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March 1, 1994

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Ms. Terry L. Phipps
Environmental Sciences Division
Oak Ridge National Laboratory
P. O. Box 2008, MS-6351
Oak Ridge, Tennessee 37831-6351

Dear Terry:

Enclosed is a copy of the report presenting results of TVA toxicity testing using fathead minnows and daphnids during the Clinch River - Environmental Restoration Program (CR-ERP) Study, January 25-February 1, 1994. Attachments to the report include Chain of Custody Forms - Originals (I), Toxicity Test Bench Sheets and Statistical Analyses (II), Meter Calibrations (III), and Reference Toxicant Test Information (IV). Exposure of fathead minnows and daphnids to water column samples collected from Clinch River Mile 9.0 and Poplar Creek Mile 2.9 resulted in no toxicity to test organisms. No toxicity to fathead minnows was demonstrated in samples from Poplar Creek Mile 1.0; however, significant reduction in daphnid reproduction occurred based on hypothesis testing of data. Point estimation (IC₂₅) analysis of data showed no toxic effects.

I have included copies of the bench sheets, as in the past. Please let me know if you again find any of them unsatisfactory. Call me (205-729-3340) if you have questions or comments regarding the report or conductance of the study.

Sincerely,

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *ph*

Jennifer Moses, Unit Supervisor
Toxicity Testing Laboratory

JM:DTH

Enclosures

cc: R. J. Pryor, HB 2D-C
J. D. Milligan, HB 2C-C (w/enclosures)
D. C. Wade, OSA 1B-M (w/enclosures)
Files, WM, HB 2C-C (w/enclosures)

MASTER

Prepared by Jennifer Moses

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TENNESSEE VALLEY AUTHORITY
TOXICITY TESTING LABORATORY
STANDARD REPORT FORM

STATIC RENEWAL TESTS USING
PIMEPHALES PROMELAS (FATHEAD MINNOWS) AND
CERIODAPHNIA DUBIA (DAPHNIDS)

Test Title: Clinch River - Environmental Restoration Program (CR-ERP)
Study, Ambient Water Toxicity

Principal Investigator: Damien J. Simbeck

Starting Date: January 25, 1994

Ending Date: February 1, 1994

1.0 EXECUTIVE SUMMARY

Clinch River - Environmental Restoration Program (CR-ERP) personnel and Tennessee Valley Authority (TVA) personnel conducted a study during the week of January 25-February 1, 1994, as described in the Statement of Work (SOW) document. [1] The organisms specified for testing were larval fathead minnows, Pimephales promelas, and the daphnid, Ceriodaphnia dubia.

Surface water samples were collected by TVA Field Engineering personnel from Clinch River Mile 9.0, Poplar Creek Mile 1.0, and Poplar Creek Mile 2.9 on January 24, 26, and 28. Samples were partitioned (split) and provided to the CR-ERP and TVA toxicology laboratories for testing. Exposure of test organisms to these samples resulted in no toxicity (survival or growth) to fathead minnows; however, toxicity to daphnids (significantly reduced reproduction) was demonstrated in undiluted samples from Poplar Creek Mile 1.0 in testing conducted by TVA based on hypothesis testing of data. Point estimation (IC₂₅) analysis of the data, however, showed no toxicity in PCM 1.0 samples.

2.0 SAMPLE COLLECTION/TREATMENTS

- 2.1 Test Sample Identification (Chemical/Effluent/Elutriate, etc.):
Samples were collected for biomonitoring at the following three sites: Clinch River Mile 9.0, Poplar Creek Mile 1.0, and Poplar Creek Mile 2.9.

Samples used for the CR-ERP Study, January 25-February 1, 1994, are identified as follows:

Station ID	Collection Date	CR-ERP ID Number	CR-ERP Chain-of-Custody Form Number	Dates Used
CRM 9.0	January 24	10695	0124944	January 25-26
	January 26	10791	0126944	January 27-28
	January 28	10900	0128943	January 29-31
PCM 1.0	January 24	10691	0124944	January 25-26
	January 26	10787	0126944	January 27-28
	January 28	10896	0128943	January 29-31
PCM 2.9	January 24	10688	0124944	January 25-26
	January 26	10785	0126944	January 27-28
	January 28	10894	0128943	January 29-31

- 2.2 Control and/or Dilution Water: Laboratory culture medium consisting of moderately hard reconstituted water was used as control and dilution water for toxicity tests.
- 2.3 Sample Dates and Times: Test samples were collected on January 24, 26, and 28, 1994. Collection times were between 1100 and 1230 EST.
- 2.4 Sampling Method: All samples were collected using an Isco peristaltic pump with the inlet tubing lowered to approximately 1.5 meters below the surface. Pumping rate was approximately four liters per minute. A 20-L composite was collected at each station and partitioned (split) according to the workplan for shipping to the TVA Toxicity Testing Laboratory (TTL) at Browns Ferry Nuclear Plant site or direct transfer to ORNL (DOE) personnel in the field.
- 2.5 Pertinent Site Conditions: Weather conditions were clear and sunny during sampling on January 24, heavy rain on January 26, and clear and sunny on January 28. Water levels were rising on January 26, and flow was heavy with considerable amounts of debris on January 28.
- 2.6 Sample Storage/Handling: All samples were placed on ice in ice chests after partitioning. Zero headspace was established in each container by filling full and expressing any air bubbles before sealing. Samples remained on ice until shipped or transferred directly to ORNL (DOE) personnel. Excess composite sample was discarded. Samples were stored in refrigerators at $\leq 4^{\circ}\text{C}$ after arrival at TTL. Note: The sample container for Clinch River Mile 9.0 on the January 24 sample had several small holes in one corner and approximately half the sample was lost during shipment.
- 2.7 Sample Transport: Samples collected on January 24 were shipped directly to the TTL via Federal Express. Samples collected on January 26 and 28 were transported to the Browns Ferry Nuclear

Plant site by overnight TVA mail courier. Personnel from the TTL picked up samples from the mailroom and transported them to the TTL. No chain of custody seals were present on samples shipped January 24. All chain of custody security seals on other samples were intact upon receipt of shipments.

- 2.8 Sample Pretreatment: Sample temperature was raised to 25°C in a warm water bath and samples were aerated as necessary to bring DO levels down to near 100 percent saturation. Adequate water for use in test initiation or daily renewal was poured into 2000-mL beakers, and appropriate dilutions were prepared where applicable.
- 2.9 Test Treatments: Samples from Clinch River Mile 9.0, Poplar Creek Mile 1.0, and Poplar Creek Mile 2.9 were tested at 100 percent (undiluted) and 50 percent, diluted using moderately hard reconstituted water.

3.0 TEST ORGANISMS/CULTURING CONDITIONS

- 3.1 Species: Pimephales promelas, Fathead minnow
- 3.1.1 Source: TTL inhouse culture
- 3.1.2 Culture Water: Culture medium consisted of moderately hard reconstituted water. Reagents for reconstituted water were added to reverse osmosis product water. Water was passed through a pack column degasser to bring dissolved gases to saturation. Culture medium was continuously aerated to help ensure aseptic conditions. Total hardness was approximately 95 mg/L as CaCO₃.
- 3.1.3 Temperature of Culture: 25°C ± 1°C
- 3.1.4 General Maintenance: Adult fathead minnows are maintained in glass aquaria in a flow through recirculating system. Flow rate to aquaria used for spawning is one aquarium volume per hour.

Approximately 20 percent of the water volume is replaced twice weekly. Adults are fed three times daily. Sexually mature fish are placed in 21-L glass aquaria (one male, four females) and reproduction is checked and recorded daily. Spawns are removed from aquaria and incubated in 1-L glass beakers under aeration to the proper stage of development for the target test.

Fish health is monitored regularly and corrective action is taken if necessary. Spawning frequency from individual aquaria is tracked and sexually spent individuals are replaced as necessary. Every 4-6 months a group of the same age fish from at least three spawns is reared to adults for replacement spawners.

- 3.1.5 Spawn Date: January 21, 1994
- 3.1.6 Hatch Date/Time: January 24, 1994/1300 CST to
January 25, 1994/1130 CST

- 3.1.7 Culture/Acclimation Water: Moderately hard reconstituted water
- 3.1.8 Acclimation Temperature: $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- 3.1.9 Diseases and Treatment: None.
- 3.1.10 Food and Feeding: Larvae were fed brine shrimp (Artemia) nauplii <24-h old twice daily beginning after hatching to ensure food availability if larvae began feeding prior to test initiation.
- 3.2 Species: Ceriodaphnia dubia, daphnids
- 3.2.1 Source: Inhouse culture, TVA, Aquatic Research Laboratory
- 3.2.2 Culture Water: Moderately hard reconstituted water containing trace elements, macronutrients, and vitamins. [2]
- 3.2.3 Temperature of Culture: $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- 3.2.4 General Maintenance: Adults used to produce neonates for test initiation are selected as neonates from broods as described below on 2 or 3 consecutive days 6-10 days prior to test initiation. (Adults up to 14 days old may be used for neonate production.) These animals are raised individually (a brood may be raised as a group until Day 3 at which time animals are transferred to individual cups), and a record is made of their reproduction. Their fourth brood is generally the second brood with 8 or more young and is the earliest brood used for test initiation.
- Mass cultures may also be maintained in 8-L glass battery jars in light and temperature controlled incubators. New cultures are started weekly (7-10 days) with approximately 50 neonates. These neonates are selected from the third or fourth brood of the adult, from broods containing 8 or more young.
- 3.2.5 Food and Feeding: Ceriodaphnia are fed food made according to methods modified from EPA/600/4-89/001 with tropical fish food substituted for trout chow and alfalfa substituted for Cerophyll. Individual animals contained in cups with 15 mL medium were fed 0.1 mL food and algae at renewal. [3]

4.0 TEST METHODS

- 4.1 Fathead Minnow (Pimephales promelas) Larval Survival and Growth Test, EPA Test Method 1000.0. [3]
- 4.1.1 Modifications to/Deviations from Method 1000.0:
- 4.1.1.1 Samples were not pre-filtered as described in EPA methods and TTL SOP-12 per request of Terry Phipps (comment provided during surveillance on 01/25/94).

- 4.1.1.2 Temperatures in one beaker on Day 2 and two beakers on Day 4 were above the required $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. These deviate temperatures ranged from 26.2°C to 26.3°C . Temperature in one beaker on Day 2 was below the required $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. This deviate temperature of 21.4°C was a result of that beaker being inadvertently left out of the incubator after change-out the previous day. No adverse affect to test results was likely since the deviant temperatures were random among treatments, and the overall means for the test (25.2°C) and all individual treatments were within the EPA required limits.
- 4.1.1.3 The beaker left out of the incubator following renewal on Day 1 did not receive two feedings. Examination of weight data shows this replicate (PCM 2.9-50%, Replicate #1) had the lowest weight in the treatment; however, no significant reduction from controls resulted based on statistical analysis.
- 4.1.2 Date/Time Test Initiated: January 25, 1994/1210 CST
- 4.1.3 Date/Time Test Terminated: February 1, 1994/1220 CST
- 4.1.4 Test Chamber: 600-mL borosilicate glass beakers
Volume per chamber: 350 mL
- 4.1.5 Age of Test Organisms at Start of Test: 0.5-23.0 hours
- 4.1.6 Mean Dry Weight of Test Organisms at Start of Test: 0.09 mg
- 4.1.7 Number of Test Organisms per Chamber: 10
- 4.1.8 Number of Replicates per Treatment: 4
- 4.1.9 Dilution Water/Control Water: Moderately hard reconstituted water
- 4.1.10 Renewal Period: 24-h
- 4.1.11 Test Temperature: $25.0^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- 4.1.12 Feeding Regime During Test: Fathead minnow larvae were fed brine shrimp (Artemia) nauplii <24-h old 2 or 3 times daily ad libitum.
- 4.1.13 Physical and Chemical Parameters Measured: Parameters measured daily (initially) on test solutions and control waters were temperature (temperature was adjusted to equal "final" temperature before renewal), DO, pH and conductivity. In addition, alkalinity, hardness, and total residual chorine were measured on each new sample at the time of first use (1/25, 1/27, and 1/29).

