Technical Memorandum on Supplemental Whole Effluent Toxicity Testing (WET) at the Unocal Bulk Fuel Terminal Edmonds Washington

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Technical Memorandum on Unocal Edmonds WET Testing

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To: David South, TCP-NWRO

From: Chris Peredney, TCP-PTSU

Subject: Unocal Edmonds WET Testing Results

Background:

The Unocal Edmonds site is a 47-acre former petroleum bulk storage and transfer facility. Bulk fuel operations at the facility were terminated in 1991 and subsequently all petroleum handling equipment has been removed. The facility handled various types of fuel during it operating years. The site is approximately 160 feet from the Puget Sound shoreline at its nearest point. To the northeast and northwest of the site lies Willow Creek which discharges to Puget Sound. North of Willow Creek lays the tidally influenced Union Oil Marsh, a 23-acre freshwater and brackish water marsh.

Due to the potential for contaminated groundwater to discharge to sensitive fresh and marine habitats it was agreed that the toxicity of product removed from groundwater wells should be evaluated for effects to aquatic receptors. WAC 173-340-730(3)(b)(ii) states that Whole Effluent Toxicity (WET) testing will be used to evaluate the effects of substances without ecological effect levels on aquatic resources.

WET testing was conducted by MEC Analytical Systems, Inc. on a Water Accommodated Fraction (WAF) prepared from free product obtained from two wells at the site. Due to ongoing remedial actions at the site they were not able to collect a sufficient amount of free product to conduct test with all four of the species outlined in the *Whole Effluent Toxicity Testing Work Plan, Unocal Edmonds Terminal*, dated June 19, 2002 (as amended January 3, 2003). The two bioassay tests that were conducted were the seven-day chronic fathead minnow (*Pimephales promelas*) and the daphnid (*Ceriodaphnia dubia*), consistent with Ecology's WET test guidance (Ecology 1997).

Results of the tests indicate that the Water Accommodated Fraction (WAF) formulations were toxic to *Pimephales.* The Lowest Observed Effect Concentration (LOEC) was 1,420 ug/L for survival (80% in the LOEC vs. 100% in the control). The No Observed Effect Concentration (NOEC) was 835 ug/L. A preliminary site-specific chronic value for total petroleum hydrocarbons (TPH) may be estimated as the geometric mean between the NOEC and the LOEC, or 1,089 ug/L.

The *Ceriodaphnia* results indicate that at the highest concentration tested, survival was not reduced relative to controls (90% vs. 100%). Mean survival in the next highest treatment was

70%; this effect could be due to a higher exposure to bioavailable WAF than at the highest concentration (potentially due to miscelle formations that were measured but less bioavailable in the highest concentration). However, the *Ceriodaphnia* test design is not sufficiently robust to statistically detect a 20% difference in control survival. Reproductive responses in *Ceriodaphnia* were characterized by high variability amongst individual test organisms, also precluding detection of statistical differences.

Review of the first round of testing pointed out two main sources of uncertainty. The first source was the lack of product variability used for the testing versus that seen in monitoring wells across the site. The second main source of uncertainty was not having a full suite of test organisms. To minimize uncertainty at the site The Department of Ecology commissioned a WET test study to be performed using contaminated ground water from six wells across the site using four aquatic bioassay organisms. The six wells were selected, using stakeholder input, to represent product variability across the site. The test organisms selected were the same organisms selected for the WAF study to account for groundwater discharging into both fresh and marine water.

Methods:

Groundwater Sampling: Ground water sampling was conducted in following the Sampling and Analysis plan developed by SAIC (Appendix A).

Chemical Analysis: Samples were analyzed for petroleum and PAHs by as described in North Creak Analytical Testing Report (Appendix B).

Results:
The results of the chemical analysis are presented in Appendix B. Level II data validation was performed by EcoChem, Inc., results are presented in Appendix C. The results of the bioassay work are presented in Appendix D and Summarized in Table 1 and Table 2.

Synthesis:
The purpose of this study was to determine an allowable level of dissolved petroleum in groundwater that would be protective of surface water organisms. There are several important concepts that must be understood to gain a proper appreciation of the study results.

First it must be realized that there are inherent problems with calculating No Observed Effect Concentration (NOECs), the 50% effect level (EC_{50}) where 50% of the organism exhibit a response, and the geometric mean between the NOEC and the 50%. These problems surface when an effect is not seen at the highest concentration tested. In that case the highest concentration tested becomes the NOEAL and the EC_{50} is unknown and reported as > the highest concentration. For example in MW-7 the TPH by VPH/EPH was 1439 µg/L. Therefore since no effect on growth was seen in fathead minnows at this concentration the NOEC was 1430 and the EC_{50} was reported as > 1430 µg/L. Where as in MW-1446 the NOEC was 2222 µg/L and the EC_{50} was 3289 µg/L. This example is representative of several of the results in the study where the NOEC and EC_{50} are artifacts of TPH concentrations being below actual effect levels. For this reason the results for samples that did not show a response at the maximum concentration need to be culled from the analysis. Since the EC_{50} is a calculated value and in the case is close to the Lowest Observed Effect Concentration the Geometric mean of the NOEC and the EC_{50} is considered to approximate the median Chronic value (MCV) use by USEPA..

The second confounding issue is the selection of an appropriate measurement of petroleum in the groundwater. Samples were analyzed by both NWTPH and by VPH/EPH. It has been demonstrated at this site and others that the two measurement techniques do not necessarily correlate. So it is necessary to choose an appropriate measurement to relate to a biological response. I ran a correlation analysis between the EPH, VPH, DRO, LRO, GRO and TPH by VPH/EPH. The only two measurements that showed a consistent correlation to the biological responses were DRO and EPH. Upon consultation with members of the Department of Ecology, Toxics Cleanup Program, Policy and Technical Support Unit and researchers outside the Department of Ecology it is the consensus that NWTPH-DRO represents the best metric, at this time, for assessing the toxicity of weathered petroleum compound to aquatic receptors. Therefor for the purpose of this memo results will be discussed primarily in terms of DRO and secondly as TPH-by NWTPH.

Four species were selected for testing. Two seven-day chronic freshwater tests were conducted using the fathead minnow (*Pimephales promelas*) and the daphnid species (*Ceriodaphnia dubia*). Two marine tests were conducted using the Pacific Topsmelt (*Atherinops affinis*) and Mysid Shrimp species (*Mysidopsis bahia*). The mysid was consistently the most sensitive species, with *C. dubia* being the most sensitive freshwater organism. The lowest value that was calculated was the Growth- NOEC for the mysid in MW-7 of 398 µg/L DRO or 615 µg/L TPH-NWTPH. Due to the small sample sizes and lack of repetition the average Growth-NOEC across the six wells provides the best indicator of expected toxicity of site petroleum compounds. The average response across all wells for Mysid growth is 1281 µg/L DRO or 1492 µg/L TPH-NWTPH (Range 398 –1947 µg/L DRO, 615-2212 µg/L DRO). The reason for MW-7 exhibiting the highest toxicity has not yet been established and the results may be due to the inherent variability of the bioassay techniques and subsequent analysis. The results for all of the other organisms showed either no response or a response at levels higher than proposed cleanup levels for other pathways for the site. Other uncertainties in calculating average values include the uncertainties associated with the calculation of a NOEC.

Recommendations: An exhaustive analysis of the data provided by this study has not been completed. However, it can be shown that looking at the general response of the organisms tested that the groundwater cleanup level set for the fish consumption pathway can be reasonably considered to be protective of aquatic organisms at this site.

Table 1-TPH-NWTPH Concentration and Biological Response

Species	Endpoint		MW-146	MW-7	MW-17	MW-129	MW-103R	MW-W		AVG
			TPH[] µg/L	TPH[] µg/L	TPH[] µg/L	TPH[] µg/L	TPH[] µg/L	TPH[] µg/L		TPH[] µg/L
Topsmelt	Survival	NOEC	15340	2463	4453	2411	7560	8849		6846
		LC_{50}	>15340	>2463	>4452	4628	>7560	>8849		4628
		GM	15340	2463	4453	3340	7560	8849		5629
	Growth	NOEC	3835	2463	4453	2411	7560	4425		4191
		EC_{50}	13039	>2463	>4452	3857	>7560	>8849		8448
		GM	7071	2463	4453	3049	7560	4425		5950
Mysid	Survival	NOEC	3835	2463	2226	2411	7560	4425		3820
Shrimp		LC_{50}	8284	>2463	3473	4532	>7560	>8849		5430
		GM	5636	2463	2781	3305	7560	4425		4554
	Growth	NOEC	1918	616	1113	1205	1890	2212		1492
		EC_{50}	6289	1921	2226	2507	>7560	5929		3775
		GM	3473	1088	1574	1738	1890	3622		2373
Fathead	Survival	NOEC	7670	2463	4453	4821	7560	4425		5232
minnow		LC_{50}	12886	>2463	>4452	8100	>7560	>8849		10493
		GM	9941	2463	4453	6249	7560	4425		7409
	Growth	NOEC	7670	2463	4453	2411	7560	2212		4461
		EC_{50}	11352	>2463	>4452	6460	>7560	>8849		8906
		GM	9331	2463	4453	3946	7560	2212		6303
Daphnid	Survival	NOEC	15340	2463	4453	9642	7560	8849		8051
		LC_{50}	>15340	>2463	>4452	>9642	>7560	>8849		4445
		GM	15340	2463	4453	9642	7560	8849		5982
	Repro.	NOEC	3835	1232	4453	4821	1890	4425		3443
		EC_{50}	9357	>2463	>4452	9257	>7560	>8849		9307
		GM	5990	1232	4453	6680	1890	4425		5660

(>) Indicates that endpoint could not be computed
GM= Geometric Mean, if not calculable then is NOEC
Averages do not include endpoints that could not be computed

Table 2- DRO Concentration and Biological Response

Species	Endpoint		MW-146	MW-7	MW-17	MW-129	MW-103R	MW-W	AVG
			DRO[]	DRO[]	DRO[]	DRO[]	DRO[]	DRO[]	DRO[]
Topsmelt	Survival	NOEC	11600	1590	3640	2333	7260	7790	4158
		LC50	>11600	>1590	>3640	4478	>7260	>7790	4478
		GM	11600	1590	3640	3232	7260	7790	4315
	Growth	NOEC	2900	1590	3640	2333	7260	3895	3508
		EC_{50}	9860	>1590	>3640	3732	>7260	>7790	3732
		GM	5347	1590	3640	2950	7260	3895	3618
Mysid	Survival	NOEC	2900	1590	1820	2333	7260	3895	3205
Shrimp		LC_{50}	6264	>1590	2839	4385	>7260	>7790	3870
		GM	4262	1590	2273	3198	7260	3895	3522
	Growth	NOEC	1450	398	910	1166	1815	1948	1234
		EC_{50}	4756	1240	1820	2426	>7260	5219	2626
		GM	2626	702	1287	1682	1815	3188	1800
Fathead	Survival	NOEC	5800	1590	3640	4665	7260	3895	4286
minnow		LC_{50}	9744	>1590	>3640	7837	>7260	>7790	7837
		GM	7518	1590	3640	6047	7260	3895	5796
	Growth	NOEC	5800	1590	3640	2333	7260	1948	3184
		EC_{50}	8584	>1590	>3640	6251	>7260	>7790	6251
		GM	7056	1590	3640	3818	7260	1948	4461
Daphnid	Survival	NOEC	11600	1590	3640	9330	7260	7790	6490
		LC_{50}	>11600	>1590	>3640	>9330	>7260	>7790	4445
		GM	11600	1590	3640	9330	7260	7790	5371
	Repro.	NOEC	2900	795	3640	4665	1815	3895	3246
		EC_{50}	7076	>1590	>3640	8957	>7260	>7790	8957
		GM	4530	795	3640	6464	1815	3895	5392

(>) Indicates that endpoint could not be computed

GM= Geometric Mean, if not calculable then is NOEC

Averages do not include endpoints that could not be computed

Appendix A
SAIC Sampling and Analysis Plan

Final
Sampling and Analysis Plan
Groundwater Sampling and Analysis

Unocal Terminal Site
Edmonds, Washington

May 23, 2003

Prepared for:

Washington State Department of Ecology
Northwest Regional Office
Bellevue, Washington

Prepared by:

Science Applications International Corporation
Bothell, Washington

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Tables follow the text.

1.0 PROJECT BACKGROUND

Science Applications International Corporation (SAIC) will collect groundwater samples from six existing monitoring wells at the Unocal Edmonds former bulk fuel terminal in Edmonds, Washington. The six sampling locations were selected by Washington State Department of Ecology (Ecology) to represent the represent the variability in product composition at the site. SAIC will collect groundwater samples on or about May 16, 2003.

Toxicity (bioassay) testing will be performed on the six groundwater samples using a number of different test organisms. In addition, samples will be chemically analyzed for petroleum hydrocarbons and various petroleum constituents.

This plan addresses the collection and analysis of groundwater samples only. The subsequent use and interpretation of the data generated will be performed at a later date by Ecology staff.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

SAIC will perform the groundwater sampling and will utilize the following subcontractors and approach:

- **AMEC Earth & Environmental, Inc.**, Fife, Washington (AMEC), will perform seven-day bioassay tests on the six groundwater samples submitted to them by SAIC. In addition, AMEC will send seven groundwater samples[1] to North Creek Analytical, Bothell, Washington (NCA) for chemical analyses, as described below.

- **North Creek Analytical** will perform chemical analyses on the groundwater samples submitted to them by AMEC.

- **EcoChem, Inc.**, Seattle, Washington, will perform Level II data validation for all relevant chemical analyses and will prepare a data validation report documenting the results of the validation.

Ecology has requested that SAIC use AMEC and NCA in order to maintain comparability with previously-analyzed samples from the Unocal site.

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[1] Samples to be analyzed by NCA will consist of groundwater that has undergone a degree of processing (e.g., aeration) by AMEC as part of the bioassay testing procedures. AMEC will submit one aliquot of each of the six groundwater samples plus one additional sample (a duplicate of one of the six), for a total of seven analytical samples. It is important to note that the primary purpose of the chemical analyses is to determine the concentration of contaminants that the *test organisms* are exposed to rather than the concentrations in the monitoring wells at the time of sampling.

3.0 GROUNDWATER SAMPLING

Groundwater samples will be collected from the following six wells at the Unocal Edmonds facility:

- MW-7
- MW-17
- MW-103
- MW-146
- MW-129
- MW-W

Purging

An initial depth-to-water measurement will be obtained at each well using an electric water-level probe. Just prior to sampling, each well will be purged to allow collection of representative groundwater. Purging will be performed using a peristaltic pump. Purging will continue until field measurements of pH, conductivity, and temperature stabilize, or until three well-volumes of water have been withdrawn. Field measurements will be made with a Horiba U-10 or equivalent instrument. Parameters will be considered stabilized when subsequent measurements differ by less than 10 percent. Wells will be purged and sampled (see below) with the tubing inlet placed approximately mid-screen. Table 1 lists the wells to be sampled, their diameters, total depths, and screen depths (where known).

Sample Collection

Once a well has been purged, groundwater samples will be collected directly into the appropriate sample containers using the peristaltic pump. Care will be taken to avoid aeration and unnecessary agitation of the sample during and after collection. Tables 2 and 3 show the analyses to be performed on groundwater collected from each well, the required sample containers, and preservation methods.

Samples will be collected into 20-liter polyethylene cubitainers obtained from the bioassay testing laboratory. At least four cubitainers will be collected from each well[2]. Containers will be filled completely, leaving no remaining headspace. During sample collection, the container will be placed in a cooler along with two or more bags of ice cubes. Once the container is full, additional ice will be added to the cooler, if necessary, and the cooler will be closed immediately to maintain the sample in dark conditions.

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[2] All the water collected from each well will be composited together upon receipt by the bioassay laboratory before initiation of testing.

Groundwater samples will be hand-delivered to AMEC where bioassay testing will be initiated. AMEC will prepare subsamples of water for chemical analysis and will submit these samples to North Creek Analytical for testing.

Decontamination

Each well will be purged and sampled using entirely new tubing in order to prevent cross contamination and to eliminate the need for equipment decontamination. Clear polyvinyl chloride (PVC) tubing will be used down-hole; silicone peristaltic tubing sized appropriately for the pump head will be used in the peristaltic pump mechanism. Following sampling, all tubing will be bagged and disposed of.

All non-disposable down-hole equipment (e.g., water-level probe) will be decontaminated between uses with a detergent solution (Alconox or Liquinox), followed by a tap-water rinse, followed by a distilled water rinse. *All efforts will be made to minimize the volume of decontamination fluids that are generated to the extent practicable.*

Investigation Derived Waste

Purge water and water-based decontamination solutions will be placed into appropriately-labeled waste drums that will have been staged at the site. A record of the approximate volume of liquid placed in the drum will be made and this information will be transmitted to Ecology and Unocal personnel. Unocal will be responsible for the subsequent storage, management, and disposal of the purge water.

Other waste material, including personnel protective equipment (disposable coveralls, gloves, sample tubing, etc.) will be placed in plastic garbage bags and transported off site and disposed of as domestic waste.

5.0 QUALITY ASSURANCE PROCEDURES

5.1 Documentation

Field documentation will consist of the following:

Field logbooks will contain a record of each day's activities and all relevant observations, measurements, and data not recorded elsewhere. Copies of the field logbooks will be made at the end of each field event and maintained in the project file.

Sample collection data sheets will be completed for each sample collected. Sample data sheets will contain date and time of sample collection, sample number, station location and depth, field measurements (e.g., pH, conductivity, temperature, etc.), and analyses collected. (For small sampling events, this information may be recorded in the field logbook instead of on a separate data sheet.)

Sample labels will be attached to each sample container collected. Labels will contain the sample number, date and time of sample collection, analyses requested, and information of sample preservatives.

Sample designation will be in the form of "WET-MW-???" where ??? represents the monitoring well designation. This same sample designation will be used by the bioassay laboratory when preparing samples for chemical analysis. For the field duplicate sample that will be prepared by the bioassay laboratory, the suffix "-FD" will be appended to the duplicate sample designation.

Chain of custody forms will accompany all samples shipped to the laboratory. In addition to containing a record of sample information, chain of custody forms will contain the signature of the sample shipper and will document the date and time the samples were shipped and the airbill number of the carrier (if any). Upon receipt at the laboratory, the chain of custody record will be compared with the samples received, any discrepancies will be noted, and the form will be signed and dated by an authorized laboratory representative and a copy returned to the sender.

5.2 Analytical Methods, Reporting Limits, and QA/QC Criteria

Table 2 shows the bioassay tests to be performed on groundwater collected from each well. Bioassay test procedures, methods, and QA/QC criteria for each of the four bioassay organisms are presented in Appendix A. Chemical analyses to be performed are listed in Table 3. Tables 2 and 3 also list the sample containers, preservatives, and holding times to be used for each analysis. Table 4 shows the chemical parameters that will be analyzed by each method, the target reporting limits that the laboratory will be expected to meet, and the QA/QC acceptance criteria.

5.3 Field QC Sampling

Field QC sampling will involve collection of a split (duplicate) sample for chemical analysis. This sample will be prepared by AMEC and submitted to North Creek Analytical along with the other analytical samples. The duplicate sample will be analyzed for all chemical analyses that are being performed on the other samples.

5.4 Containers, Preservatives, and Holding Times

Tables 3 and 4 summarizes the requirements for sample containers and preservatives as well as the maximum time that samples can be held after sampling and prior to being analyzed.

5.5 Deliverables and Data Validation

Bioassay reports will be prepared for each sample in accordance with WQ-R-95-80. One copy of the bioassay report will be submitted by AMEC to SAIC and one copy will be submitted directly to Ecology.

For Chemical analyses, North Creek Analytical will submit a Level II data package, or equivalent for each sample. Data packages will include a transmittal letter, sample analytical results, method blank results, surrogate recovery results, chain of custody documents, duplicates, matrix spikes, and duplicate matrix spikes. One complete copy of the data package will be submitted to SAIC and one copy will be submitted directly to Ecology.

Chemical analyses/deliverables will be validated by EcoChem. EcoChem will prepare a data validation report documenting the results of the validation. One copy of the validation report will be submitted to SAIC and one copy will be submitted directly to Ecology. Bioassay analyses will be validated separately by Ecology.

Laboratory deliverables will Chemical analyses from North Creek Analytical will be validated by EcoChem, Inc. EcoChem will perform data validation per EPA Level II for all results and per EPA Level IV for a portion of the results (see Table 6 for laboratory deliverables requirements).

Table 1
Monitoring Well Information

Well to be Sampled	Well Diameter (in)	Total Depth (ft below top of casing)	Top of Screen Depth (ft)	Bottom of Screen Depth (ft)
MW-7	2	13.0	3.0	13.0
MW-17	2	14.0	4.0	14.0
MW-103	2	?	?	?
MW-146	2	?	?	?
MW-129	2	14.6	4.1	14.1
MW-W	2	19.0	?	?

Table 2
Bioassay Tests

Analysis	Method	Container	Preservation	Holding Time (days)
7-day *Pimephales promelas* (Fathead minnow) survival and growth test	EPA/600/4-91/002	Polyethylene cubitainers (75 liters total)	Store in darkness 4°C	3
7-day *Atherinops affinis* (Topsmelt) survival and growth test	EPA/600/R-95/136			
7-day *Mysidopsis bahia* survival and growth test	EPA/600/4-91/003			
7-day *Ceriodaphnia dubia* survival and reproduction test	EPA/600/4-91/002			

Table 3
Chemical Analyses

Analysis	Method	Container	Preservation	Holding Time (days)
NWTPH-G & BTEX by 8021	NWTPH-Gx/8021B	2 Voa Vials - HCl	Add HCl to pH<2; Store 4°C	14
VPH	WA MTCA-VPH	3 Voa Vials HCl	Add HCl to pH<2; Store 4°C	14
NWTPH-D	NWTPH-Dx	2 x 1L Amber-HCl	Add HCl to pH<2; Store 4°C	7
EPH	WA MTCA-EPH	1L Amber HCl	Add HCl or H2SO4 to pH<2; Store 4°C	7
PAHs	8270-SIM	1L Amber	Store cool at 4°C	7
BTEX by 8260	EPA 8260B	3 Voa Vials - HCl	Add HCl to pH<2; Store 4°C	14

Table 4
Laboratory QA/QC Acceptance Criteria

Method	Analyte	MDL	MRL	Units	%R	RPD	Surr.%R	DUP RPD	%R	Matrix Spike RPD	CAS #
Volatile Petroleum Products and BTEX by NWTPH-Gx and EPA 8021B											
NWTPH-Gx/8021B	Gasoline Range Hydrocarbons	10.5	50.0	ug/l	-	25	70-130	25	80-120	25	8006-61-9
NWTPH-Gx/8021B	Benzene	0.0930	0.500	ug/l	-	-	80-134	40	80-120	40	71-43-2
NWTPH-Gx/8021B	Toluene	0.134	0.500	ug/l	-	-	68-114	40	80-120	40	108-88-3
NWTPH-Gx/8021B	Ethylbenzene	0.0520	0.500	ug/l	-	-	72-128	40	80-120	40	100-41-4
NWTPH-Gx/8021B	Xylenes (total)	0.199	1.00	ug/l	-	-	67-125	40	80-120	40	1330-20-7
NWTPH-Gx/8021B	4-BFB (FID)			Surrogate	57-125	-	-	-	-	-	460-00-4
NWTPH-Gx/8021B	4-BFB (PID)			Surrogate	62-120	-	-	-	-	-	460-00-4
Volatile Petroleum Hydrocarbons by WDOE TPH Policy Method											
WA MTCA-VPH	C5-C6 Aliphatics	0.714	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	C6-C8 Aliphatics	1.49	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	C8-C10 Aliphatics	1.72	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	C10-C12 Aliphatics	1.03	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	C8-C10 Aromatics	2.50	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	C10-C12 Aromatics	0.963	50.0	ug/l	-	25	70-130	25	70-130	25	NA

Table 4
Laboratory QA/QC Acceptance Criteria

Method	Analyte	MDL	MRL	Units	%R	RPD	Surr.%R	DUP RPD	%R	Matrix Spike RPD	CAS #
WA MTCA-VPH	C12-C13 Aromatics	1.10	50.0	ug/l	-	25	70-130	25	70-130	25	NA
WA MTCA-VPH	Total VPH (TVPH)		50.0	ug/l	-	25	70-130	25	70-130	25	
WA MTCA-VPH	4-BFB (FID)			Surrogate	60-140	-	-	-	-	-	460-00-4
WA MTCA-VPH	4-BFB (PID)			Surrogate	60-140	-	-	-	-	-	460-00-4

Table 4
Laboratory QA/QC Acceptance Criteria

Method	Analyte	MDL	MRL	Units	%R	RPD	Surr.%R	DUP RPD	%R	Matrix Spike RPD	CAS #
Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)											
NWTPH-Dx	Diesel Range Hydrocarbons	0.0540	0.250	mg/l	-	40	37-126	40	63-107	40	68476-34-6
NWTPH-Dx	Lube Oil Range Hydrocarbons	0.110	0.500	mg/l	-	40	-	-	60-140	40	NA
NWTPH-Dx	2-FBP			Surrogate	50-150	-	-	-	-	-	321-60-8
NWTPH-Dx	Octacosane			Surrogate	50-150	-	-	-	-	-	630-02-4
Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method											
WA MTCA-EPH	C8-C10 Aliphatics	0.532	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C10-C12 Aliphatics	1.90	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C12-C16 Aliphatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C16-C21 Aliphatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C21-C34 Aliphatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C8-C10 Aromatics	20.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C10-C12 Aromatics	1.44	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C12-C16 Aromatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C16-C21 Aromatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	C21-C34 Aromatics	10.0	50.0	ug/l	-	-	-	-	-	-	NA
WA MTCA-EPH	Extractable Petroleum Hydrocarbons		50.0	ug/l	-	40	70-130	25	70-130	25	NA
WA MTCA-EPH	2-FBP			Surrogate	60-140	-	-	-	-	-	321-60-8
WA MTCA-	Octacosane			Surrogate	60-140	-	-	-	-	-	630-02-4

Table 4
Laboratory QA/QC Acceptance Criteria

Method	Analyte	MDL	MRL	Units	% R	RPD	Surr.% R	DUP RPD	% R	Matrix Spike RPD	CAS #
EPH											
WA MTCA-EPH	Undecane			Surrogate	60-140	-	-	-	-	-	1120-21-4
Polynuclear Aromatic Hydrocarbons by GC/MS-SIM											
8270-SIM	Benzo (a) anthracene	0.0310	0.100	ug/l	-	-	50-150	25	50-150	25	56-55-3
8270-SIM	Benzo (a) pyrene	0.0240	0.100	ug/l	-	-	50-150	25	50-150	25	50-32-8
8270-SIM	Benzo (b) fluoranthene	0.0490	0.100	ug/l	-	-	50-150	25	50-150	25	205-99-2
8270-SIM	Benzo (k) fluoranthene	0.0310	0.100	ug/l	-	-	50-150	25	50-150	25	207-08-9
8270-SIM	Chrysene	0.0360	0.100	ug/l	-	-	50-150	25	50-150	25	218-01-9
8270-SIM	Dibenz (a,h) anthracene	0.0340	0.100	ug/l	-	-	50-150	25	50-150	25	53-70-3
8270-SIM	Indeno (1,2,3-cd) pyrene	0.0240	0.100	ug/l	-	-	50-150	25	50-150	25	193-39-5
8270-SIM	1-Methylnaphthalene	0.0240	0.100	ug/l	-	-	50-150	25	50-150	25	90-12-0
8270-SIM	2-Methylnaphthalene	0.0310	0.100	ug/l	-	-	50-150	25	50-150	25	91-57-6
8270-SIM	Naphthalene	0.0430	0.100	ug/l	-	-	50-150	25	50-150	25	91-20-3
8270-SIM	p-Terphenyl-d14			Surrogate	30-150	-	-	-	-	-	1718-51-0
BTEX, MTBE, Naphthalene, and n-Hexane by WA VPH											
EPA 8260B	Methyl tert-butyl ether	0.256	5.00	ug/l	-	-	-	-	-	-	1634-04-4
EPA 8260B	Benzene	0.281	5.00	ug/l	-	-	75-125	20	80-120	20	71-43-2
EPA 8260B	Toluene	0.982	5.00	ug/l	-	-	72-125	20	80-120	20	108-88-3
EPA 8260B	Ethylbenzene	0.328	5.00	ug/l	-	-	-	-	-	-	100-41-4
EPA 8260B	m,p-Xylene	1.53	5.00	ug/l	-	-	-	-	-	-	1330-20-7
EPA 8260B	o-Xylene	0.463	5.00	ug/l	-	-	-	-	-	-	95-47-6
EPA 8260B	Naphthalene	0.914	5.00	ug/l	-	-	-	-	-	-	91-20-3
EPA 8260B	n-Hexane	0.387	5.00	ug/l	-	-	-	-	-	-	110-54-3
EPA 8260B	1,2-DCA-d4			Surrogate	60-140	-	-	-	-	-	17060-07-0

Table 4
Laboratory QA/QC Acceptance Criteria

Method	Analyte	MDL	MRL	Units	% R	RPD	Surr.% R	DUP RPD	% R	Matrix Spike RPD	CAS #
EPA 8260B	Toluene-d8			Surrogate	60-140	-	-	-	-	-	2037-26-5
EPA 8260B	4-BFB			Surrogate	60-140	-	-	-	-	-	460-00-4

Appendix A

Bioassay Test Standard Operating Procedures (SOPs)

I. SAMPLE RECEIPT PROCEDURES

1.0 A. EFFLUENT SAMPLES

1. Open the cooler or container and identify its contents.
2. Carefully review the chain-of-custody (COC) form(s), taking note of any discrepancies between requested testing and scheduled testing. Notify the lab supervisor of conflicting information and record discrepancies on the COCs in the "Comments" section. If no tests are specified, fill them in according to scheduled testing, and initial next to them to indicate that this part of the COC was completed by laboratory personnel, and not by the client.
3. Measure the temperature of the sample and record on the COC(s). Samples must be within acceptable ranges as follows:

- Grab samples received within 1 hour of collection – less than 20°C
- Samples received within 4 hours of collection – less than 12°C
- Samples received after 4 hours of collection but within 36 hour holding time – less than 8°C.

4. If sample receipt temperatures are outside acceptable ranges notify the project manager.
5. Check to see if any subsamples are required for in-house chemical analyses (e.g. ammonia), or off-site chemical analyses (e.g. metals).
6. Sign the COC(s), and be sure to record the date and time as well.
7. Note sample condition and number of containers where requested.
8. Assign an AMEC sample number from the sample receipt and disposal logs and record on the associated COC form.
9. File COC(s) in the appropriate client folder.
10. Label container and cap with appropriate sample identification information and date of receipt (i.e. client, sample ID, date, and sample 1, 2, or 3).
11. Measure the pH, dissolved oxygen (DO), salinity or conductivity, hardness (if applicable), alkalinity, total chlorine and free chlorine (if necessary). Make necessary adjustments and record information in the sample receipt log.

    Note: Hardness is recorded in freshwater samples only (salinity of <3). Free chlorine is measured only if the total chlorine is greater than 0.1 mg/L.
12. Record sample description including matrix, color, odor, and particulate information (codes are located on the wall at the check-in station).
13. **Fill out the sample check-in and data pathway sheets that are in the client folder with all relevant information.**

Note: If time does not allow completion of entire sample check-in procedure immediately upon receipt of the sample, record temperature reading and review COC. Place the sample in the 4°C room until check-in procedures can be completed.

B. Sediment Samples

1. Measure the temperature in each cooler and record in the sediment receipt and disposal log.
2. Ensure that all sediment samples are clearly labeled and match the sample IDs on the COC(s).
3. Clearly label the outside of any cooler containing test sediments with the client name, project ID, and the date of receipt.
4. Place the samples in the 4°C room until needed for testing.

2.0 C. DANGEROUS WASTE MATERIAL (WA 80-12) SAMPLES

1. Record the sample receipt date, client name, sample ID, and technician initials in the Dangerous Waste sample receipt log book. This logbook is separate from the effluent sample logbook!
2. No physical or chemical measurements are required.
3. Store the sample in the locked refrigerator designated for hazardous material until needed for test initiation.
4. If the sample does not appear on the schedule, notify Lab Supervisor of receipt.

Sample Holding Times

A. Effluent Samples

All effluent tests must be initiated within 36 hours of sample collection time. The sample then may be used for renewals for up to 72 hours after the time of sample collection.

B. Sediment, Soil, and Dredge Material Samples

Holding times for sediment and soil samples are project specific, typically ranging from two to eight weeks. The holding time for dredge material projects is eight weeks.

C. Dangerous Waste Samples

Dangerous waste samples should be extracted within 7 days of sample receipt and tested within 8 days of sample receipt (WDOE 80-12, p.A-38).

Sample Disposal Procedures

A. Effluent Samples

1. Effluent samples that are out of holding time will be disposed of each Monday, unless the client has requested storage of the sample for future chemical or TIE analyses.
2. The Lab Supervisor or Manager will place a check mark next to the samples that are OK for disposal in the effluent sample disposal log.
3. Remove all of the samples that are cleared for disposal from the 4ºC-storage room and place next to the sink.
4. Double-check all labels and make sure that only the samples cleared for disposal have been removed from storage.
5. Cut each cubitainer with a razor blade and pour contents down the sink while the water is running; be sure to wear gloves!
6. Throw all of the emptied and slashed cubitainers out with the regular trash.
7. Fill out the effluent sample disposal log with the date of disposal, method of disposal (sink), and technician initials.

B. Sediment, Soil, and Dredge Material Samples

1. Sediments will be held for up to 90 days past the date the project report was issued.
2. Once this holding time is passed and disposal has been cleared with the client, check the sediment receipt/disposal log to determine the method of disposal.
    a. If the tests conducted on the sample passed all test acceptability criteria, the sample material can be disposed of in the regular trash.
    b. If the tests conducted on the sample failed any of the test acceptability criteria, the sample is classified as hazardous material and must be disposed of in the blue 55-gallon drum in the sediment preparation room.

       Note: For some materials (usually port dredge material), it may be OK to dispose of toxic material in the regular trash if it passes chemical concentration threshold criteria.
3. Record the method and date of disposal, as well as technician initials in the sediment receipt and disposal log.

C. Dangerous Waste Samples

1. If the tests conducted on the sample passed all test acceptability criteria, the sample material can be disposed of in the regular trash.

2. If the tests conducted on the sample failed any of the test acceptability criteria, the sample is classified as hazardous material and must be shipped back to the client. The client will then incur the cost of proper disposal.
3. Record the method and date of disposal, as well as technician initials in the WDOE 80-12 sample receipt and disposal log.

Health and Safety

Health and safety precautions and applicable regulations should be considered at all times. Gloves must always be worn when handling samples.

Personnel

Only qualified technicians who have been properly trained and can demonstrate competency with these techniques are permitted to handle samples.

I. PURPOSE

This method estimates the chronic toxicity of whole effluents and receiving waters to the topsmelt *Atherinops affinis* in a 7-day chronic bioassay. Test results are based on survival and growth (final mass) of the larvae.

3.0 SUMMARY OF TEST PROCEDURE

- 5 replicates/concentration
- 6 fish/replicate
- Age of fish: 9-15 days post hatch
- 1-liter test container
- 500 ml solution/container
- 20º C
- 30 ppt
- Feed *Artemia* twice per day
- Highest concentration for ref. tox.: 600 µg/L Cu

4.0 EQUIPMENT/SUPPLIES

- Environmental chamber maintained at 20±1°C and refrigerator at 4°C
- Thermometer, pH meter, dissolved oxygen meter, refractometer, drying oven, and balance
- *Atherinops affinis* larvae 9-15 days old
- Brine shrimp (*Artemia* cysts)
- Clear covers to prevent contamination of test chambers
- 1-L and 2-L flasks
- 1-L test containers
- Graduated cylinders
- Deionized water and high-quality synthetic sea salt for seawater preparation
- Safety equipment - lab coats, eye protection, gloves and respirator as required
- $CuCl_2$ for reference toxicant testing

III. PROCEDURE

A. Pre-test Set up

1. Test animals are purchased from a reputable dealer and shipped via overnight delivery service to the Bioassay Lab.

2. The test animals are acclimated to test temperature and fed *Artemia* nauplii during holding. Test animals are between nine and fifteen days old at test initiation.

B. Test Initiation

1. Samples are checked in upon receipt. See procedural SOP for details on routine sample check-in procedures. Samples are stored in a refrigerator at 4°C until needed for testing. Tests are initiated within 36 hours of sample collection. Check with laboratory supervisor for client-specific differences.

2. Record sample description with matrix, color, odor, and particulate information.

3. Measure chlorine content, alkalinity, and any adjustments made to the control, receiving and sample waters and record on the data sheets.

4. Prepare a randomization sheet using the **TOXCALC** database software or Excel. See procedural SOP for details on randomization sheet preparation.

5. Measure salinity of sample and adjust salinity to 30 ppt using 40 Fathoms artificial seasalt. Stir sample on magnetic stir plate for a minimum of one hour after adding salt. Check salinity again and adjust to 30 ppt as needed.

6. Prepare dilutions according to test specific concentrations. Concentrations are directed by permit language. Bioassays that require a 0.5 dilution series are serially diluted. All other concentrations must be measured with graduated cylinders and pipettes.

7. Warm each dilution to 20 ± 1°C.

8. Measure and record water quality parameters for each test concentration. Water quality parameters include pH, DO, salinity, and temperature.

9. Label test containers according to the randomization sheet.

10. Distribute 500 ml of each test solution into each of five properly labeled test containers.

11. Randomly distribute 6 topsmelt larvae to each test container and place the test containers in the 20°C environmental chamber in randomized order.

12. Add food to each test chamber. See procedural SOP for specifications on hatching *Artemia* cysts to use as a food source. Collect 10 milliliters of concentrated hatched *Artemia* nauplii, rinse with deionized water and add to 200 ml of seawater. Add 1 ml of diluted *Artemia* to each test chamber.

C. Daily Monitoring

1. Animals are fed twice daily. See step 12 above for feeding procedures.

2. Adjust sample salinity to 30 ppt using 40 Fathoms artificial seasalt. Stir sample on magnetic stir plate for a minimum of one hour after adding salt. Check salinity again and adjust to 30 ppt as needed.

3. Prepare dilutions according to test specific concentrations and warm to 20 ± 1°C.

4. To renew the tests, siphon 80% of the test solution removing excess food, dead animals and debris from the bottom. Save a composite sample from each concentration.

5. Count and record number of surviving fish.

6. Gently pour the new test solution down the side of each test chamber to avoid subjecting the larvae to excessive turbulence.

7. Measure and record water quality parameters (pH, DO, salinity, and temperature) from the composite samples saved from step 3.

D. Test Termination

1. Fish are not fed on the day of test termination.

2. Count and record the number of surviving fish.

8. Each test container is drained through a 500 µm mesh screen to collect surviving larvae. Save a composite sample from each concentration. The animals are rinsed with deionized water, and then sacrificed by dipping the screen containing the larvae into an ice bath.

9. Using forceps, gently transfer the larvae onto pieces of aluminum foil that have been dried at 105 °C for a minimum of 6 hours or 60 °C for 24 hours and tared. See procedural SOP for specifications on weighing procedures.

10. Dry the larvae at 60°C for 24 hours or at 105°C for at least 6 hours.

11. Transfer dried larvae to a desiccator and let cool for at least 2 hours. Weigh to the nearest 0.00001g and record on the data sheet.

IV. TEST ACCEPTABILITY CRITERIA

1. Control survival at test termination must be 80 percent or greater.

2. The mean weight per larvae must exceed 0.85 mg per fish in the reference and brine controls.

3. The LC_{50} for survival must be within two standard deviations of the control chart mean for the laboratory. The LC_{50} for the survival with copper must be ≤205 µg/L.

4. There must be a minimum significant difference (MSD) of <25% relative to the control for the survival for the reference toxicant test. There must be a MSD of <50% relative to the controls for growth for the reference toxicant test.

V. HEALTH AND SAFETY

Health and safety precautions and applicable regulations should be considered at all times. Gloves should always be worn when handling effluents.

VI. PERSONNEL

Only qualified technicians who have been properly trained and can demonstrate competency with these techniques are permitted to conduct this test.

VII. QUALITY ASSURANCE REQUIREMENTS

Quality assurance practices encompass all aspects of testing including the collection, handling, and preparation of test organisms, samples, and dilution waters. Proper record keeping is required, and concentrated efforts are made for complete documentation on a real-time basis.

VIII. Reference

"Short-Term Method for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms." EPA/600/R-95/136, August 1995.

I. PURPOSE

This method estimates the chronic toxicity of whole effluents and receiving water to the cladoceran *Ceriodaphnia dubia*. Test results are based on survival and reproduction.

II. SUMMARY OF TEST PROCEDURE

- 10 replicates per concentration
- One neonate per replicate
- Age: <24hours old, all within 8 eight hours of each other with known parentage
- 30 ml test container
- 15 ml solution per container
- 25°C
- Fed 100 µl YTC and 100 µl Selenastrum daily
- Highest concentration for reference toxicant test: 4 g/L NaCl

III. EQUIPMENT/SUPPLIES

- Environmental chamber maintained at 25 ± 1°C with timer-controlled ambient lighting and a cold room at 4 ± 1°C
- Thermometer, pH meter, dissolved oxygen meter, and conductivity meter for routine physical and chemical measurements
- $CuCl_2$ or NaCl for reference toxicant testing
- *Ceriodaphnia dubia* cultures
- Balance - analytical, capable of weighing accurately to 0.01 mg
- Test chambers - ten 30-mL disposable plastic test chambers per concentration and control
- Numbered "cerio boards" for holding test chambers
- Clear covers to prevent contamination of test chambers
- 1–L and 400-mL beakers for test solution preparation
- Graduated cylinders, 10-mL and 1-mL disposable pipets
- Yeast/Trout chow/Chlorophyll (YTC) and *Selenastrum* suspension to feed animals
- Dissecting microscope with substage lighting

- Safety equipment - lab coats, eye protection, gloves, and respirators as required

III. PROCEDURE

A. Pre-test Set up

1. Test animals are purchased from a reputable dealer and cultured in the laboratory.

2. A brood board is prepared 7 days prior to test initiation. Sixty neonates are pulled from adults that have produced at least eight young in their third or fourth brood. Each neonate is placed in a 30 ml cup with 15ml DMW (dilute mineral water) and is fed 100 µl each of *Selenastrum* and vitamin-enriched YTC. Daily transfer and feeding of neonates is performed and reproduction is recorded on a brood board sheet.

3. On the day of test initiation, the brood board is checked for reproduction. Only neonates from females that have produced at least 20 neonates in three broods are used. The brood on the day of test initiation must consist of at least 8 neonates (<24 hour old). Each test must use neonates within an 8-hour age range.

5.0 B. TEST INITIATION

1. Samples are checked in upon receipt. See procedural SOP for details on routine sample check-in procedures. Routinely, tests must be initiated within 36 hours of sample collection. Check with laboratory supervisor for client-specific differences.

2. Record a brief sample description with matrix, color, odor, and particulate information on the data sheet.

3. Measure residual chlorine concentration, hardness, alkalinity, ammonia, and any adjustments made to the control, receiving, and sample waters. Record on the data sheet.

4. Prepare dilutions according to test specific concentrations. Concentrations are directed by permit language. Bioassays requiring a 0.5 dilution series are serially diluted. All other concentrations must be measured with graduated cylinders and pipettes.

5. Measure and record physical and chemical parameters in all concentrations. Water quality measurements include pH, dissolved oxygen, conductivity, and temperature.

6. Warm each dilution to 25±1°C.

7. Prepare a randomization sheet from the TOXCALC database software. See procedural SOP for details.

7. Obtain a numbered "cerio board" and place the appropriate number of cups on the board (10 cups/concentration and control). Number the cups based on the randomization sheet.

8. Distribute 100 µl each of *Selenastrum* and vitamin-enriched YTC to each test chamber.

9. Distribute approximately 15 mL of the appropriate test solution into each of the ten test containers.

10. Into each test container place one neonate (hereafter referred to as the Alpha organism). Use neonates from the same adult for the same replicate for each concentration. For instance Replicate 1 for all concentrations will receive a neonate from one adult that has produced a third brood of eight or more neonates.

11. Place the test "cerio board" in the 25°C environmental chamber and cover.

C Daily Monitoring

1. Each successive day of the test prepare new test solutions, warm to 25±1°C, and distribute to new numbered test containers. Distribute 100 µL of each food to each test container.

2. View test containers from the previous day's renewal under a dissecting scope. Count and record the number of neonates and the survival status of the Alpha organism. Remove the Alpha organism with a wide bore transfer pipette, and place in the corresponding cup containing renewed solution.

3. Composite and save the test solution from each concentration for final water quality measurements.

4. Measure and record chemical and physical parameters (pH, DO, conductivity, and temperature) of the composite samples.

D. Test Termination

1. View each test container under the dissecting scope. Count and record the number of neonates and the survival status of the Alpha organism.

2. If control survival is greater than or equal to 80 percent and 60 percent of surviving females are in their third brood with an average total number of 15 or more offspring per surviving adult, the test is terminated. If the test is terminated on day 6, the animals are maintained until day 7 for the purpose of evaluating final survival status of each organism.

3. Composite and save the test solution from each concentration for final water quality measurements.

4. Measure and record chemical and physical parameters (pH, DO, conductivity, and temperature) of the composite samples.

IV. TEST ACCEPTABILITY CRITERIA

This is not a time-dependent test although extension or shortening of more than one day may indicate problems and should prompt close examination of test procedures and animal condition. The acceptability criteria for test termination are the following:

- 80% survival in the controls (including males)
- 60% of surviving females reaching at least three broods
- An average total number of 15 or greater offspring per surviving female

In addition, a valid reference toxicant test with a logical dose response curve should be obtained, using animals from the same batch.

V. HEALTH AND SAFETY

Health and safety precautions and applicable regulations should be considered at all times. Gloves should always be worn when handling effluents.

VI. PERSONNEL

Only qualified technicians who have been properly trained and can demonstrate competency with these techniques are permitted to conduct this test.

VII. QUALITY ASSURANCE REQUIREMENTS

Quality assurance practices encompass all aspects of testing including the collection, handling, and preparation of test organisms, samples, and dilution waters. Proper record keeping is required and concentrated efforts are made for complete documentation on a real-time basis.

VIII. REFERENCE

USEPA. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013.

I. PURPOSE

This method estimates the chronic toxicity of whole effluents and receiving water to the fathead minnow *Pimephales promelas* in a seven day static-renewal test. Test results are based on the survival and growth (final mass) of the larvae.

II. SUMMARY OF TEST PROCEDURE

- 4 replicates per concentration
- 10 fish per replicate
- Fathead minnows, <24 hours old
- 500 ml test container
- 250 ml test volume
- 25°C
- Daily renewals
- Feed artemia twice
- Highest concentration of ref.tox: 8 g/L NaCl

III. EQUIPMENT/SUPPLIES

- Environmental chamber maintained at 25±1°C and cold room at 4°C
- Thermometer, pH meter, dissolved oxygen meter, and conductivity meter for routine physical and chemical measurements
- $CuCl_2$ or Nacl for reference toxicant testing
- Fathead minnows, <24 hours old
- Brine shrimp (*Artemia* cysts)
- Balance - analytical, capable of weighing accurately to 0.01 mg
- Test chambers - four 500-mL disposable plastic test chambers per concentration and control
- Clear covers to prevent contamination of test chambers
- Light table for counting the number of surviving larvae
- 2-L and 1-L beakers for solution preparation
- Graduated cylinders

- 1- and 10-mL pipets
- Siphons for test renewal
- Deionized water and chemicals for making Moderately Hard Synthetic Water
- Safety equipment - lab coats, eye protection, gloves, and respirators as required

IV. PROCEDURE

A. Pre-test Set up

1. Laboratory control water is prepared 24 hours (minimum) to 14 days (maximum) prior to testing. See procedural SOP for specifications on preparation of Moderately Hard Synthetic Water (MHSW).

2. Set up *Artemia* cysts for hatching 24 hours prior to testing. See procedural SOP or specifics on the preparation and harvesting of Artemia.

3. Fish larvae are purchased from a reputable dealer and shipped via overnight delivery to the bioassay laboratory. The larvae are acclimated to testing temperature (25 ± 1°C) upon receipt and fed *Artemia* nauplii during transport and holding. Immediately prior to testing, place ten larvae at random in individual 30-mL polystyrene cups filled with control water.

B. Test Initiation

1. Samples are checked in upon receipt. See procedural SOP for details on routine sample check-in procedures. Tests must be initiated within 36 hours of sample collection. Check with laboratory supervisor for project-specific differences.

2. Record sample description with matrix, color, odor, and particulate information on the data sheet.

3. Measure chlorine content, hardness, alkalinity, ammonia, and any adjustments made to the control, receiving, and sample waters and record on the data sheet.

4. Prepare a randomization sheet using the TOXCALC database software or Excel. See procedural SOP for details on randomization sheet preparation.

5. Prepare 1.0 L of each test concentration and control water. Prepare dilutions according to test specific concentrations. Concentrations are directed by permit language. Bioassays

which require a 0.5 dilution series are serially diluted. All other concentrations must be measured with graduated cylinders and pipettes.

6. Warm each dilution to 25±1°C.

7. Measure and record physical and chemical parameters in each concentration. Parameters are pH, dissolved oxygen, conductivity, and temperature.

8. Distribute 250 mL of the test solutions into each of four properly labeled test containers. Add fish from step A.3 above.

9. Place the test containers in the 25°C environmental chamber.

10. Feed animals in each test container. See procedural SOP for specifications on feeding.

C. Daily Monitoring

1. Animals are fed twice per day. See procedural SOPs for feeding specifics.

2. Follow steps 4-6 under section III-B.

3. To renew the tests, siphon test solution leaving 15-20% of the original volume. Save a composite sample from the control, middle, and high concentrations. Excess food, dead animals and debris should be cleaned from the bottom using a disposable transfer pipet.

4. Count and record the number of surviving fish.

5. Gently pour the new test solution down the side of each test chamber to avoid subjecting the larvae to excessive turbulence.

6. Measure chemical and physical parameters (pH, DO, conductivity, and temperature) of the composite samples. Record in the appropriate column on the data sheets.

D. Test Termination

1. Fish are not fed on termination day.

2. Count and record the number of surviving fish.

3. Each test container is drained through a 35-µm mesh screen to collect surviving larvae. A composite sample is saved from each concentration for measurement of chemical and

physical parameters. The fish are rinsed with deionized water, placed into a tared weighing pan with forceps, and dried at 60°C for 24 hours. See procedural SOP for specifications on weighing procedures.

V. TEST ACCEPTABILITY CRITERIA

Control survival at test termination must be 80 percent or greater and the final mass per test animal must meet or exceed 0.25 mg for test results to be considered acceptable.

VI. HEALTH AND SAFETY

Health and safety precautions and applicable regulations should be considered at all times. Gloves should always be worn when handling effluents.

VII. PERSONNEL

Only qualified technicians who have been properly trained and can demonstrate competency with these techniques are permitted to conduct this test.

VIII. QUALITY ASSURANCE REQUIREMENTS

Quality assurance practices encompass all aspects of testing including the collection, handling, and preparation of test organisms, samples, and dilution waters. Proper record keeping is required and concentrated efforts are made for complete documentation on a real-time basis.

IX. REFERENCE

USEPA. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013.

6.0 PURPOSE

This method estimates the chronic toxicity of whole effluents and receiving waters to the opossum shrimp *Mysidopsis bahia* in a 7-day chronic bioassay. Test results are based on survival and growth.

II. SUMMARY OF TEST PROCEDURE

- 8 replicates/concentration
- 5 mysid/replicate
- Age of mysid: 7 days
- 250 ml test container
- 200 ml solution/container
- 26 ±1° C
- 30 ppt
- Feed artemia twice per day
- Highest concentration for ref. tox.: 600 µg/L Cu

III. EQUIPMENT/SUPPLIES

- Environmental chamber maintained at 26 ± 1°C and refrigerator at 4.0°C
- Thermometer, pH meter, dissolved oxygen meter, refractometer, drying oven, and balance
- *Mysidopsis bahia* juveniles, 7 days old
- Clear covers to prevent contamination of test chambers
- *Artemia* cysts for feeding test animals
- Light table for counting surviving mysids
- 250-mL test containers
- 2-L flasks
- Graduated cylinders
- Deionized water and high-quality synthetic sea salt for seawater preparation
- $CuCl_2$ for reference toxicant testing
- Safety equipment - lab coats, eye protection, gloves and respirator as required

III. PROCEDURE

A. Pre-test Set up

1. Test animals of the appropriate age are purchased from a reputable dealer and shipped via overnight delivery service to the Bioassay Lab.

2. The test animals are acclimated to test temperature and fed *Artemia* nauplii during holding. Test animals are seven days old at test initiation.

B. Test Initiation

1. Samples are checked in upon receipt. See procedural SOP for details on routine sample check-in procedures. Samples are stored in a refrigerator at 4°C until needed for testing. Tests are initiated within 36 hours of sample collection. Check with laboratory supervisor for client-specific differences.

2. Record sample description with matrix, color, odor, and particulate information.

3. Measure chlorine content, alkalinity, and any adjustments made to the control, receiving and sample waters and record on the data sheets.

4. Prepare a randomization sheet using the **TOXCALC** database software or Excel. See procedural SOP for details on randomization sheet preparation.

5. Measure salinity of sample and adjust salinity to 30 ppt using 40 Fathoms artificial seasalt. Stir sample on magnetic stir plate for a minimum of one hour after adding salt. Check salinity again and adjust to 30 ppt as needed.

6. Prepare dilutions according to test-specific concentrations. Concentrations are directed by permit language. Bioassays that require a 0.5 dilution series are serially diluted. All other concentrations must be measured with graduated cylinders and pipettes.

7. Warm each dilution to 26 ± 1°C.

8. Measure and record water quality parameters for each test concentration. Water quality parameters include pH, DO, salinity, and temperature.

9. Label test containers according to the randomization sheet.

10. Distribute dilutions to test chambers (8 reps per concentration; 150 mL test volume per replicate).

11. Randomly distribute 5 mysid larvae to each test chamber and place the test containers in the 26°C environmental chamber in randomized order.

12. Add food to each test chamber. See procedural SOP for specifications on hatching *Artemia* cysts to use as a food source. Collect 10 milliliters of concentrated hatched *Artemia*

nauplii, rinse with deionized water and add to 200 ml of seawater. Add 1 ml of diluted *Artemia* to each test chamber.

C. Daily Monitoring

1. Animals are fed twice daily. See step 12 above for details on feeding procedures.

3. Adjust sample salinity to 30 ppt using 40 Fathoms artificial seasalt. Stir sample on magnetic stir plate for a minimum of one hour after adding salt. Check salinity again and adjust to 30 ppt as needed.

2. Prepare dilutions according to test specific concentrations and warm to 26 ± 1°C.

3. To renew the tests, siphon 80% of the test solution removing excess food, dead animals and debris from the bottom. Save a composite sample from each concentration.

4. Count and record the number of surviving mysids.

5. Gently pour the new test solution down the side of each test chamber to avoid subjecting the mysids to excessive turbulence.

6. Measure and record water quality parameters (pH, D.O., salinity, and temperature) from the composite samples saved from step 3 above.

D. Test Termination

1. Mysids are not fed on the day of test termination.

2. Count and record the number of surviving mysids.

3. Each test container is drained through a 35 µm mesh screen to collect surviving mysid and rinsed with deionized water. Save a composite sample from each concentration for measurement of water quality parameters.

4. Using forceps, gently place the mysid on an appropriately labelled and tared piece of aluminum foil that has been dried at 105°C for at least 6 hours or 60°C for 24 hours. See procedural SOP for specifications on weighing procedures.

5. Dry the mysid at 60°C for 24 hours or at 105°C for at least 6 hours.

6. Transfer dried mysids to a desiccator and let cool for at least 2 hours. Weigh to the nearest 0.00001g and record on the data sheet.

IV. TEST ACCEPTABILITY CRITERIA

Control survival at test termination must be 80% or greater and the average dry weight of the control juveniles must be equal to or greater than 0.20 mg/mysid.

V. HEALTH AND SAFETY

Health and safety precautions and applicable regulations should be considered at all times. Gloves should always be worn when handling effluents.

VI. PERSONNEL

Only qualified technicians who have been properly trained and can demonstrate competency with these techniques are permitted to conduct this test.

VII. QUALITY ASSURANCE REQUIREMENTS

Quality assurance practices encompass all aspects of testing including the collection, handling, and preparation of test organisms, samples, and dilution waters. Proper record keeping is required, and concentrated efforts are made for complete documentation on a real-time basis.

VIII. REFERENCE

"Short-Term Method for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms." EPA/600/4-91/003, July 1994.

Appendix B
North Creek Analytical
Sample Analysis Report

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13 June 2003

Mark Dagel
SAIC - Bothell
18706 North Creek Parkway, Ste 110
Bothell, WA/USA 98011

RE: Unocal Groundwater Study

Enclosed are the results of analyses for samples received by the laboratory on 05/29/03 18:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kortland Orr For Jeanne Garthwaite
Project Manager

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-146	B3E0727-01	Water	05/28/03 09:35	05/29/03 18:00
MW-7	B3E0727-02	Water	05/28/03 09:36	05/29/03 18:00
MW-17	B3E0727-03	Water	05/28/03 13:25	05/29/03 18:00
MW-103R	B3E0727-04	Water	05/28/03 17:00	05/29/03 18:00
MW-129	B3E0727-05	Water	05/28/03 15:20	05/29/03 18:00
MW-W	B3E0727-06	Water	05/28/03 19:40	05/29/03 18:00
Trip Blank	B3E0727-07	Water	05/28/03 12:00	05/29/03 18:00

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX by NWTPH-G and EPA 8021B

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
Gasoline Range Hydrocarbons	**3490**	250	ug/l	5	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	**983**	12.5	"	25	"	"	06/04/03	"	
Toluene	**21.8**	2.50	"	5	"	"	06/04/03	"	
Ethylbenzene	**355**	2.50	"	"	"	"	"	"	
Xylenes (total)	**43.7**	5.00	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*112 %*	*62-127*			"	"	"	"	
Surrogate: 4-BFB (PID)	*129 %*	*72-127*			"	"	"	"	*S-04*
MW-7 (B3E0727-02) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									**Q-34**
Gasoline Range Hydrocarbons	**623**	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	**24.5**	0.500	"	"	"	"	"	"	
Toluene	**4.17**	0.500	"	"	"	"	"	"	
Ethylbenzene	**59.4**	0.500	"	"	"	"	"	"	
Xylenes (total)	**62.6**	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*128 %*	*62-127*			"	"	"	"	*S-04*
Surrogate: 4-BFB (PID)	*131 %*	*72-127*			"	"	"	"	*S-04*
MW-17 (B3E0727-03) Water Sampled: 05/28/03 13:25 Received: 05/29/03 18:00									**Q-34**
Gasoline Range Hydrocarbons	**80.8**	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*97.7 %*	*62-127*			"	"	"	"	
Surrogate: 4-BFB (PID)	*112 %*	*72-127*			"	"	"	"	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

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SAIC - Bothell	Project:	Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number:	[none]	**Reported:**
Bothell WA/USA, 98011	Project Manager:	Mark Dagel	06/13/03 14:50

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX by NWTPH-G and EPA 8021B

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-103R (B3E0727-04) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									
Gasoline Range Hydrocarbons	ND	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*91.7 %*	*62-127*			"	"	"	"	
Surrogate: 4-BFB (PID)	*113 %*	*72-127*			"	"	"	"	
MW-129 (B3E0727-05) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									**Q-34**
Gasoline Range Hydrocarbons	**59.4**	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	**0.684**	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	**0.535**	0.500	"	"	"	"	"	"	
Xylenes (total)	**1.26**	1.00	"	"	"	"	"	"	I-06
Surrogate: 4-BFB (FID)	*95.8 %*	*62-127*			"	"	"	"	
Surrogate: 4-BFB (PID)	*113 %*	*72-127*			"	"	"	"	
MW-W (B3E0727-06) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									**Q-34**
Gasoline Range Hydrocarbons	**56.2**	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	**2.51**	0.500	"	"	"	"	"	"	
Toluene	**0.764**	0.500	"	"	"	"	"	"	
Ethylbenzene	**0.653**	0.500	"	"	"	"	"	"	
Xylenes (total)	**2.80**	1.00	"	"	"	"	"	"	I-06
Surrogate: 4-BFB (FID)	*94.8 %*	*62-127*			"	"	"	"	
Surrogate: 4-BFB (PID)	*110 %*	*72-127*			"	"	"	"	

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX by NWTPH-G and EPA 8021B
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (B3E0727-07) Water Sampled: 05/28/03 12:00 Received: 05/29/03 18:00									
Gasoline Range Hydrocarbons	ND	50.0	ug/l	1	3F03016	06/04/03	06/04/03	NWTPH-Gx/8021 B	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	1.00	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*89.6 %*	*62-127*			*"*	*"*	*"*	*"*	
Surrogate: 4-BFB (PID)	*109 %*	*72-127*			*"*	*"*	*"*	*"*	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Volatile Petroleum Hydrocarbons by WDOE TPH Policy Method

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01) Water	**Sampled: 05/28/03 09:35**	**Received: 05/29/03 18:00**							**Q-34**
C5-C6 Aliphatics	ND	500	ug/l	10	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	**503**	500	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	500	"	"	"	"	"	"	
C10-C12 Aliphatics	ND	500	"	"	"	"	"	"	
C8-C10 Aromatics	**832**	500	"	"	"	"	"	"	
C10-C12 Aromatics	ND	500	"	"	"	"	"	"	
C12-C13 Aromatics	ND	500	"	"	"	"	"	"	
Total VPH (TVPH)	**1330**	500	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*98.1 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*92.7 %*	*60-140*			"	"	"	"	
MW-7 (B3E0727-02) Water	**Sampled: 05/28/03 09:36**	**Received: 05/29/03 18:00**							**Q-34**
C5-C6 Aliphatics	**75.7**	50.0	ug/l	1	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	**63.2**	50.0	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aliphatics	**85.4**	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	**272**	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	**172**	50.0	"	"	"	"	"	"	
C12-C13 Aromatics	**122**	50.0	"	"	"	"	"	"	
Total VPH (TVPH)	**790**	50.0	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*129 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*104 %*	*60-140*			"	"	"	"	
MW-17 (B3E0727-03) Water	**Sampled: 05/28/03 13:25**	**Received: 05/29/03 18:00**							**Q-34**
C5-C6 Aliphatics	ND	50.0	ug/l	1	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C13 Aromatics	ND	50.0	"	"	"	"	"	"	
Total VPH (TVPH)	ND	50.0	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*94.4 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*89.4 %*	*60-140*			"	"	"	"	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

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SAIC - Bothell	Project:	Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number:	[none]	**Reported:**
Bothell WA/USA, 98011	Project Manager:	Mark Dagel	06/13/03 14:50

Volatile Petroleum Hydrocarbons by WDOE TPH Policy Method
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-103R (B3E0727-04) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									**Q-34**
C5-C6 Aliphatics	ND	50.0	ug/l	1	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C13 Aromatics	ND	50.0	"	"	"	"	"	"	
Total VPH (TVPH)	ND	50.0	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*93.8 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*91.0 %*	*60-140*			"	"	"	"	
MW-129 (B3E0727-05) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									**Q-34**
C5-C6 Aliphatics	ND	50.0	ug/l	1	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C13 Aromatics	ND	50.0	"	"	"	"	"	"	
Total VPH (TVPH)	ND	50.0	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*89.2 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*89.6 %*	*60-140*			"	"	"	"	
MW-W (B3E0727-06) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									**Q-34**
C5-C6 Aliphatics	ND	50.0	ug/l	1	3F10009	06/11/03	06/11/03	WA MTCA-VPH	
C6-C8 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aliphatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	"	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C13 Aromatics	ND	50.0	"	"	"	"	"	"	
Total VPH (TVPH)	ND	50.0	"	"	"	"	"	"	
Surrogate: 4-BFB (FID)	*92.5 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB (PID)	*89.8 %*	*60-140*			"	"	"	"	

North Creek Analytical - Bothell

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**11.6**	1.25	mg/l	5	3F02012	06/02/03	06/04/03	NWTPH-Dx	
Lube Oil Range Hydrocarbons	ND	2.50	"	"	"	"	"	"	
Surrogate: 2-FBP	*89.3 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*63.2 %*	*50-150*			"	"	"	"	
MW-7 (B3E0727-02) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**1.59**	0.250	mg/l	1	3F02012	06/02/03	06/05/03	NWTPH-Dx	
Lube Oil Range Hydrocarbons	ND	0.500	"	"	"	"	"	"	
Surrogate: 2-FBP	*93.7 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*86.1 %*	*50-150*			"	"	"	"	
MW-17 (B3E0727-03) Water Sampled: 05/28/03 13:25 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**3.64**	0.250	mg/l	1	3F02012	06/02/03	06/04/03	NWTPH-Dx	
Lube Oil Range Hydrocarbons	**0.732**	0.500	"	"	"	"	"	"	D-10
Surrogate: 2-FBP	*91.1 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*88.1 %*	*50-150*			"	"	"	"	
MW-103R (B3E0727-04) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**7.26**	1.25	mg/l	5	3F02012	06/02/03	06/05/03	NWTPH-Dx	
Lube Oil Range Hydrocarbons	ND	2.50	"	"	"	"	"	"	
Surrogate: 2-FBP	*74.5 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*65.8 %*	*50-150*			"	"	"	"	
MW-129 (B3E0727-05) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**9.33**	1.25	mg/l	5	3F02012	06/02/03	06/05/03	NWTPH-Dx	D-06
Lube Oil Range Hydrocarbons	**2.53**	2.50	"	"	"	"	"	"	D-06
Surrogate: 2-FBP	*65.9 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*90.1 %*	*50-150*			"	"	"	"	

SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up)
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-W (B3E0727-06) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									
Diesel Range Hydrocarbons	**7.79**	0.500	mg/l	2	3F02012	06/02/03	06/05/03	NWTPH-Dx	
Lube Oil Range Hydrocarbons	**1.03**	1.00	"	"	"	"	"	"	
Surrogate: 2-FBP	*88.0 %*	*50-150*			"	"	"	"	
Surrogate: Octacosane	*74.7 %*	*50-150*			"	"	"	"	

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SAIC - Bothell 18706 North Creek Parkway, Ste 110 Bothell WA/USA, 98011	Project: Unocal Groundwater Study Project Number: [none] Project Manager: Mark Dagel	**Reported:** 06/13/03 14:50

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
C8-C10 Aliphatics	**55.9**	50.0	ug/l	1	3F02015	06/02/03	06/09/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**50.5**	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	**372**	50.0	"	"	"	"	06/09/03	"	
C10-C12 Aromatics	**334**	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	**290**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	**98.1**	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**1200**	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*68.0 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*69.5 %*	*60-140*			"	"	*06/09/03*	"	
Surrogate: Undecane	*58.5 %*	*60-140*			"	"	"	"	*X*
MW-7 (B3E0727-02) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
C8-C10 Aliphatics	**88.5**	50.0	ug/l	1	3F02015	06/02/03	06/09/03	WA MTCA-EPH	
C10-C12 Aliphatics	**59.3**	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	**55.0**	50.0	"	"	"	"	06/09/03	"	
C10-C12 Aromatics	**58.2**	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	**91.4**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	**50.4**	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**403**	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*66.9 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*92.8 %*	*60-140*			"	"	*06/09/03*	"	
Surrogate: Undecane	*57.5 %*	*60-140*			"	"	"	"	*X*

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Kortland Orr For Jeanne Garthwaite, Project Manager

SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-17 (B3E0727-03) Water Sampled: 05/28/03 13:25 Received: 05/29/03 18:00									
C8-C10 Aliphatics	ND	50.0	ug/l	1	3F02015	06/02/03	06/09/03	WA MTCA-EPH	
C10-C12 Aliphatics	**76.1**	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	**266**	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	**334**	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**151**	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	06/09/03	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	**78.0**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	**208**	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	**147**	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**1260**	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*74.5 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*91.1 %*	*60-140*			"	"	*06/09/03*	"	
Surrogate: Undecane	*71.0 %*	*60-140*			"	"	"	"	
MW-103R (B3E0727-04) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									
C8-C10 Aliphatics	ND	50.0	ug/l	1	3F02015	06/02/03	06/09/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	ND	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	06/09/03	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	ND	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	ND	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	ND	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*73.0 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*87.3 %*	*60-140*			"	"	*06/09/03*	"	
Surrogate: Undecane	*66.6 %*	*60-140*			"	"	"	"	

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-129 (B3E0727-05) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									
C8-C10 Aliphatics	ND	50.0	ug/l	1	3F02015	06/02/03	06/10/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	**182**	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	**578**	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**225**	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	06/09/03	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	**80.6**	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	**332**	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	**262**	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**1660**	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*73.8 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*88.9 %*	*60-140*			"	"	*06/10/03*	"	
Surrogate: Undecane	*66.8 %*	*60-140*			"	"	"	"	
MW-W (B3E0727-06) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									
C8-C10 Aliphatics	ND	50.0	ug/l	1	3F02015	06/02/03	06/10/03	WA MTCA-EPH	
C10-C12 Aliphatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aliphatics	**59.7**	50.0	"	"	"	"	"	"	
C16-C21 Aliphatics	**110**	50.0	"	"	"	"	"	"	
C21-C34 Aliphatics	**72.1**	50.0	"	"	"	"	"	"	
C8-C10 Aromatics	ND	50.0	"	"	"	"	06/10/03	"	
C10-C12 Aromatics	ND	50.0	"	"	"	"	"	"	
C12-C16 Aromatics	ND	50.0	"	"	"	"	"	"	
C16-C21 Aromatics	**61.8**	50.0	"	"	"	"	"	"	
C21-C34 Aromatics	**60.7**	50.0	"	"	"	"	"	"	
Extractable Petroleum Hydrocarbons	**365**	50.0	"	"	"	"	"	"	
Surrogate: 2-FBP	*72.2 %*	*60-140*			"	"	"	"	
Surrogate: Octacosane	*87.1 %*	*60-140*			"	"	*06/10/03*	"	
Surrogate: Undecane	*51.9 %*	*60-140*			"	"	"	"	*X*

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Polynuclear Aromatic Hydrocarbons by GC/MS-SIM
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01RE1) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
Acenaphthene	**0.237**	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	**0.318**	0.100	"	"	"	"	"	"	
Anthracene	**1.08**	0.100	"	"	"	"	"	"	
Benzo (a) anthracene	**0.253**	0.0100	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.500	"	50	"	"	06/11/03	"	
Benzo (b) fluoranthene	ND	0.500	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	5.00	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.500	"	"	"	"	"	"	
Chrysene	**0.162**	0.0100	"	1	"	"	06/11/03	"	
Dibenz (a,h) anthracene	ND	0.500	"	50	"	"	06/11/03	"	
Fluoranthene	ND	0.100	"	1	"	"	06/11/03	"	
Fluorene	**1.40**	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.500	"	50	"	"	06/11/03	"	
1-Methylnaphthalene	**19.8**	5.00	"	"	"	"	"	"	
2-Methylnaphthalene	**39.2**	5.00	"	"	"	"	"	"	
Naphthalene	**137**	5.00	"	"	"	"	"	"	
Phenanthrene	**1.05**	0.100	"	1	"	"	06/11/03	"	
Pyrene	ND	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*96.3 %*	*30-150*			"	"	"	"	
Surrogate: Benzo (a) pyrene-d12	*27.7 %*	*30-150*			"	"	"	"	*S-04*
MW-7 (B3E0727-02RE1) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
Acenaphthene	**0.411**	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	ND	0.100	"	"	"	"	"	"	
Anthracene	ND	0.100	"	"	"	"	"	"	
Benzo (a) anthracene	**0.0148**	0.0100	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.0100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Chrysene	ND	0.0100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.0100	"	"	"	"	"	"	
Fluoranthene	ND	0.100	"	"	"	"	"	"	
Fluorene	**0.703**	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.0100	"	"	"	"	"	"	
1-Methylnaphthalene	**24.1**	2.00	"	20	"	"	06/11/03	"	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-7 (B3E0727-02RE1) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
2-Methylnaphthalene	**27.0**	2.00	ug/l	20	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Naphthalene	**39.5**	2.00	"	"	"	"	"	"	
Phenanthrene	**0.519**	0.100	"	1	"	"	06/11/03	"	
Pyrene	ND	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*11.3 %*	*30-150*			"	"	"	"	*S-04*
Surrogate: Benzo (a) pyrene-d12	*48.5 %*	*30-150*			"	"	"	"	
MW-17 (B3E0727-03RE1) Water Sampled: 05/28/03 13:25 Received: 05/29/03 18:00									
Acenaphthene	ND	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	ND	0.100	"	"	"	"	"	"	
Anthracene	ND	0.100	"	"	"	"	"	"	
Benzo (a) anthracene	**0.0337**	0.0100	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.0100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Chrysene	ND	0.0100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.0100	"	"	"	"	"	"	
Fluoranthene	ND	0.100	"	"	"	"	"	"	
Fluorene	**0.405**	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.0100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.863**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.531**	0.100	"	"	"	"	"	"	
Naphthalene	**0.779**	0.100	"	"	"	"	"	"	
Phenanthrene	**0.217**	0.100	"	"	"	"	"	"	
Pyrene	**0.115**	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*216 %*	*30-150*			"	"	"	"	*S-04*
Surrogate: Benzo (a) pyrene-d12	*56.5 %*	*30-150*			"	"	"	"	

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-103R (B3E0727-04RE1) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									
Acenaphthene	ND	0.500	ug/l	5	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	ND	0.500	"	"	"	"	"	"	
Anthracene	ND	0.500	"	"	"	"	"	"	
Benzo (a) anthracene	ND	0.0100	"	1	"	"	06/11/03	"	
Benzo (a) pyrene	ND	0.0100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Chrysene	ND	0.0100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.0100	"	"	"	"	"	"	
Fluoranthene	ND	0.100	"	"	"	"	"	"	
Fluorene	ND	0.500	"	5	"	"	06/11/03	"	
Indeno (1,2,3-cd) pyrene	ND	0.0100	"	1	"	"	06/11/03	"	
1-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	ND	0.100	"	"	"	"	"	"	
Naphthalene	**0.225**	0.100	"	"	"	"	"	"	
Phenanthrene	ND	0.100	"	"	"	"	"	"	
Pyrene	ND	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*187 %*	*30-150*			"	"	"	"	*S-04*
Surrogate: Benzo (a) pyrene-d12	*49.6 %*	*30-150*			"	"	"	"	
MW-129 (B3E0727-05RE1) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									
Acenaphthene	ND	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	ND	0.100	"	"	"	"	"	"	
Anthracene	ND	0.100	"	"	"	"	"	"	
Benzo (a) anthracene	ND	0.0100	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.0100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Chrysene	ND	0.0100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.0100	"	"	"	"	"	"	
Fluoranthene	ND	0.100	"	"	"	"	"	"	
Fluorene	**0.254**	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.0100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.222**	0.100	"	"	"	"	"	"	

