1	0.02887	6.08%	0.0%
1	Diadon Water	4	0.95	0.858				0.95	0.9	1	0.02887	6.08%	0.0%
		4	0.95	0.858				0.95	0.9	1	0.02887	6.08%	0.0%
3.3			1	1	1			1	1	1	0	0.0%	-5.26%
		4				1		1	0.9	1	0.025	5.13%	-2.63%
11		4 4	0.975	0.8954	l 1			0.95	0.9	1	0.00007		0.0%
11 33				0.8954 0.8581				0.00			0.02887	6.08%	0.070
11 33 100	ected) Transfor	4 4	0.975 0.95			l		0.00			0.02887	6.08%	0.078
11 33 100 <b>Angular (Corr</b> e	ected) Transfor Control Type	4 4	0.975 0.95 J <b>mmary</b>		1	I 95% U	CL	Median	Min	Max	Std Err	6.08%	
11 33 100 Angular (Corro C-%		4 4 med Si	0.975 0.95 J <b>mmary</b>	0.858	1 CL 9		CL			<b>Max</b> 1.412	<b>Std Err</b> 0.04705	<b>CV%</b> 7.07%	%Effec
11 33 100 Angular (Corro C-%	Control Type	4 4 med Si Cour	0.975 0.95 ummary t Mean 1.331 1.331	0.858′ <b>95% L</b> 1.181 1.181	CL 9	9 <b>5% U</b> 1.48 1.48	CL	<b>Median</b> 1.331 1.331	<b>Min</b> 1.249 1.249	<b>Max</b> 1.412 1.412	<b>Std Err</b> 0.04705 0.04705	<b>CV%</b> 7.07% 7.07%	%Effec 0.0% 0.0%
11 33 100 <b>Angular (Corr</b> C-% D 1	Control Type	4 4 med Si Cour 4 4 4	0.975 0.95 ummary t Mean 1.331 1.331 1.331	0.858 <sup>-</sup> <b>95% L</b> 1.181 1.181 1.181	CL 9	95% U 1.48 1.48 1.48	CL	<b>Median</b> 1.331 1.331 1.331	<b>Min</b> 1.249 1.249 1.249	<b>Max</b> 1.412 1.412 1.412	<b>Std Err</b> 0.04705 0.04705 0.04705	<b>CV%</b> 7.07% 7.07% 7.07%	%Effec 0.0% 0.0% 0.0%
11 33 100 <b>Angular (Corro</b> <b>C-%</b> 0 1 3.3 11	Control Type	4 4 med St Cour 4 4 4 4	0.975 0.95 ummary t Mean 1.331 1.331 1.331 1.331 1.331 1.412	0.858 <sup>4</sup> 95% L 1.181 1.181 1.181 1.412	CL 9 6L 9 1 1 1	95% U 1.48 1.48 1.48 1.48 1.412	CL	<b>Median</b> 1.331 1.331 1.331 1.412	Min 1.249 1.249 1.249 1.249 1.412	Max 1.412 1.412 1.412 1.412	<b>Std Err</b> 0.04705 0.04705 0.04705 0	<b>CV%</b> 7.07% 7.07% 0.0%	%Effec 0.0% 0.0% 0.0% -6.12%
C-%	Control Type	4 4 med Si Cour 4 4 4	0.975 0.95 ummary t Mean 1.331 1.331 1.331	0.858 <sup>-</sup> <b>95% L</b> 1.181 1.181 1.181	CL 9 1 1 1 1 1	95% U 1.48 1.48 1.48	CL	<b>Median</b> 1.331 1.331 1.331	<b>Min</b> 1.249 1.249 1.249	<b>Max</b> 1.412 1.412 1.412	<b>Std Err</b> 0.04705 0.04705 0.04705	<b>CV%</b> 7.07% 7.07% 7.07%	%Effec 0.0% 0.0%

Analyst: 3~

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CETIS An	alytical Rep	ort				Report Date: Test Code:	17 Aug-18 11:16 (p 2 of 4) B404901ppc   11-0108-6553
Fathead Min	now 7-d Larval S	Surviva	and Growt	h Test		Test Code.	TestAmerica - ASL
Analysis ID:	12-3767-9667		Endpoint:	7d Survival R	ate	CETIS Version:	CETISv1.8.8
Analyzed:	17 Aug-18 11:	16	Analysis:	Nonparametri	ic-Control vs Treatments	Official Results:	Yes
7d Survival i	Rate Detail						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Dilution Water	0.9	1	0.9	1		
1		0.9	1	0.9	1		
3.3		1	0.9	0.9	1		
11		1	1	1	1		
33		1	1	0.9	1		
100		1	0.9	1	0.9		

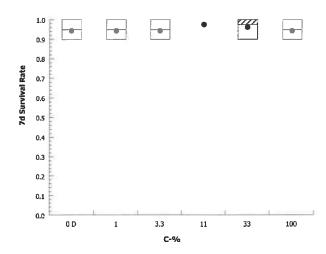
### Angular (Corrected) Transformed Detail

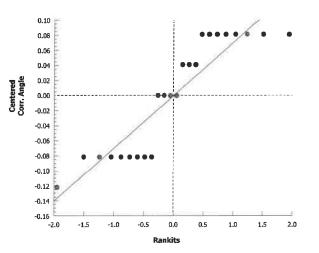
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.249	1.412	1.249	1.412
1		1.249	1.412	1.249	1.412
3.3		1.412	1.249	1.249	1.412
11		1.412	1.412	1.412	1.412
33		1.412	1.412	1.249	1.412
100		1.412	1.249	1.412	1.249

#### 7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	9/10	10/10	9/10	10/10
1		9/10	10/10	9/10	10/10
3.3		10/10	9/10	9/10	10/10
11		10/10	10/10	10/10	10/10
33		10/10	10/10	9/10	10/10
100		10/10	9/10	10/10	9/10

#### Graphics





QA:\_

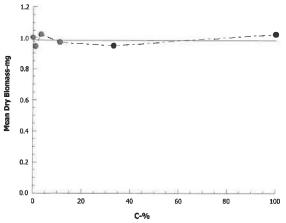
	lytical Rep									ort Date: t Code:	B40	4901ppc   1	:16 (p 3 of 11-0108-65
Fathead Minn	ow 7-d Larval S	Surviva	and Growt	h Te	st							TestAm	nerica - AS
Analysis ID:	16-8141-4904		Endpoint:	Mea	an Dry Biom	nass-mg			CET	IS Version	: CETISv	1.8.8	
Analyzed:	17 Aug-18 11:	16	Analysis:	Par	ametric-Co	ntrol vs T	rea	tments	Offi	cial Result	s: Yes		
Batch ID:	06-1927-0410		Test Type:	Gro	wth-Surviva	ıl (7d)			Ana	lyst: Br	ett Muckey		
Start Date:	26 Jul-18 15:0	5	Protocol:		A/821/R-02-		12)		Dilu	ent: Mo	d-Hard Synt	thetic Wate	r
Ending Date:	02 Aug-18 16:	20	Species:	Pim	ephales pro	omelas			Brir	ie:			
Duration:	7d 1h		Source:	Aqu	uatox, AR				Age	:			
Sample ID:	13-9857-8979		Code:	B40	)49-01				Clie	nt:			
	25 Jul-18 03:1	8	Material:	PO.	TW Effluent				Pro	ect:			
-	26 Jul-18 10:5		Source:	Ene	ergy Northwo	est (WA	002	5151)					
Sample Age:	36h		Station:										
Data Transfor	m	Zeta	Alt H	ур	Trials	Seed			PMSD	NOEL	LOEL	TOEL	TU
Untransformed		NA	C > T		NA	NA			11.0%	100	>100	NA	1
Dunnett Multi	ple Comparisor	n Test											
Control	vs C-%		Test \$	Stat	Critical	MSD	DF	P-Value	Р-Туре	Decision	n(α:5%)		
Dilution Water	1		1.282		2.407	0.110	6	0.3047	CDF		ificant Effec	t	
	3.3		-0.453	3	2.407	0.110	6	0.9328	CDF	Non-Sigr	ificant Effec	t	
	11		0.714	9	2.407	0.110	6	0.5512	CDF	-	ificant Effec		
	33		1.162		2.407	0.110	6	0.3524	CDF		ificant Effec		
	100		-0.453	}	2.407	0.110	6	0.9328	CDF	Non-Sigr	ificant Effec	t	
ANOVA Table													
Source	Sum Squ	ares	Mean	Squ	are	DF		F Stat	P-Value	Decisior	(α:5%)		
Between	0.025775	13	0.005	1550	27	5		1.228	0.3364	Non-Sigr	ificant Effec	t	
Error	0.0755410	06	0.004	1967	25	18							
Total	0.1013162	2				23							
Distributional	Tests												
Attribute	Test				Test Stat	Critica		P-Value	Decision	(α:1%)			
Variances	Bartlett E	quality	of Variance		9.134	15.09		0.1039	Equal Va	riances			
Distribution	Shapiro-\	Wilk W	Normality		0.9649	0.884		0.5442	Normal D	istribution			
Mean Dry Bior	nass-mg Sumn	nary											
C-%	Control Type	Coun	t Mean		95% LCL	95% UG	CL	Median	Min	Мах	Std Err	CV%	%Effect
D	Dilution Water	4	1.003		0.9544	1.052		1.012	0.96	1.028	0.01527	3.05%	0.0%
1		4	0.9443	3	0.8873	1.001		0.953	0.894	0.977	0.01791	3.79%	5.86%
3.3		4	1.024		0.8505	1.197		1.044	0.888	1.12	0.05443	10.63%	-2.07%
11		4	0.9703		0.8871	1.053		0.95	0.934	1.047	0.02612	5.39%	3.27%
33		4	0.9498	3	0.8092	1.09		0.934	0.861	1.07	0.04417	9.3%	5.31%
100		4	1.024		0.9854	1.062	_	1.033	0.989	1.04	0.01204	2.35%	-2.07%
Mean Dry Bior	nass-mg Detail												
	Control Type	Rep 1			Rep 3	Rep 4	_						
0	Dilution Water	1.003			1.028	0.96							
1		0.96	0.977		0.894	0.946							
		1.103	0.984		0.888	1.12							
3.3 11		1.047	0.959		0.941	0.934							
			0.959										

CETIS Ana	lytical Report			Report Date: Test Code:	17 Aug-18 11:16 (p 4 of 4) B404901ppc   11-0108-6553
Fathead Minn	ow 7-d Larval Surviva	al and Growt	h Test		TestAmerica - ASL
Analysis ID:	16-8141-4904	Endpoint:	Mean Dry Biomass-mg	CETIS Version:	CETISv1.8.8
Analyzed: Graphics	17 Aug-18 11:16	Analysis:	Parametric-Control vs Treatments	Official Results:	1 es
0.8 0.8 0.8 0.4 0.4 0.2 0.0		28.2	Reject Null Reject	• • • • • • •	•••
	0 D 1 3.3	11	33 100 -	2.0 -1.5 -1.0 -0.5 0.0	0.5 1.0 1.5 2.0

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Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

08-0066-5278		u GIUWI	th Test					TestAmerica -	ASI	
	En	dpoint:	Mean Dry Bion	nass-mg		CE	TIS Version	CETISv1.8.8		
17 Aug-18 11:1		alysis:	Linear Interpol	-	1)		cial Results			
06-1927-0410	Te	st Type:	Growth-Surviva	al (7d)		Ana	ilyst: Bre	tt Muckey		
26 Jul-18 15:05	5 Pro	otocol:	EPA/821/R-02-	-013 (2002)				d-Hard Synthetic Water		
02 Aug-18 16:2	20 <b>Sp</b>	ecies:	Pimephales pro	omelas		Brir	ie:			
7d 1h	So	urce:	Aquatox, AR			Age	1			
13-9857-8979	Co	de:	B4049-01			Clie	nt:			
25 Jul-18 03:18	3 Ma	terial:	POTW Effluent	t		Pro	ject:			
26 Jul-18 10:55	5 So	urce:	Energy Northw	est (WA 00	25151)					
36h	Sta	tion:								
tion Options										
Y Transform	n See	∋d	Resamples	Exp 95%	CL Me	thod				
Linear	751	184	200	Yes	Tw	o-Point Interp	olation			
95% LCL	95% UCL	. TU	95% LCL	95% UCL						
N/A	N/A	<1	NA	NA						
ass-mg Summ	ary			Ca	culated V	ariate				
ntrol Type	Count	Mean	Min	Мах	Std Err	Std Dev	CV%	%Effect		
tion Water	4	1.003	0.96	1.028	0.01527	0.03054	3.05%	0.0%		
	4	0.9443	0.894	0.977	0.01791	0.03582	3.79%	5.86%		
	4	1.024	0.888	1.12	0.05443	0.1089	10.63%	-2.07%		
	4					0.05224	5.39%	3.27%		
	4	1.024	0.989	1.04	0.01204	0.02409	2.35%	-2.07%		
-										
				· · · · · · · · · · · · · · · · · · ·						
tion Water										
	26 Jul-18 15:09 02 Aug-18 16:2 7d 1h 13-9857-8979 25 Jul-18 03:18 26 Jul-18 10:55 36h ttion Options Y Transform Linear 95% LCL N/A	26 Jul-18 15:05       Pro         02 Aug-18 16:20       Sp         02 Aug-18 16:20       Sp         7d 1h       So         13-9857-8979       Co         25 Jul-18 03:18       Ma         26 Jul-18 10:55       So         36h       Sta         tion Options       Y Transform         Y Transform       See         Linear       751         5       95% LCL       95% UCL         N/A       N/A         ass-mg Summary       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         4       4         5       7         6       7         7       7         7       7         8       7 </td <td>26 Jul-18 15:05       Protocol:         02 Aug-18 16:20       Species:         7d 1h       Source:         13-9857-8979       Code:         25 Jul-18 03:18       Material:         26 Jul-18 10:55       Source:         36h       Station:         tion Options         Y Transform       Seed         Linear       751184         5       95% LCL       95% UCL       TU         N/A       N/A       &lt;1</td> ass-mg Summary       Mean         ntion Water       4       1.003         4       0.9443       4       0.9443         4       1.024       4       0.9443         4       1.024       4       0.9498         4       1.024       4       0.9498         4       1.024       4       0.9498         4       1.024       4       0.9498         4       1.024       4       0.9498         4       1.024       1.024       1.024         ass-mg Detail       1.03       1.021       0.96         0.966       0.977       1.103       0.984         1.047       0.95	26 Jul-18 15:05       Protocol:         02 Aug-18 16:20       Species:         7d 1h       Source:         13-9857-8979       Code:         25 Jul-18 03:18       Material:         26 Jul-18 10:55       Source:         36h       Station:         tion Options         Y Transform       Seed         Linear       751184         5       95% LCL       95% UCL       TU         N/A       N/A       <1	Protocol:         EPA/821/R-02           26 Jul-18 15:05         Protocol:         EPA/821/R-02           20 Aug-18 16:20         Species:         Pimephales pr           7d 1h         Source:         Aquatox, AR           13-9857-8979         Code:         B4049-01           25 Jul-18 03:18         Material:         POTW Effluent           26 Jul-18 10:55         Source:         Energy Northw           36h         Station:         Station:           tion Options           Y Transform         Seed         Resamples           Linear         751184         200           95% LCL         95% UCL         TU         95% LCL           N/A         N/A         <1	Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y         Y	26 Jul-18 15:05         Protocol:         EPA/821/R-02-013 (2002)           22 Aug-18 16:20         Species:         Pimephales promelas           7d 1h         Source:         Aquatox, AR           13-9857-8979         Code:         B4049-01           25 Jul-18 03:18         Material:         POTW Effluent           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)           36h         Station:         Station:           tition Options           Y Transform         Seed         Resamples         Exp 95% CL         Me           Linear         751184         200         Yes         Tw           95% LCL         95% UCL         TU         95% LCL         95% UCL         Me           N/A         N/A         <1	Protocol:         EPA/821/R-02-013 (2002)         Dilu           22 Aug-18 16:20         Species:         Pimephales promelas         Brin           7d 1h         Source:         Aquatox, AR         Age           13-9857-8979         Code:         B4049-01         Clie           25 Jul-18 03:18         Material:         POTW Effluent         Proj           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)         Bit           36h         Station:         station:         Two-Point Interp           11near         751184         200         Yes         Two-Point Interp           95% LCL         95% UCL         TU         95% LCL         95% UCL         NA           N/A         N/A         <1	<td>Protocol:         EPA/821/R-02-013 (2002)         Diluent:         Mo           02 Aug-18 16:20         Species:         Pimephales promelas         Brine:           7d 1h         Source:         Aquatox, AR         Age:           13-9857-8979         Code:         B4049-01         Client:           25 Jul-18 03:18         Material:         POTW Effluent         Project:           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)         Project:           36h         Station:         Energy Northwest (WA 0025151)         Two-Point Interpolation           Material:         POTW Effluent         Project:           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)         Two-Point Interpolation           Station:           Transform         Seed         Resamples         Exp 95% CL         Method           Linear         751184         200         Yes         Two-Point Interpolation           **         Station:         Two-Point Interpolation         Two-Point Interpolation           **         Options         Count         Mean         Max         Std Err         Std Dev         CV%           ntion Water         4         1.024         0.894</td> <td>V         Protocol:         EPA/821/R-02-013 (2002)         Diluent:         Mod-Hard Synthetic Water           22 Aug-18 16:20         Species:         Pimephales promelas         Brine:         Agge:           13-9857-8979         Code:         84049-01         Client:         Project:           25 Jul-18 10:35         Source:         B4049-01         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Energy Northwest (WA 0025151)         Froject:           36h         Station:         Station:         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Froject:         Energy Northwest (WA 0025151)           370         Station:         Station:         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Station:         Froject:           1         N/A         N/A         &lt;1</td> NA         Material:           95% LCL         95% UCL         YU         95% UCL         Mod-Hard Synthetic Water           1         N/A         N/A         Station:         Station:           1         Station:         Station:         Station:         Station:	Protocol:         EPA/821/R-02-013 (2002)         Diluent:         Mo           02 Aug-18 16:20         Species:         Pimephales promelas         Brine:           7d 1h         Source:         Aquatox, AR         Age:           13-9857-8979         Code:         B4049-01         Client:           25 Jul-18 03:18         Material:         POTW Effluent         Project:           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)         Project:           36h         Station:         Energy Northwest (WA 0025151)         Two-Point Interpolation           Material:         POTW Effluent         Project:           26 Jul-18 10:55         Source:         Energy Northwest (WA 0025151)         Two-Point Interpolation           Station:           Transform         Seed         Resamples         Exp 95% CL         Method           Linear         751184         200         Yes         Two-Point Interpolation           **         Station:         Two-Point Interpolation         Two-Point Interpolation           **         Options         Count         Mean         Max         Std Err         Std Dev         CV%           ntion Water         4         1.024         0.894	V         Protocol:         EPA/821/R-02-013 (2002)         Diluent:         Mod-Hard Synthetic Water           22 Aug-18 16:20         Species:         Pimephales promelas         Brine:         Agge:           13-9857-8979         Code:         84049-01         Client:         Project:           25 Jul-18 10:35         Source:         B4049-01         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Energy Northwest (WA 0025151)         Froject:           36h         Station:         Station:         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Froject:         Energy Northwest (WA 0025151)           370         Station:         Station:         Project:         Energy Northwest (WA 0025151)           36h         Station:         Station:         Station:         Froject:           1         N/A         N/A         <1

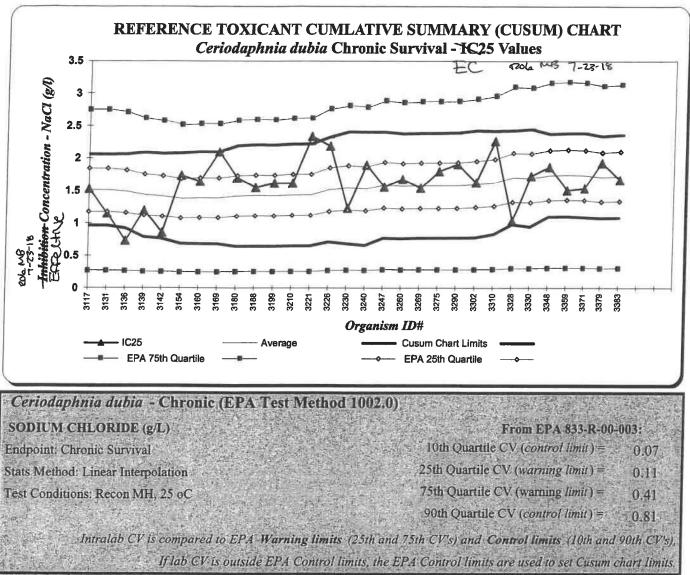


# **APPENDIX B**

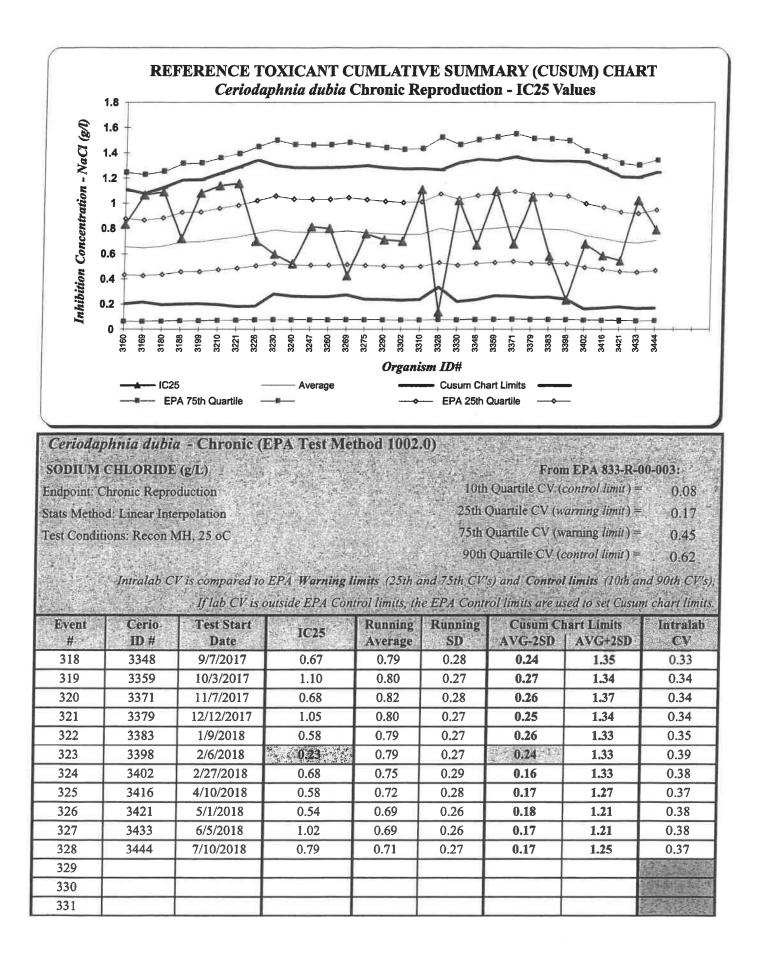
**REFERENCE TOXICANT DATA SHEETS** 

# Ceriodaphnia dubia Survival and Reproduction **Test Data Summary**

Client			QA /	QC			Test St	art Date	-	1-10-1	8	
Sample Descript	ion		Na	Cl			Initial S	Sample ID	# _2	в 0(00	8-06	
Data summarized	d by		M	B						Carl 1		
Percent or				ve Young							# Alive	Total Live
Concentration	A	B	C	D	E	F	G	H	I	J	Adults	Young
Control	10 AD?	30 AD?	Z3 AD?	3 \ AD?	Z6 AD?	27 ad?	29 AD?	AD? 🗸	27 AD?	22 AD?	9	225
0.25 g/L	10 AD?	14 AD?	14 AD?	28 AD?	2.6	3) AD?	25 AD?	29 AD?	27 AD?	AD?	10	215
0.50 g/L	() AD?	25 AD?	24 AD?	25 AD?	IY AD?	28 AD7	24 AD?	29 AD?	26 AD?	AD?	10	210
1.0 g/L	14	AD?	20 AD?	16 AD?	AD?	\8 AD?	Z\ AD?	25 AD?	AD?		9	143
1.5 g/L	0	() AD?	AD?	2	0	AD?	AD?	AD?	AD?	AD?	8	46
2.0 g/L	D	0	0	0	0	0	0	0	0	$\bigcirc$	0	ð
4.0 g/L	0	0	0	AD?	0	AD? -	AD?	AD?	0	AD?	0	0
Test Organism Mo				and the second s						AD?	at terminat	ion
Test Organism ider Test Organism Inju	ntified as i	Male =	AD?	M						luced in first		
Footnote: As per E surviving control of	EPA-600-4 rganisms i	l-91-002 a have prod	and EPA-8 uced their	21-R-02-( third broo	013, <i>Ceric</i> od, or at th	daphnia ne end of	<i>dubia</i> test <u>eight</u> days,	should be whicheve	e terminate er occurs fi	d when 60 <sup>4</sup> rst.	% of the	
Also as per EPA-82 and should not be i	21-R-02-0 ncluded ir	13 (13.10 the total	.9.1), "In t number o	his three-l f neonates	brood test, produced	, offspring l during th	g from four ie test."	rth or high	er broods	should not	be counted	l
Endpoint	<u>IC25</u>	Cus	um Chart	Limits		Task	Manager	I <u>L</u>	1A	B	$\sim$	
Survival	1,51	1	1.15 to 2	. 17		Ргоје	ر) ct Manage	r A	JA A	then	·	
Reproduction	0.70	2 0	).[[ to ]	.25		QA C	officer	Em	cohu	ey -	1/23/20	18