Final measurements taken daily before renewal were temperature and DO in every test beaker and pH and conductivity in one replicate per treatment. Mean values and ranges are reported in Section 6.3.

4.1.14 Statistics:

Revised statistical procedures contained in the second edition of EPA's short-term chronic toxicity methods require a decision process for testing statistical assumptions before selecting a specific test method to determine toxicity endpoints. [3] Decision processes followed for testing survival and sublethal (growth) effects are shown in Sections 6.1.2.2 and 6.1.3.1. Based on tests for normal distribution and homogenous variance of data, the statistical test used for endpoint determination of survival data was Steel's Many-one Rank Test and for growth data was Dunnett's Test.

4.2 Ceriodaphnia Survival and Reproduction Test, EPA Test Method 1002.0. [3]

4.2.1 Modifications/Deviations to Method 1002.0:

4.2.1.1 Culture medium (see Section 3.2.2.).

4.2.1.2 Samples were not pre-filtered as described in EPA methods and TTL SOP-15 per request of Terry Phipps (comment provided during surveillance on 01/25/94).

4.2.2 Date/Time Test Initiated: January 25, 1994/1145 CST

4.2.3 Date/Time Test Terminated: January 31, 1994/1120 CST

4.2.4 Test Chamber: 1-ounce plastic cups (Plastics, Inc., #P.I.-1)
Volume per Chamber: 15 mL

4.2.5 Age of Test Organisms at Initiation: 6-14 hours

4.2.6 Number of Test Organisms per Chamber: 1

4.2.7 Number of Replicates per Treatment: 10

4.2.8 Dilution Water/Control Water: Moderately hard reconstituted water containing trace elements, macronutrients, and vitamins.

4.2.9 Renewal Period: 24 hours

4.2.10 Test Temperature: $25.0^{\circ}\text{C} \pm 1^{\circ}\text{C}$

4.2.11 Feeding Regime During Test: Each organism was fed 0.1 mL of prepared food and algae concentrate daily (added to renewal water before introduction of test organism).

4.2.12 Physical and Chemical Parameters Measured: Parameters measured daily ("initial") on test solutions and control waters were temperature (temperature was adjusted to equal "final" temperature before renewal), DO, pH and conductivity. In addition, alkalinity,

hardness, and total residual chlorine were measured on each new sample at the time of first use (1/25, 1/27, and 1/29).

"Final" measurements of temperature were made in 10 randomly selected cups when the tray was removed from the incubator. DO and pH were measured daily in 1 cup per treatment following renewal. Mean values and ranges are reported in Section 6.3.

4.2.13 Statistics:

Revised statistical procedures contained in the second edition of EPA's short-term chronic toxicity methods require decision process for testing statistical assumptions before selecting a specific statistical test to determine toxicity endpoints. [3] Fisher's Exact Test was used to evaluate Ceriodaphnia survival effects during the study. Based on tests for normal distribution and homogenous variance of data, the statistical test used for endpoint determination for survival data was Dunnett's Test. Note: In addition to hypothesis testing, the IC₂₅ was determined as an alternative test endpoint for PCM 1.0 due to significance demonstrated based on a 7.64 percent decrease from the control using Dunnett's Test.

5.0 QUALITY ASSURANCE

5.1 Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage; glassware preparation; test organism culturing/acquisition and acclimation; test organism handling during test; and maintaining appropriate test conditions were conducted according to the protocol as described in this report, EPA/600/4-89/001, and EPA/600/4-89/001a. [3] Any known deviations were noted during the study and are reported herein.

5.2 Physical and Chemical Methods

5.2.1 Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable). All TTL chemicals are recorded in a bound Laboratory Chemical Logbook and specific chemicals used were documented on a chemical record sheet contained in the study notebook.

5.2.2 Instruments: All identification, service, calibration, and standardization information pertaining to TTL laboratory instruments is contained in bound Laboratory Instrument Logbooks and specific instruments used were documented on an instrument record sheet contained in the study notebook.

5.2.3 Temperature was measured using glass mercury thermometers. The instrument was standardized and inspected with readings made according to TVA procedures ES-43.8 and ES-42.11. [4]

- 5.2.4 Dissolved oxygen was measured using a YSI Model 57 oxygen meter. The instrument was standardized (using the Winkler method) and readings were taken according to TVA procedures ES-43.6 and ES-42.4, respectively. [4]
- 5.2.5 The pH was measured using an Orion Model SA250 meter equipped with an Orion Ross combination electrode. The instrument was standardized and readings were made according to TVA procedures ES-43.7 and ES-42.8, respectively. [4]
- 5.2.6 Conductance was measured using a YSI Model 32 SCT meter. The instrument was standardized and readings were taken according to TVA procedures ES-43.3 and ES-42.3, respectively. [4]
- 5.2.7 Alkalinity was measured by titration of 100 mL samples with 0.02 N H₂SO₄ to an end point of 4.5 according to TVA procedure ES-42.1. [4]
- 5.2.8 Hardness was determined by titration of 50 mL samples with EDTA to a colorimetric endpoint using an indicator (Instructions provided by Reagent Manufacturer [Calgon]), Schwarzenbach Method.
- 5.2.9 Total residual chlorine (TRC) was determined using the DPD Titrimetric Method according to TVA procedure ES-42.9, Rev. 0. [4]
- 5.3 Reference Toxicant Tests
- 5.3.1 Test Type: Fish - 7-day chronic (NOEC)
- 5.3.2 Standard Toxicants Used:
- Copper Sulfate Reference Toxicant Solution
Source/Brand: EPA
- 5.3.3 Dilution Water Used: Moderately hard reconstituted water
- 5.3.4 Statistics: Chronic Test, FH Survival/Growth and Daphnid Reproduction, NOEC - Dunnett's Test or Steel's Many-one Rank Test, EPA Bootstrap Procedure - IC₂₅ Daphnid Survival - Fisher's Exact Test

6.0 RESULTS

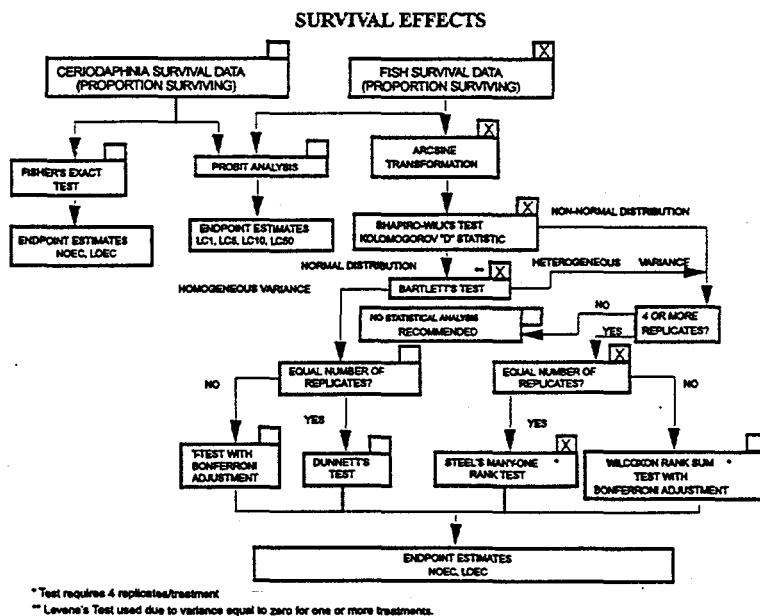
- 6.1 Fathead Minnow Larval Survival and Growth Test
- 6.1.1 Summary of Results: No survival or growth effects were demonstrated in fathead minnows exposed to Clinch River Mile 9.0, Poplar Creek Mile 1.0, or Poplar Creek Mile 2.9 samples during the CR-ERP Ambient Water Toxicity Study conducted January 25-February 1, 1994.

6.1.2 Results, Survival Data:

6.1.2.1 Daily Percent Survival Summary for Fathead Minnow Larval Survival Test, CR-ERP Study, January 25-February 1, 1994.

Treatment	Total Daily % Survival						
	Day 1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
CRM 9.0-50%	100	100	100	100	100	100	100
CRM 9.0-100%	100	100	100	98	98	98	98
PCM 1.0-50%	100	100	100	100	100	98	98
PCM 1.0-100%	100	100	100	100	100	93	90
PCM 2.9-50%	100	98	98	98	98	98	98
PCM 2.9-100%	100	100	100	100	100	100	100

6.1.2.2 Statistical Decision Process for Determining Toxicity Endpoints for 7-Day Survival of Fathead Minnows, CR-ERP Study, January 25-February 1, 1994.



6.1.2.3 Analysis of Survival Data Using Steel's Many-one Rank Test for Fathead Minnow 7-Day Larval Survival Test, CR-ERP Study, January 25-February 1, 1994.

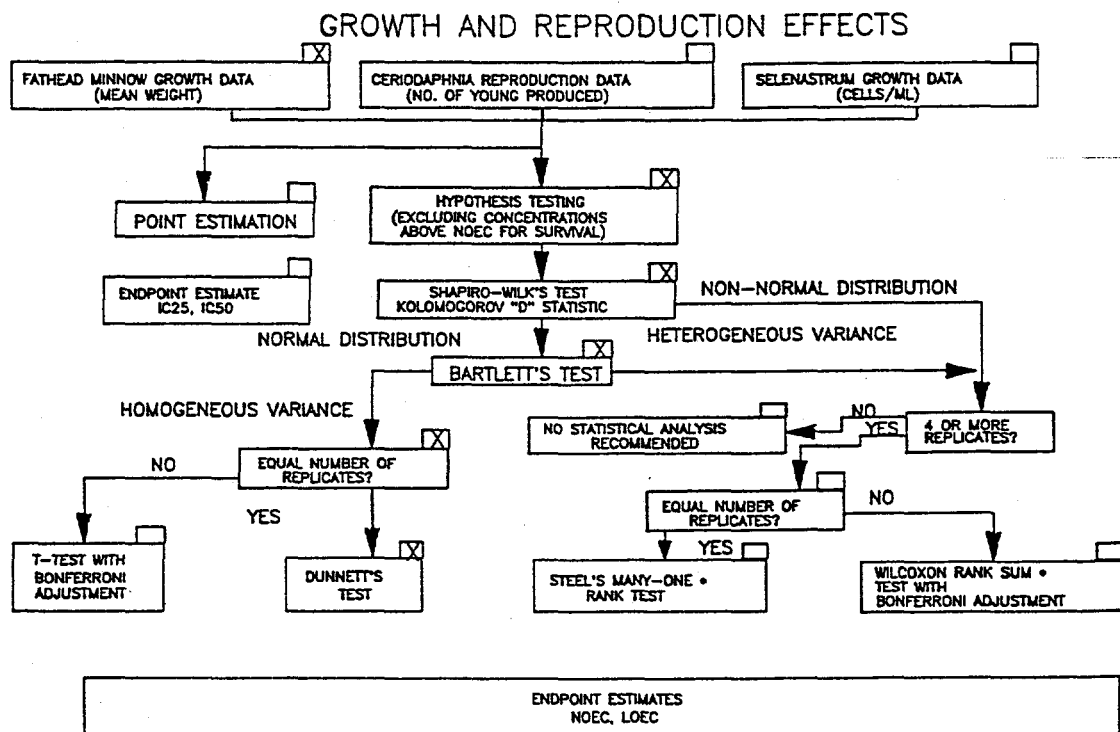
Group	Survival (%) Data										Mean	S*
	Replicate											
	1	2	3	4	5	6	7	8	9	10		
Control	100	100	100	100							100	
CRM 9.0-50%	100	100	100	100							100	
CRM 9.0-100%	90	100	100	100							98	
PCM 1.0-50%	100	100	100	90							98	
PCM 1.0-100%	100	80	100	80							90	
PCM 2.9-50%	100	90	100	100							98	
PCM 2.9-100%	100	100	100	100							100	

Steel's Many-one Rank Test			
Treatment	Replicates	Critical Rank Sum	Rank Sum*
CRM 9.0-50%	4	10	18.0
CRM 9.0-100%	4	10	16.0
PCM 1.0-50%	4	10	16.0
PCM 1.0-100%	4	10	14.0
PCM 2.9-50%	4	10	16.0
PCM 2.9-100%	4	10	18.0

*Values less than or equal to the Critical Rank Sum are significantly less than the control (Medium).