North Creek Analytical - Bothell

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-129 (B3E0727-05RE1) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									
2-Methylnaphthalene	ND	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Naphthalene	**0.136**	0.100	"	"	"	"	"	"	
Phenanthrene	**0.209**	0.100	"	"	"	"	"	"	
Pyrene	ND	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*101 %*	*30-150*			"	"	"	"	
Surrogate: Benzo (a) pyrene-d12	*57.1 %*	*30-150*			"	"	"	"	
MW-W (B3E0727-06RE1) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									
Acenaphthene	ND	0.100	ug/l	1	3F04034	06/04/03	06/11/03	EPA 8270C-SIM	
Acenaphthylene	ND	0.100	"	"	"	"	"	"	
Anthracene	ND	0.100	"	"	"	"	"	"	
Benzo (a) anthracene	ND	0.0100	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.0100	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	0.100	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.0100	"	"	"	"	"	"	
Chrysene	ND	0.0100	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.0100	"	"	"	"	"	"	
Fluoranthene	ND	0.100	"	"	"	"	"	"	
Fluorene	ND	0.100	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.0100	"	"	"	"	"	"	
1-Methylnaphthalene	**0.331**	0.100	"	"	"	"	"	"	
2-Methylnaphthalene	**0.379**	0.100	"	"	"	"	"	"	
Naphthalene	**0.407**	0.100	"	"	"	"	"	"	
Phenanthrene	ND	0.100	"	"	"	"	"	"	
Pyrene	ND	0.100	"	"	"	"	"	"	
Surrogate: 1-Methylnaphthalene-d10	*87.3 %*	*30-150*			"	"	"	"	
Surrogate: Benzo (a) pyrene-d12	*33.0 %*	*30-150*			"	"	"	"	

North Creek Analytical - Bothell

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SAIC - Bothell 18706 North Creek Parkway, Ste 110 Bothell WA/USA, 98011	Project: Unocal Groundwater Study Project Number: [none] Project Manager: Mark Dagel	**Reported:** 06/13/03 14:50

BTEX, MTBE, Naphthalene, and n-Hexane by WA VPH
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-146 (B3E0727-01) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Toluene	**18.0**	5.00	"	"	"	"	"	"	
m,p-Xylene	**20.6**	5.00	"	"	"	"	"	"	
o-Xylene	**8.34**	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*96.0 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*97.5 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*101 %*	*60-140*			"	"	"	"	
MW-146 (B3E0727-01RE1) Water Sampled: 05/28/03 09:35 Received: 05/29/03 18:00									
Benzene	**836**	200	ug/l	40	3F10020	06/10/03	06/10/03	EPA 8260B	
Ethylbenzene	**333**	200	"	"	"	"	"	"	
Naphthalene	**248**	200	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*97.5 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*96.5 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*97.5 %*	*60-140*			"	"	"	"	
MW-7 (B3E0727-02) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Benzene	**26.0**	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	**39.1**	5.00	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Naphthalene	**77.0**	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*100 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*95.0 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*96.5 %*	*60-140*			"	"	"	"	

North Creek Analytical - Bothell

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SAIC - Bothell 18706 North Creek Parkway, Ste 110 Bothell WA/USA, 98011	Project: Unocal Groundwater Study Project Number: [none] Project Manager: Mark Dagel	**Reported:** 06/13/03 14:50

BTEX, MTBE, Naphthalene, and n-Hexane by WA VPH
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-7 (B3E0727-02RE1) Water Sampled: 05/28/03 09:36 Received: 05/29/03 18:00									
Ethylbenzene	**70.5**	50.0	ug/l	10	3F10020	06/10/03	06/10/03	EPA 8260B	
Surrogate: 1,2-DCA-d4	*95.0 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*96.5 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*99.0 %*	*60-140*			"	"	"	"	
MW-17 (B3E0727-03) Water Sampled: 05/28/03 13:25 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	5.00	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*98.5 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*97.0 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*99.5 %*	*60-140*			"	"	"	"	
MW-103R (B3E0727-04) Water Sampled: 05/28/03 17:00 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	5.00	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*98.5 %*	*60-140*			"	"	"	"	
Surrogate: Toluene-d8	*98.0 %*	*60-140*			"	"	"	"	
Surrogate: 4-BFB	*98.0 %*	*60-140*			"	"	"	"	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

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SAIC - Bothell 18706 North Creek Parkway, Ste 110 Bothell WA/USA, 98011	Project: Unocal Groundwater Study Project Number: [none] Project Manager: Mark Dagel	**Reported:** 06/13/03 14:50

BTEX, MTBE, Naphthalene, and n-Hexane by WA VPH
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-129 (B3E0727-05) Water Sampled: 05/28/03 15:20 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	5.00	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*100 %*	*60-140*			*"*	*"*	*"*	*"*	
Surrogate: Toluene-d8	*98.5 %*	*60-140*			*"*	*"*	*"*	*"*	
Surrogate: 4-BFB	*98.5 %*	*60-140*			*"*	*"*	*"*	*"*	
MW-W (B3E0727-06) Water Sampled: 05/28/03 19:40 Received: 05/29/03 18:00									
Methyl tert-butyl ether	ND	5.00	ug/l	1	3F10020	06/10/03	06/10/03	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	5.00	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Hexane	ND	5.00	"	"	"	"	"	"	
Surrogate: 1,2-DCA-d4	*99.0 %*	*60-140*			*"*	*"*	*"*	*"*	
Surrogate: Toluene-d8	*98.5 %*	*60-140*			*"*	*"*	*"*	*"*	
Surrogate: 4-BFB	*99.5 %*	*60-140*			*"*	*"*	*"*	*"*	

North Creek Analytical - Bothell

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Kortland Orr For Jeanne Garthwaite, Project Manager

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX by NWTPH-G and EPA 8021B - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F03016: Prepared 06/04/03 Using EPA 5030B (P/T)										
Blank (3F03016-BLK1)										
Gasoline Range Hydrocarbons	ND	50.0	ug/l							
Benzene	ND	0.500	"							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	1.00	"							
Surrogate: 4-BFB (FID)	*42.6*		*"*	*48.0*		*88.8*	*62-127*			
Surrogate: 4-BFB (PID)	*54.3*		*"*	*48.0*		*113*	*72-127*			
LCS (3F03016-BS1)										
Gasoline Range Hydrocarbons	504	50.0	ug/l	500		101	80-120			
Benzene	7.11	0.500	"	6.65		107	80-120			
Toluene	35.5	0.500	"	37.0		95.9	80-120			
Ethylbenzene	9.47	0.500	"	8.55		111	80-120			
Xylenes (total)	46.2	1.00	"	43.0		107	80-120			
Surrogate: 4-BFB (FID)	*54.5*		*"*	*48.0*		*114*	*62-127*			
Surrogate: 4-BFB (PID)	*54.3*		*"*	*48.0*		*113*	*72-127*			
LCS Dup (3F03016-BSD1)										
Gasoline Range Hydrocarbons	498	50.0	ug/l	500		99.6	80-120	1.20	25	
Benzene	7.25	0.500	"	6.65		109	80-120	1.95	40	
Toluene	35.7	0.500	"	37.0		96.5	80-120	0.562	40	
Ethylbenzene	9.67	0.500	"	8.55		113	80-120	2.09	40	
Xylenes (total)	46.5	1.00	"	43.0		108	80-120	0.647	40	
Surrogate: 4-BFB (FID)	*54.2*		*"*	*48.0*		*113*	*62-127*			
Surrogate: 4-BFB (PID)	*54.2*		*"*	*48.0*		*113*	*72-127*			
Matrix Spike (3F03016-MS1)					**Source: B3F0005-01**					
Gasoline Range Hydrocarbons	450	50.0	ug/l	500	14.8	87.0	72-119			
Benzene	7.24	0.500	"	6.65	0.199	106	70-129			
Toluene	35.2	0.500	"	37.0	0.266	94.4	73-114			
Ethylbenzene	9.26	0.500	"	8.55	0.125	107	82-120			
Xylenes (total)	44.5	1.00	"	43.0	0.563	102	74-118			
Surrogate: 4-BFB (FID)	*50.2*		*"*	*48.0*		*105*	*62-127*			
Surrogate: 4-BFB (PID)	*54.6*		*"*	*48.0*		*114*	*72-127*			

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX by NWTPH-G and EPA 8021B - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F03016: Prepared 06/04/03 Using EPA 5030B (P/T)										
Matrix Spike Dup (3F03016-MSD1)					**Source: B3F0005-01**					
Gasoline Range Hydrocarbons	466	50.0	ug/l	500	14.8	90.2	72-119	3.49	25	
Benzene	7.27	0.500	"	6.65	0.199	106	70-129	0.414	40	
Toluene	35.6	0.500	"	37.0	0.266	95.5	73-114	1.13	40	
Ethylbenzene	9.36	0.500	"	8.55	0.125	108	82-120	1.07	40	
Xylenes (total)	45.4	1.00	"	43.0	0.563	104	74-118	2.00	40	
Surrogate: 4-BFB (FID)	*51.0*		*"*	*48.0*		*106*	*62-127*			
Surrogate: 4-BFB (PID)	*54.7*		*"*	*48.0*		*114*	*72-127*			

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SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Volatile Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F10009: Prepared 06/11/03 Using EPA 5030B (P/T)										
Blank (3F10009-BLK1)										
C5-C6 Aliphatics	ND	50.0	ug/l							
C6-C8 Aliphatics	ND	50.0	"							
C8-C10 Aliphatics	ND	50.0	"							
C10-C12 Aliphatics	ND	50.0	"							
C8-C10 Aromatics	ND	50.0	"							
C10-C12 Aromatics	ND	50.0	"							
C12-C13 Aromatics	ND	50.0	"							
Total VPH (TVPH)	ND	50.0	"							
Surrogate: 4-BFB (FID)	*44.3*		*"*	*48.0*		*92.3*	*60-140*			
Surrogate: 4-BFB (PID)	*45.2*		*"*	*48.0*		*94.2*	*60-140*			
LCS (3F10009-BS1)										
Total VPH (TVPH)	204	50.0	ug/l	200		102	70-130			
Surrogate: 4-BFB (FID)	*44.1*		*"*	*48.0*		*91.9*	*60-140*			
Surrogate: 4-BFB (PID)	*45.9*		*"*	*48.0*		*95.6*	*60-140*			
LCS Dup (3F10009-BSD1)										
Total VPH (TVPH)	235	50.0	ug/l	200		118	70-130	14.1	25	
Surrogate: 4-BFB (FID)	*44.1*		*"*	*48.0*		*91.9*	*60-140*			
Surrogate: 4-BFB (PID)	*45.1*		*"*	*48.0*		*94.0*	*60-140*			
Matrix Spike (3F10009-MS1)					**Source: B3E0727-03**					
Total VPH (TVPH)	352	50.0	ug/l	200	0.00	176	70-130			Q-02
Surrogate: 4-BFB (FID)	*45.2*		*"*	*48.0*		*94.2*	*60-140*			
Surrogate: 4-BFB (PID)	*44.6*		*"*	*48.0*		*92.9*	*60-140*			
Matrix Spike Dup (3F10009-MSD1)					**Source: B3E0727-03**					
Total VPH (TVPH)	320	50.0	ug/l	200	0.00	160	70-130	9.52	25	Q-02
Surrogate: 4-BFB (FID)	*45.8*		*"*	*48.0*		*95.4*	*60-140*			
Surrogate: 4-BFB (PID)	*44.6*		*"*	*48.0*		*92.9*	*60-140*			

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Semivolatile Petroleum Products by NWTPH-Dx (w/o Acid/Silica Gel Clean-up) - Quality Control

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F02012: Prepared 06/02/03 Using EPA 3520C										
Blank (3F02012-BLK1)										
Diesel Range Hydrocarbons	ND	0.250	mg/l							
Lube Oil Range Hydrocarbons	ND	0.500	"							
Surrogate: 2-FBP	*0.274*		*"*	*0.320*		*85.6*	*50-150*			
Surrogate: Octacosane	*0.140*		*"*	*0.160*		*87.5*	*50-150*			
LCS (3F02012-BS1)										
Diesel Range Hydrocarbons	1.78	0.250	mg/l	2.00		89.0	63-107			
Surrogate: 2-FBP	*0.296*		*"*	*0.320*		*92.5*	*50-150*			
LCS Dup (3F02012-BSD1)										
Diesel Range Hydrocarbons	1.80	0.250	mg/l	2.00		90.0	63-107	1.12	40	
Surrogate: 2-FBP	*0.282*		*"*	*0.320*		*88.1*	*50-150*			

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Extractable Petroleum Hydrocarbons by WDOE TPH Policy Method - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F02015: Prepared 06/02/03 Using EPA 3520C										
Blank (3F02015-BLK1)										
C8-C10 Aliphatics	ND	50.0	ug/l							
C10-C12 Aliphatics	ND	50.0	"							
C12-C16 Aliphatics	ND	50.0	"							
C16-C21 Aliphatics	ND	50.0	"							
C21-C34 Aliphatics	ND	50.0	"							
C8-C10 Aromatics	ND	50.0	"							
C10-C12 Aromatics	ND	50.0	"							
C12-C16 Aromatics	ND	50.0	"							
C16-C21 Aromatics	ND	50.0	"							
C21-C34 Aromatics	ND	50.0	"							
Extractable Petroleum Hydrocarbons	ND	50.0	"							
Surrogate: 2-FBP	*310*		*"*	*404*		*76.7*	*60-140*			
Surrogate: Octacosane	*376*		*"*	*410*		*91.7*	*60-140*			
Surrogate: Undecane	*308*		*"*	*409*		*75.3*	*60-140*			
LCS (3F02015-BS1)										
Extractable Petroleum Hydrocarbons	3770	50.0	ug/l	5000		75.4	60-130			
Surrogate: 2-FBP	*324*		*"*	*404*		*80.2*	*60-140*			
Surrogate: Octacosane	*370*		*"*	*410*		*90.2*	*60-140*			
Surrogate: Undecane	*346*		*"*	*409*		*84.6*	*60-140*			
LCS Dup (3F02015-BSD1)										
Extractable Petroleum Hydrocarbons	4030	50.0	ug/l	5000		80.6	60-130	6.67	25	
Surrogate: 2-FBP	*322*		*"*	*404*		*79.7*	*60-140*			
Surrogate: Octacosane	*385*		*"*	*410*		*93.9*	*60-140*			
Surrogate: Undecane	*355*		*"*	*409*		*86.8*	*60-140*			

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Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F04034: Prepared 06/04/03 Using EPA 3520C										
Blank (3F04034-BLK1)										
Acenaphthene	ND	0.100	ug/l							
Acenaphthylene	ND	0.100	"							
Anthracene	ND	0.100	"							
Benzo (a) anthracene	ND	0.0100	"							
Benzo (a) pyrene	ND	0.0100	"							
Benzo (b) fluoranthene	ND	0.0100	"							
Benzo (ghi) perylene	ND	0.100	"							
Benzo (k) fluoranthene	ND	0.0100	"							
Chrysene	ND	0.0100	"							
Dibenz (a,h) anthracene	ND	0.0100	"							
Fluoranthene	ND	0.100	"							
Fluorene	ND	0.100	"							
Indeno (1,2,3-cd) pyrene	ND	0.0100	"							
1-Methylnaphthalene	ND	0.100	"							
2-Methylnaphthalene	ND	0.100	"							
Naphthalene	ND	0.100	"							
Phenanthrene	ND	0.100	"							
Pyrene	ND	0.100	"							
Surrogate: 1-Methylnaphthalene-d10	*0.778*		*"*	*1.00*		*77.8*	*30-150*			
Surrogate: Benzo (a) pyrene-d12	*0.888*		*"*	*1.00*		*88.8*	*30-150*			
LCS (3F04034-BS1)										
Acenaphthene	7.66	1.00	ug/l	10.0		76.6	40-150			
Acenaphthylene	7.91	1.00	"	10.0		79.1	40-150			
Anthracene	8.72	1.00	"	10.0		87.2	40-150			
Benzo (a) anthracene	8.74	0.100	"	10.0		87.4	40-150			
Benzo (a) pyrene	10.4	0.100	"	10.0		104	40-150			
Benzo (b) fluoranthene	10.5	0.100	"	10.0		105	40-150			
Benzo (ghi) perylene	9.98	1.00	"	10.0		99.8	40-150			
Benzo (k) fluoranthene	11.5	0.100	"	10.0		115	40-150			
Chrysene	8.86	0.100	"	10.0		88.6	40-150			
Dibenz (a,h) anthracene	8.59	0.100	"	10.0		85.9	40-150			
Fluoranthene	9.89	1.00	"	10.0		98.9	40-150			
Fluorene	7.68	1.00	"	10.0		76.8	40-150			
Indeno (1,2,3-cd) pyrene	9.42	0.100	"	10.0		94.2	40-150			

Kortland Orr For Jeanne Garthwaite, Project Manager

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Polynuclear Aromatic Hydrocarbons by GC/MS-SIM - Quality Control

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F04034: Prepared 06/04/03 Using EPA 3520C										
LCS (3F04034-BS1)										
1-Methylnaphthalene	7.57	1.00	ug/l	10.0		75.7	40-150			
2-Methylnaphthalene	7.93	1.00	"	10.0		79.3	40-150			
Naphthalene	7.40	1.00	"	10.0		74.0	40-150			
Phenanthrene	8.61	1.00	"	10.0		86.1	40-150			
Pyrene	9.90	1.00	"	10.0		99.0	40-150			
Surrogate: 1-Methylnaphthalene-d10	*0.786*		*"*	*1.00*		*78.6*	*30-150*			
Surrogate: Benzo (a) pyrene-d12	*0.806*		*"*	*1.00*		*80.6*	*30-150*			
LCS Dup (3F04034-BSD1)										
Acenaphthene	8.72	1.00	ug/l	10.0		87.2	40-150	12.9	40	
Acenaphthylene	9.10	1.00	"	10.0		91.0	40-150	14.0	40	
Anthracene	9.12	1.00	"	10.0		91.2	40-150	4.48	40	
Benzo (a) anthracene	9.04	0.100	"	10.0		90.4	40-150	3.37	40	
Benzo (a) pyrene	10.3	0.100	"	10.0		103	40-150	0.966	40	
Benzo (b) fluoranthene	10.3	0.100	"	10.0		103	40-150	1.92	40	
Benzo (ghi) perylene	10.3	1.00	"	10.0		103	40-150	3.16	40	
Benzo (k) fluoranthene	11.4	0.100	"	10.0		114	40-150	0.873	40	
Chrysene	9.16	0.100	"	10.0		91.6	40-150	3.33	40	
Dibenz (a,h) anthracene	8.97	0.100	"	10.0		89.7	40-150	4.33	40	
Fluoranthene	10.4	1.00	"	10.0		104	40-150	5.03	40	
Fluorene	8.42	1.00	"	10.0		84.2	40-150	9.19	40	
Indeno (1,2,3-cd) pyrene	9.62	0.100	"	10.0		96.2	40-150	2.10	40	
1-Methylnaphthalene	8.36	1.00	"	10.0		83.6	40-150	9.92	40	
2-Methylnaphthalene	8.51	1.00	"	10.0		85.1	40-150	7.06	40	
Naphthalene	8.33	1.00	"	10.0		83.3	40-150	11.8	40	
Phenanthrene	8.88	1.00	"	10.0		88.8	40-150	3.09	40	
Pyrene	10.4	1.00	"	10.0		104	40-150	4.93	40	
Surrogate: 1-Methylnaphthalene-d10	*0.842*		*"*	*1.00*		*84.2*	*30-150*			
Surrogate: Benzo (a) pyrene-d12	*0.781*		*"*	*1.00*		*78.1*	*30-150*			

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SAIC - Bothell 18706 North Creek Parkway, Ste 110 Bothell WA/USA, 98011	Project: Unocal Groundwater Study Project Number: [none] Project Manager: Mark Dagel	**Reported:** 06/13/03 14:50

BTEX, MTBE, Naphthalene, and n-Hexane by WA VPH - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3F10020: Prepared 06/10/03 Using EPA 5030B										
Blank (3F10020-BLK1)										
Methyl tert-butyl ether	ND	5.00	ug/l							
Benzene	ND	5.00	"							
Toluene	ND	5.00	"							
Ethylbenzene	ND	5.00	"							
m,p-Xylene	ND	5.00	"							
o-Xylene	ND	5.00	"							
Naphthalene	ND	5.00	"							
n-Hexane	ND	5.00	"							
Surrogate: 1,2-DCA-d4	*19.5*		*"*	*20.0*		*97.5*	*60-140*			
Surrogate: Toluene-d8	*20.0*		*"*	*20.0*		*100*	*60-140*			
Surrogate: 4-BFB	*19.6*		*"*	*20.0*		*98.0*	*60-140*			
LCS (3F10020-BS1)										
Benzene	9.12	5.00	ug/l	10.0		91.2	80-120			
Toluene	9.12	5.00	"	10.0		91.2	80-120			
Surrogate: 1,2-DCA-d4	*20.0*		*"*	*20.0*		*100*	*60-140*			
Surrogate: Toluene-d8	*20.0*		*"*	*20.0*		*100*	*60-140*			
Surrogate: 4-BFB	*19.5*		*"*	*20.0*		*97.5*	*60-140*			
LCS Dup (3F10020-BSD1)										
Benzene	10.0	5.00	ug/l	10.0		100	80-120	9.21	20	
Toluene	10.1	5.00	"	10.0		101	80-120	10.2	20	
Surrogate: 1,2-DCA-d4	*20.0*		*"*	*20.0*		*100*	*60-140*			
Surrogate: Toluene-d8	*20.0*		*"*	*20.0*		*100*	*60-140*			
Surrogate: 4-BFB	*19.5*		*"*	*20.0*		*97.5*	*60-140*			

SAIC - Bothell	Project: Unocal Groundwater Study	
18706 North Creek Parkway, Ste 110	Project Number: [none]	**Reported:**
Bothell WA/USA, 98011	Project Manager: Mark Dagel	06/13/03 14:50

Notes and Definitions

D-06	The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
D-10	The heavy oil range organics present are due to hydrocarbons eluting primarily in the diesel range.
I-06	The analyte concentration may be artificially elevated due to coeluting compounds or components.
Q-02	The spike recovery for this QC sample is outside of NCA established control limits due to sample matrix interference.
Q-34	The sample container submitted for volatile analysis had either headspace or air bubbles greater than 1/4 inch in diameter.
S-04	The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
X	See case narrative.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Appendix C
AMEC Earth and Environmental
Toxicity Evaluation of Groundwater Samples
Unocal Edmonds, Washington

TOXICITY EVALUATION OF GROUNDWATER SAMPLES

Unocal, Edmonds, Washington

Prepared for
SAIC
18706 N. Creek Parkway
Suite 110
Bothell, WA 98011

Prepared by
AMEC Earth & Environmental
Northwest Bioassay Laboratory
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424
253-922-4296

June 2003

SUMMARY

Chronic toxicity tests were conducted on six groundwater samples collected from the Unocal Facility located in Edmonds, Washington. Whole effluent toxicity (WET) tests were conducted using the test organisms *Atherinops affinis* (Pacific topsmelt), *Mysidopsis bahia* (a mysid shrimp), *Pimephales promelas* (fathead minnow), and the water flea *Ceriodaphnia dubia*. Test organism survival, mysid shrimp, topsmelt, and fathead minnow growth, and *Ceriodaphnia* reproduction were evaluated after 7 days of exposure. All samples were serially diluted with laboratory water for testing.

Mark Dagel managed the project for Scientific Applications International Corporation (SAIC) working in conjunction with Washington State Department of Ecology (WDOE). Testing was conducted by AMEC Earth & Environmental, Inc. (AMEC) in Fife, Washington. Samples were collected 28 May 2003 and used to initiate tests on 29 May and renew the tests throughout the duration.

MATERIALS AND METHODS

Sample Collection and Transport

Samples of groundwater were collected from six sites at the Unocal facility in Edmonds, Washington on 28 May 2003. Sample containers consisted of 10 and 20-liter (L) polyethylene collapsible cubitainers. The cubitainers were filled, packed in coolers containing ice, and transported to AMEC by SAIC personnel. Samples arrived within 24 hours of collection in good condition. Appropriate chain-of-custody procedures were employed during collection and transport. Chain-of-custody documentation is contained in Appendix I.

Sample Receipt

Upon arrival at AMEC, coolers were opened and samples were matched to the chain-of-custody information. Receipt temperature was measured in each sample and recorded on the chain-of-custody form. Water quality parameters were measured in a subsample taken from each effluent sample and recorded in a logbook maintained in the laboratory. A summary of sample receipt water quality parameters is located in Appendix E. Samples were held in a 4°C cold room until use.

Organism Procurement and Handling

Atherinops affinis, Mysidopsis bahia, Pimephales promelas

Test specimens were obtained on 29 May 2003 from Aquatic Biosystems located in Fort Collins, Colorado. Each species was transported separately to AMEC in oxygensaturated water contained in plastic bags. Insulated ice chests containing the bags were shipped by overnight delivery service. Upon arrival at AMEC, organism receipt information including physical parameters and organism health was recorded. Test organisms were acclimated to test conditions and held until test initiation.

Ceriodaphnia dubia

Ceriodaphnia neonates were obtained from in-house cultures following EPA's block parentage method (EPA/821/R-02/013). *Ceriodaphnia* brood boards were started one week prior to test initiation by placing one neonate in a 30 milliliter (ml) polypropylene plastic cup containing 15 ml laboratory water and containing 100 microliters (μl) each of a yeast, CEROPHYLL®, trout chow (YCT) mixture, and a suspension of the green alga, *Selenastrum capricornutum*. The brood board was renewed and fed daily by transferring individuals to new cups containing laboratory water and 100 μl each of YCT and *Selenastrum*. The number of neonates produced per organism was counted and recorded on a data sheet daily.

Test Procedures

Test procedures are summarized in Tables 1 through 4 and follow protocols described in EPA/600/R-95/136 (1995) for Pacific topsmelt, EPA-821-R-02-014 (2002) for mysid shrimp) and EPA-821-R-02-013 (2002) for fathead minnow and *Ceriodaphnia*. All tests were initiated within 36 hours of sample collection. Samples were tested at five concentrations, beginning with full-strength sample and incorporating a 50-percent dilution series using laboratory water.

Topsmelt, mysid shrimp, and fathead minnow were fed brine shrimp nauplii twice daily, once in the morning and again the afternoon after test solution renewal. No food was added to test chambers on Day 7. An 80 percent solution renewal was conducted daily and the number of test organisms in each chamber was counted and recorded. Temperature, dissolved oxygen (DO), pH, and conductivity were monitored and recorded daily. Any dead test organisms were noted and discarded on a daily basis.

At test termination, the contents of each test chamber in the topsmelt, mysid shrimp, and fathead minnow tests were gently mixed and carefully poured through a fine mesh screen. The test organisms were carefully rinsed with deionized water and transferred to dried, tared weigh pans. Organisms were then dried in an oven for 24 hours at 60°C for 24 hours and weighed.

Table 1. Pacific Topsmelt 7-day Survival and Growth Test Procedure

Test Organism:	*Atherinops affinis*
Test Organism Source:	Aquatic Biosystems; Fort Collins, Colorado
Test Organism Age:	12 days post hatch
Test Duration:	7 days with daily solution renewal
Feeding:	*Artemia* nauplii twice daily
Test Chamber:	1000-ml polypropylene beaker
Test Solution Volume:	500 ml
Test Temperature:	20$\pm$1°C
Dilution Water:	40 Fathoms Artificial Seawater
Salinity:	30 ppt
Test Concentrations (% sample):	100%, 50%, 25%, 12.5%, 6.25%, 0.0%
Number of Organisms/Chamber:	6
Number of Replicates/Conc.:	5
Photoperiod:	16 hours light/ 8 hours dark
Aeration:	Samples aerated prior to mixing dilutions
Deviations:	None
Test Protocol:	EPA/600/R-95/136
Test Acceptability:	$\geq$ 80% control animal survival mean dry weight $\geq$ 0.85 mg per surviving control fish
Reference Toxicant:	Copper chloride

Table 2. Mysid Shrimp 7-day Survival and Growth Test Procedure

Test Organism:	*Mysidopsis bahia*
Test Organism Source:	Aquatic Biosystems; Fort Collins, Colorado
Test Organism Age:	7 days post hatch
Test Duration:	7 days with daily solution renewal
Feeding:	*Artemia* nauplii twice daily
Test Chamber:	250-ml polypropylene cup
Test Solution Volume:	200 ml
Test Temperature:	26$\pm$1°C
Dilution Water:	40 Fathoms Artificial Seawater
Salinity:	30 ppt
Test Concentrations (% sample):	100%, 50%, 25%, 12.5%, 6.25%, 0.0%
Number of Organisms/Chamber:	5
Number of Replicates/Conc.:	8
Photoperiod:	16 hours light/ 8 hours dark
Aeration:	Samples aerated prior to mixing dilutions
Deviations:	None
Test Protocol:	EPA-821-R-02-014
Test Acceptability:	$\geq$ 80% control animal survival mean dry weight $\geq$ 0.20 mg per surviving control fish
Reference Toxicant:	Copper chloride

Table 3. Fathead minnow 7-day Survival and Growth Test Procedure

Test Organism:	*Pimephales promelas*
Test Organism Source:	Aquatic Biosystems; Fort Collins, Colorado
Test Organism Age:	< 24 hours post hatch
Test Duration:	7 days with daily solution renewal
Feeding:	*Artemia* nauplii twice daily
Test Chamber:	500-ml polypropylene cup
Test Solution Volume:	250 ml
Test Temperature:	25 ± 1°C
Dilution Water:	Moderately Hard Synthetic Freshwater
Test Concentrations (% sample):	100%, 50%, 25%, 12.5%, 6.25%, 0.0%
Number of Organisms/Chamber:	10
Number of Replicates/Conc.:	4
Photoperiod:	16 hours light/ 8 hours dark
Aeration:	Samples aerated prior to mixing dilutions
Deviations:	None
Test Protocol:	EPA-821-R-02-013
Test Acceptability:	$\geq$ 80% control animal survival mean dry weight $\geq$ 0.25 mg per surviving control fish
Reference Toxicant:	Sodium chloride

Table 4. *Ceriodaphnia* 7-day Survival and Reproduction Test Procedure

Test Organism:	*Ceriodaphnia dubia*
Test Organism Source:	In-house cultures
Test Organism Age:	< 24 hours
Test Duration:	7 days with daily solution renewal
Feeding:	100 µl each YCT and *Selenastrum* daily
Test Chamber:	30-ml polypropylene cup
Test Solution Volume:	15 ml
Test Temperature:	25 ± 1°C
Dilution Water:	Moderately Hard Synthetic Water
Test Concentrations (% sample):	100%, 50%, 25%, 12.5%, 6.25%, 0.0%
Number of organisms/chamber:	1
Number of Replicates/Conc.:	10
Photoperiod:	16 hours light/ 8 hours dark
Aeration:	Samples aerated prior to mixing dilutions
Deviations:	None
Test Protocol:	EPA-821-R-02-013
Test Acceptability:	$\geq$ 80% control animal survival; 60% surviving control organisms producing 3 broods and averaging 15 neonates per surviving adult
Reference Toxicant:	Sodium chloride

Ceriodaphnia neonates were less than 24 hours old and within eight hours of age at test initiation. Solution renewal was performed daily by transferring organisms using a wide pore glass pipet to chambers containing fresh test solution and 100 μl each YCT and *Selenastrum*. Water quality parameters and survival were monitored and recorded daily. The number of neonates produced per organism each day were counted and recorded, prior to being discarded.

STATISTICAL ANALYSES

Statistical analyses were performed using the appropriate data analysis pathway and procedures contained in the Toxcalc Comprehensive Toxicity Data Analysis and Database Software, Version 5.0 (Tidepool Scientific Software !992 – 1994).

RESULTS

Tables detailing individual replicate results are contained in Appendices A, B, C, and D for Pacific topsmelt, mysid shrimp, fathead minnow, and *Ceriodaphnia*, respectively. Sample receipt information, water quality data, statistical analyses, reference toxicant data, and chain-of-custody information are contained in Appendices E, F, G, H, and I, respectively.

Mean control survival was 90 percent, or greater, in all tests. This value exceeds the EPA guideline survival criterion of 80 percent. Topsmelt, mysid shrimp, and fathead minnow growth exceeded the EPA criterion of a minimum average of 0.85, 0.20, and 0.25 mg per surviving organisms in the controls. *Ceriodaphnia* reproduction in the controls exceeded the minimum requirement of 60 percent of surviving control organisms producing three broods averaging a minimum of 15 neonates.

Table 5 summarizes the NOEC and EC_{50} values for samples for all species tested. The NOEC is the highest concentration exhibiting no effect and the EC_{50} is the concentration estimated to produce an effect on 50 percent of the organisms.

Table 5. Whole Effluent Toxicity Test Results – NOEC and EC_{50} in % Sample

Species	Endpoint (% Sample)		Sample ID MW-146	MW-7	MW-17	MW-103R	MW-129	MW-W
Topsmelt	Survival	NOEC	100	100	100	100	25	100
		LC_{50}	>100	>100	>100	>100	48	>100
	Growth	NOEC	25	100	100	100	25	50
		EC_{50}	85	>100	>100	>100	40	>100
Mysid Shrimp	Survival	NOEC	25	100	50	100	25	50
		LC_{50}	54	>100	78	>100	47	>100
	Growth	NOEC	12.5	25	25	25	12.5	25
		EC_{50}	41	78	50	>100	26	67
Fathead minnow	Survival	NOEC	50	100	100	100	50	50
		LC_{50}	84	>100	>100	>100	84	>100
	Growth	NOEC	50	100	100	100	25	25
		EC_{50}	74	>100	>100	>100	67	>100
Ceriodaphnia	Survival	NOEC	100	100	100	100	100	100
		LC_{50}	>100	>100	>100	>100	>100	>100
	Reproduction	NOEC	25	50	100	25	50	50
		EC_{50}	61	>100	>100	>100	96	>100

Note: NOEC - No Observed Effect Concentration

REFERENCE TOXICANT TESTS

Reference toxicant tests were conducted concurrent with the samples to assess the health of test organisms and the consistency of our laboratory procedures. The results are summarized in Table 6. Results for tests with all four test species were within internal control chart limits of ± two standard deviations (Appendix H).

Table 6. Chronic Reference Toxicant Results

Species Endpoint	Test ID	Endpoint	CV (%)
		(μg/L $CuCl_2$)	
Pacific Topsmelt	RT052903AA		
Survival (LC50)		482	33.8
Growth (EC50)		457	32.3
Mysid Shrimp	RT052903MY		
Survival LC50)		485	24.9
Growth (EC50)		489	23.1
		(g/L NaCl)	
Pimephales promelas	RT052903PP		
Survival (LC50)		5.8	15.2
Growth (EC50)		4.9	22.2
Ceriodaphnia dubia	RT052903CD		
Survival (LC50)		1.6	20.5
Reproduction (EC50)		0.9	30.2

REFERENCES

EPA. 1995. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms. EPA/600/R-95/136, February 1995.

EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013, October 2002.

EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms. Third Edition. EPA-821-R-02-014, October 2002.

Tidepool Scientific Software. 1992-1994. TOXCALC Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.

WADOE. 2001. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Washington State Department of Ecology. Water Quality Program. Publication number: WQ-R-95-80, Revised December 2001.

Appendix A

Atherinops affinis **(Pacific Topsmelt)**

Test Results Summaries

Appendix Table A-1. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-146
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	6	100	100	43.26	52.87	1.602	1.755
	2	6	100		43.75	54.06	1.718	
	3	6	100		42.67	53.28	1.768	
	4	6	100		43.53	54.49	1.827	
	5	6	100		42.90	54.07	1.862	
6.25	1	6	100	100	44.30	53.28	1.497	1.528
	2	6	100		41.65	53.04	1.898	
	3	6	100		44.08	50.86	1.130	
	4	6	100		44.16	55.83	1.945	
	5	6	100		44.11	51.13	1.170	
12.5	1	6	100	100	43.79	54.41	1.770	1.612
	2	6	100		44.46	54.28	1.637	
	3	6	100		42.40	51.91	1.585	
	4	6	100		43.25	52.14	1.482	
	5	6	100		44.42	53.94	1.587	
25	1	6	100	100	41.53	52.59	1.843	1.773
	2	6	100		43.77	56.83	2.177	
	3	6	100		43.74	53.39	1.608	
	4	6	100		42.73	53.22	1.748	
	5	6	100		41.71	50.64	1.488	
50	1	6	100	97	42.74	50.22	1.247	1.345
	2	6	100		43.99	53.56	1.595	
	3	6	100		43.45	50.04	1.098	
	4	6	100		43.92	53.29	1.562	
	5	5	83		43.27	50.62	1.225	
100	1	4	67	73	43.26	47.24	0.663	0.681
	2	1	17		41.97	42.91	0.157	
	3	6	100		44.06	49.93	0.978	
	4	6	100		43.65	49.06	0.902	
	5	5	83		43.91	48.13	0.703	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-2. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-7
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	Replicate	# Alive	% Survival	Mean % Survival	Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
	1	6	100		43.11	55.15	2.007	
	2	6	100		43.98	54.18	1.700	
Control	3	6	100	100	43.98	58.22	2.373	2.046
	4	6	100		42.85	53.98	1.855	
	5	6	100		42.23	56.00	2.295	
	1	6	100		42.83	54.74	1.985	
	2	6	100		42.89	56.41	2.253	
6.25	3	6	100	100	43.87	57.08	2.202	2.059
	4	6	100		43.60	56.38	2.130	
	5	6	100		43.70	54.04	1.723	
	1	6	100		41.85	53.57	1.953	
	2	6	100		42.85	53.59	1.790	
12.5	3	6	100	100	43.41	53.49	1.680	1.913
	4	6	100		44.00	55.41	1.902	
	5	6	100		43.09	56.52	2.238	
	1	6	100		43.93	54.48	1.758	
	2	6	100		43.06	52.22	1.527	
25	3	6	100	100	44.12	54.36	1.707	1.645
	4	6	100		43.69	52.43	1.457	
	5	6	100		42.95	53.61	1.777	
	1	6	100		43.81	56.58	2.128	
	2	6	100		43.47	53.63	1.693	
50	3	6	100	100	43.34	57.49	2.358	2.017
	4	6	100		43.46	53.95	1.748	
	5	6	100		43.81	56.75	2.157	
	1	6	100		43.41	54.21	1.800	
	2	6	100		41.67	51.94	1.712	
100	3	6	100	100	43.88	56.67	2.132	1.689
	4	6	100		43.20	51.47	1.378	
	5	6	100		43.28	51.82	1.423	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-3. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-17
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
	1	6	100		42.79	52.81	1.670	
	2	6	100		44.02	54.49	1.745	
Control	3	6	100	97	43.08	53.40	1.720	1.727
	4	5	83		43.11	55.27	2.027	
	5	6	100		43.49	52.32	1.472	
	1	6	100		43.20	55.09	1.982	
	2	6	100		42.95	53.44	1.748	
6.25	3	6	100	100	42.96	51.44	1.413	1.839
	4	6	100		43.53	54.34	1.802	
	5	6	100		43.61	57.11	2.250	
	1	5	83		42.89	50.18	1.215	
	2	6	100		43.94	56.41	2.078	
12.5	3	5	83	93	42.95	50.76	1.302	1.673
	4	6	100		43.57	53.32	1.625	
	5	6	100		42.01	54.87	2.143	
	1	6	100		44.12	56.33	2.035	
	2	6	100		42.74	52.60	1.643	
25	3	6	100	100	43.07	52.07	1.500	1.752
	4	6	100		42.35	52.24	1.648	
	5	6	100		42.73	54.33	1.933	
	1	6	100		43.56	53.01	1.575	
	2	6	100		44.05	53.84	1.632	
50	3	5	83	97	43.68	52.12	1.407	1.565
	4	6	100		43.83	52.66	1.472	
	5	6	100		43.47	53.92	1.742	
	1	6	100		42.96	49.04	1.013	
	2	6	100		44.05	56.93	2.147	
100	3	6	100	100	43.15	53.46	1.718	1.556
	4	6	100		42.23	52.07	1.640	
	5	6	100		43.62	51.20	1.263	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-4. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-103R
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	Replicate	# Alive	% Survival	Mean % Survival	Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
	1	6	100		43.83	54.46	1.772	
	2	6	100		40.45	52.32	1.978	
Control	3	6	100	100	43.52	53.24	1.620	1.881
	4	6	100		43.00	53.86	1.810	
	5	6	100		42.82	56.16	2.223	
	1	6	100		42.44	55.02	2.097	
	2	6	100		41.45	50.52	1.512	
6.25	3	6	100	97	43.40	52.65	1.542	1.752
	4	6	100		43.81	55.49	1.947	
	5	5	83		43.38	53.37	1.665	
	1	6	100		42.75	53.54	1.798	
	2	6	100		42.40	51.90	1.583	
12.5	3	6	100	100	42.31	51.58	1.545	1.572
	4	6	100		43.99	50.23	1.040	
	5	6	100		42.52	53.88	1.893	
	1	6	100		42.18	52.69	1.752	
	2	6	100		42.60	51.60	1.500	
25	3	6	100	100	43.34	54.35	1.835	1.728
	4	6	100		43.13	53.03	1.650	
	5	6	100		43.28	54.69	1.902	
	1	6	100		42.47	54.02	1.925	
	2	6	100		43.26	53.97	1.785	
50	3	6	100	100	43.36	55.36	2.000	1.909
	4	6	100		45.15	54.65	1.583	
	5	6	100		43.38	56.88	2.250	
	1	6	100		42.81	50.23	1.236	
	2	6	100		42.86	52.35	1.582	
100	3	6	100	100	43.40	53.10	1.617	1.582
	4	6	100		42.94	54.07	1.855	
	5	6	100		43.01	52.73	1.620	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-5. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-129
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	**Replicate**	**# Alive**	**% Survival**	**Mean % Survival**	**Tare Weight mg**	**Total Weight mg**	**Weight per Fish [a] (mg)**	**Mean Weight (mg)**
	1	6	100		42.84	54.64	1.967	
	2	6	100		42.53	55.26	2.122	
Control	3	6	100	100	44.07	54.64	1.762	1.880
	4	6	100		43.82	54.26	1.740	
	5	6	100		44.14	55.00	1.810	
	1	6	100		44.00	56.24	2.040	
	2	6	100		43.39	55.24	1.975	
6.25	3	6	100	100	42.40	55.60	2.200	2.005
	4	6	100		44.66	55.35	1.782	
	5	6	100		44.05	56.23	2.030	
	1	6	100		43.28	51.91	1.438	
	2	6	100		43.22	54.04	1.803	
12.5	3	6	100	100	42.43	50.65	1.370	1.545
	4	6	100		43.33	53.79	1.743	
	5	6	100		44.06	52.27	1.368	
	1	6	100		46.07	56.15	1.680	
	2	4	67		43.72	50.18	1.077	
25	3	6	100	93	40.60	51.22	1.770	1.715
	4	6	100		43.50	55.24	1.957	
	5	6	100		44.14	56.70	2.093	
	1	0	0		-	-	0.000	
	2	2	33		42.28	46.41	0.688	
50	3	2	33	47	43.21	44.11	0.150	0.498
	4	5	83		43.22	48.13	0.818	
	5	5	83		44.30	49.31	0.835	
	1	0	0		-	-	0.000	
	2	0	0		-	-	0.000	
100	3	0	0	3	-	-	0.000	0.016
	4	0	0		-	-	0.000	
	5	1	17		44.05	44.52	0.078	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-6. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-W
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	6	100	100	43.28	52.99	1.618	1.821
	2	6	100		44.34	57.00	2.110	
	3	6	100		42.18	51.90	1.620	
	4	6	100		43.30	55.15	1.975	
	5	6	100		43.50	54.20	1.783	
6.25	1	6	100	100	41.83	53.00	1.862	1.750
	2	6	100		44.62	53.20	1.430	
	3	6	100		44.86	54.38	1.587	
	4	6	100		43.57	55.60	2.005	
	5	6	100		43.29	54.50	1.868	
12.5	1	6	100	97	43.26	54.75	1.915	1.770
	2	5	83		43.36	53.20	1.640	
	3	6	100		43.90	55.78	1.980	
	4	6	100		43.54	51.22	1.280	
	5	6	100		42.88	55.09	2.035	
25	1	6	100	100	43.37	55.30	1.989	1.933
	2	6	100		43.52	56.22	2.117	
	3	6	100		44.31	54.23	1.653	
	4	6	100		43.80	54.05	1.708	
	5	6	100		44.03	57.23	2.200	
50	1	6	100	93	44.71	58.45	2.290	1.691
	2	6	100		43.65	53.02	1.562	
	3	6	100		44.40	54.75	1.725	
	4	5	83		43.25	52.03	1.463	
	5	5	83		41.69	50.19	1.417	
100	1	5	83	97	44.30	53.80	1.583	1.411
	2	6	100		44.20	53.10	1.483	
	3	6	100		42.90	51.29	1.398	
	4	6	100		43.50	51.04	1.257	
	5	6	100		44.28	52.29	1.335	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table A-1. Unocal Groundwater Study
Pacific Topsmelt Chronic Survival & Growth
WET-MW-7
Test Initiation: 29 May 2003

Foils dried again and final weights checked and adjusted

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
	1	6	100		43.11	55.10	1.998	
	2	6	100		43.98	54.29	1.718	
Control	3	6	100	100	43.98	58.10	2.353	2.047
	4	6	100		42.85	54.00	1.858	
	5	6	100		42.23	56.06	2.305	
	1	6	100		42.83	54.85	2.003	
	2	6	100		42.89	56.41	2.253	
6.25	3	6	100	100	43.87	57.13	2.210	2.071
	4	6	100		43.60	56.49	2.148	
	5	6	100		43.70	54.13	1.738	
	1	6	100		41.85	53.65	1.967	
	2	6	100		42.85	53.60	1.792	
12.5	3	6	100	100	43.41	53.41	1.667	1.915
	4	6	100		44.00	55.41	1.902	
	5	6	100		43.09	56.57	2.247	
	1	6	100		43.93	54.76	1.805	
	2	6	100		43.06	52.38	1.553	
25	3	6	100	100	44.12	54.34	1.703	1.659
	4	6	100		43.69	52.45	1.460	
	5	6	100		42.95	53.60	1.775	
	1	6	100		43.81	56.54	2.122	
	2	6	100		43.47	53.71	1.707	
50	3	6	100	100	43.34	57.55	2.368	2.023
	4	6	100		43.46	53.99	1.755	
	5	6	100		43.81	56.80	2.165	
	1	6	100		43.41	54.40	1.832	
	2	6	100		41.67	52.17	1.750	
100	3	6	100	100	43.88	56.74	2.143	1.719
	4	6	100		43.20	51.69	1.415	
	5	6	100		43.28	52.00	1.453	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix B

Mysidopsis bahia (Mysid shrimp)

Test Results Summaries

Appendix Table B-1. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-146
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival # Alive	% Survival	Mean % Survival	Growth Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
Control	1	5	100	100	43.10	44.91	0.362	0.381
	2	5	100		41.60	43.21	0.322	
	3	5	100		42.64	44.65	0.402	
	4	5	100		41.05	42.89	0.368	
	5	5	100		43.48	45.40	0.384	
	6	5	100		43.97	45.88	0.382	
	7	5	100		43.55	45.66	0.422	
	8	5	100		42.74	44.77	0.406	
6.25	1	4	80	95	42.81	44.44	0.326	0.381
	2	5	100		42.82	44.64	0.364	
	3	5	100		42.46	44.66	0.440	
	4	5	100		44.38	46.27	0.378	
	5	5	100		45.78	48.20	0.484	
	6	5	100		41.87	43.78	0.382	
	7	4	80		44.08	45.64	0.312	
	8	5	100		41.40	43.19	0.358	
12.5	1	5	100	98	43.87	45.65	0.356	0.358
	2	5	100		42.68	44.27	0.318	
	3	5	100		42.98	44.78	0.360	
	4	5	100		42.49	44.43	0.388	
	5	4	80		43.28	45.00	0.344	
	6	5	100		44.34	46.15	0.362	
	7	5	100		41.85	43.67	0.364	
	8	5	100		44.04	45.89	0.370	
25	1	4	80	98	42.24	43.26	0.204	0.324
	2	5	100		42.48	44.36	0.376	
	3	5	100		43.20	44.95	0.350	
	4	5	100		41.89	43.78	0.378	
	5	5	100		43.64	45.21	0.314	
	6	5	100		42.81	44.55	0.348	
	7	5	100		42.53	43.99	0.292	
	8	5	100		42.15	43.79	0.328	
50	1	3	60	68	43.03	43.57	0.108	0.129
	2	3	60		42.91	43.69	0.156	
	3	2	40		42.13	42.42	0.058	
	4	4	80		42.30	42.96	0.132	
	5	5	100		41.27	42.10	0.166	
	6	3	60		42.72	43.27	0.110	
	7	3	60		41.30	42.04	0.148	
	8	4	80		42.22	43.00	0.156	
100	1	1	20	5	44.94	45.09	0.030	0.006
	2	0	0		-	-	0.000	
	3	0	0		-	-	0.000	
	4	0	0		-	-	0.000	
	5	1	20		40.67	40.76	0.018	
	6	0	0		-	-	0.000	
	7	0	0		-	-	0.000	
	8	0	0		-	-	0.000	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix Table B-2. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-7
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	4	80	95	42.64	44.02	0.276	0.336
	2	5	100		43.56	45.42	0.372	
	3	5	100		44.01	45.54	0.306	
	4	5	100		42.59	44.17	0.316	
	5	5	100		42.33	44.13	0.360	
	6	5	100		42.30	44.32	0.404	
	7	5	100		42.67	44.66	0.398	
	8	4	80		42.45	43.72	0.254	
6.25	1	5	100	95	42.24	43.38	0.228	0.298
	2	5	100		43.36	45.39	0.406	
	3	5	100		42.41	44.10	0.338	
	4	4	80		42.77	43.76	0.198	
	5	4	80		43.13	44.73	0.320	
	6	5	100		41.65	42.65	0.200	
	7	5	100		40.41	41.94	0.306	
	8	5	100		42.34	44.26	0.384	
12.5	1	5	100	98	41.18	42.75	0.314	0.302
	2	5	100		43.16	44.70	0.308	
	3	5	100		42.55	44.01	0.292	
	4	4	80		43.17	44.33	0.232	
	5	5	100		42.91	44.40	0.298	
	6	5	100		43.91	45.58	0.334	
	7	5	100		43.04	44.54	0.300	
	8	5	100		42.62	44.30	0.336	
25	1	3	60	88	42.94	43.43	0.098	0.267
	2	4	80		43.22	44.70	0.296	
	3	5	100		42.85	44.30	0.290	
	4	5	100		41.63	43.33	0.340	
	5	5	100		42.47	43.83	0.272	
	6	5	100		43.46	45.18	0.344	
	7	5	100		42.76	44.37	0.322	
	8	3	60		42.07	42.93	0.172	
50	1	4	80	88	41.48	42.60	0.224	0.247
	2	3	60		42.67	43.46	0.158	
	3	4	80		43.31	44.70	0.278	
	4	5	100		42.44	43.82	0.276	
	5	5	100		42.48	43.87	0.278	
	6	5	100		41.40	43.06	0.332	
	7	5	100		42.75	43.83	0.216	
	8	4	80		43.66	44.72	0.212	
100	1	4	80	85	43.69	44.41	0.144	0.104
	2	5	100		42.97	43.63	0.132	
	3	3	60		43.19	43.42	0.046	
	4	4	80		43.02	43.54	0.104	
	5	5	100		42.26	42.86	0.120	
	6	5	100		43.20	43.77	0.114	
	7	4	80		43.11	43.50	0.078	
	8	4	80		42.19	42.66	0.094	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix Table B-3. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-17
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	**Replicate**	**# Alive**	**% Survival**	**Mean % Survival**	**Tare Weight mg**	**Total Weight mg**	**Weight per Fish [a] (mg)**	**Mean Weight (mg)**
Control	1	5	100	93	39.91	41.17	0.252	0.285
	2	4	80		44.20	45.55	0.270	
	3	5	100		43.71	45.25	0.308	
	4	5	100		44.16	45.96	0.360	
	5	5	100		45.65	47.04	0.278	
	6	4	80		43.85	45.26	0.282	
	7	5	100		42.06	43.40	0.268	
	8	4	80		41.01	42.30	0.258	
6.25	1	5	100	88	42.33	43.59	0.252	0.254
	2	4	80		43.98	44.79	0.162	
	3	4	80		38.78	39.86	0.216	
	4	4	80		42.98	44.25	0.254	
	5	5	100		41.91	43.48	0.314	
	6	5	100		45.12	46.52	0.280	
	7	4	80		43.49	44.72	0.246	
	8	4	80		43.09	44.62	0.306	
12.5	1	3	60	83	42.70	43.86	0.232	0.224
	2	4	80		44.69	45.88	0.238	
	3	5	100		41.39	42.82	0.286	
	4	5	100		43.58	44.66	0.216	
	5	4	80		42.90	43.96	0.212	
	6	5	100		41.58	42.90	0.264	
	7	3	60		44.80	45.39	0.118	
	8	4	80		43.54	44.68	0.228	
25	1	4	80	98	43.04	44.04	0.200	0.248
	2	5	100		41.60	42.83	0.246	
	3	5	100		42.76	44.18	0.284	
	4	5	100		42.14	43.62	0.296	
	5	5	100		41.13	42.38	0.250	
	6	5	100		42.35	43.28	0.186	
	7	5	100		40.56	41.77	0.242	
	8	5	100		43.50	44.88	0.276	
50	1	5	100	80	41.33	42.44	0.222	0.156
	2	3	60		42.13	42.70	0.114	
	3	2	40		43.30	43.72	0.084	
	4	5	100		43.25	44.00	0.150	
	5	5	100		44.18	45.36	0.236	
	6	5	100		43.47	44.26	0.158	
	7	2	40		43.55	44.03	0.096	
	8	5	100		43.83	44.77	0.188	
100	1	0	0	23	-	-	0.000	0.025
	2	3	60		44.35	44.60	0.050	
	3	2	40		43.87	44.13	0.052	
	4	0	0		-	-	0.000	
	5	0	0		-	-	0.000	
	6	2	40		43.67	43.85	0.036	
	7	1	20		43.71	43.90	0.038	
	8	1	20		44.13	44.26	0.026	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix Table B-4. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-103R
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	% Survival	Mean % Survival	Growth: Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
Control	1	4	80	95	42.80	44.30	0.300	0.338
	2	4	80		42.71	44.22	0.302	
	3	5	100		43.50	45.44	0.388	
	4	5	100		41.80	43.55	0.350	
	5	5	100		43.22	45.06	0.368	
	6	5	100		42.70	44.25	0.310	
	7	5	100		42.03	43.93	0.380	
	8	5	100		43.63	45.15	0.304	
6.25	1	5	100	88	44.35	46.24	0.378	0.313
	2	5	100		43.10	45.26	0.432	
	3	5	100		43.48	44.99	0.302	
	4	3	60		43.24	44.62	0.276	
	5	4	80		42.64	43.82	0.236	
	6	4	80		43.95	45.34	0.278	
	7	5	100		42.12	43.69	0.314	
	8	4	80		43.45	44.90	0.290	
12.5	1	5	100	98	41.92	43.65	0.346	0.316
	2	5	100		42.51	43.97	0.292	
	3	4	80		43.73	45.10	0.274	
	4	5	100		43.04	44.47	0.286	
	5	5	100		45.18	46.78	0.320	
	6	5	100		43.56	45.51	0.390	
	7	5	100		43.14	44.85	0.342	
	8	5	100		42.95	44.33	0.276	
25	1	5	100	95	43.14	44.62	0.296	0.317
	2	4	80		42.95	44.22	0.254	
	3	5	100		42.74	44.46	0.344	
	4	5	100		43.28	45.21	0.386	
	5	5	100		43.72	45.38	0.332	
	6	5	100		43.61	45.29	0.336	
	7	5	100		42.79	44.39	0.320	
	8	4	80		43.19	44.54	0.270	
50	1	4	80	90	43.17	44.40	0.246	0.275
	2	5	100		43.40	45.16	0.352	
	3	5	100		43.24	44.59	0.270	
	4	4	80		43.83	44.83	0.200	
	5	5	100		43.64	45.31	0.334	
	6	4	80		43.41	44.84	0.286	
	7	5	100		43.21	44.87	0.332	
	8	4	80		43.31	44.20	0.178	
100	1	5	100	90	42.85	43.63	0.156	0.227
	2	4	80		43.66	44.83	0.234	
	3	5	100		43.48	44.65	0.234	
	4	5	100		44.19	45.68	0.298	
	5	4	80		42.97	43.94	0.194	
	6	4	80		42.45	43.35	0.180	
	7	5	100		44.40	45.93	0.306	
	8	4	80		43.79	44.84	0.210	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix Table B-5. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-129
Test Initiation: 29 May 2003

Concentration %	Replicate	# Alive	% Survival	Mean % Survival	Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
		Survival			Growth			
Control	1	4	80	93	43.82	45.15	0.266	0.322
	2	5	100		43.44	45.14	0.340	
	3	4	80		43.76	45.01	0.250	
	4	5	100		42.17	44.10	0.386	
	5	5	100		43.67	45.66	0.398	
	6	5	100		42.71	44.48	0.354	
	7	4	80		43.00	44.15	0.230	
	8	5	100		42.21	43.98	0.354	
6.25	1	5	100	95	43.49	44.80	0.262	0.302
	2	5	100		44.02	45.78	0.352	
	3	5	100		43.60	45.46	0.372	
	4	4	80		43.15	44.78	0.326	
	5	4	80		43.53	44.48	0.190	
	6	5	100		42.54	44.06	0.304	
	7	5	100		43.69	45.38	0.338	
	8	5	100		43.44	44.81	0.274	
12.5	1	4	80	95	44.46	45.98	0.304	0.268
	2	5	100		41.19	42.95	0.352	
	3	5	100		43.56	44.60	0.208	
	4	5	100		43.29	44.40	0.222	
	5	5	100		43.20	44.62	0.284	
	6	4	80		43.53	44.43	0.180	
	7	5	100		43.25	44.24	0.198	
	8	5	100		42.97	44.95	0.396	
25	1	2	40	85	43.50	43.59	0.018	0.158
	2	5	100		43.18	44.36	0.236	
	3	4	80		43.02	43.98	0.192	
	4	5	100		43.23	43.90	0.134	
	5	4	80		43.72	44.27	0.110	
	6	5	100		43.30	44.60	0.260	
	7	5	100		43.34	44.15	0.162	
	8	4	80		43.88	44.64	0.152	
50	1	2	40	45	43.74	44.22	0.096	0.081
	2	3	60		43.01	43.56	0.110	
	3	2	40		42.79	43.37	0.116	
	4	2	40		44.50	44.57	0.014	
	5	3	60		43.26	43.82	0.112	
	6	3	60		43.73	44.50	0.154	
	7	2	40		42.89	42.91	0.004	
	8	1	20		43.90	44.11	0.042	
100	1	0	0	0	-	-	-	-
	2	0	0		-	-	-	
	3	0	0		-	-	-	
	4	0	0		-	-	-	
	5	0	0		-	-	-	
	6	0	0		-	-	-	
	7	0	0		-	-	-	
	8	0	0		-	-	-	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix Table B-6. Unocal Groundwater Study
Mysid Shrimp Chronic Survival & Growth
WET-MW-W
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	5	100	98	42.74	44.48	0.348	0.332
	2	5	100		43.10	44.69	0.318	
	3	5	100		42.53	44.23	0.340	
	4	5	100		42.29	43.87	0.316	
	5	5	100		42.68	44.55	0.374	
	6	5	100		43.36	44.95	0.318	
	7	5	100		43.86	45.57	0.342	
	8	4	80		43.42	44.90	0.296	
6.25	1	5	100	93	42.09	43.78	0.338	0.330
	2	5	100		42.71	44.37	0.332	
	3	5	100		42.84	44.94	0.420	
	4	5	100		43.97	45.87	0.380	
	5	5	100		43.24	45.02	0.356	
	6	4	80		43.36	44.81	0.290	
	7	4	80		42.44	43.72	0.256	
	8	4	80		43.37	44.69	0.264	
12.5	1	5	100	98	42.63	44.20	0.314	0.335
	2	5	100		43.43	45.42	0.398	
	3	5	100		42.68	44.30	0.324	
	4	5	100		42.54	43.97	0.286	
	5	4	80		43.65	45.05	0.280	
	6	5	100		42.98	44.87	0.378	
	7	5	100		42.92	44.68	0.352	
	8	5	100		42.52	44.27	0.350	
25	1	5	100	98	43.31	45.07	0.352	0.299
	2	5	100		42.16	43.45	0.258	
	3	5	100		42.69	44.50	0.362	
	4	5	100		43.01	44.33	0.264	
	5	4	80		43.04	44.11	0.214	
	6	5	100		44.48	45.98	0.300	
	7	5	100		44.03	45.69	0.332	
	8	5	100		44.22	45.78	0.312	
50	1	5	100	93	43.79	44.76	0.194	0.204
	2	5	100		43.68	44.93	0.250	
	3	5	100		42.43	43.32	0.178	
	4	5	100		42.04	43.20	0.232	
	5	4	80		42.53	43.40	0.174	
	6	5	100		44.85	45.67	0.164	
	7	4	80		43.70	44.67	0.194	
	8	4	80		42.96	44.17	0.242	
100	1	5	100	68	44.10	44.92	0.164	0.108
	2	3	60		43.30	43.80	0.100	
	3	3	60		42.25	42.74	0.098	
	4	3	60		44.01	44.58	0.114	
	5	3	60		42.78	43.19	0.082	
	6	3	60		43.95	44.41	0.092	
	7	5	100		42.13	42.91	0.156	
	8	2	40		43.60	43.87	0.054	

a- Weight per mysid evaluated using the combined growth & survival endpoint. Divide weight per container by initial organism count.

Appendix C

Pimephales promelas (Fathead minnow)

Test Results Summaries

Appendix Table C-1. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-146
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	10	100	93	43.08	49.52	0.644	0.601
	2	9	90		42.85	47.95	0.510	
	3	8	80		42.66	48.59	0.593	
	4	10	100		43.28	49.86	0.658	
6.25	1	10	100	98	42.56	47.54	0.498	0.622
	2	9	90		43.08	49.68	0.660	
	3	10	100		42.73	49.87	0.714	
	4	10	100		40.58	46.74	0.616	
12.5	1	10	100	95	42.99	48.20	0.521	0.591
	2	10	100		42.09	48.45	0.636	
	3	9	90		42.60	49.04	0.644	
	4	9	90		42.62	48.25	0.563	
25	1	8	80	85	41.65	46.43	0.478	0.533
	2	9	90		43.06	49.48	0.642	
	3	9	90		43.04	48.07	0.503	
	4	8	80		42.08	47.17	0.509	
50	1	7	70	83	42.61	47.66	0.505	0.525
	2	9	90		41.08	46.39	0.531	
	3	8	80		41.17	46.60	0.543	
	4	9	90		41.12	46.34	0.522	
100	1	4	40	33	41.47	43.05	0.158	0.112
	2	5	50		42.67	44.33	0.166	
	3	2	20		42.82	43.39	0.057	
	4	2	20		41.23	41.88	0.065	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table C-2. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-7
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	**Replicate**	**# Alive**	**% Survival**	**Mean % Survival**	**Tare Weight mg**	**Total Weight mg**	**Weight per Fish [a] (mg)**	**Mean Weight (mg)**
Control	1	10	100	90	42.83	48.15	0.532	0.521
	2	9	90		42.79	48.08	0.529	
	3	8	80		42.52	47.54	0.502	
	4	9	90		42.92	48.11	0.519	
6.25	1	10	100	98	42.82	48.71	0.589	0.572
	2	10	100		44.42	49.39	0.497	
	3	9	90		42.46	48.24	0.578	
	4	10	100		42.14	48.38	0.624	
12.5	1	10	100	90	42.86	47.57	0.471	0.493
	2	9	90		42.52	47.81	0.529	
	3	8	80		42.21	46.80	0.459	
	4	9	90		42.98	48.09	0.511	
25	1	9	90	90	43.36	47.80	0.444	0.497
	2	9	90		42.98	47.84	0.486	
	3	9	90		42.15	48.15	0.600	
	4	9	90		42.80	47.37	0.457	
50	1	10	100	95	42.81	48.75	0.594	0.576
	2	9	90		42.48	49.00	0.652	
	3	10	100		43.83	48.57	0.474	
	4	9	90		43.36	49.20	0.584	
100	1	10	100	98	43.18	47.81	0.463	0.565
	2	10	100		42.98	49.26	0.628	
	3	10	100		42.97	49.04	0.607	
	4	9	90		42.50	48.11	0.561	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table C-3. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-17
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	**Replicate**	**# Alive**	**% Survival**	**Mean % Survival**	**Tare Weight mg**	**Total Weight mg**	**Weight per Fish [a] (mg)**	**Mean Weight (mg)**
Control	1	10	100	95	43.43	50.02	0.659	0.563
	2	10	100		43.61	49.80	0.619	
	3	8	80		42.89	47.45	0.456	
	4	10	100		42.70	47.87	0.517	
6.25	1	9	90	95	41.97	46.13	0.416	0.532
	2	10	100		42.88	48.53	0.565	
	3	10	100		44.31	49.94	0.563	
	4	9	90		42.32	48.16	0.584	
12.5	1	9	90	83	44.02	49.43	0.541	0.489
	2[b]	-	-		-	-	-	
	3	8	80		42.82	47.98	0.516	
	4	8	80		42.37	46.48	0.411	
25	1	9	90	88	44.58	48.56	0.398	0.448
	2	8	80		43.74	48.01	0.427	
	3	8	80		43.09	47.46	0.437	
	4	10	100		43.20	48.48	0.528	
50	1	9	90	88	44.04	49.89	0.585	0.472
	2	8	80		41.16	44.60	0.344	
	3	9	90		43.66	48.74	0.508	
	4	9	90		43.84	48.34	0.450	
100	1	10	100	98	42.32	46.68	0.436	0.455
	2	9	90		40.89	45.60	0.471	
	3	10	100		43.85	48.74	0.489	
	4	10	100		42.08	46.32	0.424	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.
b-replicate 2 in 12.5% concentration removed from calculations. The cup was spilled on day 2 of the test and test organisms were lost.

Appendix Table C-4. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-103R
Test Initiation: 29 May 2003

		Survival			Growth			
Concentration %	**Replicate**	**# Alive**	**% Survival**	**Mean % Survival**	**Tare Weight mg**	**Total Weight mg**	**Weight per Fish [a] (mg)**	**Mean Weight (mg)**
Control	1	10	100	100	37.99	43.86	0.587	0.523
	2	10	100		43.21	47.74	0.453	
	3	10	100		42.67	47.62	0.495	
	4	10	100		43.67	49.23	0.556	
6.25	1	9	90	90	42.40	47.71	0.531	0.506
	2	10	100		43.83	49.77	0.594	
	3	8	80		45.65	50.05	0.440	
	4	9	90		43.14	47.71	0.457	
12.5	1	10	100	98	41.50	47.43	0.593	0.603
	2	9	90		42.91	48.86	0.595	
	3	10	100		43.80	50.10	0.630	
	4	10	100		42.24	48.17	0.593	
25	1	9	90	95	43.64	48.54	0.490	0.555
	2	10	100		42.27	48.42	0.615	
	3	10	100		41.96	47.91	0.595	
	4	9	90		43.61	48.81	0.520	
50	1	7	70	88	41.17	45.39	0.422	0.476
	2	10	100		43.48	49.05	0.557	
	3	8	80		42.36	46.88	0.452	
	4	10	100		43.17	47.89	0.472	
100	1	7	70	85	43.48	47.72	0.424	0.459
	2	9	90		44.02	48.60	0.458	
	3	9	90		43.17	48.26	0.509	
	4	9	90		43.22	47.67	0.445	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table C-5. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-129
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival # Alive	% Survival	Mean % Survival	Growth Tare Weight mg	Total Weight mg	Weight per Fish [a] (mg)	Mean Weight (mg)
Control	1	10	100	93	44.59	50.81	0.622	0.582
	2	9	90		42.66	48.30	0.564	
	3	9	90		42.96	49.07	0.611	
	4	9	90		42.16	47.46	0.530	
6.25	1	9	90	95	42.23	48.13	0.590	0.557
	2	10	100		44.95	50.81	0.586	
	3	9	90		44.76	49.95	0.519	
	4	10	100		42.85	48.16	0.531	
12.5	1	9	90	85	44.43	50.15	0.572	0.596
	2	9	90		43.10	50.04	0.694	
	3	9	90		42.33	47.90	0.557	
	4	7	70		43.07	48.67	0.560	
25	1	8	80	90	43.80	48.86	0.506	0.515
	2	9	90		43.48	48.48	0.500	
	3	9	90		42.96	48.58	0.562	
	4	10	100		42.71	47.62	0.491	
50	1	10	100	93	43.08	47.42	0.434	0.404
	2	8	80		42.88	47.20	0.432	
	3	10	100		43.15	47.06	0.391	
	4	9	90		44.96	48.55	0.359	
100	1	5	50	33	42.68	43.26	0.058	0.065
	2	2	20		43.69	44.00	0.031	
	3	5	50		42.93	44.60	0.167	
	4	1	10		44.48	44.53	0.005	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix Table C-6. Unocal Groundwater Study
Fathead minnow Chronic Survival & Growth
WET-MW-W
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival: # Alive	Survival: % Survival	Survival: Mean % Survival	Growth: Tare Weight mg	Growth: Total Weight mg	Growth: Weight per Fish [a] (mg)	Growth: Mean Weight (mg)
Control	1	9	90	98	41.64	47.03	0.539	0.577
	2	10	100		43.59	49.19	0.560	
	3	10	100		41.86	47.84	0.598	
	4	10	100		42.30	48.39	0.609	
6.25	1	10	100	88	42.02	47.22	0.520	0.531
	2	9	90		45.56	51.55	0.599	
	3	9	90		44.16	49.38	0.522	
	4	7	70		44.14	48.95	0.481	
12.5	1	10	100	93	44.02	49.44	0.542	0.512
	2	9	90		43.78	49.26	0.548	
	3	8	80		44.20	48.54	0.434	
	4	10	100		43.75	49.00	0.525	
25	1	10	100	93	44.23	49.71	0.548	0.514
	2	10	100		46.11	50.86	0.475	
	3	8	80		41.17	46.02	0.485	
	4	9	90		42.50	47.97	0.547	
50	1	9	90	93	44.08	48.47	0.439	0.466
	2	10	100		46.16	50.50	0.434	
	3	9	90		41.21	46.47	0.526	
	4	9	90		43.64	48.30	0.466	
100	1	6	60	70	43.48	46.28	0.280	0.302
	2	8	80		44.53	48.10	0.357	
	3	6	60		46.40	49.14	0.274	
	4	8	80		43.77	46.75	0.298	

a- Weight per fish evaluated using the combined growth & survival endpoint. Divide weight per container by initial fish count.

Appendix D

Ceriodaphnia dubia

Test Results Summaries

Appendix Table D-1. Unocal Groundwater Study
***Ceriodaphnia dubia* Chronic Survival & Reproduction**
WET-MW-146
Test Initiation: 29 May 2003

Concentration %	Replicate	Survival #Alive	Survival Mean % Survival	Reproduction Neonates per adult	Reproduction Mean neonates per adult	Concentration %	Replicate	Survival #Alive	Survival Mean % Survival	Reproduction Neonates per adult	Reproduction Mean neonates per adult
Control	1	1	100	17	20	**25**	1	1	100	16	20
	2	1		29			2	1		19	
	3	1		20			3	1		21	
	4	1		21			4	1		25	
	5	1		16			5	1		19	
	6	1		20			6	1		13	
	7	1		17			7	1		20	
	8	1		22			8	1		17	
	9	1		25			9	1		24	
	10	1		16			10	1		29	
6.25	1	1	100	24	21	**50**	1	1	100	9	15
	2	1		20			2	1		14	
	3	1		24			3	1		12	
	4	1		24			4	1		18	
	5	1		19			5	1		13	
	6	1		23			6	1		14	
	7	1		14			7	1		19	
	8	1		22			8	1		14	
	9	1		19			9	1		20	
	10	1		21			10	1		16	
12.5	1	1	100	20	21	**100**	1	1	90	3	1
	2	1		26			2	1		1	
	3	1		24			3	1		2	
	4	1		22			4	1		2	
	5	1		17			5	1		1	
	6	1		20			6	0		0	
	7	1		22			7	1		0	
	8	1		19			8	1		2	
	9	1		23			9	1		0	
	10	1		20			10	1		2	

Note: Reproduction endpoint evaluated after 6 days of exposure because 60% of surviving control organisms had produced 3 broods of neonates.
NOEC and EC50 values calculated using neonate production through both 6 and 7 days of exposure provide the same results.
Survival was evaluated after 7 days of exposure.

Appendix Table D-2. Unocal Groundwater Study
Ceriodaphnia dubia Chronic Survival & Reproduction
WET-MW-7
Test Initiation: 29 May 2003

		Survival		Reproduction				Survival		Reproduction	
Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult	Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult
Control	1	1	90	20	18	**25**	1	1	100	22	19
	2	1		22			2	1		19	
	3	1		17			3	1		20	
	4	1		20			4	1		20	
	5	1		22			5	1		23	
	6	1		19			6	1		22	
	7	0		6			7	1		16	
	8	1		26			8	1		16	
	9	1		17			9	1		4	
	10	1		14			10	1		24	
6.25	1	1	100	20	22	**50**	1	1	100	16	18
	2	1		24			2	1		20	
	3	1		22			3	1		23	
	4	1		29			4	1		14	
	5	1		22			5	1		16	
	6	1		21			6	1		17	
	7	1		23			7	1		22	
	8	1		26			8	1		16	
	9	1		22			9	1		17	
	10	1		14			10	1		17	
12.5	1	1	100	27	21	**100**	1	1	100	18	13
	2	1		16			2	1		13	
	3	1		25			3	1		9	
	4	1		24			4	1		12	
	5	1		22			5	1		15	
	6	1		20			6	1		16	
	7	1		11			7	1		12	
	8	1		17			8	1		12	
	9	1		27			9	1		7	
	10	1		18			10	1		18	

Note: Reproduction endpoint evaluated after 6 days of exposure because 60% of surviving control organisms had produced 3 broods of neonates.
NOEC and EC50 values calculated using neonate production through both 6 and 7 days of exposure provide the same results.
Survival was evaluated after 7 days of exposure.