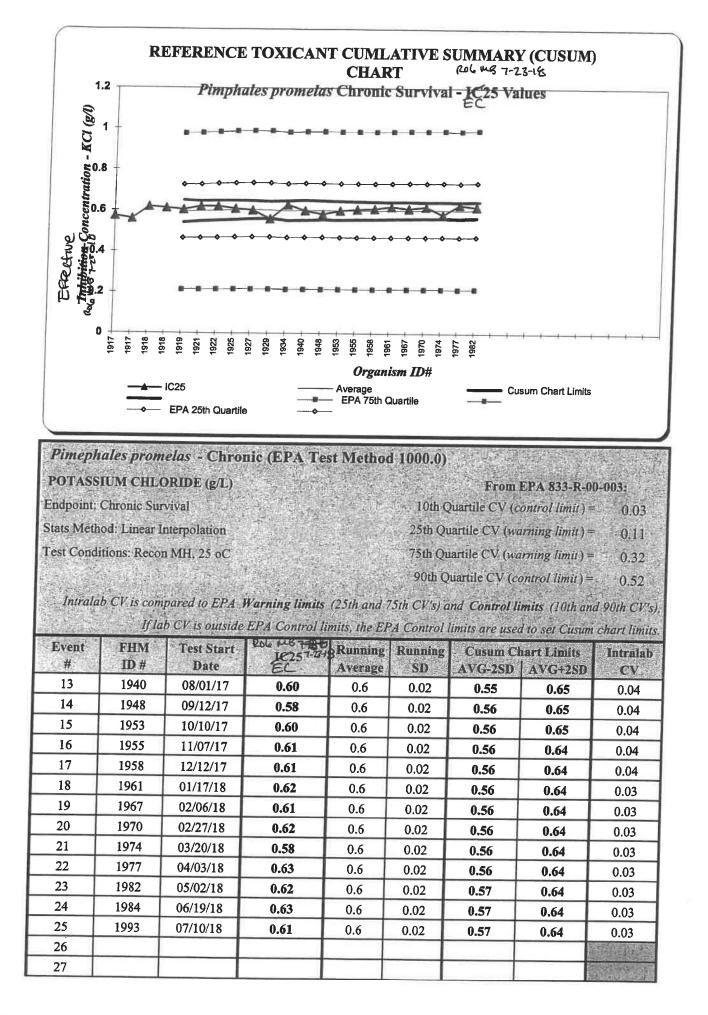


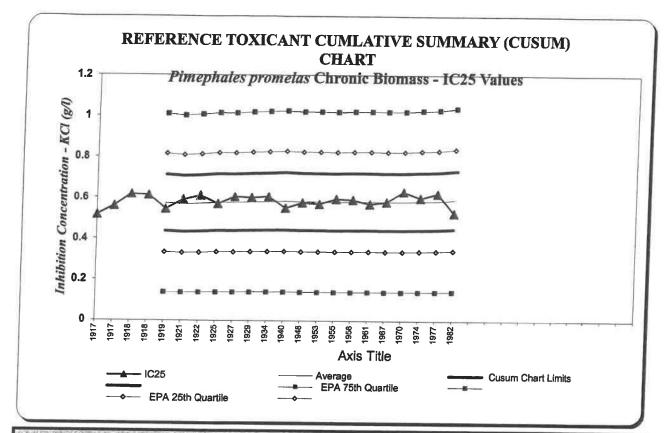
Event #	Cerio ID #	Test Start Date		Running Average	Running SD	Cusum Cl AVG-2SD	art Limits AVG+2SD	Intralab CV
316	3328	07/20/17	1.04	1.70	0.36	0.98	2.43	0.22
317	3330	08/01/17	1.73	1.70	0.37	0.95	2.45	0.18
318	3348	09/07/17	1.87	1.74	0.32	1.10	2.38	0.18
319	3359	10/03/17	1.51	1.75	0.32	1.11	2.39	0.19
320	3371	11/07/17	1.54	1.74	0.32	1.09	2.39	0.18
321	3379	12/12/17	1.93	1.71	0.32	1.08	2.34	0.19
322	3383	01/09/18	1.67	1.72	0.32	1.08	2.36	0.18
323	3398	02/06/18	1.36	1.73	0.32	1.10	2.36	0.19
324	3402	02/27/18	1.68	1.72	0.33	1.06	2.37	0.19
325	3416	04/10/18	1.62	1.72	0.33	1.07	2.37	0.17
326	3421	05/01/18	1.41	1.68	0.29	1.10	2.27	0.17
327	3433	06/05/18	1.52	1.64	0.27	1.10	2.19	0.15
328	3444	07/10/18	1.54	1.66	0.26	1.15	2.17	0.15
329								



		tAmerica		FATHEA	D MINNOW 7-	DAY SURVIVA	L AND WATER	QUALITY DAT	ГА		
			d: 6 conc. x 4			Waterbath/incuba		Date Initia		/20 1 %	Time 16 ; 30
Sto	ck Sol. I	D 2B06		-02		# 4		Date Termina			Time 09:15
Org	anism II	D: FHM C	193				Test Container S	size: 800 ml		Solution Volume	
Client			QA	/QC - Re	fTox			Sample Descript	ion	KCl (50 g/L	stock)
Tech:	Day (	MB Le Da	y 16AM I	ay2	Day 3	Day 4BAM	e Day 5 BAM	Day 6 BAM	Day 711Q		
Time	Day (	1630 Da	y1 1420 D	ay 2 1520	Day 3 1115	Day 4 100	Day 5 820	Day 6 405	Day 7 091	5	
Conc	·			f Live Organisms			ssolved O <sub>2</sub>	T	pH	Temp.	a Conductivity
or Percen	nt Day	A	В	C	D	Pre	(mg/l) Post	Pre	Post	(°C) Pre	ε (μS)
	0	10	10	10 -	10	E CLASSES	8.0	110	7.7		₽ Post (daily) 252 308
	1 2	10	10	10	10	7.1	8.3	7.2	7.8	25.0	252 302
Control	3	10	10	10	10	77	7,6	7.5	7.8		252 308
Con	4	18	10	10	9	6.6	7.9	7.0	7.6		52 335
	5	10	10	10	9	6.6.	7.8	7.1	7.7		52 388
	6	10	10	10	9	6.6	7.9	7.0	2.5		52 #
-	0	10	10	10	10	6-6	8.1	1.1	7.8	24.9	and the second se
	1	10	9	10	10	7.2	8.3	7.2	7.9	15.0	794
B/L	2	is.	2	10	10	7.4	7.8	7.5	78	Fim	744
0.25 g	3	10	9	10	10	6.7	7.9	7.4	7.8	Tu:6	757
Ö	5	10	9	10	10	6.5	7.9	9.2	7.8	24.7	776
	6	.16	9	10	01	6.5	7.9	7.0	7.8	24.9	755
	7	10	9	10	10	6.7		1.0		24.9	
	0	10	10	10	10	0	8.		7.8	Post 24.9	1218
	2	9	10	9	10	7.3	7.9	7.2	79	25.0	1220
0.50 g/L	3	9	10	4	10	67	7.9	7.4	7.8	247	1182 1205
0.5(	4	9	6	8	10	6.5	8.0	7.2	7.8	24.6	1202
	5	q	10	8	01	6.3	8.0	7.2	7.9	1.4.8	1276
	7	9	10	8	10	6,4	8.1	7.	1.7	247	àic-
	0	10	10	10	10	10,01	8.1		7.9	Post 25.0	2030
	1	2	3	4	1	7.3	8.3	7.2	7.9	25.0	2030
J/a	2 3		2	4		6.7	8.0	7.5	7.8	24.6	2030
1.0	4	0	T	5		65	8.	7.4 7.3	7.9	244	2030
	5		1	3		64	8.1	7.4	7.9	24.9	2040
ŀ	6			393	0	65	8.3	7.2	7.9	24.7	A.
	0	10	10	10	10	69	6.6	7-1		249	
t	1	0	0	0	0	74	8.0	7.2	7.9	24.9	3610
[	2	1	(		C	C		1.6	-	67.7	- C
2.0 g/L	3		_ (	- (							
~	4 5	+ +		$\rightarrow$	$\rightarrow$						
t	6								$\rightarrow$		
	7	1	1	/	1	/		/			
H	0	10	10	10	10		8.0		7.8	= 25.1	6790
	1 2	0	0	6	0	7.2	ſ	7.3		25.0	F
4.0 g/L	3			- C					-	- (	+
4.0	4										
-	5										
F	6				/	-/	Children and an and an				
Indicate.	-	anism inadverte	ently poured off	luring solution re	newal replaced	into container					Destant -1
/1" = orgar	usm miss	sing, start count	reduced. "Inj" =	organism injured	l, remove from s	tats.	Т	herm ID# = Them	Day ( nometer ID used	Temperatures = for all measures	= rost-renewals ments that day.
" = fungu	s noted o	n dead organisr	ns.			st =Post-renewal s			0.00	mp. oupof recor	
End	lpoint	ECIS	/ <u>IC25</u>		<u>Cusum Cha</u>	rt Limits	Tas	sk Manager 🛛	the	N	
Su	rvival	1	0.61	_(	).57 to	0.64		ct Manager	h	Ċ	
Gr	owth	<u>.</u>	1.53	_(	).44 to	0.73	(	DA Officer 🕯	atten n	ponley	7/23/2010
Con	ducti	My meas.	remants	L' cre mis	Sed yes	+ by anal	yst on 7-14	REFTOX - FHM chronic (K	Cl) ASL1282-1017.xism [	oc Control ID: ASL1282	2-1017

-





Pimephales promelas - Chronic (EPA Test Method 1000.0)

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = 0.12

25th Quartile CV (warning limit) = 0.21

75th Quartile CV (warning limit) = 0.38

90th Quartile CV (control limit) = 0.45

	Intralab CV is	compared	to EPA Warni	no limits (25t	h and 75th CV's)	and Control limite	(10th and 90th CV's),
- 1	A Start Grant Street			8	a una rom er sj	and Control limits	(10th and 90th CV S);
		If lab CV is	s outside EPA	Control limits.	the EPA Contro	limits are used to s	of Cusum chart limite

Event	FHM	Test Start	IC25	Running	Running	Cusum C	nart Limits	Intelat
#	ID#	Date		Average	SD .	AVG-2SD	AVG+2SD	CV
13	1940	8/1/2017	0.55	0.58	0.03	0.44	0.72	0.05
14	1948	9/12/2017	0.58	0.58	0.03	0.44	0.72	0.05
15	1953	10/10/2017	0.57	0.58	0.03	0.44	0.72	0.05
16	1955	11/7/2017	0.59	0.58	0.03	0.44	0.72	0.05
17	1958	12/12/17	0.59	0.58	0.03	0.44	0.72	0.05
18	1961	01/17/18	0.57	0.58	0.03	0.44	0.72	0.05
19	1967	02/06/18	0.58	0.58	0.03	0.44	0.72	0.05
20	1970	02/27/18	0.63	0.58	0.03	0.44	0.72	0.05
21	1974	03/20/18	0.60	0.58	0.03	0.44	0.72	0.05
22	1977	04/03/18	0.62	0.58	0.03	0.44	0.72	0.04
23	1982	05/02/18	0.53	0.59	0.02	0.45	0.73	0.05
24	1984	06/19/18	0.57	0.59	0.03	0.45	0.73	0.05
25	1993	07/10/18	0.53	0.59	0.03	0.44	0.73	0.05
26								100

# **APPENDIX C**

# **CHAIN OF CUSTODY**

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THE LEADER IN ENVIRONMENTAL TESTING	Sample Receipt Rec
Batch Number: <u><u><u>8</u>404G-01</u></u>	Date Received: 7-26-7-8
Client/Project: Frency MW	Received By:
Were custody seals intact?	∑ Yes □ No □ N/4
Packing Material:	🔀 Ice 🗌 Blue Ice 🗌 Bo
Temp OK? (<6C) Therm ID: TH173 Exp. (الح)ري)	es observet 32 °C ≥ Yes □ No □ N/
Was a Chain of Custody (CoC) Provided?	es correct 32 °C ≥ Yes □ No □ N/r add 4.5°C ≥ Yes □ No □ N/r
Was the CoC correctly filled out (If No, document below)	Yes 🗌 No 🗌 N/
Were the sample containers in good condition (not broke	en or leaking)? The Second Sec
Are all samples within 36 hours of collection?	∑ Yes □ No □ N//
Method of Shipment:  Hand Delivered,	VI UPS, Greyhound, Other: N/A
Sample Exception	Report (The following exceptions were noted)
Client was notified on:	tact:
	tact:
Client was notified on: Client cor Resolution to Exception:	tact:
	tact:
	tact:
	tact:
	tact:

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TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137 Dhone: 541.243.6137	Concentration and/or Comments	Date/Time 6-12517 0428 Date/Time Date/Time Shipping # COC Bioassay.xts COC Bioassay.xts Doc control ID: ASL612-0717 COC Bioassay.xts
IPDES COMPLIANCE BIOMONITORING A C C 2 5 1 5 - 1 Ship Samples to: nple Information Ship Samples to: PO# Volume/Sample 20 L G ALD Total Volume 20 L G ALD Collection Time 0318 Check Chlorine (Y/N) Collection Analysis Required	# of Containers       # of Containers         Image: Second Se	Date/Time     Relinquished By     (Please sign and print name)       C7251X   031X     Image: C7251X   031X     Image: C7251X       Date/Time     Relinquished By     (Please sign and print name)       Date/Time     Shipped Via     Image: Fed-Ex       Date/Time     Shipped Via     Fed-Ex       Date/Time     Shipped Via     Fed-Ex       Date/Time     Shipped Via     Fed-Ex       Date/Time     Shipped Via     Fed-Ex
IestAmerica       CHAIN OF CUSTODY RECORD FOR Not the construction of the construction	Sample ID Date Time Comp. Grab	Sampled By & Title (Please sign and print name) Muth Turrwey Chem/Shry 672518 CA8 Received By Tag (Please sign and print name) Received By (Please sign and print name) Received By (Please sign and print name) Nork Authorized By (Please sign and print name)

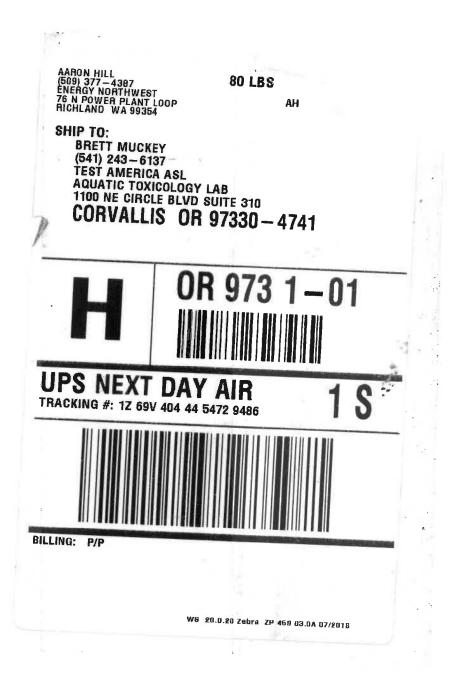
TestAmerica		Sample Receipt Record
Batch Number: B 4048-02 Client/Project: Energy NW	Date Received: Received By:	7-28-18
Were custody seals intact?		🛛 Yes 🗌 No 🗌 N/A
Packing Material:		🖄 Ice 🗌 Blue Ice 🗍 Box
Temp OK? (<6C) Therm ID: TH173 Exp. (b - 2 - (ş	C65 3.3 act 3.2	°C ⊠ Yes □ No □ N/A
Was a Chain of Custody (CoC) Provided?		🔀 Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, document below)		Yes No N/A
Were the sample containers in good condition (not broken or leaking)?		Yes 🗌 No 🗍 N/A
Are all samples within 36 hours of collection?		Yes 🗌 No 🛄 N/A
Method of Shipment: 🗌 Hand Delivered, 🔲 FedEx, 🖾 UPS,	Greyhound,	□ Other: □ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on:

Client contact:

Resolution to Exception:



	Sample Receipt Recor
Batch Number: B4049 - 63	Date Received: 7-31-18
Client/Project: ENU	Received By: BAM
Were custody seals intact?	💢 Yes 🗌 No 🗔 N/A
Packing Material:	D Ice 🗌 Blue Ice 🗌 Box
Temp OK? (<6C) Therm ID: TH173 Exp. 70/2018	2.2 °C 1 Yes □ NO □ N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, document below)	Yes 🗆 No 🗆 N/A
Were the sample containers in good condition (not broken or leaking)?	Yes No N/A
Are all samples within 36 hours of collection?	Yes 🗆 No 🗔 N/A
Method of Shipment: 🗌 Hand Delivered, 🔲 FedEx, 💢 UPS,	/ Greyhound,  Other: N/A
E I	
Client was notified on: Resolution to Exception:	SHIP TO: BRETT MUCKEY (541) 243-6137 TEST AMERICA ASL AQUATIC TOXICOLOGY LAB 1100 NE CIRCLE BLVD SUITE 310 CORVALLIS OR 97330-4741 OR 973 1- UPS NEXT DAY AIR TRACKING #: 12 69V 404 01 5550 9597

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	TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd Suite 310	Corvallis, OR 97330 Phone: 541.243.6137	;)	Concentration	Comments	Zra Sample for	Ne new X			Date/Time	Date/Time	Date/Time	Shipping	1 2
TestAmerica CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING	NPDES# <u>い</u> Aoo2SiS-1 Composite Sample InformationPO#	Volume/Sample 22 Total Volume 22 Time 72 4 C			Lab Eathe Fathe Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Cerio Co Cerio Ceri					1 3 나S Relinquished By Relinquished By	Date/Time Relinquished By (Please sign and print name)	Date/Time Relinquished By (Please sign and print name)	Date/Time Shipped Via フーズ・ズレンク UPS Bis Fed-Ex Hand Other	THITZ dos: 2.3°C CCK
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# **BIOASSAY REPORT**

CHRONIC BIOASSAYS CONDUCTED November 6 through 13, 2018

Prepared for

ENERGY NORTHWEST RICHLAND, WASHINGTON

Prepared by



THE LEADER IN ENVIRONMENTAL TESTING

ASL

1100 NE Circle Boulevard, Suite 310 Corvallis, Oregon 97330 541-207-0995

NELAC #OR100022 State of Washington Department of Ecology (WDOE), Lab ID C1233 California State Environmental Laboratory Accreditation Program, Certificate No.: 1726

> Revised Report Date: December 4, 2018 Original Report Date: November 30, 2018 Lab I.D. No. B4141-chr

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### **INTRODUCTION**

TestAmerica ASL (TA-ASL) – Bioassay Laboratory conducted chronic bioassays using the *Pimephales promelas* (fathead minnow) and the water flea (*Ceriodaphnia dubia*), on samples provided by Energy Northwest, Richland, Washington. The tests were conducted from November 6 through 13, 2018.

Also note that acute testing using the *Ceriodaphnia dubia* (water flea) was also initiated at this time. As per client request, the acute results will be reported separately.

Revision 1 of this report was issued to address typos in the Sample Collection and Storage section of the original report.

### **OVERVIEW OF REGULATORY GUIDANCE**

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from TA-ASL's reading of the NPDES permit for Energy Northwest's Columbia Generating Station in Richland, WA (permit #WA002515-1, effective Nov 1, 2014, expires Oct 31, 2019, modified Feb 8, 2016).

### **Chronic toxicity:**

### Testing:

- "Conduct chronic toxicity testing ... once per quarter in the year prior to submission of the application for permit renewal."
- "Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 11% effluent. The series of dilutions should also contain the CCEC of 1% effluent."
- o "The CCEC equals 1% effluent."

Sampling and Reporting Requirements:

- $\circ$  "The permittee must collect grab samples ... must cool the samples to 0-6 degrees Celsius during collection and send them to the lab immediately upon completion."
- "The lab must begin the toxicity testing ... no later than 36 hours after sampling was completed."

• "The Permittee must chemically dechlorinate final effluent ... with sodium thiosulfate just prior to test initiation. Do not add more sodium thiosulfate than is necessary to neutralize the chlorine. Provide in the test report the calculations to determine the amount of sodium thiosulfate necessary ..."

The following is taken from the WDOE guidance (WQ-R-95-80, June 2016 revision):

"To reduce WET limit violations (and anomalous concentration-response relationships) due to statistical significance that is a Type I error [false positive], we lower alpha when differences in test organism response are small." "Alpha will be lowered from 0.05 to 0.01 if a ... 20% difference in a chronic test is significant."

#### SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

#### EXHIBIT 1 Summary of Chronic Test Results

Species	<b>NOEC (%)</b>	LOEC (%)	IC <sub>25</sub> (%)	
C. dubia	33	100	38.7	
P. promelas	100	> 100	> 100	

Note: acronyms are as defined below.

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

More detailed information is provided in the Results and Discussion section.

#### **ACRONYM DEFINITIONS (from EPA guidance):**

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).

LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).

 $IC_{25} =$  Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.

#### **SAMPLE INFORMATION**

Exhibit 2 provides a summary of the sample conditions as received.

#### EXHIBIT 2 Sample Conditions on Receipt

Sample ID		190440	
TA-ASL SDG		B4141	
+ suffix	-01	-02	-03
Collection - Date and Time	11/05/2018 05:30	11/07/2018 05:25	11/09/2018 05:25
Receipt - Date and Time	11/06/2018 10:00	11/09/2018 10:50	11/10/2018 11:00
Temperature (°C)	4.5	1.7	1.6
Dissolved Oxygen (mg/L)	8.2	8.8	8.9
pH	7.7	8.2	7.9
Conductivity (S/cm)	1105	971	846
Total Residual Chlorine (mg/L)	0.03	0.04	0.05
Ammonia (mg/L as NH <sub>3</sub> -N)	< 0.10	< 0.10	< 0.10
Total Hardness (mg/L as CaCO <sub>3</sub> )	667	635	505
Total Alkalinity (mg/L as CaCO <sub>3</sub> )	107	108	105

Water quality measurements during testing remained within test design limits as prescribed by EPA and WDOE, except as noted with the individual test results. (see the Results and Discussion section)

#### **METHODS AND MATERIALS**

#### **TEST METHODS**

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (2002), EPA-821-R-02-013.

Additional guidance was provided by:

Whole Effluent Toxicity Testing Guidance and Test Review Criteria, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

#### **DEVIATIONS FROM PROTOCOLS**

Deviations from required procedures in the test methods:

None noted.

Deviations from recommended procedures in the test methods:

The sample collected on Wednesday, November 7, 2018 was not successfully delivered as scheduled on Thursday. The sample was received in good condition and used for test solution renewals on Friday, November 9, 2018. As a result, the chronic test renewals performed on November 9, 2018 were outside of the EPA <u>recommended</u> holding time of 36 hours for initial use of a sample. See further discussion in the Sample Collection and Storage section.

#### **TEST DESIGN**

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

Chronic tests: 1.0, 3.3, 11.0, 33.0, and 100 percent sample + dilution water for the control.

#### Test Organism Conditions:

All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002).

The test organisms appeared vigorous and in good condition prior to testing.

#### C. dubia chronic test:

Source: TA-ASL's in-house cultures

Age: Less than 24 hours old and within an 8-hour age range, with blocking by known parentage

Design: Ten test vessels per concentration, one organism per vessel Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival and neonate production (with brood determination)
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- o Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination:

• Survival: @ after 7 days.

• Reproduction: When 60%+ of surviving control organisms produce a  $3^{rd}$  brood. Endpoints: Survival (at Day 7) and Reproduction (through first 3 broods)

#### P. promelas chronic test:

Source: Aquatox Inc., Hot Springs, Arkansas

Age: Less than 48 hours old and within an 24 hour age range

Design: Four test vessels per concentration, ten organisms per vessel

Test Solution Renewal: Daily

Monitoring:

- o Daily: Survival
- o Daily: DO and pH in pre and post-renewal solutions, all concentrations
- o Daily: Temperature in pre-renewal solutions, all concentrations
- With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration

Termination: 7 days after test initiation.

Endpoints: Survival and Growth (average dry weight per organism added @ initiation)

#### **DILUTION WATER**

The dilution water used was the standard culture water used by TA-ASL:

Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as CaCO<sub>3</sub> and an alkalinity of 60 to 70 mg/L as CaCO<sub>3</sub>.

## SAMPLE COLLECTION AND STORAGE

Samples were collected by Energy Northwest personnel. The samples were accepted by TA-ASL. Chain of Custody and Sample Receipt Records are provided in Appendix C.

All samples were received within the EPA recommended 0 to 6  $^{\circ}$ C range. All samples were received within the WDOE required 0 to 6  $^{\circ}$ C range. The samples collected on November 5 and 9, 2018 were accepted as scheduled by TA-ASL and were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection. The sample collected on Wednesday, November 7, 2018 was delayed during shipment and accepted by TA-ASL on Friday, November 9, 2018.

- *C. dubia* and *P. promelas* test solution renewals performed on Thursday, November 8, 2018 were outside of the WDOE required holding time of a maximum of 72 hours past the time of collection but within the EPA recommended holding time of 72 hours past the time of initial use of that sample.
- Initial use of the November 7, 2018 sample on November 9, 2018 occurred outside of the EPA recommended maximum holding time of 36 hours of sample collection.
- All renewals conducted represented use of the freshest, good condition sample available and is in accordance with WDOE guidance.
- WDOE Pub#WQ-R-95-80, page 24 outlines 'rules for accepting 7-day tests' when sample holding conditions are not met. These include:

"If the second sample arrives late, the test will be accepted if daily renewals were continued using the first sample and the second sample arrives with a good temperature."

Except as noted above, all samples were initially used for test initiation or test solution renewal within the EPA recommended and WDOE required maximum holding time of 36 hours of sample collection.

Except as noted above, all subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample and WDOE required maximum holding time of 72 hours past the time of collection.

Following receipt, the samples were stored in the dark at 0 to 6 C until test solutions were prepared and tested.

#### SAMPLE PREPARATION

Samples used during these tests were:

Temperature adjusted prior to test initiation and each daily renewal. Dechlorination with sodium thiosulfate <u>was</u> performed.

### **DATA ANALYSIS**

The statistical analyses performed for the chronic tests were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, USEPA Office of Water, Fourth Edition (EPA 2002), EPA-821-R-02-013, using CETIS.

Additional guidance was provided by Understanding and Accounting for Method Variability in Whole Effluent Toxicity Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria, Washington State Department of Ecology (revised June 2016) Pub# WQ-R-95-80.

The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A. If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

#### **RESULTS AND DISCUSSION**

The raw data sheets are presented in Appendix A.

#### **CHRONIC BIOASSAYS**

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test initiated on November 6, 2018.

Su	Table 1 mmary of Chronic Res <i>C. dubia</i>	sults
Sample Concentration (%)	Percent Survival	Mean Number of Young Per Adult
Control	80	20.7
1.0	70	20.1
3.3	90	22.6
11.0	89	23.3
33.0	100	18.0
100	90	5.7 <sup>a</sup>

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

$$\begin{array}{rll} \text{NOEC} &=& 33.0 \ \% \\ \text{LOEC} &=& 100 \ \% \\ \text{IC}_{25} &=& 38.7 \ \% \end{array}$$

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

S	Table 2 ummary of Chronic Re <i>P. promelas</i>	sults
Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Organism Added (mg)
Control	100	0.905
1.0	92.5	0.869
3.3	100	0.961
11.0	100	0.927
33.0	100	0.856
100	86.7	0.878

Table 2 summarizes the survival and growth data for the *P. promelas* chronic test initiated on November 6, 2018.

Statistical analysis in accordance with the EPA protocol and WDOE guidance results in:

 $\begin{array}{rll} NOEC &=& 100 \ \% \\ LOEC &>& 100 \ \% \\ IC_{25} &>& 100 \ \% \end{array}$ 

From the NPDES permit: There is no effluent limit listed for chronic toxicity. "The CCEC equals 1% effluent."

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at  $25\pm1$  C.

The *P. promelas* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

### **REFERENCE TOXICANT TESTS**

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* chronic reftox test was conducted using sodium chloride. The *P. promelas* chronic reftox test was conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Chronic Referenc	able 3 e Toxicant Tests	s (g/L)
Species	IC <sub>25</sub>	Cusum Chart Limits
<i>C. dubia</i> (survival)	1.91	1.13 to 2.15
<i>C. dubia</i> (reproduction)	0.92	0.22 to 1.25
<i>P. promelas</i> (survival)	0.59	0.57 to 0.65
<i>P. promelas</i> (growth)	0.58	0.44 to 0.72

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

# **APPENDIX** A

# **RAW DATA SHEETS**

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FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA

TestAmerica

NOTE 1: State Anti-Manual Part of the State of Links						TTTTA	UTUGW							
Client	17 17	Energy Northwest	west				SDG# B UIUI		Test Initiation:		Date	1-9-11	22	
Contact	Jane L	Jane LaPage (509) 377-4061	377-4061						Test Termination:		Date	1-13-1	Q	
		Collected		Received	Ŕ	Temp	Total Residual	Ammonia	Hardness	Alkalinity	Od	Hu	Cond	
Sample ID	Field ID		Time	à Ì	Time	(°C)	Chlorine (mg/l)		mg/l as	mg/1 as	(mg/L)	TTA	(nS)	filtered?
Number		(YYY)	(Pacific	(mm/dd/yy)	( Pacific		Dechlorination allowed	mg/l	CaCO <sub>3</sub>	CaCO <sub>3</sub>				organisms
			Zone)		Zone)	as Rc'vd	as Rc'vd / after Dechlor.	as Rc'vd	as Rc'vd	as Rc'vd	as Rc'vd	as Rc'vd	as Rc'vd	noted)
34141 -01	19	N 105/16	8.8	11 10/ 11S	ന: 0/	4.5	0,03 10.04	01.07	579	5	23	27	1.05	
-02	* 190440-02	1117119	20:50	\$1 5111	10:50	t j	1,0.01 100.0	10/10	1.35	08 01	20.20	6.3	125	
-03	50-044031	111511	52:50	11110118	11:00	1.6	50.01 50.0	01.02	505	-	5.3	1 5	846	
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		N. L. W.	H	Reporting Limits:		na	0.02 mg/L	0.10 mg/L	5 mg/L	5 mg/L	na	na	na	na
	Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page	ollection or dech	lorination	not needed. Any	v other adju	istments to	samples prior to use are	documented	l in Comme	ants below o	or on Dilutio	ons page.		
ł	Hard	Hardness Alkalinity Comments:	Comment	s: 🗹 Indicates	the action	was taken.	$\blacksquare$ Indicates the action was taken, ( $\Box$ = action not taken):		$^{H} - ^{H} = Sati$	nple not dec	chlorinated,	" - " = sample not dechlorinated, or analyte not collected/needed.	not collecte	d/needed.
Dilution Water	ID# mg/	mg/l as mg/l as	_	Dechlorination is RE	QUIRED	if Total Re	is REQUIRED if Total Residual Chlorine (TRC) is detected (i.e. TRC is 0.02 mg/L or greater)	s detected (i.	e. TRC is (	).02 mg/L o	or greater).			
	Ca(	co <sub>3</sub> caco <sub>3</sub>	From	i EPA manual (E	3PA-821-R	-02-013, 8.	From EPA manual (EPA-821-R-02-013, 8.8.7): 0.025 ml of a 26.8 g/L stock of sodium thiosulfate will reduce 0.10 mg/L TRC in a 11 samule	g/L stock o	f sodium th	iosulfate w	ill reduce 0	.10 mº/L T	RC in a 11	samule
Recon MH (FHM)	, hhch	3 70	(for e	(for example: 4L of s	sample at 0	1.10 mg/L 7	4L of sample at 0.10 mg/L TRC needs 0.10 ml of 26.8g/L sodium thiosulfate stock to be dechlorinated)	.8g/L sodiur	n thiosulfat	te stock to b	e dechlorin	nated)		- Andrew
	9 HLH	8 68	-01 samp	-01 sample Calc: ( දුර	L sample	(ς Ο, Ο) X (ε	L sample) x (ひ.つろ mg/L TRC) x 0.25 = 1	0,15 n	nl of 26.8 g	/L sodium 1	thiosulfate 1	ml of 26.8 g/L sodium thiosulfate to add (ID: 2307) v ev	240700	5
	S LULH HOLIS EST	\$53 loio	-02 samp	-02 sample Calc: (20	L sample	) X (0.0K	L sample) x ( $\mathscr{O}^{\mathscr{O}^{\mathscr{C}}}$ mg/L TRC) x 0.25 = $\mathscr{O}$	0.20 n	nl of 26.8 g	/L sodium t	thiosulfate 1	ml of 26.8 g/L sodium thiosulfate to add (ID: $2.3 \circ 37$ -	2071-0	10
	4 48 810	609	-03 sample Calc:	le Calc: (20	- 1	(0.0) X (0	L sample) x ( $\mathcal{O} \cdot \mathscr{O} \sum mg/L TRC$ ) x 0.25 = 2	6.25 n	nl of 26.8 g	ml of 26.8 g/L sodium thiosulfate to add (ID:	thiosulfate 1	to add (ID:	28071-0	5
			DO	DO NOT add more s	odium thic	sulfate if "	more sodium thiosulfate if "after Dechlor" TRC reading is not reduced to $< 0.02 \text{ mg/L}$ .	ling is not re	duced to <	0.02 mg/L.	Leave as is.	s.		
		Water Quality Meters Used/ID#:	/ Meters U		Dissolved Oxygen	cygen #	U# Ha h	Conductivity	ivitv	6#				$\left \right $
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Energy NW - Cerio acute + chronics (use in 2018).xlsm Doc Control 10: ASL889-6817

# FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

#### Client

# **Energy Northwest**

Sample Designation (SDG): B  $\mathcal{U}(\mathcal{U})$ 

	Cd # 3495	FHM # 2017	
<b>Test Species Information</b>	Ceriodaphnia dubia	Pimephales promelas	
	Chronic	Chronic	
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window	
Test Container Size	30 ml	800 ml	
Test Volume	15 ml	500 ml	
Feeding: Type and Amount	0.10 ml Algae and 0.10 ml YCT daily	0.15 ml <i>Artemia</i> , 2 x Daily	
Aeration:	<ul><li>✓ None</li><li>□ Prior to use</li></ul>	None Prior to use	
In Test Chambers via Slow Bubble :		□ @ hrs	
Acclimation Period	<24 hrs	<24 hrs	
Organism Source	In-House	Ayutax	
Size	-	<u>c r</u>	
Loading Rate	-	-	

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): 
All

Date:

Comments:

**Test Solution Preparation and Dilution Record** 

Client: Energy Northwest

Note: 🗆 Indicates task not done, 🗹 Indicates task was done. Temp adj. 🏾 Temperature adjusted to ambient or test temp Ditto marks ( ' ' ) indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used. Initials K B N

Time

Date

Algae ID

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1/6/2018

used #1184

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		Daily Samule Prenaration	(prior to dilution)	Temp adi. 🗍 Aerated	Temn adi TAerstad	Temn adi TAnnada	Temn adi	Temp adi	Temn adi 🗖 Assertad	Temn adi 🗖 Aerated	□ Temp adj, □ Aerated		Daily Sample Preparation	(nrior to dilution)
		Sample ID	Used	IO-INHa (I	B - AI	B -21	B	B -02	B	B I	B.		Sample ID	Used
		Test	Day	0 (Initiation)	1	*2		4	ŝ	9	7		Test	Day
	2	Final	Volume	(mls)	200	200	200	200	200	200	297 mls		Final	Volume
	hron				î	↑	↑	↑	↑	↑	ay =	ic.		
	dubia - C	Sample	Volume	(mls)	0.00	2.00	6.60	22.0	66.0	200	needed per d	w - Chron	Sample	
· · ·	Certodaphnia dubia - Chronic	Test	Concentration	(%)	Control	1.0	3.3	11.0	33.0	100	Total Sample volume needed per day =	Fathead minnow - Chronic	Test	רעוועכוים מחטו
											Tot			

	Dilution Motor	TISAN WART DAIC	TD # LT 111 111 111 12016 11				1 X1111 1 2247 #m	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PART I	
	Daily Sample Prenaration	(prior to dilution)	Temn adi 🗍 Aeroted	Temn adi T Asseted	Trem adi TAnatad	Terms adi T Acceled	Temn adi Demed	Tem adi D Acreted	Temp adi	Instant - for draw
	Test Sample ID	Day Used	0 (Initiation) B 4/4/ - 0/	B	A 2 B -61	3 B - 0)	4 B . 8	5 B - 9	6 B W2	
	Final	Volume	(mls)	2000	2000	2000	2000	2000	2000	2966 mls
athead minnow - Chronic	Sample	Volume	(mls)	€ 0000	20.0 →	€6.0 →	220 →	€60 →	2,000 →	needed per day =
 Fathead minno	Test	Concentration	(%)	Control	1.0	3.3	11.0	33.0	100	Fotal Sample volume needed per day =
										Τί



# *Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client		Er	nergy No	orthwest			Test Star	t Date	11-6.	-18		
Sample Description	ion						Initial Sa	mple ID#	B	4141-	01	
Data summarized	l by	Ľ	$\left( \right)$									
Percent											1	Total
or			Total Liv	e Young F	Produced i	in First 3 I	Broods per	Replicate	)		# Alive	Live
Concentration	A	B	C	D	E	F	G	H	I	J	Adults	Young
Control	25	25	24	27	26	23	27	14	6	10	8	20
	AD?	AD?	AD2	AD2	AD2	AD2	4D2	AD2	AD2	4.D2		

									1				
Control	25	25	24	27	26	23	27	14	6	10	8	207	4
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?			
1.0 %	22	19	28	15	25	27	24	14	14	13	7	201	]
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		-01	
3.3 %	13	31	30	29	15	31	20	29	14	14	9	226	
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		446	
11.0 %	AM	20	32	16	27	32	32	25	12	14	8/9	210	100
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	517		221
33.0 %	7	Zg	30	11	15	25	23	29	6	5	;	180	
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	10	• -	
100 %	0	17	()	Z	9	9	1	( <sub>2</sub> )	3	0	9	57	
	AD? -	AD?	AD?	AD?									

Survival data summarized through Day 7. 60%+ of surviving controls with 3+ broods first observed on Day <u>6</u>.

Test Organism Mortality (Adult dead) = AD?

Test Organism identified as Male =

Test Organism Injured during test = AD? I

AD? M

 $\checkmark$ 

# of Alive Adults = Number of test organism alive at termination
 (for WDOE only, = Number of test organisms alive at Day 7)

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of <u>eight</u> days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

	Teri Q	LRIOD	APHNIA	CHRO	NIC SUI	RVIVAL	AND KI	EPRODU	JUTION	DATA		,
leo's obtained fro	om A	В	C	D	E	F	G	H	I	J	Incubator U	sed: <u># 6</u>
Culture Board I	D: E	E	E	E	Ē	6	É	E	E	É	Random Te	
Slot	:#: 18	28	13	22	32	5	20	57	30	7	Used: 6	conc # 19
lient			Energy No.	rthwest				Test In	itiation: Date	: 11/6/20	J 19 Time	
					10 1 10	P(1/1/						
ample Descriptio echnician Day	on	1.0	0	- 2 Initi	al Sample ID 7	# D 9/9/	-0(	- 0	ination: Date	: <u>(1//\$/2</u>	J J Iime	
echnician Day ime Day	0 <u>130</u> Day 0 <u>1130</u> Day	1 <u>MD</u> Day 1 <u>1020</u> Day	$\frac{2}{1315}$ Da	y3 <u>(23</u> 0Da	ay 4 <u>/ ) 50</u> I	Day 5 <u>1615</u> Day 5 <u>1615</u> 1	Day 6 <u>500</u> Day 6 <u>1445</u>	Day 7 ( OD)	Day 8 Day 8			
Percent				Daily Nu	mber of Live `	Young for each	Replicate				No. Live	Daily Tot
Da		B	C	D	E	F	G	Н	I	J	Adults	Live Your
1		0	0	0	0	0	0	0	0	0		0
2		0	0	0	0	$\mathcal{O}$	0	0	0	c	10	0
3		0	0	0	5	0	4	3	$\bigcirc$	0	10	12
Control		57	4	3	0	3	0	0	6	3 404		29
		9	8	11	10	10	8	<u> </u>	OAD	7 11-1		82
6	12	11	12	13	11	10	15	040	1	0	808	84
7								(			8	-
8								)	1		a an truth	
1	B	0	0	6	$\wedge$	0	0	0	0	0	0	0
2	0	0	0	Õ	0	Ū.	C.	0	0	0	10	0
3	0	0	3	4	0	3	0	24	0	0	10	14
8 4	3	0	0	0	0	0	0	Ö	5	CI	10	12
4 V 7		9	9	11AD	9	16	10	LUAR	9	9	8	97
6		10	16	C	16	14	14	(	Ő	0	2	23
7			40								7	
8				)				)				
1	0	$\cap$		0	0	0	0	0	()	0	10	()
2		0	0	0	0	õ	Ö	0	0	0	10	0
3		L.	LI	5	0	0	0	U	0	0	10	17
		0	0	0	5	3	4	0	61	4	10	23
% E 5		ĩ	11	10	,	- îi	7	11	10	10	10	TI
6		16	15	14	10	17	à	14	$\dot{\Box}$	0	10	95
7		14		19	10	11	An	17		0	9	
8							2-03-04-0					~
0		0	-	~	~	~	0	~	X	0	10	~
		0		0	$\bigcirc$	6	-O	0		$\bigcirc$	- 10	0
2		0	0	0	0	0	<u> </u>	0	0		99	22
~ 3	_	0	5	5	4	4	6	-2-		0	9	23
4 5				0	0		5	0	4	4	6	15
		12	10	LIAD	10	11	10	9	8	0	8/9	81
6		5	17		13	17	17	11	0	10	8	90
7											5	
8	_	~~~~	-	1		~	~		-		15	
1		0	0	0	0	0	0	0	0	0	10	0
2	- L	0	0	0	0	0	Ö	0	0	0	10	0
3		2	0	0	0	3	0	0	0	0	10	2
% 0°82 5		0	6	2	2	0	3	3	0	2	10	20
£ 5	5	12	10	9	9	6	7	9	6	3	10	76
6	5	15	14	0	4	16	13	17	0	0	10	79
7											10	مەمىر . م
8												
1	0	0	$\bigcirc$	Ô	0	0	T	()	0	0	10	0
2	0	ð	0	0	0	0	0	0	0	0	10	0
3		ß	0	0	8	0	0	0	0	0	10	0
	- Part	0	0	~	0	0	0	0	3	DA 4	10	3
% 4 5		0	4	OAY	OAY	OAY	CAY	OAY	0	OAY	9	4
6		17	7	2	9	9	L HO	5	0	OFT	9	50
7			- (	~					0	0	-	00
8											-	
	1		1								1	

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, "/" = split brood ( carry-over brood / current day brood ), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood Footnote: As per WDOE, C. dubia test reproduction should be when 60% of the surviving control organisms have produced their third brood (Days 6, 7, or 8). Survival is at seven days.

<u>lestAmerica</u>	rinco	<b>CERIODAPHNIA WA</b>	APHNIA WATER QUALITY DATA	
Client	Energy Northwest	Initiated Date $\dot{a}$ / $\zeta$	/20 × Time 11 :30	12:
Sample	Sample Description	Initial Sample ID # B C	4/41 - 4	Neo's Collected Date 1. 15/20 12 Time 17: 30
Tech:	Day 0 3m/NGDay 1 WG Day 2 2	Day 3 & Day 4	O Day 5 BAM	Day 6 3 Day 7 Day 8
	14:41	Day 3 1 2 : 3 0 Day 4	12:50 Day 5	Day 6 14:50 Day 7 60 : Day 8 :
Therm.	Day 0 # 200	Day 3 # 25 2 Day 4	# 252 Day 5 # 252	Day 6 # 252 Day 7 # 252 Day 8 #
	Dissolved Oxygen (mg/l)		pH	Temperature ( $^{\circ}C$ ) / Conductivity ( $\mu$ S) (1 <sup>st</sup> use of each sample only)
%	Day Day 0 1 1 2 2 3 4 5 6 7 8	0 1 2 3	Day 14 5 6 7 8	Day         Day           0         1         2         3         4         5         6         7         8
Control	2.4 2.4 2.4 2.4 0.4 1.4 1.4 1.4 0.4 1.4 1.4 0.4 1.4 0.4 1.4 0.4 1.4 1.4 0.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1	61.0	1 2. 5 0.3 0.3 0.8 S. S. S.	
% 0°I	54 8:4 8:4 4:4 1 54 8:4 8:4 4:4 1		8 10 8:0 2.0	124.4 <sup>24</sup> , 5/25 4 <sup>24</sup> , 3/24.3/25.5
% E'E	1.4/40/		C.B 0.8 1.8	24. 4 2 1 2 4 . 4 2 4 . C
% 0.11	7.3 M.4 4.3 H.3 H.3 7.5 7.5 1.5 1.5	1.8	6.2 8.8 2.8 2.8	10.10 25. C 25. 12 121. 12 25. 13 29. 14 28.1 1 28.1
% 0.££	12 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		10% 9. 2 S. 1. 2. 2 . 2 . 2 . 2 . 2 . 2 . 2 . 2 .	1. 2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1
% 00 l	73 / 1. 1 1. 1 1. 1 1. 1 1. 1. 1. 1. 1. 1. 1	5 × 0.8 /31 6L	2.2 C'3 5.2 5.4 6	24.6 W. yay 2 w. y w. y w. y 25.9 8.3 0 0
COM	COMMENTS: Temperatures taken just prior to test solution renewals. DC	DO, pH, and Conductivity taken following organism transfer.	following organism transfer.	23.8
			. 1', 1	= Temp out of recom. range

Energy NW - Cerio acute + chronics (use in 2018).xlsmDoc Control 10: ASL899-0917

Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

# **CETIS Summary Report**

Ceriodaphnia	7-d Survival and	l Rep	roduc	tion Te	est							TestAme	erica - ASI
Batch ID: Start Date: Ending Date: Duration:	01-8993-0902 06 Nov-18 11:30 13 Nov-18 10:20 6d 23h	-		ocol: cies:	Reproduction-S EPA/821/R-02-0 Ceriodaphnia du In-House Cultur	013 (2002) ubia			Analyst: Diluent: Brine: Age:		helle Bennet -Hard Synth H		
	05-9824-7280 05 Nov-18 05:30 06 Nov-18 10:00 30h (4.5 °C)		Code Mate Sour Stati	rial: rce:	B4141-01 Unknown Energy Northwe	est (WA 002	5151)		Client: Project:				
Comparison S	Summary												
Analysis ID	Endpoint			NOEL	LOEL	TOEL	PMSD	TU	Met	hod			
11-0179-2170	7d Survival Rate	)		100	>100	NA	NA	1			act/Bonferro		st
09-5182-9632	Reproduction		6	33	100	57.45	40.2%	3.03	Wild	coxon/l	Bonferroni A	\dj Test	
Point Estimate	e Summary												
Analysis ID	Endpoint			Level	%	95% LCL	95% UCL	TU	Met	hod			
09-8176-5866	Reproduction		1	IC25	38.65	18.87	53.51	2.58	7 Line	ear Inte	erpolation (I	CPIN)	
Test Acceptab	pility												
Analysis ID	Endpoint			Attrib	ute	Test Stat	TAC Limi	ts	Ove	erlap	Decision		
11-0179-2170	7d Survival Rate			Contro	ol Resp	0.8	0.8 - NL		Yes		Passes A	cceptability	Criteria 💃
09-5182-9632	Reproduction			Contro	ol Resp	20.7	15 - NL		Yes		Passes A	cceptability	Criteria~
09-8176-5866	Reproduction			Contro	ol Resp	20.7	15 - NL		Yes			cceptability	
09-5182-9632	Reproduction			PMSD	)	0.4017	0.13 - 0.47	, 	Yes		Passes A	cceptability	Criteria ~
7d Survival Ra	ate Summary												
C-%	Control Type	Cou	nt	Mean	95% LCL	95% UCL	Min	Мах	Std	Err	Std Dev	CV%	%Effec
0	Dilution Water	10		0.8	0.4984	1	0	1	0.13		0.4216	52.7%	0.0%
1		10		0.7	0.3544	1	0	1	0.15	528	0.483	69.01%	12.5%
3.3		10	1	0.9	0.6738	1	0	1	0.1		0.3162	35.14%	-12.5%
11		9	5	0.8889	9 0.6327	1	0	1	0.11	111	0.3333	37.5%	-11.119
33		10	-	1	1	1	1	1	0		0	0.0%	-25.0%
100		10		0.9	0.6738	1	0	1	0.1		0.3162	35.14%	-12.5%
Reproduction	Summary												
C-%	Control Type	Cou	nt	Mean	95% LCL	95% UCL	Min	Max		Err	Std Dev	CV%	%Effec
0	Dilution Water	10		20.7	15.18	26.22	6	27	2.44		7.718	37.28%	0.0%
1		10		20.1	15.94	24.26	13	28	1.84	11	5.82	28.96%	2.9%
		10	t .	22.6	16.85	28.35	13	31	2.54		8.044	35.59%	-9.18%
3.3		10									0.070	04.000/	-12.72
3.3 11		9	J.B.J	23.33	17.12	29.54	12	32	2.69		8.078	34.62%	
		9 10	N.S.	23.33 18	17.12 10.64	29.54 25.36	12 5	32 30	2.69 3.25		8.078 10.28 5.638	34.62% 57.14% 98.92%	-12.72 13.04% 72.46%

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GENS	Summary Repo	ы						oort Date: t Code:		Nov-18 13: 4101cdc   0	
Ceriodap	ohnia 7-d Survival ar	nd Reprod	uction Test							TestAm	erica - ASI
7d Survi	val Rate Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	0	0	1
1		1	1	0	0	1	1	1	0	1	1
3.3		1	1	1	1	1	1	0	1	1	1
11		1	1	0	1	1	1	1	1	1	
33		1	1	1	1	1	1	1	1	1	1
100		0	1	1	1	1	1	1	1	1	1
Reprodu	ction Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	25	25	24	27	26	23	27	14	6	10
1		22	19	28	15	25	27	24	14	14	13
3.3		13	31	30	29	15	31	20	29	14	14
11		20	32	16	27	32	32	25	12	14	
33		7	29	30	11	15	25	23	29	6	5
100		0	17	11	2	9	9	1	5	3	0

100		0	17	11	2	9	9	1	5	3	0
7d Survival	Rate Binomials										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1
1		1/1	1/1	0/1	0/1	1/1	1/1	1/1	0/1	1/1	1/1
3.3		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
11		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	
33		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

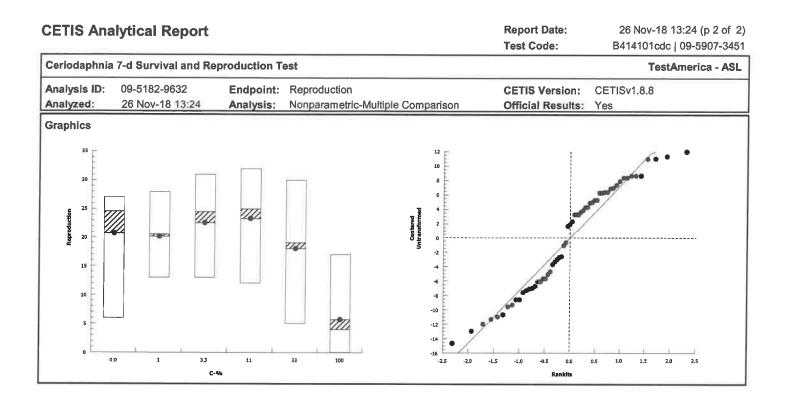
CETIS™ v1.8.8.3

#### **CETIS Analytical Report Report Date:** 26 Nov-18 13:24 (p 1 of 2) **Test Code:** B414101cdc | 09-5907-3451 Ceriodaphnia 7-d Survival and Reproduction Test TestAmerica - ASL Analysis ID: 11-0179-2170 Endpoint: 7d Survival Rate **CETIS Version:** CETISv1.8.8 Analyzed: 26 Nov-18 13:20 Analysis: STP 2x2 Contingency Tables **Official Results:** Yes **Batch ID:** 01-8993-0902 Test Type: Reproduction-Survival (7d) Analyst: **Michelle Bennett** Start Date: 06 Nov-18 11:30 Protocol: EPA/821/R-02-013 (2002) **Diluent:** Mod-Hard Synthetic Water Ending Date: 13 Nov-18 10:20 Species: Ceriodaphnia dubia Brine: **Duration:** 6d 23h Source: In-House Culture Age: <24H 05-9824-7280 Sample ID: B4141-01 Code: **Client:** Sample Date: 05 Nov-18 05:30 Material: Unknown **Project:** Receive Date: 06 Nov-18 10:00 Source: Energy Northwest (WA 0025151) Sample Age: 30h (4.5 °C) Station: **Data Transform** Zeta Alt Hyp **Trials** Seed NOEL LOEL TOEL TU Untransformed C > T NA NA 100 >100 NA 1 Fisher Exact/Bonferroni-Holm Test Control vs C-% **Test Stat P-Value** P-Type Decision(a:5%) Dilution Water 0.5 1.0000 Exact Non-Significant Effect 1 3.3 1.0000 Exact Non-Significant Effect 1 11 1 1.0000 Exact Non-Significant Effect 33 1.0000 1 Exact Non-Significant Effect 100 1 1.0000 Exact Non-Significant Effect **Test Acceptability Criteria** Attribute Test Stat TAC Limits Overlap Decision Control Resp 0.8 - NL Passes Acceptability Criteria 0.8 Yes **Data Summarv** C-% **Control Type** NR R NR + R Prop NR Prop R %Effect Dilution Water 0 8 2 10 0.8 0.2 0.0% 7 1 3 10 0.7 0.3 12.5% 3.3 9 1 10 0.9 0.1 -12.5% 11 8 1 9 0.8889 0.1111 -11.11% 33 10 0 10 0 -25.0% 1 100 9 1 0.1 10 0.9 -12.5% 7d Survival Rate Detail C-% **Control Type** Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Rep 9 Rep 10 0 **Dilution Water** 1 1 1 1 1 1 1 0 0 1 1 0 1 1 0 1 1 1 0 1 1 3.3 1 1 1 0 1 1 1 1 1 1 11 0 1 1 1 1 1 1 1 1 33 1 1 1 1 1 1 1 1 1 1 100 0 1 1 1 1 1 1 1 1 1 7d Survival Rate Binomials C-% **Control Type** Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Rep 9 Rep 10 0 **Dilution Water** 1/1 1/1 1/1 1/1 1/1 1/1 1/1 0/1 0/1 1/1 1 1/1 0/1 1/1 0/1 1/11/1 1/1 0/1 1/1 1/1 3.3 1/1 1/1 1/1 1/1 1/1 1/1 0/1 1/11/1 1/111 1/1 1/1 0/1 1/11/1 1/11/1 1/11/1 33 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 100 0/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1

CETIS Analytical Report	Report Date:	26 Nov-18 13:24 (p 2 of 2)
	Test Code:	B414101cdc   09-5907-3451

Ceriodaphnia 7-d Survival and Reproduction Test TestAmerica - A						
Analysis ID: Analyzed:	11-0179-2170 26 Nov-18 13:20	Endpoint: Analysis:		CETIS Version: Official Results:	CETISv1.8.8 Yes	
Graphics 	D 1 33	•	100 100			

CETIS An	ETIS Analytical Report							Report Date:         26 Nov-18 13:           Test Code:         B414101cdc   0				
Ceriodaphni	a 7-d Survival a	nd Rep	roduction T	est							TestAr	nerica - AS
Analysis ID: Analyzed:	09-5182-9632 26 Nov-18 13	-	Endpoint: Analysis:	Reproduction Nonparametri	c-Multipl	e Co	mparison		TIS Versio		v1.8.8	
Batch ID: Start Date: Ending Date Duration:	01-8993-0902 06 Nov-18 11 : 13 Nov-18 10 6d 23h	:30	Test Type: Protocol: Species: Source:	Reproduction EPA/821/R-02 Ceriodaphnia In-House Cult	2-013 (20 dubia	• •		Dil	uent: M ine:	Michelle Benr Mod-Hard Syr		r
Receive Date	05-9824-7280 : 05 Nov-18 05 : 06 Nov-18 10 30h (4.5 °C)	30	Code: Material: Source: Station:	B4141-01 Unknown Energy Northy	west (WA	002	25151)		ent: Dject:			
Data Transfo Untransforme		Zeta NA	Alt H	yp Trials NA	Seed NA			<b>PMSD</b> 40.2%	NOEL 33	<b>LOEL</b> 100	<b>TOEL</b> 57.45	<b>TU</b> 3.03
								40.270		100	57.45	5.05
Control Dilution Water	nferroni Adj Tes vs C-% r 1 3.3 11 33 100*		Test \$ 100.5 118 100.5 101 62	itat Critical NA NA NA NA NA NA	<b>Ties</b> 5 1 4 3 0	18 18 17 18	<b>P-Value</b> 1.0000 1.0000 1.0000 1.0000 0.0011	P-Type Exact Exact Exact Exact Exact Exact	Non-Sig Non-Sig Non-Sig Non-Sig	on(α:5%) gnificant Effe gnificant Effe gnificant Effe gnificant Effe ant Effect	ct ct	
Test Accepta	bility Criteria											
Attribute Control Resp PMSD	<b>Test Stat</b> 20.7 0.4017	<b>TAC L</b> 15 - N 0.13 -	L	Overlap Yes Yes		es Ac	ceptability					
ANOVA Table												
Source	Sum Squ	ares	Mean	Square	DF		F Stat	P-Value	Decisio	on(α:5%)		
Between Error	2091.381 3183.5		418.27 60.066		5 53		6.964	<0.0001	Signific	ant Effect		
Total	5274.881				58							
Distributional												
Attribute Variances	Test Bartlett F	ouality o	of Variance	<b>Test Stat</b> 4.339	Critica 15.09	al	P-Value 0.5017	Decision Equal Va				
Distribution	Shapiro-			0.942	0.9451		0.0073		nal Distribu	ution		
Reproduction	Summary											
C-%	Control Type	Count	Mean	95% LCL	95% U	CL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	10	20.7	15.18	26.22		24.5	6	27	2.441	37.28%	0.0%
1		10	20.1	15.94	24.26		20.5	13	28	1.841	28.96%	2.9%
3.3 11		10 9	22.6 23.33	16.85 17.12	28.35 29.54		24.5 25	13 12	31	2.544	35.59%	-9.18%
33		9 10	23.33 18	17.12	29.54 25.36		25 19	12 5	32 30	2.693 3.252	34.62% 57.14%	-12.72%
100		10	5.7	1.667	9.733		4	0	17	1.783	98.92%	13.04% 72.46%
Reproduction	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	25	25	24	27		26	23	27	14	6	10
1		22	19	28	15		25	27	24	14	14	13
3.3		13	31	30	29		15	31	20	29	14	14
11		20	32	16	27		32	32	25	12	14	
		7	29	30	11		15	25	23	29	6	5
33 100		0	29 17	30 11	2		9	25 9	1	29 5	3	0



QA:\_\_\_\_\_

CETIS	5 Ana	lytical Rep	ort						Report Date: Test Code:			:24 (p 1 of 2 )9-5907-345
Ceriod	aphnia	7-d Survival a	nd Reprodu	ction T	est						TestAn	nerica - ASL
Analys Analyz		09-8176-5866 26 Nov-18 13:		dpoint: alysi <b>s:</b>	Reproduction Linear Interpo	lation (ICP	IN)		ETIS Versior		1.8.8	
Batch I Start D Ending Duratio	ate: J Date:	01-8993-0902 06 Nov-18 11: 13 Nov-18 10: 6d 23h	30 Pro 20 Spe	t Type: tocol: cies: irce:	Reproduction- EPA/821/R-02 Ceriodaphnia In-House Cultu	-013 (2002 dubia		D	Diluent: Mo Brine:	chelle Benno od-Hard Syn 4H		r
Receive	e Date: e Date:	05-9824-7280 05 Nov-18 05:: 06 Nov-18 10:( 30h (4.5 °C)	00 <b>So</b> u	le: erial: irce: tion:	B4141-01 Unknown Energy Northw	vest (WA 0	025151)	-	lient: roject:			
Linear I X Trans Log(X+1	sform	ation Options Y Transforn Linear		<b>d</b> 2199	Resamples	Exp 95 Yes		<b>thod</b> o-Point Int	erpolation			
Test Ac Attribut Control	e	lity Criteria Test Stat 20.7	TAC Limi 15 - NL	is	<b>Overlap</b> Yes	Decisio Passes	<b>n</b> Acceptabilit	y Criteria				
Point Es Level IC25	stimate % 38.65	s 95% LCL 18.87	<b>95% UCL</b> 53.51	<b>TU</b> 2.587	<b>95% LCL</b> 1.869	<b>95% UC</b> 5.3	L					
Reprod	uction	Summary				C	alculated V	ariate				
C-%	Co	ntrol Type	Count	Mean	Min	Max	Std Err	Std De	v CV%	%Effect		
0 1 3.3 11 33 100	Dil	ution Water	10 10 10 9 10 10	20.7 20.1 22.6 23.33 18 5.7	6 13 13 12 5 0	27 28 31 32 30 17	2.441 1.841 2.544 2.693 3.252 1.783	7.718 5.82 8.044 8.078 10.28 5.638	37.28% 28.96% 35.59% 34.62% 57.14% 98.92%	0.0% 2.9% -9.18% -12.72% 13.04% 72.46%		
Reprodu	uction [	Detail		_								
C-%		ntrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0 1 3.3 11		ution Water	25 22 13 20	25 19 31 32	24 28 30 16	27 15 29 27	26 25 15 32	23 27 31 32	27 24 20 25	14 14 29 12	6 14 14 14	10 13 14
33 100			7 0	29 17	30 11	11 2	15 9	25 9	23 1	29 5	6 3	5 0

Analyst:\_\_\_\_\_\_QA:\_\_\_\_\_

CETIS Ana	alytical Report			Report Date: Test Code:	26 Nov-18 13:24 (p 2 of 2 B414101cdc   09-5907-345	
Ceriodaphnia	a 7-d Survival and Re	production T	est		TestAmerica - ASL	
Analysis ID: Analyzed:	09-8176-5866 26 Nov-18 13:24	Endpoint: Analysis:	Reproduction Linear Interpolation (ICPIN)	CETIS Version: Official Results:	CETISv1.8.8 Yes	
Graphics						
5 0 0	20 40 C-96	60	80 100			