6.1.3 Results, Growth Data:

6.1.3.1 Statistical Decision Process for Determining Toxicity Endpoints for 7-Day Growth of Fathead Minnows, CR-ERP Study, January 25-February 1, 1994.



* Test requires 4 replicates/treatment

6.1.3.2 Analysis of Dry Weight (mg) Data Using Dunnett's Test for Fathead Minnow 7-Day Larval Growth Test, CR-ERP Study, January 25-February 1, 1994.

No transformation applied before data analysis. For this set of data, the minimum significant difference is 0.08.

This represents a 19.64% decrease in dry weight, mg.

T = 2.45 Alpha = 0.05 (one-tailed test)

Treatment	Growth Data (mg)										Mean	S*
	Replicate											
	1	2	3	4	5	6	7	8	9	10		
Control	0.42	0.40	0.46	0.45							0.43	
CRM 9.0-50%	0.40	0.40	0.43	0.49							0.43	
CRM 9.0-100%	0.48	0.46	0.50	0.47							0.48	
PCM 1.0-50%	0.49	0.46	0.45	0.49							0.47	
PCM 1.0-100%	0.50	0.62	0.42	0.51							0.51	
PCM 2.9-50%	0.33	0.49	0.48	0.44							0.44	
PCM 2.9-100%	0.43	0.43	0.45	0.51							0.46	

*Values significantly less than the control (Medium). EMS = 0.002.

6.2 Ceriodaphnia Survival and Reproduction Test

6.2.1 Summary of Results: No survival effects were demonstrated in daphnids exposed to Clinch River Mile 9.0, Poplar Creek Mile 1.0, or Poplar Creek Mile 2.9 samples during the CR-ERP Ambient Water Toxicity Study conducted January 25-31, 1994. Significant reproduction effects were demonstrated for the undiluted Poplar Creek Mile 1.0 samples based on hypothesis testing (Dunnett's Test) of data. Analysis of data using point estimation techniques showed the IC₂₅ was greater than 100 percent, and, therefore, so was the IC₂₅-based NOEC. IC₂₅ analysis of data is the preferred method according to current EPA guidance. [5]

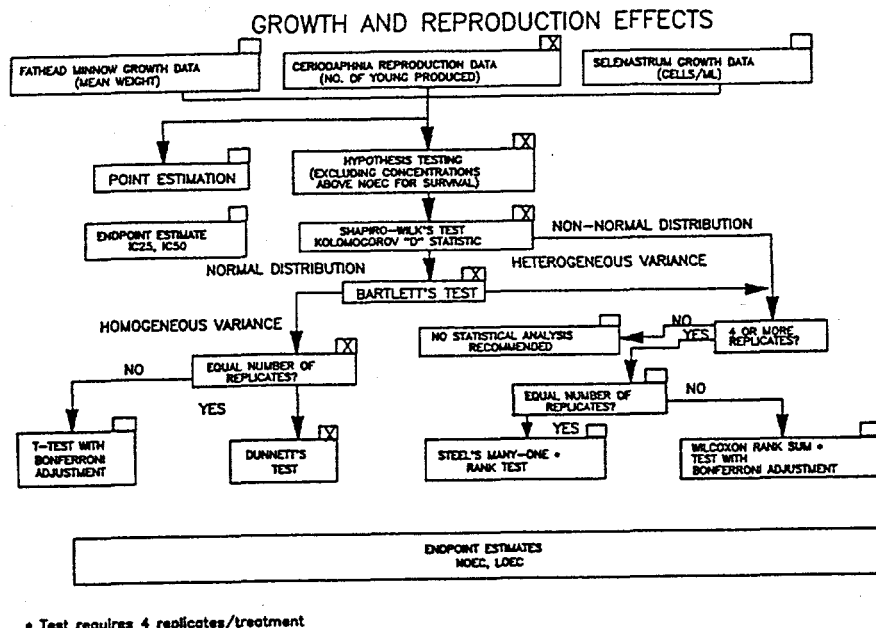
6.2.2 Results, Survival Data:

6.2.2.1 Daily percent survival summary for Ceriodaphnia Survival Test, CR-ERP Study, January 25-31, 1994.

Treatment	Total Daily % Survival					
	1	2	3	4	5	6
Control	100	100	100	100	100	100
CRM 9.0-50%	100	100	100	100	100	100
CRM 9.0-100%	100	100	100	100	100	100
PCM 1.0-50%	100	100	100	100	100	100
PCM 1.0-100%	100	100	100	100	100	100
PCM 2.9-50%	100	100	100	100	100	100
PCM 2.9-100%	100	100	100	100	100	100

6.2.3 Results, Reproduction Data:

6.2.3.1 Statistical Decision Process for Determining Toxicity Endpoints for 6-Day (3-Brood) Reproduction of Ceriodaphnia, CR-ERP Study, January 25-31, 1994.



6.2.3.2 Analysis of Reproduction (young/female/3-broods) Data Using Dunnett's Test for Ceriodaphnia 6-Day (3-brood) Reproduction Test, CR-ERP Study, January 25-31, 1994.

No transformation applied before data analysis. For this set of data, the minimum significant difference is 2.86.

This represents a 7.64% decrease in mean young/female.

T = 2.35 Alpha = 0.05 (one-tailed test)

Treatment	Number Young										Mean	S*
	Replicate											
	1	2	3	4	5	6	7	8	9	10		
Control	41	34	36	35	39	37	40	34	39	39	37.4	
CRM 9.0-50%	39	41	38	35	38	37	35	38	40	41	38.2	
CRM 9.0-100%	39	41	30	39	38	38	35	40	32	37	36.9	
PCM 1.0-50%	36	37	31	34	37	30	37	41	43	39	36.5	
PCM 1.0-100%	36	31	32	33	32	31	33	32	35	35	33.0	*
PCM 2.9-50%	35	36	33	39	36	38	39	36	35	37	36.4	
PCM 2.9-100%	34	31	32	35	36	39	35	34	36	34	34.6	

*Values significantly less than the control (Medium). EMS = 7.4.

Note: PCM 1.0-100%: IC₂₅ >100%.

6.3 Physical/Chemical Parameters

6.3.1 Overall Test Temperature: Fathead Minnow - 25.2°C (21.4°C-26.3°C)
Daphnid - 25.3°C (24.2°C-25.9°C)

6.3.2 Water chemistry summary for CR-ERP Study, January 25-February 1, 1994.

See: Appendix A Water Chemistry Mean Values and Ranges
for Fathead Minnow and Ceriodaphnia Tests,
CR-ERP Study, January 25-February 1, 1994

6.4 Reference Toxicant Tests

6.4.1 Summary of Results:

Reference toxicant tests conducted prior to CR-ERP Study showed chronic results consistent with TTL control chart ranges for fathead minnows and daphnids.

6.4.2 Fathead Minnows

6.4.2.1 Date/Time of Most Recent Test:
January 5, 1994/0945 CST to January 12, 1994/0930 CST

6.4.2.2 LOEC: 0.008 mg Cu/L
NOEC: 0.003 mg Cu/L
IC₂₅: 0.008 mg Cu/L

6.4.2.3 Control Chart Information:

Number of standard tests completed by laboratory: 51

LOEC Range: 0.008-0.02 mg Cu/L (one concentration increment)
NOEC Range: 0.003-0.008 mg Cu/L (one concentration increment)
IC₂₅ Range: 0.004-0.012 mg Cu/L

6.4.3 Ceriodaphnia

6.4.3.1 Date/Time of most recent test:
January 5, 1994/1245 CST to January 11, 1994/1245 CST

6.4.3.2 LOEC: 0.02 mg Cu/L
NOEC: 0.008 mg Cu/L
IC₂₅: 0.016 mg Cu/L

6.4.3.3 Control Chart Information:

Number of standard tests completed by laboratory: 53

LOEC Range: 0.008-0.05 mg Cu/L (two concentration increments)
NOEC Range: 0.003-0.02 mg Cu/L (two concentration increments)
IC₂₅ Range: 0.011-0.030 mg Cu/L

7.0 CONCLUSION

Surface water samples were collected by TVA Field Engineering personnel from Clinch River Mile 9.0, Poplar Creek Mile 1.0, and Poplar Creek Mile 2.9 on January 24, 26, and 28. Samples were partitioned (split) and provided to the CR-ERP and TVA toxicology laboratories for testing. Exposure of test organisms to these samples resulted in no toxicity (survival or growth) to fathead minnows; however, toxicity to daphnids (significantly reduced reproduction) was demonstrated in undiluted samples from Poplar Creek Mile 1.0 in testing conducted by TVA based on hypothesis testing of data. Point estimation (IC₂₅) analysis of the data, however, showed no toxicity in PCM 1.0 samples.

8.0 REFERENCES

1. Phipps, T. L., and L. A. Kszos, Statement of Work, Environmental Sciences Division, Biomonitoring Group, Oak Ridge National Laboratory (April 1993, revised June 1993).
2. Elenedt, B. P., and W. R. Bias. "Trace Nutrient Deficiency in Daphnia Magna Cultured in Standard Medium for Toxicity Testing. Effects of the Optimization of Culture Conditions on Life History Parameters of D. Magna." Water Resources, Great Britain, Vol. 24, No. 9, (1990) pp 1157-1167.
3. Weber, C. I., W. H. Peltier, T. J. Norberg-King, W. B. Horning, F. A. Kessler, J. R. Menkdick, T. W. Neiheisel, P. A. Lewis, D. J. Klemm, Q. H. Pickering, F. L. Robinson, J. M. Lazorchak, L. J. Wymer, and R. W. Freyberg. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-89/001 (March 1989) and EPA/600/4-89/001a (September 1989).
4. Field Operations Natural Resource Engineering Procedures Manual, Vol. 1, Division of Natural Resource Operations, Tennessee Valley Authority.
5. U.S. EPA Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90/001, PB91-127415, March 1991.