Appendix Table D-3. Unocal Groundwater Study
***Ceriodaphnia dubia* Chronic Survival & Reproduction**
WET-MW-17
Test Initiation: 29 May 2003

		Survival		Reproduction				Survival		Reproduction	
Concentration %	**Replicate**	**#Alive**	**Mean % Survival**	**Neonates per adult**	**Mean neonates per adult**	**Concentration %**	**Replicate**	**#Alive**	**Mean % Survival**	**Neonates per adult**	**Mean neonates per adult**
Control	1	1	100	21	19	**25**	1	1	100	15	16
	2	1		17			2	1		15	
	3	1		15			3	1		21	
	4	1		25			4	1		19	
	5	1		23			5	1		8	
	6	1		16			6	1		13	
	7	1		15			7	1		17	
	8	1		17			8	1		11	
	9	1		19			9	1		17	
	10	1		23			10	1		19	
6.25	1	1	100	24	20	**50**	1	1	100	2	16
	2	1		14			2	1		20	
	3	1		18			3	1		20	
	4	1		15			4	1		16	
	5	1		21			5	1		23	
	6	1		21			6	1		9	
	7	1		22			7	1		16	
	8	1		20			8	1		17	
	9	1		19			9	1		21	
	10	1		25			10	1		20	
12.5	1	1	100	18	16	**100**	1	1	100	13	15
	2	1		13			2	1		16	
	3	1		20			3	1		20	
	4	1		20			4	1		12	
	5	1		12			5	1		16	
	6	1		21			6	1		17	
	7	1		24			7	1		15	
	8	1		18			8	1		18	
	9	1		1			9	1		6	
	10	1		17			10	1		12	

Note: Reproduction endpoint evaluated after 6 days of exposure because 60% of surviving control organisms had produced 3 broods of neonates.
Survival was evaluated after 7 days of exposure.

Appendix Table D-4. Unocal Groundwater Study
***Ceriodaphnia dubia* Chronic Survival & Reproduction**
WET-MW-103R
Test Initiation: 29 May 2003

		Survival		Reproduction				Survival		Reproduction	
Concentration %	**Replicate**	**#Alive**	**Mean % Survival**	**Neonates per adult**	**Mean neonates per adult**	**Concentration %**	**Replicate**	**#Alive**	**Mean % Survival**	**Neonates per adult**	**Mean neonates per adult**
Control	1	1	100	19	20	**25**	1	1	100	16	16
	2	1		20			2	1		18	
	3	1		19			3	1		14	
	4	1		18			4	1		16	
	5	1		21			5	1		9	
	6	1		26			6	1		12	
	7	1		17			7	1		20	
	8	1		17			8	1		16	
	9	1		23			9	1		9	
	10	1		16			10	1		25	
6.25	1	1	100	24	21	**50**	1	1	100	10	12
	2	1		22			2	1		13	
	3	1		24			3	1		14	
	4	1		19			4	1		14	
	5	1		15			5	1		17	
	6	1		22			6	1		16	
	7	1		16			7	1		6	
	8	1		23			8	1		12	
	9	1		21			9	1		10	
	10	1		21			10	1		4	
12.5	1	1	100	16	19	**100**	1	1	100	13	13
	2	1		15			2	1		6	
	3	1		16			3	1		5	
	4	1		20			4	1		6	
	5	1		21			5	1		12	
	6	1		19			6	1		13	
	7	1		20			7	1		26	
	8	1		22			8	1		22	
	9	1		18			9	1		12	
	10	1		21			10	1		19	

Note: Reproduction endpoint evaluated after 6 days of exposure because 60% of surviving control organisms had produced 3 broods of neonates.
NOEC and EC50 values calculated using neonate production through both 6 and 7 days of exposure provide the same results.
Survival was evaluated after 7 days of exposure.

Appendix Table D-5. Unocal Groundwater Study
***Ceriodaphnia dubia* Chronic Survival & Reproduction**
WET-MW-129
Test Initiation: 29 May 2003

		Survival		Reproduction				Survival		Reproduction	
Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult	Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult
	1	1		10			1	1		26	
	2	1		21			2	1		21	
	3	1		18			3	1		19	
	4	1		19			4	1		24	
Control	5	1	90	19	19	**25**	5	1	100	20	22
	6	0		-			6	1		21	
	7	1		21			7	1		25	
	8	1		19			8	1		26	
	9	1		18			9	1		18	
	10	1		22			10	1		20	
	1	1		17			1	1		14	
	2	1		24			2	0		-	
	3	1		20			3	1		17	
	4	1		26			4	1		10	
6.25	5	1	100	22	22	**50**	5	1	90	31	17
	6	1		17			6	1		19	
	7	1		19			7	1		12	
	8	1		24			8	1		18	
	9	1		22			9	1		16	
	10	1		25			10	1		13	
	1	1		25			1	1		8	
	2	1		21			2	1		9	
	3	1		15			3	1		9	
	4	1		15			4	1		5	
12.5	5	1	100	10	19	**100**	5	1	100	9	9
	6	1		21			6	1		10	
	7	1		24			7	1		8	
	8	1		24			8	1		10	
	9	1		20			9	1		8	
	10	1		14			10	1		11	

Note: Reproduction endpoint evaluated after 6 days of exposure because 60% of surviving control organisms had produced 3 broods of neonates.
NOEC and EC50 values calculated using neonate production through both 6 and 7 days of exposure provide the same results.
Survival was evaluated after 7 days of exposure.

Appendix Table D-6. Unocal Groundwater Study
Ceriodaphnia dubia **Chronic Survival & Reproduction**
WET-MW-W
Test Initiation: 29 May 2003

		Survival		Reproduction				Survival		Reproduction	
Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult	Concentration %	Replicate	#Alive	Mean % Survival	Neonates per adult	Mean neonates per adult
Control	1	0	90	6	25	25	1	1	100	36	31
	2	1		29			2	1		31	
	3	1		29			3	1		33	
	4	1		25			4	1		31	
	5	1		37			5	1		36	
	6	1		21			6	1		29	
	7	1		22			7	1		27	
	8	1		28			8	1		18	
	9	1		25			9	1		38	
	10	1		28			10	1		34	
6.25	1	1	100	48	40	50	1	1	100	28	29
	2	1		40			2	1		27	
	3	1		45			3	1		27	
	4	1		37			4	1		28	
	5	1		38			5	1		29	
	6	1		38			6	1		31	
	7	1		42			7	1		32	
	8	1		36			8	1		29	
	9	1		39			9	1		21	
	10	1		33			10	1		35	
12.5	1	1	100	40	37	100	1	1	100	17	18
	2	1		42			2	1		23	
	3	1		38			3	1		12	
	4	1		34			4	1		20	
	5	1		30			5	1		18	
	6	1		37			6	1		14	
	7	1		37			7	1		15	
	8	1		34			8	1		19	
	9	1		41			9	1		21	
	10	1		40			10	1		18	

Appendix E

Sample Receipt Information

Appendix Table E. Unocal Groundwater Study
Sample Receipt Information

	Sample ID					
	MW-146	**MW-7**	**MW-17**	**MW-103 R**	**MW-129**	**MW-W**
AMEC ID	03-0186	03-0187	03-0188	03-0189	03-0190	03-0191
Sample Date	5/28/2003	5/28/2003	5/28/2003	5/28/2003	5/28/2003	5/28/2003
Sample Time	09:35	09:36	13:25	17:00	15:20	19:40
Receipt Date	5/29/2003	5/29/2003	5/29/2003	5/29/2003	5/29/2003	5/29/2003
Receipt Time	08:20	08:20	08:20	08:20	08:20	08:20
Receipt Temp. (°C)	1.0	2.5	3.8	4.3	1.2	4.8
Dissoloved Oxygen (mg/L)	1.5	4.0	3.7	2.4	1.8	3.0
pH	6.43	6.48	6.68	6.67	6.72	6.75
Conductivity (μS/cm)	388	255	225	699	717	826
Salinity (ppt)	0.1	0.1	0.1	0.4	0.4	0.6
Hardness (mg/L $CaCO_3$)	>400	>400	116	>400	>400	>400
Alkalinity (mg/L $CaCO_3$)	264	184	88	392	>400	>400
Chlorine (mg/L)	<0.03	0.06	0.12	0.05	<0.03	<0.03
Ammonia (mg/L)	3.5	1.6	0.9	5.7	2.6	4.4

Appendix F

Water Quality Data

Atherinops affinis

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #1 MW-146
Test No: 0305-27NW

Start Date & Time: 5/29/03 1945
Stop Date & Time: 6/5/03 1900
Test species: Atherinops affinis

% Concentration CON	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.31	8.03	8.37	8.04	8.33	8.09	8.35	8.05	8.45	7.93	8.45	8.06	8.38	8.14
DO (mg/l)	6.9	6.1	6.8	6.1	7.0	6.1	6.8	6.5	7.0	5.8	6.8	6.0	6.8	5.9
Salinity (ppt)	29.0	29.0	29.6	29.7	29.7	30.8	29.4	28.6	29.7	29.4	29.2	29.7	29.0	28.6
Temperature (°C)	20.8	20.1	20.0	20.4	20.5	20.0	20.0	20.1	20.0	19.8	20.7	2-.3	20.0	19.9

Concentration 6.25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.19	8.00	8.14	7.95	8.11	7.96	8.10	7.99	8.32	8.03	8.32	8.02	8.26	8.09
DO (mg/l)	7.0	6.2	6.8	6.2	6.8	5.9	6.8	6.5	6.9	6.0	6.8	6.2	6.6	6.4
Salinity (ppt)	29.0	29.3	29.6	27.9	29.5	31.0	29.5	26.1	29.2	29.5	29.3	29.7	29.7	28.8
Temperature (°C)	19.7	19.8	20.0	20.0	20.0	20.2	20.0	20.0	20.0	19.9	19.7	19.6	20.0	20.1

Concentration 12.5	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.09	7.97	7.88	7.91	7.84	7.90	7.86	7.94	8.18	7.94	8.14	7.99	8.12	8.07
DO (mg/l)	6.8	6.0	6.8	5.9	6.9	5.9	6.7	6.2	6.8	5.8	6.7	5.9	6.6	6.2
Salinity (ppt)	29.0	29.2	29.6	30.2	29.5	31.0	29.5	27.5	29.3	29.3	29.4	29.2	29.2	29.0
Temperature (°C)	19.8	20.1	20.0	19.9	19.7	20.1	19.5	20.1	20.1	19.8	19.7	19.7	20.0	20.0

Concentration 25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.87	7.92	7.37	7.88	7.35	7.85	7.38	7.92	7.85	7.91	7.74	7.92	7.78	8.07
DO (mg/l)	6.7	5.8	6.5	5.8	6.8	5.7	6.7	6.2	6.6	5.9	6.6	6.0	6.6	6.3
Salinity (ppt)	29.0	29.5	29.5	29.9	29.5	30.8	29.5	27.6	29.2	29.4	29.3	29.6	29.3	29.4
Temperature (°C)	19.7	19.6	19.9	20.1	19.5	19.8	19.4	20.0	20.1	19.9	19.0	19.3	20.0	20.1

Concentration 50	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.49	7.89	7.04	7.88	7.07	7.87	7.09	7.95	7.28	7.88	7.21	7.89	7.22	8.07
DO (mg/l)	6.5	5.9	6.6	5.8	6.7	5.8	6.7	6.4	6.3	5.8	6.5	6.0	6.2	6.3
Salinity (ppt)	29.1	29.3	29.5	30.0	29.3	30.7	29.6	27.3	28.6	29.2	29.2	29.9	29.5	29.2
Temperature (°C)	19.4	19.5	19.7	20.0	19.3	19.9	19.0	20.0	19.5	19.8	19.2	19.5	20.0	20.1

Concentration 100	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.17	7.96	6.77	7.94	6.82	7.90	6.85	7.99	6.95	7.90	6.91	7.88	6.89	8.11
DO (mg/l)	6.3	6.0	6.4	6.3	6.7	6.1	6.7	6.1	6.3	6.1	6.5	5.8	6.6	6.1
Salinity (ppt)	29.2	29.4	29.2	29.5	29.0	30.3	29.8	27.2	28.4	29.2	29.2	29.8	29.8	29.3
Temperature (°C)	19.1	19.8	20.2	20.0	19.0	20.1	19.0	20.0	20.0	19.9	19.0	19.8	19.7	20.0

	Control	MW-146		
Alkalinity*	176	264		
Initial Chlorine†	–	ND		
Ammonia †	–	3.5		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: MF mw QT
Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #2 MW-7
Test No: 0305-28NW

Start Date & Time: 5/29/03 1800
Stop Date & Time: 6/5/03 1800
Test species: Atherinops affinis

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	8.09	8.37	8.04	8.33	8.07	8.35	8.03	8.45	8.47	8.46	8.05	8.39	8.08
DO (mg/l)	6.8	5.9	6.8	5.9	7.0	5.9	6.8	6.4	7.0	6.6	6.8	5.7	6.8	6.9
Salinity (ppt)	29.0	29.0	29.6	30.2	29.7	30.7	29.4	28.8	29.7	29.7	29.2	29.6	29.0	29.7
Temperature (°C)	19.2	20.2	19.8	20.6	19.9	20.0	20.0	20.4	20.0	20.2	20.7	20.0	20.2	19.7

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	8.01	8.08	7.96	8.24	7.98	8.28	8.01	8.37	8.08	8.36	8.04	8.31	8.01
DO (mg/l)	6.8	5.9	6.8	6.2	7.0	5.9	6.8	6.4	6.9	5.8	6.9	5.7	6.7	5.7
Salinity (ppt)	29.0	29.3	29.0	30.2	29.7	30.4	29.4	27.4	30.1	29.6	29.4	29.6	29.1	29.6
Temperature (°C)	19.0	19.8	20.1	20.1	19.8	20.1	20.1	20.1	19.7	20.0	20.1	20.2	20.7	19.8

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.10	7.99	8.04	7.94	8.16	8.00	8.14	8.01	8.26	8.02	8.29	8.02	8.21	7.94
DO (mg/l)	6.9	5.9	6.7	6.1	7.0	5.9	6.8	6.5	6.9	5.8	6.9	5.6	6.8	5.9
Salinity (ppt)	29.0	29.4	29.1	29.5	29.7	30.9	29.2	27.4	29.0	29.7	29.4	29.5	29.3	30.7
Temperature (°C)	19.0	19.7	19.9	20.0	19.3	20.0	20.0	20.3	19.6	19.8	19.0	19.9	20.3	20.0

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.86	7.93	7.96	7.93	7.99	7.96	7.83	7.96	8.03	7.98	8.11	7.96	7.98	7.95
DO (mg/l)	6.9	6.0	6.9	6.4	7.2	5.7	6.8	6.3	6.8	5.8	6.8	5.5	6.8	5.8
Salinity (ppt)	29.0	29.3	29.3	30.4	29.7	30.6	29.4	28.2	29.0	29.6	29.4	29.7	29.3	29.6
Temperature (°C)	19.2	20.5	20.1	20.1	19.1	20.0	19.3	20.0	19.4	19.2	19.0	20.0	19.8	20.1

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.49	7.90	7.71	7.94	7.71	7.96	7.34	7.93	7.56	7.93	7.76	7.93	7.57	7.91
DO (mg/l)	6.9	5.8	7.2	5.9	7.1	5.9	7.1	6.4	6.9	5.7	7.0	5.8	6.9	5.8
Salinity (ppt)	29.2	30.0	29.5	30.0	29.7	30.9	29.0	27.5	28.2	29.2	29.3	29.4	29.5	29.6
Temperature (°C)	19.0	19.8	20.0	20.0	19.0	19.4	19.2	20.0	19.1	19.7	19.0	19.9	19.5	19.7

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.09	7.94	7.43	8.00	7.32	7.99	7.05	7.97	7.08	7.95	7.25	7.96	7.12	7.91
DO (mg/l)	7.1	5.6	7.4	6.2	7.4	5.9	7.4	6.1	7.1	5.7	7.4	5.7	7.1	5.2
Salinity (ppt)	29.5	30.6	29.7	29.0	29.7	30.7	29.0	23.4	28.1	29.0	29.2	29.4	29.7	29.9
Temperature (°C)	19.2	20.2	20.1	20.1	~~19~~ 19.0	19.8	19.3	20.0	19.0	19.8	19.0	20.1	19.3	19.9

	Control	MW-7		
Alkalinity*	176	184		
Initial Chlorine†	–	.06		
Ammonia †	–	1.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

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Analysts: NF [illegible]
Reviewed: [illegible]

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #3 MW-17
Test No: 0305-29NW

Start Date & Time: 5/29/03 1445
Stop Date & Time: 6/5/03 1400
Test species: Atherinops affinis

% Concentration: CON

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.31	7.94	8.37	8.06	8.33	8.04	8.35	7.97	8.45	7.99	8.45	7.98	8.38	8.11
DO (mg/l)	6.8	6.1	6.8	5.9	7.0	6.1	6.8	6.5	7.0	5.7	6.8	5.9	6.8	6.4
Salinity (ppt)	29.0	29.0	29.6	30.1	29.7	30.3	29.4	29.6	29.7	30.5	29.2	29.5	29.0	28.9
Temperature (°C)	19.8	20.2	20.1	20.5	19.9	20.1	20.0	20.0	20.6	19.4	21.0	20.0	21.0	20.0

Concentration: 6.25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.26	7.96	8.33	8.04	8.28	7.98	8.32	8.00	8.39	7.95	8.39	8.00	8.34	8.06
DO (mg/l)	6.8	5.8	6.9	6.1	7.0	6.1	6.9	6.6	6.9	5.8	6.8	5.7	6.7	6.1
Salinity (ppt)	29.0	29.1	29.7	30.9	29.7	30.4	29.5	28.2	30.1	29.0	29.6	30.3	29.0	29.2
Temperature (°C)	20.0	20.2	19.8	20.1	19.1	20.0	19.4	19.9	20.1	19.7	20.0	20.0	20.0	20.0

Concentration: 12.5

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.19	7.94	8.27	7.98	8.23	8.00	8.26	8.03	8.33	8.03	8.35	8.06	8.29	8.03
DO (mg/l)	6.9	5.9	7.0	6.0	7.1	5.9	6.9	6.6	7.0	5.8	6.9	6.2	6.7	6.2
Salinity (ppt)	29.0	29.2	29.7	29.9	29.7	30.8	29.5	27.5	29.4	29.7	29.7	29.5	29.2	29.4
Temperature (°C)	19.0	20.1	19.7	19.9	19.0	19.4	19.4	19.3	19.9	19.0	19.9	20.0	20.0	20.0

Concentration: 25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.06	7.90	8.14	7.98	8.10	7.98	8.12	8.00	8.21	8.00	8.24	8.03	8.17	8.02
DO (mg/l)	7.0	5.7	6.9	5.9	7.2	6.0	6.9	6.2	6.9	5.8	6.8	5.7	6.8	6.1
Salinity (ppt)	29.1	29.4	29.7	29.9	29.6	31.0	29.2	27.6	29.4	29.7	29.7	29.9	29.2	29.0
Temperature (°C)	19.2	19.9	20.2	20.0	19.0	19.1	19.1	19.6	19.5	19.9	19.0	20.0	20.0	20.0

Concentration: 50

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.80	7.90	7.86	7.95	7.90	7.96	7.81	7.97	7.94	7.97	8.02	7.98	7.92	7.97
DO (mg/l)	7.0	5.8	7.4	5.9	7.4	6.0	7.1	6.4	7.1	6.0	7.0	6.1	7.0	6.1
Salinity (ppt)	29.1	29.5	29.5	29.9	29.6	30.6	29.5	27.9	28.9	29.6	29.9	30.2	29.2	29.5
Temperature (°C)	19.0	19.7	20.0	20.2	19.0	19.5	19.0	19.4	19.0	19.2	19.2	20.0	19.8	20.0

Concentration: 100

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.35	7.85	7.37	7.96	7.54	7.97	7.35	8.01	7.36	7.94	7.51	7.98	7.38	7.98
DO (mg/l)	7.1	5.6	7.3	6.0	7.7	5.9	7.5	6.3	7.1	6.0	7.7	6.0	7.6	6.1
Salinity (ppt)	29.6	29.1	29.3	29.9	29.3	30.8	29.6	27.7	28.2	29.3	30.2	30.7	29.4	29.7
Temperature (°C)	19.0	19.5	20.0	20.1	19.0	19.4	19.0	19.5	19.0	19.0	19.0	20.0	19.4	20.0

	Control	MW-17		
Alkalinity*	~~168~~ 176	88		
Initial Chlorine†	—	0.12		
Ammonia †	—	<1.0		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

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Analysts: NF [illegible]
Reviewed: KO

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #4 MW-103R
Test No: 0305-30NW / MW-103R

Start Date & Time: 5/29/03 1645
Stop Date & Time: 6/5/03 1330
Test species: Atherinops affinis

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	7.96	8.37	8.02	8.33	8.08	8.35	8.01	8.45	7.95	8.45	8.05	8.39	8.10
DO (mg/l)	6.8	6.0	6.8	5.8	7.0	5.9	6.8	6.3	7.0	5.8	6.8	5.8	6.8	5.6
Salinity (ppt)	29.0	29.3	29.6	30.2	29.7	31.0	29.4	27.5	29.7	29.8	29.2	29.5	29.0	29.7
Temperature (°C)	20.2	20.2	20.1	20.3	19.8	20.0	20.0	20.3	20.6	19.7	19.8	20.1	20.0	20.0

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.21	7.93	8.21	7.97	8.25	8.07	8.26	8.01	8.33	8.04	8.32	8.04	8.27	8.12
DO (mg/l)	6.9	6.1	7.0	6.2	7.0	6.3	6.9	6.2	6.9	5.9	7.0	6.1	6.7	5.5
Salinity (ppt)	29.0	29.5	29.8	30.4	29.6	30.8	29.5	28.0	31.0	29.9	29.6	29.6	29.1	29.9
Temperature (°C)	19.0	19.5	20.0	20.1	20.0	20.0	19.3	19.9	20.1	19.3	19.8	19.9	20.0	20.1

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.09	7.75	8.05	7.97	8.16	8.04	8.16	8.03	8.23	8.03	8.21	8.03	8.14	8.08
DO (mg/l)	6.8	6.3	7.0	6.0	7.1	6.0	6.9	6.1	6.9	5.9	6.7	6.0	6.8	5.5
Salinity (ppt)	29.0	29.5	29.7	30.0	29.7	30.9	29.5	27.5	29.5	29.9	29.5	29.7	29.0	29.4
Temperature (°C)	19.8	19.7	19.7	19.9	19.5	19.8	19.4	19.9	19.9	19.9	19.8	19.8	20.0	19.8

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.89	7.93	7.76	7.97	8.00	8.04	7.93	8.02	~~[illegible]~~ 8.04	8.02	7.99	8.02	7.88	8.03
DO (mg/l)	6.9	5.8	7.1	5.7	7.0	6.2	7.0	5.9	6.7	5.6	6.8	5.7	6.7	5.4
Salinity (ppt)	29.0	29.4	29.9	30.2	29.6	30.2	29.4	27.5	29.3	30.0	29.6	29.7	29.2	29.7
Temperature (°C)	19.2	19.6	19.5	20.0	19.3	20.0	19.1	20.0	19.5	19.5	20.9	20.1	20.0	19.8

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.60	7.92	7.44	7.99	7.76	8.06	7.60	8.05	7.73	8.02	7.69	8.02	7.56	8.05
DO (mg/l)	6.7	5.7	7.2	5.7	7.2	6.0	7.1	5.9	7.1	5.8	7.0	5.7	7.0	4.9
Salinity (ppt)	29.1	29.6	29.9	30.5	29.5	30.9	29.3	28.4	29.6	30.2	29.3	29.8	29.1	29.9
Temperature (°C)	19.2	19.8	20.1	20.1	19.1	20.1	19.2	20.0	19.1	19.9	19.6	19.7	20.0	20.0

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.29	8.01	7.12	8.01	7.42	8.06	7.28	8.10	7.36	8.03	7.39	8.05	7.18	8.07
DO (mg/l)	6.9	5.9	7.0	5.6	7.7	5.4	7.8	6.1	7.7	5.6	7.5	5.6	7.5	5.7
Salinity (ppt)	29.5	30.2	30.0	30.5	29.1	30.8	29.0	27.9	30.0	30.2	29.0	29.3	29.0	30.2
Temperature (°C)	19.0	20.1	19.5	19.7	19.0	19.9	19.0	20.0	19.0	19.4	19.0	19.8	20.0	20.0

	Control	MW-103R		
Alkalinity*	176	392		
Initial Chlorine†	–	.05		
Ammonia †	–	5.7		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: NF [illegible] [illegible] Sm
Reviewed: KO

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #5 MW-129
Test No: 0305-31NW

Start Date & Time: 5/29/03 1820
Stop Date & Time: 6/5/03 1800
Test species: Atherinops affinis

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	8.00	~~8.22~~ 8.370	7.91	8.33	8.05	8.35	8.01	8.45	8.08	8.45	8.11	8.38	8.11
DO (mg/l)	6.8	6.3	6.8	6.6	7.0	5.9	6.8	6.3	7.0	5.8	6.8	5.8	6.8	5.9
Salinity (ppt)	29.0	29.2	29.6	29.6	29.7	30.8	29.4	27.7	29.7	30.4	29.2	29.8	29.0	29.0
Temperature (°C)	20.1	19.9	19.7	19.9	19.8	19.8	20.0	20.0	20.0	19.8	19.8	20.0	19.9	21.0

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.11	7.95	8.22	7.93	8.18	8.00	8.13	8.02	8.37	8.03	8.27	8.04	8.28	8.09
DO (mg/l)	6.9	6.3	6.8	6.1	7.0	6.2	6.7	6.3	6.9	5.8	6.8	5.9	6.7	6.0
Salinity (ppt)	29.0	29.8	29.8	30.4	29.8	30.6	29.4	27.6	30.1	30.2	29.6	29.7	29.1	29.1
Temperature (°C)	19.0	19.9	20.0	20.2	19.8	19.9	20.5	19.8	19.3	19.8	19.0	20.0	19.5	20.6

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.91	7.94	8.08	7.97	8.04	7.99	7.91	8.01	8.26	8.00	8.11	7.99	8.18	8.08
DO (mg/l)	6.7	5.9	6.8	6.3	7.0	5.7	6.7	6.1	6.9	6.0	6.7	6.1	6.6	5.7
Salinity (ppt)	29.0	29.7	29.8	30.3	29.7	30.8	29.4	27.8	29.0	30.1	29.6	30.0	29.2	28.8
Temperature (°C)	19.0	19.7	20.1	19.8	19.5	19.7	20.1	19.7	19.4	19.5	19.2	19.8	19.5	20.4

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.59	7.94	7.80	7.98	7.81	8.01	7.58	8.03	8.03	8.01	7.82	8.01	7.97	8.06
DO (mg/l)	6.7	5.7	6.7	5.8	6.9	5.6	6.7	6.1	6.8	5.9	6.6	6.0	6.7	5.6
Salinity (ppt)	29.2	29.2	29.8	30.2	29.7	31.0	29.5	28.0	29.0	30.0	29.5	29.7	29.3	29.2
Temperature (°C)	19.1	19.8	20.0	19.7	19.3	19.8	20.0	19.8	19.3	19.2	19.0	19.5	19.0	20.8

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.28	7.94	7.43	8.07	7.53	8.07	7.26	8.05	7.56	8.03	7.50	8.04	7.66	8.07
DO (mg/l)	6.6	5.6	6.5	6.0	6.9	5.8	6.6	6.2	6.9	6.0	6.7	6.1	6.7	5.8
Salinity (ppt)	29.4	29.9	29.7	30.1	29.7	30.9	29.7	27.9	28.2	29.9	29.4	29.5	29.5	29.2
Temperature (°C)	19.1	20.7	20.0	20.1	19.1	19.9	20.0	19.4	19.4	19.2	19.0	19.5	19.0	20.2

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.07	8.07	7.23	8.04	7.27	8.08	7.03	8.05	7.08	8.01	7.09	7.96	7.39	8.05
DO (mg/l)	6.3	5.6	6.5	6.0	6.5	6.0	6.5	6.3	7.1	5.9	6.3	6.0	7.3	5.5
Salinity (ppt)	29.5	30.5	29.6	29.9	29.4	31.0	30.0	28.3	28.1	30.5	29.2	29.4	29.8	29.4
Temperature (°C)	19.0	19.9	19.7	19.8	19.1	19.9	19.4	19.6	19.0	19.0	19.0	19.9	19.0	20.5

	Control	MW-129		
Alkalinity*	176	7400		
Initial Chlorine†	—	ND		
Ammonia †	—	2.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
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Analysts: MF & [illegible]
Reviewed: [illegible]

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #6 MW-W
Test No: 0305-32NW

Start Date & Time: 5/29/03 1925
Stop Date & Time: 6/5/03 1730
Test species: Atherinops affinis

% Concentration CON

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.31	7.98	8.37	8.01	8.33	8.11	8.35	8.02	8.45	8.13	8.45	8.10	8.39	8.16
DO (mg/l)	6.8	6.2	6.8	5.9	7.0	5.7	6.8	6.2	7.0	5.7	6.8	6.1	6.8	5.8
Salinity (ppt)	29.0	29.3	29.6	29.6	29.7	30.8	29.4	27.7	29.7	29.6	29.2	29.2	29.0	24.3
Temperature (°C)	21.0	19.8	19.8	20.1	19.7	19.8	20.0	20.6	20.5	19.8	19.8	19.0	19.9	19.8

Concentration 6.25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.20	7.98	8.17	7.92	8.23	8.02	8.20	8.01	8.29	8.07	8.27	8.06	8.26	8.08
DO (mg/l)	6.7	5.9	6.9	5.8	7.0	5.7	6.8	6.1	6.9	5.7	6.8	5.9	6.7	5.8
Salinity (ppt)	29.0	29.2	29.7	30.1	29.7	30.9	29.2	27.4	29.2	29.4	29.3	29.8	29.3	29.7
Temperature (°C)	19.0	19.7	20.2	19.8	20.2	19.7	20.0	20.1	19.9	19.6	19.9	19.9	19.0	19.7

Concentration 12.5

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.08	7.98	8.00	7.92	8.09	8.01	8.02	8.00	8.17	8.04	8.16	8.04	8.11	8.05
DO (mg/l)	6.8	5.9	6.9	5.8	7.1	6.0	6.7	6.2	6.8	5.8	6.7	6.0	6.8	5.4
Salinity (ppt)	29.0	29.1	29.7	29.9	29.7	31.2	29.4	27.3	29.1	29.5	29.5	29.7	29.4	29.7
Temperature (°C)	19.0	20.2	20.1	20.2	19.8	19.8	20.0	19.8	20.0	19.1	19.9	19.9	19.0	19.6

Concentration 25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.84	7.93	6.90	5.5	7.86	7.98	7.65	7.97	7.75	8.01	7.92	8.01	7.85	8.03
DO (mg/l)	6.9	5.9	7.64	7.90	6.9	5.8	6.7	6.3	6.8	5.9	6.7	5.7	6.3	5.7
Salinity (ppt)	29.0	29.3	29.7	30.0	29.7	30.5	29.3	27.7	28.9	29.4	29.7	29.7	29.6	29.7
Temperature (°C)	19.0	20.0	19.4	19.8	19.8	20.0	20.0	19.9	19.7	19.7	19.8	19.5	19.2	19.7

Concentration 50

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.44	7.90	7.28	7.95	7.58	8.02	7.22	7.98	7.56	7.98	7.53	7.98	7.42	7.98
DO (mg/l)	6.7	5.5	6.7	5.7	7.0	5.8	6.6	6.1	6.9	6.0	6.7	5.8	6.5	5.6
Salinity (ppt)	~~26.7~~ 29.10	29.3	29.7	30.0	29.8	31.2	29.2	27.4	28.7	29.4	29.7	~~29.5~~ 29.50	29.9	30.3
Temperature (°C)	19.0	20.0	19.8	19.7	19.5	19.7	19.5	20.0	19.8	19.3	19.1	19.2	19.0	19.7

Concentration 100

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.81	7.89	6.98	7.95	7.19	8.01	7.03	7.97	7.13	7.95	7.09	7.92	7.06	7.94
DO (mg/l)	6.5	5.0	6.5	5.5	6.8	5.8	6.8	5.9	6.5	5.7	6.7	5.6	6.8	5.5
Salinity (ppt)	29.0	29.6	29.8	29.8	29.9	31.0	29.0	27.2	28.4	29.3	29.8	29.9	30.6	30.7
Temperature (°C)	19.0	19.8	19.8	19.9	19.7	19.5	19.5	20.0	19.5	19.6	19.0	19.5	19.0	19.7

	Control	MW-W		
Alkalinity*	176	7406		
Initial Chlorine†	–	ND		
Ammonia †	–	4.4		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
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Fife, WA 98424

Analysts: NF, mm, et
Reviewed: KS

Sample Description:
Animal Source: ABS
Date Received: 5/28/03
Date of Hatch: 5/17/03

Comments:

Mysidopsis bahia

AMEC Earth & Environmental - NW Bioassay Lab

Client: Unocal
Sample ID: #1 MW-146
Test No: 0305-33NW

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay
Start Date & Time: 5/29/03 1930
Stop Date & Time: 6/5/03 1900
Test species: ~~Pimephales promelas~~ Mysidopsis bahia

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	8.07	8.37	8.07	8.33	7.98	8.35	7.89	8.45	8.04	8.45	8.04	8.38	8.07
DO (mg/l)	6.9	5.9	6.8	5.8	7.0	5.0	6.8	4.8	7.0	4.5	6.8	5.2	6.8	6.3
Salinity (ppt)	29.0	29.2	29.6	29.1	29.7	32.3	29.4	28.0	29.7	30.3	29.2	29.4	29.0	29.0
Temperature (°C)	25.5	25.2	25.5	25.0	25.5	25.3	25.5	25.7	25.5	25.0	25.2	25.9	25.4	26.8

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.19	8.01	8.14	8.00	8.11	7.99	8.10	7.91	8.32	8.04	8.32	7.99	8.26	8.07
DO (mg/l)	7.0	5.7	6.8	5.4	6.8	5.3	6.8	5.4	6.9	4.3	6.8	5.1	6.6	6.3
Salinity (ppt)	29.0	29.3	29.6	30.8	29.5	33.2	29.5	28.7	29.2	30.3	29.3	29.7	29.7	29.5
Temperature (°C)	25.3	25.2	26.2	25.0	26.0	25.6	25.5	25.6	25.7	24.7	25.6	25.0	25.3	26.8

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.09	8.00	7.88	7.98	7.84	7.98	7.86	7.91	8.18	8.00	8.14	7.97	8.12	8.08
DO (mg/l)	6.8	5.7	6.8	5.4	6.9	5.1	6.7	5.2	6.8	4.5	6.7	5.1	6.6	6.5
Salinity (ppt)	29.0	29.4	29.6	30.8	29.5	32.8	29.5	28.7	29.3	30.3	29.4	29.6	29.2	29.2
Temperature (°C)	25.5	25.2	26.1	25.2	26.5	25.8	25.5	25.5	25.5	24.7	25.1	26.4	25.3	26.8

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.87	7.97	7.37	7.97	7.35	7.97	7.38	7.94	7.85	7.99	7.74	7.74	7.78	8.09
DO (mg/l)	6.7	5.8	6.5	5.5	6.8	4.9	6.7	5.1	6.6	4.3	6.6	5.0	6.6	6.1
Salinity (ppt)	29.0	29.5	29.5	30.9	29.5	32.7	29.5	28.1	29.2	30.2	29.3	29.5	29.3	30.0
Temperature (°C)	25.5	25.4	25.5	25.1	26.5	25.6	25.5	25.5	25.4	25.0	26.3	26.2	25.5	26.8

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.49	7.94	7.04	7.92	7.07	7.98	7.09	7.96	7.28	7.94	7.21	7.94	7.22	8.08
DO (mg/l)	6.5	5.6	6.6	4.7	6.7	4.8	6.7	4.9	6.3	4.1	6.5	5.1	6.2	5.8
Salinity (ppt)	29.1	29.5	29.5	30.1	29.3	32.3	29.6	26.3	28.6	32.0	29.2	29.5	29.5	28.8
Temperature (°C)	26.2	25.2	26.0	25.0	26.0	25.4	25.5	25.3	25.5	24.8	26.0	26.2	25.5	26.8

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.17	7.96	6.77	7.99	6.82	8.06	6.85	8.03	6.95	7.98	6.91	8.02	6.89	8.11
DO (mg/l)	6.3	5.4	6.4	5.4	6.7	4.5	6.7	5.1	6.3	4.3	6.5	5.0	6.6	5.9
Salinity (ppt)	29.2	29.8	29.2	30.8	29.0	31.7	29.8	28.2	28.4	29.7	29.2	29.3	29.8	29.4
Temperature (°C)	26.0	25.5	26.5	25.0	25.5	25.5	25.5	25.5	25.4	24.8	25.0	26.1	25.3	26.8

	Control	MW-146		
Alkalinity*	176	264		
Initial Chlorine†	–	ND		
Ammonia †	–	3.5		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
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Analysts: KB ET m MF
Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Client: Unocal
Sample ID: #2 MW-7
Test No: 0305-34NW

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay
Start Date & Time: 5/29/03 18:00
Stop Date & Time: 6/5/03 1645
Test species: M. bahia

% Concentration CON	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	
pH	8.31	7.87	8.37	8.06	8.33	8.09	8.35	8.01	~~8.37~~	8.02	8.45	8.04	8.38	8.12	8.45
DO (mg/l)	6.8	4.9	6.8	5.5	7.0	5.2	6.8	5.1		4.5	6.8	4.9	6.8	5.6	7.0
Salinity (ppt)	29.0	29.6	29.6	30.2	29.7	31.6	29.4	27.4	~~30.1~~	30.6	29.2	30.6	29.0	30.6	29.7
Temperature (°C)	25.2	25.6	25.0	25.2	25.8	25.2	25.5	25.3	26.0	25.0	25.9	25.5	26.5	25.8	

Concentration 6.25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.21	7.90	8.08	7.99	8.24	8.04	8.28	7.99	8.37	7.99	8.27	7.98	8.31	8.08
DO (mg/l)	6.8	4.8	6.8	5.5	7.0	5.7	6.8	4.9	6.9	4.0	6.8	4.2	6.7	5.8
Salinity (ppt)	29.0	29.9	29.0	29.8	29.7	32.5	29.4	27.5	30.1	30.5	29.6	30.5	29.1	31.0
Temperature (°C)	25.2	25.1	25.4	25.2	25.8	25.3	25.2	25.4	25.3	25.0	26.0	25.6	26.0	25.9

Concentration 12.5	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.10	7.87	8.04	7.98	8.16	8.05	8.14	7.96	8.26	7.98	8.11	7.97	8.21	8.08
DO (mg/l)	6.9	4.8	6.7	5.4	7.0	5.1	6.8	5.1	6.9	4.4	6.7	4.5	6.8	5.2
Salinity (ppt)	29.0	29.9	29.1	29.8	29.7	31.8	29.2	27.5	29.0	30.8	29.6	30.7	29.3	32.1
Temperature (°C)	25.5	25.0	25.3	25.2	26.2	25.3	25.5	25.2	25.5	25.1	26.2	25.5	25.5	25.9

Concentration 25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.86	7.88	7.96	7.99	7.99	8.05	7.83	7.93	8.03	7.99	7.82	7.99	7.98	8.09
DO (mg/l)	6.9	4.7	6.9	5.5	7.2	5.5	6.9	4.9	6.8	4.2	6.6	4.3	6.8	5.7
Salinity (ppt)	29.0	29.9	29.3	30.0	29.7	32.8	29.4	25.2	29.0	29.7	29.5	29.9	29.3	30.7
Temperature (°C)	25.1	25.6	25.5	25.2	25.8	25.3	25.5	25.0	25.6	25.0	26.0	25.5	25.0	26.0

Concentration 50	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.49	7.88	7.71	7.99	7.71	8.05	7.34	7.91	7.56	7.93	7.50	7.95	7.57	8.08
DO (mg/l)	6.9	4.7	7.2	5.5	7.1	5.2	7.1	4.7	6.9	4.0	6.7	4.3	6.9	5.6
Salinity (ppt)	29.2	30.2	29.5	29.8	29.7	32.8	29.0	27.2	28.2	30.1	29.4	30.2	29.5	31.5
Temperature (°C)	25.0	25.1	25.1	25.2	26.6	25.2	25.3	25.1	25.4	25.0	26.0	25.5	25.0	25.9

Concentration 100	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.09	7.84	7.43	8.01	7.32	8.11	7.05	7.99	7.08	7.12	7.09	7.95	7.12	8.11
DO (mg/l)	7.1	4.8	7.4	4.8	7.4	5.1	7.4	4.6	7.1	4.0	6.3	4.3	7.1	5.3
Salinity (ppt)	29.5	29.9	29.7	30.7	29.7	33.4	29.0	27.4	28.1	29.6	29.2	29.9	29.7	31.0
Temperature (°C)	25.1	25.0	25.0	25.2	26.0	25.4	25.2	25.2	25.3	25.0	26.0	25.5	25.0	25.9

	Control	MW-7		
Alkalinity*	176	184		
Initial Chlorine†	–	.06		
Ammonia †	–	1.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: KB, CT NF
Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #3 MW-17
Test No: 0305-35NW

Start Date & Time: 5/29/03 1830
Stop Date & Time: 6/5/03 1730
Test species: M. bahia

% Concentration: CON

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.31	7.98	8.37	8.06	8.33	8.00	8.35	7.91	8.45	7.80	8.45	8.00	8.38	8.09
DO (mg/l)	6.8	5.4	6.8	5.2	7.0	4.7	6.8	4.8	7.0	4.3	6.8	4.5	6.8	5.5
Salinity (ppt)	29.0	29.2	29.6	30.3	29.7	32.0	29.4	27.7	29.7	29.9	29.2	30.0	29.0	29.4
Temperature (°C)	25.5	25.6	26.0	25.6	26.0	25.2	26.0	25.1	25.5	25.3	25.5	25.0	25.5	26.5

Concentration: 6.25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.26	7.96	8.33	8.04	8.28	8.01	8.32	7.95	8.38	7.88	8.39	7.99	8.34	8.10
DO (mg/l)	6.8	5.4	6.9	5.3	7.0	4.8	6.9	5.8	6.9	4.5	6.8	4.4	6.7	5.6
Salinity (ppt)	29.0	29.9	29.7	30.8	29.7	33.5	29.5	29.9	30.1	30.3	29.6	30.2	29.0	30.0
Temperature (°C)	26.5	25.2	26.5	25.6	26.2	25.0	25.8	25.0	25.7	25.4	25.4	25.0	25.0	26.5

Concentration: 12.5

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final*
pH	8.19	7.95	8.27	8.05	8.23	8.03	8.26	7.97	8.33	7.93	8.35	7.96	8.29	
DO (mg/l)	6.9	5.5	7.0	5.2	7.1	5.0	6.9	5.3	7.0	4.4	6.9	4.7	6.7	
Salinity (ppt)	29.0	29.8	29.7	30.4	29.7	32.6	29.5	30.1	29.4	30.7	29.7	30.6	29.2	
Temperature (°C)	26.8	25.2	26.3	25.7	26.2	25.4	25.5	25.1	25.4	25.4	25.5	24.7	25.5	26.5

*cup dropped

Concentration: 25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final*
pH	8.06	7.92	8.14	8.02	8.10	7.98	8.12	7.92	8.21	7.93	8.24	7.98	8.17	
DO (mg/l)	7.0	5.2	6.9	5.1	7.2	4.6	6.9	4.9	6.9	4.4	6.8	4.8	6.8	
Salinity (ppt)	29.1	30.0	29.7	29.9	29.6	32.8	29.2	28.3	29.4	29.9	29.7	30.6	29.2	
Temperature (°C)	26.0	25.1	26.0	25.6	26.4	25.2	26.0	25.0	25.3	25.2	25.3	25.0	25.6	26.5

*cup dropped

Concentration: 50

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.80	7.92	7.86	8.01	7.90	8.00	7.81	7.96	7.94	7.90	8.02	7.77	7.92	8.08
DO (mg/l)	7.0	5.4	7.4	4.9	7.4	4.6	7.1	5.0	7.1	4.1	7.0	4.3	7.0	5.1
Salinity (ppt)	29.1	30.1	29.5	30.4	29.6	32.3	29.5	27.9	28.7	31.0	29.9	30.8	29.2	30.0
Temperature (°C)	25.6	25.2	26.0	25.4	26.4	25.1	25.9	25.3	28.2	25.5	25.1	25.0	25.2	26.5

Concentration: 100

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.35	7.94	7.37	8.03	7.54	8.12	7.35	8.05	7.36	7.97	7.51	8.07	7.38	8.11
DO (mg/l)	7.1	5.2	7.3	5.2	7.7	~~4~~ 5.5	7.5	5.3	7.1	4.6	7.7	4.6	7.6	5.1
Salinity (ppt)	29.6	30.7	29.3	30.2	29.3	33.9	29.6	28.6	28.2	30.3	30.2	30.9	29.4	30.9
Temperature (°C)	25.5	25.2	26.0	25.4	26.2	25.3	25.4	25.1	25.3	25.5	25.0	24.8	25.0	26.5

	Control	MW-17		
Alkalinity*	176	88		
Initial Chlorine†	–	0.12		
Ammonia †	–	<1.0		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: SM KS & NF
Reviewed: KS

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #4
Test No: 0305-36NN
Start Date & Time: 5/29/03 1900
Stop Date & Time: 6/5/03 1745
Test species: M. bahia

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.31	~~8.37~~ 8.04	8.37	8.08	8.33	8.02	8.35	7.96	8.45	7.88	8.45	8.01	8.38	8.14
DO (mg/l)	6.8	~~6.8~~ 5.6	6.8	5.7	7.0	4.8	6.8	4.5	7.0	4.0	6.8	4.2	6.8	5.4
Salinity (ppt)	29.0	29.1	29.6	30.5	29.7	32.2	29.4	27.9	29.7	29.0	29.2	29.9	29.0	30.0
Temperature (°C)	25.5	25.2	26.5	25.0	26.0	25.8	25.5	25.4	25.5	25.2	25.0	26.0	25.0	26.5

MM 4 Initial

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final	
pH	8.21	8.03	8.21	8.08	8.25	8.05	8.26	8.31	~~8.38~~	8.02	8.32	8.03	8.27	8.09	8.33
DO (mg/l)	6.9	5.8	7.0	5.7	7.0	5.2	6.9	6.4	~~6.9~~	4.0	7.0	4.7	6.7	5.2	6.9
Salinity (ppt)	29.0	29.8	29.8	29.2	29.6	32.3	29.5	29.3	~~30.1~~	30.7	29.6	30.7	29.1	29.5	31.0
Temperature (°C)	26.0	25.2	26.2	25.0	26.5	25.5	26.3	25.5	25.1	25.3	26.0	26.0	26.8	26.8	

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final	
pH	8.09	8.03	8.05	8.06	8.16	8.08	8.16	8.21	~~8.33~~	7.98	8.21	7.98	8.14	8.14	8.23
DO (mg/l)	6.8	5.9	7.0	6.0	7.1	5.3	6.9	6.4	~~7.0~~	3.9	6.7	4.8	6.8	5.0	6.9
Salinity (ppt)	29.0	29.9	29.7	30.4	29.7	32.5	29.5	29.3	~~29.4~~	30.1	29.5	30.2	29.0	29.5	29.5
Temperature (°C)	26.5	25.3	26.2	25.0	26.5	25.5	26.0	25.3	25.8	25.0	26.2	25.6	27.0	26.3	

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final	
pH	7.89	8.04	7.76	8.07	8.00	8.11	7.93	8.05	~~8.21~~	8.00	7.99	7.97	7.88	8.11	8.04
DO (mg/l)	6.9	6.1	7.1	5.6	7.0	5.6	7.0	4.7	~~6.9~~	3.9	6.8	4.8	6.7	5.7	6.7
Salinity (ppt)	29.0	30.4	29.9	30.8	29.6	32.2	29.4	25.9	~~29.4~~	30.5	29.6	30.8	29.2	29.9	29.3
Temperature (°C)	26.5	25.2	26.2	25.0	26.5	25.5	26.0	25.3	25.5	25.1	26.1	25.5	25.5	26.5	

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final	
pH	7.60	8.05	7.44	8.08	7.76	8.15	7.60	8.08	~~7.94~~	8.04	7.69	7.98	7.56	8.13	7.73
DO (mg/l)	6.7	6.0	7.2	5.6	7.2	5.1	7.1	4.7	~~7.1~~	4.1	7.0	4.2	7.0	4.9	7.1
Salinity (ppt)	29.1	30.9	29.9	30.6	29.5	32.7	29.3	26.3	~~28.7~~	30.6	29.3	30.2	29.1	30.5	29.6
Temperature (°C)	26.5	25.4	26.2	25.0	26.0	25.6	25.8	25.4	25.0	25.0	25.9	25.8	26.0	26.5	

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final	
pH	7.29	8.07	7.12	8.17	7.42	8.21	7.28	8.15	~~7.36~~	8.13	7.39	8.12	7.18	8.20	7.36
DO (mg/l)	6.9	5.4	7.0	5.2	7.7	5.1	7.8	4.2	~~7.1~~	4.0	7.5	4.7	7.5	4.8	7.7
Salinity (ppt)	29.5	31.0	30.0	31.0	29.1	33.3	29.0	27.8	~~28.2~~	30.9	29.0	30.0	29.0	29.9	32.0
Temperature (°C)	26.8	25.3	26.3	25.0	25.5	25.4	25.3	25.2	25.5	25.2	26.0	25.4	26.5	26.7	

	Control	MW-603R		
Alkalinity*	176	392		
Initial Chlorine†	–	.05		
Ammonia †	–	5.7		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: KP, ET, SM, NF
Reviewed: KP

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #5 MW-129
Test No: 0305-37NW

Start Date & Time: 5/29/03 16:45
Stop Date & Time: 6/5/03 1500
Test species: M. bahia

% Concentration CON	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	8.31	7.76	8.37	8.05	8.33	8.02	8.35	7.97	8.45	8.05	8.45	8.04	8.38	8.14
DO (mg/l)	6.8	5.2	6.8	5.6	7.0	5.3	6.8	5.0	7.0	4.4	6.8	4.8	6.8	5.7
Salinity (ppt)	29.0	29.8	29.6	30.5	29.7	33.2	29.4	29.2	29.7	30.3	29.2	29.4	29.0	29.7
Temperature (°C)	25.2	25.0	25.8	25.0	25.5	25.1	25.7	25.8	25.5	25.0	25.0	25.0	25.2	27.0

Concentration 6.25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 (#2) init.	5 final	6 init.	6 final
pH	8.11	7.94	8.22	8.08	8.18	8.07	8.13	8.00	8.26	8.03	8.36	7.99	8.28	8.10
DO (mg/l)	6.9	4.9	6.8	5.5	7.0	5.4	6.7	4.9	6.9	4.4	6.9	4.5	6.7	5.8
Salinity (ppt)	29.0	29.8	29.8	30.5	29.8	32.8	29.4	27.8	29.3	30.8	29.4	30.3	29.1	30.0
Temperature (°C)	25.4	25.0	25.5	25.2	26.0	26.2	25.5	25.9	25.7	25.0	25.0	26.0	25.2	27.0

Concentration 12.5	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.91	7.92	8.08	8.08	8.04	8.05	7.91	8.01	8.06	8.02	8.29	8.02	8.18	8.17
DO (mg/l)	6.7	4.8	6.8	5.6	7.0	5.2	6.7	4.8	6.9	4.4	6.9	4.7	6.6	5.7
Salinity (ppt)	29.0	30.5	29.8	30.6	30.0	33.7	29.4	28.2	29.4	30.9	29.4	29.9	29.2	29.7
Temperature (°C)	25.4	25.0	25.5	25.0	26.5	26.0	25.5	25.9	25.5	25.0	25.0	26.4	25.2	27.0

Concentration 25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.59	7.99	7.80	8.11	7.81	8.12	7.58	8.05	7.75	8.03	8.11	8.02	7.97	8.24
DO (mg/l)	6.7	5.2	6.7	5.6	6.9	5.5	6.7	4.7	6.8	4.3	6.9	4.6	6.7	5.7
Salinity (ppt)	29.2	30.4	29.8	30.3	29.7	35.2	29.5	27.9	29.3	30.4	29.4	30.0	29.3	22.4
Temperature (°C)	25.1	25.0	25.8	25.0	26.5	26.0	25.2	25.7	25.4	25.0	25.0	26.4	25.2	27.0

Concentration 50	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.28	8.06	7.43	8.14	7.53	8.15	7.26	8.06	7.38	8.07	7.76	8.08	7.66	8.16
DO (mg/l)	6.6	5.1	6.5	5.4	6.9	5.3	6.6	5.0	6.6	4.6	7.0	4.9	6.7	5.6
Salinity (ppt)	29.4	30.5	29.7	30.7	29.7	32.4	29.7	27.9	29.1	30.6	29.3	29.5	29.5	29.2
Temperature (°C)	25.0	25.0	25.8	25.1	26.0	26.2	25.4	25.8	25.4	25.0	25.0	26.4	25.2	27.0

Concentration 100	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.07	8.11	7.23	8.14	7.27	8.10	7.03	8.05	7.09	7.97	7.25	8.01	7.39	
DO (mg/l)	6.3	4.7	6.5	5.5	6.5	5.3	6.5	5.0	5.9	4.9	7.4	4.8	7.3	
Salinity (ppt)	29.5	30.3	29.6	30.7	29.4	32.6	30.0	28.9	29.3	30.4	29.2	30.1	29.8	
Temperature (°C)	25.0	25.0	25.9	25.1	25.8	25.3	25.2	25.8	25.5	25.0	25.2	25.8	25.2	27.0

	Control	MW-129		
Alkalinity*	176	>400		
Initial Chlorine†	—	ND		
Ammonia †	—	2.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: St, SM NF
Reviewed: KS

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

AMEC Earth & Environmental - NW Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Saltwater Bioassay

Client: Unocal
Sample ID: #6 MW-W
Test No: 0305-38NW

Start Date & Time: 5/29/03 19:30
Stop Date & Time: 6/5/03 1830
Test species: M. bahia

% Concentration: CON	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	8.31	8.02	8.37	8.09	8.33	7.95	8.35	7.92	8.45	8.04	8.45	7.92	8.38	8.15
DO (mg/l)	6.8	5.7	6.8	5.5	7.0	4.7	6.8	5.3	7.0	4.7	6.8	5.0	6.8	6.4
Salinity (ppt)	29.0	29.4	29.6	30.6	29.7	32.2	29.4	28.9	29.7	29.3	29.2	29.3	29.0	28.5
Temperature (°C)	25.5	25.4	26.5	25.4	25.6	25.3	25.0	25.2	25.3	25.4	26.5	25.3	25.1	26.5

Concentration: 6.25	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	8.20	8.00	8.17	8.05	8.23	7.99	8.20	7.96	8.29	8.00	8.27	8.04	8.26	8.15
DO (mg/l)	6.7	5.7	6.9	5.7	7.0	4.9	6.8	5.1	6.9	4.7	6.8	5.1	6.7	6.3
Salinity (ppt)	29.0	29.2	29.7	30.8	29.7	31.9	29.2	27.9	29.2	29.5	29.3	29.8	29.3	29.1
Temperature (°C)	25.5	25.3	26.0	25.4	26.2	25.4	25.0	25.4	25.1	25.4	26.0	25.3	26.0	26.5

Concentration: 12.5	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	8.08	8.00	8.00	8.04	8.09	8.00	8.02	7.98	8.17	8.05	8.16	8.00	8.11	8.23
DO (mg/l)	6.8	5.7	6.9	5.6	7.1	4.8	6.7	5.1	6.8	4.8	6.7	4.6	6.8	6.7
Salinity (ppt)	29.0	29.4	29.7	30.8	29.7	32.1	29.4	27.9	29.1	30.0	29.5	29.9	29.4	30.7
Temperature (°C)	25.3	26.0	26.0	25.5	25.8	25.7	25.0	25.2	25.8	25.5	26.2	25.3	26.0	26.4

Concentration: 25	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	7.84	7.99	6.90	8.04	7.86	8.05	7.65	8.01	7.95	8.05	7.92	8.01	7.83	8.15
DO (mg/l)	6.9	5.5	7.64	5.5	6.9	5.1	6.7	5.2	6.8	4.7	6.7	4.7	6.3	6.3
Salinity (ppt)	29.0	29.4	29.7	30.7	29.7	32.1	29.3	28.1	28.9	30.1	29.7	30.1	29.6	29.1
Temperature (°C)	25.2	25.5	26.1	25.3	25.8	25.8	25.0	25.6	25.5	25.4	26.2	25.3	26.2	26.3

Concentration: 50	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	7.44	7.99	7.28	8.05	7.58	8.08	7.22	8.07	7.56	8.07	7.53	8.00	7.42	8.23
DO (mg/l)	6.7	5.4	6.7	5.4	7.0	5.0	6.6	4.9	6.9	4.4	6.7	4.3	6.5	6.7
Salinity (ppt)	29.1	29.4	29.7	30.5	29.8	31.9	29.2	27.7	28.7	30.3	29.7	30.2	29.9	30.9
Temperature (°C)	25.3	25.4	26.0	25.5	25.8	25.4	26.5	25.3	25.0	25.4	26.2	25.3	25.1	26.0

Concentration: 100	Day 0 init	Day 0 final	Day 1 init	Day 1 final	Day 2 init	Day 2 final	Day 3 init	Day 3 final	Day 4 init	Day 4 final	Day 5 init	Day 5 final	Day 6 init	Day 6 final
pH	7.81	8.04	6.98	8.06	7.19	8.15	7.03	8.15	7.13	8.15	7.09	8.04	7.06	8.24
DO (mg/l)	6.5	5.4	6.5	5.2	6.8	4.7	6.8	5.1	6.5	4.5	6.7	4.7	6.8	6.3
Salinity (ppt)	29.0	29.7	29.8	30.5	29.9	32.6	29.0	28.0	28.4	30.6	29.8	30.8	30.6	30.6
Temperature (°C)	25.4	25.3	26.4	25.5	25.4	25.3	27.0	25.2	25.5	25.3	26.0	25.3	25.0	26.5

	Control	MW-W		
Alkalinity*	176	>400		
Initial Chlorine†	–	ND		
Ammonia †	–	4.4		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2-0
Fife, WA 98424

Analysts: KB, SM, & NF
Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Date of Hatch: 5/22/03

Comments:

Pimephales promelas

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: *Pimephales promelas*
Client: Unocal
Sample ID. #1 MW-146

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay
Start Date & Time: 5/29/03 1400
Stop Date & Time: 6/5/03 10:45
Test No: 0305-21NW

% Concentration: CON

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.92	7.23	7.93	7.58	8.11	7.75	8.01	7.59	8.01	7.78	7.94	7.65	7.83	7.49
DO (mg/l)	7.6	5.9	7.9	6.9	7.8	5.9	7.7	6.3	8.07	5.9	8.1	6.3	7.8	6.0
Cond. (µmhos-cm)	337	345	322	350	325	365	333	325	310	333	270	328	261	321
Temperature (°C)	24.2	24.7	24.4	24.3	24.1	25.0	25.5	25.5	25.2	25.0	26.0	25.0	25.8	25.7

Concentration: 6.25

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.54	7.53	7.55	7.71	7.34	7.72	7.55	7.61	7.71	7.69	7.48	7.67	7.46	7.53
DO (mg/l)	7.7	6.5	7.9	6.5	7.8	5.8	7.9	6.0	8.11	5.9	8.2	5.9	7.8	5.8
Cond. (µmhos-cm)	341	348	324	351	325	406	~~373~~ 335	325	313	337	312	348	268	319
Temperature (°C)	25.0	24.5	24.3	24.3	24.5	25.1	25.5	25.4	25.0	25.0	26.0	24.8	25.0	25.8

Concentration: 12.5

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.35	7.62	7.33	7.71	7.22	7.77	7.33	7.56	7.50	7.71	7.36	7.69	7.28	7.57
DO (mg/l)	7.7	6.0	8.0	6.2	7.7	5.8	7.8	4.7	8.19	6.0	8.1	6.0	7.7	5.8
Cond. (µmhos-cm)	342	345	327	352	329	462	332	343	315	338	315	345	274	335
Temperature (°C)	25.5	24.5	24.5	24.3	24.5	25.4	25.3	25.7	25.2	25.0	25.5	25.0	25.2	25.8

Concentration: 25

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.16	7.69	7.13	7.75	6.99	7.80	7.11	7.67	7.30	7.70	7.13	7.75	7.02	7.64
DO (mg/l)	7.6	6.1	8.1	5.9	7.7	5.5	7.8	5.4	8.07	6.0	7.9	5.9	7.8	5.0
Cond. (µmhos-cm)	347	351	334	352	331	~~548~~ 387	338	343	319	338	322	344	291	362
Temperature (°C)	25.2	24.3	24.3	24.2	24.7	25.2	25.5	25.5	25.0	25.0	25.5	25.1	25.5	25.8

Concentration: 50

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	6.97	7.73	6.98	7.88	6.85	7.89	6.89	7.81	7.07	7.87	6.76	7.84	6.79	7.72
DO (mg/l)	7.6	6.2	8.2	5.9	7.8	5.7	7.8	5.5	8.3	6.1	8.0	5.9	7.7	4.6
Cond. (µmhos-cm)	361	361	349	371	348	403	361	357	329	363	337	366	317	375
Temperature (°C)	24.5	24.5	24.8	24.2	24.5	25.0	25.4	25.8	25.0	25.0	25.5	25.0	25.2	25.7

Concentration: 100

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	6.84	7.99	6.84	8.10	~~7.6~~ 6.74	8.08	6.79	~~409~~ 8.02	6.92	7.96	6.86	7.96	6.66	7.86
DO (mg/l)	7.5	5.9	8.6	6.0	7.9	5.6	8.0	5.3	8.7	5.5	8.6	5.7	7.8	5.0
Cond. (µmhos-cm)	393	400	386	421	393	450	407	409	356	406	370	419	373	421
Temperature (°C)	25.0	24.4	24.8	24.3	25.0	25.0	25.0	25.8	25.0	24.9	25.8	24.9	24.8	25.7

	Control	MW-146		
Hardness*	80	>400		
Alkalinity*	60	~~264~~ 184 KB		
Initial Chlorine†	–	ND		
Ammonia †	–	3.5		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: SM, ET, KB
Reviewed: KB

Sample Description:
Date Received: 5/29/03 <24hrs
Animal Source: ABS
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: *Pimephales promelas*
Client: Unocal
Sample ID. ~~#1~~ #2 MW-7

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Start Date & Time: 5/29/03 1445
Stop Date & Time: 6/5/03 1145
Test No: 0305-22NW

% Concentration CON	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.92	7.82	7.93	7.75	8.11	7.83	8.01	7.76	7.89	7.77	7.74	7.67	7.83	7.41
DO (mg/l)	7.6	6.2	8.0	6.3	7.8	6.0	7.7	6.0	8.2	5.1	8.1	6.1	7.8	4.8
Cond. (µmhos-cm)	337	344	325	355	325	368	333	341	306	343	270	342	261	388
Temperature (°C)	25.0	24.8	24.8	25.0	25.2	25.5	25.6	25.7	25.0	25.0	24.5	24.6	25.0	26.0

Concentration 6.25	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.51	7.75	7.82	7.77	7.69	7.79	7.56	7.66	7.74	7.71	7.60	7.62	7.63	7.45
DO (mg/l)	7.7	6.0	8.0	6.3	8.1	6.5	7.8	5.9	8.2	4.9	8.2	5.9	7.9	4.9
Cond. (µmhos-cm)	334	337	334	357	313	365	324	328	306	351	302	343	261	311
Temperature (°C)	25.4	24.7	24.2	24.8	25.5	25.5	26.0	25.8	25.2	25.1	25.0	24.8	24.6	26.0

Concentration 12.5	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.45	7.71	7.77	7.75	7.56	7.75	7.52	7.63	7.54	7.72	7.49	7.64	7.52	7.43
DO (mg/l)	7.9	6.0	8.0	5.8	7.8	5.7	8.0	5.4	8.4	4.8	8.3	6.0	8.0	4.9
Cond. (µmhos-cm)	332	335	331	354	309	351	319	324	305	353	298	334	258	312
Temperature (°C)	25.5	24.5	24.3	25.0	25.5	25.6	26.0	25.8	25.0	25.1	24.3	25.0	25.8	26.0

Concentration 25	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.27	7.72	7.48	7.83	7.34	7.75	7.27	7.60	7.31	7.67	7.29	7.68	7.28	7.48
DO (mg/l)	7.9	6.0	8.2	6.2	8.0	5.8	8.2	5.2	8.5	5.0	8.3	6.0	8.2	4.8
Cond. (µmhos-cm)	324	330	322	349	301	356	310	338	306	357	291	326	260	311
Temperature (°C)	25.5	24.3	24.4	25.1	25.8	25.5	26.0	25.5	25.5	25.2	24.0	24.8	25.9	26.0

Concentration 50	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.05	7.74	7.23	7.83	7.11	7.82	7.11	7.73	7.05	7.66	7.08	7.74	7.06	7.55
DO (mg/l)	8.1	5.8	8.3	5.8	8.5	5.9	8.6	5.3	8.7	4.9	8.8	5.6	8.5	4.9
Cond. (µmhos-cm)	312	314	310	330	289	333	278	324	310	344	281	319	257	312
Temperature (°C)	25.6	24.3	24.3	24.8	25.2	25.5	25.5	25.5	25.5	25.0	24.0	24.6	25.6	26.0

Concentration 100	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	6.97	7.95	7.08	8.05	6.97	7.97	6.92	7.86	6.92	7.85	6.95	7.85	6.93	7.78
DO (mg/l)	7.9	5.9	8.9	5.9	9.3	5.9	9.6	5.4	9.4	4.9	9.5	5.4	9.1	4.8
Cond. (µmhos-cm)	295	297	287	307	274	333	277	286	322	372	266	317	260	314
Temperature (°C)	25.5	24.2	24.2	25.0	25.4	25.4	25.2	25.7	25.5	24.8	24.0	24.5	25.0	26.0

	Control	MW-7		
Hardness*	80	7400		
Alkalinity*	60	184		
Initial Chlorine†	–	.06		
Ammonia †	–	1.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: SM mm KSJ Rf
Reviewed: KJ

Sample Description:
Animal Source: ABS
Comments:

Date Received: 5/29/03 <24 hrs.