Analyst: MB QA:\_\_\_\_

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			FAT	HEAD MINN	OW 7-DAY S	URVIVAL A	ND WATER	QUALITY DA	ATA		
Rar	dom Te	mplate Used:	6 conc. x 4 rep	s. #	Water	bath/incubato	r Used:	Date Initiated	11/10/	<u>20 ( 8</u> _Time	15:10
		-	141			# 3		ate Terminated			13:10
Client			Energ	y Northwest			Samp	le Description			
Tech:	Day 0	MB Day	Day	y2 BAM I	Day 3 UBC	Day 4.	Day 5 BA	Day 6	BAM Day 7	Brough	
Time	Day 0	1510 Day	1 1356 Day	y2 <u>13 10</u> I	Day 3 (Selo	Day 4 133	<u>S</u> Day 5 <u>173</u>	<u>30</u> Day 6 j	<u>135</u> Day 7		Conductivity
Conc. or	Day		Number of Li	ve Organisms		Sec. 17	lved O <sub>2</sub> ng/l)	F	H	Temp. # (°C) #	(μS)
Percent	Day	А	В	С	D	Pre	Post	Pre	Post	(°C) Pre	Post (1 <sup>st</sup> use)
	0	10	10	10	10	6.8	7-8	8.6	8.4	Post: 24.6 252 24.3 252	302
	2	16	10	10	10	6.3	7.3	8.1	8.3	24.7 255	321
Control	3	10	10	10	10	6.5	6.6	7.6	8.0	24.6 155	294
Ŭ	5	10	10	10	10	6.9	7.0	8.6	8.2	24,7 255	
	6	10	10	10	10	7.6	7.5	8.1	8.2	24.7 255	
	0	10	10	10	10		7.8	8.2	8.4	Post: 24-6 24.2	316
	1 2	10	9	10	10	6.6	7.5	8.1	8.4	24.7	330
1.0 %	3	10	1	9	10	6.6	6.9	7.3	8.1	24.6	309
-	4	10	9	a	(2)	6.7	7.3	7.6	8.3	24.6	310
	6	10	9	q	10	7.5	7.6	8.1	8.2	24.6	
	7	10	<u>8</u> 10	<u>9</u> 10	10	7.2	7.7	7,8	8.4	Post: 24.6	341
	1	(0	10	10	16	6.5	7.4	8.1	8.3	24.2	357
8	2	10	10	10	10	6.2	7.6	31	8.5	74.6	325
3.3	4	10	10	10	60	62	7.6	7-6	8.1	24.6	327
	5	10	10	10	18	6.5	7.3	8.1	8.3	24.6	
	7	10	10	10	10	7.5	7.7	7.7	8.3	24.7 Post: 24.6	415
	0	10	D D	10	10	6.5	7.4	8.1	8.3	2413	
%	2	16	10	10	10	6.2	7.7	80	8.1	24.6	424
11.0	3	10	10	10	10	6.2	7.5	7.6	8.1	24.4	374
	5	10	10	0	10	6.5	1.5	8.0	8.3	24.6	
	6 7	01	10	10	10	7.3		7.7		24.7	
	0	10 ( 0		10	10	6.5	7.7	8.0	8.2	Post: 24-6	624
	1 2	10	10	10	10	6.2	7.8	7.9	8.3	24.6	634
33.0 %	3	10	10	10	10	6.5	7.7	73	8.1	24.6	559
33	5	10	10	10	10	6.4	7.6	8.0	8.2	24.7	
	6	10	10	10	10	7.4	7.9	7.9	8.1	24.6	
	0	10	10	10	10		7.7	······	010	Post: 24.6	1173
	1 2	G G	10	16	10	6.4	7.5	79	8.1 8.2	24.3	1169
100 %	3	Ŷ	10	18	10	6.5	8.0	7.2	7.9	24.6	1020
10(	4	9	*	18	()	6.4	8.1	7.4	7-9	24.4'	901
	6	9		10	10	7.4	8:2	7.8	8.6	24.7	
	7	G	5	10	7 F	7.1		1.5		14.1 Det Det an	avel colutions

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container. "M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

Aeration in test chambers begun @ \_\_\_\_\_ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions. Day 0 Temperatures = Post-renewals

Therm ID# = Thermometer ID used for all measurements that day. = Temp. out of recommended range 23.8)

\* rep spilled on 11-10-18 lo

# FATHEAD MINNOW 7-DAY GROWTH DATA

Client	Energy NW		Tins Labeled As:	ENW
Lab ID:	B4141		Start Date:	11/6/2018
Sample Description:				
	Technician:		BAM	-
	Date:	D200542(47	11/12/2018	-
	Balance Serial #:	B328543647	B328543647	-
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
I CI CONC	Replicate	() organ (mg)	(	
	A		1098.10	10
Control	B		1105.75	10
Control	C		1109.57	10
	D		1082.78	10
	A		1086.35	10
1 %	B		1090.31	8
	С		1109.91	9
	D		1102.29	12
	A		1080.98	10
3.3 %	В		1102.75	10
	C		1100.31	10
	D		1109.05	10
	A		1090.46	10
11 %	B		1124.02	10
	C		1095.22	10
	D		1086.21	10
			1107.00	
22.0/	A		1107.32	10
33 %	B		1085.92 1113.02	10
	C		1089.00	12
	D		1089.00	
	A		1092.98	9
100 %	B		1099.50	Vap spilled
100 /0	C		1124.61	10
	D		1123.81	7
	A			
	B			
	С			
	D			

weigh to 0.01 mg

Client	Energy NW		Tins Labeled As:	ENW
Lab ID:	B4141		Start Date:	11/6/2018
Sample Description:				
	Technician:	MB	BAM	_
	Date:	11/9/2018	11/12/2018	2 <del>.</del>
	Balance Serial #:	B328543647	B328543647	-
		Total	Tare	No. of
Percent	Replicate	Weight (mg)	Weight (mg)	Fish
rercent	Replicate	weight (ing)	weight (mg)	I ISH
		1107.00	1000.10	10
	A	1107.38	1098.10	10
Control	B	1115.70	1105.75	
	C	1118.64	1109.57	10
	D	1090.69	1082.78	10
	A	1095.98	1086.35	10
1 %	B	1095.98	1090.31	8
1 /0	C	1117.98	1109.91	9
	D	1111.60	1109.91	10
	D	1111.00	1102.29	10
	A	1090.48	1080.98	10
3.3 %	B	1113.47	1102.75	10
	C	1109.72	1100.31	10
	D	1117.85	1109.05	10
	A	1099.31	1090.46	10
11 %	В	1134.17	1124.02	10
	C	1104.82	1095.22	10
	D	1094.69	1086.21	10
	A	1116.83	1107.32	10
33 %	B	1094.23	1085.92	10
	C	1122.23	1113.02	10
	D	1096.20	1089.00	10
	A	1102.67	1092.98	9
100 %	B		1099.50	-
	C	1134.17	1124.61	10
	D	1130.89	1123.81	7
	A			
	B			
	С			
	D			

# FATHEAD MINNOW 7-DAY GROWTH DATA

weigh to 0.01 mg

CETIS Summary Report								Report Date Test Code:		26 Nov-18 13:35 (p 1 of 2) B414101ppc   12-5040-8443	
Fathead Minn	ow 7-d Larval S	urvival and	Growt	h Test						TestAme	erica - ASL
Batch ID: Start Date: Ending Date: Duration:	17-0146-7237 06 Nov-18 15:1 13 Nov-18 13:1 6d 22h	0 Prot	ocol: cies:	Growth-Surviva EPA/821/R-02-0 Pimephales pro Aquatox, AR	013 (2002)			Analyst: Diluent: Brine: Age:	Michelle Benne Mod-Hard Syn 1D		
Sample ID: Sample Date: Receive Date: Sample Age:	05-9824-7280 05 Nov-18 05:3 06 Nov-18 10:0 34h (4.5 °C)		erial: rce:	B4141-01 Unknown Energy Northwe	est (WA 002	5151)		Client: Project:			
Comparison S	Summary										
Analysis ID	Endpoint		NOEL		TOEL	PMSD	TU	Meth			
19-7532-0055 03-7177-7068	7d Survival Rat Mean Dry Biom		100	>100	NA NA	NA 20.9%	1 1		r Exact/Bonferr erroni Adj t Test		
Point Estimat	e Summary	$\langle$	_	$\leq$							
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	TU	Meth			
11-9808-0149	Mean Dry Biom	ass-mg	IC25	>100	N/A	N/A	<1	Linea	r Interpolation (	ICPIN)	
Test Acceptat Analysis ID	bility Endpoint		Attrib	ute	Test Stat	TAC Limi	ts	Over			
19-7532-0055	7d Survival Rat	e	Contr	ol Resp	1	0.8 - NL		Yes		Acceptability	
03-7177-7068	Mean Dry Biom	lass-mg	Contr	ol Resp	0.9052	0.25 - NL		Yes		Acceptability	
11-9808-0149	Mean Dry Biom	iass-mg	Contr	ol Resp	0.9052	0.25 - NL		Yes		Acceptability	-
03-7177-7068	Mean Dry Biom	lass-mg	PMS	)	0.2095	0.12 - 0.3		Yes	Passes	Acceptability	Criteria -
7d Survival R	ate Summary							0.41	rr Std Dev	CV%	%Effect
C-%	Control Type	Count	Mean		95% UCL	Min	Max	C Std E	0	0.0%	0.0%
0	Dilution Water	4	1	1	1 1	1 0.8	1 1	0.047	-	10.35%	7.5%
1		4	0.925	0.7727 1	1	0.8 1	1	0.047	0.00014	0.0%	0.0%
3.3		4 125	1 1	1	1	1	1	0	õ	0.0%	0.0%
11 33		4 7	1	1	1	1	1	0	0	0.0%	0.0%
100		3	0.866		1	0.7	1	0.088	0.1528	17.63%	13.33%
Mean Dry Bio	mass-mg Sumn	nary									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Ma			CV%	%Effect
0	Dilution Water	4	0.905		1.04	0.791	0.9			9.38%	0.0%
1		4	0.868		1.016	0.774	0.9			10.62%	4.03%
3.3		4	0.960		1.089	0.88	1.0			8.37%	-6.13%
11		4	0.927		1.046	0.848	1.0			8.08%	-2.4% 5.47%
33		4	0.855		1.021	0.72	0.9			12.14% 16.76%	5.47% 3.05%
100		3	0.877	7 0.5123	1.243	0.708	0.9	69 0.084	192 0.1471	16.76%	0.0076

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Analyst: MB QA: Br

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# **CETIS Summary Report**

26 Nov-18 13:35 (p 2 of	2)
B414101ppc   12-5040-84	443

Report Date:

Test Code:

Fathead	Minnow 7-d Larval S	urvival an	TestAmerica - ASL			
7d Surviv	val Rate Detail					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	1	1	1	1	
1		1	0.8	0.9	1	
3.3		1	1	1	1	
11		1	1	1	1	
33		1	1	1	1	
100		0.9	1	0.7		
Mean Dry	Biomass-mg Detail					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	0.928	0.995	0.907	0.791	
1		0.963	0.774	0.807	0.931	
3.3		0.95	1.072	0.941	0.88	
11		0.885	1.015	0.96	0.848	
33		0.951	0.831	0.921	0.72	
100		0.969	0.956	0.708		
7d Surviv	al Rate Binomials					
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	
0	Dilution Water	10/10	10/10	10/10	10/10	
1		10/10	8/10	9/10	10/10	
3.3		10/10	10/10	10/10	10/10	
11		10/10	10/10	10/10	10/10	
33		10/10	10/10	10/10	10/10	
100		9/10	10/10	7/10		

CETIS Analytical Report									Report Date: Test Code:		26 Nov-18 13:35 (p 1 of 2) B414101ppc   12-5040-8443		
Fathead Minn	low 7-d Larval S	urviva	l and Growt	h Te	st							TestAm	nerica - ASL
Analysis ID: Analyzed:	19-7532-0055 26 Nov-18 13:3	34	Endpoint: Analysis:		Survival Ra P 2x2 Conti	te ngency Tabl	es	-		Version: Results	CETIS <sup>,</sup> Yes	v1.8.8	
Batch ID: Start Date: Ending Date: Duration:	17-0146-7237 06 Nov-18 15:1 13 Nov-18 13:1 6d 22h		Test Type: Protocol: Species: Source:	EP# Pim	wth-Surviva A/821/R-02- lephales pro latox, AR	013 (2002)		D	nalyst iluent rine: ge:		nelle Benr I-Hard Syr	ett hthetic Wate	r
-	05-9824-7280 05 Nov-18 05:3 : 06 Nov-18 10:0 34h (4.5 °C)		Code: Material: Source: Station:	Unk	41-01 nown ergy Northw	est (WA 002	25151)		lient: roject	:			
Data Transfor	m	Zeta	Alt H	ур	Trials	Seed			M	IOEL	LOEL	TOEL	TU
Untransformed	t		C > T		NA	NA			1	00	>100	NA	1
Fisher Exact/	Bonferroni Adj 1	lest .											
Control	vs C-%		Test	Stat	P-Value	Р-Туре	Decision	(α:5%)					
Dilution Water	1 3.3 11		0.120 1 1	3	0.6013 1.0000 1.0000	Exact Exact Exact	Non-Signi Non-Signi Non-Signi	ificant Ef	ect				
	33 100		1 0.029	89	1.0000 0.1494	Exact Exact	Non-Signi Non-Signi	ificant Ef	ect				
Test Acceptat	allity Critoria			_					_				
ICSL AGGEDIAL													
		TAC	limite		Overlan	Decision							
Attribute	Test Stat	<b>TAC</b>	Limits		Overlap Yes	Decision Passes Ad	cceptability	Criteria	_				
Attribute Control Resp	Test Stat						cceptability	Criteria					
Attribute Control Resp Data Summar	Test Stat 1	0.8 -	NL		Yes	Passes Ad							
Attribute Control Resp Data Summar C-%	Test Stat 1 Y Control Type	0.8 - NR	NL R		Yes NR + R	Passes Ac	Prop R	%Effe	et				
Attribute Control Resp Data Summar C-% 0	Test Stat 1	0.8 -	NL		Yes	Passes Ad	Prop R		st				
Attribute Control Resp Data Summar C-%	Test Stat 1 Y Control Type	0.8 - <b>NR</b> 40	NL <b>R</b> 0		Yes <b>NR + R</b> 40	Passes Ac Prop NR 1	Prop R	%Effe	:t				
Attribute Control Resp Data Summar C-% 0 1	Test Stat 1 Y Control Type	0.8 - NR 40 37	NL R 0 3		Yes <b>NR + R</b> 40 40	Passes Ac Prop NR 1 0.925	<b>Prop R</b> 0 0.075	%Effe 0.0% 7.5%	:t				
Attribute Control Resp Data Summar C-% 0 1 3.3	Test Stat 1 Y Control Type	0.8 - <b>NR</b> 40 37 40	NL R 0 3 0		Yes <b>NR + R</b> 40 40 40	Passes Ac Prop NR 1 0.925 1	<b>Prop R</b> 0 0.075 0	%Effe 0.0% 7.5% 0.0%	ət				
Attribute Control Resp Data Summar C-% 0 1 3.3 11	Test Stat 1 Y Control Type	0.8 - <b>NR</b> 40 37 40 40	R 0 3 0 0		Yes NR + R 40 40 40 40	Passes Ac Prop NR 1 0.925 1 1	<b>Prop R</b> 0 0.075 0 0	%Effe 0.0% 7.5% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33	Test Stat 1 y Control Type Dilution Water	0.8 - NR 40 37 40 40 40	NL		Yes NR + R 40 40 40 40 40	Passes Ac Prop NR 1 0.925 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra	Test Stat 1 y Control Type Dilution Water	0.8 - NR 40 37 40 40 40	NL 0 3 0 0 0 4		Yes NR + R 40 40 40 40 40	Passes Ac Prop NR 1 0.925 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100	Test Stat 1	0.8 - NR 40 37 40 40 40 26	NL 0 3 0 0 0 4	2	Yes NR + R 40 40 40 40 40 30	Passes Ac Prop NR 1 0.925 1 1 1 0.8667	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra C-%	Test Stat 1 Y Control Type Dilution Water ate Detail Control Type	0.8 - <b>NR</b> 40 37 40 40 40 26 <b>Rep</b>	NL R 0 3 0 0 0 4 I Rep 2	2	Yes NR + R 40 40 40 40 40 30 <b>Rep 3</b>	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra C-% 0	Test Stat 1 Y Control Type Dilution Water ate Detail Control Type	0.8 - <b>NR</b> 40 37 40 40 40 40 26 <b>Rep</b> <sup>2</sup> 1	NL R 0 3 0 0 0 4 1 Rep 2 1	2	Yes NR + R 40 40 40 40 40 40 30 8 Rep 3 1	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra C-% 0 1	Test Stat 1 Y Control Type Dilution Water ate Detail Control Type	0.8 - <b>NR</b> 40 37 40 40 40 40 26 <b>Rep</b> 1 1	NL R 0 3 0 0 0 4 1 Rep 2 1 0.8	2	Yes NR + R 40 40 40 40 40 40 30 8 Rep 3 1 0.9	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival R C-% 0 1 3.3	Test Stat 1 Y Control Type Dilution Water ate Detail Control Type	0.8 - NR 40 37 40 40 40 40 26 Rep 1 1 1 1	NL R 0 3 0 0 0 4 1 0.8 1	2	Yes NR + R 40 40 40 40 40 30 30 <b>Rep 3</b> 1 0.9 1	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra C-% 0 1 3.3 11 3.3	Test Stat 1 Y Control Type Dilution Water ate Detail Control Type	0.8 - NR 40 37 40 40 40 40 26 Rep 7 1 1 1 1 1 1	NL R 0 3 0 0 0 4 1 1 0.8 1 1 1	2	Yes NR + R 40 40 40 40 40 30 8 Rep 3 1 0.9 1 1 1	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival R C-% 0 1 3.3 11 3.3 11 3.3	Test Stat 1 y Control Type Dilution Water ate Detail Control Type Dilution Water	0.8 - NR 40 37 40 40 40 40 26 Rep 7 1 1 1 1 1 1 1	NL R 0 3 0 0 0 4 1 0.8 1 1 1 1	2	Yes NR + R 40 40 40 40 40 30 8 Rep 3 1 0.9 1 1 1 1 1	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival Ra C-% 0 1 3.3 11 3.3 11 3.3 100	Test Stat 1	0.8 - NR 40 37 40 40 40 40 26 Rep 7 1 1 1 1 1 1 1	NL R 0 3 0 0 0 4 1 1 1 1 1 1		Yes NR + R 40 40 40 40 30 30 <b>Rep 3</b> 1 1 0.9 1 1 1 0.7 <b>Rep 3</b>	Passes Ac Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival R C-% 0 1 3.3 11 3.3 11 3.3 11 3.3 11 3.3 11 3.3 11 7d Survival R C-%	Test Stat 1  Y Control Type Dilution Water ate Detail Control Type Dilution Water	0.8 - <b>NR</b> 40 37 40 40 40 26 <b>Rep</b> 7 1 1 1 1 1 0.9	NL R 0 3 0 0 0 4 1 1 1 1 1 1 1 1 1 1 1 1 1	2	Yes NR + R 40 40 40 40 30 30 <b>Rep 3</b> 1 1 0.9 1 1 1 1 0.7 <b>Rep 3</b> 10/10	Passes Ad Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival R C-% 0 1 3.3 11 33 100 7d Survival R C-%	Test Stat 1	0.8 - NR 40 37 40 40 40 40 26 Rep <sup>2</sup> 1 1 1 1 1 0.9 Rep <sup>2</sup>	R         0         3         0         0         0         0         0         0         0         0         4         0         4         0         4         0         3         0         0         4         0         3         0         0         4         1         1         0.8         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	2	Yes NR + R 40 40 40 40 30 30 <b>Rep 3</b> 1 1 0.9 1 1 1 0.7 <b>Rep 3</b>	Passes Ad Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 111 33 100 7d Survival R C-% 0 1 3.3 11 3.3 110 3.3 11 3.3 110 7d Survival R C-% 0	Test Stat 1	0.8 - NR 40 37 40 40 40 40 26 Rep 7 1 1 1 1 0.9 Rep 7 10/10	R         0         3         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	2	Yes NR + R 40 40 40 40 30 30 <b>Rep 3</b> 1 1 0.9 1 1 1 1 0.7 <b>Rep 3</b> 10/10	Passes Ad Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 11 33 100 7d Survival R C-% 0 1 3.3 11 3.3 11 3.3 11 3.3 11 3.3 11 3.3 11 3.3 100 7d Survival R C-% 0 1 3.3 100	Test Stat 1	0.8 - NR 40 37 40 40 40 26 7 1 1 1 1 1 1 1 1 0.9 Rep 7 10/10 10/10	R         0         3         0         0         3         0         0         0         0         0         0         4         I         1         0         8         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	2	Yes NR + R 40 40 40 40 30 30 <b>Rep 3</b> 1 1 0.9 1 1 1 1 0.7 <b>Rep 3</b> 10/10 9/10	Passes Ad Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					
Attribute Control Resp Data Summar C-% 0 1 3.3 111 33 100 7d Survival R C-% 0 1 3.3 111 33 100 7d Survival R C-% 0 1 3.3 100 7d Survival R C-%	Test Stat 1	0.8 - NR 40 37 40 40 40 26 Rep 1 1 1 1 1 1 0.9 Rep 1 10/10 10/10 10/10	R           0           3           0           0           0           0           0           0           0           0           0           0           0           0           0           0           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1           1	2	Yes NR + R 40 40 40 40 30 30 Rep 3 1 1 0.9 1 1 1 1 1 0.7 7 <b>Rep 3</b> 10/10 9/10 10/10	Passes Ad Prop NR 1 0.925 1 1 1 0.8667 Rep 4 1 1 1 1 1 1 1 1 1 1 1 1 1	Prop R 0 0.075 0 0 0	%Effe 0.0% 7.5% 0.0% 0.0% 0.0%					

Analyzed: 26 Nov-18 13:34 Analysis: STP 2x2 Contingency Tables Official Results: Yes		1000 00000									
Analyzed: 26 Nov-18 13:34 Analysis: STP 2x2 Contingency Tables Official Results: Yes	TestAmerica - AS			athead Minnow 7-d Larval Survival and Growth Test							
PUT	ETISv1.8.8 ps		Tables							-	
									ics	Graph	
					•	11 C-%	•	•	0.9 0.8 0.7 0.6 0.5 0.4 0.2 0.1	7d Survival Rate	

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#### 26 Nov-18 13:35 (p 1 of 2) **Report Date: CETIS Analytical Report** B414101ppc | 12-5040-8443 **Test Code: TestAmerica - ASL** Fathead Minnow 7-d Larval Survival and Growth Test CETISv1.8.8 **CETIS Version:** Mean Dry Biomass-mg Analysis ID: 03-7177-7068 Endpoint: Parametric-Multiple Comparison **Official Results:** Yes Analysis: Analyzed: 26 Nov-18 13:33 Michelle Bennett Growth-Survival (7d) Analyst: **Batch ID:** Test Type: 17-0146-7237 **Diluent:** Mod-Hard Synthetic Water Protocol: EPA/821/R-02-013 (2002) Start Date: 06 Nov-18 15:10 Brine: 13 Nov-18 13:10 **Pimephales promelas** Species: Ending Date: 1D Age: Aquatox, AR **Duration:** 6d 22h Source: 05-9824-7280 Code: B4141-01 **Client:** Sample ID: Project: Sample Date: 05 Nov-18 05:30 Material: Unknown Receive Date: 06 Nov-18 10:00 Source: Energy Northwest (WA 0025151) 34h (4.5 °C) Station: Sample Age: LOEL TOEL ΤU PMSD NOEL **Data Transform** Zeta Alt Hyp **Trials** Seed NA 20.9% 100 >100 NA 1 NA C > T NA Untransformed Bonferroni Adj t Test Decision(a:5%) Critical **DF P-Value** P-Type C-% MSD Control VS **Test Stat** Non-Significant Effect CDF 1.0000 **Dilution Water** 1 0.5337 2.567 0.176 6 Non-Significant Effect 6 1.0000 CDF 3.3 -0.8114 2.567 0.176 CDF Non-Significant Effect 2.567 0.176 6 1.0000 -0.318 11 Non-Significant Effect CDF 1.0000 33 0.7237 2.567 0.176 6 Non-Significant Effect CDF 1.0000 100 0.3733 2.567 0.19 5 **Test Acceptability Criteria** Overlap Decision Attribute Test Stat **TAC Limits** Passes Acceptability Criteria Control Resp 0.9052 0.25 - NL Yes Passes Acceptability Criteria PMSD 0.2095 0.12 - 0.3 Yes **ANOVA** Table Decision(a:5%) **P-Value** Sum Squares Mean Square DF F Stat Source Non-Significant Effect 0.006204536 5 0.6631 0.6563 Between 0.03102268 0.009356508 17 Error 0.1590606 22 Total 0.1900833 **Distributional Tests P-Value** Decision(a:1%) **Test Stat** Critical Attribute Test Equal Variances 0.9239 1.403 15.09 Variances Bartlett Equality of Variance Normal Distribution Shapiro-Wilk W Normality 0.9286 0.88 0.1019 Distribution Mean Dry Biomass-mg Summary Std Err CV% %Effect 95% UCL Median Min Max 95% LCL C-% **Control Type** Count Mean 0.0% 9.38% 0.791 0.995 0.04246 0.7701 1.04 #Error D 4 0.9052 0 4.03% #Error 0.774 0.963 0.04614 10.62% 0.7219 1.016 4 0.8687 1 0.04021 8.37% -6.13% #Error 0.88 1.072 1.089 3.3 4 0.9607 0.8328 -2.4% 1.015 0.03746 8.08% 0.848 #Error 11 4 0.927 0.8078 1.046 5.47% 12.14% 0.951 0.05194 1.021 #Error 0.72 33 4 0.8557 0.6905 3.05% 0.08492 16.76% #Error 0.708 0.969 3 0.5123 1.243 100 0.8777 Mean Dry Biomass-mg Detail **Control Type** Rep 3 Rep 4 C-% Rep 1 Rep 2 D 0.928 0.995 0.907 0.791 0 1 0.963 0.774 0.807 0.931 0.95 1.072 0.941 0.88 3.3 0.885 1.015 0.96 0.848 11 0.921 0.72 0.831 0.951 33 0.969 0.956 0.708 100

CETIS Ana	lytical Report			Report Date: Test Code:	26 Nov-18 13:35 (p 2 of 2) B414101ppc   12-5040-8443	
Fathead Minn	low 7-d Larval Survi	val and Growt	h Test		TestAmerica - ASL	
Analysis ID: Analyzed:	03-7177-7068 26 Nov-18 13:33	Endpoint: Analysis:	Mean Dry Biomass-mg Parametric-Multiple Comparison	CETIS Version: Official Results:	CETISv1.8.8 Yes	

Analyst: MD QA:\_\_\_\_\_

CETIS Ana	lytical Repo	ort						ort Date: Code:		lov-18 13:35 (p 1 of 2) 101ppc   12-5040-8443
Fathead Minn	ow 7-d Larval S	urvival and	Growt	h Test						TestAmerica - ASL
Analysis ID: Analyzed:	11-9808-0149 26 Nov-18 13:3		point: lysis:	Mean Dry Biom Linear Interpola		N)		S Version: ial Results		.8.8
Batch ID: Start Date: Ending Date: Duration:	17-0146-7237 06 Nov-18 15:1 13 Nov-18 13:1 6d 22h	0 Prot	: Type: cocol: cies: rce:	Growth-Surviva EPA/821/R-02- Pimephales pro Aquatox, AR	013 (2002	)	Anal Dilue Brine Age:	ent: Moo	nelle Bennet I-Hard Synth	
	05-9824-7280 05 Nov-18 05:3 06 Nov-18 10:0 34h (4.5 °C)		erial: rce:	B4141-01 Unknown Energy Northwe	est (WA 00	)25151)	Clier Proje			
Linear Interpo X Transform Log(X+1)	olation Options Y Transform Linear	<b>See</b> 1690		Resamples	Exp 959 Yes		od Point Interp	olation		
Test Acceptat Attribute Control Resp	-	TAC Limit 0.25 - NL	5	<b>Overlap</b> Yes	Decision Passes /	n Acceptability	Criteria			
Point Estimat Level % IC25 >100	95% LCL	95% UCL	<b>TU</b> <1	95% LCL NA	95% UC NA	L				
Mean Dry Bio	mass-mg Summ	nary			C	alculated Va	riate			
	Control Type	Count 4 4 4 4 4 3	Mean 0.905 0.868 0.960 0.927 0.855 0.877	2 0.791 7 0.774 7 0.88 0.848 7 0.72	Max 0.995 0.963 1.072 1.015 0.951 0.969	Std Err           0.04246           0.04614           0.04021           0.03746           0.05194           0.08492	Std Dev           0.08491           0.09228           0.08042           0.07492           0.1039           0.1471	CV% 9.38% 10.62% 8.37% 8.08% 12.14% 16.76%	%Effect 0.0% 4.03% -6.13% -2.4% 5.47% 3.05%	
-	mass-mg Detail Control Type	Rep 1	Rep 2	Rep 3	Rep 4					
	Dilution Water	0.928 0.963 0.95 0.885 0.951 0.969	0.995 0.774 1.072 1.015 0.831 0.956	0.907 0.807 0.941 0.96 0.921	0.791 0.931 0.88 0.848 0.72					