PLARC501-119

Appendix A

Water Chemistry Mean Values and Ranges for Fathead Minnow and Ceriodaphnia Tests,
CR-ERP Study, January 25-February 1, 1994

Source	Temperature		Dissolved Oxygen		pH		Conductivity		Alk		Hardness		Chlorine
	Fish	Cerio	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
	(°C)	(°C)	(mg/L)	(mg/L)	(S.U.)	(S.U.)	(µmhos)	(µmhos)	*	*	*	*	(mg/L)
CRM 9.0-50% w/F.Medium†	25.2 (24.2-26.3)	-	8.4 (8.3-8.4)	5.9 (4.1-6.9)	7.9 (7.8-8.1)	7.8 (7.6-7.8)	288 (286-291)	292 (289-295)	-	-	-	-	-
CRM 9.0-50% w/C.Medium‡	-	25.3 (24.2-25.9)	8.2 (8.1-8.3)	-	8.0 (7.9-8.0)	-	292 (289-295)	-	-	-	-	-	-
CRM 9.0-100%	25.2 (24.5-26.2)	25.3 (24.2-25.9)	8.4 (8.3-8.4)	5.9 (5.0-6.7)	7.9 (7.8-8.1)	7.9 (7.8-8.0)	261 (255-266)	264 (257-268)	100 (95-103)	114.6 (111.2-116.3)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)
PCM 1.0-50% w/F.Medium†	25.3 (24.5-26.0)	-	8.4 (8.2-8.4)	5.7 (5.0-6.4)	7.7 (7.6-7.8)	7.6 (7.4-7.7)	269 (242-293)	271 (245-297)	-	-	-	-	-
PCM 1.0-50% w/C.Medium‡	-	25.3 (24.2-25.9)	8.2 (8.1-8.3)	-	7.8 (7.7-7.8)	-	278 (246-298)	-	-	-	-	-	-
PCM 1.0-100%	25.3 (24.5-26.0)	25.3 (24.2-25.9)	8.3 (8.2-8.4)	5.7 (4.6-6.5)	7.6 (7.5-7.7)	7.6 (7.4-7.7)	219 (154-273)	225 (166-277)	59 (42-71)	84.9 (65.0-99.2)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)
PCM 2.9-50% w/F.Medium†	25.1 (21.4-26.0)	-	8.4 (8.3-8.4)	5.9 (4.4-7.7)	7.6 (7.6-7.7)	7.6 (7.3-7.7)	261 (237-288)	261 (237-283)	-	-	-	-	-
PCM 2.9-50% w/C.Medium‡	-	25.3 (24.2-25.9)	8.2 (8.1-8.3)	-	7.8 (7.7-7.8)	-	270 (241-292)	-	-	-	-	-	-
PCM 2.9-100%	25.2 (24.5-26.2)	25.3 (24.2-25.9)	8.3 (8.2-8.4)	5.8 (4.7-6.4)	7.6 (7.5-7.7)	7.5 (7.3-7.8)	204 (152-257)	208 (156-258)	55 (37-74)	80.9 (58.1-100.9)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)	<0.1 (<0.1-<0.1)
Fish Medium†	25.2 (24.5-25.8)	-	8.4 (8.2-8.5)	6.0 (4.3-6.7)	8.1 (8.0-8.2)	7.7 (7.6-7.8)	317 (310-325)	320 (312-327)	62 (60-63)	85.8 (85.5-87.2)	-	-	-
Cerio Medium‡	-	25.3 (24.2-25.9)	8.4 (8.3-8.5)	-	8.0 (7.9-8.1)	-	328 (326-330)	-	62 (62-62)	90.6 (90.6-90.6)	-	-	-

*mg/L as CaCO3

†Fathead Minnow Test

‡Ceriodaphnia Test

PLARC501-120

ATTACHMENT I

**CR-ERP AMBIENT WATER TOXICITY STUDY
Chain-of-Custody Forms - Originals**

FIELD CHAIN OF CUSTODY

1-800-828-2151

NO SEC. BY SCALIS OR CONRADIS OR SAMPLES

DOCUMENT ID:

CR2-00288



TV A → BFerry

4-100 Rev. 2 2151193

Security Seals intact on seal
containers

Date collected
for phone
conversation w/ J. Stockhouse
1-27-93-2/5

DOCUMENT ID:

ATTACHMENT II

**CR-ERP AMBIENT WATER TOXICITY STUDY
Toxicity Test Bench Sheets and Statistical Analyses**

TTL CHRONIC TOXICITY TEST MASTER CHECKLIST

CL # 0025Study: DOE AmbientTest Dates: 1/25/94 - 2/1/94Date Issued: 1/23/94 To: DJSReport Due: 3/10/94 By: DJS

1. Test organism availability: FH Minnows-T.L.* OK C.U.† TS Date _____
 Daphnids - T.L. OK C.U. OK Date _____

2. Sample Collection Coordination: Date 1-21-94 By JM With T. Phipps

3. Glassware availability: T.L. DJS Tech. _____ Date 1-18-94

4. Glassware prep. complete: Date 1-18-94 By DJS

5. Data Sheet prep. complete: Date 1-18-94 By DJS

6. Test organism availability verification: FH-OK? OK Daphnids-OK? OK

7. Culture Medium Availability: Date 1-24-94 By DJS With OK/MS

8. FH Minnow acclimation:

Day 1 2

By NA

9. Test Initiation: FH-Date/Time 1-25-94/1210 Daphnid-Date/Time 1-25-94/1145

Initial FH Sample TS/DJS

10. Daily:	Day #:	0	1	2	3	4	5	6	7
Initial Chem.	T.L.	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>NA</u>
	T.M.#	<u>4/24</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>NA</u>
Final Chem.	T.L.	<u>NA</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>TS</u>
	T.M.	<u>NA</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>TS</u>
F.H.	T.L.	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>
	T.M.	<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>OK</u>	<u>OK</u>	<u>TS</u>	<u>TS</u>
Daphnid	T.L.	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>DJS</u>	<u>OK</u>	<u>NA</u>
	T.M.	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>NA</u>
Log Samples	T.L.	<u>DJS</u>	<u>NA</u>	<u>DJS</u>	<u>NA</u>	<u>DJS</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
	T.M.	<u>NA</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>NA</u>
Security Seals	T.L.	<u>DJS</u>	<u>NA</u>	<u>DJS</u>	<u>NA</u>	<u>DJS</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
	T.M.	<u>NA</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>OK</u>	<u>NA</u>

11. Test Termination: FH-Date/Time 2-1-94/1220 Daphnid-Date/Time 1-31-94/11:20

Clean-up, By: TS/OK/DJS, 2-1-94

12. Weigh Fish: Date 02-04-94 By DJS/NA 13. Run Stats: Date 02-08-94 By OK

14. Report Prep.: Assigned To DJS Date 2-22-94 By DJS

15. Report Final: Date 3-1-94 By JM Approved: DCW

*Team Leader †Culture Unit *Team Member

PLARC501-1266(1)(Rev 12/93)

Chronic Study Fathead Record Sheet

Study CR-ERP QA JAN '94
 Test Organism P. promelas
 Beginning Date/Time 1-20-94 / 1210
 Ending Date/Time 1-27-94 / 1220
 Personnel Simbeck, Haraway, Sessler

Control/Dilution Water F-MED #'s 1576, 1578, 1581, 1582, 1584

Test Treatment Identification

1. F-MED
2. CRM 9.0 50%
3. CRM 9.0 100%
4. PCM 1.0 50%
5. PCM 1.0 100%
6. PCM 2.9 50%
7. PCM 2.9 100%
8. _____

Spawn Date	Tile #	Hatch Date
<u>1/21/94</u>	<u>19,23,15,17,26,10,11</u>	<u>1/24/94 AF 1300</u>
_____	_____	<u>BF 1130 1/25/94</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Test # _____
 NOEC _____
 LOEC _____
 Notes: _____

> 100%
 all samples

FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

Page 1 of 2

Study CR-ERP 0A JAN 94

Personnel Sinbeck

Beginning Date/Time 1-26-94/1210

Ending Date/Time 1-29-94/1220

Hawaway

Sesler

— Number Alive —

Treatment	Rep	- Day -						
		1	2	3	4	5	6	7
F-MEP	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
CRM 9.0	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
CRM 9.0	1	10695	10695	10695	10695	10695	10695	10695
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
CRM 9.0	1	10695	10695	10695	10695	10695	10695	10695
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
PCM 1.0	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
PCM 1.0	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
PCM 1.0	1	10691	10691	10691	10691	10691	10691	10691
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS
PCM 2.0	1	10	10	10	10	10	10	10
	2	10	9	9	9	9	9	9
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	TS	TS	OTH	OTH	TS	TS

Notes:

* Beaker incubator not placed in incubator after change-out on 1-26-94. not fed or temperature controlled - O/S

1 - one non-feeder
2 - non-feeder dead

Fed- Time/By: 0630/CR 0645/CR 0655/CR 0710/CR 0725/CR 0740/CR 0755/CR

1230/CR 1230/TS 1235/TS 1235/TS 1240/CR 1240/CR 1240/CR

1230/CR 1635/CR 1500/CR 1600/CR 1630/CR

Dilution Water ID: 1576 1578 1582 1582 1581 1584 1584
(PLARC501-257) Reviewed By: TS TS TS TS TS TS TS

FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

Page 2 of 2

Study CR-ERP QA JAN 94 ²¹⁻⁹⁴

Personnel Subeck

Beginning Date/Time 1-25-94/1210

Ending Date/Time 2-1-94/1220

Haraway

— Number Alive —

Sesler

Treatment	Rep	- Day -						
		1	2	3	4	5	6	7
SAMPLE 10 #	1	10688	10688	10785	10894	10894	10894	
	12688	10	10	10	10	10	10	10
PCM 2.9	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
100%	4	10	10	10	10	10	10	10
	By:	075	075	075	075	075	075	075
	1							
	2							
	3							
	4							
	By:							
	1							
	2							
	3							
	4							
	By:							
	1							
	2							
	3							
	4							
	By:							
	1							
	2							
	3							
	4							
	By:							
	1							
	2							
	3							
	4							
	By:							

Notes:

Fed- Time/By: 0 1 2 3 4 5 6

0620/CR 0645/CR 0630/CR 0640/CR 0640/CR 0640/CR 0640/CR

1230/TS 1230/TS 1230/TS 1235/TS 1240/CR 1240/CR 1240/CR

1430/CR 1630/CR 1500/CR 1600/CR 1630/CR

Dilution Water ID: 157V 1578 1582 1582 1581 1584 1584

(PLARC501-257) Reviewed By: 075 075 075 075 075 075 075

Analysis of Survival

CR-ERP JANUARY
Starting Date: 01/25/94

Survival (%) Data

Treatment	Replicate										Mean
	1	2	3	4	5	6	7	8	9	10	
F-MEDIUM	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
CRM 9.0 50%	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
CRM 9.0 100%	0.90	1.00	1.00	1.00	.	.	.	.	.	.	0.98
PCM 1.0 50%	1.00	1.00	1.00	0.90	.	.	.	.	.	.	0.98
PCM 1.0 100%	1.00	0.80	1.00	0.80	.	.	.	.	.	.	0.90
PCM 2.9 50%	1.00	0.90	1.00	1.00	.	.	.	.	.	.	0.98
PCM 2.9 100%	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00

Steel's Many-One Rank Test

Treatment	No. of Replicates	Critical Rank Sum	Rank Sum*
CRM 9.0 50%	4	10	18
CRM 9.0 100%	4	10	16
PCM 1.0 50%	4	10	16
PCM 1.0 100%	4	10	14
PCM 2.9 50%	4	10	16
PCM 2.9 100%	4	10	18

* Values less than Critical Rank Sum significantly less than the control (F-MEDIUM).