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Pimephales promelas
Client: Unocal
Sample ID. #3 MW-17

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay
Start Date & Time: 5/29/03 1545
Stop Date & Time: 6/5/03 1145
Test No: 0305-23NW

% Concentration CON	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.92	7.66	7.93	7.45	8.11	7.86	8.01	7.68	8.02	7.69	7.94	7.68	7.83	7.28
DO (mg/l)	7.6	6.0	8.0	6.3	7.8	6.6	7.7	5.7	8.4	5.6	8.1	5.9	7.8	5.4
Cond. (µmhos-cm)	337	346	325	342	325	399	333	318	331	343	270	332	261	311
Temperature (°C)	25.2	25.0	24.1	24.1	24.3	26.0	~~26.0~~ 25.0	25.5	25.5	25.0	24.6	24.1	24.1	25.8

Concentration 6.25	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.80	7.67	7.90	7.67	7.81	7.80	7.74	7.63	7.91	7.66	7.71	7.68	7.72	7.38
DO (mg/l)	7.8	5.9	8.2	6.7	8.1	6.4	8.0	5.6	8.3	5.6	8.3	6.2	8.0	5.8
Cond. (µmhos-cm)	326	333	317	344	306	353	312	310	294	327	298	322	254	305
Temperature (°C)	25.3	24.8	24.2	24.7	24.8	25.8	25.6	25.5	25.5	25.1	24.3	24.1	24.2	25.8

Concentration 12.5	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.71	7.67	7.84	7.67	7.74	7.80	7.68	7.62	7.79	7.66	7.68	7.66	7.62	7.42
DO (mg/l)	8.0	6.1	8.1	6.3	8.0	6.7	8.1	5.6	8.5	5.5	8.4	6.1	8.1	5.4
Cond. (µmhos-cm)	316	338	314	344	298	330	306	305	287	320	288	313	248	298
Temperature (°C)	25.0	24.5	24.8	24.8	25.0	25.5	25.8	25.5	25.4	25.0	24.0	24.2	24.4	25.7

Concentration 25	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.49	7.70	7.67	7.68	7.54	7.81	7.52	7.69	7.61	7.65	7.47	7.68	7.42	7.42
DO (mg/l)	7.9	5.8	8.4	6.1	8.1	6.6	8.3	6.0	8.6	5.5	8.3	5.9	8.2	4.6
Cond. (µmhos-cm)	299	310	295	287	281	298	289	290	271	312	271	296	238	291
Temperature (°C)	25.5	24.3	24.8	24.7	25.1	25.8	25.2	25.4	26.0	25.0	24.2	25.0	24.7	25.7

Concentration 50	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.19	7.72	7.39	7.69	7.24	7.82	7.21	7.66	7.39	7.64	7.20	7.65	7.15	7.44
DO (mg/l)	8.0	5.9	8.6	6.0	8.3	6.7	8.5	6.0	9.1	5.8	8.6	5.9	8.4	4.8
Cond. (µmhos-cm)	264	279	256	282	247	283	253	259	237	267	238	264	215	262
Temperature (°C)	25.4	24.3	25.0	24.9	25.0	25.6	24.8	25.3	25.8	25.1	24.5	24.9	24.1	25.6

Concentration 100	Days 0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	6.88	7.67	7.14	7.66	6.98	7.80	6.99	7.70	7.15	7.68	6.95	7.67	6.92	7.55
DO (mg/l)	7.7	5.9	9.1	5.8	8.8	6.3	9.2	5.8	9.8	5.4	9.0	6.0	9.1	4.7
Cond. (µmhos-cm)	203	212	186	229	187	215	194	200	178	207	180	205	176	216
Temperature (°C)	25.0	24.1	25.3	25.0	25.1	25.5	24.6	25.3	24.5	25.0	24.8	25.0	24.1	25.8

	Control	MW-17		
Hardness*	80	116		
Alkalinity*	60	88		
Initial Chlorine†	–	0.12		
Ammonia †	–	0.9		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: SM et NF
Reviewed: KD

Sample Description:
Animal Source: ABS
Date Received: 5/29/03 <24 hrs.
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Pimephales promelas
Client: Unocal
Sample ID. #4 MW-103R

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Start Date & Time: 5/29/03 1630
Stop Date & Time: 6/5/03 1400
Test No: 0305-24NW

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.92	7.62	7.93	7.65	8.11	7.73	8.01	7.75	8.02	7.59	7.94	7.54	7.83	7.43
DO (mg/l)	7.6	5.5	8.0	5.9	7.8	5.8	7.7	5.9	8.4	5.6	8.1	6.5	7.8	5.2
Cond. (µmhos-cm)	337	361	325	363	325	360	333	323	331	330	270	293	261	291
Temperature (°C)	24.3	25.0	24.5	24.3	24.5	25.5	25.6	24.8	25.5	25.2	24.0	24.8	24.8	25.7

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.81	7.72	7.86	7.72	7.80	7.72	7.83	7.73	7.86	7.65	7.77	7.64	7.62	7.49
DO (mg/l)	7.7	5.7	8.2	6.0	8.0	5.8	8.1	5.8	8.4	5.3	8.3	6.1	7.8	5.4
Cond. (µmhos-cm)	373	391	367	398	349	387	356	359	334	369	295	333	297	328
Temperature (°C)	24.3	24.8	25.5	25.0	24.9	25.6	25.5	24.7	25.2	25.0	24.8	24.2	24.7	25.9

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.83	7.77	7.73	7.87	7.72	7.81	7.79	7.80	7.81	7.71	7.62	7.72	7.60	7.54
DO (mg/l)	8.0	5.4	8.0	6.1	7.9	5.8	8.1	6.2	8.4	5.4	8.4	6.0	7.9	5.1
Cond. (µmhos-cm)	405	423	403	435	385	440	391	405	367	401	333	367	335	365
Temperature (°C)	24.2	24.6	25.6	24.7	25.0	25.8	25.3	24.8	25.0	25.2	25.0	25.5	24.2	25.9

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.70	7.89	7.48	7.99	7.51	7.92	7.59	7.95	7.71	7.88	7.41	7.92	7.43	7.73
DO (mg/l)	7.9	5.5	8.2	6.2	8.1	5.4	8.3	6.2	8.7	5.6	8.3	6.1	8.3	4.9
Cond. (µmhos-cm)	478	485	470	490	449	499	460	448	427	465	403	445	401	442
Temperature (°C)	24.2	24.5	25.5	24.6	24.3	25.5	25.4	24.6	25.0	25.1	26.0	24.9	24.3	25.8

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.57	8.08	7.38	8.24	7.35	8.20	7.41	8.14	7.56	8.12	7.25	8.08	7.32	7.99
DO (mg/l)	8.3	5.3	8.4	6.0	8.3	6.0	8.7	5.9	9.2	5.6	8.6	5.8	8.7	4.5
Cond. (µmhos-cm)	611	624	603	651	569	690	586	604	550	633	542	609	527	601
Temperature (°C)	24.4	24.5	25.5	24.8	25.0	25.4	25.5	24.4	24.5	25.0	25.2	25.2	24.0	25.9

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.61	8.33	7.22	8.39	7.26	8.47	7.26	8.31	7.45	8.31	7.16	8.34	7.19	8.35
DO (mg/l)	8.4	5.5	8.8	6.1	8.9	6.1	9.4	6.0	10.0	5.6	9.1	6.1	9.5	5.2
Cond. (µmhos-cm)	882	901	853	897	807	997	819	801	776	886	773	884	745	880
Temperature (°C)	24.2	24.3	25.7	24.7	25.0	25.5	25.4	24.3	24.2	25.0	25.5	24.9	24.3	25.8

	Control	MW-103R		
Hardness*	80	7400		
Alkalinity*	60	392		
Initial Chlorine†	–	0.05		
Ammonia †	–	5.7		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: Sm mr, BT
Reviewed: BD

Sample Description:
Animal Source: ABS
Comments:

Date Received: 5/29/03 <24 hrs

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Pimephales promelas
Client: Unocal
Sample ID. #5 MW-129

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Start Date & Time: 5/29/03 1700
Stop Date & Time: ~~6/5/03~~ 6/6 1430
Test No: 0305-25NW

% Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.92	7.47	7.93	7.73	8.11	7.88	8.01	7.74	8.02	7.68	7.94	7.84	7.83	7.53
DO (mg/l)	7.6	5.6	8.0	6.5	7.8	6.1	7.7	6.5	8.4	5.8	8.1	6.3	7.8	6.2
Cond. (µmhos-cm)	337	366	325	361	325	351	333	328	331	344	270	293	261	327
Temperature (°C)	24.1	24.9	24.1	25.0	25.0	25.5	25.8	24.3	24.0	25.0	26.0	24.7	24.0	25.7

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.57	7.67	7.76	7.81	7.71	7.81	7.83	7.83	7.78	7.69	7.64	7.74	7.48	7.67
DO (mg/l)	7.8	5.8	8.1	6.1	8.0	6.1	7.9	6.3	8.1	5.2	8.2	6.1	7.7	5.8
Cond. (µmhos-cm)	369	389	372	401	352	391	373	374	340	380	306	336	307	354
Temperature (°C)	24.0	24.8	24.8	25.0	25.3	25.6	25.8	24.5	25.3	25.2	26.0	24.3	24.1	25.6

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.48	7.79	7.71	8.00	7.64	7.91	7.68	7.92	7.69	7.77	7.57	7.84	7.41	7.76
DO (mg/l)	8.0	5.9	8.1	6.1	7.7	6.1	8.0	6.3	8.2	5.2	8.1	6.3	7.8	5.4
Cond. (µmhos-cm)	410	421	409	443	392	428	411	400	379	412	347	379	349	408
Temperature (°C)	24.0	24.9	24.8	25.4	25.0	25.5	25.3	24.5	25.8	25.2	26.0	24.4	24.8	25.6

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.33	8.00	7.53	8.19	7.47	8.08	7.51	8.12	7.54	8.02	7.44	8.03	7.27	8.11
DO (mg/l)	7.7	5.6	8.2	~~5.8~~ 6.1	7.8	5.8	7.8	6.2	8.4	5.5	8.3	6.1	7.9	5.9
Cond. (µmhos-cm)	487	508	489	533	467	522	487	490	452	508	423	458	431	500
Temperature (°C)	24.0	24.8	24.2	25.0	24.9	25.4	25.0	24.4	26.0	25.0	26.0	24.6	24.6	25.7

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.22	8.23	7.39	8.33	7.31	8.32	7.37	8.32	7.35	8.28	7.33	8.23	7.13	8.24
DO (mg/l)	7.3	5.9	8.0	6.0	7.8	5.7	8.2	6.0	8.6	5.8	8.2	6.1	7.8	5.3
Cond. (µmhos-cm)	645	650	649	681	612	703	633	644	593	646	575	621	590	669
Temperature (°C)	24.0	24.5	25.2	25.0	24.9	25.5	25.4	24.3	24.5	25.1	25.6	24.3	~~26~~ NF 24.0	25.5

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.03	8.28	7.19	8.31	7.22	8.21	7.28	8.20	7.20	8.03	7.28	8.01	6.77	8.30
DO (mg/l)	7.5	6.1	7.8	5.9	7.6	5.4	8.5	5.9	8.5	4.5	8.4	5.2	7.6	5.8
Cond. (µmhos-cm)	928	913	936	940	866	953	874	875	856	905	826	897	888	975
Temperature (°C)	24.0	24.5	25.0	25.5	24.9	25.5	25.0	24.4	24.4	25.0	25.0	24.4	24.5	25.8

	Control	MW-129		
Hardness*	80	7400		
Alkalinity*	60	7400		
Initial Chlorine†	–	ND		
Ammonia †	–	4.4		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: SM, KB, ?, NF
Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/29/03 <24 hrs
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Pimephales promelas
Client: Unocal
Sample ID. #6 Mw-W

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay
Start Date & Time: 5/29/03 1715
Stop Date & Time: 6/5/03 1530
Test No: 0305-26NW

% Concentration CON	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.92	7.82	7.93	7.51	8.11	7.75	8.01	7.62	7.99	7.63	7.74	7.84	7.83	7.79
DO (mg/l)	7.6	6.4	8.0	6.3	7.89	5.9	7.7	5.6	8.2	5.5	8.1	7.1	7.8	6.6
Cond. (µmhos-cm)	337	345	325	348	325	365	333	327	306	330	270	282	261	290
Temperature (°C)	24.2	25.0	24.2	25.2	25.0	26.0	24.5	25.8	25.0	25.3	24.8	24.0	24.8	25.9

Concentration 6.25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.56	7.78	7.72	7.70	7.61	7.72	7.71	7.66	7.73	7.54	7.74	7.80	7.48	7.72
DO (mg/l)	7.6	6.2	8.1	6.3	8.0	5.9	7.8	5.8	8.2	5.3	8.1	6.8	7.7	5.9
Cond. (µmhos-cm)	383	397	371	399	372	402	370	359	354	377	319	336	314	336
Temperature (°C)	25.0	25.0	24.3	25.3	25.3	26.0	24.5	25.9	25.0	25.0	25.3	24.8	25.1	25.1

Concentration 12.5	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.39	7.85	7.66	7.77	7.50	7.77	7.59	7.72	7.54	7.68	7.55	7.83	7.46	7.72
DO (mg/l)	7.8	6.5	8.0	6.2	7.8	5.8	7.9	6.1	8.2	5.4	8.3	6.8	7.9	5.8
Cond. (µmhos-cm)	431	445	422	447	421	451	408	406	401	430	368	406	358	386
Temperature (°C)	24.7	24.8	24.2	25.3	25.3	25.8	24.5	25.8	25.0	25.2	25.0	24.0	25.0	25.1

Concentration 25	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.26	7.89	7.54	8.02	7.36	7.93	7.41	7.88	7.37	7.82	7.39	7.91	7.30	7.91
DO (mg/l)	7.6	5.9	8.3	6.3	7.8	5.9	8.1	5.9	8.4	5.4	8.2	6.9	8.0	5.6
Cond. (µmhos-cm)	525	533	516	557	514	573	484	498	486	523	454	470	458	492
Temperature (°C)	25.0	24.8	24.3	25.3	25.7	26.0	24.2	25.8	25.0	25.3	25.0	24.6	24.8	25.9

Concentration 50	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	7.13	8.05	7.43	8.08	7.20	8.12	7.29	7.98	7.23	7.97	7.21	8.04	7.14	8.24
DO (mg/l)	7.4	6.0	8.5	5.9	7.7	6.2	8.3	5.3	8.4	5.1	8.5	6.4	7.9	6.5
Cond. (µmhos-cm)	704	722	690	760	701	783	625	699	651	711	628	689	637	716
Temperature (°C)	25.0	24.6	24.1	25.4	25.2	25.8	24.0	25.5	25.0	25.0	25.2	24.6	24.8	25.9

Concentration 100	Days 0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final
pH	6.96	8.17	7.31	8.06	7.09	8.11	7.18	8.22	7.09	8.09	7.09	8.11	6.97	8.19
DO (mg/l)	7.2	5.9	9.2	5.4	7.8	5.7	8.7	5.4	8.4	5.2	8.7	6.4	7.9	5.2
Cond. (µmhos-cm)	1056	1077	1015	1161	1052	1182	973	1059	964	1097	921	1063	959	1099
Temperature (°C)	25.0	24.6	24.2	25.3	24.8	25.8	24.0	25.8	25.0	25.1	25.2	25.0	24.8	25.8

	Control	MW-W		
Hardness*	80	>400		
Alkalinity*	60	>400		
Initial Chlorine†	–	ND		
Ammonia †	–	4.4		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: Sm, KB, ET, im
Reviewed: [illegible]

Sample Description:
Animal Source: ABS
Date Received: 5/29/03 <24 hrs.
Comments:

Ceriodaphnia dubia

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #1 MW-146

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay
Start Date & Time: 5/29/03 1430
Stop Date & Time: 6/5/03 1530
Test No: 0305-15NW

Concentration: CON

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.01	8.43	7.95	8.27	8.08	8.30	7.90	8.30	8.02	8.23	7.82	8.23	7.98	8.46
DO (mg/l)	7.9	8.1	7.9	8.6	7.7	8.2	8.1	8.2	8.2	8.3	8.2	8.7	8.1	8.3
Cond. (µmhos-cm)	169	171	170	209	179	218	179	173	164	178	162	172	161	176
Temperature (°C)	25.0	25.4	25.0	25.1	25.0	25.1	24.2	25.4	24.1	25.2	25.0	25.3	25.0	25.3

Concentration: 6.25

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.80	8.48	7.80	8.30	7.72	8.35	7.68	8.25	7.83	8.26	7.68	8.23	7.37	8.41
DO (mg/l)	8.1	8.3	8.6	8.5	7.9	8.4	8.2	8.3	8.1	8.3	8.2	8.9	8.0	8.2
Cond. (µmhos-cm)	179	187	182	180	191	203	185	184	163	184	182	190	182	198
Temperature (°C)	25.0	25.3	25.0	25.3	25.0	24.8	24.5	25.4	24.0	25.4	24.0	25.2	25.0	25.5

Concentration: 12.5

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.60	8.39	7.66	8.25	7.45	8.32	7.46	8.21	7.86	8.26	7.51	8.25	7.32	8.42
DO (mg/l)	8.4	8.3	8.5	8.6	8.0	8.3	8.0	8.3	8.2	8.5	8.1	8.8	8.1	8.2
Cond. (µmhos-cm)	195	197	194	180	205	218	201	196	200	196	188	177	185	211
Temperature (°C)	25.0	25.2	25.0	25.1	24.8	24.7	24.0	25.4	25.0	25.2	24.9	25.3	25.0	24.8

Concentration: 25

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.45	8.35	7.48	8.31	7.24	8.16	7.28	8.25	7.51	8.26	7.31	8.26	7.14	8.38
DO (mg/l)	8.3	8.0	8.5	8.7	7.7	8.0	8.0	8.5	8.3	8.5	8.2	8.8	7.9	8.2
Cond. (µmhos-cm)	224	225	221	185	247	249	230	223	157	221	214	217	210	229
Temperature (°C)	25.0	25.3	25.0	25.1	25.2	25.2	24.0	25.4	24.9	25.1	26.0	25.3	25.0	24.7

Concentration: 50

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.26	8.40	7.25	8.30	6.99	8.38	7.01	8.28	7.26	8.32	7.14	8.31	6.91	8.44
DO (mg/l)	7.9	7.9	8.4	8.4	7.2	8.1	7.4	8.1	8.1	8.4	7.9	8.7	7.9	8.1
Cond. (µmhos-cm)	279	274	279	191	301	303	290	275	205	275	227	270	265	285
Temperature (°C)	25.0	25.3	25.0	25.0	25.0	25.0	25.3	25.4	25.0	25.1	25.2	25.4	25.0	25.2

Concentration: 100

	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.01	8.48	7.07	8.35	6.83	8.45	6.84	8.38	7.10	8.45	7.13	8.40	6.75	8.54
DO (mg/l)	7.0	8.0	8.0	8.7	7.0	7.9	7.0	8.0	7.8	8.2	7.7	8.4	7.7	8.1
Cond. (µmhos-cm)	393	373	389	209	414	405	386	375	420	367	384	371	373	383
Temperature (°C)	25.0	25.0	25.0	25.2	24.8	25.1	24.3	25.4	24.8	25.1	24.0	25.1	25.0	25.2

	Control	MW-146		
Hardness*	80	7400		
Alkalinity*	60	264		
Initial Chlorine†	–	~~KB, 4/3~~ ND		
Ammonia †	–	3.5		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: BH NE KB nw

Reviewed: KB

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #2 MW-7
Start Date & Time: 5/29/03 1400
Stop Date & Time: 6/5/03 1500
Test No: 0305-16NW

Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.01	8.21	7.95	8.37	8.08	8.20	7.90	8.08	7.99	8.13	7.82	8.08	7.98	8.13
DO (mg/l)	7.9	7.9	7.9	8.7	7.7	7.8	8.1	7.9	8.2	8.4	8.2	8.9	8.1	7.8
Cond. (μmhos-cm)	169	174	170	~~179~~ 179	179	193	179	174	149	185	162	170	161	278
Temperature (°C)	25.0	25.4	25.0	25.2	24.8	25.3	25.1	25.1	24.0	25.1	24.0	25.1	25.2	25.0

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.90	8.22	7.24	8.31	7.82	8.18	7.71	8.07	7.90	8.16	7.65	8.13	7.66	8.17
DO (mg/l)	8.2	8.1	8.6	8.4	8.0	8.0	8.1	7.9	8.3	8.4	8.2	8.8	8.2	8.0
Cond. (μmhos-cm)	175	180	181	186	181	198	183	179	174	187	173	172	163	184
Temperature (°C)	25.0	25.3	25.0	25.3	24.8	25.2	24.0	25.3	24.0	25.2	24.8	25.3	25.2	25.0

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.73	8.23	7.39	8.33	7.73	8.22	7.70	8.09	7.68	8.22	7.58	8.18	7.57	8.26
DO (mg/l)	8.4	8.0	8.5	8.6	8.1	8.1	8.2	7.9	8.4	8.7	8.2	8.8	8.2	8.1
Cond. (μmhos-cm)	183	187	184	192	189	212	187	186	189	207	175	179	170	190
Temperature (°C)	25.0	25.3	25.0	20.5	25.0	25.3	24.5	25.3	24.0	25.2	24.8	25.5	25.5	25.1

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.62	8.26	7.42	8.28	7.51	8.20	7.57	8.15	7.41	8.31	7.41	8.26	7.43	8.29
DO (mg/l)	8.4	8.0	8.5	8.5	8.1	8.0	8.5	7.8	8.2	8.7	8.3	9.1	8.1	8.1
Cond. (μmhos-cm)	198	201	197	206	203	213	200	203	207	218	193	193	192	205
Temperature (°C)	25.0	25.0	25.0	20.1	25.1	25.0	24.1	25.2	24.7	25.1	25.0	25.5	25.1	25.1

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.47	8.27	7.40	8.32	7.31	8.26	7.36	8.21	7.22	8.31	7.20	8.28	7.23	8.39
DO (mg/l)	8.1	8.0	8.7	8.4	8.1	7.9	8.2	8.0	8.5	8.6	8.4	8.8	8.3	8.0
Cond. (μmhos-cm)	231	230	224	234	234	249	230	230	237	272	222	223	225	233
Temperature (°C)	25.0	24.9	25.0	20.1	25.1	24.9	24.2	25.1	24.0	25.2	24.9	25.4	25.1	25.1

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.12	8.42	7.35	8.42	7.27	8.38	7.13	8.36	6.98	8.40	7.03	8.36	7.01	8.48
DO (mg/l)	8.0	7.8	8.5	8.3	8.0	7.9	8.4	7.9	8.9	8.6	8.5	8.9	8.2	8.0
Cond. (μmhos-cm)	288	280	277	282	268	302	272	285	281	341	277	273	276	284
Temperature (°C)	25.0	25.3	25.0	20.3	25.5	25.2	24.3	25.0	24.0	25.4	25.8	25.4	25.2	25.0

	Control	MW-7		
Hardness*	80	7400		
Alkalinity*	60	184		
Initial Chlorine†	–	0.06		
Ammonia †	–	1.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: Et MF
Reviewed: KO

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #3 MW-17
Start Date & Time: 5/29/03 1500
Stop Date & Time: 6/5/03 1600
Test No: 0305-17NW

Concentration CON	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	8.01	8.19	7.95	8.33	8.08	8.25	7.90	8.15	~~7.~~8.03	8.14	7.82	8.22	7.98	8.32
DO (mg/l)	7.9	7.7	7.9	8.4	7.7	7.8	8.1	8.2	8.1	8.5	8.2	8.7	8.1	8.1
Cond. (µmhos-cm)	169	177	170	182	179	200	179	179	151	186	162	173	161	190
Temperature (°C)	25.0	24.5	25.0	25.3	25.0	25.2	24.0	25.4	25.0	25.1	24.0	25.3	25.0	25.5

Concentration 6.25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.86	8.18	7.33	8.33	7.92	8.26	7.81	8.16	8.03	8.20	7.77	8.20	7.88	8.33
DO (mg/l)	8.3	7.9	8.7	8.4	7.9	8.0	8.2	8.1	8.2	8.4	8.1	8.8	8.1	8.0
Cond. (µmhos-cm)	167	177	173	191	178	196	175	175	165	177	179	166	160	182
Temperature (°C)	25.0	25.4	25.0	25.5	25.1	25.0	24.2	25.4	25.0	25.1	25.0	25.3	25.0	25.0

Concentration 12.5	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.79	8.13	7.43	8.29	7.81	8.28	7.82	8.14	7.92	8.27	7.69	8.21	7.76	8.30
DO (mg/l)	8.5	8.2	8.6	8.5	8.1	8.2	8.2	8.0	8.2	8.7	8.3	8.8	8.3	8.0
Cond. (µmhos-cm)	168	178	170	201	177	196	176	176	166	181	162	172	160	189
Temperature (°C)	25.0	25.3	25.0	25.2	25.1	24.9	25.2	25.4	24.7	25.1	26.0	25.3	25.0	25.0

Concentration 25	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.65	8.14	7.44	8.27	7.63	8.23	7.71	8.14	7.70	8.31	7.49	8.24	7.60	8.28
DO (mg/l)	8.6	8.0	8.7	8.4	~~8.8~~ 8.1	8.1	8.4	8.1	8.5	8.6	8.5	8.9	8.3	8.1
Cond. (µmhos-cm)	170	180	174	223	181	198	179	180	169	181	165	171	160	188
Temperature (°C)	25.0	25.2	25.0	25.2	25.1	24.7	24.8	25.4	25.1	25.2	26.0	25.3	25.0	25.0

Concentration 50	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.43	8.17	7.42	8.34	7.38	8.30	7.50	8.17	7.48	8.28	7.28	8.25	7.34	8.34
DO (mg/l)	8.3	8.0	8.9	8.1	8.0	8.0	8.4	8.2	8.6	8.6	8.6	8.8	8.5	8.1
Cond. (µmhos-cm)	179	188	179	269	188	206	185	185	174	188	170	177	170	193
Temperature (°C)	25.0	25.0	25.0	25.1	24.8	25.1	24.0	25.4	25.0	25.1	26.0	25.3	25.0	25.0

Concentration 100	Day 0 init.	Day 0 final	Day 1 init.	Day 1 final	Day 2 init.	Day 2 final	Day 3 init.	Day 3 final	Day 4 init.	Day 4 final	Day 5 init.	Day 5 final	Day 6 init.	Day 6 final
pH	7.13	8.22	7.35	8.48	7.14	8.35	7.18	8.23	7.34	8.32	7.05	8.25	7.03	8.36
DO (mg/l)	8.0	8.1	9.0	8.1	8.1	8.1	8.3	8.2	8.8	8.5	8.8	8.9	8.8	8.3
Cond. (µmhos-cm)	193	203	193	366	201	217	202	198	188	203	185	191	182	205
Temperature (°C)	25.0	25.3	25.0	25.4	24.3	25.0	24.0	25.4	24.9	25.1	26.0	25.3	25.0	25.0

	Control	MW 17		
Hardness*	80	116		
Alkalinity*	60	88		
Initial Chlorine†	/	0.12		
Ammonia †	/	<1.0		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: RA, KB
Reviewed: KP

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #4 MW-103R

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Start Date & Time: 5/29/03 1525
Stop Date & Time: 6/5/03 1625
Test No: 0305-18NW

Concentration: CON

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	8.01	8.06	7.95	8.28	8.08	8.6	7.70	8.12	7.99	8.27	7.82	8.19	7.98	8.55
DO (mg/l)	7.9	8.0	7.9	8.5	7.7	8.1	8.1	8.1	8.4	8.5	8.2	8.6	8.1	8.5
Cond. (µmhos-cm)	169	193	170	176	179	195	179	182	160	175	162	173	~~148~~ 161	180
Temperature (°C)	25.0	24.8	25.0	24.7	25.0	25.0	24.8	25.4	24.1	25.3	24.6	25.5	25.0	24.9

Concentration: 6.25

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.96	8.18	7.33	8.35	7.95	8.21	7.89	8.22	7.98	8.35	7.81	8.21	7.82	8.63
DO (mg/l)	8.5	8.0	8.5	8.5	7.8	7.9	8.3	7.9	8.3	8.5	8.2	8.5	8.1	8.7
Cond. (µmhos-cm)	227	221	217	215	227	242	~~228~~ 278	230	202	217	202	210	198	224
Temperature (°C)	25.0	24.7	25.0	24.9	25.5	25.0	24.8	25.4	24.8	~~204~~ 25.2	24.9	25.5	25.0	24.8

Concentration: 12.5

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.98	8.30	7.46	8.36	7.82	8.31	7.76	8.29	7.97	8.36	7.71	8.27	7.75	8.70
DO (mg/l)	8.5	7.8	8.7	8.5	7.9	8.0	8.5	8.1	8.5	8.6	8.3	8.8	7.7	8.9
Cond. (µmhos-cm)	257	282	258	258	274	282	263	269	247	217	243	245	238	257
Temperature (°C)	25.0	24.6	25.0	25.0	25.5	25.6	24.3	25.3	25.0	25.2	25.1	25.2	25.0	24.8

Concentration: 25

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.95	8.38	7.48	8.45	7.70	840	7.72	8.42	7.88	8.44	7.61	8.33	7.60	8.70
DO (mg/l)	8.5	7.7	8.6	8.5	8.0	8.2	8.5	8.1	8.6	8.8	8.5	8.9	8.4	8.8
Cond. (µmhos-cm)	344	348	345	346	361	378	350	374	314	255	313	332	320	349
Temperature (°C)	25.0	24.6	25.0	24.8	25.8	25.6	24.0	25.4	24.8	25.3	25.9	25.4	25.0	24.8

Concentration: 50

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.90	8.50	7.50	8.58	7.57	8.54	7.59	8.52	7.81	8.55	7.55	8.50	7.47	8.82
DO (mg/l)	8.4	8.2	8.8	8.6	8.3	8.2	8.7	8.3	8.8	8.8	8.6	8.8	8.6	8.7
Cond. (µmhos-cm)	516	508	524	501	555	558	515	523	493	376	510	491	482	608
Temperature (°C)	25.0	24.5	25.0	24.8	25.8	25.6	24.0	25.3	24.9	25.1	25.8	25.5	25.0	24.9

Concentration: 100

Days	0		1		2		3		4		5		6	
	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.74	8.68	7.47	8.74	7.41	8.69	7.48	8.69	7.69	8.77	7.29	8.68	7.36	8.87
DO (mg/l)	8.6	8.0	9.1	8.6	8.5	9.2	9.1	8.1	9.5	8.9	8.9	8.8	9.1	8.6
Cond. (µmhos-cm)	878	831	8.71	755	915	912	839	799	799	844	823	816	791	873
Temperature (°C)	25.0	24.5	25.0	24.7	25.0	25.6	24.2	25.2	24.6	25.1	24.9	25.5	25.0	25.0

	Control	MW 103R	
Hardness*	80	7400	
Alkalinity*	60	392	
Initial Chlorine†	–	0.05	
Ammonia †	–	5.7	

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: MF

Reviewed: [illegible]

Sample Description:

Date Received: 5/29/03

Animal Source: ABS

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #5 MW-129

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay
Start Date & Time: 5/29/03 1550
Stop Date & Time: 6/5/03 1640
Test No: 0305-19NW

Concentration: CON

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	8.01	8.32	7.95	8.33	8.08	8.26	7.90	8.34	7.99	8.43	7.82	8.29	7.98	8.47	8.16
DO (mg/l)	7.9	8.1	7.9	8.4	7.7	8.1	8.1	8.3	8.4	8.8	8.2	8.7	8.1	8.5	7.8
Cond. (µmhos-cm)	169	172	170	180	179	191	~~228~~ 180	268	160	173	162	169	161	180	176
Temperature (°C)	25.0	25.6	25.0	25.2	24.8	25.6	24.8	25.6	24.8	25.0	24.1	25.5	25.2	25.0	

Concentration: 6.25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	7.75	8.33	7.15	8.35	7.83	8.36	7.81	8.42	7.72	8.56	7.67	8.35	7.64	8.58	8.27
DO (mg/l)	8.6	8.0	8.0	8.3	7.9	8.3	8.4	8.2	8.4	8.9	8.2	8.9	8.1	8.6	7.9
Cond. (µmhos-cm)	219	226	228	226	239	246	228	240	258	268	212	218	208	233	230
Temperature (°C)	25.0	25.4	25.0	24.9	24.8	25.6	24.9	25.6	24.4	25.4	24.9	25.5	25.2	24.9	

Concentration: 12.5

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	7.65	8.46	7.38	8.45	7.71	8.51	7.75	8.41	7.71	8.56	7.59	8.43	7.54	8.69	8.37
DO (mg/l)	8.4	8.2	8.2	8.5	7.9	8.3	8.5	8.4	8.5	9.1	8.4	9.1	8.0	8.0	8.1
Cond. (µmhos-cm)	278	273	278	273	290	295	282	318	262	274	260	261	261	284	288
Temperature (°C)	25.0	25.4	25.0	24.7	25.5	25.6	25.2	25.6	25.0	25.3	25.4	25.5	25.5	25.8	

Concentration: 25

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	7.51	8.56	7.42	8.54	7.56	8.59	7.61	8.49	7.63	8.67	7.48	8.48	7.38	8.65	8.49
DO (mg/l)	8.3	8.1	8.0	8.6	7.8	8.5	8.3	8.5	8.3	9.0	8.3	8.7	8.1	8.4	8.1
Cond. (µmhos-cm)	381	366	382	367	401	394	370	439	339	360	356	356	361	388	385
Temperature (°C)	25.0	25.4	25.0	24.8	25.7	25.6	24.5	25.6	24.9	25.5	26.0	25.6	25.1	24.9	

Concentration: 50

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	7.55	8.67	7.34	8.72	7.39	8.72	7.51	8.59	7.47	8.70	7.41	8.62	7.23	8.74	8.62
DO (mg/l)	8.1	8.2	8.0	8.5	7.7	8.6	8.3	8.5	8.5	9.1	8.3	8.8	8.1	8.3	8.2
Cond. (µmhos-cm)	583	537	582	538	607	584	468	681	544	534	529	522	554	531	546
Temperature (°C)	25.0	25.3	25.0	25.2	24.8	25.6	25.0	25.6	25.2	25.5	25.8	25.6	25.2	25.6	

Concentration: 100

Days	0 init.	0 final	1 init.	1 final	2 init.	2 final	3 init.	3 final	4 init.	4 final	5 init.	5 final	6 init.	6 final	Day 3 Final
pH	7.28	8.59	7.26	8.65	7.29	8.61	7.49	8.68	7.34	8.63	7.30	8.57	7.12	8.68	8.59
DO (mg/l)	7.0	8.0	7.5	8.4	7.3	8.6	8.5	8.5	8.5	9.1	8.3	8.8	7.7	8.0	8.2
Cond. (µmhos-cm)	951	754	956	744	1004	814	912	1138	882	712	848	728	911	769	733
Temperature (°C)	25.0	25.2	25.0	25.1	25.0	25.6	24.0	25.6	24.2	25.4	24.8	25.7	25.2	25.3	

	Control	MW-129		
Hardness*	80	>400		
Alkalinity*	60	>400		
Initial Chlorine†	—	ND		
Ammonia †	—	2.6		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: LF EH

Reviewed: KB

Sample Description:

Animal Source: ABS

Date Received: 5/29/03

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab

Initial and Final Chemistries
Seven Day Chronic Freshwater Bioassay

Test Species: Ceriodaphnia dubia
Client: Unocal
Sample ID. #6 MW-W

Start Date & Time: 5/29/03 1615
Stop Date & Time: 6/5/03 1700
Test No: 0305-20NW

Concentration	Days													
	0		1		2		3		4		5		6	
CON	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	8.01	8.32	7.95	8.33	8.08	8.34	7.90	8.23	8.06	8.20	7.82	8.15	7.98	8.45
DO (mg/l)	7.9	8.1	7.7	8.3	7.7	8.3	8.1	8.1	8.3	8.1	8.2	8.4	8.1	8.0
Cond. (µmhos-cm)	169	175	170	184	179	206	179	192	161	185	162	173	161	182
Temperature (°C)	25.0	25.5	25.0	24.9	24.8	25.6	24.0	25.4	24.7	25.3	24.7	25.5	25.0	25.1

Concentration	Days													
	0		1		2		3		4		5		6	
6.25	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.83	8.27	7.38	8.30	7.88	8.42	7.93	8.30	7.93	8.23	7.71	~~8.58~~ 8.17	7.88	8.35
DO (mg/l)	8.4	8.1	8.1	8.4	7.8	8.2	8.2	8.2	8.3	8.1	8.2	8.8	8.1	7.8
Cond. (µmhos-cm)	227	232	232	238	248	240	225	255	219	235	224	~~173~~ 2230	225	241
Temperature (°C)	25.0	25.5	25.0	25.2	25.2	25.6	24.1	25.4	24.0	25.3	25.1	25.3	25.0	25.0

Concentration	Days													
	0		1		2		3		4		5		6	
12.5	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.69	8.30	7.48	8.32	7.79	8.41	7.80	8.35	7.80	8.25	7.63	8.24	7.69	8.33
DO (mg/l)	~~7.7~~ 8.3	8.2	8.3	8.4	7.9	8.4	8.4	8.3	8.3	8.2	8.2	8.5	8.2	7.9
Cond. (µmhos-cm)	285	288	287	294	307	318	285	288	275	294	279	278	267	299
Temperature (°C)	25.0	25.4	25.0	24.7	25.5	25.6	24.6	25.4	24.0	25.1	25.6	25.2	25.0	25.6

Concentration	Days													
	0		1		2		3		4		5		6	
25	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.57	8.39	7.47	8.41	7.61	8.49	7.69	8.46	7.65	8.33	7.49	8.34	7.60	8.49
DO (mg/l)	8.3	8.1	8.1	8.5	7.9	8.5	8.4	8.4	8.4	8.1	8.4	8.5	8.3	8.0
Cond. (µmhos-cm)	398	399	402	409	430	439	397	414	385	407	384	388	347	398
Temperature (°C)	25.0	25.2	25.0	25.0	25.8	25.6	24.3	25.4	24.0	25.1	25.7	25.2	25.0	24.5

Concentration	Days													
	0		1		2		3		4		5		6	
50	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.41	8.50	7.47	8.52	7.41	8.59	7.54	8.52	7.42	8.47	7.34	8.46	7.34	8.58
DO (mg/l)	8.0	7.8	8.1	8.3	7.7	8.5	8.5	8.3	8.4	8.2	8.4	8.6	8.3	8.1
Cond. (µmhos-cm)	632	616	631	638	665	681	589	655	599	631	558	612	570	697
Temperature (°C)	25.0	25.2	25.0	25.0	25.5	25.6	24.0	25.4	24.1	25.3	25.0	25.2	25.0	25.3

Concentration	Days													
	0		1		2		3		4		5		6	
100	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final	init.	final
pH	7.20	8.63	7.51	8.69	7.23	8.68	7.50	8.69	7.33	8.63	7.23	8.60	7.12	8.72
DO (mg/l)	7.3	7.9	7.4	8.5	7.4	8.5	8.7	8.3	8.5	8.2	8.3	8.4	8.0	7.8
Cond. (µmhos-cm)	1069	1025	1075	1054	1138	1138	1055	1099	1001	1048	922	999	982	1084
Temperature (°C)	25.0	25.4	25.0	25.1	25.0	25.6	24.8	25.4	24.0	25.3	24.1	25.1	25.0	25.5

	Control	MW-W		
Hardness*	80	7400		
Alkalinity*	60	7400		
Initial Chlorine†	–	ND		
Ammonia †	–	4.4		

* mg/L as CaCO3; † mg/L; ND: no chlorine detected

Analysts: Et, KB
Reviewed: KC

Sample Description:
Animal Source: ABS
Date Received: 5/29/03
Comments:

Appendix G

Statistical Analyses

Atherinops affinis

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-27NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa|	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-146				

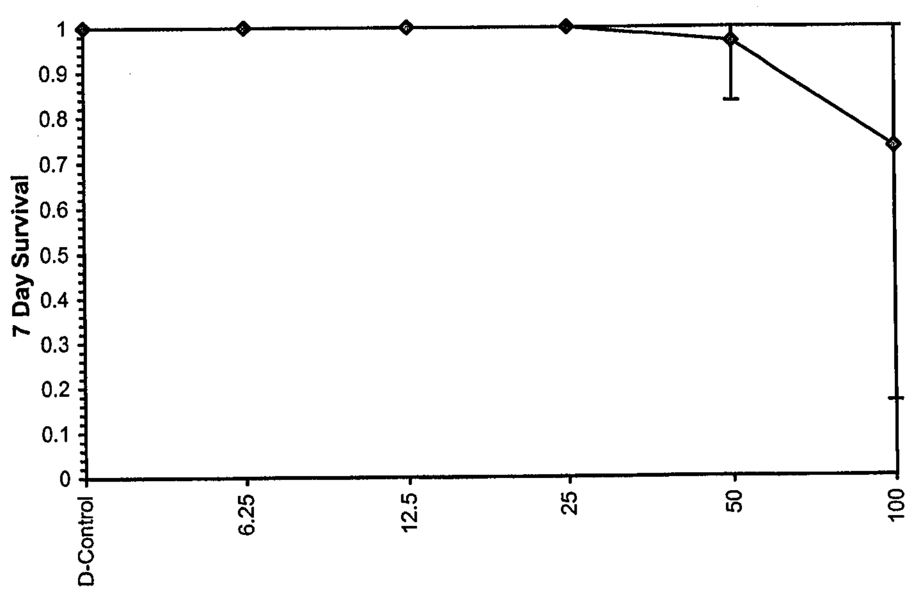
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	0.8333
100	0.6667	0.1667	1.0000	1.0000	0.8333

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5		
6.25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
12.5	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
50	0.9667	0.9667	1.3222	1.1503	1.3652	7.271	5	25.00	16.00
100	0.7333	0.7333	1.0513	0.4205	1.3652	37.266	5	20.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.59773	0.9	-2.1291	11.7165
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: VB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-27NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-146				

Conc-%	1	2	3	4	5
D-Control	1.6017	1.7183	1.7683	1.8267	1.8617
6.25	1.4967	1.8983	1.1300	1.9450	1.1700
12.5	1.7700	1.6367	1.5850	1.4817	1.5867
25	1.8433	2.1767	1.6083	1.7483	1.4883
50	1.2467	1.5950	1.0983	1.5617	1.2250
100	0.6633	0.1567	0.9783	0.9017	0.7033

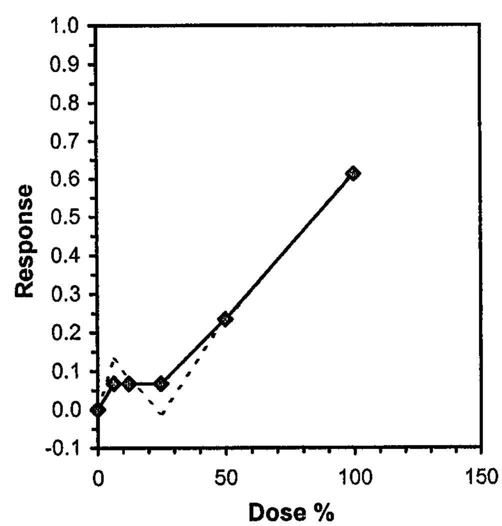
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.7553	1.0000	1.7553	1.6017	1.8617	5.806	5				1.7553	1.0000
6.25	1.5280	0.8705	1.5280	1.1300	1.9450	25.317	5	1.406	2.360	0.3815	1.6377	0.9330
12.5	1.6120	0.9183	1.6120	1.4817	1.7700	6.501	5	0.887	2.360	0.3815	1.6377	0.9330
25	1.7730	1.0101	1.7730	1.4883	2.1767	14.833	5	-0.109	2.360	0.3815	1.6377	0.9330
*50	1.3453	0.7664	1.3453	1.0983	1.5950	16.385	5	2.536	2.360	0.3815	1.3453	0.7664
*100	0.6807	0.3878	0.6807	0.1567	0.9783	47.198	5	6.648	2.360	0.3815	0.6807	0.3878

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97628		0.9		-0.136	-0.1186
Bartlett's Test indicates equal variances (p = 0.09)					9.3871		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	25	50	35.3553	4	0.3815	0.21734	0.83271	0.06533	4.1E-06	5, 24

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	4.662	11.545	0.644	44.669	0.5932
IC10	29.949	12.005	0.000	45.586	-0.8852
IC15	37.454	8.260	0.000	58.464	-1.5413
IC20	44.960	6.645	28.647	62.730	-0.8482
IC25	52.169	6.021	36.548	68.693	0.0595
IC40	71.976	6.317	55.760	93.263	0.3359
IC50	85.181				

* indicates IC estimate less than the lowest concentration



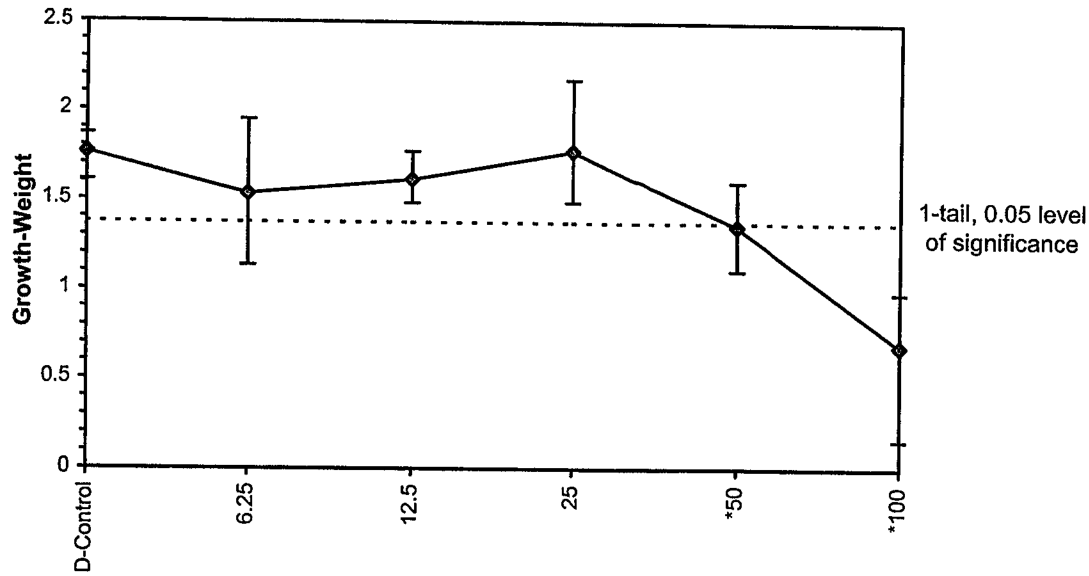
ToxCalc v5.0.23

Reviewed by: [signature]

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-27NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-146				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: JB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal **Test Date:** 5/29/03 1945

Sample ID: #1 MW-146 **Test No.:** 0305-27NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	23	1	6	6	6	6	6	6	6	6		
	16	2	6	6	6	6	6	6	6	6		
	18	3	6	6	6	6	6	6	6	6		
	12	4	6	6	6	6	6	6	6	6		
	27	5	6	6	6	6	6	6	6	6		100%
6.25	19	1	6	6	6	6	6	6	6	6		
	30	2	6	6	6	6	6	6	6	6		
	4	3	6	6	6	6	6	6	6	6		
	3	4	6	6	6	6	6	6	6	6		
	10	5	6	6	6	6	6	6	6	6		100%
12.5	14	1	6	6	6	6	6	6	6	6		
	6	2	6	6	6	6	6	6	6	6		
	28	3	6	6	6	6	6	6	6	6		
	8	4	6	6	6	6	6	6	6	6		
	7	5	6	6	6	6	6	6	6	6		100%
25	9	1	6	6	6	6	6	6	6	6		
	11	2	6	6	6	6	6	6	6	6		
	20	3	6	6	6	6	6	6	6	6		
	25	4	6	6	6	6	6	6	6	6		
	1	5	6	6	6	6	6	6	6	6		100%
50	29	1	6	6	6	6	6	6	6	6		
	5	2	6	6	6	6	6	6	6	6		
	15	3	6	6	6	6	6	6	6	6		
	2	4	6	6	6	6	6	6	6	6		
	24	5	6	6	6	6	6	6	6	5		97%
100	26	1	6	6	4	4	4	4	4	4		
	21	2	6	3	1	1	1	1	1	1		
	17	3	6	6	6	6	6	6	6	6		
	13	4	6	6	6	6	6	6	6	6		
	22	5	6	6	6	6	5	5	5	5		80%
Tech Initials			NF	mw	mw	mw	am	NF	mw	ET		

Feeding Times: 0 ____ 2100 1 0730 1815 2 0800 1830 3 0830 1730 4 0730 1600 5 0730 1730 6 0730 1730

Comments:

Analysts: NF MW

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #1 MW-146

Species: *A. affinis*

Test No: 0305-27NW

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	23	1	0.04326	0.05287		6		
	16	2	0.04375	0.05406		6		
	18	3	0.04267	0.05328		6		
	12	4	0.04353	0.05449		6		
	27	5	0.04290	0.05407		6		
6.25	19	1	0.04430	0.05328		6		
	30	2	0.04165	0.05304		6		
	4	3	0.04408	0.05086		6		
	3	4	0.04416	0.05583		6		
	10	5	0.04411	0.05113		6		
12.5	14	1	0.04379	0.05441		6		
	6	2	0.04446	0.05428		6		
	28	3	0.04240	0.05191		6		
	8	4	0.04325	0.05214		6		
	7	5	0.04442	0.05394		6		
25	9	1	0.04153	0.05259		6		
	11	2	0.04377	0.05683		6		
	20	3	0.04374	0.05339		6		
	25	4	0.04273	0.05322		6		
	1	5	0.04171	0.05064		6		
50	29	1	0.04274	0.05022		6		
	5	2	0.04399	0.05356		6		
	15	3	0.04345	0.05004		6		
	2	4	0.04392	0.05329		6		
	24	5	0.04327	0.05062		5		
100	26	1	0.04326	0.04724		4		
	21	2	0.04197	0.04291		1		
	17	3	0.04406	0.04993		6		
	13	4	0.04365	0.04906		6		
	22	5	0.04391	0.04813		5		

Tare: SM
Total: mm

Date/Time in: 6/5/03 2000
Date/Time out: ~~9/11/2003 1245~~ 6/6/03 2000
Oven temp. (°C): 60

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-28NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-7				

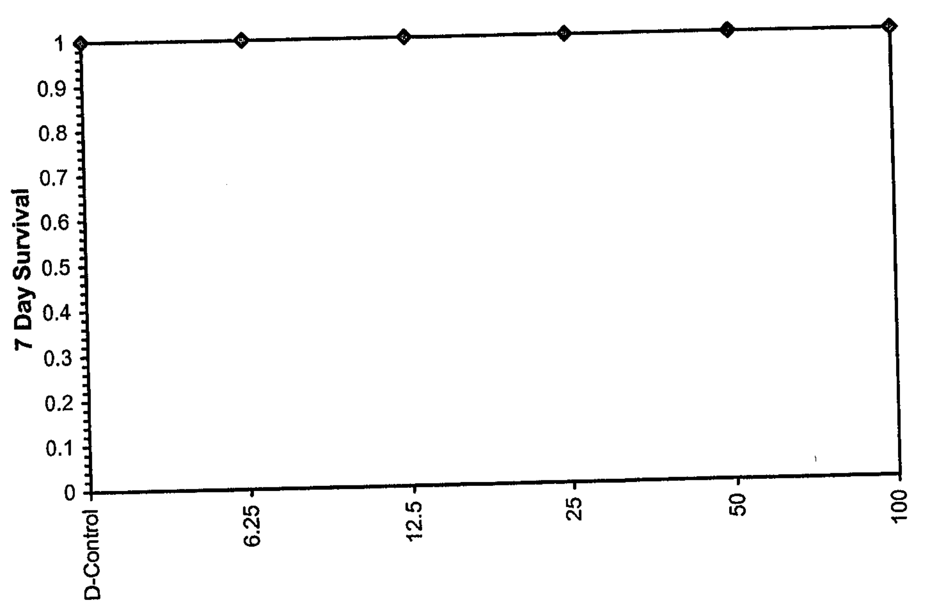
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5		
6.25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
12.5	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
50	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
100	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	1	0.9		
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

Larval Fish Growth and Survival Test-Growth-Weight

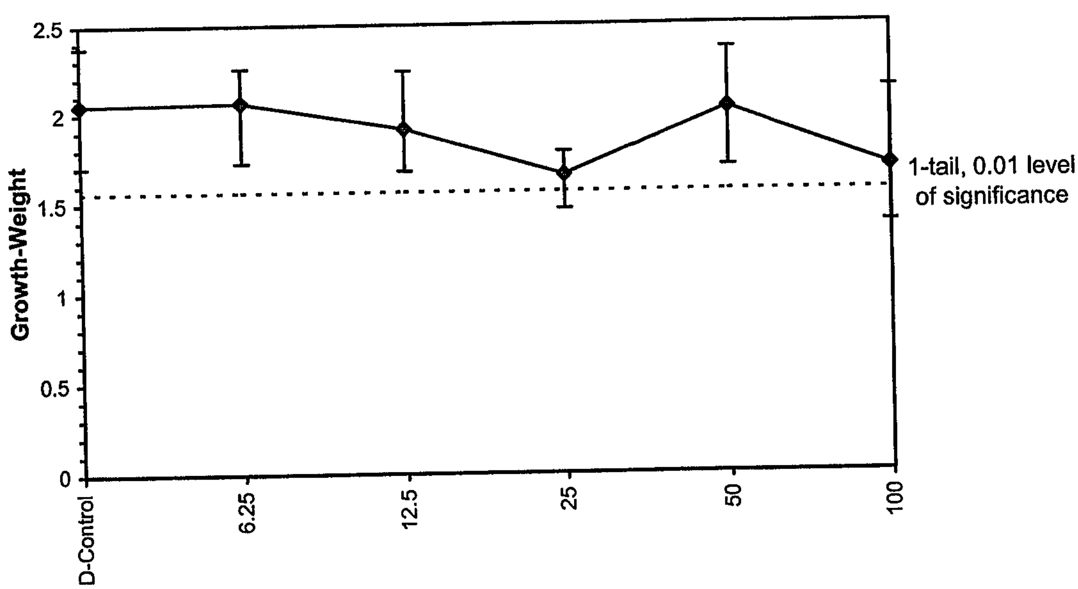
Start Date:	5/29/03	Test ID:	0305-28NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-7				

Conc-%	1	2	3	4	5
D-Control	2.0067	1.7000	2.3733	1.8550	2.2950
6.25	1.9850	2.2533	2.2017	2.1300	1.7233
12.5	1.9533	1.7900	1.6800	1.9017	2.2383
25	1.7583	1.5267	1.7067	1.4567	1.7767
50	2.1283	1.6933	2.3583	1.7483	2.1567
100	1.8000	1.7117	2.1317	1.3783	1.4233

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	2.0460	1.0000	2.0460	1.7000	2.3733	13.972	5			
6.25	2.0587	1.0062	2.0587	1.7233	2.2533	10.342	5	-0.081	3.110	0.4868
12.5	1.9127	0.9348	1.9127	1.6800	2.2383	10.999	5	0.852	3.110	0.4868
25	1.6450	0.8040	1.6450	1.4567	1.7767	8.781	5	2.562	3.110	0.4868
50	2.0170	0.9858	2.0170	1.6933	2.3583	14.140	5	0.185	3.110	0.4868
100	1.6890	0.8255	1.6890	1.3783	2.1317	18.150	5	2.281	3.110	0.4868

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95374		0.9		0.06598	-0.9427
Bartlett's Test indicates equal variances (p = 0.77)					2.56138		15.0863			
Hypothesis Test (1-tail, 0.01)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	100	>100		1	0.48678	0.23792	0.16972	0.06125	0.04103	5, 24

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03 1800

Sample ID: #2 MW-7

Test No.: 0305-28NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	17	1	6	6	6	6	6	6	6	6		
	9	2	6	6	6	6	6	6	6	6		
	12	3	6	6	6	6	6	6	6	6		
	16	4	6	6	6	6	6	6	6	6		
	26	5	6	6	6	6	6	6	6	6		100%
6.25	13	1	6	6	6	6	6	6	6	6		
	23	2	6	6	6	6	6	6	6	6		
	30	3	6	6	6	6	6	6	6	6		
	7	4	6	6	6	6	6	6	6	6		
	4	5	6	6	6	6	6	6	6	6		100%
12.5	22	1	6	6	6	6	6	6	6	6		
	1	2	6	6	6	6	6	6	6	6		
	18	3	6	6	6	6	6	6	6	6		
	10	4	6	6	6	6	6	6	6	6		
	27	5	6	6	6	6	6	6	6	6		100%
~~250~~ 25	6	1	6	6	6	6	6	6	6	6		
	19	2	6	6	6	6	6	6	6	6		
	29	3	6	6	6	6	6	6	6	6		
	21	4	6	6	6	6	6	6	6	6		
	25	5	6	6	6	6	6	6	6	6		100%
50	5	1	6	6	6	6	6	6	6	6		
	8	2	6	6	6	6	6	6	6	6		
	24	3	6	6	6	6	6	6	6	6		
	28	4	6	6	6	6	6	6	6	6		
	2	5	6	6	6	6	6	6	6	6		100%
100	20	1	6	6	6	6	6	6	6	6		
	3	2	6	6	6	6	6	6	6	6		
	11	3	6	6	6	6	6	6	6	6		
	14	4	6	6	6	6	6	6	6	6		
	15	5	6	6	6	6	6	6	6	6		100%
Tech Initials			MF	Et	mm	mm	mm	MF	mm	Et		

Feeding Times: 0 2100 1 0730/1815 2 0800/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Comments:

Analysts: MF mm

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #2 MW-7

Test Date: 5/29/03

Species: *A. affinis*

Test No: 0305-28NW

Foils dried again and reweighed

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	17	1	0.04311	.05515		6	.05510	
	9	2	0.04398	.05418		6	.05429	
	12	3	0.04398	.05822		6	.05810	
	16	4	0.04285	.05398		6	.05400	
	26	5	0.04223	.05600		6	.05606	
6.25	13	1	0.04283	.05474		6	.05485	
	23	2	0.04289	.05641		6	.05641	
	30	3	0.04387	.05708		6	.05713	
	7	4	0.04360	.05638		6	.05649	
	4	5	0.04370	.05404		6	.05413	
12.5	22	1	0.04185	.05357		6	.05365	
	1	2	0.04285	.05359		6	.05360	
	18	3	0.04341	.05349		6	.05341	
	10	4	0.04400	.05541		6	.05541	
	27	5	0.04309	.05652 B		6	.05657	
25	6	1	0.04393	~~.05448~~ 88	.05448	6	.05476	
	19	2	0.04306	~~.05222~~ 322	.05222	6	.05238	
	29	3	0.04412	~~.05486~~	.05436	6	.05434	
	21	4	0.04369	~~.05243~~ 343	.05243	6	.05245	
	25	5	0.04295	~~.05361~~ 461	.05361	6	.05360	
50	5	1	0.04381	.05658		6	.05654	
	8	2	0.04347	.05363		6	.05371	
	24	3	0.04384	.05749		6	.05755	
	28	4	0.04346	.05395		6	.05399	
	2	5	0.04381	.05675		6	.05680	
100	20	1	0.04341	.05421		6	.05440	
	3	2	0.04167	.05194		6	.05217	
	11	3	0.04388	.05667		6	.05674	
	14	4	0.04320	.05147		6	.05169	
	15	5	0.04328	.05182		6	.05200	

Tare: SM
Total: SM

Date/Time in: 6/5/03 1530
Date/Time out: 6/6/03 1600
Oven temp. (°C): 60

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-29NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-17				

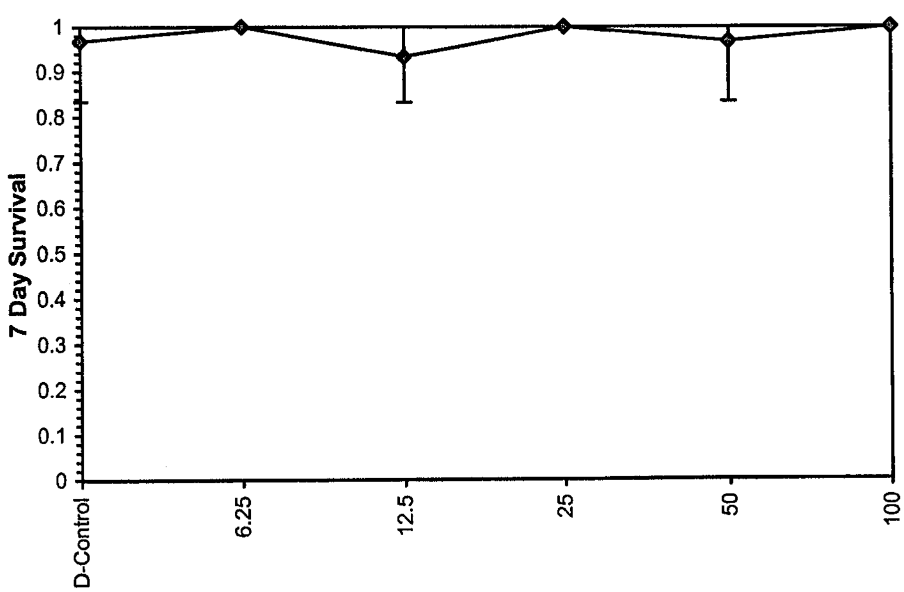
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	0.8333	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	0.8333	1.0000	0.8333	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	0.8333	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	0.9667	1.0000	1.3222	1.1503	1.3652	7.271	5		
6.25	1.0000	1.0345	1.3652	1.3652	1.3652	0.000	5	30.00	16.00
12.5	0.9333	0.9655	1.2792	1.1503	1.3652	9.204	5	25.00	16.00
25	1.0000	1.0345	1.3652	1.3652	1.3652	0.000	5	30.00	16.00
50	0.9667	1.0000	1.3222	1.1503	1.3652	7.271	5	27.50	16.00
100	1.0000	1.0345	1.3652	1.3652	1.3652	0.000	5	30.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.76012	0.9	-1.4778	1.97749
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: HB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID: 0305-29NW		Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID: WAAEE-AMEC NW Bioassay		Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol: EPAW 95-EPA West Coast		Test Species:	AA-Atherinops affinis
Comments:	MW-17				

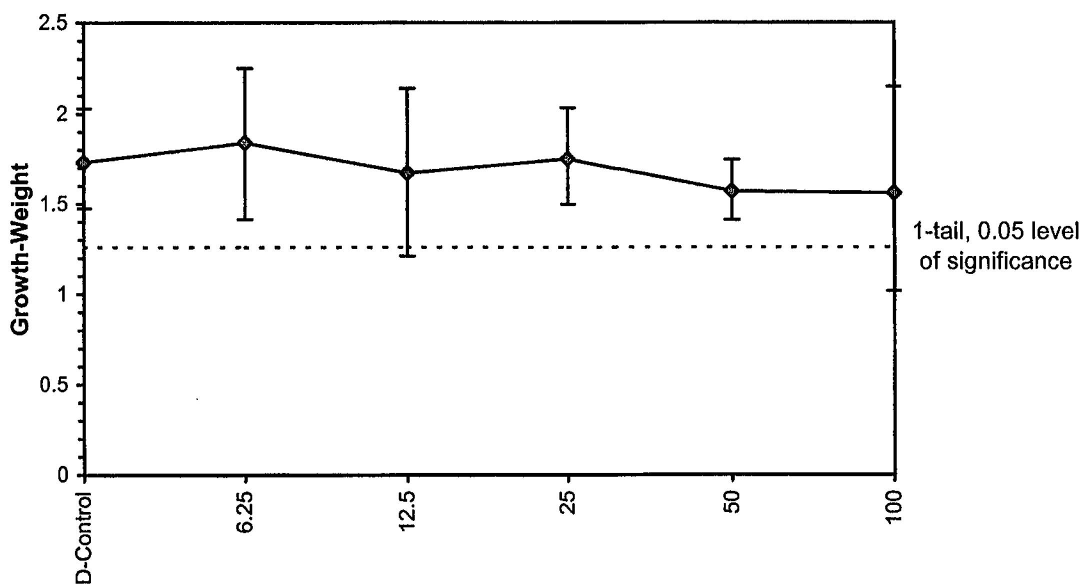
Conc-%	1	2	3	4	5
D-Control	1.6700	1.7450	1.7200	2.0267	1.4717
6.25	1.9817	1.7483	1.4133	1.8017	2.2500
12.5	1.2150	2.0783	1.3017	1.6250	2.1433
25	2.0350	1.6433	1.5000	1.6483	1.9333
50	1.5750	1.6317	1.4067	1.4717	1.7417
100	1.0133	2.1467	1.7183	1.6400	1.2633

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.7267	1.0000	1.7267	1.4717	2.0267	11.533	5			
6.25	1.8390	1.0651	1.8390	1.4133	2.2500	16.762	5	-0.573	2.360	0.4626
12.5	1.6727	0.9687	1.6727	1.2150	2.1433	25.635	5	0.275	2.360	0.4626
25	1.7520	1.0147	1.7520	1.5000	2.0350	12.732	5	-0.129	2.360	0.4626
50	1.5653	0.9066	1.5653	1.4067	1.7417	8.423	5	0.823	2.360	0.4626
100	1.5563	0.9014	1.5563	1.0133	2.1467	28.052	5	0.869	2.360	0.4626

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98327	0.9	0.10737	-0.3622
Bartlett's Test indicates equal variances (p = 0.22)	7.02755	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.46258	0.2679	0.06097	0.09605	0.6752	5, 24

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03 1445

Sample ID: #3 MW-17

Test No.: 0305-29NW

% Conc.	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival	Average Survival
CON	7	1	6	6	6	6	6	6	6	6		
	9	2	6	6	6	6	6	6	6	6		
	23	3	6	6	6	6	6	6	6	6		
	5	4	6	6	6	6	6	5	5	5		
	10	5	6	6	6	6	6	6	6	6		97%
6.25	25	1	6	6	6	6	6	6	6	6		
	18	2	6	6	6	6	6	6	6	6		
	22	3	6	6	6	6	6	6	6	6		
	3	4	6	6	6	6	6	6	6	6		
	1	5	6	6	6	6	6	6	6	6		100%
12.5	16	1	6	6	5	5	5	5	5	5		
	29	2	6	6	6	6	6	6	6	6		
	27	3	6	6	6	5	5	5	5	5		
	24	4	6	6	6	6	6	6	6	6		
	19	5	6	6	6	6	6	6	6	6		95%
25	30	1	6	6	6	6	6	6	6	6		
	15	2	6	6	6	6	6	6	6	6		
	17	3	6	6	6	6	6	6	6	6		
	20	4	6	6	6	6	6	6	6	6		
	11	5	6	6	6	6	6	6	6	6		100%
50	12	1	6	6	6	6	6	6	6	6		
	26	2	6	6	6	6	6	6	6	6		
	8	3	6	6	6	6	6	5	5	5		
	6	4	6	6	6	6	6	6	6	6		
	14	5	6	6	6	6	6	6	6	6		97%
100	21	1	6	6	6	6	6	6	6	6		
	4	2	6	6	6	6	6	6	6	6		
	28	3	6	6	6	6	6	6	6	6		
	13	4	6	6	6	6	6	6	6	6		
	2	5	6	6	6	6	6	6	6	6		100%
Tech Initials			NF	ET	MM	MM	MM	NF	SM	SM		

Feeding Times: 0 2000 1 0730 1815 2 0800 ~~1800~~ 1830 3 0830 1730 4 0730 1600 5 0730 1730 6 0730 1730

Comments:

Analysts: NF MM SM

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #3 MW-17

Species: *A. affinis*

Test No: 0305-29NW

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	7	1	~~0.043~~ sm 0.04279	.05281		6		
	9	2	0.04402	.05449		6		
	23	3	0.04308	.05340		6		
	5	4	0.04311	.05527		5		
	10	5	0.04349	.05232		6		
6.25	25	1	0.04320	.05509		6		
	18	2	0.04295	.05344		6		
	22	3	0.04296	.05144		6		
	3	4	0.04353	~~.05718~~ sm .05434		6		
	1	5	0.04361	.05711		6		
12.5	16	1	0.04289	.05018		5		
	29	2	0.04394	.05641		6		
	27	3	0.04295	.05076		5		
	24	4	0.04357	.05332		6		
	19	5	0.04201	.05487		6		
25	30	1	0.04412	.05633		6		
	15	2	0.04274	.05260		6		
	17	3	0.04307	.05207		6		
	20	4	0.04235	.05224		6		
	11	5	0.04273	.05433		6		
50	12	1	0.04356	.05301		6		
	26	2	0.04405	.05384		6		
	8	3	0.04368	.05212		5		
	6	4	0.04383	.05266		6		
	14	5	0.04347	.05392		6		
100	21	1	0.04296	.04904		6		
	4	2	0.04405	.05693		6		
	28	3	0.04315	.05346		6		
	13	4	0.04223	.05207		6		
	2	5	0.04362	.05120		6		

Tare: SM
Total: SM

Date/Time in: 6/5/03 ~~1430~~ 1315 KB
Date/Time out: 6/5/03 1600
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-30NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-103R				

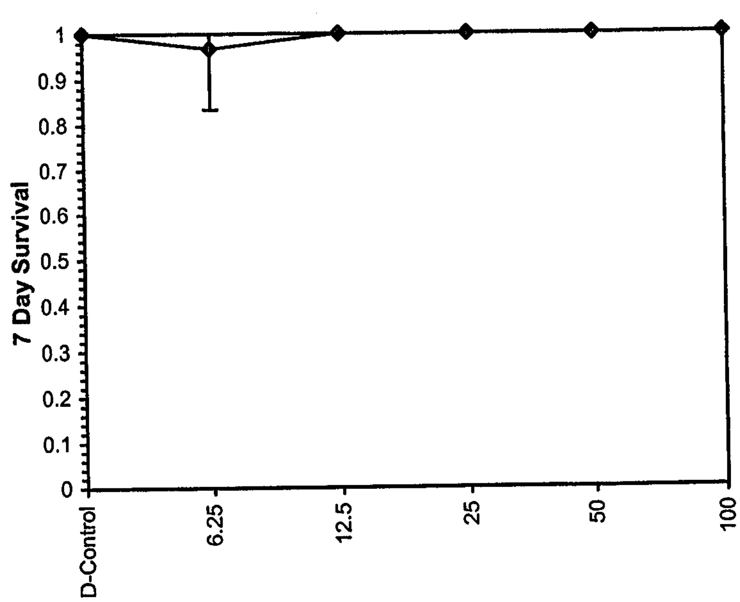
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	0.8333
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5		
6.25	0.9667	0.9667	1.3222	1.1503	1.3652	7.271	5	25.00	16.00
12.5	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
50	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
100	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.41613	0.9	-3.8705	19.8512
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: KD

Larval Fish Growth and Survival Test-Growth-Weight

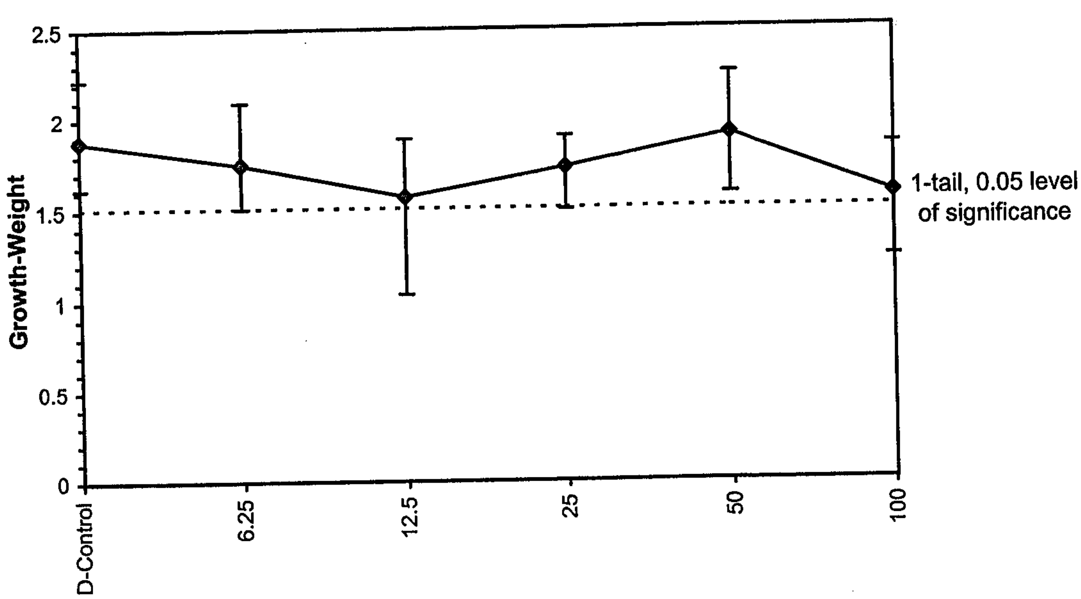
Start Date:	5/29/03	Test ID: 0305-30NW		Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID: WAAEE-AMEC NW Bioassay		Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol: EPAW 95-EPA West Coast		Test Species:	AA-Atherinops affinis
Comments:	MW-103R				

Conc-%	1	2	3	4	5
D-Control	1.7717	1.9783	1.6200	1.8100	2.2233
6.25	2.0967	1.5117	1.5417	1.9467	1.6650
12.5	1.7983	1.5833	1.5450	1.0400	1.8933
25	1.7517	1.5000	1.8350	1.6500	1.9017
50	1.9250	1.7850	2.0000	1.5833	2.2500
100	1.2367	1.5817	1.6167	1.8550	1.6200

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.8807	1.0000	1.8807	1.6200	2.2233	12.235	5			
6.25	1.7523	0.9318	1.7523	1.5117	2.0967	14.723	5	0.823	2.360	0.3681
12.5	1.5720	0.8359	1.5720	1.0400	1.8933	21.059	5	1.979	2.360	0.3681
25	1.7277	0.9186	1.7277	1.5000	1.9017	9.163	5	0.981	2.360	0.3681
50	1.9087	1.0149	1.9087	1.5833	2.2500	13.000	5	-0.180	2.360	0.3681
100	1.5820	0.8412	1.5820	1.2367	1.8550	14.008	5	1.915	2.360	0.3681

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96829		0.9		-0.2686	-0.296
Bartlett's Test indicates equal variances (p = 0.85)					1.99245		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.36805	0.1957	0.10168	0.06081	0.17966	5, 24

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #4 MW103R

Test No.: 0305-30NW

% Conc.	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival	Average Survival
CON	4	1	6	6	6	6	6	6	6	6		
	28	2	6	6	6	6	6	6	6	6		
	6	3	6	6	6	6	6	6	6	6		
	8	4	6	6	6	6	6	6	6	6		
	19	5	6	6	6	6	6	6	6	6		100%
6.25	2	1	6	6	6	6	6	6	6	6		
	14	2	6	6	6	6	6	6	6	6		
	22	3	6	6	6	6	6	6	6	6		
	3	4	6	6	6	6	6	6	6	6		
	5	5	6	5	~~6~~5	~~6~~5	5	5	5	5		97%
12.5	29	1	6	6	6	6	6	6	6	6		
	25	2	6	6	6	6	6	6	6	6		
	15	3	6	6	6	6	6	6	6	6		
	7	4	6	6	6	6	6	6	6	6		
	12	5	6	6	6	6	6	6	6	6		100%
25	13	1	6	6	6	6	6	6	6	6		
	23	2	6	6	6	6	6	6	6	6		
	24	3	6	6	6	6	6	6	6	6		
	21	4	6	6	6	6	6	6	6	6		
	9	5	6	6	6	6	6	6	6	6		100%
50	16	1	6	6	6	6	6	6	6	6		
	17	2	6	6	6	6	6	6	6	6		
	30	3	6	6	6	6	6	6	6	6		
	1	4	6	6	6	6	6	6	6	6		
	26	5	6	6	6	6	6	6	6	6		100%
100	20	1	6	6	6	6	6	6	6	6		
	11	2	6	6	6	6	6	6	6	6		
	10	3	6	6	6	6	6	6	6	6		
	27	4	6	6	6	6	6	6	6	6		
	18	5	6	6	6	6	6	6	6	6		100%
Tech Initials			NF	Et	im	im	im	NF	Sm	Et		

Feeding Times: 0 2000 1 0730/1815 2 0800/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Comments:

Analysts: im NF Et Sm

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #4 MW103R

Species: *A. affinis*

Test No: 0305-30NW

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	4	1	0.04383	0.05446		6		
	28	2	0.04045	0.05232		6		
	6	3	0.04352	0.05324		6		
	8	4	0.04300	0.05386		6		
	19	5	0.04282	0.05616		6		
6.25	2	1	0.04244	0.05502		6		
	14	2	0.04145	0.05052		6		
	22	3	0.04340	0.05265		6		
	3	4	0.04381	0.05549		6		
	5	5	0.04338	0.05337		5		
12.5	29	1	0.04275	0.05354		6		
	25	2	0.04240	0.05190		6		
	15	3	0.04231	0.05158		6		
	7	4	0.04399	0.05023		6		
	12	5	0.04252	0.05388		6		
25	13	1	0.04218	0.05269		6		
	23	2	0.04260	0.05160		6		
	24	3	0.04334	0.05435		6		
	21	4	0.04313	0.05303		6		
	9	5	0.04328	0.05469		6		
50	16	1	0.04247	0.05402		6		
	17	2	0.04326	0.05397		6		
	30	3	0.04336	0.05536		6		
	1	4	0.04515	0.05465		6		
	26	5	0.04338	0.05688		6		
100	20	1	0.04281	0.05023		6		
	11	2	0.04286	0.05235		6		
	10	3	0.04340	0.05310		6		
	27	4	0.04294	0.05407		6		
	18	5	0.04301	0.05273		6		

Tare: SM
Total: SM

Date/Time in: 6/5/03 1330
Date/Time out: 6/5/03 1600
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-31NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa)	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-129				

Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	0.6667	1.0000	1.0000	1.0000
50	0.0000	0.3333	0.3333	0.8333	0.8333
100	0.0000	0.0000	0.0000	0.0000	0.1667

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5			0	30
6.25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00	0	30
12.5	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00	0	30
25	0.9333	0.9333	1.2832	0.9553	1.3652	14.285	5	25.00	16.00	2	30
*50	0.4667	0.4667	0.7474	0.2056	1.1503	54.058	5	15.00	16.00	16	30
*100	0.0333	0.0333	0.2486	0.2056	0.4205	38.677	5	15.00	16.00	29	30

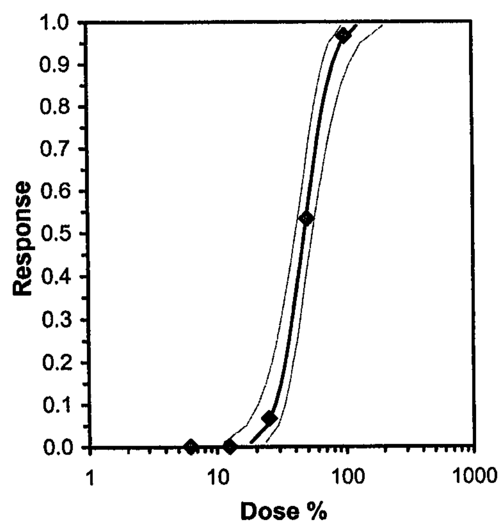
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.78649	0.9	-0.4718	4.64768
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	5.53995	0.89255	3.79055	7.28934	0	0.07302	7.81472	0.99	1.67814	0.18051	3
Intercept	-4.2968	1.50589	-7.2483	-1.3452							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	18.1223	11.2605	23.5723
EC05	3.355	24.0563	16.8383	29.576
EC10	3.718	27.9774	20.7885	33.5042
EC15	3.964	30.978	23.9037	36.5384
EC20	4.158	33.5906	26.6521	39.2286
EC25	4.326	36.007	29.2017	41.7778
EC40	4.747	42.8949	36.3349	49.5346
EC50	5.000	47.6581	41.0059	55.4599
EC60	5.253	52.9502	45.8671	62.6493
EC75	5.674	63.0793	54.3157	78.0496
EC80	5.842	67.6169	57.8255	85.5453
EC85	6.036	73.3196	62.0638	95.4106
EC90	6.282	81.1831	67.6654	109.739
EC95	6.645	94.4157	76.6313	135.521
EC99	7.326	125.331	96.1226	202.706



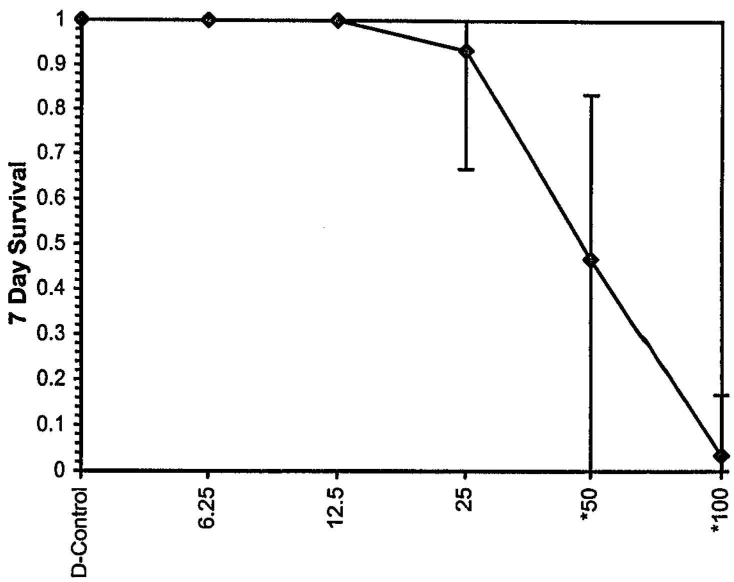
ToxCalc v5.0.23

Reviewed by: KB

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-31NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-129				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-31NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-129				

Conc-%	1	2	3	4	5
D-Control	1.9667	2.1217	1.7617	1.7400	1.8100
6.25	2.0400	1.9750	2.2000	1.7817	2.0300
12.5	1.4433	1.8033	1.3700	1.7433	1.3683
25	1.6800	1.0767	1.7700	1.9567	2.0933
50	0.0000	0.6883	0.1500	0.8183	0.8350
100	0.0000	0.0000	0.0000	0.0000	0.0783

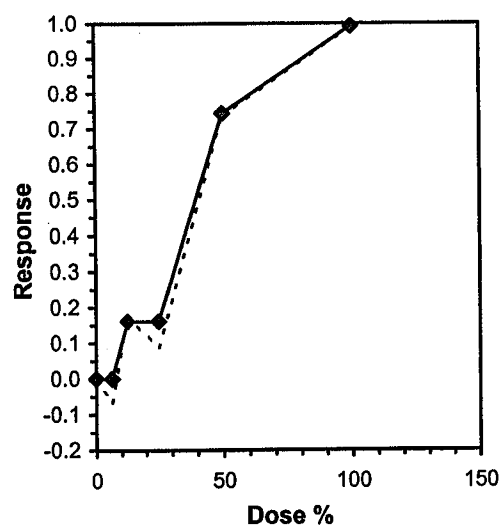
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	1.8800	1.0000	1.8800	1.7400	2.1217	8.594	5			1.9427	1.0000
6.25	2.0053	1.0667	2.0053	1.7817	2.2000	7.507	5	34.00	16.00	1.9427	1.0000
12.5	1.5457	0.8222	1.5457	1.3683	1.8033	13.657	5	18.00	16.00	1.6305	0.8393
25	1.7153	0.9124	1.7153	1.0767	2.0933	22.827	5	24.00	16.00	1.6305	0.8393
*50	0.4983	0.2651	0.4983	0.0000	0.8350	79.100	5	15.00	16.00	0.4983	0.2565
*100	0.0157	0.0083	0.0157	0.0000	0.0783	223.607	5	15.00	16.00	0.0157	0.0081

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95049	0.9	-0.736	0.8755
Bartlett's Test indicates unequal variances (p = 3.74E-03)	17.4403	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	8.195	1.519	6.671	12.903	6.7853
IC10	10.139	4.906	7.975	34.731	2.4250
IC15	12.084	7.474	9.015	36.774	0.2385
IC20	26.686	5.897	3.607	32.262	-1.4458
IC25	28.831	3.804	5.670	34.378	-2.5743
IC40	35.266	2.369	27.505	41.633	-0.4520
IC50	39.555	2.525	33.068	47.060	0.1495