CETIS Ana	lytical Report		Report Date: Test Code:	26 Nov-18 13:35 (p 2 of 2) B414101ppc   12-5040-8443	
Fathead Minn	low 7-d Larval Surviv	val and Growt	h Test		TestAmerica - ASL
Analysis ID: Analyzed:	11- <del>9</del> 808-0149 26 Nov-18 13:33	Endpoint: Analysis:	CETIS Version: Official Results:	CETISv1.8.8 Yes	
0.0 Weren 0.4 0.4 0.4 0.4					
0	20 40 C-%	50 6	60 100		

# **APPENDIX B**

# **REFERENCE TOXICANT DATA SHEETS**

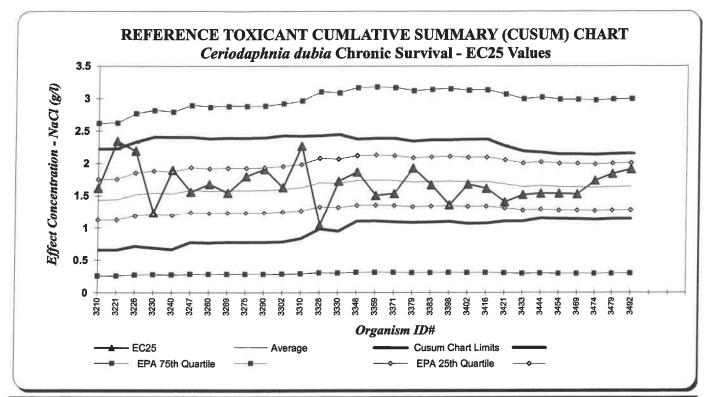
### *Ceriodaphnia dubia* Survival and Reproduction Test Data Summary

Client	16		QA/	QC			Test Sta	rt Date		10-30	-18	
Sample Descript	ion		NaC	C1			Initial S	ample ID#	2	B 0 68	206	
Data summarized	d by _		TS-									
Percent or			Total Liv	e Young	Produced	in First 3	Broods pe	er Replicate	9		# Alive	Total Live
Concentration	A	B	C	D	E	F	G	H	I	J	Adults	Young
Control	19	22	23	15	27	24	23	19	24	15	10	211
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.25 g/L	14	2523	24	20	18	28	22	23	23	u	10	206
0	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.50 g/L	15	17	27	21	23	22	20	19	20	61	10	194
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		(
1.0 g/L	19	В	13	17	22	٩	16	16	17	15	10	152
_	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.5 g/L	13	7	8	12	6	10	14	12	٩	0	10	91
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
2.0 g/L	0	0	0	0	2	0	2	0	б	0	7	4
	AD?	AD?	AD?	AD?	AD?	AD? 🗸	AD?	AD? V	AD?	AD?		
4.0 g/L	0	0	0	0	0	0	0	J	0	0	0	0
	AD?	AD?	AD?	AD?	AD?	AD?	AD? 🗸	AD?	AD?	AD?		
est Organism M	ortality (A	dult dead	) = AD?	×		# of Aliv	e Adults =	Number o	of test org	anism alive	e at termina	tion
est Organism ide	entified as	Male =	AD?	Μ		Total Liv	e Young =	= Total neo	nates pro	duced in fi	irst 3 broods	\$
est Organism Inj	jured duri	ng test =	AD?	Ι					F.4.			
ootnote: As per											0% of the	

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

<u>Endpoint</u>	Valec ger 206 11-2-12 <u>IC25</u> <u>Cusum Chart</u>	ع Limits
Survival Eca	1.91 1.13 to	2.15
Reproduction	0.74 0.22 to	1.25
1025	0.92 Br	
	11/4/18	

Task Manager Project Manager QA Officer



#### Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

#### SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

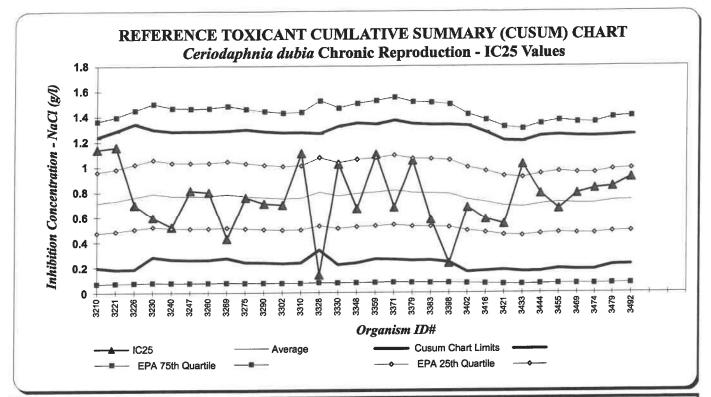
From EPA 833-R-00-003:

- 10th Quartile CV (control limit) = 0.07
- 25th Quartile CV (warning limit) = 0.11
- 75th Quartile CV (warning *limit*) = 0.41
- 90th Quartile CV (control limit) = 0.81

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),

Event	Cerio	Test Start	EC25	Running	Running		hart Limits	Intralab
#	<b>D</b> #	Date	De Barris Harri	Average	SD	AVG-2SD	AVG+2SD	CV
323	3398	02/06/18	1.36	1.73	0.32	1.10	2.36	0.19
324	3402	02/27/18	1.68	1.72	0.33	1.06	2.37	0.19
325	3416	04/10/18	1.62	1.72	0.33	1.07	2.37	0.17
326	3421	05/01/18	1.41	1.68	0.29	1.10	2.27	0.17
327	3433	06/05/18	1.52	1.64	0.27	1.10	2.19	0.15
328	3444	07/10/18	1.54	1.66	0.26	1.15	2.17	0.15
329	3454	08/07/18	1.54	1.64	0.25	1.14	2.14	0.15
330	3469	09/07/18	1.53	1.64	0.25	1.14	2.14	0.15
331	3474	09/20/18	1.74	1.63	0.25	1.13	2.14	0.15
332	3479	10/04/18	1.84	1.64	0.25	1.14	2.15	0.15
333	3492	10/30/18	1.91	1.64	0.25	1.13	2.15	0.15
334								
335								

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.



## Ceriodaphnia dubia - Chronic (EPA Test Method 1002.0)

#### SODIUM CHLORIDE (g/L)

**Endpoint: Chronic Reproduction** 

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

- From EPA 833-R-00-003:
- 10th Quartile CV (control limit) = 0.08
- 25th Quartile CV (warning limit) = 0.17
- 75th Quartile CV (warning *limit*) = 0.45
- 90th Quartile CV (control limit) = 0.62

## Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),

If lab CV is outside EPA Control limits, the EP	A Control limits are used to set Cusum chart limits.
-------------------------------------------------	------------------------------------------------------

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
323	3398	2/6/2018	0.23	0.79	0.27	0,24	1.33	0.39
324	3402	2/27/2018	0.68	0.75	0.29	0.16	1.33	0.38
325	3416	4/10/2018	0.58	0.72	0.28	0.17	1.27	0.37
326	3421	5/1/2018	0.54	0.69	0.26	0.18	1.21	0.38
327	3433	6/5/2018	1.02	0.69	0.26	0.17	1.21	0.38
328	3444	7/10/2018	0.79	0.71	0.27	0.17	1.25	0.37
329	3455	8/7/2018	0.67	0.72	0.27	0.19	1.25	0.37
330	3469	9/7/2018	0.79	0.71	0.27	0.18	1.24	0.37
331	3474	9/20/2018	0.83	0.71	0.27	0.18	1.24	0.35
332	3479	10/4/2018	0.84	0.73	0.26	0.22	1.25	0.35
333	3492	10/30/2018	0.92	0.74	0.26	0.22	1.25	0.35
334								
335								

			l: 6 conc. x 4 re	A COLORED TO A COL		Vaterbath/incubat	tor Used:		utéd    / (c		ime 15 :3
		2807		- 02		# 7			ited 1/1		ime 12 : L
	aism ID	: <u>FHM</u> 2	017				Test Container Si	ize: 800 ml		Solution Volume /	rep: 500 m
ent			QA /	QC - Ref	Tox			Sample Descript	ion	KCl (50 g/L sto	ock)
ch:	Day 0	MB Day	1_S/BAD	y 20th R	Day 3 NBD	Day 4 MB	Day 5 Ban	Day 6 BAM	Day 7 BAN	10	
ne	Day 0	<u> 53</u> ]Day	1 1500 Da	142 TUDO D	Day 3 1105	Day 4 0900	Day 5 140	Day 6 1820	Day 7 124	5	
onc. or	Day			Live Organisms		Dis	solved Q	1	pH		a Conductiv
rcent	1 1	A	B	T C	D	Pre	(mg/l) Post	Pre	Post	(°C)	[ (μS)
	0	10	10	10	10	No. Selector	7.1	116	8,3	Pre	
	1	10	10	10	10	6.2	6.9	7.6	8.3	24.0 25	
IO IO	2	d	10	10	10	5.8	7.5	7.5	8.2	24.6 2	0 309
Control	4	a	10	10	10	7.	7.4	7.9	8.2	24 5 25	
1	5	q	10	10	10	6.3	14	7.4	7.8	14.5 25	
	6	q	10	10	io	6.1	7.5	11.7	7.9	24.3 25	
_	7	10	10	10	6)	6.2	Ang fail	7.7		24.4 25	0
	1	10	10	10	10	6.3	7.3	7.6	8.3	Post 24.5	745
1	2	10	10	10	10	6.1	7.5	7.7	8.3	24.4	780
1 20 20	3	9	10	10	10	7.2	76	7.9	8.2	24.3	118
	4	9	10	10	10	6.5	7.9	7.0	7.6	×	688
	6	q	10	10	10	6.3	7.5	7.6	7.9	24.6	710
	7	1	9	10	(0	6.5	(1)	7.6	8.1	24.3	732
-18	0	10	10	10	10		7.3		8.4	Par 29.6	1204
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"F" = fungus noted on dead organisms. Endpoint

Pre =Pre-renewal solutions. Post =Post-renewal solutions.

Survival -  $EC_{25}$ 0.5%Growth -  $IC_{25}$ 0.5%

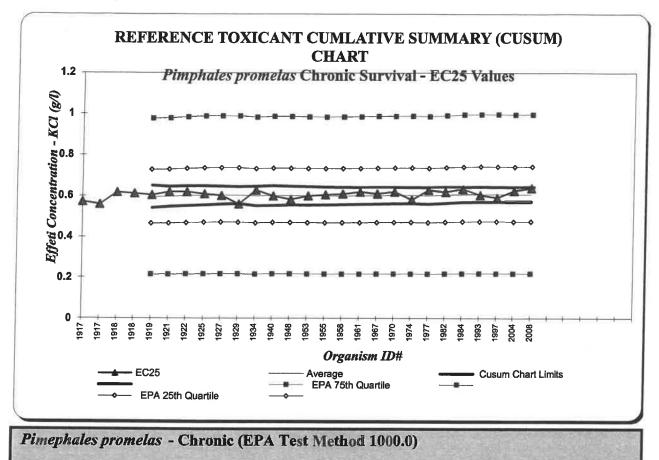
 Cusum Chart Limits

 0.57
 to
 0.65

 0.44
 to
 0.72

The minimum $=$ The moments that day.
23.8 = Temp. out of recommended range
Task Manager
Project Manager
QA Officer Kathy Mckenlas

REFTOX - FHM chronic (KCI) ASL1282-1118.xism Doc Control ID: ASL1282-1118



POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = 0.03

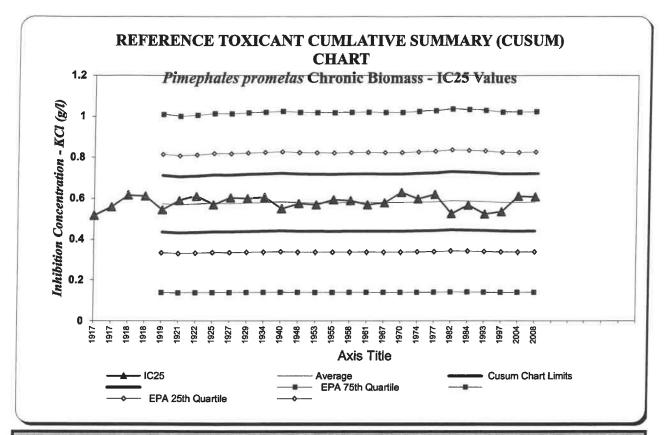
25th Quartile CV (warning limit) = 0.11

75th Quartile CV (warning limit) = 0.32

90th Quartile CV (control limit) = 0.52

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM D#	Test Start Date	EC25	Running Average	Running SD	Cusum Cl AVG-2SD	hart Limits AVG+2SD	Intralab CV
19	1967	02/06/18	0.61	0.6	0.02	0.56	0.64	0.03
20	1970	02/27/18	0.62	0.6	0.02	0.56	0.64	0.03
21	1974	03/20/18	0.58	0.6	0.02	0.56	0.64	0.03
22	1977	04/03/18	0.63	0.6	0.02	0.56	0.64	0.03
23	1982	05/02/18	0.62	0.6	0.02	0.57	0.64	0.03
24	1984	06/19/18	0.63	0.6	0.02	0.57	0.64	0.03
25	1993	07/10/18	0.61	0.6	0.02	0.57	0.64	0.03
26	1997	08/01/18	0.59	0.6	0.02	0.57	0.64	0.03
27	2004	9/6/2018	0.63	0.6	0.02	0.57	0.64	0.03
28	2008	10/2/2018	0.638	0.6	0.02	0.571	0.644	0.03
29	2009	10/4/2018	0.63	0.6	0.02	0.57	0.65	0.03
30	2017	11/6/2018	0.59	0.6	0.02	0.57	0.65	0.03
31								
32								
33								



Pimephales promelas - Chronic (EPA Test Method 1000.0)

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA \$33-R-00-003:

10th Quartile CV (control limit) = 0.12

25th Quartile CV (warning limit) = 0.21

75th Quartile CV (warning limit) = 0.38

90th Quartile CV (control limit) = 0.45

Intralab CV is compared to EPA Warning limits (25th and 75th CV's) and Control limits (10th and 90th CV's),

Event	FHM	Test Start	IC25	Running	Running	Cusum Cl	hart Limits	Intralab
#	<b>ID</b> #.	Date	1023	Average	SD	AVG-2SD	AVG+2SD	CV
18	1961	01/17/18	0.57	0.58	0.03	0.44	0.72	0.05
19	1967	02/06/18	0.58	0.58	0.03	0.44	0.72	0.05
20	1970	02/27/18	0.63	0.58	0.03	0.44	0.72	0.05
21	1974	03/20/18	0.60	0.58	0.03	0.44	0.72	0.05
22	1977	04/03/18	0.62	0.58	0.03	0.44	0.72	0.04
23	1982	05/02/18	0.53	0.59	0.02	0.45	0.73	0.05
24	1984	06/19/18	0.57	0.59	0.03	0.45	0.73	0.05
25	1993	07/10/18	0.53	0.59	0.03	0.44	0.73	0.05
26	1997	08/01/18	0.54	0.58	0.03	0.44	0.72	0.05
27	2004	9/6/2018	0.61	0.58	0.03	0.44	0.72	0.05
28	2008	10/2/2018	0.61	0.58	0.03	0.44	0.72	0.05
29	2009	10/4/2018	0.62	0.58	0.03	0.44	0.72	0.05
30	2017	11/6/2018	0.58	0.58	0.03	0.44	0.72	0.05
31								

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

## APPENDIX C

## **CHAIN OF CUSTODY**

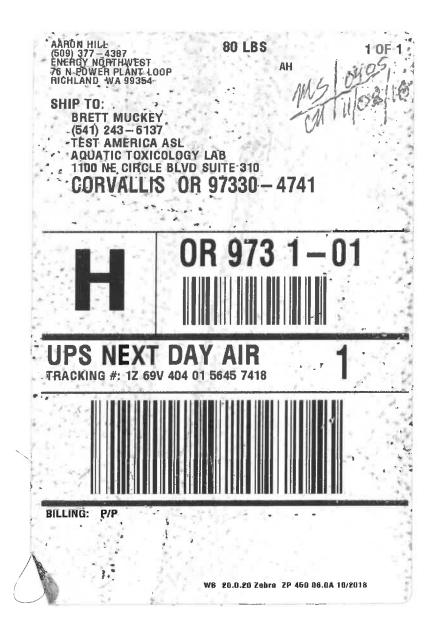
/ere custody seals intact?       Ice       Blue Ice       Bo         acking Material:       Ice       Blue Ice       Bo         emp OK? (<6°C) Therm ID: 173       Expires: 1/16, /20 K² Observed: 1,9 °C, Actual Temp: 4.5 °C       Yes       No       N/         Vas a Chain of Custody (CoC) Provided?       Yes       No       N/         Vas the CoC correctly filled out?       (If No, document below)       Yes       No       N/         Vere the sample containers in good condition (not broken or leaking)?       Yes       No       N/         wre all samples within 36 hours of collection?       Yes       No       N/	TestAmerica The leader in environmental testing	Sample Receipt Rec	or
Client/Project: <u>Fund</u> ere custody seals intact? acking Material: ere custody seals intact? acking Material: ere custody seals intact? acking Material: ere custody (cs°C) Them ID: 173 Expires: 1/1/ <sub>6</sub> / 2016 Observed: ],9 °C, Actual Temp: 4/.5 °C (R, Yes   No   N/ Are a Chain of Custody (CoC) Provided? Fas the CoC correctly filled out? (If No, document below) ere all samples within 36 hours of collection? ere all samples within 36 hours of collection? FY LBS HIP FCT: Bethod of Shipment: Hand Delivered, FedEx, (UPS, Greyhound, Other: NA Method of Shipment: Hand Delivered, FedEx, (UPS, Greyhound, Other: NA SHIP FCT: FEST ANERICA ASL AUXING Status CORVALLIS OR 97331-01 EVENT AS 1.001 EVENT AS 1.001 EVENT AS 1.001 EVENT AS 1.001 EVENT AS 1.001 EVENT AND EVENT ASL AUXING STATUS EVENT AVENT AVENT AND AVENT ASL AUXING STATUS EVENT AND AVENT ASL AUXING STATUS EVENT AND AVENT ASL AUXING STATUS EVENT AVENT AVENT AND AVENT ASL AUXING STATUS EVENT AVENT AVENT AND AVENT ASL AUXING STATUS EVENT AVENT AVENT AVENT AND AVENT ASL AUXING STATUS EVENT AVENT AVENT AVENT AND AVENT ASL AUXING STATUS EVENT AVENT	atah Numbar B 4141-01	Date Received: 11-6-18	
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Provided (Correctly filled out? (If No, document below) Provided?	-		N/A
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Contact Person: <u>Jane Le?</u> Phone: ちる <u>す・373-46(al</u>	Letas	Eni	Initiated: [ Ended: [	Date U	Date 10518	Time	0230	0		Che	ck Ch	lorin	Check Chlorine (Y/N)				
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TestAmerica THE LEADER IN ENVIRONMENTAL TESTING	Sample Receipt Record
Batch Number: <u>BUIUI - OZ</u> Client/Project: ENW	Date Received: 11-5-18 Received By:
Were custody seals intact?	Yes No N/A
Packing Material:	Ice Blue Ice Box
Temp OK? (<6°C) Therm ID: 17 3 Expires: ( 116 / 2017 (	Dbserved: 1 9 °C, Actual Temp: 1 9 °C
Was a Chain of Custody (CoC) Provided?	Yes No N/A
Was the CoC correctly filled out? (If No, document below)	Yes No N/A
Were the sample containers in good condition (not broken or	leaking)?
Are all samples within 36 hours of collection?	Yes No N/A
Method of Shipment: Hand Delivered, É FedEx,	UPS, Greyhound, Other: N/A

### Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:	
Resolution to Exception:		



THE LEADER IN ENVIRONMENTAL TESTING

**TestAmerica** 

Sample Receipt Record

Baton Itanibon	84141-03 NW	_ Date Received	d: 11-10-18 y:	
Were custody seals int	act?		Yes No	□ N/A
Packing Material:			⊠ Ice Blue Ice	Box
	rm ID: / 7 3 Expires: 1 / 6 / 20/*	7 Observed: /	emp: / ¿ °C 🖄 Yes 🗌 No	
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	ainers in good condition (not broken o		Yes No	□ N/A
Are all samples within 3			K Yes 🗌 No	N/A
Method of Shipment:	Hand Delivered, FedEx,	🕅 UPS, 🗌 Greyhound	d, 🗌 Other:	□ N/A
	Sample Exception Re	port (The following exceptions v	vere noted)	

Client was notified on:

Client contact:

Resolution to Exception:

TestAmerica ASL Attention: Aquatic Toxicology Laboratory 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Phone: 541.243.6137 ) (°C)	Concentration Arronic MYS Acute MYS Chronic MYS Chronic MYS Chronic Algae Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration Concentration	Tame) Date/Time つと、 Date/Time Tame) Date/Time Tame) Date/Time Tame) Date/Time COC_Bloassay.xls Store, 2, 2 h(L. C. Doc Control ID: ASLAT20717
A ひゃえちいちょう       Ship S         A ひゃえちいちょう       Ship S         A ひゃえちいちょう       Ship S         nple Information       PO#         Volume/Sample       20 L         Total Volume       20 L         a       1104 L         a       1104 L         a       1104 L         a       1104 L         Collection       1106 C         Collection       Time         Collection       Temp	# of Containers       # of Containers       Containers       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B       B <td>Date/Time       Relinquished By       (Please sign and print name)         <math>110^{c}11^{\circ}8^{\circ}0^{\circ}2_{\circ}5^{\circ}</math>       Date/Time       L       C         <math>110^{c}11^{\circ}8^{\circ}0^{\circ}5_{\circ}5^{\circ}</math>       Date/Time       L       C       C         <math>110^{c}11^{\circ}8^{\circ}0^{\circ}5_{\circ}5^{\circ}</math>       Relinquished By       (Please sign and print name)       L       C         <math>1(-lo-l)^{\circ}f^{\circ}(loo)^{\circ}</math>       Relinquished By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         Date/Time       Relinquished By       (Please sign and print name)       Date/Time       Remarks       Date/Time       Relinquished Via         Date/Time       Shipped Via       Remarks       Eed-Ex       Hand       Oth         Cov       No       N       N       N       N</td>	Date/Time       Relinquished By       (Please sign and print name) $110^{c}11^{\circ}8^{\circ}0^{\circ}2_{\circ}5^{\circ}$ Date/Time       L       C $110^{c}11^{\circ}8^{\circ}0^{\circ}5_{\circ}5^{\circ}$ Date/Time       L       C       C $110^{c}11^{\circ}8^{\circ}0^{\circ}5_{\circ}5^{\circ}$ Relinquished By       (Please sign and print name)       L       C $1(-lo-l)^{\circ}f^{\circ}(loo)^{\circ}$ Relinquished By       (Please sign and print name)       Date/Time       Relinquished By       (Please sign and print name)         Date/Time       Relinquished By       (Please sign and print name)       Date/Time       Remarks       Date/Time       Relinquished Via         Date/Time       Shipped Via       Remarks       Eed-Ex       Hand       Oth         Cov       No       N       N       N       N
IestAmerica       CHAIN OF CUSTODY RECORD FOR National and the set of	Sample ID Date Time Comp. Grab	Sampled By & Title     (Please sign and print name)       Received By     L t ? A       Received By     C (Please sign and print name)       Received By     (Please sign and print name)       Received By     (Please sign and print name)       Received By     (Please sign and print name)       Nork Authorized By     (Please sign and print name)



## ENCLOSURE C

# EPA FORM 2-C SUPPLEMENTAL COOLING WATER INTAKE STRUCTURE



CWA §316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. EPA has promulgated rules for new facilities at 40 CFR 125 Subpart I and for existing facilities at 40 CFR 125 Subpart J. This form requests information from applicants using EPA Form 2-C to determine applicability of CWA 316(b) requirements and inform applicants of additional application requirements that may apply to the facility.

Facility Name: Energy Northwest Columbia Generating Station NPDES Permit Number: WA002515-1

## SECTION A. APPLICABILITY

- Yes No Is there a cooling water intake associated with this facility? Cooling water intake means a structure withdrawing cooling water, for contact or noncontact cooling, from a surface water source. Withdrawal from groundwater or a public water system is not applicable. If No, STOP.
- 1. What is the design intake flow (in gallons per day)?
- 2. What percentage of the flow is used exclusively for cooling?
- 3. What is the maximum intake velocity?

36,000,000 gal/day

#### ~90 to 99%

The intake screens on Cooling Water Intake Structure (CWIS) were designed for low throughscreen velocities to minimize impingement and entrainment. At the external screen surface under maximum operating conditions, the velocity through the external screen openings is ~0.5 ft/s. At a distance of less than 1/3" from the outer screen surface, the inlet velocity drops to 0.2 ft/s. During reduced flow, the perforated pipe intake velocity is proportionately reduced. For average intake conditions, the nominal bulk velocity approaching the screens (screen-nominal direction) is 0.07 ft/s and the average normal through-pore velocity is 0.16 ft/s.

<u>Closed-cycle Recirculating</u> <u>System. The system typically</u> <u>operates between 5 and 12 cycles.</u> <u>The blowdown rate is 1.91 MGD</u> (2016-18 average).

Columbia River

46.471419 / -119.262954

- 4. Describe the cooling water system (e.g., once-through, closed-cycle).
- 5. Name the surface water body from which cooling water is withdrawn.
- 6. Provide latitude/longitude of the cooling water intake(s) (NAD83/WGS84). To ensure accurate locations provide at least 5 significant digits.

7.	Describe the configuration of the intake(s) (e.g., dimensions, screen type). If as-built plans and specifications are available, please provide.	Dual intake screened cylinders. Each cylinder is 30 feet long and is composed of two intake screens each 6.5 ft long. The screens consist of an outer and inner sleeve of perforated pipe. The outer sleeve is 42" diameter with 3/8" holes and the inner sleeve is 36" diameter with <sup>3</sup> /4" holes. (see attachment for additional information).
8.	When was the intake(s) installed, including any major modifications?	Prior to December 1984 when the plant became operational
9.	When was the intake(s) last inspected? If regular inspections are scheduled, provide frequency.	September 17, 2018. Inspections are conducted every 3 years.
10.	Have there been any studies to determine the impact of the intake(s) on aquatic organisms (e.g., impingement/entrainment studies). Impingement Study (GO2-18-104) submitted to NMFS, Ecology and EFSEC on 9/26/18.	Xes □ No If yes, please provide

## SECTION B. APPLICATION REQUIREMENTS

CWA §316(b) requirements apply to all industrial NPDES permitted facilities with cooling water intake structures. EPA has promulgated best technology available (BTA) effluent guidelines for facilities meeting certain thresholds:

- Design intake flow greater than two million gallons per day.
- Greater than 25 percent of the water withdrawn is used for cooling purposes.

#### Submittal requirements for facilities subject to BTA effluent guidelines:

- New facilities must submit information specified in 40 CFR 122.21(r) and 40 CFR 125.86.
- Existing facilities must submit information specified in 40 CFR 122.21(r) and 40 CFR 125.95.

Facilities subject to BTA guidelines are encouraged to contact Ecology early in the application process. Ecology may consider this application administratively incomplete until the required information is received.

See attachment

#### Submittal requirements for existing facilities and new facilities below BTA thresholds:

• Ecology will evaluate the information submitted with this form and may request additional information to assess the need for requirements under 40 CFR 125.90(b) or 40 CRF 125.80(c).

## **SECTION C. INSTRUCTIONS**

All applicants required to submit EPA Form 2C, available here: <u>www.ecy.wa.gov/programs/wq/permits/forms.html</u> must also submit this supplemental form to determine the applicability of CWA §316(b) and any additional application requirements. Enter all applicable information and submit this form as an attachment to Form 2C.

#### APPLICABILITY

CWA §316(b) requirements apply only to point sources (facilities that have or are required to have an NPDES permit) withdrawing cooling water from waters of the U.S. (surface waters). Withdrawal from groundwater, a public water system, or the use of treated effluent that would otherwise be discharged to waters of the state does not constitute use of a cooling water intake structure. Select Yes or No to the first question. If you answer No, you do not need to complete the remainder of the form.

1. Design intake flow (DIF) means the value assigned during the facility's design representing the maximum instantaneous rate of flow of water the cooling water intake system is capable of withdrawing from a source waterbody. Existing facilities may adjust this value to reflect any permanent changes to the maximum capabilities of the intake system including but not limited to permanent removal of pumps, flow limit devices, and physical

limitations of piping. DIF doesn't include emergency capacity or redundant pumps. Report this value in gallons per day (gpd).

- 2. Report the percentage of water withdrawn that is used exclusively for cooling purposes, measured on an average monthly (new facilities) or average annual over the past three years (existing facilities) basis. Cooling water that is used in a manufacturing process either before or after it is used for cooling is not considered cooling water for the purposes of calculating this percentage.
- 3. Provide the maximum actual or design intake velocity as water passes through the structural components of the intake screen, measured perpendicular to the screen mesh. Report this value in feet per second (fps). Indicate which value is reported, design or actual.
- 4. Describe the cooling water system, including if the water is used once (once-through) or recirculated (closedcycle). If recirculated, provide the minimum number of cycles the water is recirculated and average blowdown flow in gpd.
- 5. Provide the name of the surface water body your intake structure withdraws water from (e.g., ABC river)
- 6. Provide an accurate location for each intake structure associated with the facility.
- 7. Describe the cooling water system including a description of the intake screen dimensions, perforation sizes (if known), and screen type (e.g., traveling screens, wedgewire, barrier nets, trash racks). Provide any design drawings and specifications available.
- 8. Give the date the intake was first installed and the date(s) of any major modifications to the structure(s).
- 9. Provide the date of last intake inspection and the frequency of any regularly scheduled inspections.
- 10. Please provide any available studies of the impact to aquatic life from your cooling water intake structure. These may include studies of entrainment and impingement of fish and shellfish.