Non-parametric analysis of toxicity data

2

5:43 Tuesday, January 21, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS TEST=STEEL -----

OBS	TREATMENT	N CONTROL	N EFFLUENT	RANK SUM	CRITICAL RANK SUM	SIGNIFICANT DIFFERENCE
1	CRM 9.0 50%	4	4	18	10	
2	CRM 9.0 100%	4	4	16	10	
3	PCM 1.0 50%	4	4	16	10	
4	PCM 1.0 100%	4	4	14	10	
5	PCM 2.9 50%	4	4	16	10	
6	PCM 2.9 100%	4	4	18	10	

1

[illegible]

1	CR-ERP	JANUARY	012594	MINS	2	0	10	4	4	4	4	4	6	6	STEEL	1	CRM	9.0	50%	18
2	CR-ERP	JANUARY	012594	MINS	2	0	10	4	4	4	4	4	6	6	STEEL	2	CRM	9.0	50%	18
3	CR-ERP	JANUARY	012594	MINS	3	0	10	4	4	4	4	4	6	6	STEEL	1	CRM	9.0	100%	20
4	CR-ERP	JANUARY	012594	MINS	3	0	10	4	4	4	4	4	6	6	STEEL	3	CRM	9.0	100%	16
5	CR-ERP	JANUARY	012594	MINS	4	0	10	4	4	4	4	4	6	6	STEEL	1	PCM	1.0	50%	20
6	CR-ERP	JANUARY	012594	MINS	4	0	10	4	4	4	4	4	6	6	STEEL	4	PCM	1.0	50%	16
7	CR-ERP	JANUARY	012594	MINS	5	0	10	4	4	4	4	4	6	6	STEEL	1	PCM	1.0	100%	22
8	CR-ERP	JANUARY	012594	MINS	5	0	10	4	4	4	4	4	6	6	STEEL	5	PCM	1.0	100%	14
9	CR-ERP	JANUARY	012594	MINS	6	0	10	4	4	4	4	4	6	6	STEEL	1	PCM	2.9	50%	20
10	CR-ERP	JANUARY	012594	MINS	6	0	10	4	4	4	4	4	6	6	STEEL	6	PCM	2.9	50%	16
11	CR-ERP	JANUARY	012594	MINS	7	0	10	4	4	4	4	4	6	6	STEEL	1	PCM	2.9	100%	18
12	CR-ERP	JANUARY	012594	MINS	7	0	10	4	4	4	4	4	6	6	STEEL	7	PCM	2.9	100%	18

TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	28	Sum Wgts	28
Mean	0	Sum	0
Std Dev	0.075204	Variance	0.005656
Skewness	-0.45664	Kurtosis	0.76369
USS	0.152703	CSS	0.152703
CV	.	Std Mean	0.014212
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	8	Prob> S	0.6945
Num ^= 0	16		
W:Normal	0.828921	Prob<W	0.0002

Quantiles (Def=5)

100% Max	0.152434	99%	0.152434
75% Q3	0.040743	95%	0.152434
50% Med	0	90%	0.040743
25% Q1	0	10%	-0.12223
0% Min	-0.15243	5%	-0.15243
		1%	-0.15243
Range	0.304867		
Q3-Q1	0.040743		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.15243(	44)	0.040743(	51)
-0.15243(	42)	0.040743(	53)
-0.12223(	34)	0.040743(	54)
-0.12223(	52)	0.152434(	41)
-0.12223(	21)	0.152434(	43)

Missing Value

Count 42

% Count/Nobs 60.00

TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS

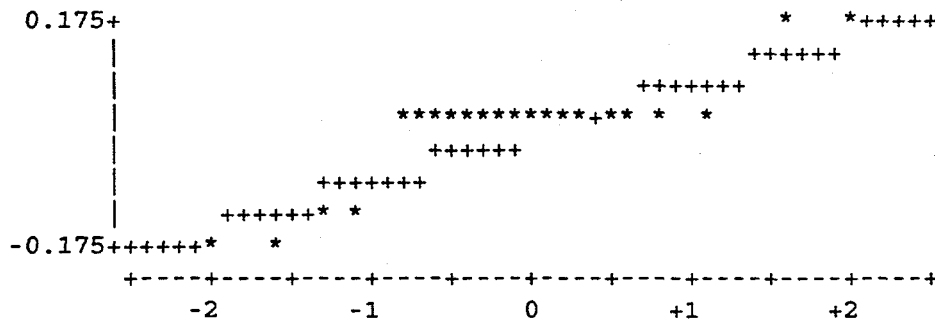
UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
1 55	2	0
1		
0		
0 0000000000000444444444	21	+---+---+
-0		
-0		
-1 222	3	0
-1 55	2	*

Multiply Stem.Leaf by 10**-1

Normal Probability Plot



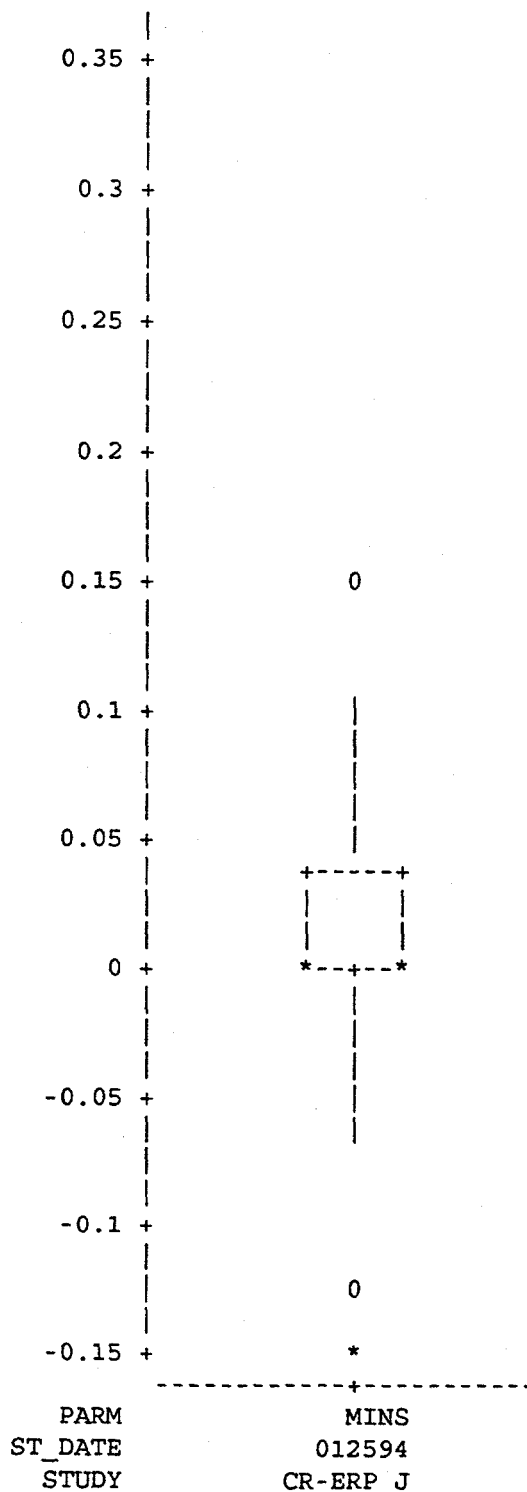
TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

UNIVARIATE PROCEDURE

Schematic Plots

Variable=CENTER

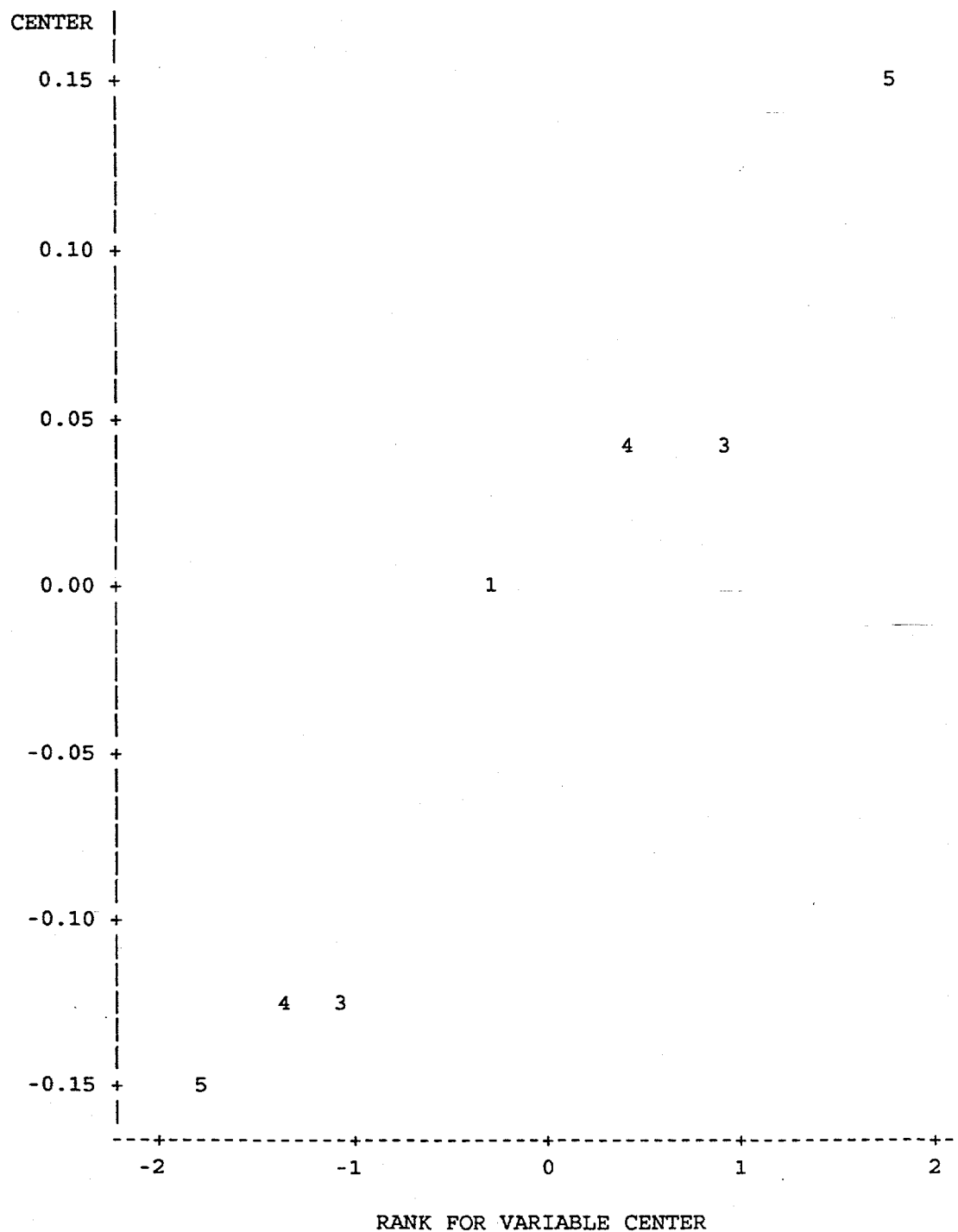


TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS -----

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 42 obs had missing values. 21 obs hidden.

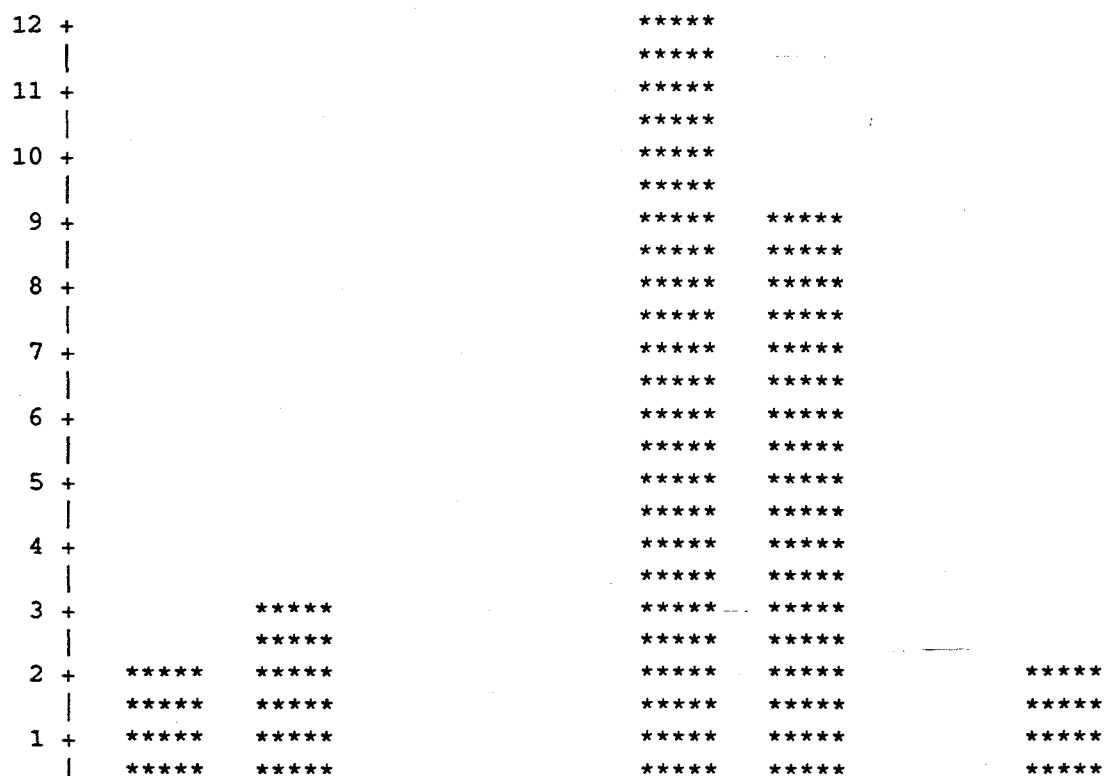
TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS -----

FREQUENCY OF CENTER

FREQUENCY



CENTER MIDPOINT

Tests of assumptions for survival data (arcsine transformed)

6

TEST FOR NORMAL DISTRIBUTION

5:40 Tuesday, January 21, 1992

VARIANCE EQUAL TO ZERO FOR ONE OR MORE TREATMENTS
BARTLETT'S TEST CAN NOT BE CALCULATED

LEVENE'S TEST WILL BE USED

Tests of assumptions for survival data (arcsine transformed)

7

LEVENE'S TEST FOR HOMOGENEITY OF VARIANCE

5:40 Tuesday, January 21, 1992

--(----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS -----

General Linear Models Procedure

Class Level Information

Class	Levels	Values
TRT	7	CRM 9.0 100% CRM 9.0 50% F-MEDIUM PCM 1.0 100% PCM 1.0 50% PCM 2.9 100% PCM 2.9 50%

Number of observations in by group = 70

NOTE: Due to missing values, only 28 observations can be used in this analysis.