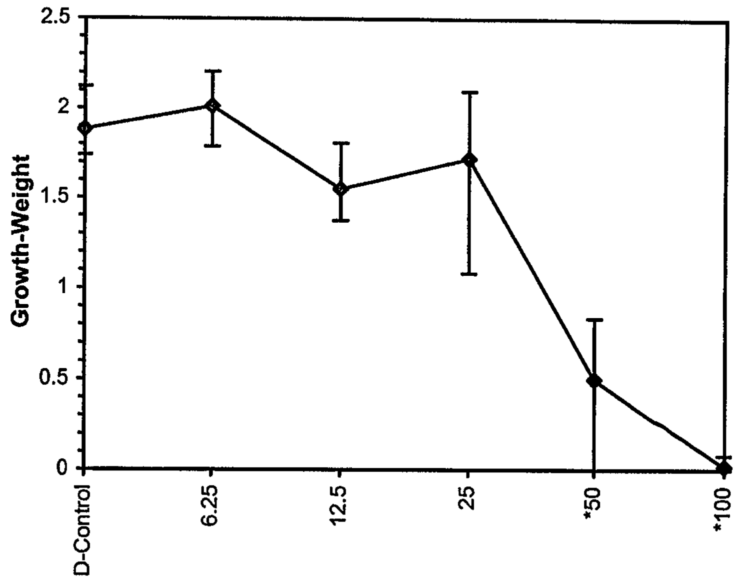


Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-31NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-129				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal
Test Date: 5/29/03 1820
Sample ID: #5 MW-129
Test No.: 0305-31NW

% Conc.	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival	Average Survival
CON	22	1	6	6	6	6	6	6	6	6		
	1	2	6	6	6	6	6	6	6	6		
	16	3	6	6	6	6	6	6	6	6		
	13	4	6	6	6	6	6	6	6	6		
	19	5	6	6	6	6	6	6	6	6		100%
6.25	23	1	6	6	6	6	6	6	6	6		
	6	2	6	6	6	6	6	6	6	6		
	30	3	6	6	6	6	6	6	6	6		
	20	4	6	6	6	6	6	6	6	6		
	25	5	6	6	6	6	6	6	6	6		100%
12.5	26	1	6	6	6	6	6	6	6	6		
	10	2	6	6	6	6	6	6	6	6		
	17	3	6	6	6	6	6	6	6	6		
	28	4	6	6	6	6	6	6	6	6		
	12	5	6	6	6	6	6	6	6	6		100%
25	14	1	6	6	6	6	6	6	6	6		
	5	2	6	6	6	6	4	4	4	4		
	7	3	6	6	6	6	6	6	6	6		
	27	4	6	6	6	6	6	6	6	6		
	21	5	6	6	6	6	6	6	6	6		93%
50	15	1	6	6	2	1	0					
	18	2	6	6	5	3	2 w	2	2	2		
	8	3	6	6	3	3	2	2	2	2		
	2	4	6	6	6	5	5	5	5	5		
	24	5	6	6	5	4 5	5 md	5	5	5		47%
100	3	1	6	5	4	4	1	0				
	9	2	6	5	5	3	2	0				
	4	3	6	4	2	1	1	0				
	11	4	6	1	0							
	29	5	6	6	5	4	1	1	1	1		3%
Tech Initials			NF	mc	ef	mc	mc	NF	KB	SM		

Feeding Times: 0 ____ 2100 1 0730 1815 2 0800 1830 3 0830 1730 4 0730 1600 5 0730 1730 6 0730 1730

Comments: ______________________

Analysts: NF SM

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Species: *A. affinis*

Test No: 0305-31NW

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	22	1	0.04284	.05464		6		
	1	2	0.04253	.05526		6		
	16	3	0.04407	.05464		6		
	13	4	0.04382	.05426		6		
	19	5	0.04414	.05500		6		
6.25	23	1	0.04400	.05624		6		
	6	2	0.04339	.05524		6		
	30	3	0.04240	.05560		6		
	20	4	0.04466	.05535		6		
	25	5	0.04405	.05623		6		
12.5	26	1	0.04325	.05191		6		
	10	2	0.04322	.05404		6		
	17	3	0.04243	.05065		6		
	28	4	0.04333	.05379		6		
	12	5	0.04406	.05227		6		
25	14	1	0.04607	.05615		6		
	5	2	0.04372	.05018		4		
	7	3	0.04060	.05122		6		
	27	4	0.04350	.05524		6		
	21	5	0.04414	.05670		6		
50	15	1	0.04324	~~.0~~ sm				
	18	2	0.04228	.04641		2		
	8	3	0.04321	.04411		2		
	2	4	0.04322	.04813		5		
	24	5	0.04430	.04931		5		
100	3	1	0.04345	sm ~~.0~~				
	9	2	0.04353	sm ~~.0~~				
	4	3	0.04322	sm ~~.0~~				
	11	4	0.04309	sm ~~.0~~				
	29	5	0.04405	.04452		1		

Tare: SM
Total: NF

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/03 1800
Oven temp. (°C): ~~100~~ 60

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-32NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-W				

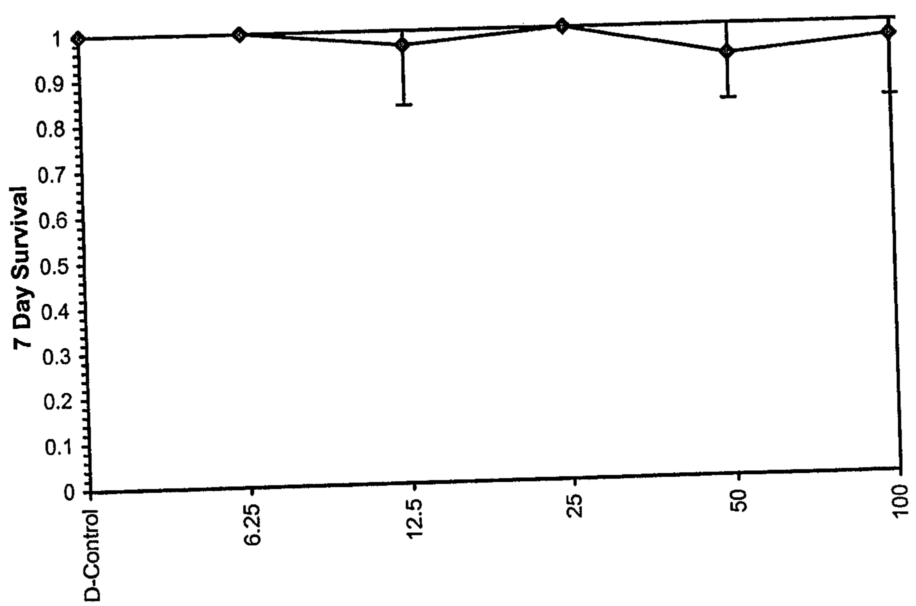
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	0.8333	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	0.8333	0.8333
100	0.8333	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5		
6.25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
12.5	0.9667	0.9667	1.3222	1.1503	1.3652	7.271	5	25.00	16.00
25	1.0000	1.0000	1.3652	1.3652	1.3652	0.000	5	27.50	16.00
50	0.9333	0.9333	1.2792	1.1503	1.3652	9.204	5	22.50	16.00
100	0.9667	0.9667	1.3222	1.1503	1.3652	7.271	5	25.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.76012	0.9	-1.4778	1.97749
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



Reviewed by: [signature]

ToxCalc v5.0.23

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-32NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-W				

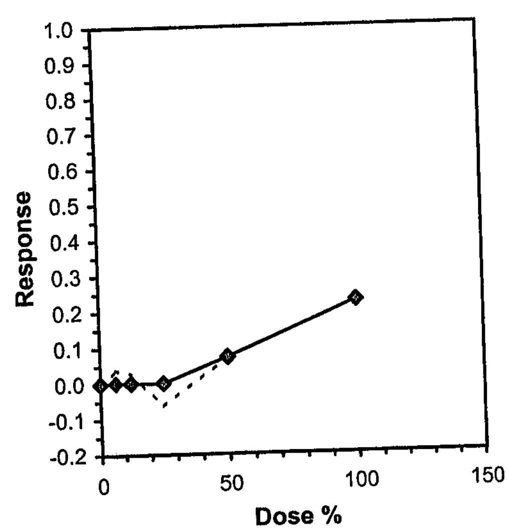
Conc-%	1	2	3	4	5
D-Control	1.6183	2.1100	1.6200	1.9750	1.7833
6.25	1.8617	1.4300	1.5867	2.0050	1.8683
12.5	1.9150	1.6400	1.9800	1.2800	2.0350
25	1.9883	2.1167	1.6533	1.7083	2.2000
50	2.2900	1.5617	1.7250	1.4633	1.4167
100	1.5833	1.4833	1.3983	1.2567	1.3350

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.8213	1.0000	1.8213	1.6183	2.1100	11.970	5				1.8213	1.0000
6.25	1.7503	0.9610	1.7503	1.4300	2.0050	13.416	5	0.434	2.360	0.3864	1.8179	0.9981
12.5	1.7700	0.9718	1.7700	1.2800	2.0350	17.694	5	0.314	2.360	0.3864	1.8179	0.9981
25	1.9333	1.0615	1.9333	1.6533	2.2000	12.584	5	-0.684	2.360	0.3864	1.8179	0.9981
50	1.6913	0.9286	1.6913	1.4167	2.2900	20.983	5	0.794	2.360	0.3864	1.6913	0.9286
*100	1.4113	0.7749	1.4113	1.2567	1.5833	9.010	5	2.504	2.360	0.3864	1.4113	0.7749

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97569		0.9		0.21944	0.04785
Bartlett's Test indicates equal variances (p = 0.56)					3.90852		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.38638	0.21214	0.15474	0.06701	0.07572	5, 24

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	42.309	18.102	0.000	71.225	-0.2683
IC10	59.310	15.901	0.000	82.446	-0.5181
IC15	75.571				
IC20	91.833				
IC25	>100				
IC40	>100				
IC50	>100				



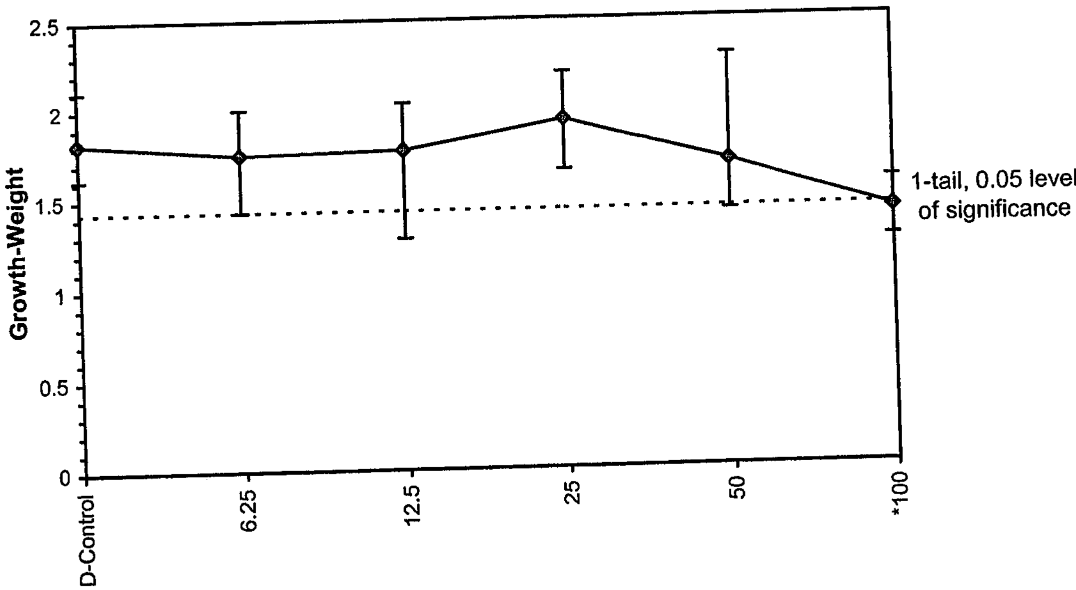
ToxCalc v5.0.23

Reviewed by: KB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-32NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	MW-W				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Pacific Topsmelt
(Atherinops affinis)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03 1925

Sample ID: #6 Mw-W

Test No.: 0305-32NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	14	1	6	6	6	6	6	6	6	6		
	3	2	6	6	6	6	6	6	6	6		
	27	3	6	6	6	6	6	6	6	6		
	19	4	6	6	6	6	6	6	6	6		100%
	22	5	6	6	6	6	6	6	6	6		
6.25	26	1	6	6	6	6	6	6	6	6		
	13	2	6	6	6	6	6	6	6	6		
	5	3	6	6	6	6	6	6	6	6		
	9	4	6	6	6	6	6	6	6	6		100%
	12	5	6	6	6	6	6	6	6	6		
12.5	18	1	6	6	6	6	6	6	6	6		
	29	2	6	6	6	6	6	MF ~~6~~ 5	5	5		
	16	3	6	6	6	6	6	6	6	6		
	25	4	6	6	6	6	6	6	6	6		97%
	15	5	6	6	6	6	6	6	6	6		
25	8	1	6	6	6	6	6	6	6	6		
	20	2	6	6	6	6	6	6	6	6		
	7	3	6	6	6	6	6	6	6	6		
	30	4	6	6	6	6	6	6	6	6		100%
	11	5	6	6	6	6	6	6	6	6		
50	1	1	6	6	6	6	6	6	6	6		
	10	2	6	6	6	6	6	6	6	6		
	24	3	6	6	6	6	6	6	6	6		
	21	4	6	6	6	6	6	~~6~~ 5	5	5		
	28	5	6	5	5	5	5	5	5	5		95%
100	2	1	6	6	6	6	6	5	5	5		
	4	2	6	6	6	6	6	6	6	6		
	23	3	6	6	6	6	6	6	6	6		
	17	4	6	6	6	6	6	6	6	6		97%
	6	5	6	6	6	6	6	6	6	6		
Tech Initials			NF	Et	Et	m	m	NF	NF	Et		

Feeding Times: 0 2000 1 0730 / 1815 2 0800 / 1830 3 0830 / 1730 4 0730 / 1600 5 0730 / 1730 6 0730 / 1730

Analysts: NF m Et

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #6 Mw-w

Test Date: 5/29/03

Species: *A. affinis*

Test No: 0305-32NW

% Conc.	cont. #	rep.	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	14	1	0.04328	0.05299		6		
	3	2	0.04434	0.05700		6		
	27	3	0.04218	0.05190		6		
	19	4	0.04330	0.05515		6		
	22	5	0.04350	0.05420		6		
6.25	26	1	0.04183	0.05300		6		
	13	2	0.04462	0.05320		6		
	5	3	0.04486	0.05438		6		
	9	4	0.04357	0.05560		6		
	12	5	0.04329	0.05450		6		
12.5	18	1	0.04326	0.05475		6		
	29	2	0.04336	0.05320		5		
	16	3	0.04390	0.05578		6		
	25	4	0.04354	0.05122		6		
	15	5	0.04288	0.05509		6		
25	8	1	0.04337	0.05530		6		
	20	2	0.04352	0.05622		6		
	7	3	0.04431	0.05423		6		
	30	4	0.04380	0.05405		6		
	11	5	0.04403	0.05723		6		
50	1	1	0.04471	0.05845		6		
	10	2	0.04365	0.05302		6		
	24	3	0.04440	0.05475		6		
	21	4	0.04325	0.05203		5		
	28	5	0.04169	0.05019		5		
100	2	1	0.04430	0.05380		5		
	4	2	0.04420	0.05310		6		
	23	3	0.04290	0.05129		6		
	17	4	0.04350	0.05104		6		
	6	5	0.04428	0.05229		6		

Tare: SM
Total: mm

Date/Time in: 6/5/03 1730
Date/Time out: 6/14/03 17:15
Oven temp. (°C): 60

Mysidopsis bahia

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-33NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-146				

Conc-%	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
25	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	0.6000	0.6000	0.4000	0.8000	1.0000	0.6000	0.6000	0.8000
100	0.2000	0.0000	0.0000	0.0000	0.2000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	8			0	40
6.25	0.9500	0.9500	1.2857	1.1071	1.3453	8.574	8	60.00	46.00	2	40
12.5	0.9750	0.9750	1.3155	1.1071	1.3453	6.400	8	64.00	46.00	1	40
25	0.9750	0.9750	1.3155	1.1071	1.3453	6.400	8	64.00	46.00	1	40
*50	0.6750	0.6750	0.9736	0.6847	1.3453	20.831	8	40.00	46.00	13	40
*100	0.0500	0.0500	0.2850	0.2255	0.4636	38.672	8	36.00	46.00	38	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.91982	0.929	0.19979	2.80419
Equality of variance cannot be confirmed				

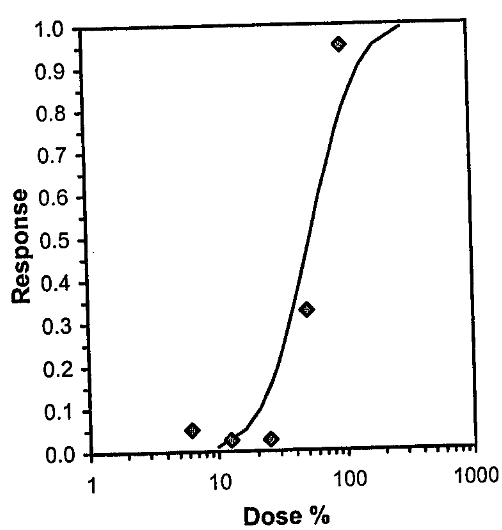
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.14912	2.09225	-3.5094	9.8076	0	73.423	7.81472	7.9E-16	1.73447	0.31755	5
Intercept	-0.462	3.51896	-11.661	10.7369							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	9.90234	
EC05	3.355	16.2984	
EC10	3.718	21.2575	
EC15	3.964	25.4302	
EC20	4.158	29.3232	
EC25	4.326	33.1348	
EC40	4.747	45.0836	
EC50	5.000	54.2586	
EC60	5.253	65.3008	
EC75	5.674	88.8489	
EC80	5.842	100.398	
EC85	6.036	115.768	
EC90	6.282	138.492	
EC95	6.645	180.63	
EC99	7.326	297.303	

Significant heterogeneity detected (p = 7.89E-16)



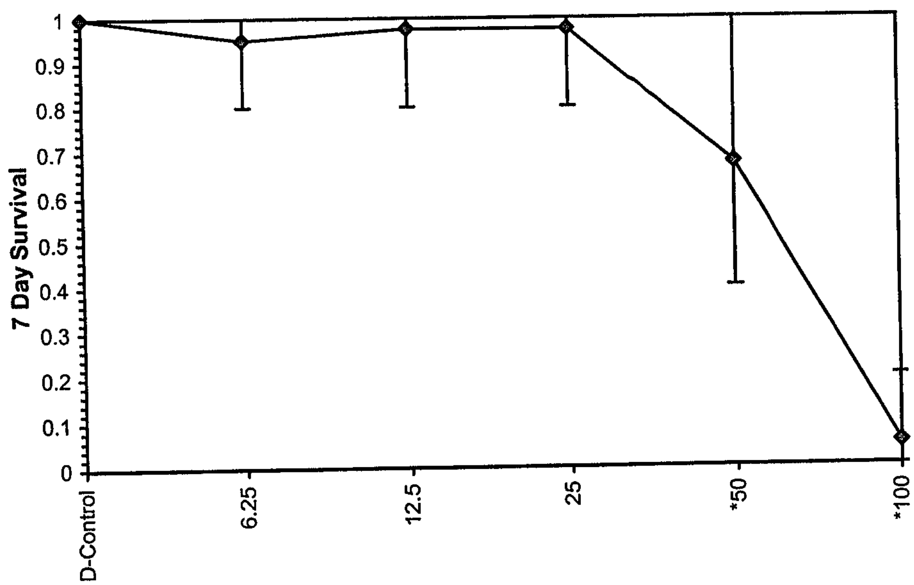
Reviewed by: KB

ToxCalc v5.0.23

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-33NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-146				

Dose-Response Plot



ToxCalc v5.0.23
Reviewed by: BS

Mysid Survival, Growth and Fecundity Test-Growth-Weight					
Start Date:	5/29/03	Test ID:	0305-33NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-146				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.3620	0.3220	0.4020	0.3680	0.3840	0.3820	0.4220	0.4060
6.25	0.3260	0.3640	0.4400	0.3780	0.4840	0.3820	0.3120	0.3580
12.5	0.3560	0.3180	0.3600	0.3880	0.3440	0.3620	0.3640	0.3700
25	0.2040	0.3760	0.3500	0.3780	0.3140	0.3480	0.2920	0.3280
50	0.1080	0.1560	0.0580	0.1320	0.1660	0.1100	0.1480	0.1560
100	0.0300	0.0000	0.0000	0.0000	0.0180	0.0000	0.0000	0.0000

			Transform: Untransformed					Rank	1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.3810	1.0000	0.3810	0.3220	0.4220	8.161	8			0.3810	0.0000
6.25	0.3805	0.9987	0.3805	0.3120	0.4840	14.967	8	62.50	46.00	0.3805	0.0013
12.5	0.3578	0.9390	0.3578	0.3180	0.3880	5.689	8	50.50	46.00	0.3578	0.0610
*25	0.3238	0.8497	0.3238	0.2040	0.3780	17.477	8	45.00	46.00	0.3238	0.1503
*50	0.1293	0.3392	0.1293	0.0580	0.1660	27.803	8	36.00	46.00	0.1293	0.6608
*100	0.0060	0.0157	0.0060	0.0000	0.0300	192.725	8	36.00	46.00	0.0060	0.9843

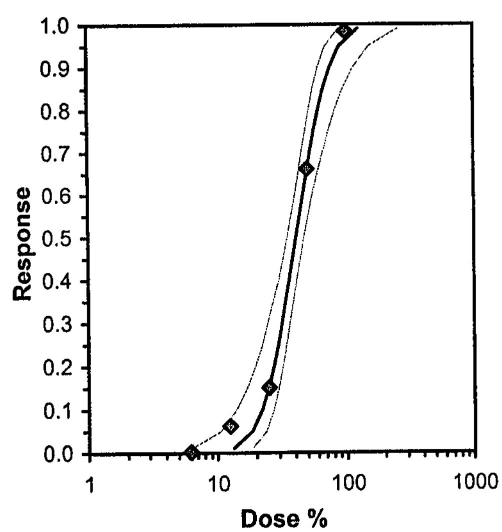
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96133	0.929	-0.4433	2.28198
Bartlett's Test indicates unequal variances (p = 1.60E-03)	19.424	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	12.5	25	17.6777	8

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.78396	0.95682	2.90858	6.65933	0	0.78472	7.81472	0.85	1.61056	0.20903	6
Intercept	-2.7048	1.55495	-5.7525	0.34288							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	13.3129	6.26622	18.7157
EC05	3.355	18.4811	10.6644	23.8735
EC10	3.718	22.0125	14.1188	27.2594
EC15	3.964	24.769	17.0242	29.8765
EC20	4.158	27.2038	19.7132	32.2012
EC25	4.326	29.4826	22.3067	34.4154
EC40	4.747	36.1075	29.9562	41.3748
EC50	5.000	40.7902	35.0598	47.1585
EC60	5.253	46.0801	40.1906	54.8773
EC75	5.674	56.4346	48.5959	73.2742
EC80	5.842	61.1619	51.9981	82.8175
EC85	6.036	67.1743	56.0954	95.8108
EC90	6.282	75.5859	61.5266	115.441
EC95	6.645	90.029	70.2973	152.738
EC99	7.326	124.979	89.72	259.8

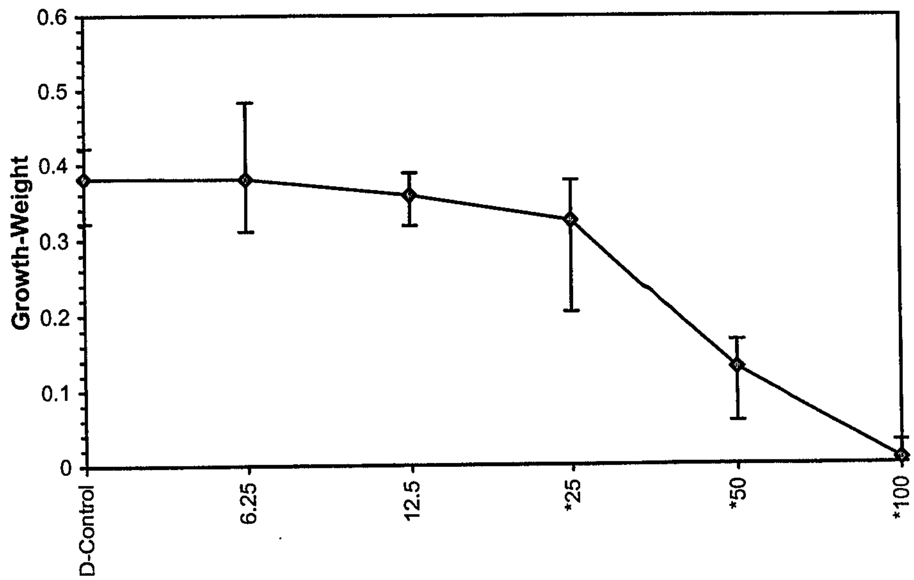


 ToxCalc v5.0.23 Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-33NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-146				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #1 MW-146

Test Number: 0305-33NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
CON	15	1	5	5	5	5	5	5	5	5	
	33	2	5	5	5	5	5	5	5	5	
	25	3	5	5	5	5	5	5	5	5	
	23	4	5	5	5	5	5	5	5	5	
	4	5	5	5	5	5	5	5	5	5	
	6	6	5	5	5	5	5	5	5	5	
	14	7	5	5	5	5	5	5	5	5	
	19	8	5	5	5	5	5	5	5	5	100%
10.25	16	1	5	4	4	4	4	4	4	4	
	26	2	5	5	5	5	5	5	5	5	
	44	3	5	5	5	5	5	5	5	5	
	11	4	5	5	5	5	5	5	5	5	
	10	5	5	5	5	5	5	5	5	5	
	22	6	5	5	5	5	5	5	5	5	
	48	7	5	5	5	4	4	4	4	4	
	38	8	5	5	5	5	5	5	5	5	95%
12.5	13	1	5	5	5	5	5	5	5	5	
	43	2	5	5	5	5	5	5	5	5	
	46	3	5	5	5	5	5	5	5	5	
	40	4	5	5	5	5	5	5	5	5	
	47	5	5	5	4	4	4	4	4	4	
	9	6	5	5	5	4	~~4~~ NF 5	5	5	5	
	36	7	5	5	5	5	5	5	5	5	
	1	8	5	5	5	5	5	5	5	5	97.5%
Technician Initials			SM	KB	SM	MM	EJ	NF	KB		

Feeding Times: 0 2000 1 0730/1830 2 0830/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: KB NF SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #1 MW-146

Test Number: 0305-33NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
25	31	1	5	5	5	5	4	4	4	4	
	42	2	5	5	5	5	5	5	5	5	
	17	3	5	5	5	5	5	5	5	5	
	3	4	5	5	5	5	5	5	5	5	
	5	5	5	5	5	5	5	5	5	5	
	45	6	5	5	5	5	5	5	5	5	
	41	7	5	5	5	5	5	5	5	5	
	35	8	5	5	5	5	5	5	5	5	97.5%
50	28	1	5	5	5	5	5	3	3	3	
	27	2	5	5	4	4	3	3	3	3	
	29	3	5	5	5	4	3	3	3	2	
	39	4	5	5	5	5	5	5	4	4	
	30	5	5	5	5	5	5	5	5	5	
	2	6	5	5	5	4	4	4	3	3	
	37	7	5	4	~~5~~ 4	4	4	3	3	3	
	32	8	5	5	5	5	5	5	5	4	67.5%
100	12	1	5	5	3	3	1	1	1	1	
	34	2	5	5	3	1	0				
	21	3	5	4	2	0					
	20	4	5	5	4	2	0				
	24	5	5	5	3	2	2	KB ~~2~~	1	1	
	7	6	5	5	3	1	0				
	8	7	5	5	3	1	0				
	18	8	5	5	3	2	0				
Technician Initials			SM	KB	SM	[illegible]	Et	NF	KB	KB	

Feeding Times: 0 2000 1 0730/1830 2 0830/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: KB SM

Comments:

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #1 Mw-146

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-33NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	15	1	.04310	0.04491		5		
	33	2	.04160	0.04321		5		
	25	3	.04264	0.04465		5		
	23	4	.04105	0.04289		5		
	4	5	.04348	0.04540		5		
	6	6	.04397	0.04588		5		
	14	7	.04355	0.04566		5		
	19	8	.04274	0.04477		5		
6.25	16	1	.04281	0.04444		4		
	26	2	.04282	0.04464		5		
	44	3	.04246	0.04466		5		
	11	4	.04438	0.04627		5		
	10	5	.04578	0.04820		5		
	22	6	.04187	0.04378		5		
	48	7	.04408	0.04564		4		
	38	8	.04140	0.04319		5		
12.5	13	1	.04387	0.04565		5		
	43	2	.04268	0.04427		5		
	46	3	.04298	0.04478		5		
	40	4	.04249	0.04443		5		
	47	5	.04328	0.04500		4		
	9	6	.04434	0.04615		5		
	36	7	.04185	0.04367		5		
	1	8	.04404	0.04589		5		

Tare Initials: Sm
Total Initials: mm

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/03 18:15
Oven temp. (°C): 60

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #1 MW-146

Test Date: 5/29/03

Species: M. bahia

Test Number: 05/29/03

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	31	1	.04224	0.04326		4		
	42	2	.04248	0.04436		5		
	17	3	.04320	0.04495		5		
	3	4	.04189	0.04378		5		
	5	5	.04364	0.04521		5		
	45	6	.04281	0.04455		5		
	41	7	.04253	0.04399		5		
	35	8	.04215	0.04379		5		
50	28	1	.04303	0.04357		3		
	27	2	.04291	0.04369		3		
	29	3	.04213	0.04242		2		
	39	4	.04230	0.04296		4		
	30	5	.04127	0.04210		5		
	2	6	.04272	0.04327		3		
	37	7	.04130	0.04204		3		
	32	8	.04222	0.04300		4		
100	12	1	.04494	0.04509		1		
	34	2	.04208	0.04196		0		
	21	3	.04226	0.04224		0		
	20	4	.04168	0.04166		0		
	24	5	.04067	0.04076		1		
	7	6	.04429	0.04432		0		
	8	7	.04345	0.04354		0		
	18	8	.04267	0.04265		0		

Tare Initials: SM
Total Initials: MN

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/03 1815
Oven temp. (°C): 60

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-34NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-7				

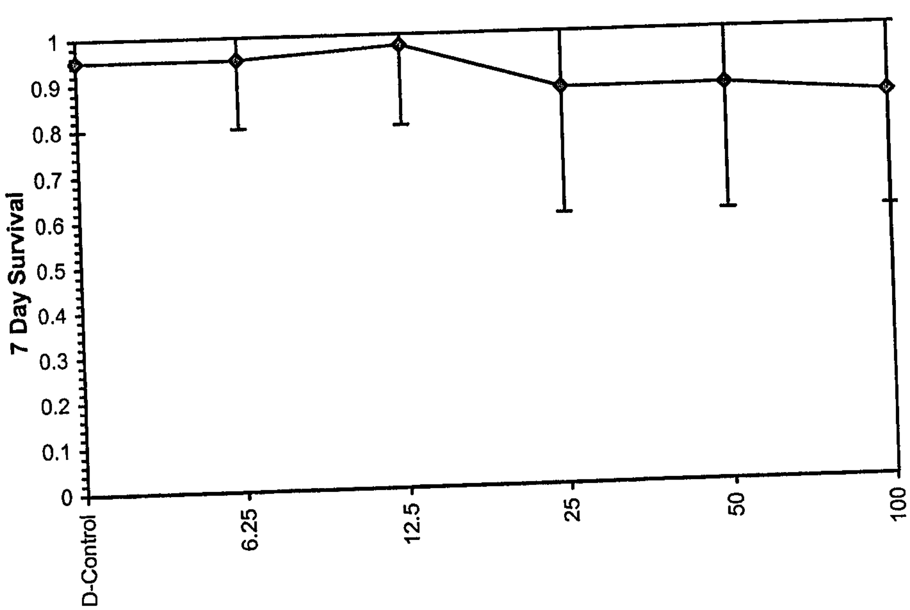
Conc-%	1	2	3	4	5	6	7	8
D-Control	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
6.25	1.0000	1.0000	1.0000	0.8000	0.8000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000
25	0.6000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.6000
50	0.8000	0.6000	0.8000	1.0000	1.0000	1.0000	1.0000	0.8000
100	0.8000	1.0000	0.6000	0.8000	1.0000	1.0000	0.8000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	8.574	8		
6.25	0.9500	1.0000	1.2857	1.1071	1.3453	8.574	8	68.00	46.00
12.5	0.9750	1.0263	1.3155	1.1071	1.3453	6.400	8	72.00	46.00
25	0.8750	0.9211	1.2007	0.8861	1.3453	17.562	8	62.00	46.00
50	0.8750	0.9211	1.1986	0.8861	1.3453	14.410	8	59.00	46.00
100	0.8500	0.8947	1.1688	0.8861	1.3453	14.043	8	55.00	46.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87912	0.929	-0.8346	-0.1698
Bartlett's Test indicates equal variances (p = 0.18)	7.54301	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-34NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-7				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.2760	0.3720	0.3060	0.3160	0.3600	0.4040	0.3980	0.2540
6.25	0.2280	0.4060	0.3380	0.1980	0.3200	0.2000	0.3060	0.3840
12.5	0.3140	0.3080	0.2920	0.2320	0.2980	0.3340	0.3000	0.3360
25	0.0980	0.2960	0.2900	0.3400	0.2720	0.3440	0.3220	0.1720
50	0.2240	0.1580	0.2780	0.2760	0.2780	0.3320	0.2160	0.2120
100	0.1440	0.1320	0.0460	0.1040	0.1200	0.1140	0.0780	0.0940

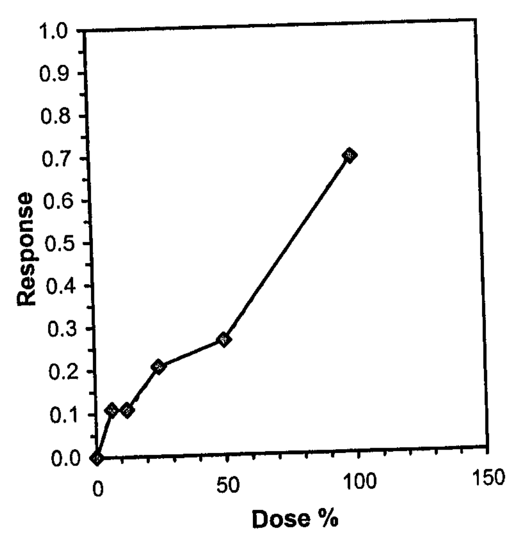
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.3358	1.0000	0.3358	0.2540	0.4040	16.683	8				0.3358	1.0000
6.25	0.2975	0.8861	0.2975	0.1980	0.4060	27.162	8	1.256	2.306	0.0702	0.2996	0.8924
12.5	0.3018	0.8987	0.3018	0.2320	0.3360	10.760	8	1.116	2.306	0.0702	0.2996	0.8924
25	0.2668	0.7945	0.2668	0.0980	0.3440	32.701	8	2.266	2.306	0.0702	0.2668	0.7945
*50	0.2468	0.7349	0.2468	0.1580	0.3320	21.998	8	2.922	2.306	0.0702	0.2468	0.7349
*100	0.1040	0.3098	0.1040	0.0460	0.1440	30.145	8	7.610	2.306	0.0702	0.1040	0.3098

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96332		0.929		-0.6369	0.39234
Bartlett's Test indicates equal variances (p = 0.05)					11.28		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	25	50	35.3553	4	0.07022	0.20914	0.0535	0.00371	3.2E-08	5, 42

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	2.904	7.581	1.478	28.556	2.3786
IC10*	5.809	9.638	2.957	38.159	1.4188
IC15	17.913	11.904	4.435	50.038	0.6350
IC20	24.297	13.264	5.913	55.475	0.2383
IC25	43.672	13.094	17.445	60.625	-0.4166
IC40	65.867	6.036	51.882	74.363	-0.6906
IC50	77.627	4.763	67.246	85.088	-0.3877

* indicates IC estimate less than the lowest concentration



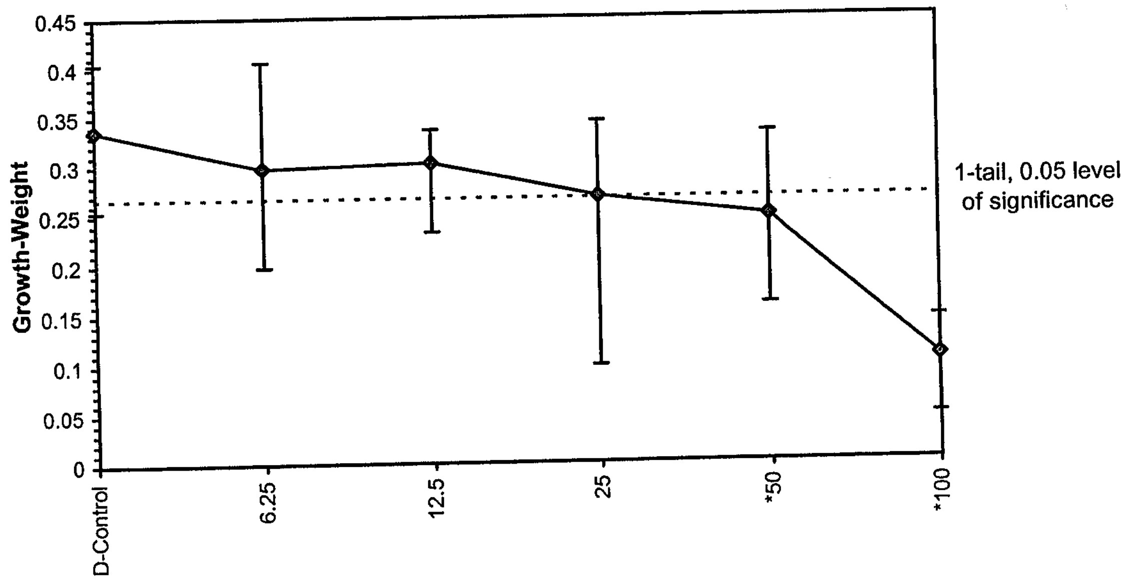
Reviewed by: YD

ToxCalc v5.0.23

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-34NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-7				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: _____

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Sample ID: #2 MW-7

Test Date: 5/29/03

Test Number: 0305-34NW

Conc'n or %	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival
CON	19	1	5	5	5	5	5	4	4	4	
	39	2	5	5	5	5	5	5	5	5	
	21	3	5	5	5	5	5	5	5	5	
	17	4	5	5	5	5	5	5	5	5	
	26	5	5	5	5	5	5	5	5	5	
	28	6	5	5	5	5	5	5	5	5	
	33	7	5	5	5	5	5	5	5	5	95%
	48	8	5	5	4	~~5~~ 4	4	4	4	4	
6.25	8	1	5	5	5	5	5	5	5	5	
	47	2	5	5	5	5	5	5	5	5	
	25	3	5	5	5	5	5	5	5	5	
	24	4	5	4	4	4	4	4	4	4	
	36	5	5	5	5	5	5	5	4	4	
	32	6	5	5	5	5	5	5	5	5	
	43	7	5	5	5	5	5	5	5	5	95%
	7	8	5	5	5	5	5	5	5	5	
12.5	29	1	5	5	5	5	5	5	5	5	
	23	2	5	5	5	5	5	5	5	5	
	31	3	5	5	5	5	5	5	4	4	
	46	4	5	5	5	5	5	5	5	5	
	27	5	5	5	5	5	5	5	5	5	
	1	6	5	5	5	5	5	5	5	5	
	42	7	5	5	5	5	5	5	5	5	97.5%
	45	8	5	5	5	5	5	5	5	5	
Technician Initials			Et	ML	KB	Et	SM	ML	SM	Et	

Feeding Times: 0 ___ 2100 1 0730 1815 2 0800 1830 3 0830 1730 4 0730 1600 5 0730 1730 6 0730 1730

Analysts: KB ML SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #2 MW-7

Test Number: 0305-34NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
25	40	1	5	5	5	4	4	4	3	3	
	44	2	5	5	5	5	5	4	4	4	
	11	3	5	5	5	5	5	5	5	5	
	3	4	5	5	5	5	5	5	5	5	
	15	5	5	5	5	5	5	5	5	5	
	34	6	5	5	5	5	5	5	5	5	
	12	7	5	5	5	5	5	5	5	5	87.5%
	13	8	5	5	5	4	4	4	3	3	
50	16	1	5	5	5	5	5	5	4	4	
	22	2	5	5	5	5	3	3	3	3	
	4	3	5	5	5	5	5	5	5	4	
	10	4	5	5	5	5	5	5	5	5	
	14	5	5	5	5	5	5	5	5	5	
	20	6	5	5	5	5	5	5	5	5	
	2	7	5	5	5	5	5	5	5	5	87.5%
	9	8	5	5	5	5	4	4	4	4	
100	41	1	5	5	5	5	4	4	4	4	
	37	2	5	5	5	5	5	5	5	5	
	38	3	5	5	4	4	3	3	3	3	
	35	4	5	5	4	4	4	4	4	4	
	6	5	5	5	5	5	5	5	5	5	
	5	6	5	5	5	5	5	5	5	5	
	18	7	5	5	4	4	4	4	4	4	75%
	30	8	5	5	5	5	4	4	4	4	
Technician Initials			ET	MW	KB	ET	SM	MW	SM	ET	

Feeding Times: 0 ___ 2100 1 0730 1815 2 ~~0645~~ 0800 SM 1830 3 0830 1730 4 0730 1600 5 0730 1730 6 0730 1730

Analysts: KB ML SM

Comments:

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #2 MW-7

Test Date: 5/29/03

Species: M. bahia

Test Number: 5/29/03

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	19	1	.04264	.04402		4		
	39	2	.04356	.04542		5		
	21	3	.04401	.04554		5		
	17	4	.04259	.04417		5		
	26	5	.04233	.04413		5		
	28	6	.04230	.04432		5		
	33	7	.04267	.04466		5		
	48	8	.04245	.04372		4		
6.25	8	1	.04224	.04338		5		
	47	2	.04336	.04539		5		
	25	3	.04241	.04410		5		
	24	4	sm ~~.043~~ .04271	.04376		4		
	36	5	.04313	.04473		4		
	32	6	.04165	sm ~~.04312~~ .04265		5		
	43	7	.04041	.04194		5		
	7	8	.04234	.04426		5		
12.5	29	1	.04118	.04275		5		
	23	2	.04316	.04470		5		
	31	3	.04255	.04401		5		
	46	4	.04317	.04433		4		
	27	5	.04291	.04440		5		
	1	6	.04391	.04558		5		
	42	7	.04304	.04454		5		
	45	8	.04262	.04430		5		

Tare Initials: sm
Total Initials: sm

Date/Time in: 6/5/03 1645
Date/Time out: 6/5/03 1845
Oven temp. (°C): 100

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
fe, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #2 MW-7

Species: M. bahia

Test Number: 0305-34NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	40	1	.04294	.04343		3		
	44	2	.04322	.04470		4		
	11	3	.04285	.04430		5		
	3	4	.04163	.04333		5		
	15	5	.04247	.04383		5		
	34	6	.04346	.04518		5		
	12	7	.04276	.04437		5		
	13	8	.04207	.04293		3		
50	16	1	.04148	.04260		4		
	22	2	.04267	.04346		3		
	4	3	.04331	.04470		4		
	10	4	.04244	.04382		5		
	14	5	.04248	.04387		5		
	20	6	.04140	.04306		5		
	2	7	.04275	.04383		5		
	9	8	.04366	.04472		4		
100	41	1	.04369	.04441		4		
	37	2	.04297	.04363		5		
	38	3	.04319	.04342		3		
	35	4	.04302	.04354		4		
	6	5	.04226	.04286		5		
	5	6	.04320	.04377		5		
	18	7	.04311	.04350		4		
	30	8	.04219	.04266		4		

Tare Initials: SM
Total Initials: SM

Date/Time in: 6/5/03 1645
Date/Time out: 6/5/03 1845
Oven temp. (°C): 100

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-35NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-17				

Conc-%	1	2	3	4	5	6	7	8
D-Control	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.8000
6.25	1.0000	0.8000	0.8000	0.8000	1.0000	1.0000	0.8000	0.8000
12.5	0.6000	0.8000	1.0000	1.0000	0.8000	1.0000	0.6000	0.8000
25	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	0.6000	0.4000	1.0000	1.0000	1.0000	0.4000	1.0000
100	0.0000	0.6000	0.4000	0.0000	0.0000	0.4000	0.2000	0.2000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			3	40
6.25	0.8750	0.9459	1.1964	1.1071	1.3453	10.301	8	60.00	46.00	5	40
12.5	0.8250	0.8919	1.1412	0.8861	1.3453	16.843	8	57.00	46.00	7	40
25	0.9750	1.0541	1.3155	1.1071	1.3453	6.400	8	76.00	46.00	1	40
50	0.8000	0.8649	1.1227	0.6847	1.3453	27.910	8	63.50	46.00	8	40
*100	0.2250	0.2432	0.4824	0.2255	0.8861	52.176	8	36.00	46.00	31	40

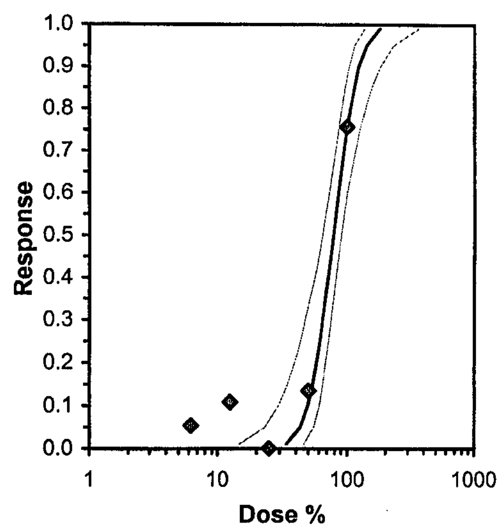
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9571	0.929	-0.3756	-0.243
Bartlett's Test indicates unequal variances (p = 9.68E-03)	15.1642	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.39043	1.52604	3.39939	9.38148	0.075	5.28551	7.81472	0.15	1.89385	0.15648	7
Intercept	-7.1025	2.93497	-12.855	-1.3499							
TSCR	0.1004	0.02392	0.05351	0.1473							

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	33.8696	14.7899	46.4238
EC05	3.355	43.2965	23.2766	55.3227
EC10	3.718	49.3519	29.5646	60.9045
EC15	3.964	53.9089	34.6757	65.1073
EC20	4.158	57.829	39.2955	68.7681
EC25	4.326	61.4185	43.6723	72.1944
EC40	4.747	71.4827	56.3215	82.5683
EC50	5.000	78.3152	64.7301	90.764
EC60	5.253	85.8007	73.2035	101.396
EC75	5.674	99.8602	86.4574	126.628
EC80	5.842	106.059	91.4374	139.697
EC85	6.036	113.771	97.1641	157.354
EC90	6.282	124.276	104.393	183.632
EC95	6.645	141.657	115.436	232.206
EC99	7.326	181.085	138.108	364.013

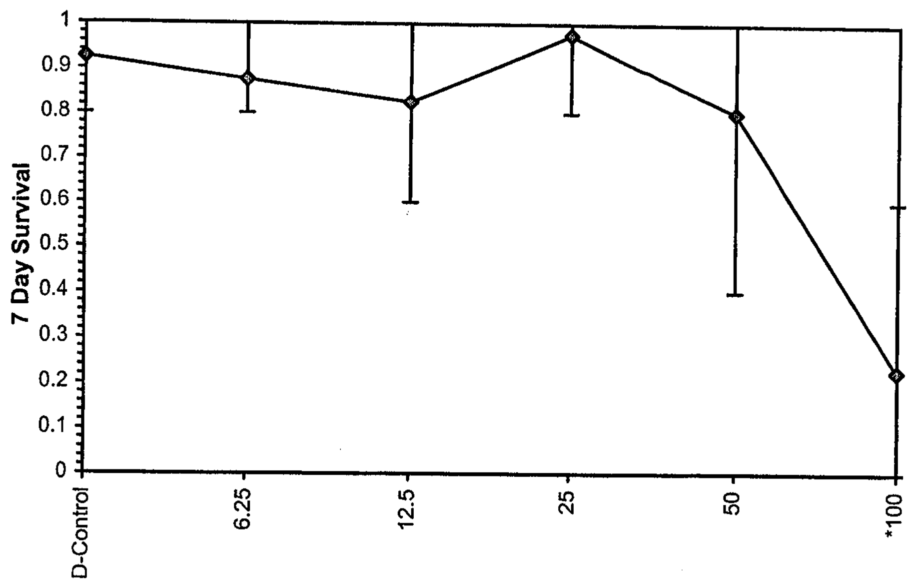


 ToxCalc v5.0.23 Reviewed by: VB

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-35NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-17				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-35NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-17				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.2520	0.2700	0.3080	0.3600	0.2780	0.2820	0.2680	0.2580
6.25	0.2520	0.1620	0.2160	0.2540	0.3140	0.2800	0.2460	0.3060
12.5	0.2320	0.2380	0.2860	0.2160	0.2120	0.2640	0.1180	0.2280
25	0.2000	0.2460	0.2840	0.2960	0.2500	0.1860	0.2420	0.2760
50	0.2220	0.1140	0.0840	0.1500	0.2360	0.1580	0.0960	0.1880
100	0.0000	0.0500	0.0520	0.0000	0.0000	0.0360	0.0380	0.0260

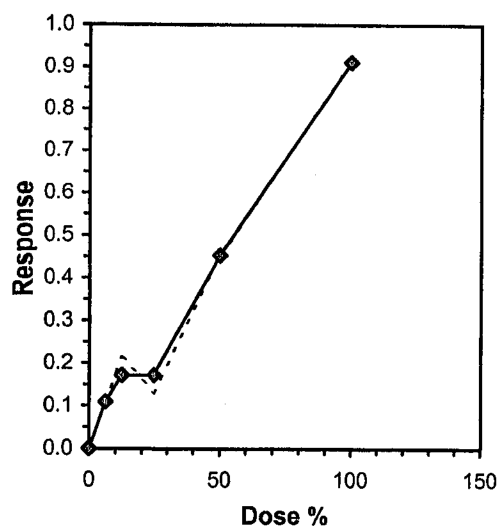
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.2845	1.0000	0.2845	0.2520	0.3600	12.279	8				0.2845	1.0000
6.25	0.2538	0.8919	0.2538	0.1620	0.3140	19.395	8	1.417	2.306	0.0500	0.2538	0.8919
*12.5	0.2243	0.7882	0.2243	0.1180	0.2860	22.081	8	2.776	2.306	0.0500	0.2359	0.8291
25	0.2475	0.8699	0.2475	0.1860	0.2960	15.703	8	1.705	2.306	0.0500	0.2359	0.8291
*50	0.1560	0.5483	0.1560	0.0840	0.2360	36.236	8	5.921	2.306	0.0500	0.1560	0.5483
*100	0.0253	0.0888	0.0253	0.0000	0.0520	88.803	8	11.946	2.306	0.0500	0.0253	0.0888

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97666		0.929		-0.3089	0.26627
Bartlett's Test indicates equal variances (p = 0.29)					6.18531		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	25	50	35.3553	4	0.05004	0.17588	0.07254	0.00188	1.2E-14	5, 42

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	2.891	2.693	1.444	8.537	3.1247
IC10*	5.783	5.264	2.888	27.193	2.5500
IC15	10.420	8.966	4.332	31.013	0.7811
IC20	27.590	9.372	5.776	35.420	-0.5583
IC25	32.042	7.091	11.352	40.763	-1.3622
IC40	45.399	5.506	36.783	56.237	0.4402
IC50	55.258	6.088	44.374	65.329	0.0136

* indicates IC estimate less than the lowest concentration

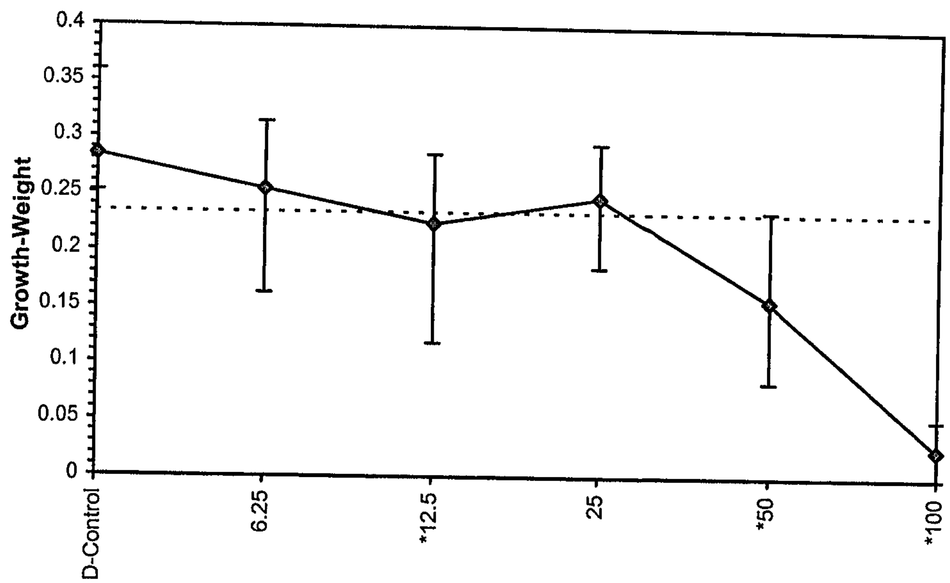


 ToxCalc v5.0.23 Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-35NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-17				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal
Test Date: 5/29/03
Sample ID: #3 MW-17
Test Number: 0305-35NW

Conc'n or %	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival
CON	28	1	5	5	5	5	5	5	5	5	
	43	2	5	4	4	4	4	4	4	4	
	38	3	5	5	5	5	5	5	5	5	
	22	4	5	5	5	5	5	5	5	5	
	26	5	5	5	5	5	5	5	5	5	
	21	6	5	4	4	4	4	4	4	4	
	2	7	5	5	5	5	5	5	5	5	
	35	8	5	4	4	4	4	4	4	4	92.5%
6.25	8	1	5	5	5	5	5	5	5	5	
	23	2	5	4	4	4	4	4	4	4	
	41	3	5	5	5	4	4	4	4	4	
	13	4	5	5	5	4	4	4	4	4	
	33	5	5	5	5	5	5	5	5	5	
	25	6	5	5	5	5	5	5	5	5	
	44	7	5	5	5	4	4	4	4	4	
	3	8	5	4	4	4	4	4	4	4	87.5%
12.5	9	1	5	5	4	4	4	3	3	3	
	24	2	5	5	5	5	5	5	4	4	
	14	3	5	5	5	5	5	5	5	5	
	46	4	5	5	5	5	5	5	5	5	
	5	5	5	5	4	4	4	4	4	4	
	30	6	5	5	5	5	5	5	5	5	
	27	7	5	5	5	5	4	3	3	3	
	42	8	5	5	5	5	4	4	4	4	82.5%
Technician Initials			SM	KB	KB	MC	MM	ET	MF	KB	

Feeding Times: 0 2100 1 0730 1815 2 0800 1830 3 0830 1730 4 0730 ~~1730~~ 1600 5 0730 1730 6 0730 1730

Analysts: KB MM MF SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #3 MW-17

Test Number: 0305-35NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
25	47	1	5	5	5	5	5	5	5	4	
	37	2	5	5	5	5	5	5	5	5	
	7	3	5	5	5	~~4~~ 5	5	5	5	5	
	6	4	5	5	5	5	5	5	5	5	
	40	5	5	5	5	5	5	5	5	5	
	32	6	5	5	5	5	5	5	5	5	
	36	7	5	5	5	5	5	5	5	5	
	45	8	5	5	5	5	5	5	5	5	97.5%
50	31	1	5	5	5	5	5	5	5	5	
	1	2	5	5	KB ~~4~~ 5 4	3	3	3	3	3	
	34	3	5	5	3	2	2	2	2	2	
	48	4	5	5	5	5	5	5	5	5	
	29	5	5	5	5	5	5	5	5	5	
	15	6	5	5	5	5	5	5	5	5	
	18	7	5	5	5	3	2	2	2	2	
	11	8	5	5	5	5	5	5	5	5	80%
100	16	1	5	5	1	0					
	39	2	5	5	4	3	~~4~~ 3	3	3	3	
	10	3	5	5	4	~~1~~ 2 KW	2	2	2	2	
	4	4	5	5	2	1	1	0			
	17	5	5	5	2	1	0				
	19	6	5	5	4	2	2	2	2	2	
	12	7	5	5	3	1	1	1	1	1	
	20	8	5	5	4	1	1	1	1	1	22.5%
Technician Initials			SM	KB	KB	ML	Cm	EA	NF	KB	

Feeding Times: 0 2100 1 0730 / 1815 2 0800 / 1830 3 0830 / 1730 4 0730 / 1600 5 0730 / 1730 6 0730 / 1730

Analysts: KB SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #3 MW-17

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-35NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	28	1	0.03991	0.04117		5		
	43	2	0.04420	0.04555		4		
	38	3	0.04371	0.04525		5		
	22	4	0.04416	0.04596		5		
	26	5	0.04565	0.04704		5		
	21	6	0.04385	0.04526		4		
	2	7	0.04206	0.04340		5		
	35	8	0.04101	0.04230		4		
6.25	8	1	0.04233	0.04359		5		
	23	2	0.04398	0.04479		4		
	41	3	0.03878	0.03986		4		
	13	4	0.04298	~~0.~~ 0.04425 mm		4		
	33	5	0.04191	0.04348		5		
	25	6	0.04512	0.04652		5		
	44	7	0.04349	0.04472		4		
	3	8	0.04309	0.04462		4		
12.5	9	1	0.04270	0.04386		3		
	24	2	0.04469	0.04588		4		
	14	3	0.04139	0.04282		5		
	46	4	0.04358	0.04466		5		
	5	5	0.04290	0.04396		4		
	30	6	0.04158	0.04290		5		
	27	7	0.04480	0.04539		3		
	42	8	0.04354	0.04468		4		

Tare Initials: SM
Total Initials: mm

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/2003 18:30
Oven temp. (°C): 60

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #3 MW-17

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-35NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	41	1	0.04304	0.04404		4		
	37	2	0.04160	0.04283		5		
	7	3	0.04276	0.04418		5		
	6	4	0.04214	0.04362		5		
	40	5	0.04113	0.04238		5		
	32	6	0.04235	0.04328		5		
	36	7	0.04056	0.04177		5		
	45	8	0.04350	0.04488		5		
50	31	1	0.04133	0.04244		5		
	1	2	0.04213	0.04270		3		
	34	3	0.04330	0.04372		2		
	48	4	0.04325	0.04400		5		
	29	5	0.04418	0.04536		5		
	15	6	0.04347	0.04426		5		
	18	7	0.04355	0.04403		2		
	11	8	0.04383	0.04477		5		
100	16	1	0.04258	0.04241		0		
	39	2	0.04435	0.04460		3		
	10	3	0.04387	0.04413		2		
	4	4	0.04214	0.04207		0		
	17	5	0.04367	0.04353		0		
	19	6	0.04367	0.04385		2		
	12	7	0.04371	0.04390		1		
	20	8	0.04413	0.04426		1		

Tare Initials: SM
Total Initials: MN

Date/Time in: 6/5/03 1806
Date/Time out: 6/6/03 1830
Oven temp. (°C): 60

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-36NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-103R				

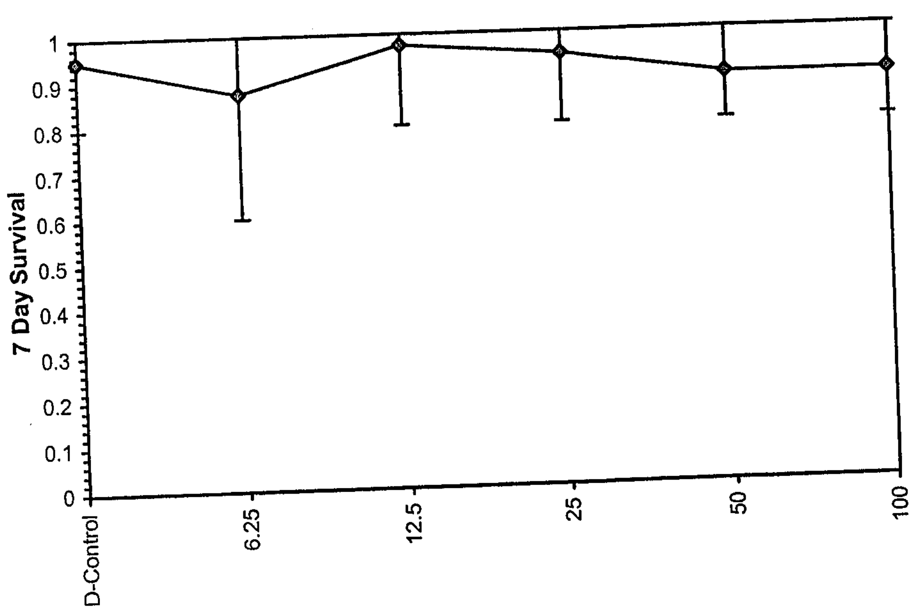
Conc-%	1	2	3	4	5	6	7	8
D-Control	0.8000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	0.6000	0.8000	0.8000	1.0000	0.8000
12.5	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
50	0.8000	1.0000	1.0000	0.8000	1.0000	0.8000	1.0000	0.8000
100	1.0000	0.8000	1.0000	1.0000	0.8000	0.8000	1.0000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	8.574	8		
6.25	0.8750	0.9211	1.1986	0.8861	1.3453	14.410	8	59.00	46.00
12.5	0.9750	1.0263	1.3155	1.1071	1.3453	6.400	8	72.00	46.00
25	0.9500	1.0000	1.2857	1.1071	1.3453	8.574	8	68.00	46.00
50	0.9000	0.9474	1.2262	1.1071	1.3453	10.381	8	60.00	46.00
100	0.9000	0.9474	1.2262	1.1071	1.3453	10.381	8	60.00	46.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.8782	0.929	-0.6647	-0.5998
Bartlett's Test indicates equal variances (p = 0.59)	3.75449	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



Reviewed by: [signature]

ToxCalc v5.0.23

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-36NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-103R				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.3000	0.3020	0.3880	0.3500	0.3680	0.3100	0.3800	0.3040
6.25	0.3780	0.4320	0.3020	0.2760	0.2360	0.2780	0.3140	0.2900
12.5	0.3460	0.2920	0.2740	0.2860	0.3200	0.3900	0.3420	0.2760
25	0.2960	0.2540	0.3440	0.3860	0.3320	0.3360	0.3200	0.2700
50	0.2460	0.3520	0.2700	0.2000	0.3340	0.2860	0.3320	0.1780
100	0.1560	0.2340	0.2340	0.2980	0.1940	0.1800	0.3060	0.2100

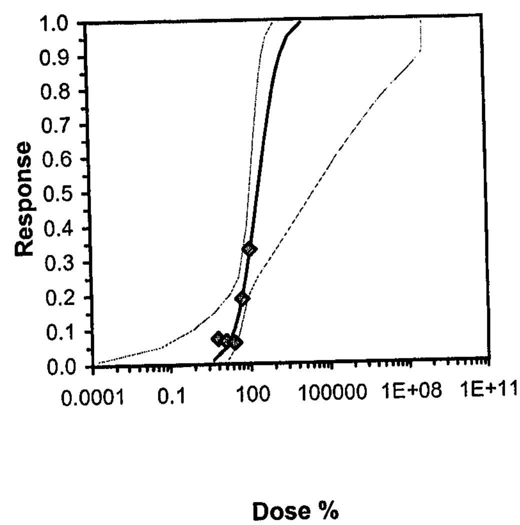
			Transform: Untransformed						1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.3378	1.0000	0.3378	0.3000	0.3880	11.184	8				0.3378	0.0000
6.25	0.3133	0.9275	0.3133	0.2360	0.4320	20.031	8	0.954	2.306	0.0592	0.3133	0.0725
12.5	0.3158	0.9349	0.3158	0.2740	0.3900	13.062	8	0.856	2.306	0.0592	0.3158	0.0651
25	0.3173	0.9393	0.3173	0.2540	0.3860	13.428	8	0.798	2.306	0.0592	0.3173	0.0607
*50	0.2748	0.8135	0.2748	0.1780	0.3520	23.297	8	2.453	2.306	0.0592	0.2748	0.1865
*100	0.2265	0.6706	0.2265	0.1560	0.3060	23.603	8	4.331	2.306	0.0592	0.2265	0.3294

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97067		0.929		0.31088	-0.4665
Bartlett's Test indicates equal variances (p = 0.64)					3.37691		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	25	50	35.3553	4	0.05923	0.17535	0.01304	0.00264	0.0012	5, 42

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.33716	0.53716	0.28433	2.38999	0	0.98252	7.81472	0.81	2.35329	0.74785	7
Intercept	1.85327	0.97045	-0.0488	3.75535							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	4.10703	0.00018	14.2683
EC05	3.355	13.2796	0.04214	28.6818
EC10	3.718	24.8246	0.74994	43.3516
EC15	3.964	37.8612	4.86307	61.6281
EC20	4.158	52.9524	17.9793	97.4082
EC25	4.326	70.6114	38.3599	207.603
EC40	4.747	145.824	84.2567	4294.41
EC50	5.000	225.577	113.371	31699.1
EC60	5.253	348.948	148.76	239943
EC75	5.674	720.632	228.804	7088047
EC80	5.842	960.956	270.472	2.7E+07
EC85	6.036	1343.98	328.232	1.3E+08
EC90	6.282	2049.78	418.083	4.9E+08
EC95	6.645	3831.8	597.129	4.9E+08
EC99	7.326	12389.7	1160.62	4.9E+08



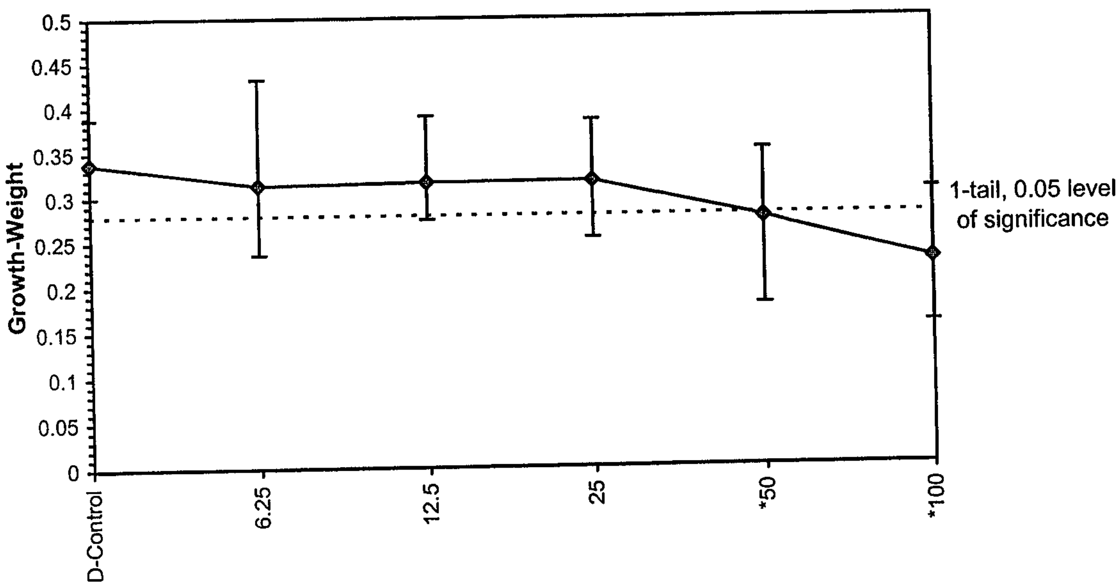
ToxCalc v5.0.23

Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-36NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-103R				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Sample ID: #4 MW-103R

Test Date: 5/29/03

Test Number: 0305-36NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
CON	12	1	5	5	5	5	5	5	5	4	
	18	2	5	5	5	4	4	4	4	4	
	26	3	5	5	5	5	5	5	5	5	
	3	4	5	5	5	5	5	5	5	5	
	6	5	5	5	5	5	5	5	5	5	
	21	6	5	5	5	5	5	5	5	5	
	20	7	5	5	5	5	5	5	5	5	95%
	9	8	5	5	5	5	5	5	5	5	
6.25	13	1	5	5	5	5	5	5	5	5	
	44	2	5	5	5	5	5	5	5	5	
	39	3	5	5	5	5	5	5	5	5	
	42	4	5	4	4	3	3	3	3	3	
	36	5	5	4	4	4	4	4	4	4	
	10	6	5	4	4	4	4	4	4	4	
	33	7	5	5	5	5	5	5	5	5	85%
	38	8	5	5	5	5	5	5	5	4	
12.5	40	1	5	5	5	5	5	5	5	5	
	16	2	5	5	5	5	5	5	5	5	
	14	3	5	5	5	5	5	5	4	4	
	11	4	5	5	5	5	5	5	5	5	
	19	5	5	5	5	S,~~4~~ 5	5	5	5	5	
	8	6	5	5	5	5	5	5	5	5	
	30	7	5	5	5	5	5	5	5	5	97.5%
	4	8	5	5	5	5	5	5	5	5	
Technician Initials			SM	KB	SM	SM	NF	SM	SM	SM	

Feeding Times: 0 2000 1 0730/1830 2 0830/1800 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: KB, SM,

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #4 MW-103R

Test Number: 0305-36NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
25	34	1	5	5	5	5	5	5	5	5	
	46	2	5	5	4	4	4	4	4	4	
	31	3	5	5	5	5	5	5	5	5	
	48	4	5	5	5	5	5	5	5	5	
	17	5	5	5	5	5	5	5	5	5	
	41	6	5	5	5	5	5	5	5	5	
	28	7	5	5	5	5	5	5	5	5	
	37	8	5	5	5	5	4	4	4	4	95%
50	27	1	5	5	5	5	5	5	4	4	
	22	2	5	5	5	5	5	5	5	5	
	2	3	5	5	5	5	5	5	5	5	
	7	4	5	5	5	5	5	5	5	4	
	47	5	5	5	5	5	5	5	5	5	
	15	6	5	5	5	5	5	4	4	4	
	45	7	5	5	5	5	5	5	5	5	
	32	8	5	5	5	5	5	5	5	4	90%
100	1	1	5	5	5	5	5	5	5	5	
	25	2	5	5	5	5	4	4	4	4	
	29	3	5	5	5	5	5	5	5	5	
	5	4	5	5	5	5	5	5	5	5	
	23	5	5	4	4	4	4	4	4	4	
	35	6	5	5	4	4	4	4	4	4	
	24	7	5	5	5	5	5	5	5	5	
	43	8	5	5	5	5	5	5	4	4	90%
Technician Initials			SM	KB	SM	SM	MF	SM	SM	SM	

Feeding Times: 0 2000 1 0730/1830 2 0830/1800 3 0830/1715 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: KB SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #4 MW-103R

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-36NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	12	1	0.04280	0.04430		4		
	18	2	0.04271	0.04422		4		
	26	3	0.04350	0.04544		5		
	3	4	0.04180	0.04355		5		
	6	5	0.04322	0.04506		5		
	21	6	0.04270	0.04425		5		
	20	7	0.04203	0.04393		5		
	9	8	0.04363	0.04515		5		
6.25	13	1	0.04435	0.04624		5		
	44	2	0.04310	0.04526		5		
	39	3	0.04348	0.04499		5		
	42	4	0.04324	0.04462		3		
	36	5	0.04264	0.04382		4		
	10	6	0.04395	0.04534		4		
	33	7	0.04212	0.04369		5		
	38	8	0.04345	0.04490		4		
12.5	40	1	0.04192	0.04365		5		
	16	2	0.04251	0.04397		5		
	14	3	0.04373	0.04510		4		
	11	4	0.04304	0.04447		5		
	19	5	0.04518	0.04678		5		
	8	6	0.04356	0.04551		5		
	30	7	0.04314	0.04485		5		
	4	8	0.04295	~~0.04483~~ SMM 0.04433		5		

Tare Initials: SM
Total Initials: mm

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/03 18:00
Oven temp. (°C): 60

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #4 MW-103R

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-36NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	34	1	0.04314	0.04462		5		
	46	2	0.04295	0.04422		4		
	31	3	0.04274	0.04446		5		
	48	4	0.04328	0.04521		5		
	17	5	0.04372	0.04538		5		
	41	6	0.04361	0.04529		5		
	28	7	0.04279	0.04439		5		
	37	8	0.04319	0.04454		4		
50	27	1	0.04317	0.04440		4		
	22	2	0.04340	0.04516		5		
	2	3	0.04324	0.04459		5		
	7	4	0.04383	0.04483		4		
	47	5	0.04364	0.04531		5		
	15	6	0.04341	0.04484		4		
	45	7	0.04321	0.04487		5		
	32	8	0.04331	0.04420		4		
100	1	1	0.04285	0.04363		5		
	25	2	0.04366	0.04483		4		
	29	3	0.04348	0.04465		5		
	5	4	0.04419	~~0.04459~~ mm		5		
	23	5	0.04297	0.04394		4		
	35	6	0.04245	0.04335		4		
	24	7	0.04440	0.04593		5		
	43	8	0.04379	0.04484		4		

0.04568

Tare Initials: SM
Total Initials: MM

Date/Time in: 6/5/03 1800
Date/Time out: 6/6/03 1800
Oven temp. (°C): 60

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-129				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.8000	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000
6.25	1.0000	1.0000	1.0000	0.8000	0.8000	1.0000	1.0000	1.0000
12.5	0.8000	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000
25	0.4000	1.0000	0.8000	1.0000	0.8000	1.0000	1.0000	0.8000
50	0.4000	0.6000	0.4000	0.4000	0.6000	0.6000	0.4000	0.2000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			3	40
6.25	0.9500	1.0270	1.2857	1.1071	1.3453	8.574	8	72.00	46.00	2	40
12.5	0.9500	1.0270	1.2857	1.1071	1.3453	8.574	8	72.00	46.00	2	40
25	0.8500	0.9189	1.1734	0.6847	1.3453	19.597	8	62.50	46.00	6	40
*50	0.4500	0.4865	0.7326	0.4636	0.8861	20.126	8	36.00	46.00	22	40
*100	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	40	40

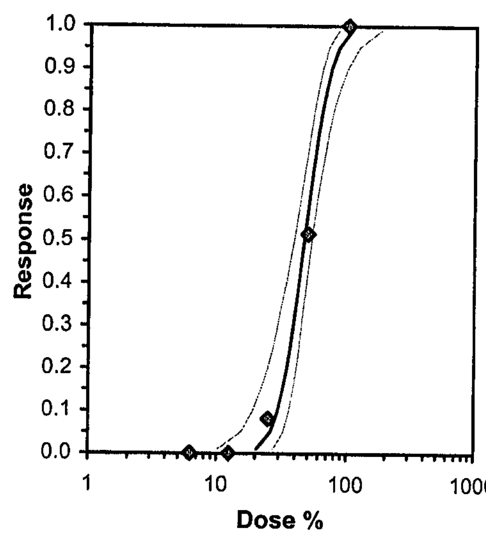
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.89421	0.929	-1.3318	2.95139
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.44159	1.34328	3.80876	9.07442	0.075	2.36764	7.81472	0.5	1.6702	0.15524	11
Intercept	-5.7588	2.30657	-10.28	-1.2379							
TSCR	0.06665	0.02209	0.02336	0.10994							