#### **APPLICATION REQUIREMENTS**

Facilities with design intake flows greater than two million gallons per day, of which greater than 25 percent of the water withdrawn is used exclusively for cooling purposes, must comply with applicable application requirements in federal rule. Please refer directly to the applicable rules, cited in Section B. to determine requirements specific to your facility. Existing facilities should also contact their permit manager for technical assistance. New facility applicants should contact their regional office permit coordinator (www.ecy.wa.gov/programs/wq/permits/permit\_coord.html) for assistance.

All applicants are encouraged to provide thorough answers to the questions on this form, along with any additional information that may be useful in determining applicability and application requirements. Ecology may request additional information from facilities with cooling water intake structures operating below the design intake and percentage flow thresholds. Ecology will use the information provided to make a case-by-case determination of the need for additional requirements per 40 CFR 125.80(c) and 40 CFR 125.90(b).

For special accommodations or documents in alternate format, call the Water Quality Program at 360-407-6600. Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 877-833-6341.



## **Columbia Generation Station § 316(B)**

Addendum to EPA Form 2-C Supplemental Cooling Water Intake Structure in adherence with §122.21(R)(2), (3), (4), (5), (6), (7) and (8)

> Energy Northwest Environmental and Regulatory Programs April 2019

## 1. Introduction

This document contains summary information to support §122.21(r) permit application requirements for Columbia Generating Station (CGS) located in Richland, WA. The §122.21(r) studies are submitted in compliance with U.S. Environmental Protection Agency (EPA) final §316(b) regulations (Rule) for existing facilities. The Rule became effective on October 14, 2014. The Rule applies to owners and operators of existing facilities that meet all following criteria:

• The facility is a point source that uses cooling water from one or more cooling water intake structures that withdraws water from waters of the United States and provides cooling water to the facility by any sort of contract or other arrangement;

• The facility-wide design intake flow (DIF) for all cooling water intake structures at the facility is greater than 2 Million Gallons per Day (MGD);

• The cooling water intake structure withdraws cooling water from waters of the United States; and

• At least 25 percent of the water actually withdrawn – actual intake flow (AIF) – is used exclusively for cooling purposes.

CGS meets all of these requirements. The Rule requires all facilities using greater than 2 MGD to install best technology available ("BTA") to reduce entrainment and impingement mortality. Existing facilities, such as CGS, with a DIF greater than 2 MGD but actual intake flow (AIF) less than 125 MGD are required to meet the impingement mortality standards of § 125.94(c) and site-specific entrainment requirements under the entrainment standards of § 125.94(d). Facilities with an AIF less than 125 MGD are required to submit the §122.21(r)(2) and (3) information and applicable provisions of the (r)(4) through (8) that includes:

- (r)(2) Source Water Physical Data
- (r)(3) Cooling Water Intake Structure Data
- (r)(4) Source Water Baseline Biological Characterization Data
- (r)(5) Cooling Water System Data
- (r)(6) Chosen Method of Compliance with the Impingement Mortality Standard
- (r)(7)—Entrainment Performance Studies
- (r)(8) Operational Status

Information presented on the following pages includes summarized data from numerous recently prepared and historic documents that detail CGS design, operation, licensing and studies related to fish impingement and entrainment performance and risk. This summary report has been prepared to meet the requirements of §122.21(r) and section B of EPA Form 2-C Supplemental for Cooling Water Intake Structure. This form is to accompany the CGS National Pollutant Discharge Elimination System (NPDES) Permit renewal application.

## 2. 40 CFR 122.21(r)(2) Source water physical data

40 CFR 122.21(r)(2) requires Energy Northwest to provide the following source waterbody physical data for CGS:

- (i) A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the water body type where each cooling water intake structure is located;
- (ii) Identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods you used to conduct any physical studies to determine your intake's area of influence within the waterbody and the results of such studies; and
- (iii) Locational maps.

The following source water physical data are provided to characterize the source waterbody in the vicinity of CGS. The following sections describe the Columbia River's dimensions, key physical and water characteristics, and provides figures and maps required under 40 CFR 122.21(r)(2).

#### 2.1 Narrative description of source water

The Columbia River is the source of non-contact cooling water for CGS, which is owned and operated by Energy Northwest. The river travels more than 1,200 miles from its origin in the Canadian Rocky Mountains and occupies a watershed area of 262,000 square miles. There are three geographic regions of the river, including the headwaters, the semi-arid basin, and the coastal rain forest. The Columbia River terminates in the Pacific Ocean near Astoria, Washington. CGS draws water from the Hanford Reach, which is located in the semi-arid basin. The Columbia River is the largest river in North America that discharges into the Pacific Ocean and is primarily fed by snowmelt runoff in the Canadian Rockies, as well as downstream tributaries, such as the Snake and Yakima rivers (Energy Northwest 2010). The entire run of the Columbia River is shown in Figure 2-1.

The Hanford Reach describes the 51-mile stretch of the Columbia River that is unobstructed and flows freely. The reach begins at the tailrace of the Priest Rapids Dam and ends at the McNary Dam pool. The river elevation in this stretch drops approximately 70 feet (Energy Northwest 2010). The river tends to meander within the reach and braided islands are common – for example, Homestead Island splits the river into two channels, east and west, and occurs directly to the east of the Tower Makeup Pumphouse (TMU) used by CGS to withdraw water. The banks of the northern reach are protected either by National Monument status or as a function of being on the Hanford Nuclear Reservation.

Water from the Columbia River is used in irrigation, domestic purposes, hydropower generation, fisheries, transportation, recreation, and industry. It also provides habitat for pacific salmonid migration (Energy Northwest 2010).





#### 2.2 Aerial dimensions

CGS is located downstream from the Priest Rapids Dam and approximately 10 miles north of Richland, Washington (Figures 2-2 to 2-4). The river exhibits some braided features in the area and runs north-south. The river width varies from 1,000 to 3,300 feet in the Hanford reach and discharges to the south (Energy Northwest 2010).



Figure 2-2: Location of CGS in Washington State (Alden 2018)

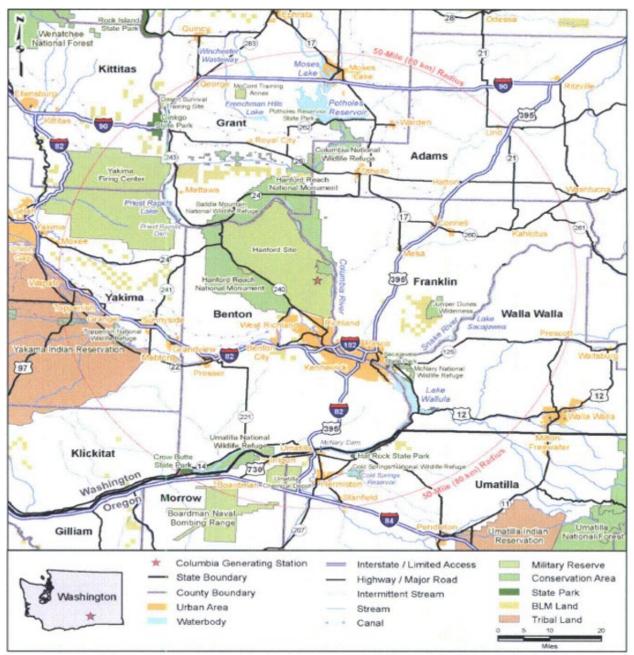


Figure 2-3: Location of CGS relative to a 50-mile radius (Energy Northwest 2010)



Figure 2-4: Aerial View of CGS and the Columbia River (Google Maps 2019)

### 2.3 Water depths

Flow in the Hanford Reach of the Columbia River varies seasonally, but is usually highest during April through July run-off events and lowest in September and October. Figures 2-5 and 2-6 are maps produced by Pacific Northwest National Laboratory (PNNL) which display the depth of the Columbia River nearest to the pumphouse over varying states of discharge (Anchor 2019). The mean discharge through Priest Rapids Dam from 1984 to 2008 was 114,410 cubic feet per second (ft<sup>3</sup>/s) (Energy Northwest 2010). Based on the maps and discharge data, depth can be estimated with a range of approximately 16 to 20 feet, with late fall and winter likely dropping below 16 feet. Water elevations near the pumphouse range from an extreme high of approximately 373 feet above mean sea level to an extreme low of 342 feet above mean sea level (Anchor 2019).

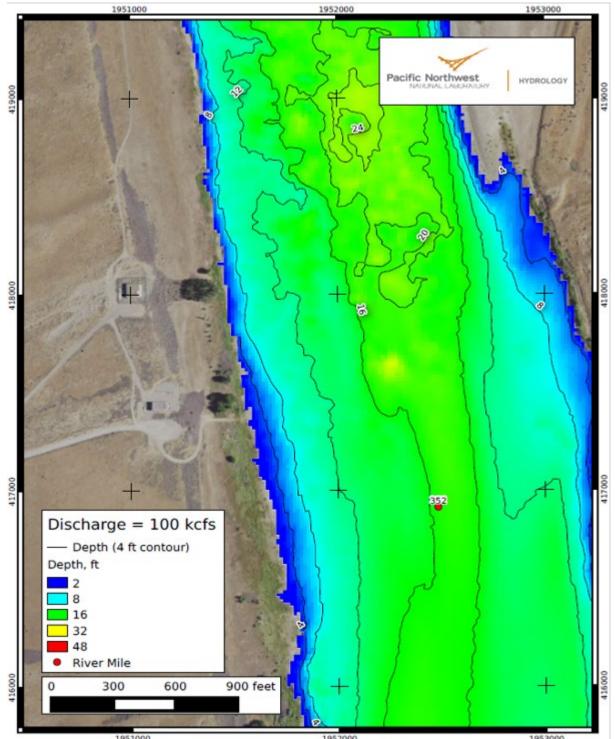
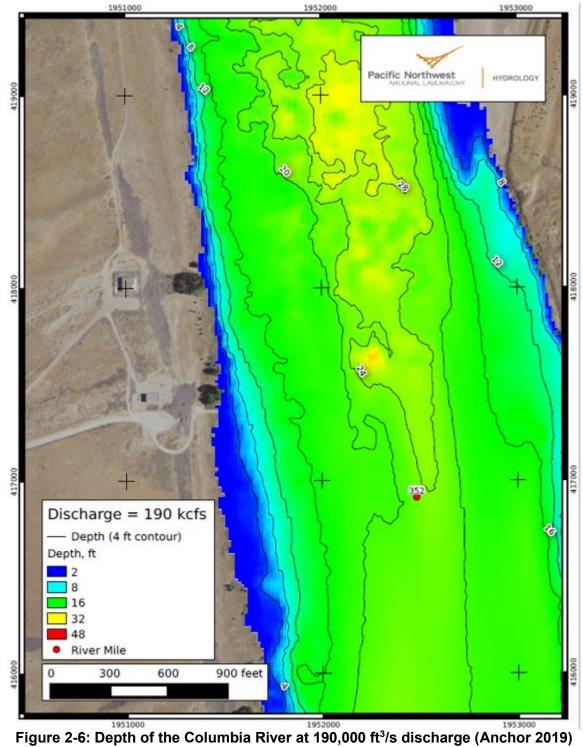


Figure 2-5: Depth of the Columbia River at 100,000 ft<sup>3</sup>/s discharge (Anchor 2019)



#### **Temperature Regime** 2.4

Grant Public Utility District tracks dissolved gas super-saturation measurements for the Priest Rapids Dam Tailrace. Monthly average temperature data was collected from 2014 through 2018 and the mean water temperature was calculated monthly for 5 years.

Month	Mean (deg. C)		
January	4.2		
February	3.2		
March	4.7		
April	7.5		
May	11.5		
June	15.2		
July	18.4		
August	20.0		
September	18.8		
October	16.1		
November	12.1		
December	7.8		

#### Table 2-1: Monthly average water temperature in the Columbia River (2014-2018)

As expected, the Columbia River temperatures follow ambient temperatures through the year and is at its warmest in summer and beginning to decline in fall before reaching its lowest in winter.

#### 2.5 Hydrological & Geomorphological Features

The Hanford Reach of the Columbia River in the vicinity of CGS is typical of the Columbia Basin; the width-to-depth morphology is high, the gradient is low, and the bed of the river is primarily sand. The large islands that are braided through the main channel are frequently inundated and modify river flow and velocity (Alden 2018). Flow is controlled by the amount of water discharged by Priest Rapids Dam, and meanders roughly north-to-south in the Hanford Reach before bending to the west and towards the pacific downstream at Wallula Gap.

The intake structures are raised slightly above the riverbed in the main channel and are doublescreened parallel to the direction of flow. The ends of the intakes are capped and water can only enter through the side perforations. Water is gravitationally fed from the Cooling Water Intake Structure (CWIS) to the pumphouse well at the TMU. There is no direct pumping from the Columbia River. At low water, the structures are approximately 350 feet offshore (EFSEC 2014). Figure 2-7 is a qualitative description of the intake structure function.

The Area of Influence (AOI) of the water intake structures was modeled using Computational Fluid Dynamics (CFD) Analysis by Alden Research Laboratory for an Impingement Study Report. The study found the CWIS influence of operation is remarkably similar or with only limited increase in risk of impingement in both On and Off conditions (Alden 2018). In other words, in the context of sweeping velocity, the circulating water intake screen in operation has little to no more risk of impingement than when the CWIS is not in operation for all models run.

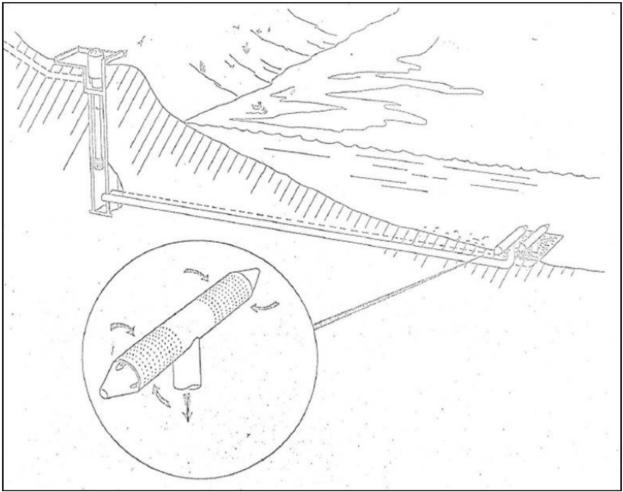


Figure 2-7: Artist rendering of CGS intakes structures (Coutant 2014)

## 3. 40 CFR 122.21(r)(3) Cooling water intake structure data

40 CFR 122.21(r)(3) requires CGS to provide the following cooling water intake information:

- (i) A narrative description of the configuration of each of your cooling water intake structures and where it is located in the water body and in the water column;
- (ii) Latitude and longitude in degrees, minutes and seconds for each of your cooling water structures;
- (iii) A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation number of days of the year in operation and seasonal changes, if applicable;
- (iv) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and
- (v) Engineering drawings of the cooling water intake structure.

The following data are provided to characterize the CGS CWIS and evaluate the potential for impingement and entrainment of aquatic organisms.

## 3.1 CWIS Configuration

CGS is a single-unit, boiling-water nuclear power plant that began commercial operating in December 1984. The reactor produces heat that boils water, producing steam for direct use in a steam turbine, which generates electricity for the Pacific Northwest grid. Steam that exits the turbine is condensed with cool water from a closed cycle cooling system consisting of six mechanical-draft cooling towers that remove heat from the circulating water and transfer the heat to the atmosphere. A portion of the water in the circuit is lost by evaporation and drift of droplets entrained in air. The evaporation and drift losses lead to concentration of dissolved salts in the cooling circuit, necessitating a gradual replacement of water in the circuit by release of so-called "blowdown" water to the Columbia River. The combined losses from evaporation, drift and blowdown are replenished by so-called "makeup" water pumped from the Columbia River.

The Tower Makeup Pumphouse (TMU) is located 3 miles (5 kilometers) east of the CGS reactor complex and approximately 300 feet (91 meters) shoreward of the river's normal high-water mark at RM 352 (Figure 3-1). It houses three 800-horsepower makeup water pumps situated in a pump well. The pump well is connected to two CWIS in the river by two 36-inch (91-centimeter) diameter buried pipes that extend 900 feet (274 meters) from the pump house. Columbia River water flows by gravity into the pump well.

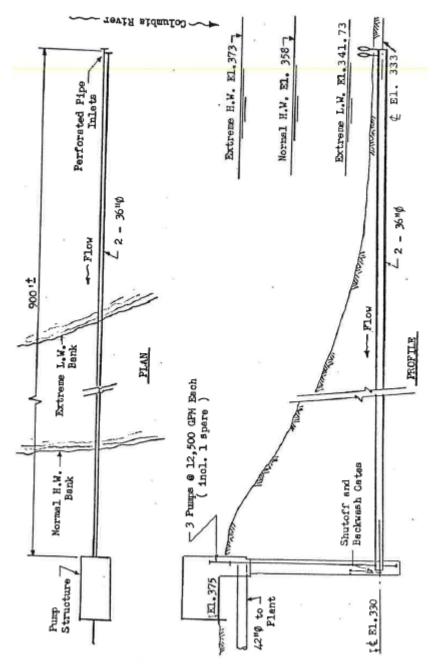


Figure 3-1: CGS Intake sytem plan and profile (Coutant 2014)

The pumps are designed to each supply 12,500 gallons per minute (gpm) (0.79 cubic meters per second [m<sup>3</sup>/s] or 9 million gallons per day [MGD]) or half the system capacity at design head. Two pumps can supply makeup water to the plant with a withdrawal capacity of 25,000 gpm (1.58 m<sup>3</sup>/s or 36 MGD) but during normal operating periods, the average makeup water withdrawal is approximately 17,000 gpm (1.1 m<sup>3</sup>/s or 24.48 MGD). This contrasts with the average mean annual discharge of the Columbia River near the site of 117,823 ft<sup>3</sup>/s (3,336 m<sup>3</sup>/s or 76.2 billion gallons per day [BGD]) and a minimum mean annual discharge of 80,650 ft<sup>3</sup>/s (2,284 m<sup>3</sup>/s or 52.1 BGD) (USGS 2010). The average makeup water withdrawal of 17,000 gpm is thus about 0.03 percent of the average mean annual discharge and 0.05 percent of the minimum mean annual discharge of the river.

An intake structure is located at the end of the buried pipes. The pipes make a 90-degree upward bend and extend slightly above the surface of the riverbed (Figures 2-7 and 3-2). The elevation at the top of the CWIS's is approximately 341 feet. The normal high water elevation of the Columbia River is 358 feet and the extreme low water elevation is 342 feet.

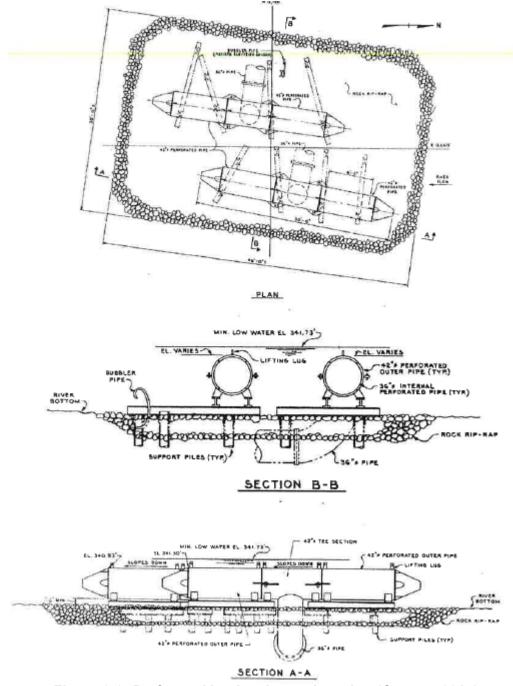
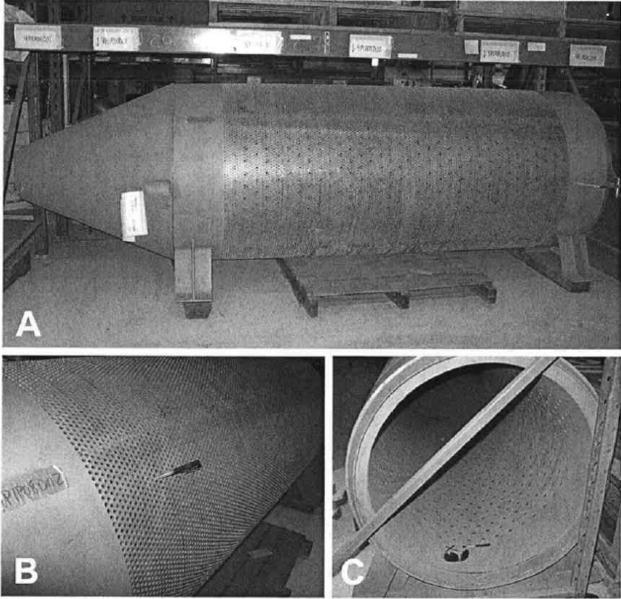


Figure 3-2: Perforated intake plan and section (Coutant 2014)

Attached to each of the pipes is a 30 feet (9 meters)-long, cylindrical screen housing mounted above the riverbed and approximately parallel to the river flow. Each cylinder is composed of two intake screens each 6.5 feet (2 meters) long and mounted upstream and downstream of a central chamber attached to the buried pipe. Solid cones cap each end of the dual-screen structure (Figure 3-3). The screens consist of an outer and inner sleeve of perforated pipe. The outer sleeve (forming the wall of the cylinder is 42-inches in diameter (107 centimeter [cm]) with 3/8-inch (9.5 millimeter [mm]) holes comprising 40 percent of the surface area. The inner sleeve is 36-inches (91-cm) diameter cylinder with <sup>3</sup>/<sub>4</sub>-inch (19 mm) holes comprising 7 percent of the surface area. The double-sleeve intake screens are designed to distribute water flow into the structure evenly along its outer surface (Coutant 2014).



**Figure 3-3: Spare perforated pip for the intakes at CGS (Coutant 2014)** (A: side view; B: close up of outer sleeve; C: end view showing inner sleeve of perforated pipe)

The dual intake cylinders are located in the main channel of the Columbia River, which is flowing north to south (Figure 3-4). CGS's CWIS is located at latitude 46.471419 and longitude -119.2629.54.

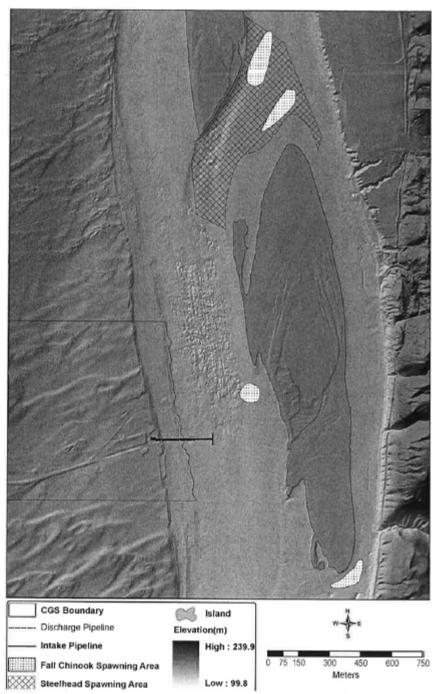


Figure 3-4: Location of pumphouse, pipelines, intakes, and outfalls

## 3.2 CWIS Operation and Intake Flows

As discussed above, there are three pumps located in the pumphouse. These pumps are used to withdraw water from the pumphouse well. Each pump is rated for 12,500 gpm. Normally,

only two pumps are used to supply makeup water to CGS. The design intake flow (DIF) with the two pumps operating at a maximum rate is 25,000 gpm (55.7 ft<sup>3</sup>/s, 36 MGD) (Energy Northwest 2010).

The CWIS typically operates 24-hours per day and for 365-days per year. Every two years CGS is shut down for a refueling and maintenance outage. These outages typically last for approximately 30 to 40 days. During these outages the CWIS structure remains in operation at a reduced rate. Depending on the maintenance schedule, the TMU pumphouse may also be taken out of service.

There is also seasonal variation in the amount of cooling water required by CGS. This variation requires increased makeup water utilization during the summer months. CGS's 2014 through 2018 water intake flow data from the Columbia River is provided in Table 3-1.

	Total Annual Intake from the Columbia River (gal)	Average Daily Intake Flow				
Year		Days	(gal/day)	(gal/min)	(MGD)	Percent of Maximum Design Intake Flow (%) Note: DIF = 36 MGD
2018	8,117,581,704	365	22,239,950	15,444	22.24	61.8
2017*	7,141,491,034	365	19,565,729	13,587	19.57	54.3
2016	8,383,706,926	366	22,906,303	15,907	22.91	63.6
2015*	7,391,298,555	365	20,250,133	14,063	20.25	56.3
2014	8,081,877,394	365	22,142,130	15,376	22.14	61.5

Table 3-1: Water intake flow data (2014-2018)

\* Maintenance outage years

As shown in Table 3-1, CGS's typical intake flow rate is approximately 54 to 64 percent of the maximum design intake flow rate of 36 MGD.

Water withdrawn from the Columbia River supports the closed cycle cooling system that consists of six mechanical-draft cooling towers, and the following: the Standby Service Water Ponds, Fire Protection, Potable Water, and Demineralized Water. The vast majority of the water withdrawn from the river however, is utilized by the closed cycle cooling system. The closed cycle cooling system consists of the Circulating Water (CW) and the Plant Service Water (TSW) system. The percent of the flow used for cooling purposes by the CW/TSW system is estimated to approximately 90 to 99 percent. This amount is difficult to precisely determine due the lack of flow meters installed on a number of the plant's water distribution lines.

### 3.3 Flow Distribution and Water Balance Diagram

The water balance diagram for CGS is provided in Figure 3-5. It is important to note that a number of flows provided on the diagram are estimated.

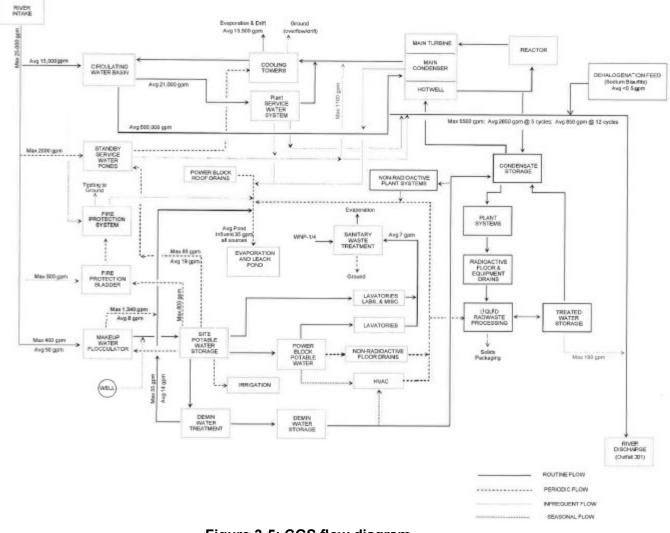


Figure 3-5: CGS flow diagram

## 4. 40 CFR 122.21(r)(4) Source water baseline biological characterization data

40 CFR 122.21(r)(4) requires source water biological baseline characterization data for the Hanford Reach of the Columbia River in the vicinity of CGS.

## 4.1 40 CFR 122.21(r)(4)(i): List of data required in paragraphs (r)(4)(ii) through (r)(4)(vi) that were not available with an explanation of efforts to identify sources of that data.

Biological community data for the Hanford Reach of the Columbia River near the CGS CWIS is mostly focused on salmonid species. CGS has commissioned a detailed impingement and entrainment studies conducted for the CGS CWIS that offer data on the potential for susceptible species and life stages to impinge or entrain. A literature search was conducted to obtain any additional relevant data for species in the vicinity of CGS and is included as an appendix in the Interim Fish Entrainment Report for CGS (Anchor 2019).

## 4.2 40 CFR 122.21(r)(4)(ii): List of species (or relevant taxa) for all life stages and their relative abundance near the CWIS.

Fishery survey and scientific studies conducted near the vicinity of the CGS CWIS that provide limited information on the life stages and abundance of fish are limited and mostly focus on anadromous salmonid species. A list of species in the Hanford Reach of the Columbia River was compiled from a variety of historical sources (Table 4-1). The supporting data contained in this table, sources and additional detail are discussed in the Interim Fish Entrainment Report for CGS (Anchor 2019).