LEVENE'S TEST FOR HOMOGENEITY OF VARIANCE

5:40 Tuesday, January 21, 1992

STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MINS

General Linear Models Procedure

Dependent Variable: ABS_VAL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.07333724	0.01222287	17.18	0.0001
Error	21	0.01493962	0.00071141		
Corrected Total	27	0.08827687			
	R-Square	C.V.	Root MSE	ABS_VAL Mean	
	0.830764	55.60444	0.026672	0.04796790	

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	0.07333724	0.01222287	17.18	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TI	6	0.07333724	0.01222287	17.18	0.0001

FATHEAD DRY WEIGHT RECORD SHEET

Page 1 of 2

Study/Date CR-EP1 QA JAN '94

Personnel JS

Pans: Date/Time of Drying 2/19/94 0735 - 2/19/94 0720 Fish: Date/Time of Drying 2/4/94 0750-0950

CEL

Pans: Date/Time of Weighing 2/2/94 0830-1030 Fish: Date/Time of Weighing 02-04-94 / 1300-1415

Notes:

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt.	Mean Wt. Difference
Initial	1. 1.00958	1.01044		10		
	2. 1.05367	1.05454		10		
	3. 1.00897	1.00984		10		
	4. 1.04885	1.04973		10		
Initial Mean Wt.						
F-MEO	1. 0.99383	0.99799		10		
	2. 1.04586	1.04988		10		
	3. 1.02007	1.02469		10		
	4. 0.99080 0.99080	0.99527		10		
CRM 9.0 50%	1. 1.02212	1.02612		8/10 ²		
	2. 1.01509	1.01911		10		
	3. 0.99111	0.99536		10		
	4. 0.99199	0.99687		10		
CRM 9.0 100%	1. 1.03494	1.03928		9		
	2. 1.00259	1.00715		10		
	3. 1.03023	1.03520		10		
	4. 1.02469	1.02941		10		
PCM 1.2 50%	1. 1.00333	1.00820		10		
	2. 1.05335	1.05791		10		
	3. 1.02013	1.02460		10		
	4. 1.01373	1.01814		9		
PCM 1.0 100%	1. 1.06288	1.06790		10		
	2. 1.03662	1.04156		8		
	3. 1.01796	1.02213		10		
	4. 0.99109	0.99518		8		
PCM 2.9 50%	1. 1.03787	1.04117		10		
	2. 1.00586	1.01023		9		
	3. 0.99669	1.00148		10		
	4. 0.99340	0.99776		10		

Reviewed By: JS

FATHEAD DRY WEIGHT RECORD SHEET

Page 2 of 2

Study/Date CR-EPT QA JAN '94

Personnel ETS

Pans: Date/Time of Drying 2/1/94 1335 - 2/2/94 0920 Fish: Date/Time of Drying 02-04-94/0750-0950

Pans: Date/Time of Weighing 2/2/94 0930-1030 Fish: Date/Time of Weighing 02-04-94/1300-1415

Sample ID	Fare Wt.	Fare + Fish Wt.	Fish Wt.	# Fish	Mean Wt.	Mean Wt. Difference	
Initial	1.						
	2.						
	3.						
	4.						
Initial Mean Wt.							
PCN 2.9 100%	1.	1.01702	1.02129	10			
	2.	1.01443	1.01870	10			
	3.	1.07320	1.07771	10			
	4.	1.07408	1.07915	10			
	1.						
	2.						
	3.						
	4.						
	1.						
	2.						
	3.						
	4.						
	1.						
	2.						
	3.						
	4.						
	1.						
	2.						
	3.						
	4.						
	1.						
	2.						
	3.						
	4.						

Notes:

Reviewed By: Can

FATHEAD DRY WEIGHT RECORD SHEET

Page 1 of 1

Study/Date LEER Jan 94 Rowcish

Personnel JS

Pans: Date/Time of Drying 2/9/94 0740-0900

Fish: Date/Time of Drying 2/9/94 1010-1130

Pans: Date/Time of Weighing 2/9/94 0950-1005

Fish: Date/Time of Weighing 2/9/94 1200-1220

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt.	Mean Wt. Difference	
Initial 1.							
Initial 2.							
3.							
4.							
Initial Mean Wt.							
1.							
PCM 1.0 2.	1.05134	1.05606	0.00472	8	0.596mg	-0.027	4.4%
100% 3.	1.06512	1.06910	0.00398	10	0.398mg	-0.019	4.6%
4.							
1.	1.03650	1.03977	0.00327	10	0.327mg	-0.003	-0.9%
PCM 2.9 2.	1.02251	1.02672	0.00421	9	0.468mg	-0.018	3.9%
50% 3.							
4.							
1.							
2.							
3.							
4.							
1.							
2.							
3.							
4.							
1.							
2.							
3.							
4.							

Notes:

previous at

0.677 2.9

0.417

0.330

0.486

Reviewed By: JS

FATHEAD DRY WEIGHT RECORD SHEET

Study/Date: CR-ERP QA JANUARY

Personnel: DJS

Pans:Date/Time of Drying: 02/01/94-1335 to

Fish:Date/Time of Drying: 02-04-94/0750-0950

CLR

02/02/94-0720

Pans:Date/Time of Weighing: 02-02-94/0830-1030

Fish:Date/Time of Weighing: 02-04-94/1300-1415

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt. grams	Mean Wt. Difference	Mean Wt. mg
1.	1.00958	1.01044	0.00086	10	0.000086	-	-
Initial 2.	1.05367	1.05454	0.00087	10	0.000087	-	-
3.	1.00897	1.00984	0.00087	10	0.000087	-	-
4.	1.04885	1.04973	0.00088	10	0.000088	-	-
Initial						0.000087	
Mean Wt.							
1.	0.99383	0.99799	0.00416	10	0.000416	0.000329	0.416
MEDIUM 2.	1.04586	1.04988	0.00402	10	0.000402	0.000315	0.402
3.	1.02007	1.02469	0.00462	10	0.000462	0.000375	0.462
4.	0.99080	0.99527	0.00447	10	0.000447	0.000360	0.447
1.	1.02212	1.02612	0.00400	10	0.000400	0.000313	0.400
CRM 9.0 50% 2.	1.01509	1.01911	0.00402	10	0.000402	0.000315	0.402
3.	0.99111	0.99536	0.00425	10	0.000425	0.000338	0.425
4.	0.99199	0.99687	0.00488	10	0.000488	0.000401	0.488
1.	1.03494	1.03928	0.00434	9	0.000482	0.000395	0.482
CRM 9.0 100% 2.	1.00259	1.00715	0.00456	10	0.000456	0.000369	0.456
3.	1.03023	1.03520	0.00497	10	0.000497	0.000410	0.497

Notes:

02-08-94

	4.	1.02469	1.02941	0.00472	10	0.000472	0.000385	0.472
	1.	1.00333	1.00820	0.00487	10	0.000487	0.000400	0.487
PCM 1.0 50%	2.	1.05335	1.05791	0.00456	10	0.000456	0.000369	0.456
	3.	1.02013	1.02460	0.00447	10	0.000447	0.000360	0.447
	4.	1.01373	1.01814	0.00441	9	0.000490	0.000403	0.490
	1.	1.06288	1.06790	0.00502	10	0.000502	0.000415	0.502
PCM 1.0 100%	2.	1.03662	1.04156	0.00494	8	0.000617	0.000530	0.617
	3.	1.01796	1.02213	0.00417	10	0.000417	0.000330	0.417
	4.	0.99109	0.99518	0.00409	8	0.000511	0.000424	0.511
	1.	1.03787	1.04117	0.00330	10	0.000330	0.000243	0.330
PCM 2.9 50%	2.	1.00586	1.01023	0.00437	9	0.000486	0.000399	0.486
	3.	0.99669	1.00148	0.00479	10	0.000479	0.000392	0.479
	4.	0.99340	0.99776	0.00436	10	0.000436	0.000349	0.436
	1.	1.01702	1.02129	0.00427	10	0.000427	0.000340	0.427

Review

Review

PCM 2.9 100%	2.	1.01443	1.01870	0.00427	10	0.000427	0.000340	0.427
	3.	1.07320	1.07771	0.00451	10	0.000451	0.000364	0.451
	4.	1.07408	1.07915	0.00507	10	0.000507	0.000420	0.507

Reviewed By: Russell

Cup 02-08-94

Analysis of 7-day Larval Growth Test

CR-ERP JANUARY

Starting Date: 01/25/94

Analysis of Dry Weight (mg) Data Dunnett's Test

No transformation applied before data analysis.

For this set of data, the minimum significant difference is 0.08

This represents a 19.64 % reduction in Dry Weight (mg).

T = 2.45 ALPHA = 0.05

Dry Weight (mg) Data

TREATMENT	Replicate										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
1 F-MEDIUM	0.42	0.40	0.46	0.45	.	.	.	.	.	.	0.43	
2 CRM 9.0 50%	0.40	0.40	0.43	0.49	.	.	.	.	.	.	0.43	
3 CRM 9.0 100%	0.48	0.46	0.50	0.47	.	.	.	.	.	.	0.48	
4 PCM 1.0 50%	0.49	0.46	0.45	0.49	.	.	.	.	.	.	0.47	
5 PCM 1.0 100%	0.50	0.62	0.42	0.51	.	.	.	.	.	.	0.51	
6 PCM 2.9 50%	0.33	0.49	0.48	0.44	.	.	.	.	.	.	0.44	
7 PCM 2.9 100%	0.43	0.43	0.45	0.51	.	.	.	.	.	.	0.46	

Asterisk (*) indicates values significantly less than control (F-MEDIUM).