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	20.3732	10.3408	27.4372
EC05	3.355	25.9929	15.5004	32.8535
EC10	3.718	29.5975	19.1918	36.2435
EC15	3.964	32.3078	22.1344	38.7834
EC20	4.158	34.6378	24.7603	40.9802
EC25	4.326	36.7702	27.2263	43.017
EC40	4.747	42.7439	34.3041	49.0077
EC50	5.000	46.7955	39.0584	53.4973
EC60	5.253	51.2311	43.9936	59.0327
EC75	5.674	59.5542	52.1001	71.5526
EC80	5.842	63.2205	55.2288	77.9106
EC85	6.036	67.7799	58.8472	86.4278
EC90	6.282	73.9867	63.4258	98.9649
EC95	6.645	84.2467	70.4274	121.738
EC99	7.326	107.485	84.8296	181.406



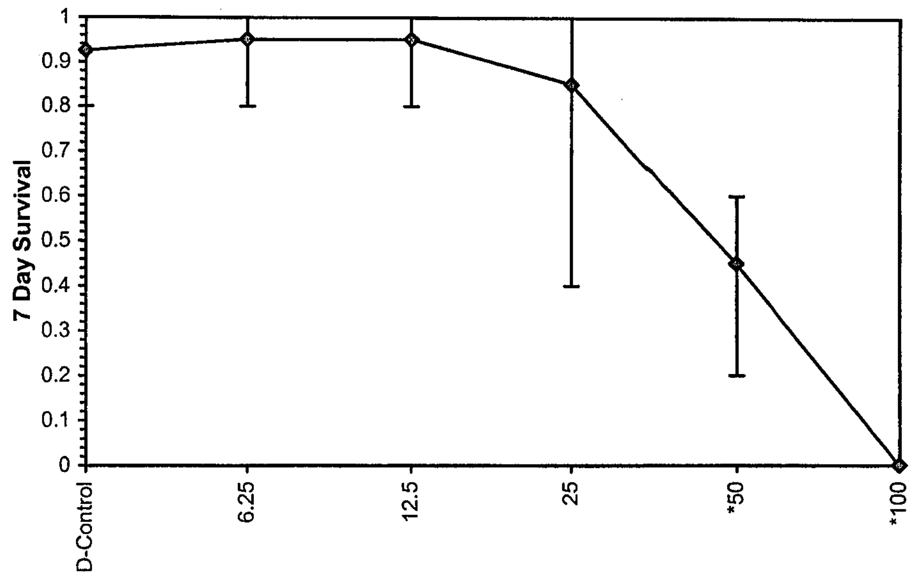
ToxCalc v5.0.23

Reviewed by: KB

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-129				

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by:

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-129				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.2660	0.3400	0.2500	0.3860	0.3980	0.3540	0.2300	0.3540
6.25	0.2620	0.3520	0.3720	0.3260	0.1900	0.3040	0.3380	0.2740
12.5	0.3040	0.3520	0.2080	0.2220	0.2840	0.1800	0.1980	0.3960
25	0.0180	0.2360	0.1920	0.1340	0.1100	0.2600	0.1620	0.1520
50	0.0960	0.1100	0.1160	0.0140	0.1120	0.1540	0.0040	0.0420
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					Rank	1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.3223	1.0000	0.3223	0.2300	0.3980	19.983	8			0.3223	0.0000
6.25	0.3023	0.9379	0.3023	0.1900	0.3720	19.455	8	60.00	46.00	0.3023	0.0621
12.5	0.2680	0.8317	0.2680	0.1800	0.3960	29.364	8	53.00	46.00	0.2680	0.1683
*25	0.1580	0.4903	0.1580	0.0180	0.2600	47.949	8	39.00	46.00	0.1580	0.5097
*50	0.0810	0.2514	0.0810	0.0040	0.1540	66.843	8	36.00	46.00	0.0810	0.7486
*100	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	1.0000

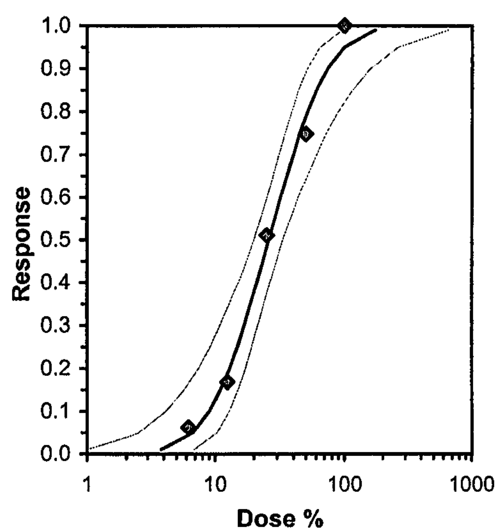
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98039	0.929	-0.2036	-0.1747
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	12.5	25	17.6777	8

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.80716	0.57847	1.67335	3.94097	0	0.8038	7.81472	0.85	1.41224	0.35623	3
Intercept	1.03562	0.82944	-0.5901	2.66133							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	3.83281	1.01693	6.86688
EC05	3.355	6.70328	2.56296	10.3632
EC10	3.718	9.0304	4.17389	12.9715
EC15	3.964	11.0414	5.77724	15.1528
EC20	4.158	12.9546	7.45201	17.2104
EC25	4.326	14.858	9.23253	19.2766
EC40	4.747	20.9887	15.3472	26.4765
EC50	5.000	25.8366	20.0504	33.3006
EC60	5.253	31.8043	25.2128	43.5153
EC75	5.674	44.9273	34.6224	72.3509
EC80	5.842	51.5285	38.7773	89.6416
EC85	6.036	60.4569	44.0416	115.632
EC90	6.282	73.9204	51.4461	160.054
EC95	6.645	99.5827	64.3931	260.661
EC99	7.326	174.162	97.1776	656.959



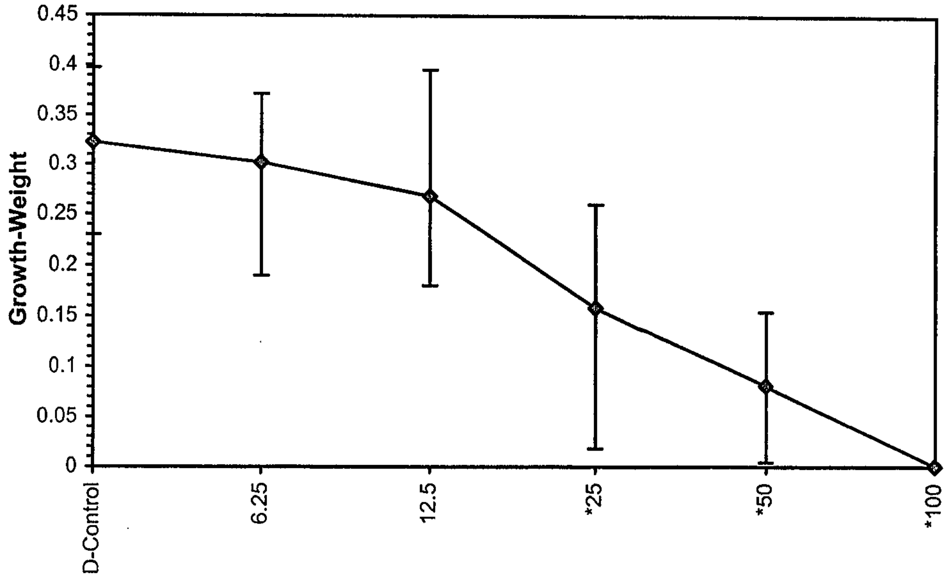
ToxCalc v5.0.23

Reviewed by:

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-129				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Test Number: 0305-37NW

Conc'n or %	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival
CON	7	1	5	5	5	5	5	5	5	4	
	37	2	5	5	5	5	5	5	5	5	
	11	3	5	5	5	5	5	5	4	4	
	46	4	5	5	5	5	5	5	5	5	
	48	5	5	5	5	5	5	5	5	5	
	43	6	5	5	5	5	5	5	5	5	
	41	7	5	5	5	5	5	5	5	4	
	32	8	5	5	5	5	5	5	5	5	92.5%
6.25	15	1	5	5	5	5	5	5	5	5	
	22	2	5	5	5	5	5	5	5	5	
	27	3	5	5	5	5	5	5	5	5	
	5	4	5	5	5	5	5	5	5	4	
	34	5	5	5	5	4	4	4	4	4	
	42	6	5	5	5	5	5	5	5	5	
	20	7	5	5	5	5	5	5	5	5	
	19	8	5	5	5	5	5	5	5	5	95%
12.5	33	1	5	5	5	5	5	5	5	4	
	6	2	5	5	5	5	5	5	5	5	
	31	3	5	5	5	5	5	5	5	5	
	28	4	5	5	5	5	5	5	5	5	
	47	5	5	5	5	5	5	5	5	5	
	35	6	5	4	4	4	4	4	4	4	
	17	7	5	5	5	5	5	5	5	5	
	23	8	5	5	5	5	5	5	5	54 SM	95%
Technician Initials			Et	SM	SM	Et	Et	MP	KB	SM	

Feeding Times: 0 0000 1 0730/1830 2 0830/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Test Number: 0305-37NW

Conc'n or %	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival
25	40	1	5	5	3	3	3	3	3	2	
	26	2	5	5	5	5	5	5	5	5	
	10	3	5	5	5	4	4	4	4	4	
	1	4	5	5	5	5	5	5	5	5	
	2	5	5	5	5	4	4	4	4	4	
	8	6	5	5	5	5	5	5	5	5	
	3	7	5	5	5	5	5	5	5	5	
	44	8	5	5	5	4	4	4	4	4	85%
50	39	1	5	5	4	2	2	2	2	2	
	25	2	5	5	5	5	5	4	3	3	
	38	3	5	5	4	3	3	3	3	2	
	4	4	5	5	5	3	2	2	2	2	
	9	5	5	5	5	4	3	3	3	3	
	24	6	5	5	5	4	4	4	3	3	
	45	7	5	5	4	4	3	3	2	2	
	36	8	5	5	5	4	4	3	1	1	45% ~~40%~~ sm
100	29	1	5	5	3	2	0				
	13	2	5	4	2	0					
	30	3	5	5	3	1	0				
	12	4	5	5	1	1	1	1	0		
	16	5	5	5	3	1	0				
	21	6	5	5	3	3	0				
	18	7	5	5	3	1	1	0			
	14	8	5	5	2	1	0				0
Technician Initials			Ct	Sm	Sm	Ct	Ct	MF	KB	Sm	

Feeding Times: 0 2000 1 0730/1830 2 0830/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Analysts: Sm

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Species: M. bahia

Test Number: 0305-37NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	7	1	0.04382	.04515		4		
	37	2	0.04344	.04514		5		
	11	3	0.04376	.04501		4		
	46	4	0.04217	.04410		5		
	48	5	0.04367	.04566		5		
	43	6	0.04271	.04448		5		
	41	7	0.04300	.04415		4		
	32	8	0.04221	.04398		5		
6.25	15	1	0.04349	.04480		5		
	22	2	0.04402	.04578		5		
	27	3	0.04360	.04546		5		
	5	4	0.04315	.04478		4		
	34	5	0.04353	.04448		4		
	42	6	0.04254	.04406		5		
	20	7	0.04369	.04538		5		
	19	8	0.04344	.04481		5		
12.5	33	1	0.04446	.04598		4		
	6	2	0.04119	.04295		5		
	31	3	0.04356	.04460		5		
	28	4	0.04329	.04440		5		
	47	5	0.04320	.04462		5		
	35	6	0.04353	.04443		4		
	17	7	0.04325	.04424		5		
	23	8	0.04297	.04495		5		

Tare Initials: SM
Total Initials: SM

Date/Time in: 6/5/03 1500
Date/Time out: 6/5/03 1700
Oven temp. (°C): 100

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #5 MW-129

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-37NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	40	1	0.04350	.04359		2		
	26	2	0.04318	.04436		5		
	10	3	0.04302	.04398		4		
	1	4	0.04323	.04390		5		
	2	5	0.04372	.04427		4		
	8	6	0.04330	.04460		5		
	3	7	0.04334	.04415		5		
	44	8	0.04388	.04464		4		
50	39	1	0.04374	.04422		2		
	25	2	0.04301	.04356		3		
	38	3	0.04279	.04337		2		
	4	4	0.04450	.04457		2		
	9	5	0.04326	.04382		3		
	24	6	0.04373	.04450		3		
	45	7	0.04289	.04291		2		
	36	8	0.04390	.04411		1		
100	29	1	0.04213					
	13	2	0.04338					
	30	3	0.04270					
	12	4	0.04328					
	16	5	0.04314					
	21	6	0.04302					
	18	7	0.04201					
	14	8	0.04366					

Tare Initials: SM
Total Initials: SM

Date/Time in: 6/5/03 1500
Date/Time out: 6/5/03 1700
Oven temp. (°C): 100

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-W				

Conc-%	1	2	3	4	5	6	7	8
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000	0.8000	0.8000
12.5	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	0.8000	0.8000
100	1.0000	0.6000	0.6000	0.6000	0.6000	0.6000	1.0000	0.4000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8			1	40
6.25	0.9250	0.9487	1.2560	1.1071	1.3453	9.813	8	60.00	46.00	3	40
12.5	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8	68.00	46.00	1	40
25	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8	68.00	46.00	1	40
50	0.9250	0.9487	1.2560	1.1071	1.3453	9.813	8	60.00	46.00	3	40
*100	0.6750	0.6923	0.9757	0.6847	1.3453	24.439	8	45.00	46.00	13	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.86643	0.929	0.36172	1.80253
Bartlett's Test indicates equal variances (p = 0.02)	13.349	15.0863		

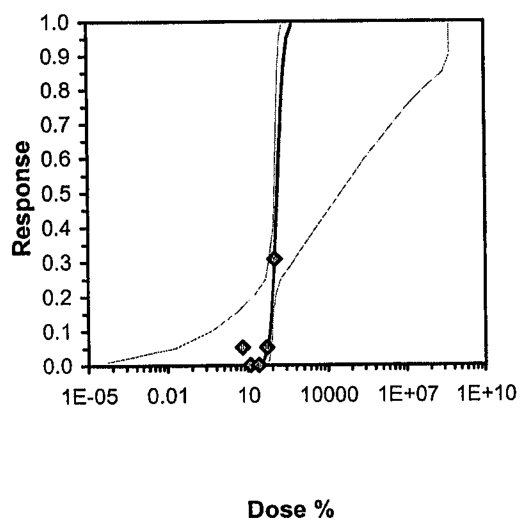
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits	
Slope	4.21094	2.01276	0.26594	8.15595
Intercept	-3.9476	3.94162	-11.673	3.77794
TSCR	0.0376	0.01542	0.00737	0.06783

Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
0.025	1.92455	7.81472	0.59	2.12485	0.23748	5

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	37.3594	5.5E-05	59.6222
EC05	3.355	54.2299	0.01959	73.8161
EC10	3.718	66.1476	0.44158	84.2851
EC15	3.964	75.6352	3.50203	95.1049
EC20	4.158	84.1371	16.7557	113.447
EC25	4.326	92.1886	48.0618	176.24
EC40	4.747	116.062	92.4702	3955.02
EC50	5.000	133.307	103.604	34000.8
EC60	5.253	153.115	113.515	298902
EC75	5.674	192.765	130.002	1.1E+07
EC80	5.842	211.212	136.841	4.8E+07
EC85	6.036	234.953	145.122	2.6E+08
EC90	6.282	268.653	156.093	4.9E+08
EC95	6.645	327.693	173.65	4.9E+08
EC99	7.326	475.67	211.529	4.9E+08



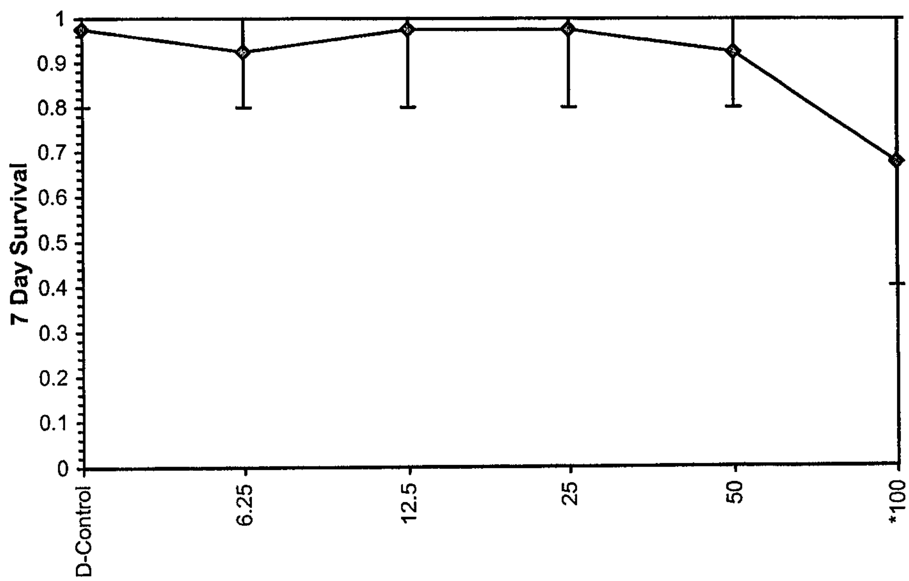
ToxCalc v5.0.23

Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-W				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-W				

Conc-%	1	2	3	4	5	6	7	8
D-Control	0.3480	0.3180	0.3400	0.3160	0.3740	0.3180	0.3420	0.2960
6.25	0.3380	0.3320	0.4200	0.3800	0.3560	0.2900	0.2560	0.2640
12.5	0.3140	0.3980	0.3240	0.2860	0.2800	0.3780	0.3520	0.3500
25	0.3520	0.2580	0.3620	0.2640	0.2140	0.3000	0.3320	0.3120
50	0.1940	0.2500	0.1780	0.2320	0.1740	0.1640	0.1940	0.2420
100	0.1640	0.1000	0.0980	0.1140	0.0820	0.0920	0.1560	0.0540

			Transform: Untransformed						1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.3315	1.0000	0.3315	0.2960	0.3740	7.324	8				0.3315	0.0000
6.25	0.3295	0.9940	0.3295	0.2560	0.4200	17.311	8	0.095	2.306	0.0486	0.3295	0.0060
12.5	0.3353	1.0113	0.3353	0.2800	0.3980	12.513	8	-0.178	2.306	0.0486	0.3353	-0.0113
25	0.2993	0.9027	0.2993	0.2140	0.3620	17.024	8	1.531	2.306	0.0486	0.2993	0.0973
*50	0.2035	0.6139	0.2035	0.1640	0.2500	16.317	8	6.075	2.306	0.0486	0.2035	0.3861
*100	0.1075	0.3243	0.1075	0.0540	0.1640	34.244	8	10.631	2.306	0.0486	0.1075	0.6757

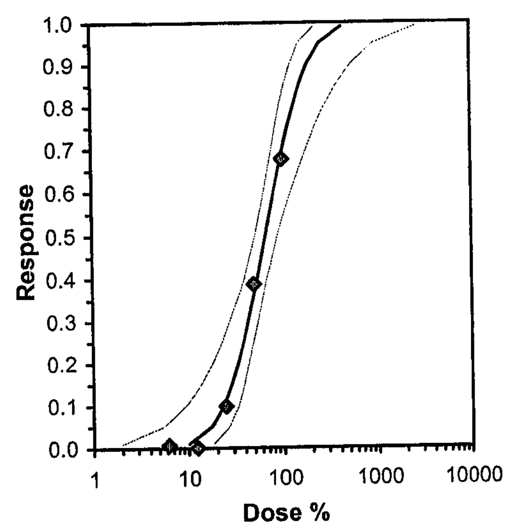
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98362	0.929	0.03717	-0.5061
Bartlett's Test indicates equal variances (p = 0.33)	5.79895	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	25	50	35.3553	4	0.04858	0.14656	0.06917	0.00178	1.0E-14	5, 42

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.85044	0.68967	1.49867	4.2022	0	0.32982	7.81472	0.95	1.82459	0.35082	5
Intercept	-0.2009	1.23736	-2.6261	2.22434							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	10.1966	1.98431	18.642
EC05	3.355	17.6824	5.58075	27.4357
EC10	3.718	23.7135	9.63082	33.9013
EC15	3.964	28.906	13.8514	39.2894
EC20	4.158	33.8324	18.3989	44.394
EC25	4.326	38.7228	23.3371	49.5863
EC40	4.747	54.4144	40.3742	68.9501
EC50	5.000	66.7719	52.6341	89.6827
EC60	5.253	81.9359	65.0317	123.08
EC75	5.674	115.139	86.6028	222.336
EC80	5.842	131.782	96.0289	284.074
EC85	6.036	154.241	107.927	379.363
EC90	6.282	188.015	124.572	547.835
EC95	6.645	252.143	153.419	948.557
EC99	7.326	437.252	225.164	2675.16



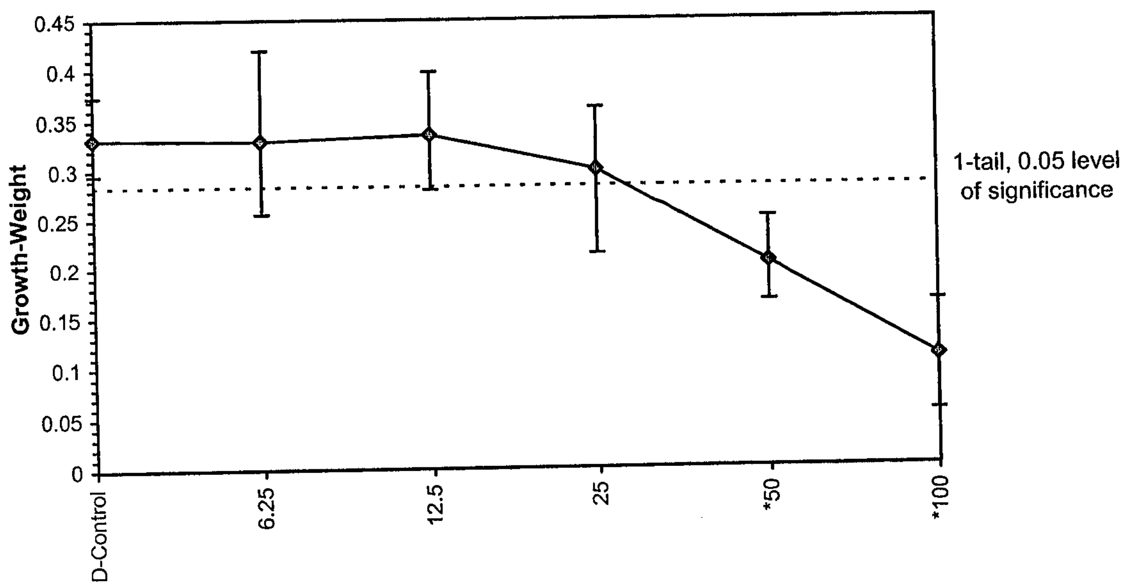
ToxCalc v5.0.23

Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-37NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:	MW-W				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #6 MW-W

Test Number: 0305-38 NW

Conc'n or %	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival
CON	9	1	5	5	5	5	5	5	5	5	
	25	2	5	5	5	5	5	5	5	5	
	4	3	5	5	5	5	5	5	5	5	
	32	4	5	5	5	5	5	5	5	5	
	8	5	5	5	5	5	5	5	5	5	
	21	6	5	5	5	5	5	5	5	5	
	14	7	5	5	5	5	5	5	5	5	
	3	8	5	4	4	4	4	4	4	4	97.5%
6.25	36	1	5	5	5	5	5	5	5	5	
	19	2	5	5	5	5	5	5	5	5	
	28	3	5	5	5	5	5	5	5	5	
	15	4	5	5	5	5	5	5	5	5	
	26	5	5	5	5	5	5	5	5	5	
	13	6	5	5	5	5	5	4	4	4	
	33	7	5	5	5	5	5	5	5	4	
	46	8	5	5	5	5	5	4	4	4	92.5%
12.5	12	1	5	5	5	5	5	5	5	5	
	45	2	5	5	5	5	5	5	5	5	
	6	3	5	5	5	5	5	5	5	5	
	31	4	5	5	5	5	5	5	5	5	
	39	5	5	5	5	5	5	5	5	~~5~~ 4	
	20	6	5	5	5	5	5	5	5	5	
	43	7	5	5	5	5	5	5	5	5	
	34	8	5	5	5	5	5	5	5	5	97.5%
Technician Initials			GT	KB	KB	WL	SM	KB	KB	W	

Feeding Times: 0 2000 1 0730 / 1815 2 0800 / 1830 3 0830 / 1730 4 0730 / 1600 5 0730 / 1730 6 0730 / 1730

Analysts: KB SM

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Mysid Shrimp
(Mysidopsis bahia)
Survival and Growth Test

Client: Unocal

Test Date: 5/29/03

Sample ID: #6 MW-W

Test Number: 0305-38NW

Conc'n or %	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival
25	22	1	5	5	5	5	5	5	5	5	
	38	2	5	5	5	5	5	5	5	5	
	1	3	5	5	5	5	5	5	5	5	
	16	4	5	5	5	5	5	5	5	5	
	11	5	5	5	5	5	4	4	4	4	
	48	6	5	5	5	5	5	5	5	5	
	41	7	5	5	5	5	5	5	5	5	
	47	8	5	5	5	5	5	5	5	5	97.5%
50	23	1	5	5	5	5	5	5	5	5	
	7	2	5	5	5	5	5	5	5	5	
	18	3	5	5	5	5	5	5	5	5	
	5	4	5	5	5	5	5	5	5	5	
	35	5	5	5	5	5	5	5	5	4	
	30	6	5	5	5	5	5	5	5	5	
	27	7	5	4	4	4	4	4	4	4	
	24	8	5	5	5	5	5	5	5	4	92.5%
100	17	1	5	5	5	5	5	5	5	5	
	2	2	5	5	5	4	4	4	4	3	
	37	3	5	5	5	4	4	4	4	3	
	40	4	5	5	3	3	3	3	3	3	
	29	5	5	5	5	~~8~~ 3	3	3	3	3	
	42	6	5	5	5	5	5	3	3	3	
	10	7	5	5	5	KB ~~4~~ 5	KB ~~4~~ 5	5	5	5	
	44	8	5	5	5	2	2	2	2	2	67.5%
Technician Initials			Et	KB	KB	mc	SM	KB	KB	Et	

Feeding Times: 0 2000 1 0730 / 1815 2 0800 / 1830 3 0830 / 1730 4 0730 / ~~1730~~ SM 1600 5 0730 / 1730 6 0730 / 1730

Analysts: KB SM

Comments:

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
fe, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #6 MW-W

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-38MW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
CON	9	1	0.04274	.04448		5		
	25	2	0.04310	.04469		5		
	4	3	0.04253	.04423		5		
	32	4	0.04229	.04387		5		
	8	5	0.04268	.04455		5		
	21	6	0.04336	.04495		5		
	14	7	0.04386	.04557		5		
	3	8	0.04342	.04490		4		
6.25	36	1	0.04209	.04378		5		
	19	2	0.04271	.04437		5		
	28	3	0.04284	.04494		5		
	15	4	0.04397	.04587		5		
	26	5	0.04324	.04502		5		
	13	6	0.04336	.04481		4		
	33	7	0.04244	.04372		4		
	46	8	0.04337	.04469		4		
12.5	12	1	0.04263	.04420		5		
	45	2	0.04343	.04542		5		
	6	3	0.04268	.04430		5		
	31	4	0.04254	.04397		5		
	39	5	0.04365	.04505		4		
	20	6	0.04298	.04487		5		
	43	7	0.04292	.04468		5		
	~~24~~ MF 34	8	0.04252	.04427		5		

Tare Initials: SM
Total Initials: SM

Date/Time in: 6/5/03 1830
Date/Time out: 6/6/03 1830
Oven temp. (°C): 60

MEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy., E. Suite 2-0
Fife, WA 98424

Raw Data Sheet
Mysid Weights
Seven Day Chronic Bioassay

Client: Unocal

Sample ID: #6 MW-W

Test Date: 5/29/03

Species: M. bahia

Test Number: 0305-38 NW

% Conc.	Cont.	Rep.	pan wt. (gm)	pan + mysid (gm)	mysid wt. (mg)	# mysids	avg. per mysid (mg)	avg. per conc. (mg)
25	22	1	0.04331	.04507		5		
	38	2	0.04216	.04345		5		
	1	3	0.04269	.04450		5		
	16	4	0.04301	.04433		5		
	11	5	0.04304	.04411		4		
	43	6	0.04448	.04598		5		
	41	7	0.04403	.04569		5		
	47	8	0.04422	.04578		5		
50	23	1	0.04379	.04476		5		
	7	2	0.04368	.04493		5		
	18	3	0.04243	.04332		5		
	5	4	0.04204	.04320		5		
	35	5	0.04253	.04340		4		
	30	6	0.04485	.04567		5		
	27	7	0.04370	.04467		4		
	24	8	0.04296	.04417		4		
100	17	1	0.04410	.04492		5		
	2	2	0.04330	.04380		3		
	7	3	0.04225	.04274		3		
	10	4	0.04401	.04458		3		
	29	5	0.04278	.04319		3		
	12	6	0.04395	.04441		3		
	10	7	0.04213	.04291		5		
	14	8	0.04360	.04387		2		

Tare Initials: SM
Total Initials: SM

Date/Time in: 6/5/03 1830
Date/Time out: 6/6/03 1830
Oven temp. (°C): 60

Pimephales promelas

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-21NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-146				

Conc-%	1	2	3	4
D-Control	1.0000	0.9000	0.8000	1.0000
6.25	1.0000	0.9000	1.0000	1.0000
12.5	1.0000	1.0000	0.9000	0.9000
25	0.8000	0.9000	0.9000	0.8000
50	0.7000	0.9000	0.8000	0.9000
100	0.4000	0.5000	0.2000	0.2000

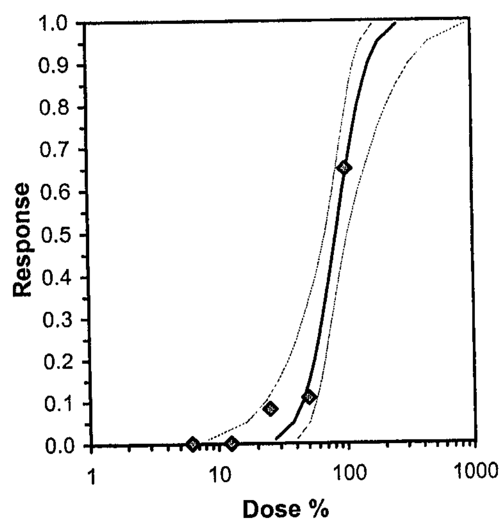
			Transform: Arcsin Square Root						1-Tailed		Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	0.9250	1.0000	1.2951	1.1071	1.4120	11.347	4				3	40
6.25	0.9750	1.0541	1.3713	1.2490	1.4120	5.942	4	-0.902	2.410	0.2036	1	40
12.5	0.9500	1.0270	1.3305	1.2490	1.4120	7.072	4	-0.420	2.410	0.2036	2	40
25	0.8500	0.9189	1.1781	1.1071	1.2490	6.954	4	1.385	2.410	0.2036	6	40
50	0.8250	0.8919	1.1491	0.9912	1.2490	10.856	4	1.728	2.410	0.2036	7	40
*100	0.3250	0.3514	0.5994	0.4636	0.7854	27.029	4	8.237	2.410	0.2036	27	40

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.9308		0.884		-0.2054	-1.2208
Bartlett's Test indicates equal variances (p = 0.80)					2.35171		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	0.13854	0.14963	0.3252	0.01427	3.3E-07	5, 18

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.76602	1.25475	2.30671	7.22532	0.075	4.83307	7.81472	0.18	1.92535	0.20982	24
Intercept	-4.1762	2.38901	-8.8587	0.50623							
TSCR	0.07027	0.02108	0.02896	0.11159							

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	27.3675	8.37318	40.6531
EC05	3.355	38.0387	16.3574	51.054
EC10	3.718	45.3371	23.2739	57.8968
EC15	3.964	51.0369	29.4223	63.2463
EC20	4.158	56.0737	35.3238	68.0865
EC25	4.326	60.7892	41.1584	72.8209
EC40	4.747	74.5059	58.6	89.0586
EC50	5.000	84.2068	69.7255	104.49
EC60	5.253	95.1709	80.1397	126.915
EC75	5.674	116.646	96.1768	184.141
EC80	5.842	126.455	102.505	215.309
EC85	6.036	138.935	110.057	259.183
EC90	6.282	156.402	119.976	328.334
EC95	6.645	186.41	135.821	467.978
EC99	7.326	259.095	170.318	915.569



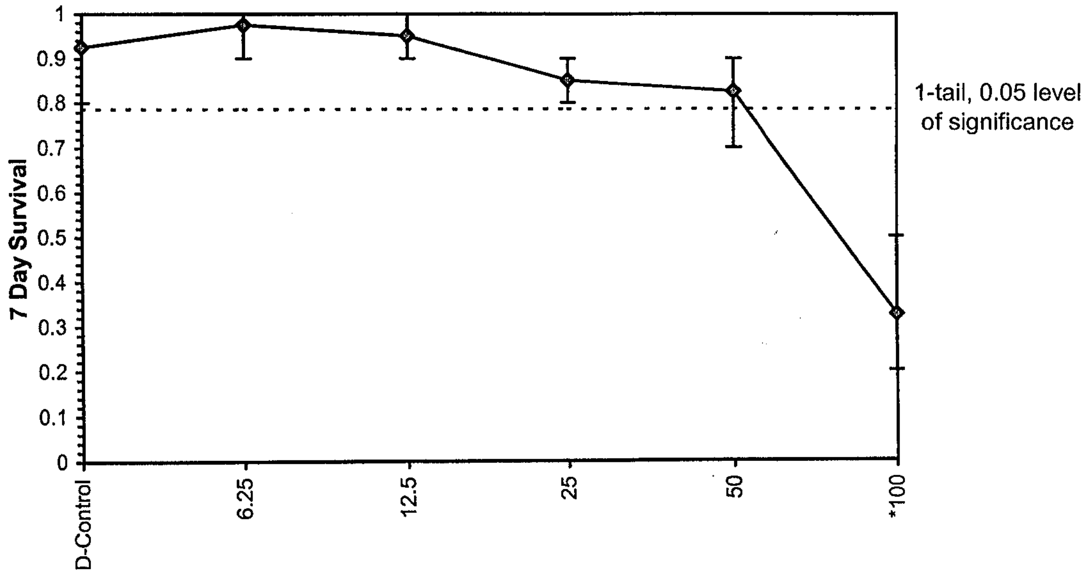
ToxCalc v5.0.23

Reviewed by: KS

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-21NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-146				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-21NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-146				

Conc-%	1	2	3	4
D-Control	0.6440	0.5100	0.5930	0.6580
6.25	0.4980	0.6600	0.7140	0.6160
12.5	0.5210	0.6360	0.6440	0.5630
25	0.4780	0.6420	0.5030	0.5090
50	0.5050	0.5310	0.5430	0.5190
100	0.1580	0.1660	0.0570	0.0650

			Transform: Untransformed						1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6013	1.0000	0.6013	0.5100	0.6580	11.133	4				0.6013	0.0000
6.25	0.6220	1.0345	0.6220	0.4980	0.7140	14.770	4	-0.449	2.410	0.1113	0.6220	-0.0345
12.5	0.5910	0.9830	0.5910	0.5210	0.6440	10.019	4	0.222	2.410	0.1113	0.5910	0.0170
25	0.5330	0.8865	0.5330	0.4780	0.6420	13.864	4	1.478	2.410	0.1113	0.5330	0.1135
50	0.5245	0.8723	0.5245	0.5050	0.5430	3.104	4	1.663	2.410	0.1113	0.5245	0.1277
*100	0.1115	0.1854	0.1115	0.0570	0.1660	52.462	4	10.609	2.410	0.1113	0.1115	0.8146

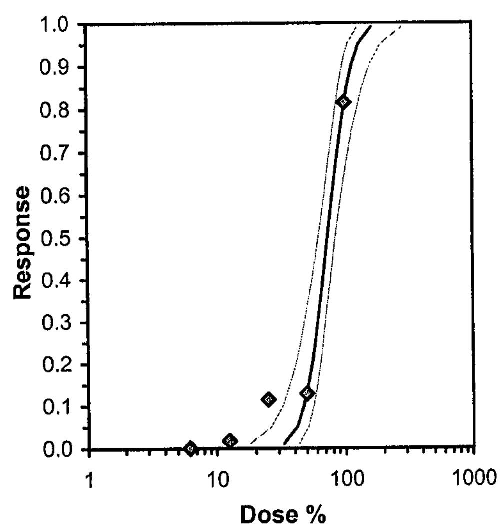
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98182	0.884	-0.1504	-0.3472
Bartlett's Test indicates equal variances (p = 0.32)	5.87449	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	0.11126	0.18504	0.14879	0.00426	1.2E-08	5, 18

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.68729	1.393	3.95701	9.41757	0	2.90525	7.81472	0.41	1.86688	0.14954	7
Intercept	-7.4844	2.63242	-12.644	-2.3248							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	33.0371	18.009	43.2978
EC05	3.355	41.7745	26.5242	51.63
EC10	3.718	47.3411	32.5061	56.8813
EC15	3.964	51.5102	37.2078	60.8519
EC20	4.158	55.0839	41.3488	64.3225
EC25	4.326	58.3468	45.1853	67.5791
EC40	4.747	67.4518	55.8605	77.42
EC50	5.000	73.6001	62.7141	85.0196
EC60	5.253	80.3088	69.5963	94.4549
EC75	5.674	92.841	80.7556	115.289
EC80	5.842	98.3405	85.1196	125.578
EC85	6.036	105.163	90.2266	139.164
EC90	6.282	114.424	96.7622	158.901
EC95	6.645	129.672	106.847	194.294
EC99	7.326	163.966	127.681	285.551

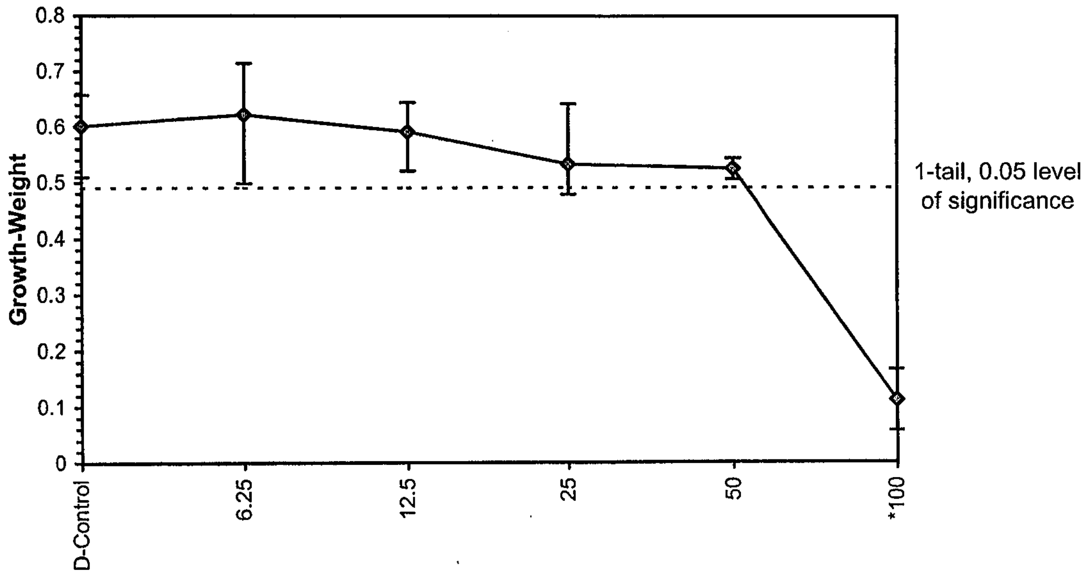


 ToxCalc v5.0.23 Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-21NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-146				

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: _[signature]_

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal **Test Date:** 5/29/03

Sample ID: #1 MW-146 **Test No.:** 0305-21NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	17	1	10	10	10	10	10	10	10	10		
	1	2	10	9	9	9	9	9	9	9		
	12	3	10	9	8	8	8	8	8	8		
	3	4	10	10	10	10	10	10	10	10		92.5%
6.25	16	1	10	10	10	10	10	10	10	10		
	13	2	10	9	9	9	9	9	9	9		
	23	3	10	10	10	10	10	10	10	10		
	18	4	10	10	10	10	10	10	10	10		97.5%
12.5	10	1	10	10	10	10	10	10	10	10		
	4	2	10	10	10	10	10	10	10	10		
	22	3	10	10	10	10	9	9	9	9		
	19	4	10	10	10	10	9	9	9	9		95%
25	9	1	10	10	9	9	9	9	8	8		
	5	2	10	10	10	9	9	9	9	9		
	11	3	10	10	9	9	9	9	9	9		
	14	4	10	10	8	8	8	8	8	8		85%
50	15	1	10	9	8	7	7	7	7	7		
	7	2	10	9	9	9	9	9	9	9		
	8	3	10	10	9	9	9	9	8	8		
	21	4	10	9	9	9	9	9	9	9		82.5%
100	24	1	10	10	10	7	6	4	4	4		
	20	2	10	9	8	6	6	6	6	5		
	2	3	10	9	6	2	2	2	2	2		
	6	4	10	10	10	4	3	3	2	2		32.5%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			SM	SM	SM	SM	ET	SM	SM	ET		

Feeding Times: 0 2000 1 0730 / 1815 2 0830 / ~~1800~~ 1300 3 0800 / 1730 4 0730 / 1600 5 0730 / 1730 6 0730 / 1730

Comments:

Analysts: SM, ET

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #1 MW-146

Species: *P. promelas*

Test No: 0305-21NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	17	1	.04308	0.04952		10		
	1	2	.04285	0.04795		9		
	12	3	.04266	0.04859		8		
	3	4	.04328	0.04986		10		
6.25	16	1	.04256	0.04754		10		
	13	2	.04308	0.04968		9		
	23	3	.04273	0.04987		10		
	18	4	.04058	0.04674		10		
12.5	10	1	.04299	0.04820		10		
	4	2	.04209	0.04845		10		
	22	3	.04260	0.04904		9		
	19	4	.04262	0.04825		9		
25	9	1	.04165	0.04643		8		
	5	2	.04306	0.04948		9		
	11	3	.04304	0.04807		9		
	14	4	.04208 ~~.0424~~ mm	0.04717		8		
50	15	1	.04261	0.04766		7		
	7	2	.04108	0.04639		9		
	8	3	.04117	0.04660		8		
	21	4	.04112	0.04631		9		
100	24	1	.04147	0.04305		4		
	20	2	.04267	0.04433		5		
	2	3	.04282	0.04339		2		
	6	4	.04123	0.04188		2		
		1						
		2						
		3						
		4						

Tare: mm
Total: mm

Date/Time in: 6/5/03 10:45
Date/Time out: 6/5/03 15:30
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-22NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-7				

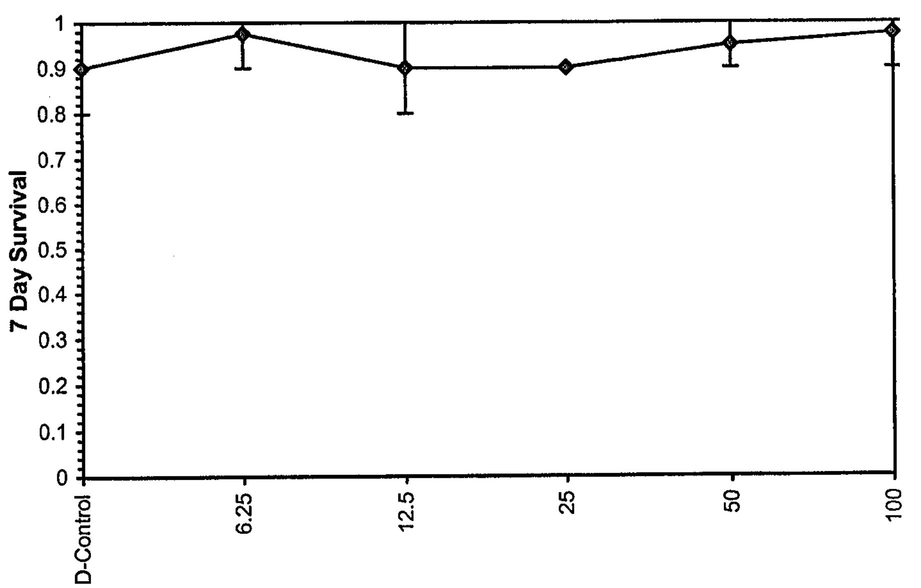
Conc-%	1	2	3	4
D-Control	1.0000	0.9000	0.8000	0.9000
6.25	1.0000	1.0000	0.9000	1.0000
12.5	1.0000	0.9000	0.8000	0.9000
25	0.9000	0.9000	0.9000	0.9000
50	1.0000	0.9000	1.0000	0.9000
100	1.0000	1.0000	1.0000	0.9000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	0.9000	1.0000	1.2543	1.1071	1.4120	9.935	4		
6.25	0.9750	1.0833	1.3713	1.2490	1.4120	5.942	4	22.50	10.00
12.5	0.9000	1.0000	1.2543	1.1071	1.4120	9.935	4	18.00	10.00
25	0.9000	1.0000	1.2490	1.2490	1.2490	0.000	4	18.00	10.00
50	0.9500	1.0556	1.3305	1.2490	1.4120	7.072	4	21.00	10.00
100	0.9750	1.0833	1.3713	1.2490	1.4120	5.942	4	22.50	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92425	0.884	-0.1459	-0.1333
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: JB

Larval Fish Growth and Survival Test-Growth-Weight

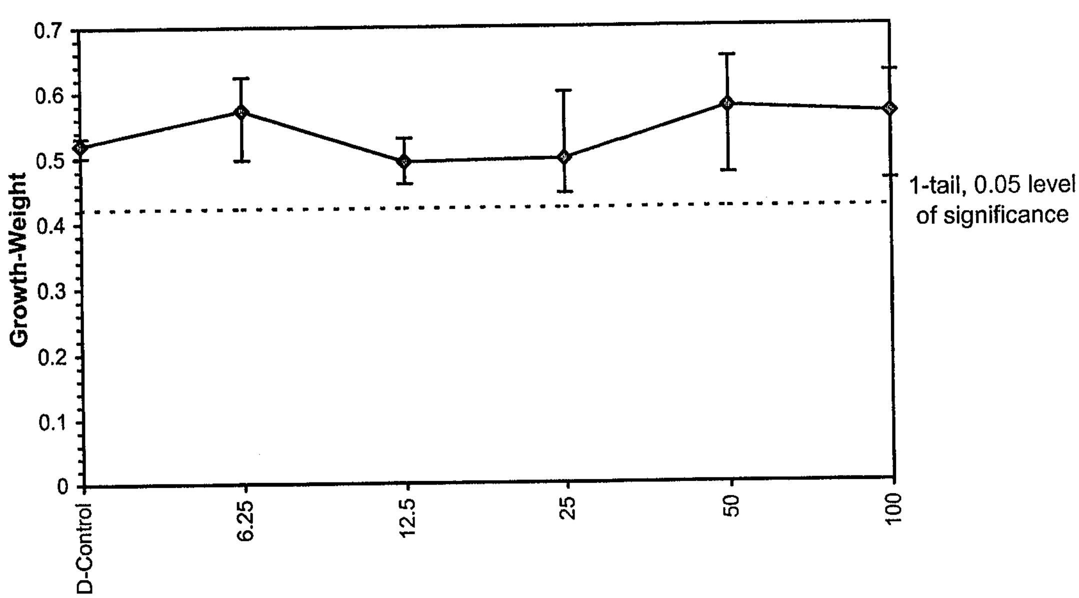
Start Date:	5/29/03	Test ID:	0305-22NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-7				

Conc-%	1	2	3	4
D-Control	0.5320	0.5290	0.5020	0.5190
6.25	0.5890	0.4970	0.5780	0.6240
12.5	0.4710	0.5290	0.4590	0.5110
25	0.4440	0.4860	0.6000	0.4570
50	0.5940	0.6520	0.4740	0.5840
100	0.4630	0.6280	0.6070	0.5610

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.5205	1.0000	0.5205	0.5020	0.5320	2.599	4			
6.25	0.5720	1.0989	0.5720	0.4970	0.6240	9.390	4	-1.258	2.410	0.0987
12.5	0.4925	0.9462	0.4925	0.4590	0.5290	6.692	4	0.684	2.410	0.0987
25	0.4968	0.9544	0.4968	0.4440	0.6000	14.300	4	0.580	2.410	0.0987
50	0.5760	1.1066	0.5760	0.4740	0.6520	12.902	4	-1.356	2.410	0.0987
100	0.5648	1.0850	0.5648	0.4630	0.6280	12.993	4	-1.081	2.410	0.0987

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97382		0.884		-0.2557	0.13204
Bartlett's Test indicates equal variances (p = 0.19)					7.43864		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	100	>100		1	0.09865	0.18953	0.00591	0.00335	0.1713	5, 18

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: [signature]

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #2 MW-7

Test No.: 0305-22NW

% Conc.	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival	Average Survival
CON	22	1	10	10	10	10	10	10	10	10		
	19	2	10	10	10	10	9	9	9	9		
	11	3	10	10	10	10	9	8	8	8		
	17	4	10	10	10	10	10	10	10	9		90%
6.25	1	1	10	10	10	10	10	10	10	10		
	3	2	10	10	10	10	10	10	10	10		
	20	3	10	9	9	9	9	9	9	9		
	12	4	10	10	10	10	10	10	10	10		97.5%
12.5	16	1	10	10	10	10	10	10	10	10		
	15	2	10	9	9	9	9	9	9	9		
	8	3	10	10	9	9	9	8	8	8		
	18	4	10	9	9	9	9	9	9	9		90%
25	6	1	10	10	9	9	9	9	9	9		
	13	2	10	9	9	9	9	9	9	9		
	9	3	10	10	10	9	9	9	9	9		
	10	4	10	10	10	9	9	9	9	9		90%
50	21	1	10	10	10	10	10	10	10	10		
	14	2	10	10	10	10	10	9	9	9		
	4	3	10	10	10	10	10	10	10	10		
	5	4	10	10	9	9	9	9	9	9		95%
100	2	1	10	10	10	10	10	10	10	10		
	23	2	10	10	10	10	10	10	10	10		
	7	3	10	10	10	10	10	10	10	10		
	24	4	10	10	9	9	9	9	9	9		97.5%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			Sm	Sm	KB	Sm	EY	Sm	Sm	Sm		

Feeding Times: 0 2000 1 0730/1815 2 0800/1300 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Comments:

Analysts: Sm, KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #2 MW-7

Species: *P. promelas*

Test No: 0305-22NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	22	1	.04283	.04815		10		
	19	2	.04279	.04808		9		
	11	3	.04252	.04754		8		
	17	4	.04292	.04811		9		
6.25	1	1	.04282	.04871		10		
	3	2	.04442	.04939		10		
	20	3	.04246	.04824		9		
	12	4	.04214	.04838		10		
12.5	16	1	.04286	.04757		10		
	15	2	.04252	.04781		9		
	8	3	.04221	.04680		8		
	18	4	.04298	.04809		9		
25	6	1	.04336	.04780		9		
	13	2	.04298	.04784		9		
	9	3	.04215	.04815		9		
	10	4	.04280	.04737		9		
50	21	1	.04281	.04875		10		
	14	2	.04248	.04900		9		
	4	3	.04383	.04857		10		
	5	4	.04336	.04920		9		
100	2	1	.04318	.04781		10		
	23	2	.04298	.04926		10		
	7	3	.04297	.04904		10		
	24	4	.04250	.04811		9		
		1						
		2						
		3						
		4						

Tare: mm
Total: SM

Date/Time in: 6/5/03 1145
Date/Time out: 6/5/03 1400
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

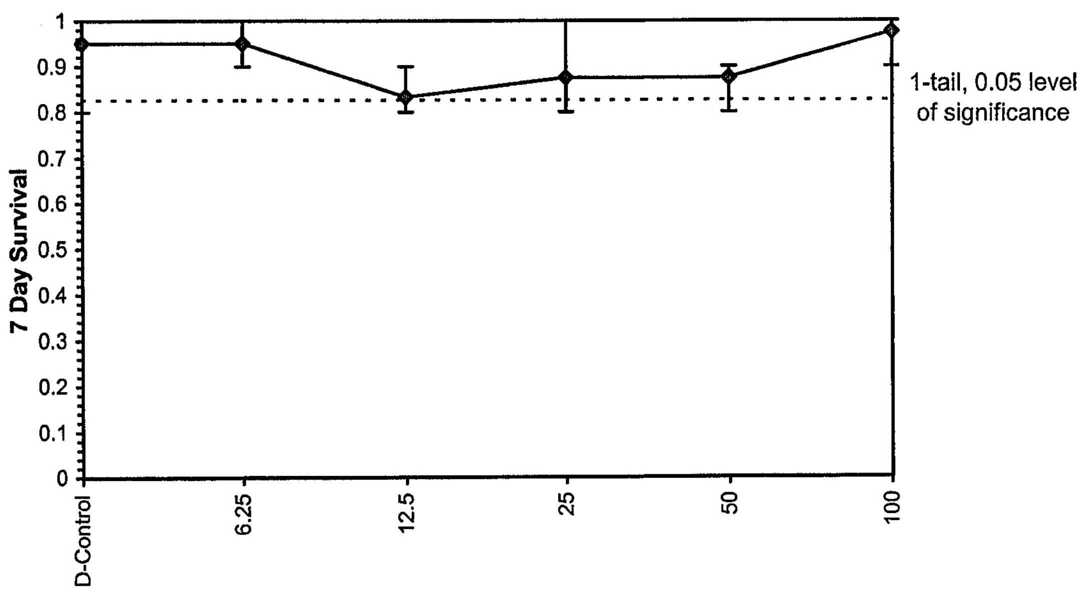
Start Date:	5/29/03	Test ID:	0305-23NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-17				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	0.8000	1.0000
6.25	0.9000	1.0000	1.0000	0.9000
12.5	0.9000	0.8000	0.8000	
25	0.9000	0.8000	0.8000	1.0000
50	0.9000	0.8000	0.9000	0.9000
100	1.0000	0.9000	1.0000	1.0000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4			
6.25	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4	0.067	2.567	0.2007
12.5	0.8333	0.8772	1.1544	1.1071	1.2490	7.096	3	2.147	2.567	0.2168
25	0.8750	0.9211	1.2188	1.1071	1.4120	11.906	4	1.496	2.567	0.2007
50	0.8750	0.9211	1.2136	1.1071	1.2490	5.846	4	1.563	2.567	0.2007
100	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	-0.454	2.567	0.2007

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.93134		0.881		-0.4464	0.0018
Bartlett's Test indicates equal variances (p = 0.74)					2.72477		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Bonferroni t Test	100	>100		1	0.12392	0.13103	0.0271	0.01223	0.10028	5, 17

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

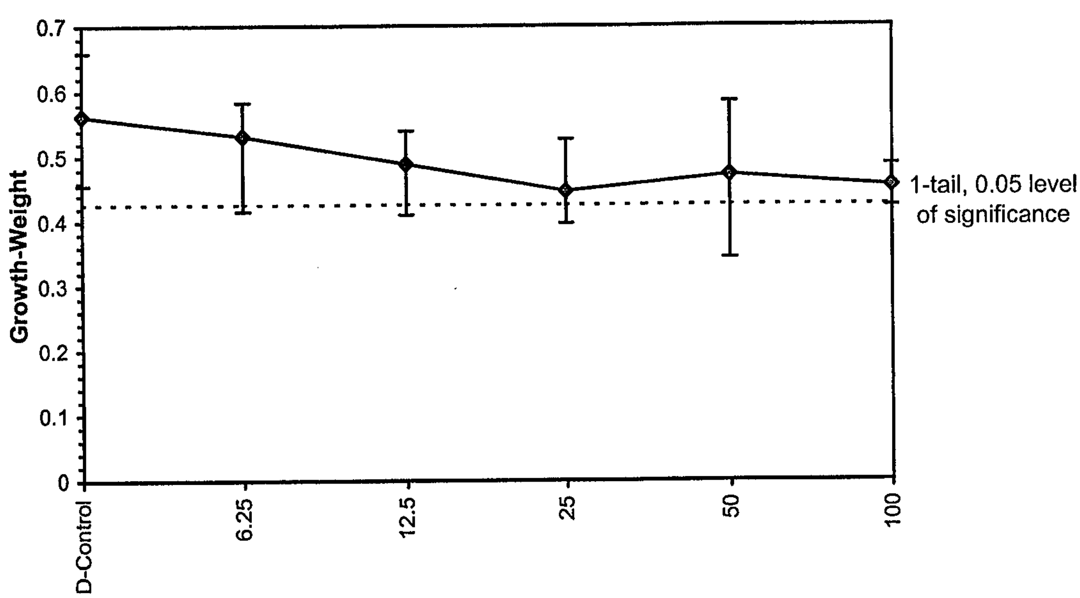
Start Date:	5/29/03	Test ID:	0305-23NW	Sample ID:	UNOCAL GW
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-17				

Conc-%	1	2	3	4
D-Control	0.6590	0.6190	0.4560	0.5170
6.25	0.4160	0.5650	0.5630	0.5840
12.5	0.5410	0.5160	0.4110	
25	0.3980	0.4270	0.4370	0.5280
50	0.5850	0.3440	0.5080	0.4500
100	0.4360	0.4710	0.4890	0.4240

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.5628	1.0000	0.5628	0.4560	0.6590	16.516	4			
6.25	0.5320	0.9454	0.5320	0.4160	0.5840	14.645	4	0.576	2.567	0.1369
12.5	0.4893	0.8695	0.4893	0.4110	0.5410	14.097	3	1.274	2.567	0.1479
25	0.4475	0.7952	0.4475	0.3980	0.5280	12.549	4	2.160	2.567	0.1369
50	0.4718	0.8383	0.4718	0.3440	0.5850	21.525	4	1.706	2.567	0.1369
100	0.4550	0.8085	0.4550	0.4240	0.4890	6.635	4	2.020	2.567	0.1369

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96341		0.881		-0.3615	-0.5262
Bartlett's Test indicates equal variances (p = 0.57)					3.85774		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Bonferroni t Test	100	>100		1	0.13695	0.24335	0.00829	0.00569	0.25529	5, 17

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #3 MW-17

Test No.: 0305-23NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	22	1	10	10	10	10	10	10	10	10		
	20	2	10	10	10	10	10	10	10	10		
	13	3	10	10	10	9	9	8	8	8		
	6	4	10	10	10	10	10	10	10	10		95%
6.25	12	1	10	10	10	10	10	10	9	9		
	11	2	10	10	10	10	10	10	10	10		
	17	3	10	10	10	10	10	10	10	10		
	19	4	10	9	9	9	9	9	9	9		95%
12.5	24	1	10	10	9	9	9	9	9	9		
	1	2	10	10	*2	2	2	2	2	2		
	14	3	10	10	9	8	8	8	8	8		
	15	4	10	9	9	9	9	9	8	8		
25	23	1	10	9	9	9	9	9	9	9		
	16	2	10	10	9	8	8	8	8	8		
	7	3	10	10	9	9	9	8	8	8		
	8	4	10	10	10	10	10	10	10	10		87.5%
50	21	1	10	10	9	9	9	9	9	9		
	2	2	10	10	9	8	8	8	8	8		
	5	3	10	10	9	9	9	9	9	9		
	4	4	10	10	9	9	9	9	9	9		87.5%
100	9	1	10	10	10	10	10	10	10	10		
	3	2	10	10	10	10	9	9	9	9		
	18	3	10	10	10	10	10	10	10	10		
	10	4	10	10	10	10	10	10	10	10		97.5%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			SM	SM	m	SM	SM	SM	NF	ET		

Feeding Times: 0 2000 1 0730/1815 2 0800/~~1800~~ 1300 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Comments: * CUP #1 SPILLED ON DAY 2 Lost 8 fish

Analysts: SM, m NF

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #3 MW-17

Species: *P. promelas*

Test No: 0305-23NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	22	1	.04343	.05002		10		
	20	2	.04361	.04980		10		
	13	3	.04289	.04745		8		
	6	4	.04270	.04787		10		
6.25	12	1	.04197	.04613		9		
	11	2	.04288	.04853		10		
	17	3	.04431	.04994		10		
	19	4	.04232	.04816		9		
12.5	24	1	.04402	.04943		9		
	1	2	.04177	.04380		2		
	14	3	.04282	.04798		8		
	15	4	.04237	.04648		8		
25	23	1	.04458	.04856		9		
	16	2	.04374	.04801		8		
	7	3	.04309	.04746		8		
	8	4	.04320	.04848		10		
50	21	1	.04404	.04989		9		
	2	2	.04116	.04460		8		
	5	3	.04366	.04874		9		
	4	4	.04384	.04834		9		
100	9	1	.04232	.04668		10		
	3	2	.04089	.04560		9		
	18	3	.04385	.04874		10		
	10	4	.04208	.04632		10		
		1						
		2						
		3						
		4						

Tare: MM
Total: SM

Date/Time in: 6/5/03 11:45
Date/Time out: 6/6/03 1400
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-24NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-103R				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
6.25	0.9000	1.0000	0.8000	1.0000
12.5	1.0000	0.9000	1.0000	0.9000
25	0.9000	1.0000	1.0000	1.0000
50	0.7000	1.0000	0.8000	1.0000
100	0.7000	0.9000	0.9000	0.9000

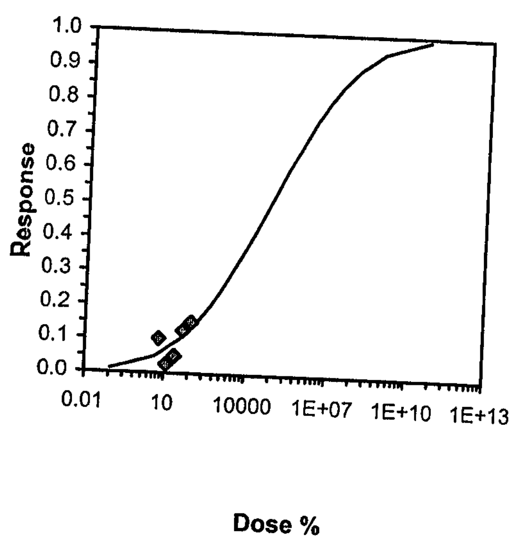
			Transform: Arcsin Square Root								
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Rank Sum	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
6.25	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00	4	40
12.5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
25	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
50	0.8750	0.8750	1.2306	0.9912	1.4120	17.454	4	14.00	10.00	5	40
*100	0.8500	0.8500	1.1846	0.9912	1.2490	10.885	4	10.00	10.00	6	40

Auxiliary Tests						Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)						0.95397	0.884	-0.385	-0.1774
Equality of variance cannot be confirmed									
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU					
Steel's Many-One Rank Test	50	100	70.7107	2					

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.40023	0.29974	-0.1873	0.98773	0	3.74184	7.81472	0.29	4.79626	2.49855	3
Intercept	3.08038	0.45954	2.17968	3.98108							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	0.09633	
EC05	3.355	4.85862	
EC10	3.718	39.2863	
EC15	3.964	160.946	
EC20	4.158	493.661	
EC25	4.326	1291.27	
EC40	4.747	14563.4	
EC50	5.000	62554.9	
EC60	5.253	268697	
EC75	5.674	3030455	
EC80	5.842	7926732	
EC85	6.036	2.4E+07	
EC90	6.282	1E+08	
EC95	6.645	8.1E+08	
EC99	7.326	4.1E+10	



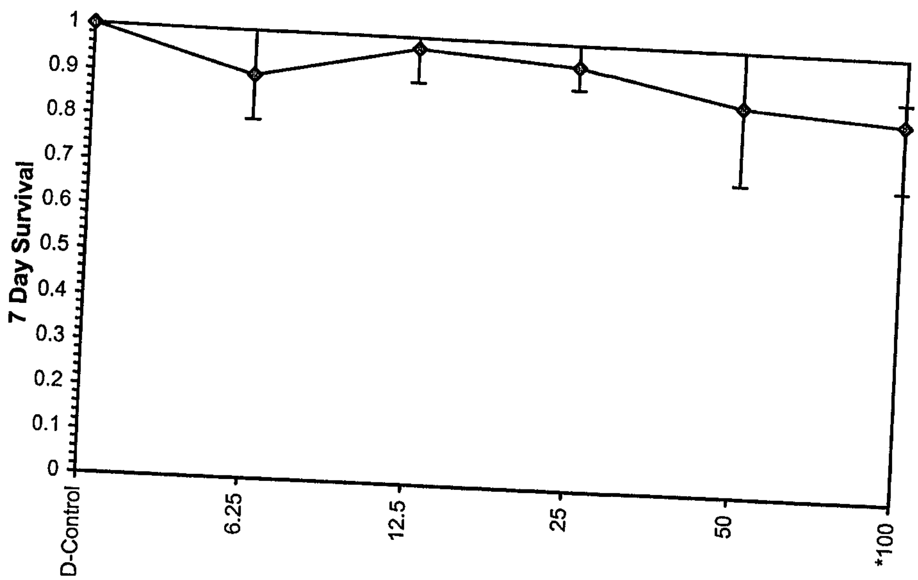
ToxCalc v5.0.23

Reviewed by: KS

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-24NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-103R				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-24NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-103R				

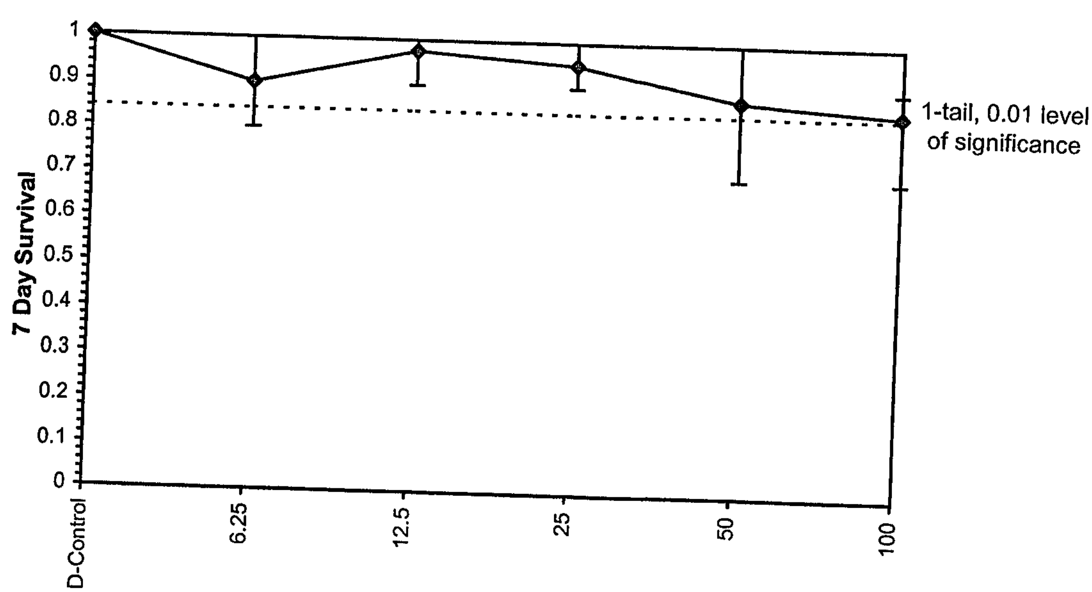
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
6.25	0.9000	1.0000	0.8000	0.9000
12.5	1.0000	0.9000	1.0000	1.0000
25	0.9000	1.0000	1.0000	0.9000
50	0.7000	1.0000	0.8000	1.0000
100	0.7000	0.9000	0.9000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			
6.25	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	1.784	3.210	0.2838
12.5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	0.461	3.210	0.2838
25	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	0.922	3.210	0.2838
50	0.8750	0.8750	1.2306	0.9912	1.4120	17.454	4	2.052	3.210	0.2838
100	0.8500	0.8500	1.1846	0.9912	1.2490	10.885	4	2.573	3.210	0.2838

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95397	0.884	-0.385	-0.1774
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.01)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.1584	0.16246	0.03099	0.01563	0.13015	5, 18

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KJ

Larval Fish Growth and Survival Test-Growth-Weight

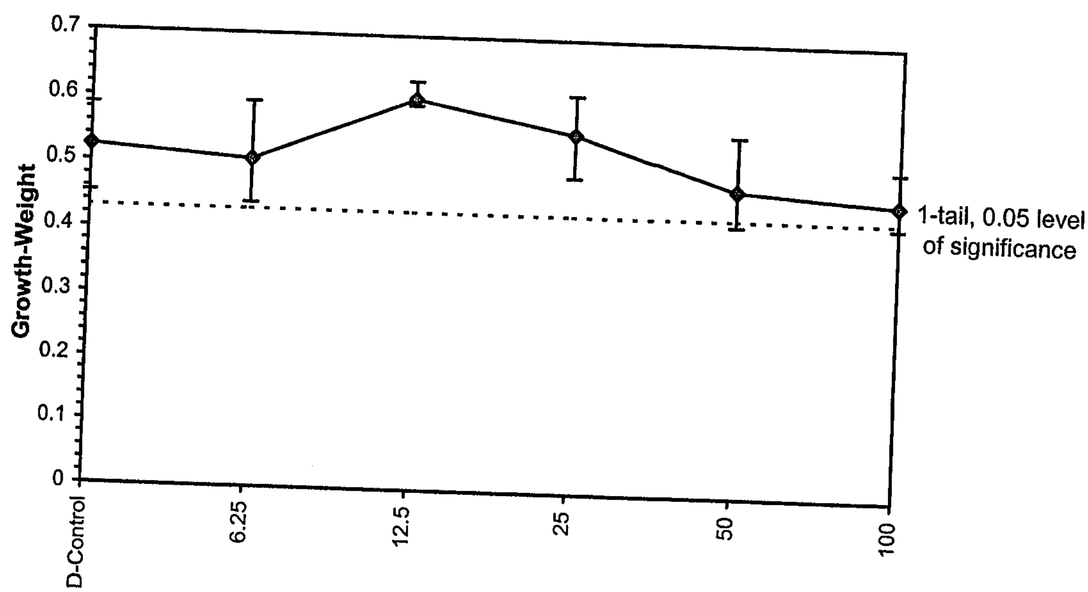
Start Date:	5/29/03	Test ID:	0305-24NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-103R				

Conc-%	1	2	3	4
D-Control	0.5870	0.4530	0.4950	0.5560
6.25	0.5310	0.5940	0.4400	0.4570
12.5	0.5930	0.5950	0.6300	0.5930
25	0.4900	0.6150	0.5950	0.5200
50	0.4220	0.5570	0.4520	0.4720
100	0.4240	0.4580	0.5090	0.4450

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.5228	1.0000	0.5228	0.4530	0.5870	11.514	4			
6.25	0.5055	0.9670	0.5055	0.4400	0.5940	14.046	4	0.456	2.410	0.0913
12.5	0.6028	1.1530	0.6028	0.5930	0.6300	3.018	4	-2.113	2.410	0.0913
25	0.5550	1.0617	0.5550	0.4900	0.6150	10.735	4	-0.852	2.410	0.0913
50	0.4758	0.9101	0.4758	0.4220	0.5570	12.177	4	1.241	2.410	0.0913
100	0.4590	0.8780	0.4590	0.4240	0.5090	7.877	4	1.683	2.410	0.0913

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95265		0.884		0.30478	-0.928
Bartlett's Test indicates equal variances (p = 0.45)					4.71972		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.09127	0.17459	0.01118	0.00287	0.01437	5, 18

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KB

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #4 MW-103R

Test No.: 0305-24NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	10	1	10	10	10	10	10	10	10	10		
	24	2	10	10	10	10	10	10	10	10		
	21	3	10	10	10	10	10	10	10	10		
	14	4	10	10	10	10	10	10	10	10		100%
6.25	13	1	10	10	10	9 (10 SM)	9	9	9	9		
	23	2	10	10	10	10	10	10	10	10		
	15	3	10	9	9	9	8	8	8	8		
	18	4	10	10	10	10	10	10	9	9		90%
12.5	8	1	10	10	10	10	10	10	10	10		
	4	2	10	10	10	10	10	9	9	9		
	12	3	10	10	10	10	10	10	10	10		
	11	4	10	10	10	10	10	10	10	10		97.5%
25	22	1	10	10	10	10	10	10	9	9		
	9	2	10	10	10	10	10	10	10	10		
	20	3	10	10	10	10	10	10	10	10		
	17	4	10	10	10	9	9	9	9	9		95%
50	16	1	10	9	7	7	7	7	7	7		
	1	2	10	10	10	10	10	10	10	10		
	3	3	10	10	9	9	9	8	8	8		
	7	4	10	10	10	10	10	10	10	10		87.5%
100	6	1	10	10	8	8	7	7	7	7		
	19	2	10	10	9	9	9	9	9	9		
	2	3	10	10	10	10	9	9	9	9		
	5	4	10	10	10	10	9	9	9	9		85%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			SM	SM	MM	SM	SM	SM	Lt	mm		

Feeding Times: 0 2000 1 0730/1815 2 0800/1830 3 0830/1730 4 0730/1600 5 0730/1730 6 0730/1730

Comments:

Analysts: SM mm

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #4 MW-103R

Species: *P. promelas*

Test No: 0305-24NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	10	1	.03799	.04386		10		
	24	2	.04321	.04774		10		
	21	3	.04267	.04762		10		
	14	4	.04367	.04923		10		
6.25	13	1	.04240	.04771		9		
	23	2	.04383	.04977		10		
	15	3	.04565	.05005		8		
	18	4	.04314	.04771		9		
12.5	8	1	.04150	.04743		10		
	4	2	.04291 ~~.04347~~	.04886		9		
	12	3	.04380	.05010		10		
	11	4	.04224	.04817		10		
25	22	1	.04364	.04854		9		
	9	2	.04227	.04842		10		
	20	3	.04196	.04791		10		
	17	4	.04361	.04881		9		
50	16	1	.04117	.04539		7		
	1	2	.04348	.04905		10		
	3	3	.04236	.04688		8		
	7	4	.04317	.04789		10		
100	6	1	.04348	.04772		7		
	19	2	.04402	.04860		9		
	2	3	.04317	.04826		9		
	5	4	.04322	.04767		9		
		1						
		2						
		3						
		4						

Tare: mr
Total: SM

Date/Time in: 6/5/03 1400
Date/Time out: 6/5/03 1600
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-25NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa)	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-129				