Family	Common Name <sup>a</sup>	Scientific Name <sup>a</sup>	Life Stage	Relative Abundance Near CGS <sup>1</sup>	Approximate Size (mm)	Seasonal Occurrence	Habitat Uses	Preferred Habitat	Preferred Depth (ft)	Preferred Velocity (ft/s)	State	Federal	Origin
Bullhead Catfishes	Black Bullhead	Ameiurus melas	Juvenile	Uncommon	<170	Year-Round	Rearing	Nearshore, Backwaters	Shallow to moderate	Low			Non- native
Bullhead Catfishes	Brown Bullhead	Ameiurus nebulosus	Juvenile	Uncommon	<190	Year-Round	Rearing	Nearshore, Backwaters	Shallow to moderate	Low			Non- native
Bullhead Catfishes	Yellow Bullhead	Ameiurus natalis	Juvenile	Uncommon	<110	Year-Round	Rearing	Nearshore, Backwaters	Shallow to moderate	Low			Non- native
Bullhead Catfishes	Channel Catfish	lctalurus punctatus	Juvenile	Uncommon	<250	Year-Round	Rearing	Nearshore, Backwaters, Pools	Shallow	Moderate to High			Non- native
Herrings	American Shad	Alosa sapidissima	Juvenile*	Abundant	75-125	Late Jun- late fall	Rearing	Nearshore	3-20	0.1-2.5			Non- native
Lamprey	Pacific Lamprey	Lampetra tridentata	Ammocoetes*	Common	< 125	Year-Round	Rearing	Mid- channel/Benthic	2 to 2.5	< 0.8 (pref <0.3)		Concern	Native
Lamprey	Pacific Lamprey	Lampetra tridentata	Macrophthalmia	Common	125-200	October - early spring	Migratory	Mid- channel/Benthic	3 to 40	High; individuals drift with flow		Concern	Native
Lamprey	River Lamprey	Lampetra ayresii	Ammocoetes*	Uncommon	< 175	Year-Round	Rearing	Mid- channel/Benthic	Shallow to moderate	<0.5 - 0.1	Candidate	Concern	Native
Lamprey	River Lamprey	Lampetra ayresii	Macrophthalmia	Uncommon	> 175	Early Apr - mid-June	Migratory	Mid- channel/Benthic	Deep	High; individuals drift with flow	Candidate	Concern	Native
Livebearers	Western Mosquitofish	Gambusia affinis	Adult	Uncommon	> 40	Year-Round	Resident	Nearshore, Backwaters, Pools	Shallow	Low			Non- native
Livebearers	Western Mosquitofish	Gambusia affinis	Juvenile	Uncommon	< 40	Year-Round	Rearing	Nearshore, Backwaters, Pools	Shallow	Low			Non- native
Minnows and Carps	Longnose Dace	Rhinichthys cataractae	Subadult/Adult	Common	100-125	Year-Round	Resident	Benthic	3	3			Native
Minnows and Carps	Longnose Dace	Rhinichthys cataractae	Juvenile*	Common	7-100	Mid May - Mid July	Rearing	Mid-channel	1.5	3			Native
Minnows and Carps	Northern Pikeminnow	Ptychocheilus oregonensis	Subadult/Adult	Abundant	75 - 440	Year-Round	Resident	Mid-channel, Nearshore	>15	>3			Native
Minnows and Carps	Peamouth	Mylocheilus caurinus	Subadult/Adult	Abundant	75 - 290	Year-Round	Resident	Mid-channel, Nearshore	Shallow to deep	Low to Moderate			Native
Minnows and Carps	Chiselmouth	Acrocheilus alutaceus	Subadult/Adult	Common	65-290	Year-Round	Rearing	Mid-channel, Nearshore, Pools	Shallow to deep	Low to Moderate			Native
Minnows and Carps	Redside Shiner	Richardsonius balteatus	Subadult/Adult	Abundant	120-140	Year-Round	Resident	Nearshore	Shallow	Low to Moderate			Native
Minnows and Carps	Northern Pikeminnow	Ptychocheilus oregonensis	Juvenile (Age 0)	Abundant	9-75	Year-Round	Rearing	Nearshore	<15	<3			Native
Minnows and Carps	Peamouth	Mylocheilus caurinus	Juvenile (Age 0)	Abundant	9-75	Year-Round	Rearing	Nearshore	Shallow	Low			Native
Minnows and Carps	Common Carp	Cyprinus carpio	Juvenile	Present	6-305	spring- summer	Resident	Nearshore	<4	Low			Non- native

 Table 4-1 Species located in the vicinity of the CGS CWIS and their Federal Status

Family	Common Name <sup>a</sup>	Scientific Name <sup>a</sup>	Life Stage	Relative Abundance Near CGS <sup>1</sup>	Approximate Size (mm)	Seasonal Occurrence	Habitat Uses	Preferred Habitat	Preferred Depth (ft)	Preferred Velocity (ft/s)	State	Federal	Origin
Minnows and Carps	Umatilla Dace	Rhinichthys umatilla	Subadult/Adult	Uncommon	50 -100	Year-Round	Resident	Nearshore	< 3.3	< 1.5	Candidate		Native
Minnows and Carps	Umatilla Dace	Rhinichthys umatilla	Juvenile	Uncommon	< 50	Year-Round	Rearing	Nearshore	< 3.3	Low to Moderate	Candidate		Native
Minnows and Carps	Tench	Tinca tinca	Juvenile (Age 0)	Uncommon	< 75	Year-Round	Rearing	Nearshore, Backwaters, Pools	Shallow	Low			Non- native
Minnows and Carps	Redside Shiner	Richardsonius balteatus	Juvenile	Abundant	<50 - 120	Jul-Sep	Rearing	Nearshore, Pools	Shallow	Low to Moderate			Native
Minnows and Carps	Speckled Dace	Rhinichthys osculus	Subadult/Adult	Present	50 -100	Year-Round	Resident	Nearshore, Benthic/Pools, Runs, Riffles	<3	Low to High			Native
Minnows and Carps	Speckled Dace	Rhinichthys osculus	Juvenile	Present	< 50	Year-Round	Rearing	Nearshore, Benthic/Pools, Runs, Riffles	<3	Low			Native
Minnows and Carps	Leopard Dace	Rhinichthys falcatus	Juvenile*	Present	7-70	Mid May - Early Aug	Rearing	Nearshore/Benthic	1.5	1.5	Candidate		Native
Minnows and Carps	Leopard Dace	Rhinichthys falcatus	Subadult/Adult	Present	70-120	Year-Round	Resident	Nearshore/Benthic, Pools, Riffles	3	1.5	Candidate		Native
Minnows and Carps	Chiselmouth	Acrocheilus alutaceus	Juvenile (Age 0)	Uncommon	<65	Year-Round	Rearing	Tributary streams	1.5	0.4			Native
Perches	Yellow Perch	Perca flavenscens	Juvenile	Present	<10 - 130	Year-Round	Rearing	Nearshore	Shallow	Low			Non- native
Perches	Walleye	Sander vitreus	Juvenile*	Present	13-225	Year-Round	Rearing	Nearshore/Benthic	1	Low			Non- native
Salmonids	Mountain Whitefish	Prosopium williamsoni	Juvenile (Age 0)	Common	15-100	Year-Round	Rearing	Benthic	< 1	0.9			Native
Salmonids	Chinook Salmon, Spring	Oncorhynchus tshawytscha	Smolt	Common	100-225	Late Apr	Migratory	Mid-channel	6.5-40	3.2-4.7	Candidate	Endangered	Native
Salmonids	Coho Salmon	Oncorhynchus kisutch	Smolt	Common	90-130	Late Apr - Mid May	Migratory	Mid-channel	5-40	3.2-4.7			Native
Salmonids	Sockeye Salmon	Oncorhynchus nerka	Smolt	Common	74-100	Mid Apr - Late June	Migratory	Mid-channel	6.5-40	3.2-4.7			Native
Salmonids	Steelhead	Oncorhynchus mykiss	Smolt	Present	165-240	Late Apr - Early Jun	Migratory	Mid-channel	13-40	4.2-4.7	Candidate	Threatened	Native
Salmonids	Chinook Salmon, Fall	Oncorhynchus tshawytscha	Juvenile (Age 0)	Abundant	45-80	Mid Mar - Mid June	Rearing	Mid-channel, Nearshore	5-20	0.6-2.6			Native
Salmonids	Steelhead	Oncorhynchus mykiss	Juvenile (Age 0)	Present	35 - 155	Year-Round	Rearing	Mid-channel, Nearshore	< 10	<1.5	Candidate	Threatened	Native
Sculpins	Mottled Sculpin	Cottus bairdii	Adult	Present	25-125	Year-Round	Resident	Mid- channel/Benthic, Nearshore	0.5-3	1-3			Native

 Table 4-1 Species located in the vicinity of the CGS CWIS and their Federal Status

Family	Common Name <sup>a</sup>	Scientific Name <sup>a</sup>	Life Stage	Relative Abundance Near CGS <sup>1</sup>	Approximate Size (mm)	Seasonal Occurrence	Habitat Uses	Preferred Habitat	Preferred Depth (ft)	Preferred Velocity (ft/s)	State	Federal	Origin
Sculpins	Mottled Sculpin	Cottus bairdii	Juvenile (Age 0)	Present	6-25	Mar-Jul	Rearing	Mid- channel/Benthic, Nearshore	0.5-3	1-3			Native
Sculpins	Torrent Sculpin	Cottus rhotheus	Adult	Present	25 - 152	Year-Round	Resident	Mid- channel/Benthic, Nearshore	Shallow	1.4-4			Native
Sculpins	Torrent Sculpin	Cottus rhotheus	Juvenile (Age 0)	Present	< 25	May-Late Jul	Rearing	Mid- channel/Benthic, Nearshore	Shallow	1.4-4			Native
Sculpins	Paiute Sculpin	Cottus beldingi	Adult	Uncommon	35-125	Year-Round	Resident	Mid- channel/Benthic, Nearshore	Shallow	1.4-4			Native
Sculpins	Paiute Sculpin	Cottus beldingi	Juvenile (Age 0)	Uncommon	< 35	May-Late Jul	Rearing	Mid- channel/Benthic, Nearshore	Shallow	1.4-4			Native
Sculpins	Prickley Sculpin	Cottus asper	Adult	Present	13-150	Year-Round	Resident	Nearshore/Benthic	0.5-3	Low			Native
Sculpins	Prickley Sculpin	Cottus asper	Juvenile (Age 0)*	Present	13-35	May-Late Jul	Rearing	Nearshore/Benthic	0.5-3	Low			Native
Sculpins	Reticulate Sculpin	Cottus perplexus	Adult	Uncommon	40-100	Year-Round	Resident	Nearshore/Pools, Riffles	Shallow	0-4			Native
Sculpins	Reticulate Sculpin	Cottus perplexus	Juvenile	Uncommon	< 43	Year-Round	Rearing	Nearshore/Pools, Riffles	Shallow	0-4			Native
Sticklebacks	Threespine Stickleback	Gasterosteus aculeatus	Adult	Uncommon	55-75	Year-Round	Resident	Mid- channel/Benthic, Nearshore	Shallow to moderate	Low			Native
Sticklebacks	Threespine Stickleback	Gasterosteus aculeatus	Juvenile	Uncommon	< 55	Year-Round	Rearing	Mid- channel/Benthic, Nearshore	Shallow to moderate	Low			Native
Sturgeons	White Sturgeon	Acipenser transmontanus	Juvenile (Age 0)*	Present	< 280	Mid May - Late July	Rearing	Mid- channel/Benthic, Nearshore	40-90	1.3			Native
Suckers	Bridgelip Sucker	Catostomus columbianus	Juvenile	Common	< 200	Year-Round	Rearing	Mid-channel	2-8	Low			Native
Suckers	Mountain Sucker	Catostomus platyrhynchus	Juvenile	Present	40-125	Year-Round	Rearing	Mid-channel	3.3-5	1.5	Candidate		Native
Suckers	Mountain Sucker	Catostomus platyrhynchus	Juvenile (Age 0)	Present	25-40	July-Sep	Rearing	Nearshore	0.5-1.3	Low to Moderate	Candidate		Native
Suckers	Longnose Sucker	Catostomus catostomus	Juvenile	Uncommon	< 200	Year-Round	Rearing	Pools	Shallow	Low			Native
Suckers	Longnose Sucker	Catostomus catostomus	Juvenile (Age 0)	Uncommon	< 75	June - Sep	Rearing	Pools	< 11	Low			Native

 Table 4-1 Species located in the vicinity of the CGS CWIS and their Federal Status

Family	Common Name <sup>a</sup>	Scientific Name <sup>a</sup>	Life Stage	Relative Abundance Near CGS <sup>1</sup>	Approximate Size (mm)	Seasonal Occurrence	Habitat Uses	Preferred Habitat	Preferred Depth (ft)	Preferred Velocity (ft/s)	State	Federal	Origin
Suckers	Bridgelip Sucker	Catostomus columbianus	Juvenile (Age 0)	Common	< 80	Mid May - Sep	Rearing	Pools, Nearshore	0.03-2	Low			Native
Suckers	Largescale Sucker	Catostomus macrocheilus	Juvenile (Age 0)*	Common	8-55	Jun-Aug	Rearing	Pools, Nearshore	0.32 -15	Low			Native
Sunfishes	Bluegill	Lepomis macrochirus	Juvenile	Present	< 90	Year-Round	Rearing	Backwaters	Shallow	Low			Non- native
Sunfishes	Pumpkinseed	Lepomis gibbosus	Juvenile	Present	< 90	Year-Round	Rearing	Backwaters	Shallow	Low			Non- native
Sunfishes	Largemouth Bass	Micropterus salmoides	Juvenile (Age 0)	Uncommon	6-190	Year-Round	Rearing	Backwaters	< 20	Low			Non- native
Sunfishes	Burbot	Lota lota	Juvenile (Age 0)	Uncommon	< 205	Year-Round	Rearing	Deep nearshore, Deep pools	Shallow to moderate	Low			Native
Sunfishes	Black Crappie	Pomoxis nigromaculatus	Juvenile (Age 0)	Present	< 105	Year-Round	Rearing	Mid-channel, Nearshore	< 10	Low			Non- native
Sunfishes	White Crappie	Pomoxis annularis	Juvenile (Age 0)	Present	< 125	Year-Round	Rearing	Mid-channel, Nearshore	< 10	Low			Non- native
Sunfishes	Smallmouth Bass	Micropterus dolomieui	Juvenile (Age 0)	Present	< 80	July-Winter	Rearing	Nearshore	< 25	Low			Non- native
Trout- perches	Sand Roller	Percopsis transmontana	Adult	Uncommon	75-105	Year-Round	Resident	Mid-channel, Nearshore	3-70	Low	Monitor		Native
Trout- perches	Sand Roller	Percopsis transmontana	Juvenile	Uncommon	< 75	Year-Round	Rearing	Nearshore	3-70	Low	Monitor		Native

Table 4-1 Species located in the vicinity of the CGS CWIS and their Federal Status

Notes:

\* Eggs may drift or larvae have a pelagic phase

1. Relative Abundances: Abundances: Abundances: Abundances: Abundant = >10%, Common = > 1%, Present = < 1% (as reported in WPPSS 1982). Some species are noted as abundant or present in other literature but not directly observed in CGS studies. Uncommon = suspected presence but rarely observed Sources:

# 4.3 40 CFR 122.21(r)(4)(iii): Identification of species and life stage that would be most susceptible to impingement and entrainment. Species evaluated must include the forage base as well as those important in terms of significance to commercial and recreational fisheries.

Of all species and life stages that are known to occur in the Hanford Reach and listed in Table 4-1, a subset can be identified that are at elevated risk of entrainment or impingement because their habitat preferences increase their potential to occur in proximity to the CGS intake. The species listed in Table 4-2 are: 1) abundant in the Hanford Reach; 2) prefer mid-channel or benthic habitat; and 3) inhabit waters where conditions exceed the minimum depth and velocity observed at the CGS intake site of 8 feet and 3 ft<sup>3</sup>/s, respectively. The subset of species and life stages listed are also those that can be small in body size, increasing their risk of impingement or entrainment due to poor swimming ability or ability to pass through screen pores.

Of the 14 species listed in Table 4-2, nearly all overlap in proximity to CGS in September through October, with the exception of migratory salmonids. This exception includes Hanford Reach subyearling fall Chinook salmon, which typically have emigrated from the reach by September. March through June is when fall Chinook salmon fry emerge in the Hanford Reach and therefore are most at risk of entrainment. March through June is also when smolts from upstream tributaries are typically migrating through the Hanford Reach. Low flows in late summer through winter largely affect resident fish species and those with extended residency before outmigration (steelhead, lamprey). River discharge is typically lowest in October, resulting in lowest average monthly river depths and lowest sweeping velocities past the CGS intake.

Common Name	Scientific Name	Life Stage	Preferred Habitat Type	Preferred Depth (feet)	Preferred Velocity (ft/s)	Size (length in mm)
Herring						
American Shad	Alosa sapidissima	Juvenile (Age-0)*	Mid-channel, Sloughs	3 to 20	0.1 to 2.5	75 to 125
Lamprey						
Desifie Lemprov	Lampetra	Macrophthalmia	Mid-channel/ Benthic	3 to 40	High; individuals drift with flow	125 to 200
Pacific Lamprey	tridentata	Ammocoetes*	Mid-channel/ Benthic	2 to 3	Less than 0.8 (prefer less than 0.3)	Less than 125
Minnows and Carps						
Chiselmouth	Acrocheilus alutaceus	Juvenile	Nearshore, pools, then mid- channel later in summer	Shallow to deep	Low to Moderate	30 to 250
Northern Pikeminnow	Ptychocheilus oregonensis	Juvenile*	Nearshore, pools, then mid- channel later in summer	Greater than 15	Greater than 3	9 to 75

Table 4-2. Impingement and Entrainment Potential for Species of Concern near CGS

Common Name	Scientific Name	Life Stage	Preferred Habitat Type	Preferred Depth (feet)	Preferred Velocity (ft/s)	Size (length in mm)
Peamouth	Mylocheilus caurinus	Juvenile	Nearshore, then mid- channel later in summer	Shallow to deep	Low to Moderate	9 to 75
Salmonids						
Chinook Salmon, Fall	Oncorhynchus tshawytscha	Juvenile (Age-0)	Nearshore, then mid- channel later in summer	5 to 20	< 2.6	45 to 80
Chinook Salmon, Spring	O. tshawytscha	Smolt	Mid-channel	6.5 to 40	3 to 4.5	100 to 225
Coho Salmon	O. kisutch	Smolt	Mid-channel	5 to 40	3 to 4.5	90 to 130
Sockeye Salmon	O. nerka	Smolt	Mid-channel	6.5 to 40	3 to 4.5	74 to 100
Steelhead	O. mykiss	Juvenile (Age-0)	Nearshore, then mid- channel later in summer	Less than 10	Less than 1.5	35 to 155
Steelhead	O. mykiss	Smolt	Mid-channel	13 to 40	4 to 4.5	165 to 240
Suckers						
Bridgelip Sucker	Catostomus columbianus	Juvenile (Age-0)	Mid-channel	2 to 8	Low	Less than 80
Largescale Sucker	C. macrocheilus	Juvenile (Age-0)	Nearshore/ Benthic, Pools	0.3 to 15	Low	8 to 55

# 4.4 40 CFR 122.21(r)(4)(iv&v): Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance of relevant taxa. Seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure.

Specific information is only provided for relevant species (those of greatest concern or potential of impingement or entrainment) in the vicinity.

#### Salmonids

#### Chinook salmon (Onchorhychus tshawyscha)

The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

Adult fall Chinook salmon enter freshwater at a fully mature state in late summer through fall, typically spawning in the Hanford Reach between mid-October through the third week of November. Fall Chinook salmon fry emerge from gravels from mid-March through mid-May, with peak emergence observed in mid- to- late April depending on water temperatures. Fry range in length between 37 and 44 mm fork length at emergence, and are highly dependent on shallow, shoreline habitats for feeding and sanctuary. Subyearling fall Chinook salmon feed and swim in the middle or upper portion of relatively shallow water (4 to 22 inches deep) during daytime, while during nighttime they remain less active in the lower portion of the water column. As subyearlings increase in size, they begin to inhabit deeper water with greater velocities. In

the Hanford Reach, subyearling fall Chinook salmon are most abundant in nearshore areas occupying water depths of 4.9 to 19.4 feet, and preferring velocities between 0.6 to 2.6 ft/s; however, subyearlings can be found across the full width of the river and in the upper, middle, and lower portions of the water column. Once the wild Fall Chinook smolt initiate downstream migration in late spring, they tend to travel rapidly through the free-flowing Hanford Reach.

#### Steelhead trout (Oncorhynchus mykiss)

The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

Similar to fall Chinook salmon, steelhead spawn and rear within the Hanford Reach. The newly emerged fry are similarly small in size, but, in contrast, steelhead rear in the Hanford Reach for an entire year prior to migrating downstream. Population trends for steelhead in the Hanford Reach have not been intensively studied; however, their presence has been documented in redd surveys. Adult steelhead typically move into the Hanford Reach from August to November with a peak in September; however, they may be present in the reach year-round as they hold for 6 to 8 months prior to spawning. Adults tend to migrate near shorelines in water depths of less than 3 meters. Spawning has rarely been observed directly in the Hanford Reach, but is likely to occur between February and early June, with peak spawning in mid-May. Adult upper Columbia River steelhead typically use smaller tributary habitat and substrate to spawn in, compared to fall Chinook salmon, but steelhead will spawn in mainstem reaches of large rivers where suitable habitat exists. Habitat with suitable depths, velocity, substrate size, and substrate embeddedness for steelhead spawning exists in several locations throughout the Hanford Reach at flows that typically occur during the spawning season.

Steelhead fry emerge from the gravel 2 to 3 weeks after hatching, usually between mid-May through late-July. Fry are between 35 and 56 mm fork length, and immediately move to shoreline environments with vegetation and submerged cover. As fry grow larger, they move away from nearshore environments, occupying shallow riffles and pools, yet remaining outside of the main channel, preferring low water velocities (0.67 ft/s). Juveniles rear year-round in freshwater, and smolts begin their outmigration after 1 to 3 years in the river environment.

If steelhead spawning were common in the Hanford Reach it would be expected that age-0 (young-of-the-year) fry would be regularly observed in juvenile fish surveys. Observations of age-0 steelhead fry are limited however; numerous studies have failed to collect age-0 steelhead despite methods directed at collecting salmonids in this life stage, confirming the rarity of steelhead spawning in the Hanford Reach.

#### Lamprey

#### Pacific lamprey and Western river lamprey (Lampetra ayresii)

The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

Pacific lamprey and Western river lamprey (Lampetra ayresii) reportedly occupy the Hanford Reach; however, no Western river lamprey have been observed in the Columbia Basin since 1980, and the species may have been extirpated from the drainage.

Both Pacific lamprey and Western river lamprey are anadromous, with a relatively complex life history. After hatching, larvae (ammocoetes) drift downstream and burrow in soft substrate in areas of low water velocity (less than 1 ft/s) to filter feed and rear for up to 8 years. After

metamorphosing, the macrophthalmia begin downstream migration, which usually occurs between late fall and spring. Lamprey mature into adults in the ocean, and spend several years in the marine environment. Adults migrate back to freshwater between February and June, and may spend up to a year in the freshwater habitat before spawning between March and July. Lamprey are largely nocturnal and generally migrate mid-channel in the lower part of the water column as they stop frequently to attach to substrate. Activity is usually restricted to darkness.

Both life stages are small, with ammocoetes usually less than 40 mm in length and 2 mm in width as yearlings, but can get as large as 174 mm in length. Macrophthalmia range between 75 to 200 mm in length and 6 to 11 mm in width at the eye. Ammocoetes are relatively immobile in low-flow environments; however, they may be displaced during high water events, particularly in the springtime, when soft sediment burrows are scoured. Macrophthalmia outmigration is relatively lengthy compared to salmonids. Macrophthalmia have been observed in the Columbia River during every month of the year, with peak numbers collected in winter and early spring, usually coinciding with high river discharge events; however, substantial numbers are also observed from March through October.

#### Minnows

## Chiselmouth (*Acrocheilus alutaceus*), Peamouth (*Mylocheilus caurinus*), Northern pikeminnow (*Ptychocheilus oregonensis*)

The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

An abundant resident fish population occurs in the Hanford Reach comprised of species that spend their entire life-cycle in the reach, in contrast to anadromous salmonids and lamprey that migrate long distances and only occur during portions of their life-cycle. Minnows make up the majority of the resident fish species present in the reach. In the Hanford Reach, minnows are predominantly found in shallow water habitat that occurs in side channels that have flowing water during periods of high flow and become backwater sloughs at lower flows. Adult minnows spawn between mid-May and early-August, with larvae emerging days to weeks later, depending on the species. Juveniles demonstrate preference for nearshore and shoreline environments, occupying relatively shallow (1.5 to 15 feet) water with low velocities (0.36 to 3.3 ft/s). Age-0 juveniles of the minnow family are abundant in dense schools of mixed minnow and sucker species in shoreline areas with less than 1 meter (3.3 feet) of water from late June through September or October, following the spring and summer spawning season. Most adult minnows are also found in low velocity (less than 1.5 ft/s) environments, preferring shoreline environments during the warmer months, while retreating to deeper water from October through April.

#### Suckers

### Bridgelip suckers (*Catostomus columbianus*) and Largescale suckers (*Catostomus macrocheilus*)

### The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

Largescale suckers are one of the most abundant species near the CGS intake system and juvenile suckers are some of the most abundant fish found in shallow shoreline areas of the Hanford Reach. Other species, such as the bridgelip sucker are also associated with the Hanford Reach, but relative abundance for these species is unknown. Species in the sucker

family inhabit the river environment year-round. Adult suckers generally prefer deeper water habitats during the day, while moving to shoreline environments during the night. All species can tolerate relatively strong currents, with water velocity ranging from 1.3 to 3.6 ft/s, with bridgelip suckers often found at the ends of riffles in the main river channel. Adults spawn between mid-April and July. Juveniles prefer shallower water, occupying pools, backwaters, and shoreline environments between 0.3 to 15 feet deep, between June and August.

#### **Non-Native Species**

#### American shad (Alosa sapidissima)

The following has been summarized from the Interim Fish Entrainment Report for CGS (Anchor 2019).

Larval and juvenile American shad have been observed in small numbers in backwaters and sloughs in the Hanford Reach. In the John Day Reservoir and below Bonneville Dam, American shad are one of the most abundant species (Petersen et al. 2003). Larval American shad are initially pelagic and can be found in plankton tows across the entire channel starting in late June, prior to recruiting to shallow shoreline areas in August. Age-0 juveniles are observed in nearshore areas from late July through September, before outmigrating to the ocean in late fall. Age-0 Juvenile shad may be found in water between 3 and 20 feet deep and relatively slow velocities of 0.1 to 2.5 ft/s.

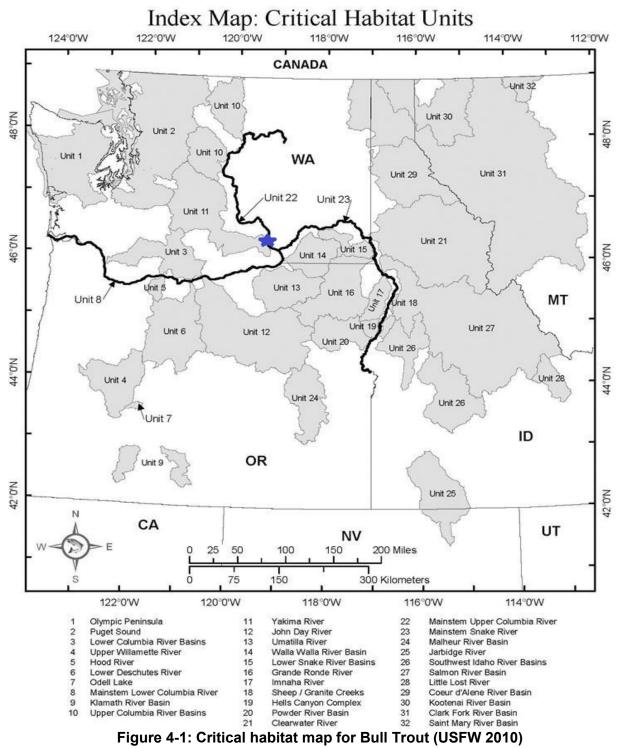
## 4.5 40 CFR 122.21(r)(4)(vi): Identification of all Federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area.

Four species in the Hanford Reach of Columbia River Basin are on the Federal Endangered (E) or Threatened (T) Species List (Table 4-3). Of the four, the Pacific lamprey is the only species considered a species of concern (C) versus a threatened or endangered species.

Table 4-3 Federally-listed Threatened and Endangered Species										
Family	Scientific Name	Common Name	Federal Status							
Petromyzontidae	Entosphenus tridentatus	Pacific lamprey	С							
Salmonidae	Onchorhychus tshawyscha	Chinook salmon	Т							
	Oncorhynchus mykiss	steelhead trout	Т							
	Salvelinus confluentus	Bull trout	Т							

#### Table 4-3 Federally-listed Threatened and Endangered Species

Figures 4-1 to 4-4 show the range of the species in Table 4-3 within the Hanford Reach.