Analysis of Variance

Source	DF	Sum OF Sq.	Mean Sq.	Calc F	F(0.05)
Among	6	0.022	0.004	1.530	0.2168
Within	21	0.051	0.002		
Total	27	0.000			

10:27 Thursday, February 6, 1992

STUDY=CR-ERP JANUARY

ST_DATE=012594

PARM=MING

DUNNETT'S TEST

T = 2.45 ALPHA = 0.05

TREATMENT	N	MEAN	SIGNIFICANT DIFFERENCE
F-MEDIUM	4	0.43	
CRM 9.0 50%	4	0.43	
CRM 9.0 100%	4	0.48	
PCM 1.0 50%	4	0.47	
PCM 1.0 100%	4	0.51	
PCM 2.9 50%	4	0.44	
PCM 2.9 100%	4	0.46	

MINIMUM SIGNIFINANT DIFFERENCE = 0.08

THIS REPRESENTS A 19.64 % DECREASE IN SURVIVAL FROM THE CONTROL

10:27 Thursday, February 6, 1992

STUDY=CR-ERP JANUARY

ST_DATE=012594

PARM=MING

DUNNETT'S TEST

T = 2.45 ALPHA = 0.05

TREATMENT	REPLICATE										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
1 F-MEDIUM	0.42	0.40	0.46	0.45	.	.	.	.	.	.	0.43	
2 CRM 9.0 50%	0.40	0.40	0.43	0.49	.	.	.	.	.	.	0.43	
3 CRM 9.0 100%	0.48	0.46	0.50	0.47	.	.	.	.	.	.	0.48	
4 PCM 1.0 50%	0.49	0.46	0.45	0.49	.	.	.	.	.	.	0.47	
5 PCM 1.0 100%	0.50	0.62	0.42	0.51	.	.	.	.	.	.	0.51	
6 PCM 2.9 50%	0.33	0.49	0.48	0.44	.	.	.	.	.	.	0.44	
7 PCM 2.9 100%	0.43	0.43	0.45	0.51	.	.	.	.	.	.	0.46	

MINIMUM SIGNIFINANT DIFFERENCE = 0.08

THIS REPRESENTS A 19.64 % DECREASE IN SURVIVAL FROM THE CONTROL

10:27 Thursday, February 6, 1992

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	7	CRM 9.0 100% CRM 9.0 50% F-MEDIUM PCM 1.0 100% PCM 1.0 50% PCM 2.9 100% PCM 2.9 50%

Number of observations in data set = 70

NOTE: Due to missing values, only 28 observations can be used in this analysis.

Analysis of untransformed data

4

10:27 Thursday, February 6, 1992

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.02208571	0.00368095	1.53	0.2168
Error	21	0.05050000	0.00240476		
Corrected Total	27	0.07258571			

R-Square	C.V.	Root MSE	RESP Mean
0.304271	10.67709	0.0490384	0.45928571

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	0.02208571	0.00368095	1.53	0.2168

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	6	0.02208571	0.00368095	1.53	0.2168

Tests of assumptions for untransformed data

1

Test for Normal Distribution

10:22 Thursday, February 6, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MING -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	28	Sum Wgts	28
Mean	0	Sum	0
Std Dev	0.043248	Variance	0.00187
Skewness	-0.07951	Kurtosis	1.512062
USS	0.0505	CSS	0.0505
CV	.	Std Mean	0.008173
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	-2.5	Prob> S	0.9534
Num ^= 0	27		
W:Normal	0.949265	Prob<W	0.2124

Quantiles (Def=5)

100% Max	0.1075	99%	0.1075
75% Q3	0.02	95%	0.06
50% Med	-0.00375	90%	0.055
25% Q1	-0.02375	10%	-0.0325
0% Min	-0.105	5%	-0.0925
		1%	-0.105
Range	0.2125		
Q3-Q1	0.04375		
Mode	0.0175		

Extremes

Lowest	Obs	Highest	Obs
-0.105(	51)	0.045(	53)
-0.0925(	43)	0.055(	52)
-0.0325(	2)	0.055(	64)
-0.03(	12)	0.06(	14)
-0.03(	11)	0.1075(	42)

Missing Value

Count	42
% Count/Nobs	60.00

Test for Normal Distribution

10:22 Thursday, February 6, 1992

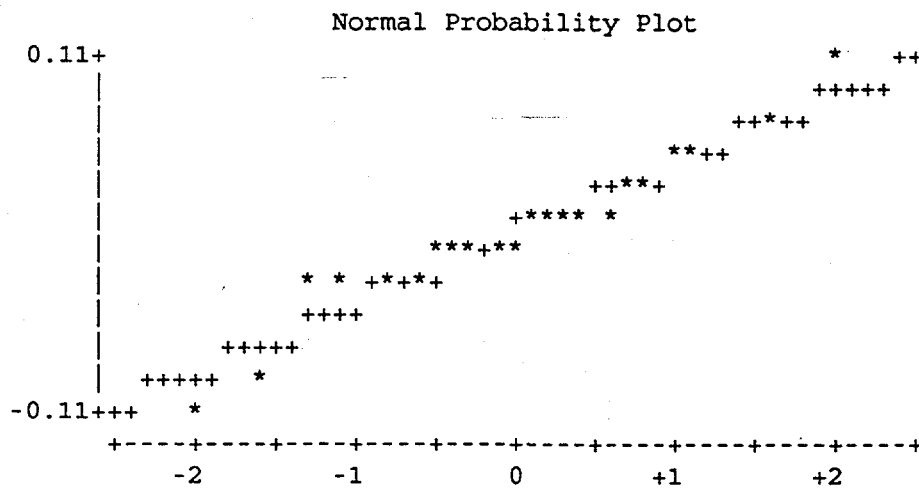
STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MING

UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
10 8	1	0
8		
6 0	1	
4 555	3	
2 28	2	+---+---+
0 025888	6	+
-0 8222852	7	*---*
-2 200552	6	+---+---+
-4		
-6		
-8 2	1	0
-10 5	1	0

Multiply Stem.Leaf by 10**-2



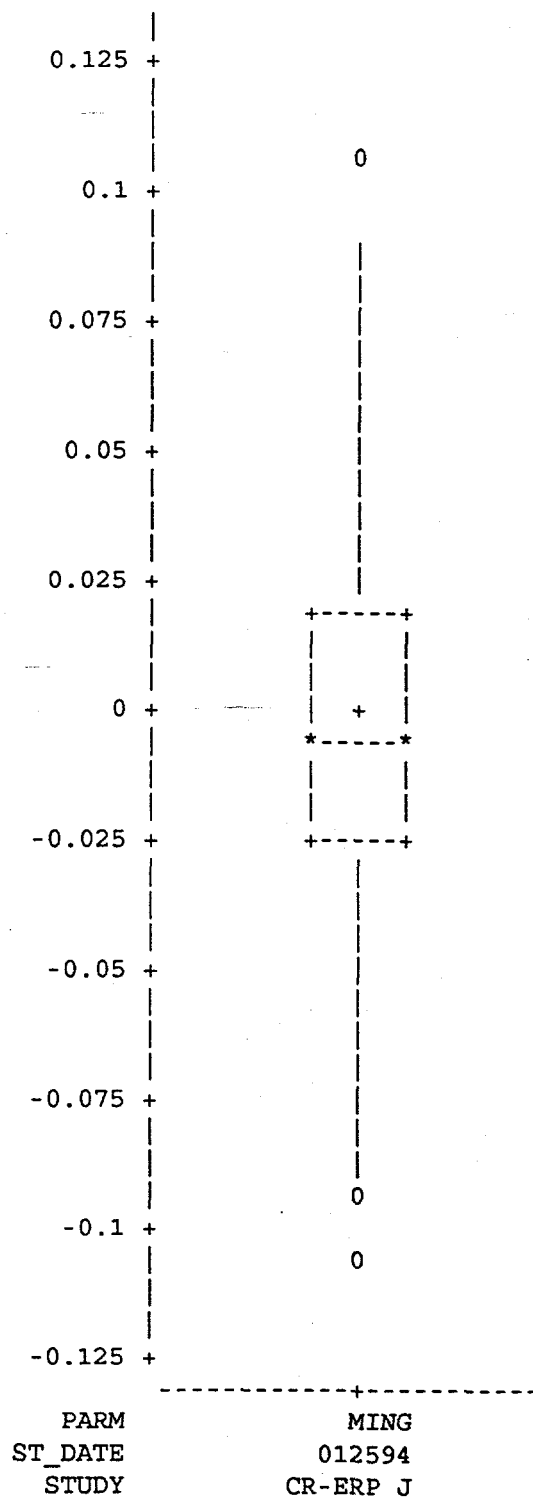
Test for Normal Distribution

10:22 Thursday, February 6, 1992

UNIVARIATE PROCEDURE

Schematic Plots

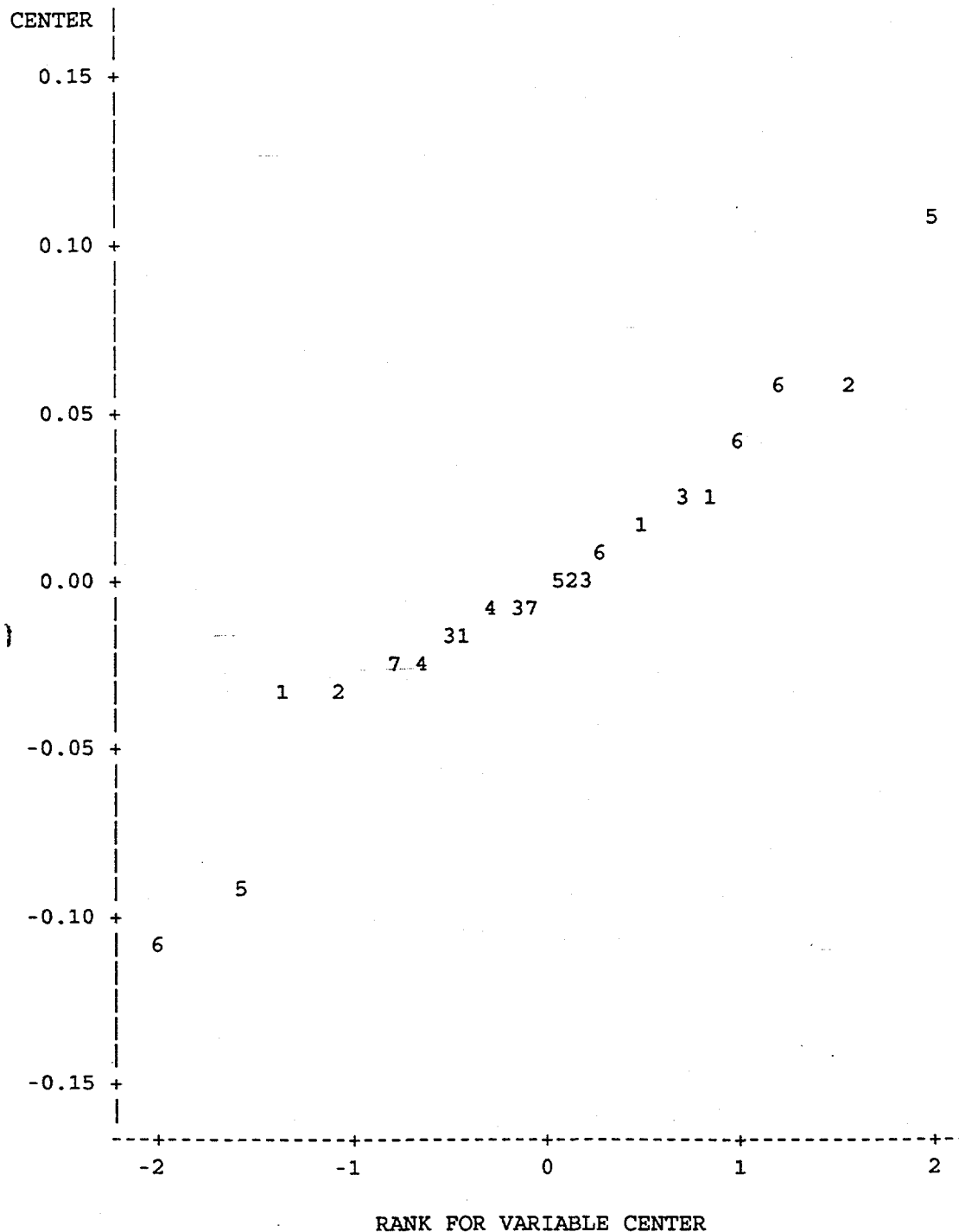
Variable=CENTER



10:22 Thursday, February 6, 1992

----- STUDY=CR-ERP JANUARY ST_DATE=012594 PARM=MING -----

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 42 obs had missing values. 6 obs hidden.