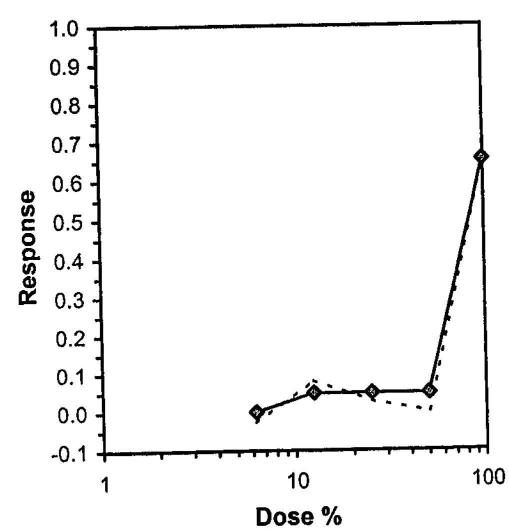
Conc-%	1	2	3	4
D-Control	1.0000	0.9000	0.9000	0.9000
6.25	0.9000	1.0000	0.9000	1.0000
12.5	0.9000	0.9000	0.9000	0.7000
25	0.8000	0.9000	0.9000	1.0000
50	1.0000	0.8000	1.0000	0.9000
100	0.5000	0.2000	0.5000	0.1000

			Transform: Arcsin Square Root						1-Tailed		Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	0.9250	1.0000	1.2898	1.2490	1.4120	6.318	4				3	40
6.25	0.9500	1.0270	1.3305	1.2490	1.4120	7.072	4	-0.401	2.410	0.2450	2	40
12.5	0.8500	0.9189	1.1846	0.9912	1.2490	10.885	4	1.035	2.410	0.2450	6	40
25	0.9000	0.9730	1.2543	1.1071	1.4120	9.935	4	0.349	2.410	0.2450	4	40
50	0.9250	1.0000	1.2951	1.1071	1.4120	11.347	4	-0.052	2.410	0.2450	3	40
*100	0.3250	0.3514	0.5890	0.3218	0.7854	39.727	4	6.893	2.410	0.2450	27	40

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96452		0.884		-0.3121	-0.6514
Bartlett's Test indicates equal variances (p = 0.56)					3.89951		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	0.17517	0.18976	0.31968	0.02067	5.7E-06	5, 18

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%			
Auto-34.7%	83.876	73.627	95.550



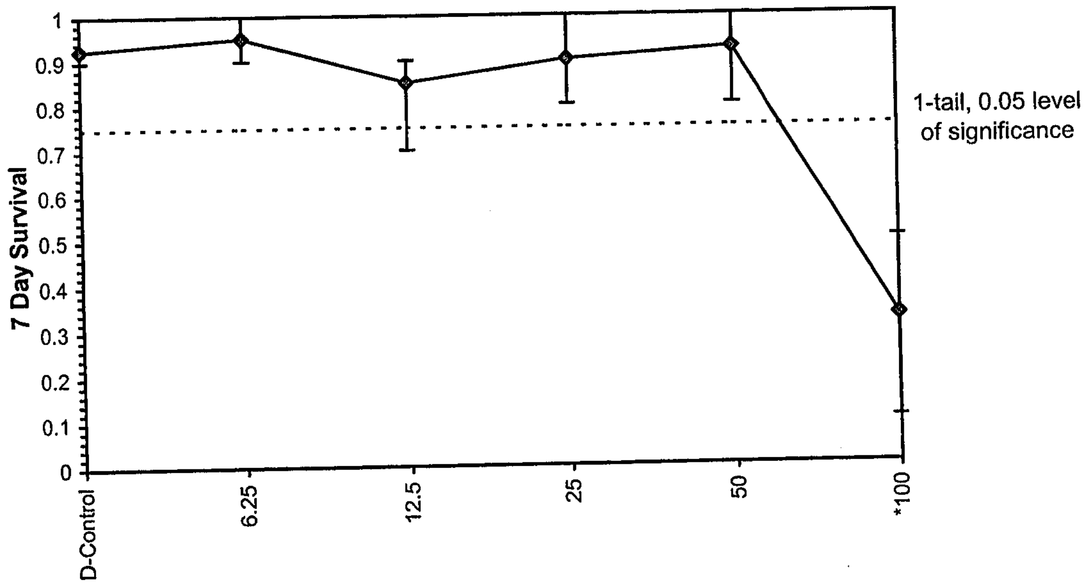
ToxCalc v5.0.23

Reviewed by: [signature]

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-25NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-129				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-25NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-129				

Conc-%	1	2	3	4
D-Control	0.6220	0.5640	0.6110	0.5300
6.25	0.5900	0.5860	0.5190	0.5310
12.5	0.5720	0.6940	0.5570	0.5600
25	0.5060	0.5000	0.5620	0.4910
50	0.4340	0.4320	0.3910	0.3590
100	0.0580	0.0310	0.1670	0.0050

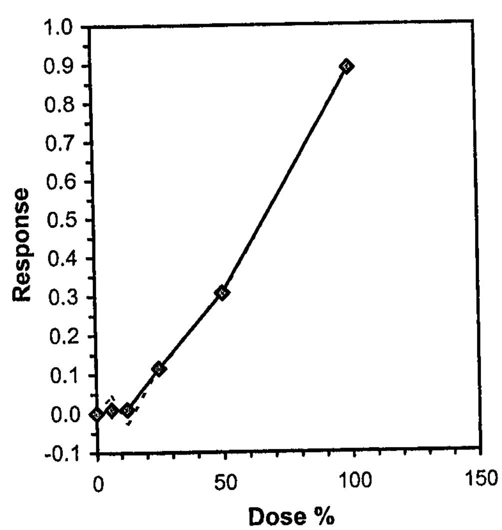
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5818	1.0000	0.5818	0.5300	0.6220	7.339	4				0.5818	1.0000
6.25	0.5565	0.9566	0.5565	0.5190	0.5900	6.602	4	0.717	2.410	0.0849	0.5761	0.9903
12.5	0.5958	1.0241	0.5958	0.5570	0.6940	11.048	4	-0.397	2.410	0.0849	0.5761	0.9903
25	0.5148	0.8848	0.5148	0.4910	0.5620	6.236	4	1.902	2.410	0.0849	0.5148	0.8848
*50	0.4040	0.6945	0.4040	0.3590	0.4340	8.899	4	5.045	2.410	0.0849	0.4040	0.6945
*100	0.0653	0.1122	0.0653	0.0050	0.1670	109.120	4	14.659	2.410	0.0849	0.0653	0.1122

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90471	0.884	0.89105	0.2301
Bartlett's Test indicates equal variances (p = 0.68)	3.1348	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	25	50	35.3553	4	0.08491	0.14596	0.16338	0.00248	6.2E-11	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	17.279	5.191	0.000	24.970	-0.9005
IC10	23.203	3.854	11.038	33.890	-0.5340
IC15	29.574	3.718	18.268	40.446	0.0548
IC20	36.140	3.652	24.673	45.671	0.0112
IC25	42.706	3.699	31.019	53.063	0.1592
IC40	58.111	2.520	48.486	64.944	-0.1397
IC50	66.697	2.470	57.783	75.352	0.1885



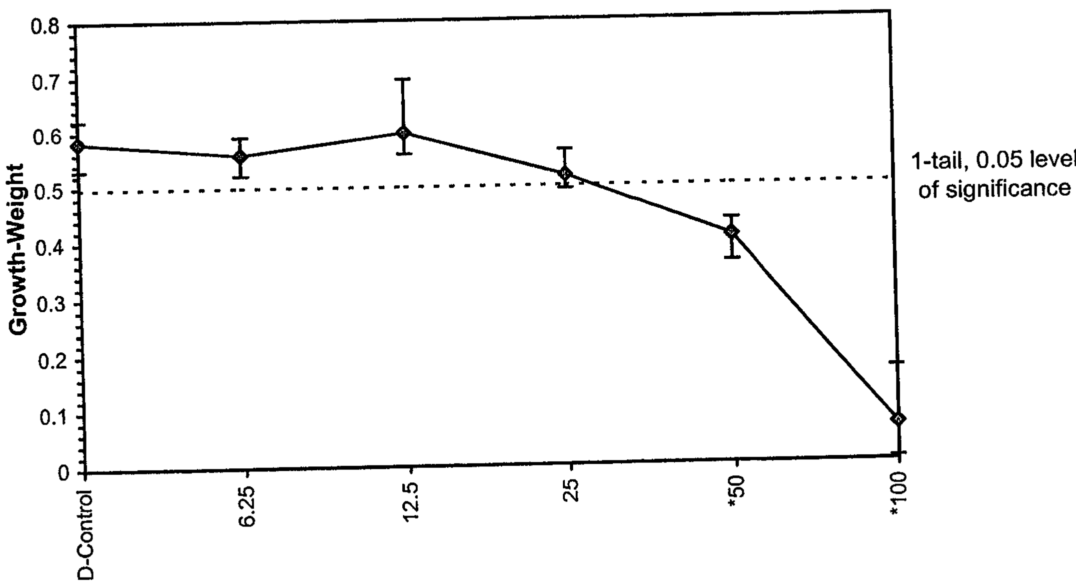
ToxCalc v5.0.23

Reviewed by: KB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-25NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa)	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-129				

Dose-Response Plot



Reviewed by: [signature]

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Test No.: 0305-25NW

% Conc.	Cont.	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Percent Survival	Average Survival
CON	24	1	10	10	10	10	10	10	10	10		
	17	2	10	10	10	10	10	9	9	9		
	3	3	10	9	9	9	9	9	9	9		
	9	4	10	10	10	10	10	9	9	9		92.5%
6.25	21	1	10	9	9	9	9	9	9	9		
	2	2	10	10	10	10	10	10	10	10		
	7	3	10	10	10	10	9	9	9	9		
	18	4	10	10	10	10	10	10	10	10		95%
12.5	1	1	10	10	9	9	9	9	9	9		
	19	2	10	9	9	9	9	9	9	9		
	8	3	10	10	10	9	9	9	9	9		
	4	4	10	9	9	8	8	8	8	7		85%
25	12	1	10	10	10	10	9	9	8	8		
	14	2	10	9	9	9	9	9	9	9		
	20	3	10	9	9	9	9	9	9	9		
	5	4	10	10	10	10	10	10	10	10		90%
50	11	1	10	10	10	10	10	10	10	10		
	13	2	10	10	10	9	8	8	8	8		
	23	3	10	10	10	10	10	10	10	10		
	22	4	10	10	9	9	9	9	9	9		92.5%
100	16	1	10	10	8	5	5	5	5	5		
	10	2	10	9	6	2	2	2	2	2		
	6	3	10	10	9	5	5	5	5	5		
	15	4	10	8	5	2	2	2	1	1		32.5%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			SM	SM	KJ	SM	SM	SM	MF	ET		

Feeding Times: 0 2000; 1 0730 / 1815; 2 0800 / 1830; 3 ~~0730~~ 0830 SM / 1730; 4 0730 / 1600; 5 0730 / 1730; 6 0730 / 1730

Analysts: SM, KJ MF

Comments:

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #5 MW-129

Species: *P. promelas*

Test No: 0305-25NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	24	1	0.04459	.05081		10		
	17	2	0.04266	.04830		9		
	3	3	0.04296	.04907		9		
	9	4	0.04216	.04746		9		
6.25	21	1	0.04223	.04813		9		
	2	2	0.04495	.05081		10		
	7	3	0.04476	.04995		9		
	18	4	0.04285	.04816		10		
12.5	1	1	0.04443	.05015		9		
	19	2	0.04310	.05004		9		
	8	3	0.04233	.04790		9		
	4	4	0.04307	~~.049~~ .04867		7		
25	12	1	0.04380	.04886		8		
	14	2	0.04348	.04848		9		
	20	3	0.04296	.04858		9		
	5	4	0.04271	.04762		10		
50	11	1	0.04308	.04742		10		
	13	2	0.04288	.04720		8		
	23	3	0.04315	.04706		10		
	22	4	0.04496	.04855		9		
100	16	1	0.04268	.04326		5		
	10	2	0.04369	.04400		2		
	6	3	0.04293	.04460		5		
	15	4	0.04448	~~.04403~~ Sm .04453		1		
		1						
		2						
		3						
		4						

Tare: Sm
Total: Sm

Date/Time in: 6/5/03 1430
Date/Time out: 6/5/03 1630
Oven temp. (°C): 100

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-26NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-W				

Conc-%	1	2	3	4
D-Control	0.9000	1.0000	1.0000	1.0000
6.25	1.0000	0.9000	0.9000	0.7000
12.5	1.0000	0.9000	0.8000	1.0000
25	1.0000	1.0000	0.8000	0.9000
50	0.9000	1.0000	0.9000	0.9000
100	0.6000	0.8000	0.6000	0.8000

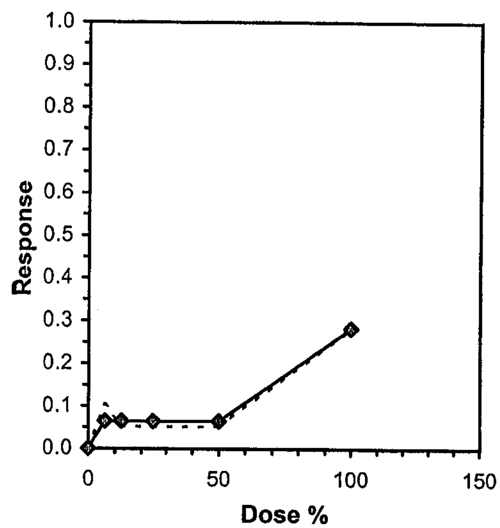
			Transform: Arcsin Square Root						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4				0.9750	1.0000
6.25	0.8750	0.8974	1.2253	0.9912	1.4120	14.199	4	1.575	2.410	0.2233	0.9125	0.9359
12.5	0.9250	0.9487	1.2951	1.1071	1.4120	11.347	4	0.823	2.410	0.2233	0.9125	0.9359
25	0.9250	0.9487	1.2951	1.1071	1.4120	11.347	4	0.823	2.410	0.2233	0.9125	0.9359
50	0.9250	0.9487	1.2898	1.2490	1.4120	6.318	4	0.879	2.410	0.2233	0.9125	0.9359
*100	0.7000	0.7179	0.9966	0.8861	1.1071	12.807	4	4.043	2.410	0.2233	0.7000	0.7179

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.93704		0.884		-0.407	-0.7673
Bartlett's Test indicates equal variances (p = 0.78)					2.46392		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	0.1291	0.13438	0.06804	0.01717	0.01342	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	4.875	20.029	1.519	88.420	1.2001
IC10	58.235	18.498	0.000	80.279	-1.5990
IC15	69.706				
IC20	81.176				
IC25	92.647				
IC40	>100				
IC50	>100				

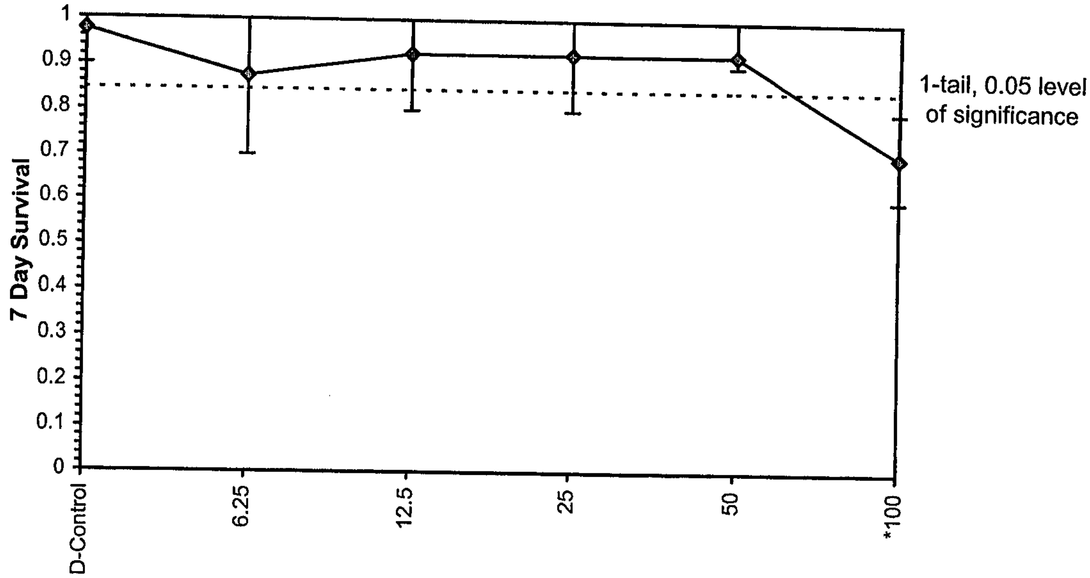
* indicates IC estimate less than the lowest concentration



Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	0305-26NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-W				

Dose-Response Plot



Reviewed by: JB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-26NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-W				

Conc-%	1	2	3	4
D-Control	0.5390	0.5600	0.5980	0.6090
6.25	0.5200	0.5990	0.5220	0.4810
12.5	0.5420	0.5480	0.4340	0.5250
25	0.5480	0.4750	0.4850	0.5470
50	0.4390	0.4340	0.5260	0.4660
100	0.2800	0.3570	0.2740	0.2980

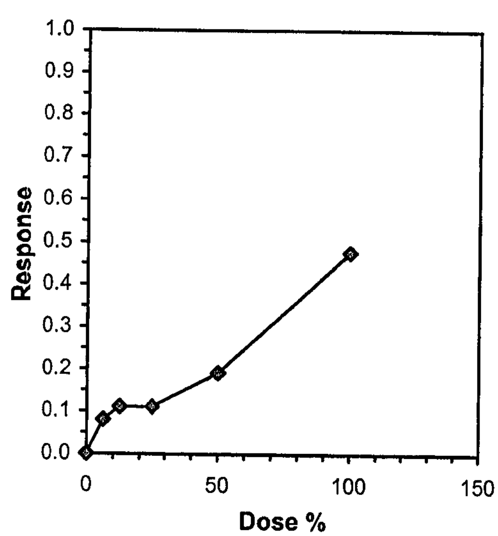
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5765	1.0000	0.5765	0.5390	0.6090	5.663	4				0.5765	1.0000
6.25	0.5305	0.9202	0.5305	0.4810	0.5990	9.314	4	1.514	2.410	0.0732	0.5305	0.9202
12.5	0.5123	0.8886	0.5123	0.4340	0.5480	10.360	4	2.114	2.410	0.0732	0.5130	0.8899
25	0.5138	0.8912	0.5138	0.4750	0.5480	7.628	4	2.065	2.410	0.0732	0.5130	0.8899
*50	0.4663	0.8088	0.4663	0.4340	0.5260	9.060	4	3.628	2.410	0.0732	0.4663	0.8088
*100	0.3023	0.5243	0.3023	0.2740	0.3570	12.539	4	9.026	2.410	0.0732	0.3023	0.5243

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96723		0.884		0.05643	-0.7007
Bartlett's Test indicates equal variances (p = 0.97)					0.8458		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	25	50	35.3553	4	0.07323	0.12703	0.0366	0.00185	9.5E-07	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	3.916	4.623	1.246	38.143	3.2088
IC10	10.411	11.230	0.944	55.547	0.9192
IC15	37.286	12.329	0.000	65.301	-0.3320
IC20	51.540	7.621	25.746	68.162	-0.8917
IC25	60.328	5.486	41.096	75.387	-0.2482
IC40	86.692				
IC50	>100				

* indicates IC estimate less than the lowest concentration



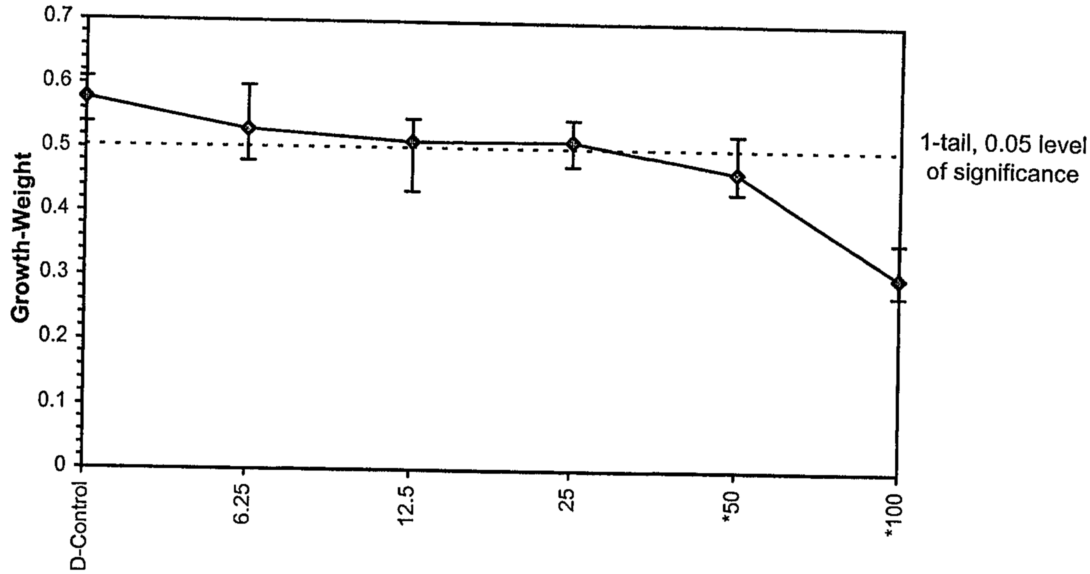
ToxCalc v5.0.23

Reviewed by: [signature]

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	0305-26NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	MW-W				

Dose-Response Plot



ToxCalc v5.0.23

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AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fathead Minnow
(*Pimephales promelas*)
Larval Survival and Growth Test

Client Name: Unocal

Test Date: 5/29/03

Sample ID: #6 MW-W

Test No.: 0305-26NW

% Conc.	Cont.	Rep.	Days 0	1	2	3	4	5	6	7	Percent Survival	Average Survival
CON	20	1	10	~~10~~ 9	9	9	9	9	9	9		
	2	2	10	10	10	10	10	10	10	10		
	13	3	10	10	10	10	10	10	10	10		
	14	4	10	10	10	10	10	10	10	10		97.5%
6.25	11	1	10	10	10	10	10	10	10	10		
	22	2	10	10	10	10	10	10	9	9		
	16	3	10	10	10	10	9	9	9	9		
	7	4	10	9	9	9	7	7	7	7		87.5%
12.5	23	1	10	10	10	10	10	10	10	10		
	1	2	10	10	10	10	9	9	~~8~~ 9	9		
	8	3	10	10	10	9	9	9	8	8		
	15	4	10	10	10	10	10	10	10	10		92.5%
25	12	1	10	10	10	10	10	10	10	10		
	19	2	10	10	10	10	10	10	10	10		
	21	3	10	10	10	10	8	8	8	8		
	3	4	10	10	10	9	9	9	9	9		92.5%
50	10	1	10	10	10	9	9	9	9	9		
	18	2	10	10	10	10	10	10	10	10		
	5	3	10	10	10	9	9	9	9	9		
	6	4	10	10	10	10	10	9	9	9		92.5%
100	4	1	10	10	10	9	8	7	7	6		
	24	2	10	10	10	9	9	8	8	8		
	17	3	10	9	7	6	6	6	6	6		
	9	4	10	10	9	9	9	9	9	8		70%
		1										
		2										
		3										
		4										
		1										
		2										
		3										
		4										
Tech Initials			SM	SM	KB	SM	LT	SM	NF	[illegible]		

Feeding Times: 0 2000 1 0730 / 1815 2 0800 / 1300 3 0830 / 1730 4 0730 / 1600 5 0730 / 1730 6 0730 / 1730

Comments: __________

Analysts: SM, [illegible]

AMEC Earth & Environmental
Northwest Bioassay Lab
5009 Pacific Hwy. E., Suite 2
Fife, WA 98424

Raw Data Sheet
Fish Weights
Seven Day Chronic Bioassay

Client: Unocal

Test Date: 5/29/03

Sample ID: #6 MW-W

Species: *P. promelas*

Test No: 0305-26NW

% Conc.	cont #	rep #	pan wt. (gm)	pan + fish (gm)	fish wt. (mg)	# fish	avg. per fish (mg)	avg. per conc. (mg)
CON	20	1	0.04164	.04703		9		
	2	2	0.04359	.04919		10		
	13	3	0.04186	.04784		10		
	14	4	0.04230	.04839		10		
6.25	11	1	0.04202	.04722		10		
	22	2	0.04556	.05155		9		
	16	3	0.04416	.04938		9		
	7	4	0.04414	.04895		7		
12.5	23	1	0.04402	.04944		10		
	1	2	0.04378	.04926		9		
	8	3	0.04420	.04854		8		
	15	4	0.04375	.04900		10		
25	12	1	0.04423	.04971		10		
	19	2	0.04611	.05086		10		
	21	3	0.04117	.04602		8		
	3	4	0.04250	.04797		9		
50	10	1	0.04408	.04847		9		
	18	2	0.04616	.05050		10		
	5	3	0.04121	.04647		9		
	6	4	0.04364	.04830		9		
100	4	1	0.04348	.04628		6		
	24	2	0.04453	.04810		8		
	17	3	0.04640	.04914		6		
	9	4	0.04377	.04675		8		
		1						
		2						
		3						
		4						

Tare: SM
Total: SM

Date/Time in: 6/5/03 ~~1530~~ KS 1600
Date/Time out: 6/6/03 1830
Oven temp. (°C): 100

Ceriodaphnia dubia

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

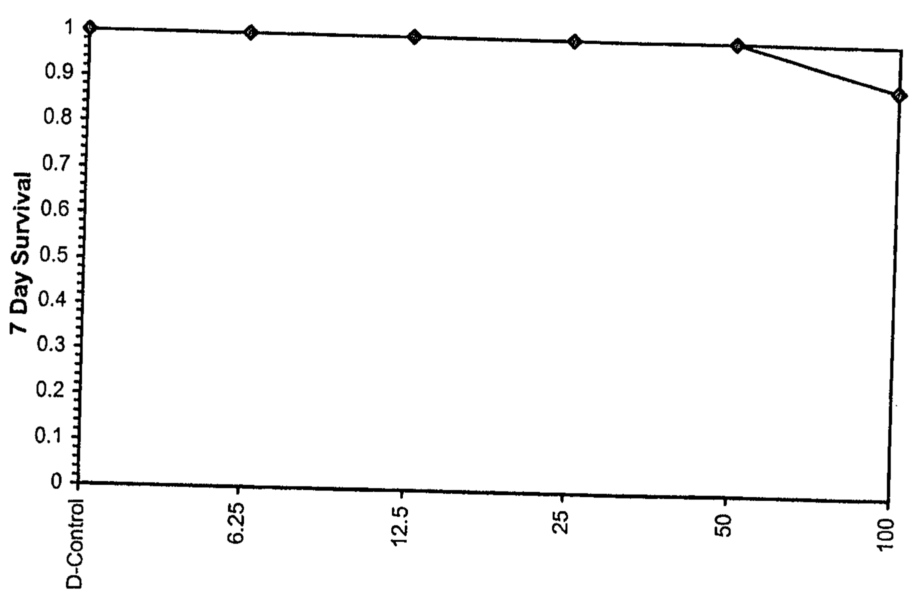
Start Date:	5/29/03	Test ID:	0305-15NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-146				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000					
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
6.25	1.0000	1.0000	0	10	10	10		
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500
100	0.9000	0.9000	1	9	10	10	0.5000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-15NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-146 Day 6				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	17.000	29.000	20.000	21.000	16.000	20.000	17.000	22.000	25.000	16.000
6.25	24.000	20.000	24.000	24.000	19.000	23.000	14.000	22.000	19.000	21.000
12.5	20.000	26.000	24.000	22.000	17.000	20.000	22.000	19.000	23.000	20.000
25	16.000	19.000	21.000	25.000	19.000	13.000	20.000	17.000	24.000	29.000
50	9.000	14.000	12.000	18.000	13.000	14.000	19.000	14.000	20.000	16.000
100	3.000	1.000	2.000	2.000	1.000	0.000	0.000	2.000	0.000	2.000

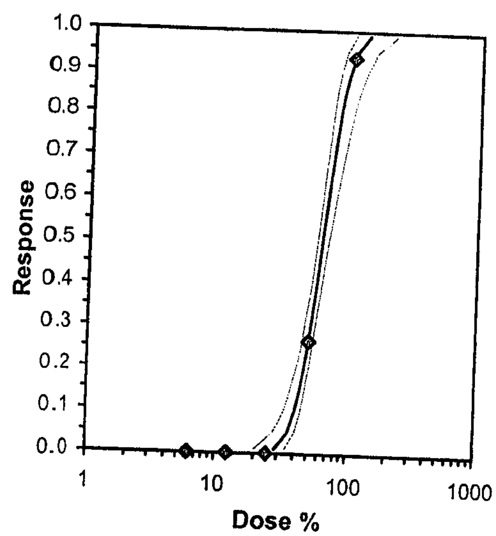
			Transform: Untransformed								
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Rank Sum	1-Tailed Critical	Mean	N-Mean
D-Control	20.300	1.0000	20.300	16.000	29.000	20.777	10			20.300	0.0000
6.25	21.000	1.0345	21.000	14.000	24.000	15.058	10	114.00	75.00	21.000	-0.0345
12.5	21.300	1.0493	21.300	17.000	26.000	12.332	10	117.00	75.00	21.300	-0.0493
25	20.300	1.0000	20.300	13.000	29.000	23.111	10	104.50	75.00	20.300	0.0000
*50	14.900	0.7340	14.900	9.000	20.000	22.693	10	69.00	75.00	14.900	0.2660
*100	1.300	0.0640	1.300	0.000	3.000	81.488	10	55.00	75.00	1.300	0.9360

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.76946	1.035	0.30405	0.68251
Bartlett's Test indicates unequal variances (p = 5.40E-03)					16.5659	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	25	50	35.3553	4				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.13752	1.28472	4.61947	9.65557	0	1.76255	7.81472	0.62	1.78659	0.1401	3
Intercept	-7.7518	2.23523	-12.133	-3.3708							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	28.8838	20.1268	34.5923
EC05	3.355	35.9861	28.0743	40.9782
EC10	3.718	40.4609	33.4153	44.9975
EC15	3.964	43.7903	37.4772	48.0635
EC20	4.158	46.6307	40.9394	50.7912
EC25	4.326	49.2139	44.0281	53.4182
EC40	4.747	56.3757	51.8547	61.8607
EC50	5.000	61.1768	56.3379	68.6253
EC60	5.253	66.3868	60.6841	76.7877
EC75	5.674	76.0477	67.9567	93.5227
EC80	5.842	80.2605	70.9419	101.33
EC85	6.036	85.4665	74.5281	111.344
EC90	6.282	92.4992	79.2319	125.469
EC95	6.645	104.001	86.6575	149.934
EC99	7.326	129.574	102.307	209.85



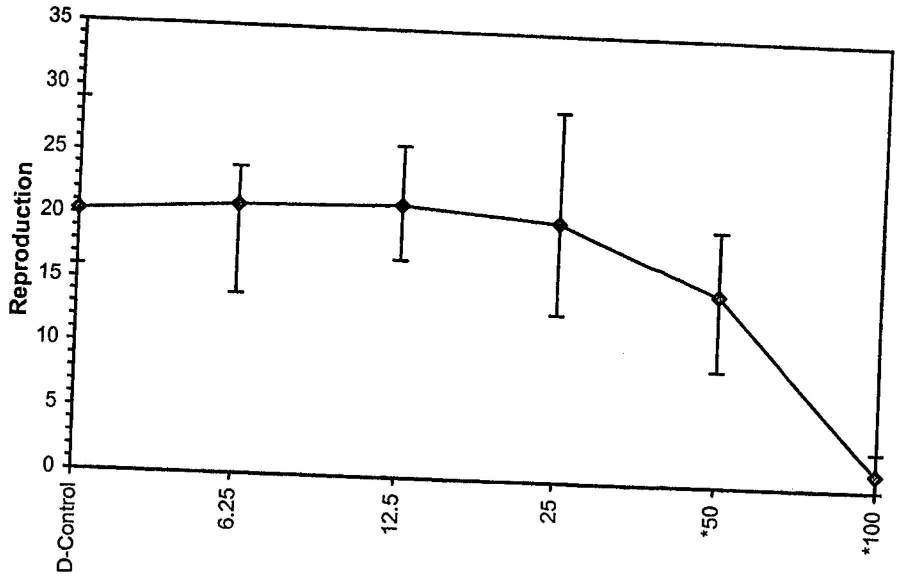
ToxCalc v5.0.23

Reviewed by: [illegible]

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-15NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-146				

Dose-Response Plot



Reviewed by: [illegible]

Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #1 MW-146
Test Number: 0305-15NW
Start Date and Time: 5/29/03 1430
Stop Date and Time: 6/5/03 1530

day6 day7

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	
CON	1	45			4	2	11		12		17	29
	2	42			6		10	13			29	
	3	21			4		8	8	12		20	32
	4	48			4	7		10	14		NP ~~23~~ 21	~~37~~ 35
	5	49			4		6	6	10		16	26
	6	52			4	5	11		12		20	32
	7	50			3	5	9		13		17	30
	8	46			4	7		11	16		22	38
	9	8			6		8	11	14		25	39
	10	37			3	4		9	13		16	29
Analyst		mw	mw	ML	MF	KB	Et	Et	mw			

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	
25	1	43				7		9	12		16	28
	2	11			4	6		9	10		19	29
	3	22			4	7		10	14		21	35
	4	47			4		9	12	12		25	37
	5	3			4	9	6		13		19	32
	6	28			2	5	6		9		13	22
	7	30			NP 4		6	10	13		20	33
	8	60			2	8	7		13		17	30
	9	7				6	8	10			24	
	10	14				5	10	14	16		29	45

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	
6.25	1	1			4		9	11	14		24	38
	2	25			4	7	9		17		20	37
	3	59			4		10	10	15		24	39
	4	56			4		7	13	17		24	41
	5	16			3		7	9	14		19	33
	6	5			4		8	11	13		23	36
	7	17			4	8	2		14		14	28
	8	18			3	8		11	15		22	37
	9	53			3	7	9		14		19	33
	10	39			3	7		11	16		21	37

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	
50	1	44				4		5	11		9	20
	2	36					6	8	5		14	19
	3	4				6		6	9		12	21
	4	51				2	7	9	9		18	27
	5	31					6	7			13	
	6	38			2		4	8	9		14	23
	7	9				2	6	11	7		19	26
	8	26				4		10	9		14	23
	9	57				4	6	10	8		20	28
	10	2					7	9	8		16	24

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	
12.5	1	33			4		7	9	11		20	31
	2	15			4	9		13	18		26	44
	3	13			4	9		11	15		24	39
	4	12			2		7	13	14		22	36
	5	24			1	7		9	16		17	33
	6	27			4		8	8	14		20	34
	7	35			4		6	12	14		22	~~34~~ 36
	8	19			4		7	8	14		19	33
	9	58				4	8	11	13		23	36
	10	55			4	7		9	15		20	35

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
100	1	20						3			3
	2	34						1			1
	3	41					2				2
	4	54						2			2
	5	10					1				1
	6	23						X			X
	7	6									
	8	32						2			2
	9	29									
	10	40					2				2

Comments: ______________________

AMEC Earth and Environmental
Northwest Bioassay Lab

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

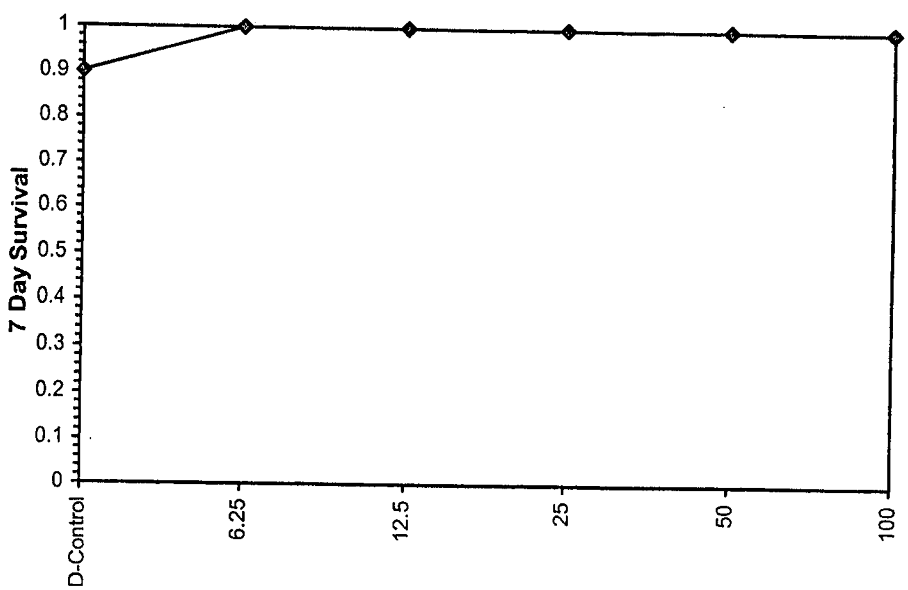
Start Date:	5/29/03	Test ID:	0305-16NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-7				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	0.9000	1.0000	1	9	10	10		
6.25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
12.5	1.0000	1.1111	0	10	10	10	0.5000	0.0500
25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
50	1.0000	1.1111	0	10	10	10	0.5000	0.0500
100	1.0000	1.1111	0	10	10	10	0.5000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: YB

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID: 0305-16NW		Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID: WAAEE-AMEC NW Bioassay		Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol: EPAF 02-EPA Freshwater		Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-7	Reproduction evaluated after 6 days of exposure.			

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	20.000	22.000	17.000	20.000	22.000	19.000	6.000	26.000	17.000	14.000
6.25	20.000	24.000	22.000	29.000	22.000	21.000	23.000	26.000	22.000	14.000
12.5	27.000	16.000	25.000	24.000	22.000	20.000	11.000	17.000	27.000	18.000
25	22.000	19.000	20.000	20.000	23.000	22.000	16.000	16.000	4.000	24.000
50	16.000	20.000	23.000	14.000	16.000	17.000	22.000	16.000	17.000	17.000
100	18.000	13.000	9.000	12.000	15.000	16.000	12.000	12.000	7.000	18.000

			Transform: Untransformed						1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	18.300	1.0000	18.300	6.000	26.000	29.713	10				18.300	0.0000
6.25	22.300	1.2186	22.300	14.000	29.000	17.566	10	-1.940	2.287	4.715	22.300	-0.2186
12.5	20.700	1.1311	20.700	11.000	27.000	25.364	10	-1.164	2.287	4.715	20.700	-0.1311
25	18.600	1.0164	18.600	4.000	24.000	31.164	10	-0.145	2.287	4.715	18.600	-0.0164
50	17.800	0.9727	17.800	14.000	23.000	16.282	10	0.242	2.287	4.715	17.800	0.0273
*100	13.200	0.7213	13.200	7.000	18.000	27.385	10	2.473	2.287	4.715	13.200	0.2787

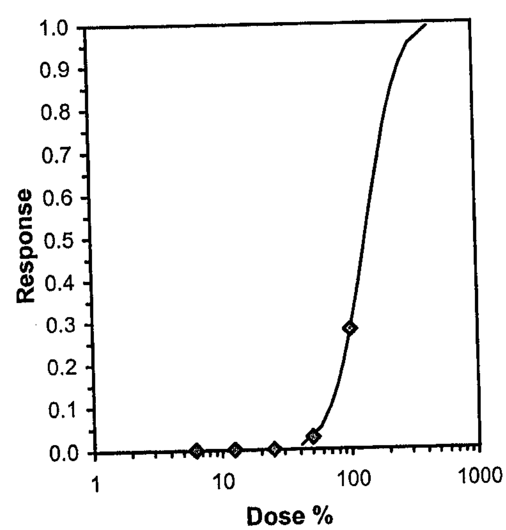
Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.84948		1.035		-0.9834	1.7284
Bartlett's Test indicates equal variances (p = 0.31)					5.98213		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	4.71491	0.25765	95.8167	21.2574	0.00166	5, 54

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.49131	8.15506	-21.462	30.4444	0	33.5959	7.81472	2.4E-07	2.13058	0.22265	3
Intercept	-4.5691	16.2375	-56.244	47.1058							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	40.9835	
EC05	3.355	58.1227	
EC10	3.718	70.0222	
EC15	3.964	79.3984	
EC20	4.158	87.7378	
EC25	4.326	95.5871	
EC40	4.747	118.623	
EC50	5.000	135.075	
EC60	5.253	153.81	
EC75	5.674	190.876	
EC80	5.842	207.953	
EC85	6.036	229.795	
EC90	6.282	260.565	
EC95	6.645	313.911	
EC99	7.326	445.187	

Significant heterogeneity detected (p = 2.41E-07)



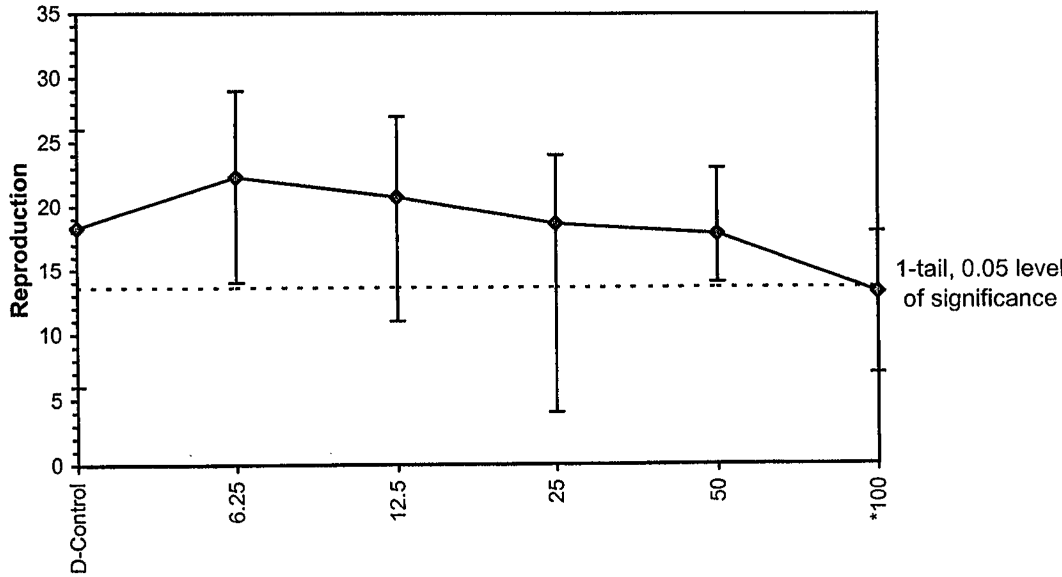
Reviewed by: HS

ToxCalc v5.0.23

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-16NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-7	Reproduction evaluated after 6 days of exposure.			

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: [signature]

Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #2 MW-7
Test Number: 0305-16NW

Start Date and Time: 5/29/03 1400
Stop Date and Time: 6/5/03 1500

Conc.	Rep	Cont	Daily Reproduction 1	2	3	4	5	6	7	8	day6 Total	day7
CON	1	4			4	4		12	14		20	34
	2	13			4		7	11	15		22	37
	3	47			4	3		10	14		17	31
	4	22			4		8	9	10		20	30
	5	40			4		8	10	15		22	37
	6	23			4	7		8	16		19	35
	7	8			4	X2					6X	
	8	49			4		9	13	14		26	40
	9	50			4	2		11	15		17	32
	10	7			4			10	15		14	29
Analyst		mi	mi		NF	NF	et	et	m			

Conc.	Rep	Cont	Daily Reproduction 1	2	3	4	5	6	7	8	day6 Total
25	1	60			4		9	9	11		22
	2	31			3	6	10		14		19
	3	6			4	6		10	14		20
	4	17			4		8	8	11		20
	5	35				3	9	11	14		23
	6	10			4		8	10	13		22
	7	53			2	6		8	15		16
	8	48				7		9	15		16
	9	42			4						4
	10	43				3	8	13	11		24

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	day6 Total
6.25	1	36			3	8		9	15		20
	2	24			4	8		12	15		24
	3	30			4	7		11	15		22
	4	18			4		12	13	12		29
	5	12			4	6		12	15		22
	6	38			4		7	10	14		21
	7	9			5		7	11	17		23
	8	32			4	9		13	18		26
	9	41			4	8		10	17		22
	10	45			3	7		4	12		14

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
50	1	21			3		5	8	11		16
	2	29			~~4~~	NF 36		10	14		20
	3	28			5		8	10	13		23
	4	33				4	7	3			14
	5	25			2		5	9	12		16
	6	1			2		7	8			17
	7	2			6		6	10	15		22
	8	58			3	6		7	13		16
	9	54			3	7		7	12		17
	10	15			4	5		8	13		17

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
12.5	1	46				5	10	12	16		27
	2	56				5	11				16
	3	37			4		9	12	10		25
	4	16			4	8		12	11		24
	5	34			4	8		10	13		22
	6	3			4	7		9	16		20
	7	19			NF ~~4~~	4		7	10		11
	8	52			4	6		7	13		17
	9	39			5		11	11	14		27
	10	5			3	5		10	14		28

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
100	1	55				1	8	9	10		18
	2	24				4	9		10		13
	3	20				3		6			9
	4	59				6		6	8		12
	5	11			2	1	6	6			15
	6	57			3		4	9	9		16
	7	44			3		4	5	9		12
	8	14					5	7	~~4~~ m		12
	9	51				3	4		4		7
	10	27			4		6	8	14		18

Comments:

AMEC Earth and Environmental
Northwest Bioassay Lab

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

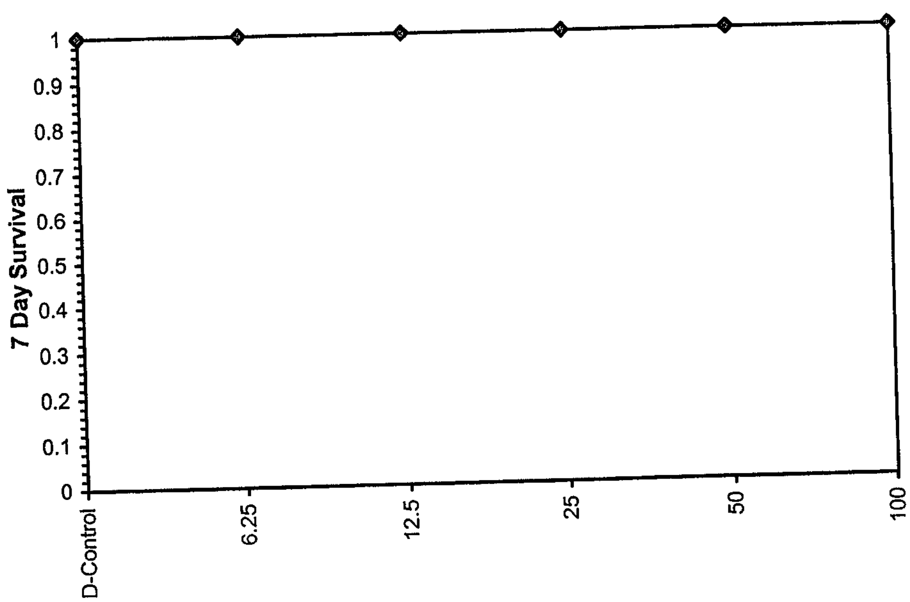
Start Date:	5/29/03	Test ID:	0305-17NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-17				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0100
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0100
25	1.0000	1.0000	0	10	10	10	1.0000	0.0100
50	1.0000	1.0000	0	10	10	10	1.0000	0.0100
100	1.0000	1.0000	0	10	10	10	1.0000	0.0100

Hypothesis Test (1-tail, 0.01)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

Ceriodaphnia Survival and Reproduction Test-Reproduction

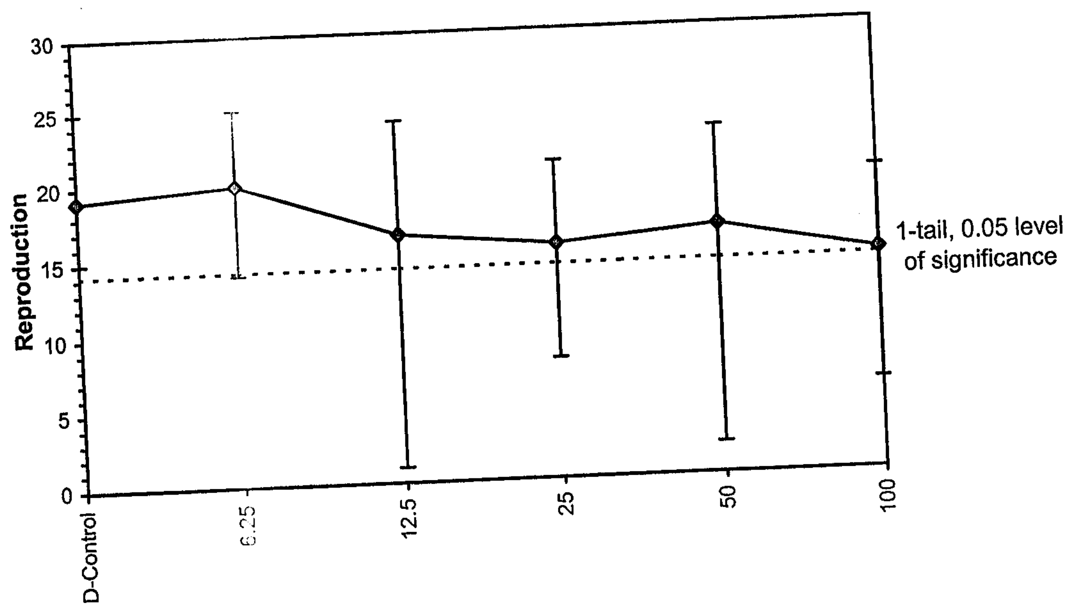
Start Date:	5/29/03	Test ID:	0305-17NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-17	Reproduction evaluated on neonate production through 6 days of exposure.			

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	21.000	17.000	15.000	25.000	23.000	16.000	15.000	17.000	19.000	23.000
6.25	24.000	14.000	18.000	15.000	21.000	21.000	22.000	20.000	19.000	25.000
12.5	18.000	13.000	20.000	20.000	12.000	21.000	24.000	18.000	1.000	17.000
25	15.000	15.000	21.000	19.000	8.000	13.000	17.000	11.000	17.000	19.000
50	2.000	20.000	20.000	16.000	23.000	9.000	16.000	17.000	21.000	20.000
100	13.000	16.000	20.000	12.000	16.000	17.000	15.000	18.000	6.000	12.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	19.100	1.0000	19.100	15.000	25.000	19.189	10			
6.25	19.900	1.0419	19.900	14.000	25.000	17.798	10	-0.370	2.287	4.943
12.5	16.400	0.8586	16.400	1.000	24.000	39.538	10	1.249	2.287	4.943
25	15.500	0.8115	15.500	8.000	21.000	25.672	10	1.665	2.287	4.943
50	16.400	0.8586	16.400	2.000	23.000	38.906	10	1.249	2.287	4.943
100	14.500	0.7592	14.500	6.000	20.000	27.249	10	2.128	2.287	4.943

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.83908		1.035		-1.1818	2.0184
Bartlett's Test indicates equal variances (p = 0.21)					7.11371		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	4.9429	0.25879	44.0667	23.363	0.11198	5, 54

Dose-Response Plot



Reviewed by: [signature]

Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #3
Test Number: 0305-17NW
Start Date and Time: 5/29/03 1500
Stop Date and Time: 6/5/03 1600

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day 6)	day 7
CON	1	59			3	9		9	15		NE ~~9~~ 21	36
	2	52			3	7	7		14		17	31
	3	7			4		7	4			15	
	4	40			5	8	12		14		25	39
	5	26			3	9		11	13		23	36
	6	3			3		6	7	9		16	25
	7	25			2		5	8	13		15	28
	8	1			3	7		7	9		17	26
	9	55			3		6	10	13		19	32
	10	5			4	9		10	14		23	37
Analyst		mc	mc	mc	NF	KB	Et	Et	mi			

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day 6)
25	1	34			2	5		8	14		15
	2	60			4		9	2	10		15
	3	14			4		7	10	10		21
	4	38			4		6	9			19
	5	50			2		6		13		8
	6	37			4	7		2	15		13
	7	4			4		8	5	8		17
	8	21			3	8			9		11
	9	46			4	6		7	12		17
	10	22			3		7	9	12		19

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day 6)
6.25	1	27			4	10		10	15		24
	2	49			1	7	6		10		14
	3	10			4		9	5	11		18
	4	47			3	6	6		11		15
	5	30			4	8		9	16		21
	6	44			4	8	9		11		21
	7	12			4	8		10	14		22
	8	45			4	7	7	2	14		20
	9	2			3	7		9	16		129 NF
	10	24			4	9		12	15		25

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
50	1	53				2					2
	2	41			4	6		10	16		20
	3	57			4	7		9	~~9~~ 5		20
	4	28			4		9	3	5		16
	5	16			5	8		10	14		23
	6	35				4	5		9		9
	7	19			3	6		7	13		16
	8	15			1	8		8	14		17
	9	17				5	10	6	13		21
	10	39			4	6		10			20

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
12.5	1	43			4	7	7		8		18
	2	29				4	9		13		13
	3	13			4	7		9	16		20
	4	26			4	7	9		14		20
	5	6			4		8		13		12
	6	51			4		8	9			21
	7	11			4		11	9	12		24
	8	8			4		7	7	~~5~~		18
	9	23					1		23		1
	10	20			4	8		5	14		17

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
100	1	18			3		7	3	~~9~~		13
	2	31			3		9	4	9		16
	3	58			4	6	3	7			20
	4	56			1	6	5		4		12
	5	9			4		8	4			16
	6	54			4		6	7			17
	7	48			2	1	6	6	4		15
	8	42			4	7		7	12		18
	9	32			2		3	1	10		6
	10	33			3	7		2	2		12

Comments:

AMEC Earth and Environmental
Northwest Bioassay Lab

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

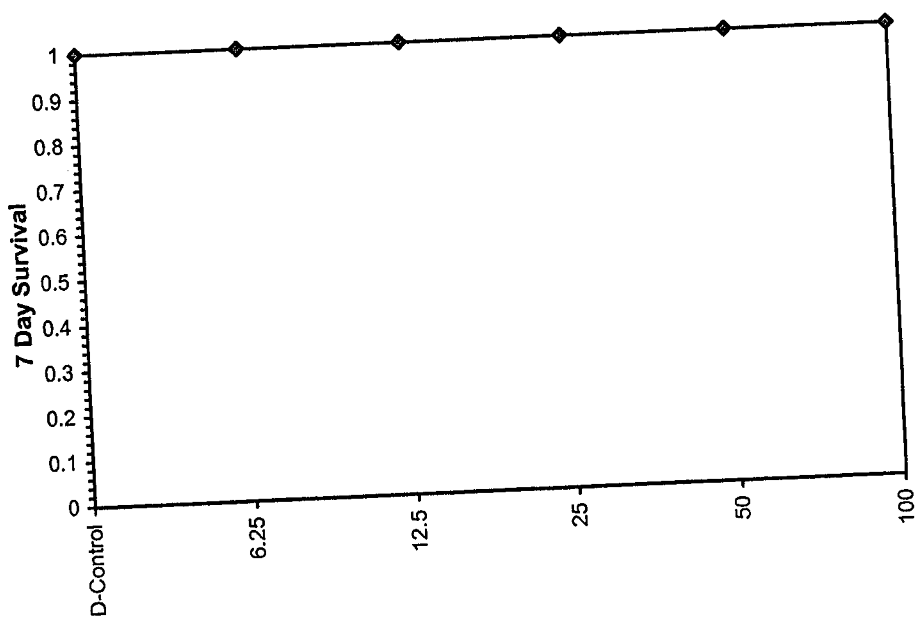
Start Date:	5/29/03	Test ID:	0305-18NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-103R				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500
100	1.0000	1.0000	0	10	10	10	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



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ToxCalc v5.0.23

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-18NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-103R	Reproduction through Day 6			

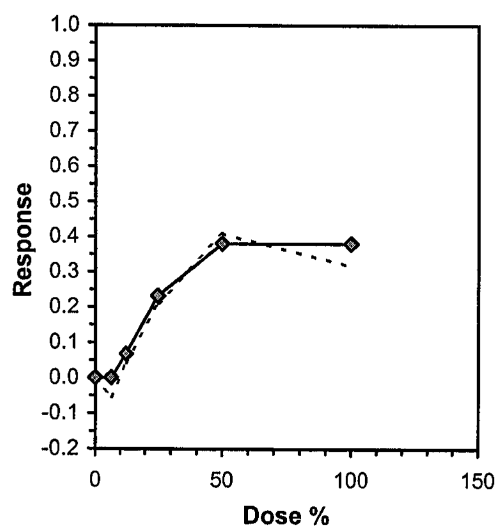
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	19.000	20.000	19.000	18.000	21.000	26.000	17.000	17.000	23.000	16.000
6.25	24.000	22.000	24.000	19.000	15.000	22.000	16.000	23.000	21.000	21.000
12.5	16.000	15.000	16.000	20.000	21.000	19.000	20.000	22.000	18.000	21.000
25	16.000	18.000	14.000	16.000	9.000	12.000	20.000	16.000	9.000	25.000
50	10.000	13.000	14.000	14.000	17.000	16.000	6.000	12.000	10.000	4.000
100	13.000	6.000	5.000	6.000	12.000	13.000	26.000	22.000	12.000	19.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	19.600	1.0000	19.600	16.000	26.000	15.624	10				20.150	1.0000
6.25	20.700	1.0561	20.700	15.000	24.000	15.115	10	-0.558	2.287	4.504	20.150	1.0000
12.5	18.800	0.9592	18.800	15.000	22.000	12.981	10	0.406	2.287	4.504	18.800	0.9330
25	15.500	0.7908	15.500	9.000	25.000	31.643	10	2.082	2.287	4.504	15.500	0.7692
*50	11.600	0.5918	11.600	4.000	17.000	35.937	10	4.062	2.287	4.504	12.500	0.6203
*100	13.400	0.6837	13.400	5.000	26.000	52.675	10	3.148	2.287	4.504	12.500	0.6203

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.60123		1.035		0.32661	0.71017
Bartlett's Test indicates equal variances (p = 0.02)					13.308		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	25	50	35.3553	4	4.50378	0.22978	134.2	19.3963	4.7E-05	5, 54

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	10.914	3.295	4.213	18.429	0.7325
IC10	15.019	3.866	9.794	24.628	0.9366
IC15	18.835	4.742	12.261	30.693	0.9142
IC20	22.652	5.719	16.376	36.801	0.9270
IC25	28.229				
IC40	>100				
IC50	>100				



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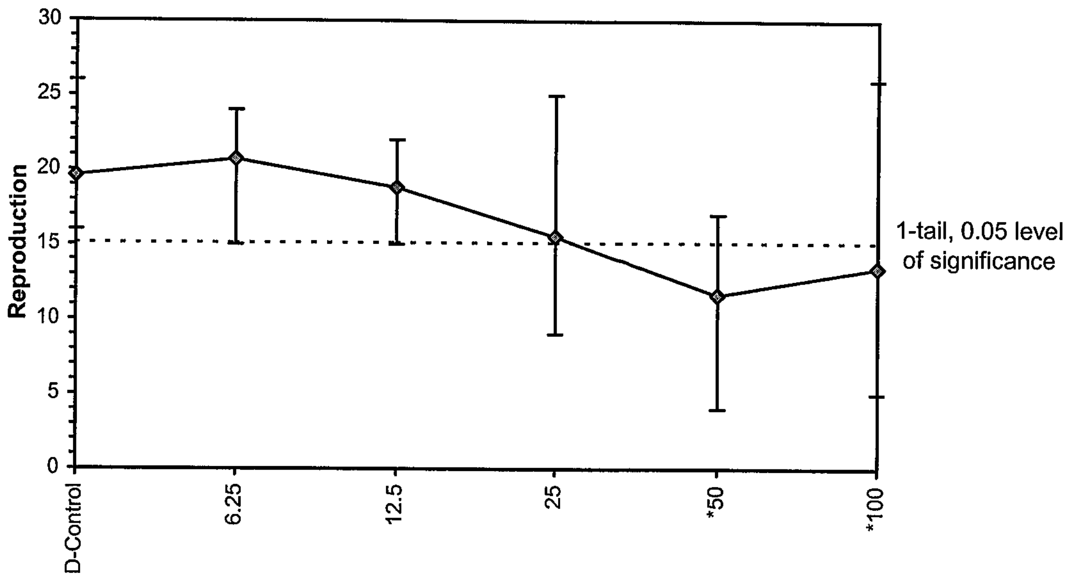
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-18NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-103R	Reproduction through Day 6			

Dose-Response Plot



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Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #4 MW 103-R
Test Number: 0305-18NW

Start Date and Time: 5/29/03 1525
Stop Date and Time: 6/5/03 1625

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	day 6 Total	day 7
CON	1	17			4	4	7	4	8		19	27
	2	7			4	8		8			20	
	3	55			4	5		10	14		19	23
	4	11			5	7		6	8		18	26
	5	37			4	8		9	12		21	33
	6	35			6		10	10	13		26	39
	7	9			2	6		9	14		17	31
	8	23			2	6		9	8		17	25
	9	44				6	7	10	12		23	35
	10	46			4	6		6	10		16	26
Analyst		m	m		NF	NF	m	Et	m			

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	day 6 Total
25	1	10			1		5	10	~~15~~ m		16
	2	4			3	8	7		15		18
	3	26			4	5	5		14		14
	4	2			4	7		5	15		16
	5	52			4		5		12		9
	6	15			4	7	1		10		12
	7	19			3		7	10	7		20
	8	36			4		2	10	3		16
	9	33			1		8		14		9
	10	41			3	7	8	7			25

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	day 6 Total
6.25	1	1			4	8		12	16		24
	2	38			4	6		12	14		22
	3	60			5		10	9	13		24
	4	58			4		10	5	14		19
	5	20			3		6	6			15
	6	16				5	8	9	x		22
	7	45			1		6	9			16
	8	56			4	7		12	15		23
	9	57				4	7	10			21
	10	48			4	6		11	17		21

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
50	1	40			2	6		2	9		10
	2	29			4	8		1			13
	3	25			5	6	1	2	7		14
	4	32			4			10	10		14
	5	12			4	8		5			17
	6	5			5		5	6			16
	7	59			4		2		15		6
	8	54			2			10			12
	9	50			2		5	3	3		10
	10	24			4				15		4

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
125	1	47			4		3	9	4		16
	2	13			4	8	3		10		15
	3	51			4	6		6	15		16
	4	34			3		8	9	5		20
	5	28			4		6	11			21
	6	22			4	5		10	16		19
	7	14			4		10	6			20
	8	30			5		10	7	3		NF 22
	9	42			4	7	7		9		18
	10	21			4	10		7	16		21

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
100	1	53			2			11			13
	2	27					1	5			6
	3	6			3	2			7		5
	4	3				6					6
	5	18			3				9		12
	6	31			3	5	1		4		13
	7	49			3		10	13			26
	8	8			~~2~~	7		11	8		22
	9	43			13		3	6			12
	10	39			~~24~~		6	9	5		19

NF - still alive

AMEC Earth and Environmental
Northwest Bioassay Lab

Comments:

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

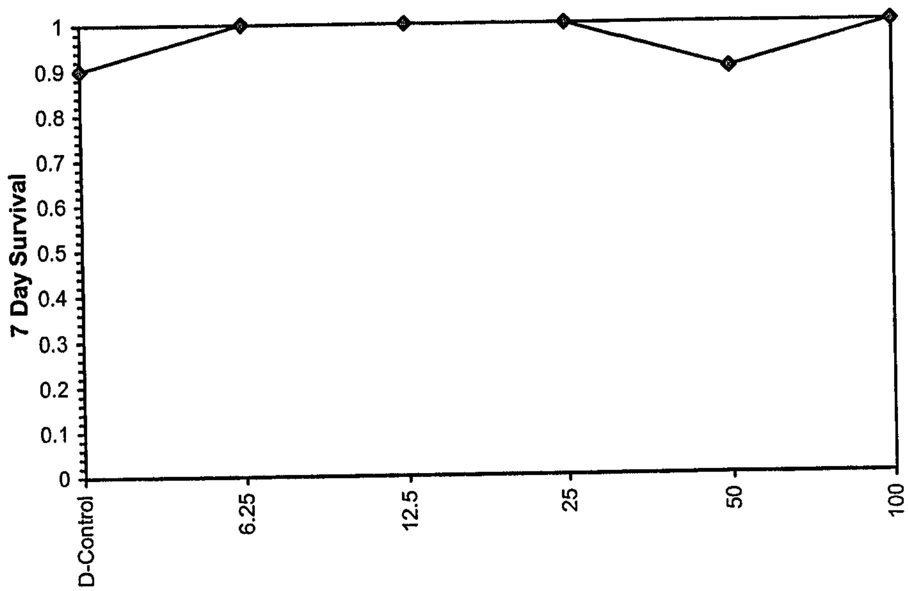
Start Date:	5/29/03	Test ID:	0305-19NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-129				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	0.9000	1.0000	1	9	10	10		
6.25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
12.5	1.0000	1.1111	0	10	10	10	0.5000	0.0500
25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
50	0.9000	1.0000	1	9	10	10	0.7632	0.0500
100	1.0000	1.1111	0	10	10	10	0.5000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-19NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-129	Reproduction through Day 6			

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	10.000	21.000	18.000	19.000	19.000	21.000	19.000	18.000	22.000	
6.25	17.000	24.000	20.000	26.000	22.000	17.000	19.000	24.000	22.000	25.000
12.5	25.000	21.000	15.000	15.000	10.000	21.000	24.000	24.000	20.000	14.000
25	26.000	21.000	19.000	24.000	20.000	21.000	25.000	26.000	18.000	20.000
50	14.000	17.000	10.000	31.000	19.000	12.000	18.000	16.000	13.000	
100	8.000	9.000	9.000	5.000	9.000	10.000	8.000	10.000	8.000	11.000

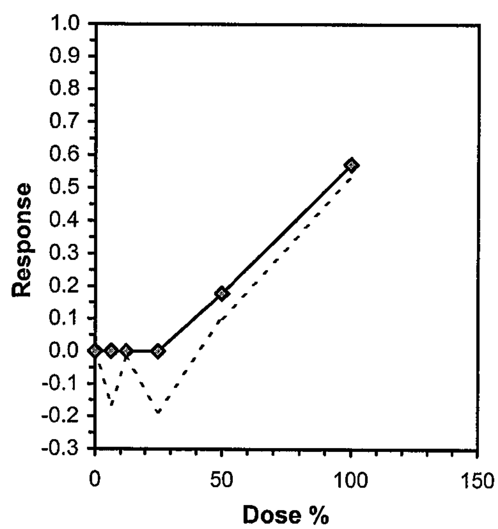
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	18.556	1.0000	18.556	10.000	22.000	18.884	9			20.264	1.0000
6.25	21.600	1.1641	21.600	17.000	26.000	14.994	10	120.50	71.00	20.264	1.0000
12.5	18.900	1.0186	18.900	10.000	25.000	26.915	10	105.50	71.00	20.264	1.0000
25	22.000	1.1856	22.000	18.000	26.000	13.552	10	123.50	71.00	20.264	1.0000
50	16.667	0.8982	16.667	10.000	31.000	36.742	9	66.00	59.00	16.667	0.8225
*100	8.700	0.4689	8.700	5.000	11.000	18.809	10	57.00	71.00	8.700	0.4293

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.68248	1.035	0.47869	2.66043
Bartlett's Test indicates unequal variances (p = 9.09E-03)	15.3178	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	50	100	70.7107	2

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	32.042	10.834	9.944	54.187	-0.0406
IC10	39.083	9.183	27.872	58.478	0.3164
IC15	46.125	8.662	34.182	62.716	0.2361
IC20	52.859	8.584	39.390	66.955	-0.0090
IC25	59.218	8.652	43.182	71.353	-0.2505
IC40	78.295	6.592	62.772	85.929	-1.1954
IC50	91.013	4.152	82.094	96.759	-1.0801



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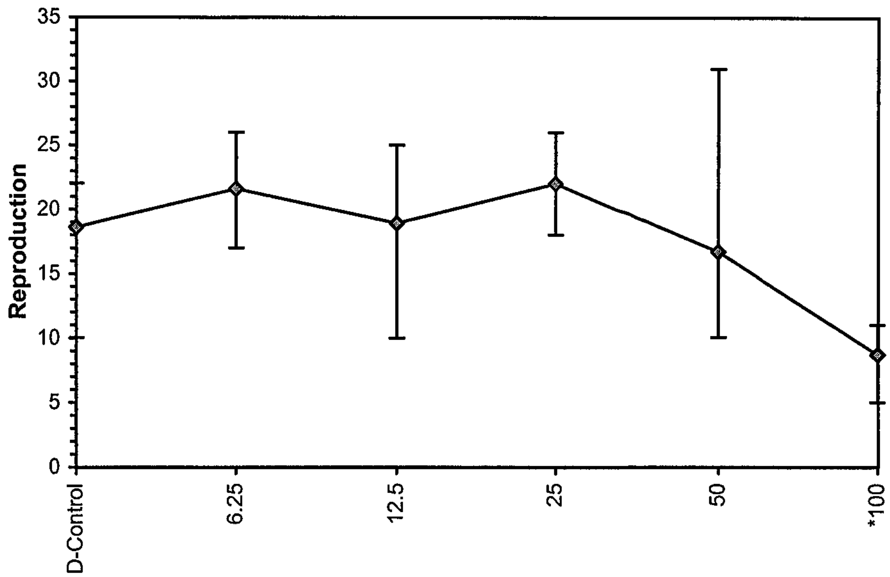
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-19NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-129	Reproduction through Day 6			

Dose-Response Plot



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Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #5 MW-129
Test Number: 0305-19NW

Start Date and Time: 5/29/03 1550
Stop Date and Time: 6/5/03 1640

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day6)	day7
CON	1	41			4			6	14		10	24
	2	60			0	4	7	10			21	21
	3	33			4	8		6	12		18	30
	4	29			3	8	8		15		19	34
	5	38			4	7		8	12		19	31
	6	8			X				'		X	
	7	19			3	7	11		12		21	33
	8	15			3	1	8	7	12		19	31
	9	32			5		5	8	15		18	33
	10	26			3	9		11	19		22	41
Analyst		m	m	m	NF	KB	m	EF	m			

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day6)
25	1	47			4		9	13	15		26
	2	45			4	6		11	17		21
	3	10			4	7	8		9		19
	4	34			3		9	12	15		24
	5	42			4	9	8		16		20
	6	48			3	8	10		14		21
	7	3			3		9	13	12		25
	8	9			4		8	14	15		26
	9	58			4	6	8		12		18
	10	31			3	7		10	17		20

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total (day6)
6.25	1	1			3	8	6		15		17
	2	36			4	9		11	18		24
	3	25			4	7	9		16		20
	4	44			4	9		13	17		26
	5	2			4	8		10	17		22
	6	49				7		10	15		17
	7	7			3	7		9	17		19
	8	39			4	7		13	16		24
	9	5			5	9		8	15		22
	10	4			4		9	12	16		25

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
50	1	54			1	6		7	13		14
	2	40			X						X
	3	18			3	7	7		10		17
	4	51			2	4		4	10		10
	5	27			4	8	8	11	13		31
	6	35			4		6	9	12		19
	7	21			4			8	11		12
	8	23			4		7	7	11		18
	9	55			4	7		5	9		16
	10	17			4	4		5	13		13

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
12.5	1	12			4		9	12	16		25
	2	43			4	7		10	15		21
	3	52				5		10			15
	4	50				5		10	14		15
	5	14				5	5		10		10
	6	24			3	7		11	17		21
	7	22			4		8	12	16		24
	8	16			4		8	12	16		24
	9	57			2	7		11	17		20
	10	30			4			10	15		14

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total
100	1	13				4		4			8
	2	56					4	5	13		9
	3	20				5		4	8		9
	4	11				5			8		5
	5	59				6		3	5		9
	6	53				5		5	7		10
	7	46				2		6	7		8
	8	28				5		5	11		10
	9	37				2	6		9		8
	10	6				5	6		6		11

Comments: ______

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

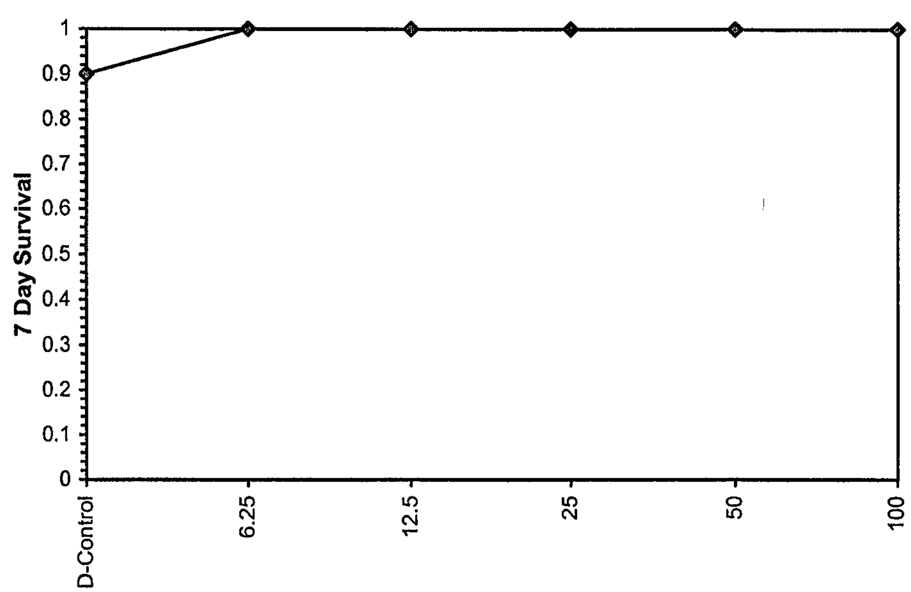
Start Date:	5/29/03	Test ID:	0305-20NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-W				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	0.9000	1.0000	1	9	10	10		
6.25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
12.5	1.0000	1.1111	0	10	10	10	0.5000	0.0500
25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
50	1.0000	1.1111	0	10	10	10	0.5000	0.0500
100	1.0000	1.1111	0	10	10	10	0.5000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



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Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-20NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-W	Reproduction through Day 7			

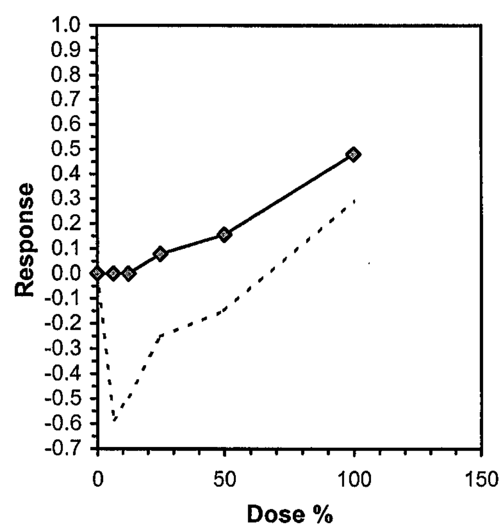
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	6.000	29.000	29.000	25.000	37.000	21.000	22.000	28.000	25.000	28.000
6.25	48.000	40.000	45.000	37.000	38.000	38.000	42.000	36.000	39.000	33.000
12.5	40.000	42.000	38.000	34.000	30.000	37.000	37.000	34.000	41.000	40.000
25	36.000	31.000	33.000	31.000	36.000	29.000	27.000	18.000	38.000	34.000
50	28.000	27.000	27.000	28.000	29.000	31.000	32.000	29.000	21.000	35.000
100	17.000	23.000	12.000	20.000	18.000	14.000	15.000	19.000	21.000	18.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	25.000	1.0000	25.000	6.000	37.000	32.111	10				33.967	1.0000
6.25	39.600	1.5840	39.600	33.000	48.000	11.116	10	-6.405	2.287	5.212	33.967	1.0000
12.5	37.300	1.4920	37.300	30.000	42.000	10.035	10	-5.396	2.287	5.212	33.967	1.0000
25	31.300	1.2520	31.300	18.000	38.000	18.449	10	-2.764	2.287	5.212	31.300	0.9215
50	28.700	1.1480	28.700	21.000	35.000	12.834	10	-1.623	2.287	5.212	28.700	0.8449
*100	17.700	0.7080	17.700	12.000	23.000	18.842	10	3.203	2.287	5.212	17.700	0.5211