(Note: Blue Star indicates location of CGS)



Critical Habitat Upper Columbia River Spring-run Chinook Salmon

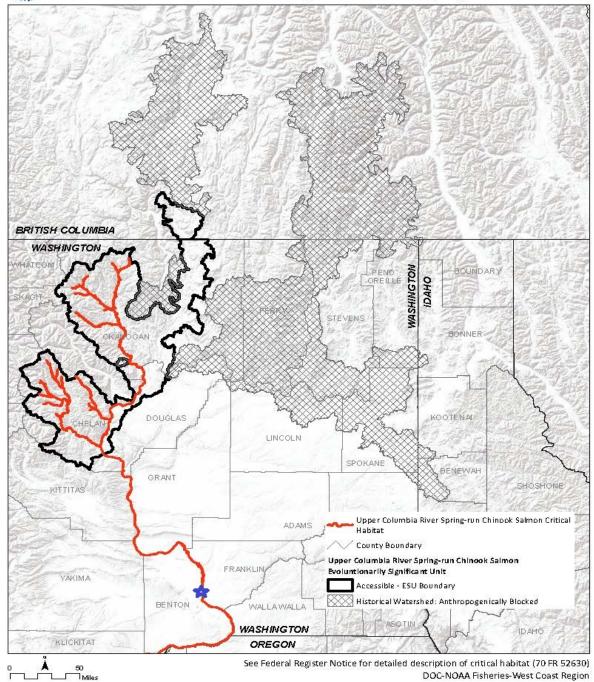


Figure 4-2: Critical habitat map for Chinook Salmon in the Upper Columbia River (NMFS 2019) (Note: Blue Star indicates location of CGS)



Critical Habitat Upper Columbia River Steelhead

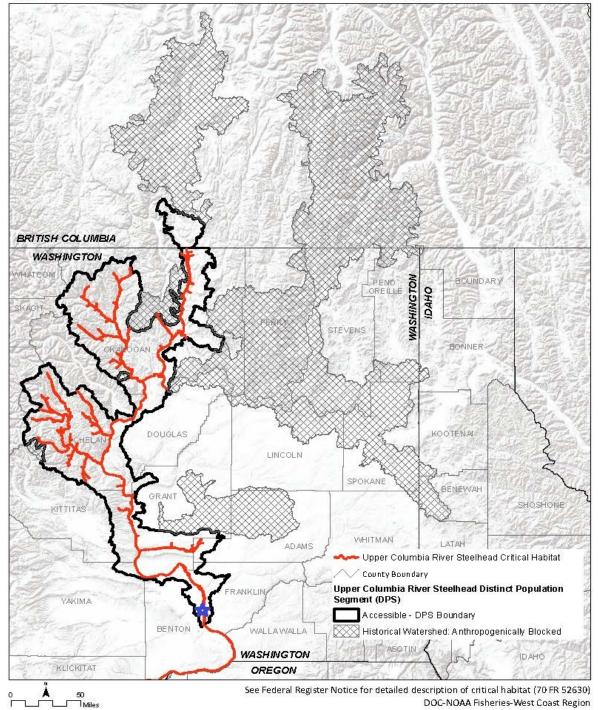


Figure 4-3: Critical habitat map for Steelhead in the Upper Columbia River (NMFS 2019) (Note: Blue Star indicates location of CGS)

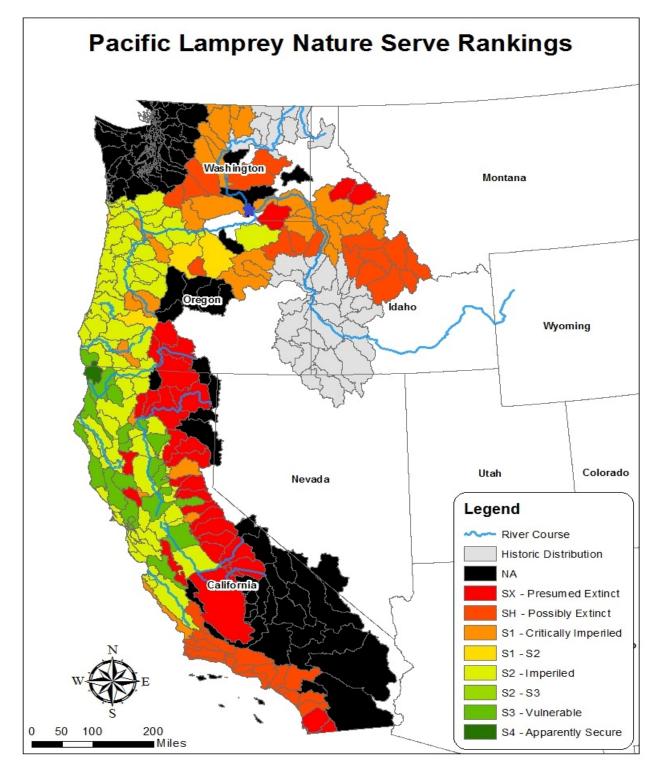


Figure 4-4: Relative Threat Rankings for Pacific Lamprey (USFWS 2019) (Note: Blue star indicates location of CGS.)

4.6 40 CFR 122.21(r)(4)(vii): Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan.

This section does not apply to CGS.

4.7 40 CFR 122.21(r)(4)(viii): If the information requested in paragraph (r)(4)(i) of this section is supplemented with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

Recent specific studies related to fish entrainment and impingement have, or are in the process of, being conducted for CGS and used extensively to support the discussion within this 122.21(r)(4) section. They include the following:

**Computation Fluid Dynamics Analysis of Perforated Intake Screens at CGS (Alden 2018)** The hydrodynamic risks of fish impingement associated with the two 42-inch diameter cylindrical T-screen intake units currently used to withdraw water from the Columbia River for cooling operations at CGS were evaluated. The intent of this study was to analyze the physical flow patterns (i.e., velocity and pressure fields) around the screens using three-dimensional computational fluid dynamics (CFD) modeling, with CFD results to be interpreted by Alden's fish biologists and a third party consultant, Dr. Charles Coutant.

The report describes the CFD modeling approach and discusses the results in the context of risk of impingement (i.e., fish held to screen face by suction). A two-phased approach was taken in the modeling effort, with the first phase focused on simulating larger-scale (screen body-scale) dynamics around the two T-screen units and the second phase focused on simulating smaller-scale (fish-scale) dynamics in the turbulent boundary layer over individual holes of perforated screen areas.

The study had two main objectives: 1) Investigate patterns in velocity and pressure around the intake units, with a particular emphasis on the high pressure/low velocity region near the upstream noses of the units; and 2) Investigate the sweeping (tangential, across screen) and approach (normal, toward screen) components of velocity in the near-field turbulent boundary layer over the screens.

Specific methodologies for sampling and data analysis, procedures and analysis can be found with the report and was provided to the U.S. Nuclear Regulatory Commission (NRC), National Marine Fisheries Service (NMFS), Energy Facility Site Evaluation Council (EFSEC), and the Washington Department of Fish and Wildlife.

#### Draft Entrainment Characterization Study Plan for the Columbia Generating Station, Richland, Washington (Plan; Coutant 2014)

A reissuance of National Pollutant Discharge Elimination System (NPDES) Permit No. WA-

002515-1 for CGS was published in 2014 by EFSEC. To address concerns regarding fish entrainment, NPDES Condition S12.B was included requiring CGS to prepare an entrainment characterization study that includes a 2-year fish entrainment monitoring study.

The design of the required fish entrainment study, described above, was outlined in this plan to guide the development and implementation of the fish entrainment study. This study plan was subject to three independent peer reviews and received approval from EFSEC.

#### Interim Fish Entrainment Report for Columbia Generating Station (Anchor 2019)

The interim report describes the results for the first year of the fish entrainment study, described above, which began in the spring of 2018. In addition to describing the methodology used to conduct the 2-year fish entrainment study, the results of the first years of sample, a review of existing literature was also included to identify fish species and life stages at risk of entrainment or impingement. The Historical Fish Occurrence Literature Review of the Hanford Reach is summarized in the interim report with the full literature review attached as Appendix F. The review of the Historical Fish Occurrence Literature Review was used extensively in in summarizing the responses of this document.

Specific methodologies for sampling and data collection, procedures and analysis can be found with the report. This report was submitted to EFSEC.

#### 4.8 40 CFR 122.21(r)(4)(ix)—this part clarifies that the Source Water Baseline Characterization Data for owners/operators of existing facilities or new units at existing facilities is the information in paragraphs (r)(4)(i) through (xii) of this section.

This provision simply contains a statement of clarification and does not call for any specific information. The report does provide information required under 122.21(r)(4)(i-xii).

# 4.9 40 CFR 122.21(r)(4)(x): Identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition near the intake.

CGS has not conducted any protective measures and stabilization activities near the CWIS.

#### 4.10 40 CFR 122.21(r)(4)(xi): List of fragile species, as defined at 40 CFR 125.92(m).

Fragile species means those species of fish and shellfish that are least likely to survive any form of impingement. As defined in 40 CFR 125.92(m), the only known fragile species is the American shad (Alosa sapidissima), which is a non-native species in the Columbia River.

4.11 40 CFR 122.21(r)(4)(xii): This section requires owners/operators of existing facilities that have incidental take exemptions or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, to provide any information submitted to obtain those exemptions or authorizations to satisfy the permit application information requirement of paragraph 40 CFR 125.95(f) if included in the application.

CGS was issued an Incidental Take Permit from the NMFS on March 10, 2017.

The following information was used to support the Endangered Species Act Section (7) consultation with NMFS for CGS operations:

Biological Assessment and Essential Fish Habitat Assessment, Columbia Generating Station, License Renewal (NRC 2011)

Generic Final Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 47, Columbia Generating Station (NRC 2012)

Computation Fluid Dynamics Analysis of Perforated Intake Screens at Columbia Generating Station (Alden 2018)

#### 5. 40 CFR 122.21(r)(5) Cooling water system data

40 CFR 122.21(r)(5) requires the following cooling water system data:

- (i) A narrative description of the operation of the cooling water system and its relationship to cooling water intake structures; the proportion of the design intake flow that is used in the system; the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable; the proportion of design intake flow for contact cooling, non- contact cooling, and process uses; a distribution of water reuse to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling; a description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals; a description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows; the proportion of the source waterbody withdrawn (on a monthly basis);
- (ii) Design and engineering calculations prepared by a qualified professional and supporting data to support the description required by paragraph (r)(5)(i) of this section; and
- (iii) Description of existing impingement and entrainment technologies or operational measures and a summary of their performance, including but not limited to reductions in impingement mortality and entrainment due to intake location and reductions in total water withdrawals and usage.

The data presented in this section is used in determining the appropriate standards that would apply to the CGS facility.

#### 5.1 Cooling water system design and operation

CGS is a nuclear-fueled steam electric power generation plant that discharges blowdown water from its non-contact cooling water system to the Columbia River. Demineralized water passes around zirconium tubes containing the reactor fuel in the core and is converted to steam at about 70 atmospheres (1,000 pounds per square inch [psi]). The electrical generator is turned by a steam-powered turbine, which converts thermal energy to mechanical energy and ultimately to electrical energy. The separate CW/TSW systems are used primarily to provide non-contact cooling water. The CW system non-contact cooling water is fed through the main condenser to convert steam from the closed-loop demineralized water system back into water that is returned to the reactor, and the TSW non-contact cooling water is fed through separate heat exchangers in the plant. The CW/TSW process water is recirculated through six

mechanical draft cooling towers where heat is discharged to the atmosphere. Evaporation, drift, and blowdown losses are replenished from the CWIS located in the Columbia River.

CGS operates under NPDES Permit No. WA002515-1, issued by EFSEC. Blowdown from the CW/TSW system is discharged to the primary outfall (NPDES Outfall 001) in the Columbia River, approximately 3 miles east of CGS. The major wastewater stream at CGS is the blowdown from the CW/TSW system.

As described above, the operations at CGS require the CW and TSW systems to provide noncontact cooling water. The CW system non-contact cooling water is fed through the main condenser to convert steam from the closed-loop demineralized water system back into water that is returned to the reactor, and the TSW non-contact cooling water is fed through separate heat exchangers in the plant. The combined CW/TSW process water is recirculated through six mechanical draft cooling towers where heat is discharged to the atmosphere. The CW/TSW system is circulated at approximately 600,000 gpm.

To limit the buildup of mineral salts, a small portion of the water is released to Outfall 001 to the Columbia River as blowdown. CGS typically operates between 5 and 12 cycles of recirculation. The blowdown discharge has an average flow rate of 2,850 gpm at five cycles of recirculation and 850 gpm at 12 cycles. During typical operation, the blowdown flow rate is approximately 1,300 to 1,650 gpm.

The cooling tower evaporation and drift loss on average is 13,500 gpm. This evaporation acts to concentrate the dissolved solids in the circulation water, cause excessive mineral salt deposition in the system, and result in a reduction in heat transfer (i.e., cooling) efficiency. To limit this buildup of mineral salts, a small portion of the concentrated water is released as blowdown to Outfall 001 in the Columbia River, and fresh makeup water is added to the system to offset the loss from evaporation and blowdown (Landau Associates 2018).

The CW/TSW system typically operates 24 hours per day and for 365 days per year. Every two years CGS is shut down for a refueling and maintenance outage and the CW/TSW system is taken out of service. These outages typically last for approximately 30 to 40 days.

There is also seasonal variation in the amount of water required by the CW/TSW system. The CW/TSW system requires more makeup water from the Columbia River in the summer months than during the winter months.

#### 5.2 Proportion of Design Intake Flow for Non-contact Cooling and Process Uses

CGS has a Design Intake Flow (DIF) of 25,000 gpm (55.7 ft<sup>3</sup>/s, 36 MGD). The majority of the intake flow is used by the CW/TSW system. The monthly amount of water withdrawn from the Columbia River from 2014 through 2018 is provided in the Table 5-1 below.

Year				Av	erage /	Actual I	ntake F	low (M	GD)			
rear	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	20.0	20.0	21.3	22.5	22.3	25.0	27.1	21.5	23.9	21.9	20.1	20.1
2015	19.4	21.0	24.7	24.3	7.4	4.1	21.5	28.0	26.2	23.3	20.8	10.6
2016	21.2	22.2	21.0	24.5	24.4	25.5	25.3	26.9	23.6	22.8	21.5	16.0
2017	18.9	20.2	21.7	15.9	10.4	12.1	28.4	19.6	22.5	23.0	22.0	20.2
2018	20.6	20.2	22.0	22.7	18.5	21.6	27.0	26.4	24.4	22.8	20.8	19.2

Table 5-1: Monthly Average Intake Flows (2014-2018)

The monthly flow percentage used for cooling by the CW/TSW system is estimated to be approximately 90 to 99 percent of the average Actual Intake Flow (AIF).

#### 5.3 Proportion of Source Water Body Withdrawn

CGS has a DIF of 25,000 gpm (55.7 ft<sup>3</sup>/s, 36 MGD). The AIF varies throughout the year, based on the water demand at the facility. The average monthly AIF from 2014 through 2018, as presented in the Table 5-2, were used when calculating the percent of the Columbia River flow withdrawn by CGS.

Average monthly Columbia River flows were estimated using United States Geological Survey (USGS) flow data from the Priest Rapids Dam located upstream from CGS. The average monthly river flows for the period of record were compared to the DIF and the average monthly AIFs from 2014 through 2018 to estimate the percent of river flow withdrawn by CGS. The following equation was used to determine the proportion of the Columbia River flow withdrawn by CGS:

Proportion of Source Waterbody =  $\frac{CGS Intake Flow (ft^{3}/s)}{Columbia River Flow (ft^{3}/s)} \times 100$ 

The average monthly proportion of the Columbia River withdrawn by CGS for the DIF is provided in Table 5-2. As can be seen from the table, if operated at its current DIF, CGS will withdraw a maximum of 0.08 percent of the monthly Columbia River flow. The percent of the monthly river flow withdrawn by CGS from 2014 through 2018 is presented in Table 5-3. Over the past five years, CGS withdrew a maximum of 0.06 percent of the Columbia River flow, occurring during the months of September 2014, October 2017 and September 2018.

Month	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean of Monthly Columbia River Discharge (ft <sup>3</sup> /s)*	119,972	123,672	133,880	159,800	204,000	172,240	128,180	104,272	70,310	70,338	94,670	108,352.5
				D	esign Intal	ke Flow (3	6 MGD)					
Design Intake Flow (ft <sup>3</sup> /s)	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7
Percent of River Flow	0.05%	0.05%	0.04%	0.03%	0.03%	0.03%	0.04%	0.05%	0.08%	0.08%	0.06%	0.05%
			Ν	lonthly Da	aily Avera	ge Intake F	low (2014	-2018)				
Actual Intake Flow (ft <sup>3</sup> /s)	30.9	32.3	34.3	34.0	25.7	27.3	40.0	37.9	37.3	35.2	32.5	25.9
Percent of River Flow	0.03%	0.03%	0.03%	0.02%	0.01%	0.02%	0.03%	0.04%	0.05%	0.05%	0.03%	0.02%

Table 5-2: Average Monthly Columbia River Flow (2014-2018) and Percent of Columbia River Flow Withdrawn by CGS

Month	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	-					2014						
Columbia River monthly discharge (ft <sup>3</sup> /s)*	99,360	76,560	124,800	148,400	196,300	187,200	161,700	117,000	66,270	70,430	93,660	114,900
Intake flow (ft <sup>3</sup> /s)	30.9	30.9	33.0	34.9	34.5	38.6	41.9	33.3	37.0	33.8	31.1	31.1
Percent of river flow withdrawn	0.03%	0.04%	0.03%	0.02%	0.02%	0.02%	0.03%	0.03%	0.06%	0.05%	0.03%	0.03%
					2	2015						
Columbia River monthly discharge (ft <sup>3</sup> /s)*	139,200	155,700	140,700	118,200	124,600	119,000	106,200	110,100	73,780	72,040	95,330	94,110
Intake flow (ft <sup>3</sup> /s)	30.1	32.4	38.2	37.6	11.5	6.3	33.3	43.3	40.6	36.0	32.2	16.4
Percent of river flow withdrawn	0.02%	0.02%	0.03%	0.03%	0.01%	0.01%	0.03%	0.04%	0.05%	0.05%	0.03%	0.02%
	1				:	2016						
Columbia River monthly discharge (ft <sup>3</sup> /s)*	101,300	107,000	120,800	166,100	146,300	136,300	116,700	99,150	68,510	80,860	107,900	122,300
Intake flow (ft <sup>3</sup> /s)	32.7	34.4	32.6	37.8	37.8	39.5	39.2	41.7	36.5	35.3	33.2	24.8

#### Table 5-3: Average Monthly Columbia River Flow and Percent of Columbia River Flow Withdrawn by CGS (2014-2018)

Month	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Percent of river flow withdrawn	0.03%	0.03%	0.03%	0.02%	0.03%	0.03%	0.03%	0.04%	0.05%	0.04%	0.03%	0.02%
						2017						
Columbia River monthly discharge (ft <sup>3</sup> /s)*	131,800	123,100	163,500	214,500	250,600	231,900	128,800	94,610	76,850	62,070	79,650	102,100
Intake flow (ft <sup>3</sup> /s)	29.2	31.3	33.5	24.6	16.1	18.7	43.9	30.3	34.8	35.5	34.0	31.2
Percent of river flow withdrawn	0.02%	0.03%	0.02%	0.01%	0.01%	0.01%	0.03%	0.03%	0.05%	0.06%	0.04%	0.03%
						2018						
Columbia River monthly discharge (ft <sup>3</sup> /s)*	128,200	156,000	119,600	151,800	302,200	186,800	127,500	100,500	66,140	66,290	96,810	No data.¹
Intake flow (ft <sup>3</sup> /s)	31.9	32.3	34.0	35.1	28.7	33.4	41.7	40.9	37.7	35.2	32.1	
Percent of river flow withdrawn	0.02%	0.02%	0.03%	0.02%	0.01%	0.02%	0.03%	0.04%	0.06%	0.05%	0.03%	

\*USGS 2019

<sup>&</sup>lt;sup>1</sup> Columbia River discharge data at Priest Rapids Dam is unavailable for this month

#### 5.4 Intake Velocities

The intake screens on the CWIS located in the Columbia River were designed for low throughscreen velocities to minimize impingement and entrainment. The inlet velocities are expected to be well below the acceptable limit required for suitable protection of small fish when water is being taken into the system. At the external screen surface under maximum operating conditions (DIF of 25,000 gpm, 36 MGD), the velocity through the external screen openings is approximately 0.5 ft/s. At a distance of less than one third inch from the outer screen surface, the inlet approach velocity drops to 0.2 ft/s (WPPSS 1981). During reduced flow, the perforated pipe intake velocity characteristics would be proportionately reduced. For average intake conditions, the nominal bulk velocity approaching the screens (screen-normal direction) is 0.07 ft/s and the average normal through-pore velocity is 0.16 ft/s (Alden 2018).

#### 5.5 Existing Impingement and Entrainment Reduction Measures

CGS utilizes screens on the CWIS located in the Columbia River to minimize impingement and entrainment of the biological community. See section 3.1 for a description of the screens.

## 6. 40 CFR 122.21(r)(6) Chosen method of compliance with impingement mortality standard

CGS has identified the pre-approved Option 1 (Closed-Cycle Recirculating System) of the Best Technology Available (BTA) Standards for Impingement Mortality as its applicable standard. EFSEC initially determined the CGS CWIS represent the best technology available in the Fact Sheet for the 2014 CGS NPDES permit renewal (EFSEC 2014).

#### 7. 40 CFR 122.21(r)(7) Entrainment performance studies

40 CFR 122.21(r)(7) requires CGS to discuss entrainment performance studies for CGS. Specifically the Rule requires:

The owner or operator of an existing facility must submit any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from other locations are relevant and representative of conditions at your facility. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of condition how the data should be interpreted using the definition of entrainment at 40 CFR 125.92(h).

#### **Historical Studies:**

Fish entrainment studies have previously been conducted at CGS. Beak Consultants conducted entrainment studies in May 1979 to May 1980 as part of the Preoperational Environmental Monitoring Program for what was then called the Washington Public Power Supply System (WPPSS) Nuclear Project No. 2 (WNP-2) (Beak 1980; Mudge et al. 1981). No juvenile

salmonids were entrained. As a result of EFSEC's review, WPPSS was required to conduct additional studies during one spring (April-June) out-migration of naturally spawned juvenile salmon when the facility was at or above 75 percent power load (EFSEC Resolution 214 issued in 1982). Further review by NMFS (Evans 1983) established the study period would extend to September 15 (Sorensen 1983), although recent studies in the Hanford Reach indicate that entrainment sampling to this late date is not biologically relevant. The facility reached approximately 75 percent thermal (power) load in November 1984 and the studies were conducted in 1985 to fulfill the requirements set forth in EFSEC Resolution No. 214 and to address the concerns of NMFS. The entrainment sampling equipment for each study was the same as described in Mudge et al. (1981) and is largely the same for the current entrainment plan (Coutant 2014). During times when Chinook salmon juveniles were confirmed present in the vicinity by beach seining there were no fish, fish eggs or larvae collected during 294 hours of entrainment sampling with an average sampling period of just under 12 hours per sample (WPPSS 1985).

Fish impingement and biofouling at the intakes were also studied in 1985 using SCUBA divers (WPPSS 1985). On nine occasions between March 13 and December 3 (six of which took place in April-September when juvenile salmonids were likely present) divers inspected and reported any fish impingement on or interaction with the intake structure, the need for maintenance, accumulation of submerged debris and plugging of orifices by attached growths. Videotape logs were made in spring and fall. Although resident fish were seen around the intakes structures, there were no impinged fish found and no fouling by algae, insects, sponges or debris occurred that would impact proper operation of the intakes.

#### **Current Studies:**

The current entrainment monitoring study as prescribed in the Draft Entrainment Characterization Study Plan for CGS (Coutant 2014) and initially reported in the Interim Fish Entrainment Report for CGS (Anchor 2019), concentrates on entrainment of fall Chinook salmon fry. Through consultations with NMFS it is mutually recognized that newly emerged Chinook salmon derived from spawning beds in the Hanford Reach are the species and life stage most likely to be entrained. This is not a federally-listed species but its population's proximity to CGS, its abundance and its seasonal sizes near the CGS intake make it a useful surrogate for all entrainable fish. It is also in NMFS's regulatory authority through the Magnuson-Stevens Act.

Although other species and life stages of fish occur in the vicinity of the CGS intake, most salmonids including those with Federal listing are large enough that entrainment through the 3/8th-inch diameter pores of the intake would not be possible (Bell 1990; Nordlund 2013a). For example, downstream-migrating juveniles of Chinook (underyearlings >75 mm long and 12 mm deep), Steelhead (wild pre-smolt >125 mm long and 22 mm deep), Sockeye (89-127 mm long) and Coho salmon (yearling or older 89-114 mm) from populations spawning and rearing upstream in or upstream of the Hanford Reach would be excluded by a 3/8-inch mesh (for sizes sampled in the Hanford Reach see Dauble et al. 1989 and other Hanford reports cited above). In further support of this, a conclusion from the recently completed Computation Fluid Dynamics Analysis of Perforated Intake Screens at CGS (Alden 2018) found that the effective opening of a 3/8-inch pore within the Columbia River with high sweeping flow posed a very low entrainment risk to a circa 40 mm long salmon fry due to the large size of the fish relative to the small hydrodynamically-effective pore size (about 1/3 of the pore diameter or ~3 mm) (Alden 2018).

As outlined in the Interim Entrainment report, the first year of entrainment sampling indicate that few fish were entrained over the observation season, with only two fish observed during thirteen 24-hour sampling events. The small number of fish entrained is consistent with the findings of

previous monitoring (Anchor 2019, Mudge et al. 1981). Discharge from the upper Columbia River Basin and Priest Rapids Dam was exceptionally high in 2018 and peak flows occurred in May, approximately one month earlier than average, causing an interruption in routine fish entrainment monitoring activities. Nonetheless, the fish entrainment monitoring that was undertaken in March and April prior to the high flows coincided with the typical peak emergence period for Hanford Reach Fall Chinook Salmon, allowing for representative sampling during this key time of year. The second year of the entrainment study is ongoing as of the time of preparation of this report.

As indicated throughout this section and the report submission to EFSEC, both historically and currently, CGS has performed numerous entrainment and sampling studies which have demonstrated little to no actual entrainment, and very low risk of entrainment or impingement.

#### 8. 40 CFR 122.21(r)(8) Operational status

40 CFR 122.21(r)(8) requires a description of the operational status of CGS. Specifically;

the owner or operator of an existing facility must submit a description of the operational status of each generating, production, or process unit that uses cooling water, including but not limited to:

- (i) For power production or steam generation, descriptions of individual unit operating status including age of each unit, capacity utilization rate (or equivalent) for the previous 5 years, including any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors, including identification of any operating unit with a capacity utilization rate of less than 8 percent averaged over a 24-month block contiguous period, and any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes to fuel type;
- (ii) Descriptions of completed, approved, or scheduled uprates and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities;
- (iii) For process units at your facility that use cooling water other than for power production or steam generation, if you intend to use reductions in flow or changes in operations to meet the requirements of 40 CFR 125.94(c), descriptions of individual production processes and product lines, operating status including age of each line, seasonal operation, including any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors, any major upgrades completed within the last 15 years, and plans or schedules for decommissioning or replacement of process units or production processes and product lines;
- (iv) For all manufacturing facilities, descriptions of current and future production schedules; and
- (v) Descriptions of plans or schedules for any new units planned within the next 5 years.

#### 8.1 Age and status

Commercial operation of CGS was initiated in December of 1984. The original license issued by the NRC was renewed in 2012. The license renewal extended CGS operations through December 2043. An additional license extension is possible.

#### 8.2 Capacity utilization for the previous five years

The CGS capacity factor from 2014 through 2018 is provided in Table 8-1.

Calendar Year	Capacity Factor <sup>2</sup>
2014	98.58%
2015	84.16%
2016	99.03%
2017	83.48%
2018	98.8%

#### Table 8-1: CGS Capacity Factor (2014-2018)

2015 and 2017 were refueling and maintenance outage years.

#### 8.3 Major upgrades in the past 15 years

The CGS main steam condenser was replaced during the 2011 refueling and maintenance outage. The brass condenser tubes were replaced with titanium to reduce copper content in reactor feed water and blowdown, reduce radiation exposure, and improve operational efficiencies.

In calendar year 2019, CGS is undergoing a process modification to improve inhibition of biological fouling of the CW/TSW systems. The modification will replace the batch cooling water halogenation process with a continuous halogenation and the installation of a dehalogenation feed prior to blowing down to the Columbia River. The modification was approved through Amendment #2 of NPDES Permit No. WA002515-1 in March 2019.

#### 8.4 Completed, approved or scheduled uprates and NRC relicensing status

CGS operation began in 1984 during which the plant was licensed to operate at a rated power level of 3,323 Megawatts thermal (MWt). In 1995, CGS was approved to increase the generating capacity to 3,486 MWt.

In 2017, CGS was approved to increase the generating capacity to 3,544 MWt. This uprate was accomplished through more accurate means of measuring feedwater flow. Table 2 summarizes CGS power history.

Description	Rated thermal power (MWt)
Original licensed thermal power (1984)	3,323 MWt
Licensed thermal power uprate (1995)	3,486 MWt
Licensed thermal power uprate (2017)	3,544 MWt

#### Table 8-2: CGS Power History

#### 8.5 Plans or schedules for decommissioning or replacement of units

CGS operating license issued by the NRC expires in December 2043. This date is used for the commencement of decommissioning activities.

The technical approach selected for the plant's decommissioning uses the SAFSTOR (Mothball with Delayed Dismantling) option. The SAFSTOR approach consists of placing and maintaining

<sup>&</sup>lt;sup>2</sup> Capacity factor is the ratio of total generation divided by the maximum amount of electricity the plant could send to the grid at the most seasonally restrictive period (summer).

the facility in protective storage after fuel and source material are removed from the site. Initial mothball (plant lay-up) operations consist of general plant decommissioning, radiation surveys, processing and the disposal of the radioactive waste materials, securing a possession-only license, and implementing security surveillance and maintenance plans for the delay period. Delayed dismantling activities are initiated after the dormancy period resulting in the restoration and release of the site.

Decommissioning of the Independent Spent Fuel Storage Installation (ISFSI) will occur five years after ceasing of plant operations, contingent on all the spent fuel loaded Multi-Purpose Casks (MPCs) having been removed from the ISFSI by the U.S. Department of Energy (DOE) for off-site disposal. ISFSI decommissioning will consist of removal and disposal of overpacks for the MPCs and removal and disposal of residual radioactive material as needed to meet the 10 CFR 20.1402 criteria for unrestricted release of the ISFSI area.

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