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.85982		1.035		-1.0647	3.68266
Bartlett's Test indicates equal variances (p = 0.06)					10.7859		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	5.21217	0.20849	650.187	25.9778	5.9E-13	5, 54

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	20.461	6.645	15.893	36.441	1.0861
IC10	32.019	9.726	19.286	52.332	0.3770
IC15	48.349	10.559	22.678	59.668	-0.7462
IC20	56.939	7.146	39.884	65.971	-1.2240
IC25	64.659	5.583	52.087	72.952	-0.5052
IC40	87.818				
IC50	>100				



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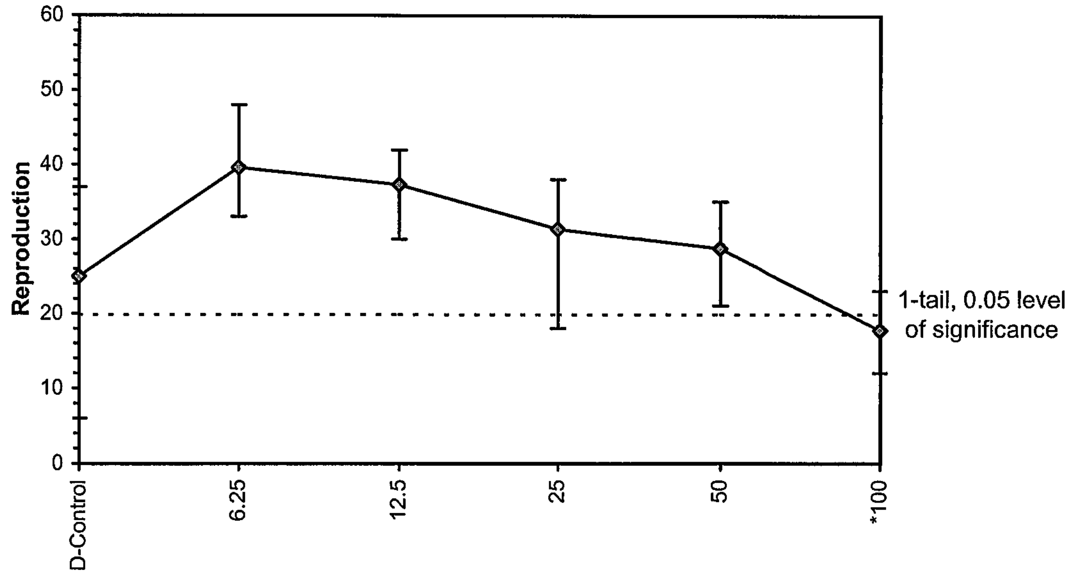
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	0305-20NW	Sample ID:	UNOCAL-Unocal Groundwater Study
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	GR-Groundwater
Sample Date:	5/28/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	MW-W	Reproduction through Day 7			

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

Ceriodaphnia 7-Day Chronic Survival and Reproduction

Client/Sample ID: Unocal #6 MW-W
Test Number: 0305-20 NW

Start Date and Time: 5/29/03 1615
Stop Date and Time: 6/5/03 1700

Conc.	Rep	Cont	Daily Reproduction 1	2	3	4	5	6	7	8	Total (day6)	day7
CON	1	3			4	X2			~~12~~		6X	
	2	12			2	7	8		12		17	29
	3	41			4	5	1	5	14		15	29
	4	15			2	2		8	13		12	25
	5	13			3		7	10	17		20	37
	6	49			4			9	9		12	21
	7	7			3	4		7	8		14	22
	8	53			3	7		10	9		20	28
	9	38			3	3	8		11		14	25
	10	29			2	5		9	12		16	28
Analyst		Mi	im	mL	NF	NF	im	et	M			

Conc.	Rep	Cont	Daily Reproduction 1	2	3	4	5	6	7	8	Total (day6)	day 7
25	1	39			4	8		9	15		21	36
	2	46			5		7	10	14		17	31
	3	5			4	6	9		14		19	33
	4	35			4	6		9	12		19	31
	5	59			3	6		10	17		19	36
	6	26			2		7	8	12		17	29
	7	32			3	6	6		12		15	27
	8	19			4		5	9			18	
	9	40			4	5		11	18		20	38
	10	2			2	7		10	15		19	34

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	day7
6.25	1	57			4	6	12	11	15		33	48
	2	50			4	8		11	17		23	40
	3	33			5	8		11	21		24	45
	4	52			5	6	1	10	15		22	37
	5	23			3	8		10	17		21	38
	6	24			3	8		11	16		22	38
	7	47			3		10	13	16		26	42
	8	54			4	8	9		15		21	36
	9	43			4	8		10	17		22	39
	10	26			4	7	6		16		17	33

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	day7
50	1	8			2	4		8	14		14	28
	2	9			2	4	1	9	11		16	27
	3	37			2	4		8	13		14	27
	4	34			4	7		7	10		18	28
	5	31			4	4		8	13		16	29
	6	36			2	5		10	14		17	31
	7	25			2	5		10	15		17	32
	8	58			1	7		8	13		16	29
	9	1			~~4~~	6		11			21	
	10	11			4		9	8	14		21	35

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	day7
12.5	1	28			4	8		12	16		24	40
	2	55			5		9	13	16		26	42
	3	51			3	7		10	18		20	38
	4	10				8		10	16		18	34
	5	17			2	6		8	14		16	30
	6	56			3	7		10	17		20	37
	7	4			3	8		9	17		20	37
	8	44			2	7		10	15		19	34
	9	42			5		10	11	15		26	41
	10	6			4	8		11	17		~~24~~ NF23	~~38~~ 40

Conc.	Rep	Cont	1	2	3	4	5	6	7	8	Total	day7
100	1	30					5	5	7		10	17
	2	22			2	4	5		12		11	23
	3	27					5	7	~~6~~		12	
	4	60			4	3		7	6		14	20
	5	14			1	4	7		6		12	18
	6	21			1	3		8	2		12	14
	7	45			2	2		5	6		9	15
	8	16			2	3	6		8		11	19
	9	48			2	3	1	8	7		14	21
	10	18			2	3		8	5		13	18

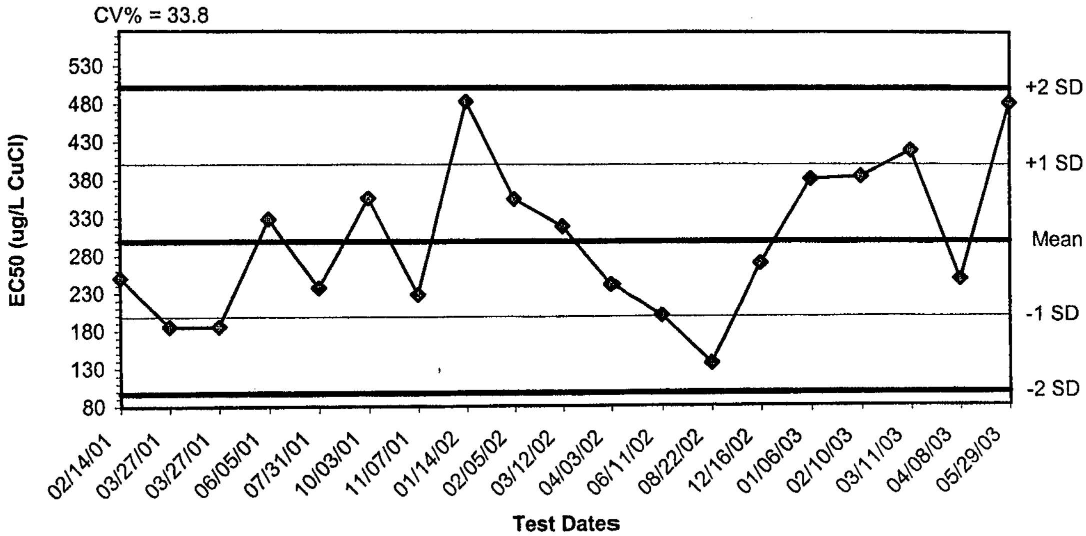
Comments:

Appendix H

Reference Toxicant Tests

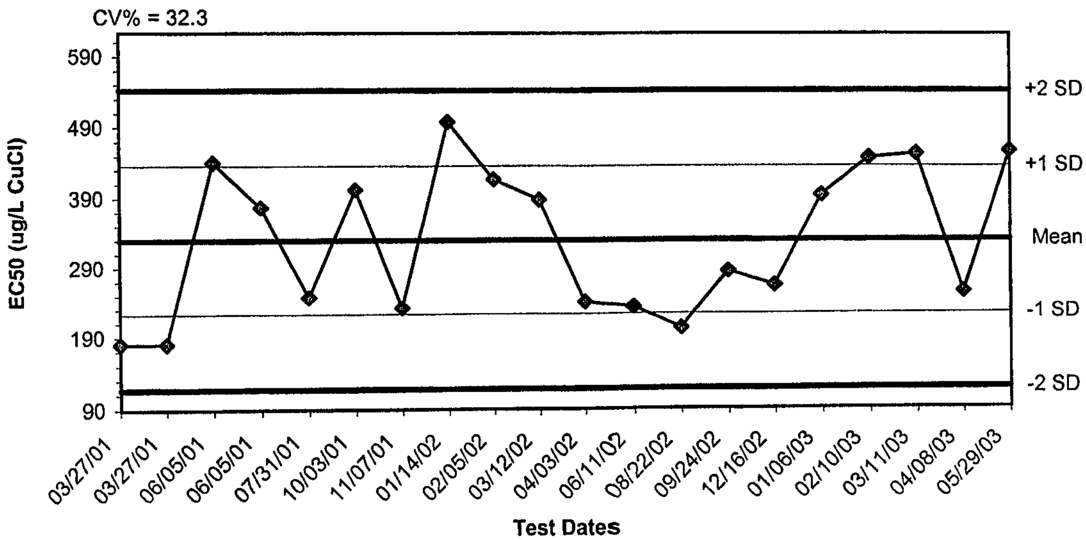
Atherinops affinis

Control Chart - Topsmelt 7-day Survival



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
02/14/01	250.5039	299.5336	198.3053	97.0771	400.7618	501.9900
03/27/01	185.2787	299.5336	198.3053	97.0771	400.7618	501.9900
03/27/01	185.2787	299.5336	198.3053	97.0771	400.7618	501.9900
06/05/01	328.5079	299.5336	198.3053	97.0771	400.7618	501.9900
07/31/01	236.9808	299.5336	198.3053	97.0771	400.7618	501.9900
10/03/01	356.3646	299.5336	198.3053	97.0771	400.7618	501.9900
11/07/01	228.0437	299.5336	198.3053	97.0771	400.7618	501.9900
01/14/02	483.5422	299.5336	198.3053	97.0771	400.7618	501.9900
02/05/02	354.8769	299.5336	198.3053	97.0771	400.7618	501.9900
03/12/02	319.1384	299.5336	198.3053	97.0771	400.7618	501.9900
04/03/02	241.1836	299.5336	198.3053	97.0771	400.7618	501.9900
06/11/02	199.6365	299.5336	198.3053	97.0771	400.7618	501.9900
08/22/02	135.4495	299.5336	198.3053	97.0771	400.7618	501.9900
12/16/02	270.0595	299.5336	198.3053	97.0771	400.7618	501.9900
01/06/03	381.6445	299.5336	198.3053	97.0771	400.7618	501.9900
02/10/03	384.8918	299.5336	198.3053	97.0771	400.7618	501.9900
03/11/03	418.9836	299.5336	198.3053	97.0771	400.7618	501.9900
04/08/03	248.3585	299.5336	198.3053	97.0771	400.7618	501.9900
05/29/03	482.4142	299.5336	198.3053	97.0771	400.7618	501.9900

Control Chart - Topsmelt 7-day Growth



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/27/01	180.4179	329.4792	223.0672	116.6552	435.8913	542.3033
03/27/01	180.4179	329.4792	223.0672	116.6552	435.8913	542.3033
06/05/01	440.5936	329.4792	223.0672	116.6552	435.8913	542.3033
06/05/01	376.9499	329.4792	223.0672	116.6552	435.8913	542.3033
07/31/01	247.5874	329.4792	223.0672	116.6552	435.8913	542.3033
10/03/01	402.1123	329.4792	223.0672	116.6552	435.8913	542.3033
11/07/01	231.9856	329.4792	223.0672	116.6552	435.8913	542.3033
01/14/02	497.7609	329.4792	223.0672	116.6552	435.8913	542.3033
02/05/02	416.7067	329.4792	223.0672	116.6552	435.8913	542.3033
03/12/02	387.7426	329.4792	223.0672	116.6552	435.8913	542.3033
04/03/02	239.8788	329.4792	223.0672	116.6552	435.8913	542.3033
06/11/02	232.5774	329.4792	223.0672	116.6552	435.8913	542.3033
08/22/02	202.1067	329.4792	223.0672	116.6552	435.8913	542.3033
09/24/02	284.1359	329.4792	223.0672	116.6552	435.8913	542.3033
12/16/02	263.7032	329.4792	223.0672	116.6552	435.8913	542.3033
01/06/03	394.2657	329.4792	223.0672	116.6552	435.8913	542.3033
02/10/03	447.0627	329.4792	223.0672	116.6552	435.8913	542.3033
03/11/03	453.1027	329.4792	223.0672	116.6552	435.8913	542.3033
04/08/03	253.6458	329.4792	223.0672	116.6552	435.8913	542.3033
05/29/03	456.8309	329.4792	223.0672	116.6552	435.8913	542.3033

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903AA	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/29/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis

Comments:

Conc-ug/L	1	2	3	4	5
D-Control	0.8333	1.0000	1.0000	1.0000	1.0000
37.5	1.0000	1.0000	1.0000	1.0000	1.0000
75	1.0000	1.0000	1.0000	1.0000	1.0000
150	1.0000	0.8333	1.0000	0.8333	1.0000
300	1.0000	1.0000	1.0000	0.8333	1.0000
600	0.1667	0.1667	0.1667	0.0000	0.1667

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9667	1.0000	1.3222	1.1503	1.3652	7.271	5			1	30
37.5	1.0000	1.0345	1.3652	1.3652	1.3652	0.000	5	30.00	16.00	0	30
75	1.0000	1.0345	1.3652	1.3652	1.3652	0.000	5	30.00	16.00	0	30
150	0.9333	0.9655	1.2792	1.1503	1.3652	9.204	5	25.00	16.00	2	30
300	0.9667	1.0000	1.3222	1.1503	1.3652	7.271	5	27.50	16.00	1	30
*600	0.1333	0.1379	0.3775	0.2056	0.4205	25.464	5	15.00	16.00	26	30

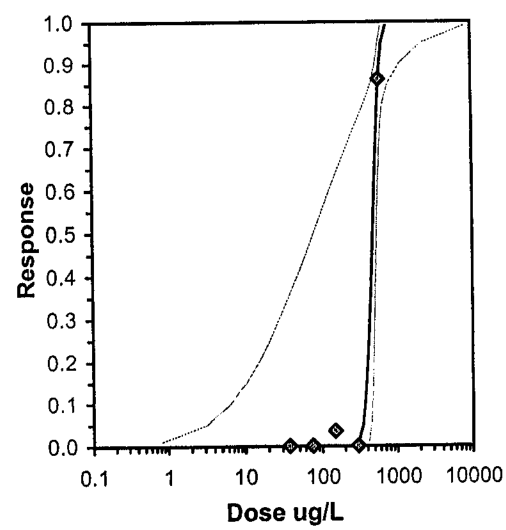
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.75189	0.9	-1.4191	1.02293
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	300	600	424.264	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	11.5593	5.30491	1.1617	21.957	0.03333	3.67522	7.81472	0.3	2.68342	0.08651	7
Intercept	-26.019	14.6786	-54.789	2.75153							
TSCR	0.025	0.01425	-0.0029	0.05293							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	303.506	0.81608	419.267
EC05	3.355	347.635	3.1419	451.55
EC10	3.718	373.726	6.44188	470.073
EC15	3.964	392.426	10.4523	483.202
EC20	4.158	407.954	15.3505	494.069
EC25	4.326	421.764	21.3389	503.754
EC40	4.747	458.673	48.8295	530.167
EC50	5.000	482.414	80.1249	548.212
EC60	5.253	507.385	130.899	569.38
EC75	5.674	551.786	286.941	625.532
EC80	5.842	570.465	377.29	674.289
EC85	6.036	593.038	476.51	801.712
EC90	6.282	622.712	547.787	1163.17
EC95	6.645	669.448	597.904	2274.58
EC99	7.326	766.784	658.584	8562.44



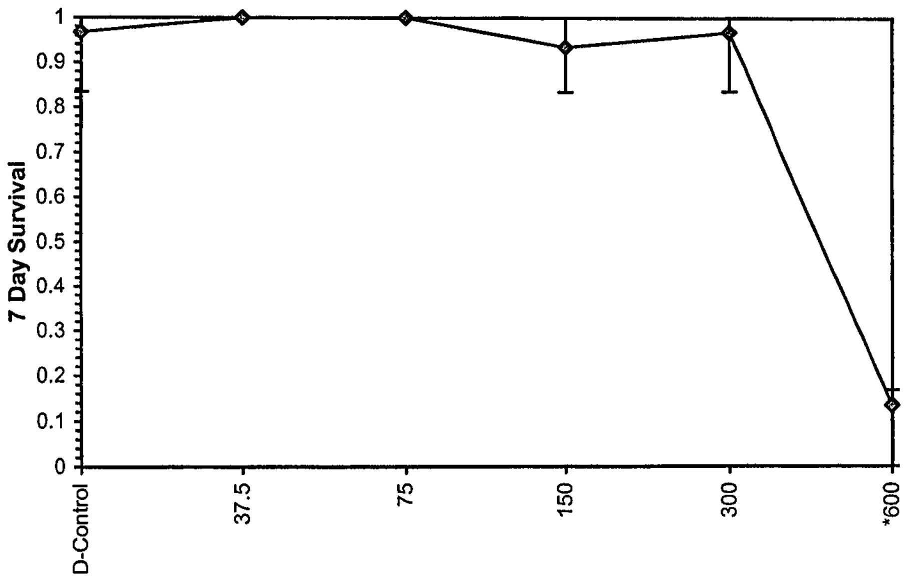
ToxCalc v5.0.23

Reviewed by: YS

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903AA	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/29/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:					

Dose-Response Plot



 ToxCalc v5.0.23 Reviewed by: KB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903AA	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/29/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:					

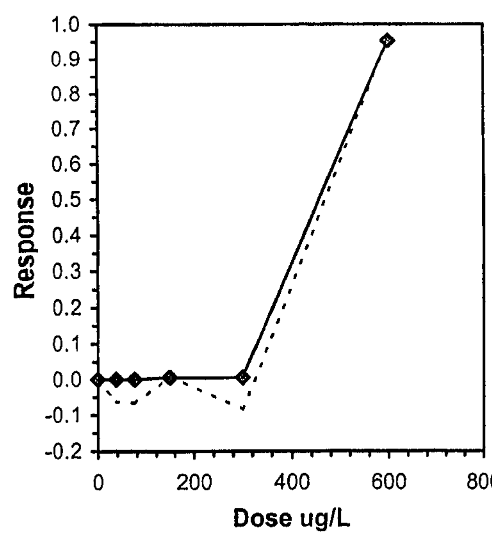
Conc-ug/L	1	2	3	4	5
D-Control	1.2733	1.8850	1.7033	1.9283	2.2533
37.5	2.0117	1.8433	1.8133	2.2383	1.7033
75	2.1867	1.6217	1.8867	2.2117	1.7500
150	2.1433	1.4033	2.0467	1.7533	1.6183
300	2.1017	2.3150	1.7083	1.6400	2.0433
600	0.1433	0.0817	0.0767	0.0000	0.1550

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.8087	1.0000	1.8087	1.2733	2.2533	19.849	5				1.8873	1.0000
37.5	1.9220	1.0627	1.9220	1.7033	2.2383	10.849	5	-0.679	2.360	0.3936	1.8873	1.0000
75	1.9313	1.0678	1.9313	1.6217	2.2117	13.565	5	-0.735	2.360	0.3936	1.8873	1.0000
150	1.7930	0.9913	1.7930	1.4033	2.1433	16.985	5	0.094	2.360	0.3936	1.8773	0.9947
300	1.9617	1.0846	1.9617	1.6400	2.3150	14.391	5	-0.917	2.360	0.3936	1.8773	0.9947
*600	0.0913	0.0505	0.0913	0.0000	0.1550	67.953	5	10.296	2.360	0.3936	0.0913	0.0484

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.98352		0.9		-0.1316	-0.4057
Bartlett's Test indicates equal variances (p = 0.13)					8.51434		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	300	600	424.264		0.39363	0.21764	2.69972	0.06955	9.7E-11	5, 24

Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew
IC05	314.17	98.76	0.00	316.97	-1.2271
IC10	330.02	54.31	25.46	333.10	-3.5450
IC15	345.87	28.32	286.99	349.23	-7.8369
IC20	361.72	23.03	305.99	365.36	-9.7262
IC25	377.58	10.96	325.69	381.49	-1.5932
IC40	425.13	8.83	384.22	429.88	-1.4963
IC50	456.83	7.48	421.28	462.14	-1.3655

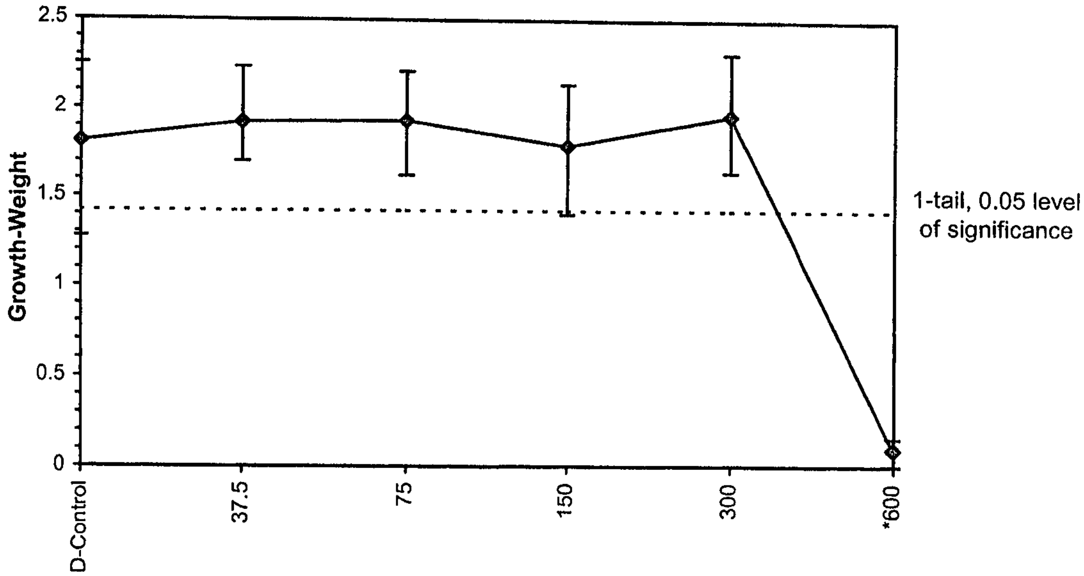


 ToxCalc v5.0.23 Reviewed by: [signature]

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903AA	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/29/03	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:					

Dose-Response Plot

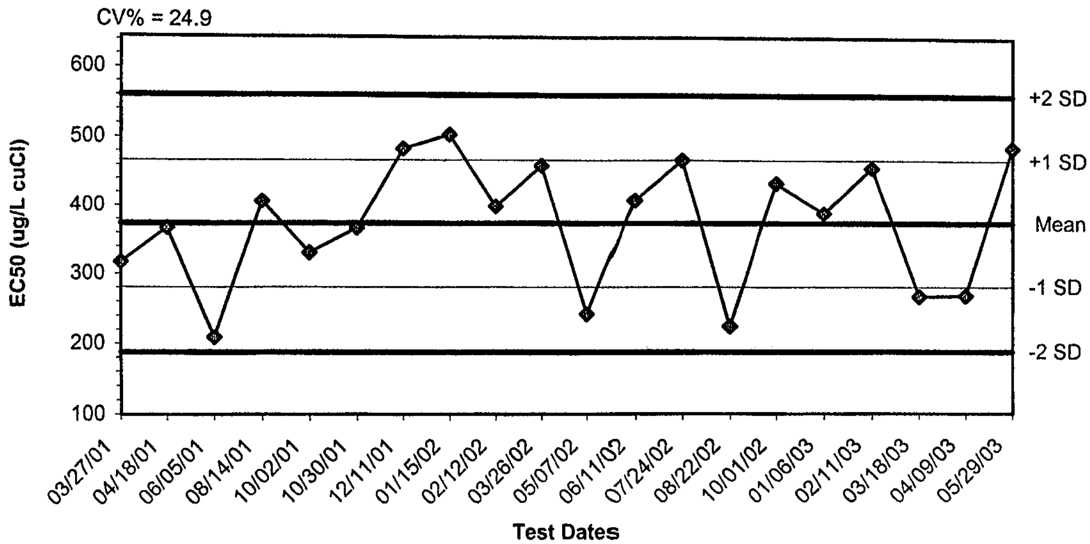


ToxCalc v5.0.23

Reviewed by: [signature]

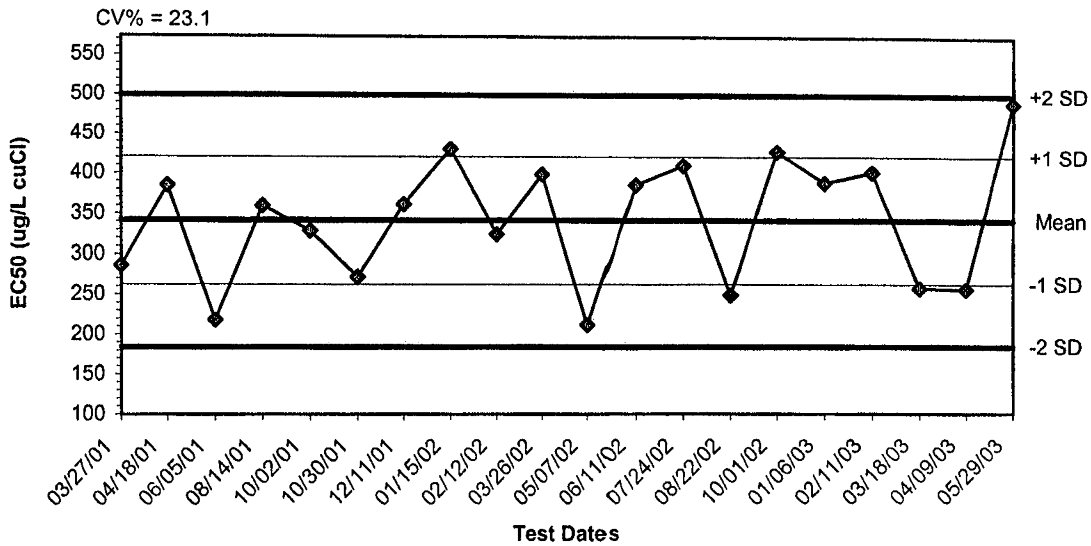
Mysidopsis bahia

Control Chart - Mysid 7-day Survival - 29 May 2003



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/27/01	317.0925	373.6200	280.4460	187.2720	466.7941	559.9681
04/18/01	366.7758	373.6200	280.4460	187.2720	466.7941	559.9681
06/05/01	208.3945	373.6200	280.4460	187.2720	466.7941	559.9681
08/14/01	406.0594	373.6200	280.4460	187.2720	466.7941	559.9681
10/02/01	330.4267	373.6200	280.4460	187.2720	466.7941	559.9681
10/30/01	366.5167	373.6200	280.4460	187.2720	466.7941	559.9681
12/11/01	482.4718	373.6200	280.4460	187.2720	466.7941	559.9681
01/15/02	503.2507	373.6200	280.4460	187.2720	466.7941	559.9681
02/12/02	398.3546	373.6200	280.4460	187.2720	466.7941	559.9681
03/26/02	458.3692	373.6200	280.4460	187.2720	466.7941	559.9681
05/07/02	241.9284	373.6200	280.4460	187.2720	466.7941	559.9681
06/11/02	407.3106	373.6200	280.4460	187.2720	466.7941	559.9681
07/24/02	466.7756	373.6200	280.4460	187.2720	466.7941	559.9681
08/22/02	223.8779	373.6200	280.4460	187.2720	466.7941	559.9681
10/01/02	432.7500	373.6200	280.4460	187.2720	466.7941	559.9681
01/06/03	387.6680	373.6200	280.4460	187.2720	466.7941	559.9681
02/11/03	455.3662	373.6200	280.4460	187.2720	466.7941	559.9681
03/18/03	266.4734	373.6200	280.4460	187.2720	466.7941	559.9681
04/09/03	267.7790	373.6200	280.4460	187.2720	466.7941	559.9681
05/29/03	484.7598	373.6200	280.4460	187.2720	466.7941	559.9681

Control Chart - Mysid 7-day Growth - 29 May 2003



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/27/01	285.7251	341.6162	262.6861	183.7559	420.5464	499.4765
04/18/01	384.4340	341.6162	262.6861	183.7559	420.5464	499.4765
06/05/01	217.8049	341.6162	262.6861	183.7559	420.5464	499.4765
08/14/01	359.1623	341.6162	262.6861	183.7559	420.5464	499.4765
10/02/01	328.3414	341.6162	262.6861	183.7559	420.5464	499.4765
10/30/01	271.1047	341.6162	262.6861	183.7559	420.5464	499.4765
12/11/01	360.8934	341.6162	262.6861	183.7559	420.5464	499.4765
01/15/02	430.2927	341.6162	262.6861	183.7559	420.5464	499.4765
02/12/02	324.3569	341.6162	262.6861	183.7559	420.5464	499.4765
03/26/02	398.0565	341.6162	262.6861	183.7559	420.5464	499.4765
05/07/02	211.5815	341.6162	262.6861	183.7559	420.5464	499.4765
06/11/02	384.8619	341.6162	262.6861	183.7559	420.5464	499.4765
07/24/02	408.9427	341.6162	262.6861	183.7559	420.5464	499.4765
08/22/02	249.0047	341.6162	262.6861	183.7559	420.5464	499.4765
10/01/02	427.1217	341.6162	262.6861	183.7559	420.5464	499.4765
01/06/03	387.8457	341.6162	262.6861	183.7559	420.5464	499.4765
02/11/03	400.6579	341.6162	262.6861	183.7559	420.5464	499.4765
03/18/03	257.3116	341.6162	262.6861	183.7559	420.5464	499.4765
04/09/03	256.0484	341.6162	262.6861	183.7559	420.5464	499.4765
05/29/03	488.7765	341.6162	262.6861	183.7559	420.5464	499.4765

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903MY	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia

Comments:

Conc-ug/L	1	2	3	4	5	6	7	8
D-Control	1.0000	0.6000	0.8000	0.8000	0.8000	0.8000	0.8000	1.0000
37.5	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	0.6000
75	1.0000	1.0000	0.6000	1.0000	1.0000	1.0000	0.8000	0.6000
150	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.6000
300	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
600	0.4000	0.2000	0.4000	0.0000	0.2000	0.2000	0.4000	0.2000

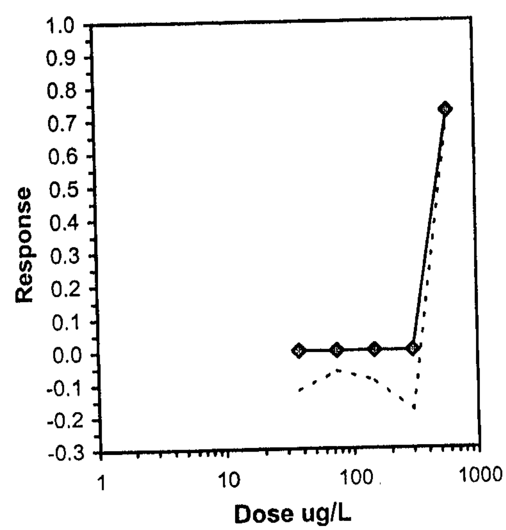
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.8250	1.0000	1.1390	0.8861	1.3453	13.028	8			7	40
37.5	0.9250	1.1212	1.2581	0.8861	1.3453	13.661	8	82.00	46.00	3	40
75	0.8750	1.0606	1.2007	0.8861	1.3453	17.562	8	75.50	46.00	5	40
150	0.9000	1.0909	1.2283	0.8861	1.3453	14.264	8	78.50	46.00	4	40
300	0.9750	1.1818	1.3155	1.1071	1.3453	6.400	8	88.50	46.00	1	40
*600	0.2500	0.3030	0.5168	0.2255	0.6847	31.093	8	36.00	46.00	30	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.89299	0.929	-0.929	0.05744
Bartlett's Test indicates equal variances (p = 0.39)	5.17544	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	300	600	424.264	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%			
Auto-27.8%	484.76	441.22	532.60



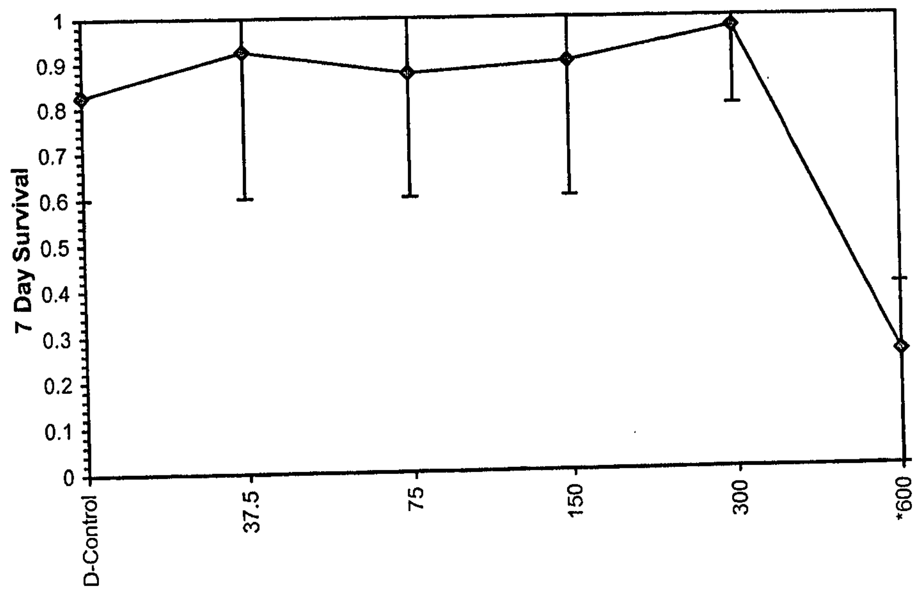
Reviewed by: _4S_

Mysid Survival, Growth and Fecundity Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903MY	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	CUCL-Copper chloride
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia

Comments:

Dose-Response Plot



Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903MY	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia

Comments:

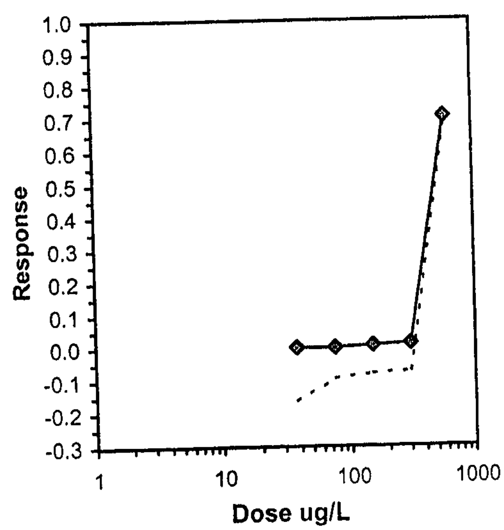
Conc-ug/L	1	2	3	4	5	6	7	8
D-Control	0.3380	0.2240	0.3680	0.2460	0.3580	0.3140	0.3120	0.2580
37.5	0.3760	0.2920	0.4140	0.3420	0.3660	0.3960	0.3940	0.2300
75	0.3360	0.4200	0.1860	0.4220	0.3480	0.3700	0.3500	0.2140
150	0.3720	0.2700	0.3320	0.2960	0.3620	0.3540	0.3860	0.2380
300	0.3460	0.3000	0.3620	0.3180	0.3020	0.3620	0.3060	0.2980
600	0.0760	0.0700	0.0980	0.0000	0.0660	0.0560	0.1180	0.2900

			Transform: Untransformed						1-Tailed			
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.3023	1.0000	0.3023	0.2240	0.3680	17.767	8				0.3023	0.0000
37.5	0.3513	1.1621	0.3513	0.2300	0.4140	17.647	8	-1.513	2.306	0.0747	0.3513	-0.1621
75	0.3308	1.0943	0.3308	0.1860	0.4220	26.336	8	-0.880	2.306	0.0747	0.3308	-0.0943
150	0.3263	1.0794	0.3263	0.2380	0.3860	16.224	8	-0.741	2.306	0.0747	0.3263	-0.0794
300	0.3243	1.0728	0.3243	0.2980	0.3620	8.619	8	-0.679	2.306	0.0747	0.3243	-0.0728
*600	0.0967	0.3201	0.0967	0.0000	0.2900	88.147	8	6.346	2.306	0.0747	0.0967	0.6799

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97277		0.929		0.08425	1.40311
Bartlett's Test indicates equal variances (p = 0.10)					9.31212		15.0863			
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	300	600	424.264		0.07467	0.24704	0.07261	0.00419	2.8E-09	5, 42

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%			
Auto-29.5%	488.78	389.09	614.00



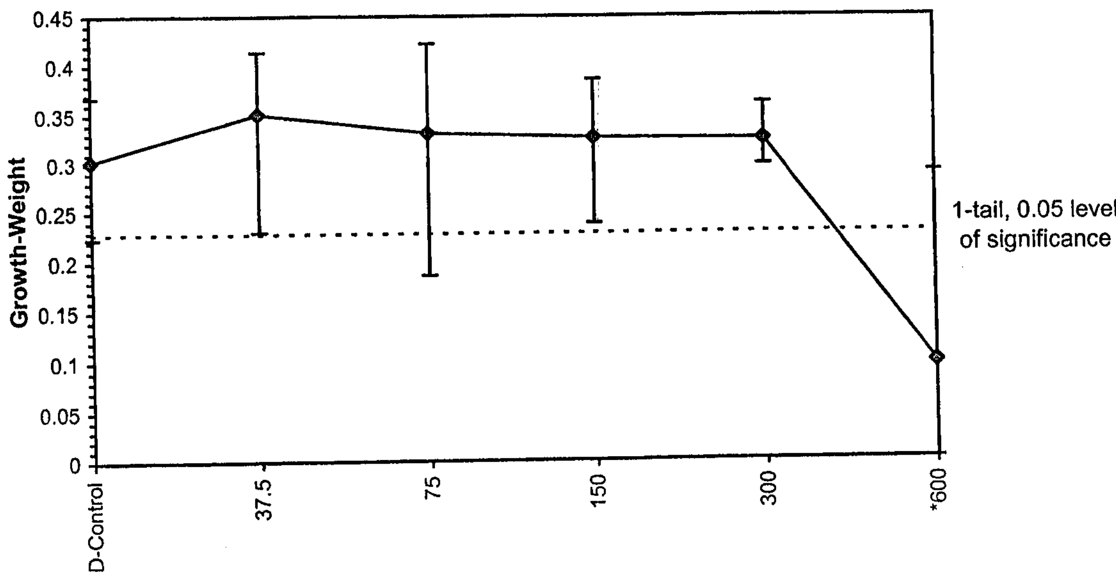
ToxCalc v5.0.23

Reviewed by: KS

Mysid Survival, Growth and Fecundity Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903MY	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassay	Sample Type:	CUCL-Copper chloride
Sample Date:	5/28/03	Protocol:	EPAM 94-EPA Chronic Marin	Test Species:	MY-Mysidopsis bahia
Comments:					

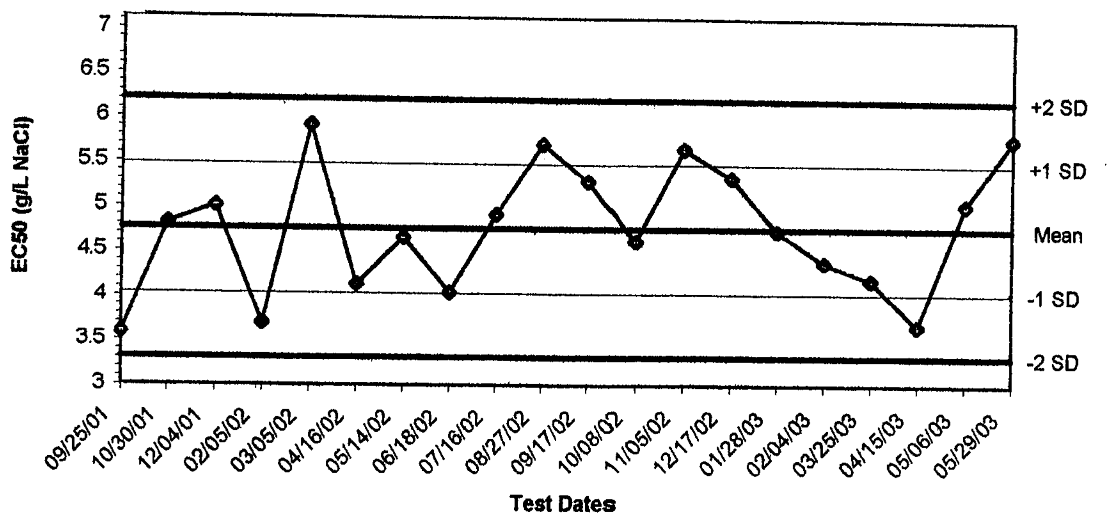
Dose-Response Plot



Pimephales promelas

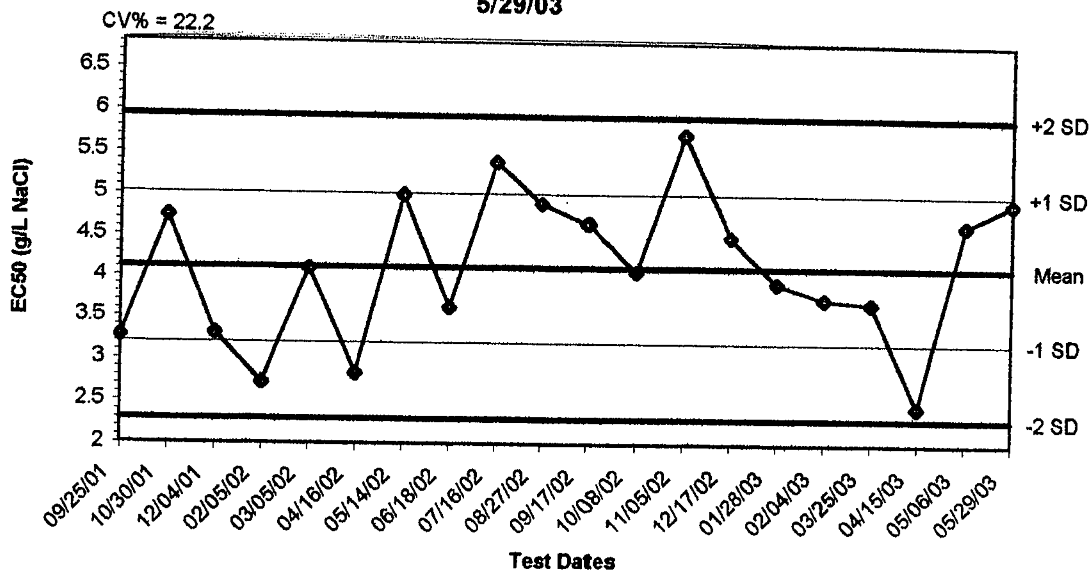
Reference Toxicant Control Chart- Fathead Minnow 7 Day Survival
5/29/03

CV% = 15.2



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
09/25/01	3.5877	4.7591	4.0341	3.3091	5.4841	6.2091
10/30/01	4.8178	4.7591	4.0341	3.3091	5.4841	6.2091
12/04/01	5.0108	4.7591	4.0341	3.3091	5.4841	6.2091
02/05/02	3.6907	4.7591	4.0341	3.3091	5.4841	6.2091
03/05/02	5.9134	4.7591	4.0341	3.3091	5.4841	6.2091
04/16/02	4.1310	4.7591	4.0341	3.3091	5.4841	6.2091
05/14/02	4.6588	4.7591	4.0341	3.3091	5.4841	6.2091
06/18/02	4.0381	4.7591	4.0341	3.3091	5.4841	6.2091
07/16/02	4.9180	4.7591	4.0341	3.3091	5.4841	6.2091
08/27/02	5.7098	4.7591	4.0341	3.3091	5.4841	6.2091
09/17/02	5.2951	4.7591	4.0341	3.3091	5.4841	6.2091
10/08/02	4.6260	4.7591	4.0341	3.3091	5.4841	6.2091
11/05/02	5.6570	4.7591	4.0341	3.3091	5.4841	6.2091
12/17/02	5.3359	4.7591	4.0341	3.3091	5.4841	6.2091
01/28/03	4.7398	4.7591	4.0341	3.3091	5.4841	6.2091
02/04/03	4.3808	4.7591	4.0341	3.3091	5.4841	6.2091
03/25/03	4.1887	4.7591	4.0341	3.3091	5.4841	6.2091
04/15/03	3.6659	4.7591	4.0341	3.3091	5.4841	6.2091
05/06/03	5.0405	4.7591	4.0341	3.3091	5.4841	6.2091
05/29/03	5.7755	4.7591	4.0341	3.3091	5.4841	6.2091

Reference Toxicant Control Chart- Fathead Minnow Growth-Weight
5/29/03



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
09/25/01	3.2659	4.1117	3.1992	2.2867	5.0242	5.9366
10/30/01	4.7405	4.1117	3.1992	2.2867	5.0242	5.9366
12/04/01	3.3054	4.1117	3.1992	2.2867	5.0242	5.9366
02/05/02	2.7202	4.1117	3.1992	2.2867	5.0242	5.9366
03/05/02	4.0948	4.1117	3.1992	2.2867	5.0242	5.9366
04/16/02	2.8280	4.1117	3.1992	2.2867	5.0242	5.9366
05/14/02	5.0011	4.1117	3.1992	2.2867	5.0242	5.9366
06/18/02	3.6221	4.1117	3.1992	2.2867	5.0242	5.9366
07/16/02	5.3974	4.1117	3.1992	2.2867	5.0242	5.9366
08/27/02	4.8972	4.1117	3.1992	2.2867	5.0242	5.9366
09/17/02	4.6612	4.1117	3.1992	2.2867	5.0242	5.9366
10/08/02	4.0708	4.1117	3.1992	2.2867	5.0242	5.9366
11/05/02	5.7310	4.1117	3.1992	2.2867	5.0242	5.9366
12/17/02	4.5031	4.1117	3.1992	2.2867	5.0242	5.9366
01/28/03	3.9327	4.1117	3.1992	2.2867	5.0242	5.9366
02/04/03	3.7418	4.1117	3.1992	2.2867	5.0242	5.9366
03/25/03	3.6901	4.1117	3.1992	2.2867	5.0242	5.9366
04/15/03	2.4442	4.1117	3.1992	2.2867	5.0242	5.9366
05/06/03	4.6530	4.1117	3.1992	2.2867	5.0242	5.9366
05/29/03	4.9331	4.1117	3.1992	2.2867	5.0242	5.9366

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903PP	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

Conc-gm/L	1	2	3	4
D-Control	0.9000	1.0000	1.0000	0.9000
0.5	1.0000	1.0000	0.9000	1.0000
1	0.9000	0.9000	1.0000	1.0000
2	0.9000	1.0000	0.8000	1.0000
4	0.9000	0.9000	0.9000	0.8000
8	0.1000	0.1000	0.1000	0.1000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4			2	40
0.5	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	20.00	10.00	1	40
1	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4	18.00	10.00	2	40
2	0.9250	0.9737	1.2951	1.1071	1.4120	11.347	4	17.00	10.00	3	40
4	0.8750	0.9211	1.2136	1.1071	1.2490	5.846	4	13.00	10.00	5	40
*8	0.1000	0.1053	0.3218	0.3218	0.3218	0.000	4	10.00	10.00	36	40

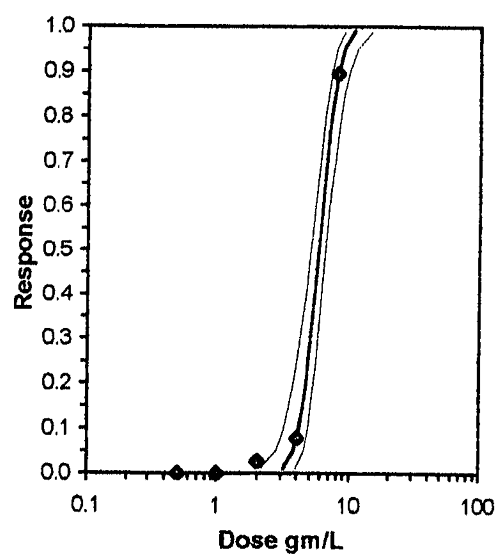
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93694	0.884	-0.5448	-0.4428
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	4	8	5.65685	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.848	1.57739	5.75631	11.9397	0.05	1.05182	7.81472	0.79	0.76159	0.11302	5
Intercept	-1.7386	1.27857	-4.2446	0.76743							
TSCR	0.04998	0.01723	0.01621	0.08376							

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	3.15259	2.10554	3.88129
EC05	3.355	3.76435	2.74443	4.46023
EC10	3.718	4.13762	3.15462	4.81287
EC15	3.964	4.41015	3.46119	5.07269
EC20	4.158	4.6395	3.7223	5.29434
EC25	4.326	4.84574	3.95844	5.49708
EC40	4.747	5.40702	4.5986	6.07385
EC50	5.000	5.77552	5.00819	6.48097
EC60	5.253	6.16914	5.42801	6.94882
EC75	5.674	6.8837	6.13055	7.89745
EC80	5.842	7.18971	6.40799	8.34251
EC85	6.036	7.56361	6.73068	8.91496
EC90	6.282	8.0618	7.13776	9.72139
EC95	6.645	8.8612	7.75058	11.1045
EC99	7.326	10.5807	8.96442	14.3807

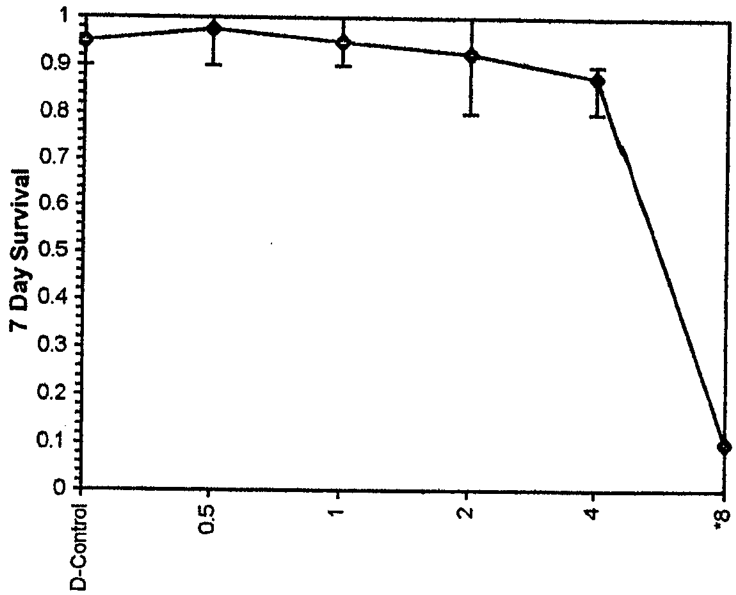


 ToxCalc v5.0.23 Reviewed by: KB

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903PP	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KS

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903PP	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

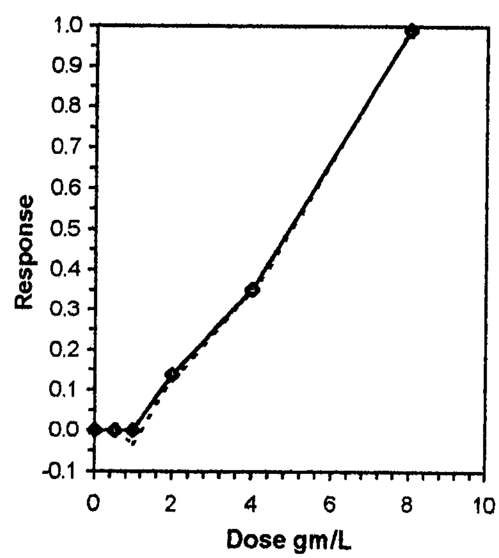
Conc-gm/L	1	2	3	4
D-Control	0.5600	0.5020	0.5510	0.5320
0.5	0.5760	0.5700	0.5140	0.4930
1	0.5610	0.5460	0.4970	0.6110
2	0.4240	0.5110	0.4300	0.5070
4	0.3600	0.3840	0.2770	0.3890
8	0.0090	0.0050	0.0000	0.0050

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5363	1.0000	0.5363	0.5020	0.5600	4.782	4				0.5428	1.0000
0.5	0.5383	1.0037	0.5383	0.4930	0.5760	7.637	4	-0.071	2.410	0.0678	0.5428	1.0000
1	0.5538	1.0326	0.5538	0.4970	0.6110	8.477	4	-0.622	2.410	0.0678	0.5428	1.0000
*2	0.4680	0.8727	0.4680	0.4240	0.5110	10.136	4	2.425	2.410	0.0678	0.4680	0.8623
*4	0.3525	0.6573	0.3525	0.2770	0.3890	14.724	4	6.528	2.410	0.0678	0.3525	0.6495
*8	0.0047	0.0089	0.0047	0.0000	0.0090	77.591	4	18.882	2.410	0.0678	0.0047	0.0088

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96041		0.884		-0.425	-0.5983
Bartlett's Test indicates equal variances (p = 0.04)					11.5895		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	1	2	1.41421		0.06784	0.1265	0.17915	0.00158	6.0E-13	5, 18

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.3630	0.2128	0.4022	2.1642	-0.2946
IC10	1.7261	0.2412	1.0540	2.6862	0.4811
IC15	2.1154	0.2755	1.3829	2.9776	0.3081
IC20	2.5853	0.3084	1.5144	3.3486	-0.2042
IC25	3.0552	0.2869	2.0520	3.8288	-0.0899
IC40	4.3088	0.2340	3.4007	4.8108	-0.7711
IC50	4.9331	0.1989	4.1470	5.3500	-0.9228



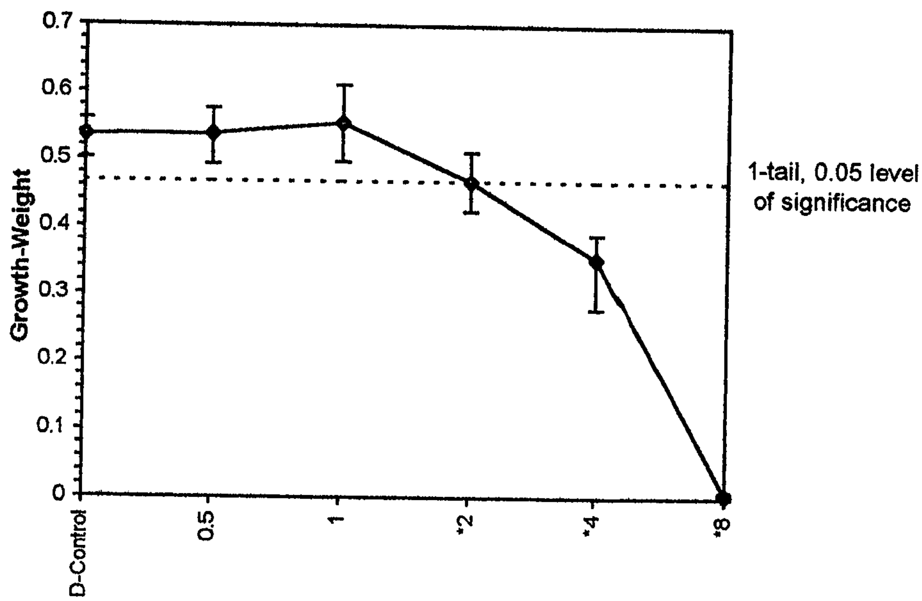
ToxCalc v5.0.23

Reviewed by: KB

Larval Fish Growth and Survival Test-Growth-Weight

Start Date:	5/29/03	Test ID:	RT052903PP	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 02-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot

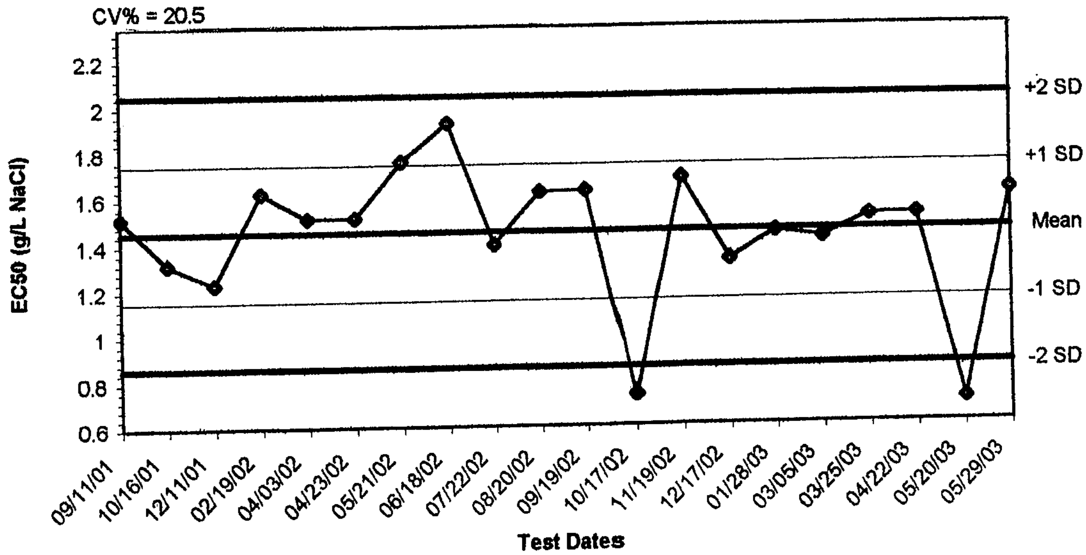


ToxCalc v5.0.23

Reviewed by: KS

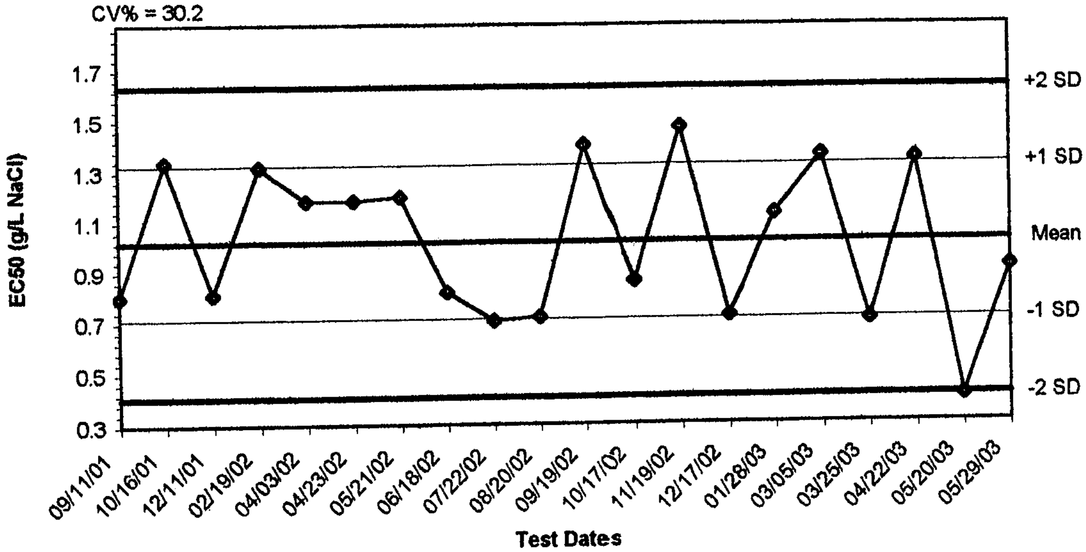
Ceriodaphnia dubia

Reference Toxicant Control Chart- *Ceriodaphnia dubia* 7 Day Survival
5/29/03



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
09/11/01	1.5174	1.4510	1.1538	0.8567	1.7481	2.0452
10/16/01	1.3195	1.4510	1.1538	0.8567	1.7481	2.0452
12/11/01	1.2311	1.4510	1.1538	0.8567	1.7481	2.0452
02/19/02	1.6245	1.4510	1.1538	0.8567	1.7481	2.0452
04/03/02	1.5157	1.4510	1.1538	0.8567	1.7481	2.0452
04/23/02	1.5157	1.4510	1.1538	0.8567	1.7481	2.0452
05/21/02	1.7608	1.4510	1.1538	0.8567	1.7481	2.0452
06/18/02	1.9296	1.4510	1.1538	0.8567	1.7481	2.0452
07/22/02	1.3974	1.4510	1.1538	0.8567	1.7481	2.0452
08/20/02	1.6245	1.4510	1.1538	0.8567	1.7481	2.0452
09/19/02	1.6303	1.4510	1.1538	0.8567	1.7481	2.0452
10/17/02	0.7368	1.4510	1.1538	0.8567	1.7481	2.0452
11/19/02	1.6843	1.4510	1.1538	0.8567	1.7481	2.0452
12/17/02	1.3241	1.4510	1.1538	0.8567	1.7481	2.0452
01/28/03	1.4444	1.4510	1.1538	0.8567	1.7481	2.0452
03/05/03	1.4142	1.4510	1.1538	0.8567	1.7481	2.0452
03/25/03	1.5106	1.4510	1.1538	0.8567	1.7481	2.0452
04/22/03	1.5157	1.4510	1.1538	0.8567	1.7481	2.0452
05/20/03	0.7024	1.4510	1.1538	0.8567	1.7481	2.0452
05/29/03	1.6200	1.4510	1.1538	0.8567	1.7481	2.0452

Reference Toxicant Control Chart- *Ceriodaphnia dubia* Reproduction
5/29/03



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
09/11/01	0.8019	1.0186	0.7114	0.4042	1.3257	1.6329
10/16/01	1.3379	1.0186	0.7114	0.4042	1.3257	1.6329
12/11/01	0.8128	1.0186	0.7114	0.4042	1.3257	1.6329
02/19/02	1.3191	1.0186	0.7114	0.4042	1.3257	1.6329
04/03/02	1.1844	1.0186	0.7114	0.4042	1.3257	1.6329
04/23/02	1.1844	1.0186	0.7114	0.4042	1.3257	1.6329
05/21/02	1.1992	1.0186	0.7114	0.4042	1.3257	1.6329
06/18/02	0.8191	1.0186	0.7114	0.4042	1.3257	1.6329
07/22/02	0.7022	1.0186	0.7114	0.4042	1.3257	1.6329
08/20/02	0.7166	1.0186	0.7114	0.4042	1.3257	1.6329
09/19/02	1.4011	1.0186	0.7114	0.4042	1.3257	1.6329
10/17/02	0.8609	1.0186	0.7114	0.4042	1.3257	1.6329
11/19/02	1.4710	1.0186	0.7114	0.4042	1.3257	1.6329
12/17/02	0.7183	1.0186	0.7114	0.4042	1.3257	1.6329
01/28/03	1.1259	1.0186	0.7114	0.4042	1.3257	1.6329
03/05/03	1.3585	1.0186	0.7114	0.4042	1.3257	1.6329
03/25/03	0.7029	1.0186	0.7114	0.4042	1.3257	1.6329
04/22/03	1.3434	1.0186	0.7114	0.4042	1.3257	1.6329
05/20/03	0.4000	1.0186	0.7114	0.4042	1.3257	1.6329
05/29/03	0.9118	1.0186	0.7114	0.4042	1.3257	1.6329

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903CD	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia

Comments:

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
2	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

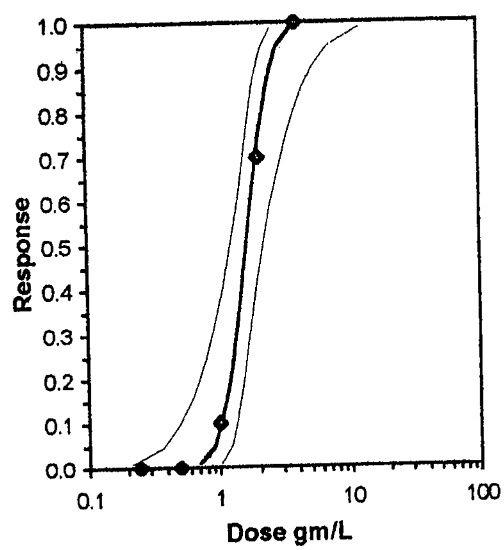
Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
0.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
0.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
*2	0.3000	0.3000	7	3	10	10	0.0015	0.0500	7	10
*4	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1	2	1.41421	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.41177	1.89162	2.7042	10.1193	0	0.10062	7.81472	0.99	0.2095	0.15596	3
Intercept	3.65671	0.51283	2.65156	4.66187							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	0.70255	0.21231	1.00551
EC05	3.355	0.89736	0.37195	1.19736
EC10	3.718	1.02242	0.4982	1.32299
EC15	3.964	1.1165	0.60391	1.42186
EC20	4.158	1.19741	0.70078	1.51196
EC25	4.326	1.27147	0.79294	1.6003
EC40	4.747	1.47908	1.05536	1.89406
EC50	5.000	1.61996	1.22283	2.14858
EC60	5.253	1.77425	1.38639	2.49089
EC75	5.674	2.06395	1.63978	3.31747
EC80	5.842	2.19162	1.7353	3.75439
EC85	6.036	2.35044	1.84499	4.35725
EC90	6.282	2.56672	1.98262	5.28242
EC95	6.645	2.92442	2.19038	7.07624
EC99	7.326	3.73532	2.608	12.3986



ToxCalc v5.0.23

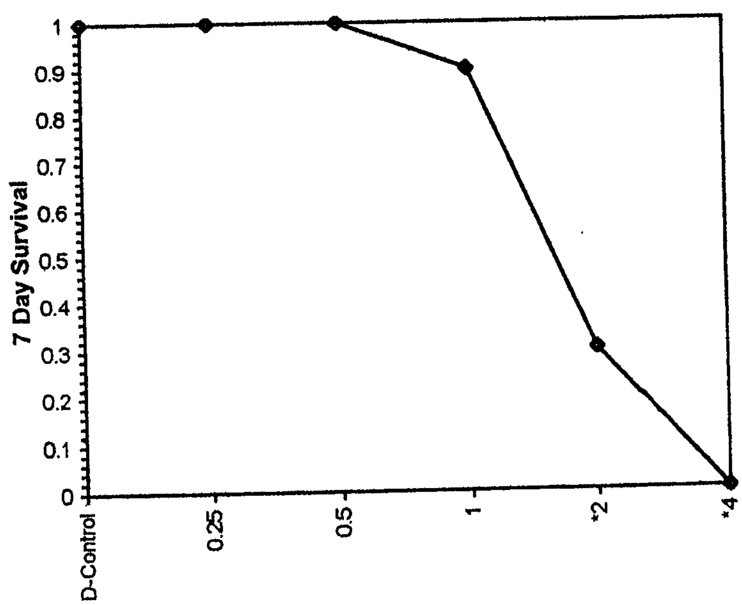
Reviewed by: [signature]

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/29/03	Test ID:	RT052903CD	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia

Comments:

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: [signature]

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	RT052903CD	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia

Comments:

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	13.000	7.000	1.000	15.000	22.000	26.000	19.000	10.000	16.000	21.000
0.25	13.000	20.000	15.000	4.000	14.000	12.000	20.000	17.000	14.000	19.000
0.5	4.000	13.000	17.000	13.000	13.000	7.000	4.000	15.000	13.000	4.000
1	3.000	10.000	8.000	12.000	0.000	10.000	7.000	0.000	4.000	15.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

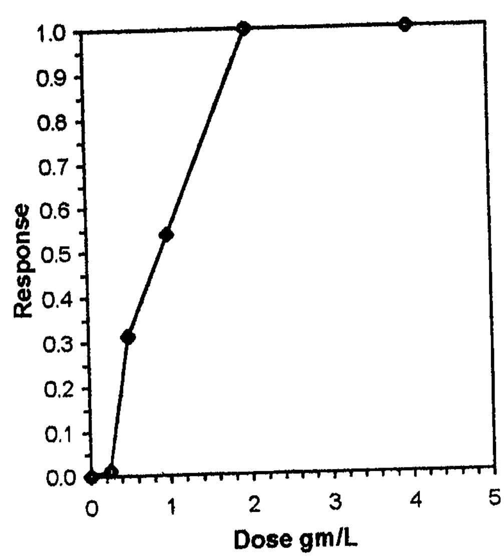
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	15.000	1.0000	15.0000	1.0000	26.0000	50.283	10			15.000	1.0000
0.25	14.800	0.9867	14.8000	4.0000	20.0000	32.295	10	101.50	75.00	14.800	0.9867
0.5	10.300	0.6867	10.3000	4.0000	17.0000	48.662	10	84.00	75.00	10.300	0.6867
*1	6.900	0.4600	6.9000	0.0000	15.0000	73.408	10	73.00	75.00	6.900	0.4600
*2	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	55.00	75.00	0.000	0.0000
*4	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	55.00	75.00	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.6999	1.035	-0.528	1.32857
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	0.5	1	0.70711	

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.2806	0.1211	0.0436	0.4940	0.1714
IC10	0.3222	0.1204	0.0872	0.5518	0.5332
IC15	0.3639	0.1258	0.1308	0.6181	0.8773
IC20	0.4056	0.1364	0.1744	0.6980	0.9450
IC25	0.4472	0.1613	0.2180	0.8010	1.1536
IC40	0.6912	0.2137	0.3993	1.1544	0.6009
IC50	0.9118	0.2189	0.4727	1.2953	-0.0711



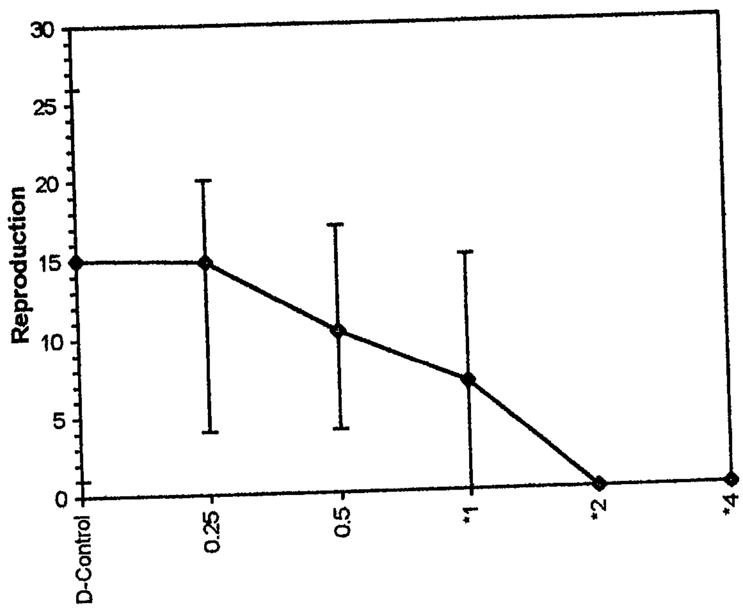
ToxCalc v5.0.23

Reviewed by: KO

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/29/03	Test ID:	RT052903CD	Sample ID:	REF-REFERENCE TOXICANT
End Date:	6/5/03	Lab ID:	WAAEE-AMEC NW Bioassa	Sample Type:	NACL-Sodium chloride
Sample Date:	5/29/03	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: KJ

Appendix I

Chain-of-Custody Form

Chain of Custody

amec Earth & Environmental
AMEC Northwest Bioassay Laboratory
5009 Pacific Highway East, Suite 2
Fife, WA 98424
253-922-4296

Date 5/28/03 Page 1 of 1

COMPANY SAIC
ADDRESS 18706 N. CREEK PARKWAY SUITE 110
CITY BOTHELL STATE WA ZIP 98011
PHONE NO. 425 482-3318
ATTN: MARK DAGEL

PROJECT MANAGER: Mark Dagel
SAMPLERS (SIGNATURE): Glenn Haupt
PHONE NUMBER: 425 482-3318

ANALYSIS REQUIRED

SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	EPA/600/4-91/002 FLATHEAD	EPA/600/4-91/002 CERIODAPHNIA	EPA/600/R-95/136 Atherinops affinis	EPA/600/4-91/003 Mysidopsis	temp upon receipt °C	login #	CONCENTRATIONS/COMMENTS	NUMBER OF CONTAINERS
WET-MW-146 #1	5/28/03 ~~5/31/03~~	0935	WATER		✓	✓	✓	✓	1.0	03-0186	(4) 20 Liter cubitainers 80 Liters total	4
WET-MW-7 #2	5/28/03	0936	water		✓	✓	✓	✓	2.5	03-0187		4
WET-MW-17 #3	5/28/03	1325	water		✓	✓	✓	✓	3.8	03-0188		4
WET-MW-103R #4	5/28/03	1700	water		✓	✓	✓	✓	4.3	03-0189		4
WET-MW-129 #5	5/28/03	1520	water		✓	✓	✓	✓	1.2	03-0190	(5) 10; 20 liter cubitainers 80 Liter total	5
WET-MW-W #6	5/28/03	1940	water		✓	✓	✓	✓	4.8	03-0191		4

PROJECT INFORMATION
CLIENT
P.O. NO.
SHIPPED VIA:

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	25
CHAIN OF CUSTODY SEALS	N
RECEIPT TEMP	see above
CONFORMS TO RECORD	Y

RELINQUISHED BY
(Signature) Glenn Haupt (Time) 815
(Printed Name) Glenn Haupt (Date) 5/29/03
(Company) SAIC

RELINQUISHED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
(Signature) Noelle Frick (Time) 0820
(Printed Name) Noelle Frick (Date) 5/29/03
AMEC Bioassay Lab Log-in No. see above

SPECIAL INSTRUCTIONS/COMMENTS:
prepare chemical samples for NCA labs.
pre-~~contr~~ contract agreement.
comment - date indicated on sample cubes for WET-MW-146 incorrectly dated 5/31/03

Additional disposal charges may apply.

DISTRIBUTION: WHITE, CANARY - AMEC Bioassay Lab, PINK - Originator