Tests of assumptions for untransformed data

5

Bartlett's Test for Homogeneous Variance

10:22 Thursday, February 6, 1992

STUDY=CR-ERP JANUARY

ST_DATE=012594

PARM=MING

TREATMENT	N	MEAN	VARIANCE
F-MEDIUM	4	0.43	0.001
CRM 9.0 5	4	0.43	0.002
CRM 9.0 1	4	0.48	0.000
PCM 1.0 5	4	0.47	0.000
PCM 1.0 1	4	0.51	0.007
PCM 2.9 5	4	0.44	0.005
PCM 2.9 1	4	0.46	0.001

BARTLETT'S TEST STATISTIC = 10.562

PROB>B = 0.103

Chronic Study Zooplankton Record Sheet

Study CR-ERP DA JAN 94

Test Organism C. dubia

Beginning Date/Time 1-20-94^{25th 12th 1994} / 11:45

Ending Date/Time 1-31-94 / 1120

Personnel Simbeck, Haraway

Control/Dilution Water C-MED #'s 1577,

Test Treatment Identification

1. C-MED
2. CRM 9.0 50%
3. CRM 9.0 100%
4. PCM 1.0 50%
5. PCM 1.0 100%
6. PCM 2.9 50%
7. PCM 2.9 ¹⁰⁰ 50% ²⁹¹ 1-18-94
8. _____

Released From

Date

1-24-94

Time

10:00 pm

To

Date

1-25-94

Time

6:00 Am

Test # _____

NOEC CRM 9.0 / 100%

LOEC PCM 2.9

Notes:

PCM 1.0 LOEC=100
NOEC=50

IC₂₅ > 100%

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Page 1 of 2

Study: CR-ERP RA JAN 94
Beginning Date: 1-22-94
Ending Date: 1-31-94Time: 11:45
Time: 11:20Personnel: Simbeck
Haraway

Number of Young/Day

Treatment	By Rep.	0	1	2	3	4	5	6	7	8	Total Young
	1	0	0	0	5	15	21				41
	2			0	5	11	18				34
① CMED	3			0	5	12	19				37
	4			0	6	12	17				35
	5			0	6	13	20				39
	6			0	6	11	20				37
	7			0	6	13	21				39
	8			0	6	10	18				34
	9	✓	✓	0	5	13	21				38
	10	✓	✓	0	6	11	22				39
	1	0	0	0	6	13	20				39
	2			0	5	14	22				41
② CRM 9.0	3			0	5	12	21				38
50%	4			0	6	14	15				35
	5			0	6	11	21				38
	6			0	6	12	19				37
	7			0	5	13	17				35
	8			0	5	11	22				38
	9		✓	0	6	12	22				40
	10	✓	✓	0	6	14	21				41
	1	0	0	0	6	13	20				39
	2			0	6	13	22				41
③ CRM 9.0	3			0	5	11	14				30
100%	4			0	6	13	20				39
	5			0	5	11	22				38
	6			0	6	12	20				38
	7			0	6	12	17				35
	8			0	5	14	21				40
	9		✓	0	5	11	16				32
	10	✓	✓	0	5	13	19				37
	1	0	0	0	4	13	19				36
④ Perm 1.0	2			0	6	11	20				37
50%	3			0	6	9	16				31
	4			0	2	13	19				34
	5			0	6	12	19				37
	6			0	4	11	13				30
	7			0	6	11	20				37
	8			0	5	13	23				41
	9		✓	0	6	13	24				43
	10	✓	✓	0	6	13	20				39

0 1 2 3 4 5 6 7 8

Chow ID#: CF167 CF167 CF167 CF167 CF168 CF168

Algae ID#: A0530 A0530 A0530 A0530 A0531 A0531

Dilution Water ID#: 1577 1577 1577 1577 1577 1577

Reviewed By: MJS C/I MJS E/J MJS Y/S

Notes: CRM 9.0

1cm 1.0

1cm 2.2

PLARCS01-310

Day 2-1 2-3 4-1 0 1 2-3 4-1 0 1 2-3 4-1

Sample ID# 10695 10771 10800 10671 10751 10870 10688 10785 10894

1/31-94

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Study: CR-ERP RA JAN 94 22-25-94
 Beginning Date: 1-20-94 25-94
 Ending Date: 1-31-94

Time: 1145
 Time: 11:20

Page 2 of 2
 Personnel: Simbeck
Haraway

Number of Young/Day

Treatment	By Rep.	0	1	2	3	4	5	6	7	8	Total Young
	1	0	0	0	6	11	19				36
	2			0	5	10	16				31
(5) PCM 1.0	3			0	5	12	15				32
100%	4			0	5	11	17				33
	5			0	6	10	16				32
	6			0	4	12	15				31
	7			0	6	12	15				33
	8			0	5	11	16				32
	9			0	5	12	18				35
	10			0	5	12	18				35
	1	0	0	0	5	12	18				35
	2			0	5	13	18				36
(6) PCM 2.9	3			0	5	11	17				33
50%	4			0	6	14	19				39
	5			0	5	12	19				36
	6			0	6	14	18				38
	7			0	5	14	20				39
	8			0	5	11	20				36
	9			0	5	14	16				35
	10			0	6	12	19				37
	1	0	0	0	5	13	16				34
	2			0	5	11	15				31
(7) PCM 2.9	3			0	5	12	15				32
100%	4			0	5	14	16				35
	5			0	6	12	18				36
	6			0	5	15	19				39
	7			0	5	13	17				35
	8			0	5	12	17				34
	9			0	4	15	17				36
	10			0	5	14	15				34
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

0 1 2 3 4 5 6 7 8

Chow ID#: CF11.7 CF16.7 CF16.7 CF16.7 CF16.8 CF16.8

Algae ID#: A05301 A05304 A0536 A0536 A0531 A0531

Dilution Water ID#: 1577 1577 1577 1577 1577 1577

Reviewed By: ajs ajs ajs ajs ajs ajs

Notes:

PLARC501-310

ajs
 1-31-94

CERIODAPHTHA RANDOMIZATION

Study CKERP DA JAN '94

Personnel

Simbela

Beginning Date 1-25-94

Haraway

Ending Date 1-31-94

Treatment									
10	8	2	1	3	5	7	6	4	
9	6	7	2	5	1	4	3	8	
8	4	6	5	2	7	8	1	3	
7	5	7	4	3	2	6	8	1	
6	2	8	6	7	1	4	5	3	
5	4	2	5	6	8	7	1	3	
4	1	6	4	5	7	8	3	2	
3	8	4	5	7	6	2	3	1	
2	5	8	3	4	2	1	7	6	
1	4	5	6	8	3	7	2	1	

Treatment Identification:

Notes:

1. C-MED
2. CRM 9.0 50%
3. CRM 9.0 100%
4. PCM 1.0 50%
5. PCM 1.0 100%
6. PCM 2.9 50%
7. PCM 2.9 100%
8. Temperature
9. _____
10. _____

w. in EDTA

CERIODAPHNIA BROOD RECORD SHEET

Batch ID: B125Tray #: 8Personnel: MLB

Row	Brood Source <u>A118/E-10/7</u> (# Young)														
10				0	6	0	10	16	15	0					
9					5	0	9	17	20	0					
8					5	0	8	15	19	0					
7					5	0	10	15	16	0					
6					5	0	9	14	16	0					
5					4	7	0	14	17	22					
4					2	8	0	15	20	20					
3					5	0	8	16	20	0					
2					3	0	10	16	19	0					
1				✓	4	0	10	17	19	0					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	Brood Source <u>A118/F-3/7</u> (# Young)														
10				0	5	0	9	18	20	0					
9					5	0	10	19	19	0					
8					5	0	9	16	20	0					
7					3	10	0	17	19	21					
6					6	0	9	16	20	17					
5					5	10	0	18	18	10-6					
4					4	0	9	15	20	21					
3					3	0	11	18	20	18					
2					4	0	11	17	19	0					
1				✓	4	0	11	17	17	0					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	Brood Source <u>A118/E-1/7</u> (# Young)														
10				0	4	0	8	19	22	0					
9					5	0	11	16	20	20					
8					4	10	0	16	19	20					
7					5	0	9	17	17	22					
6					6	8	0	16	20	10-6					
5					6	8	0	18	20	10-6					
4					5	9	0	18	15	10-6					
3					5	0	8	15	18	20					
2					5	0	9	16	16	23					
1				✓	6	0	9	18	17	0					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

	14	17	18	19	20	21	22	23	24	25
Time			12:00	10:20	10:30	8:45	10:05	9:45	9:03	9:00
Temp			24.0	24.0	24.2	25.0	25.1	25.2	25.1	25.0
Med.			1575	1575	1575	1575	1575	1575	1575	1579
Food			CF16	CF16	CF16	CF16	CF16	CF16	CF16	CF16
Alga			1527	1527	1527	1527	1527	1527	1527	1527

NOTES: 10-6 = from 10 pm 1-24-94 to 6 am 1-25-94

1571/CF16-6/1527

+ = Young present in brood cup at 3 days or more than one brood present in individual cup at renewal.

CERIODAPHNIA BROOD RECORD SHEET

Batch ID: B126 Tray #: 8 Personnel: MB

Row	Brood Source <u>A 117 / B. 7 / 7 (# Young)</u>														
10				0	4	9	0	18	18	23					
9					5	8	0	16	15	10-6 19					
8					2	8	0	16	18	10-6 20-7					
7					4	8	0	15	17	10-6 18-6					
6					6	7	0	17	17	10-6 20-5					
5					5	7	0	16	19	10-6 19					
4					5	8	0	17	20	10-6 19-4					
3					4	8	0	17	19	10-6 18-3					
2					4	0	9	13	18	0					
1				✓	3	0	9	14	18	0					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	Brood Source <u>A118/D.4/7</u> (# Young)														
10				0	3	9	0	18	23	24					
9					4	9	0	19	19	10-6 17					
8					4	9	0	2-15	I wing	(none killed this one)					
7					4	9	0	17	19	16					
6					5	9	0	14	14	10-6 18					
5					4	0	10	17	17	21					
4					5	8	0	20	20	10-6 17-10					
3					5	8	0	18	21	10-6 22-9					
2					5	9	0	20	22	10-6 21-4					
1				✓	4	0	9	16	21	10-6 18					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	Brood Source <u>A117/B3/7</u> (# Young)														
10				0		5	8	16	14	0					
9				0		6	8	15	17	0					
8				0		5	8	19	17	0					
7				0		6	8	16	0	BF-12 22					
6				3		7	7	14	15	0					
5				0		5	9	15	0	BF-12 21					
4				0		8	8	15	16	0					
3				BF-12 3		0	9	17	18	0					
2				2		0	10	16	17	0					
1				✓ 4		0	9	16	17	0					
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Time															
Temp															
Med.															
Food															
Alga															

= DOE test
 NOTES: 10-6 = Turn 10 pm 1-24-94 to 600 am 1-25-94

+ = Young present in brood cup at 3 days or more than one brood present in individual cup at renewal.

01-31-94
Cur

Analysis of 6-day Reproduction Test

CR-ERP JAN94
Starting Date: 01/25/94

Analysis of Reproduction (# young/female/6 days) Data Dunnett's Test

No transformation applied before data analysis.

For this set of data, the minimum significant difference is 2.86

This represents a 7.64 % reduction in Reproduction (# young/female/6 days).

T = 2.35 ALPHA = 0.05

Reproduction (# young/female/6 days) Data

TREATMENT	Replicate										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
MEDIUM	41	34	36	35	39	37	40	34	39	39	37.40	
2 CRM 9.0-50%	39	41	38	35	38	37	35	38	40	41	38.20	
3 CRM 9.0-100%	39	41	30	39	38	38	35	40	32	37	36.90	
4 PCM 1.0-50%	36	37	31	34	37	30	37	41	43	39	36.50	
5 PCM 1.0-100%	36	31	32	33	32	31	33	32	35	35	33.00	*
6 PCM 2.9-50%	35	36	33	39	36	38	39	36	35	37	36.40	
7 PCM 2.9-100%	34	31	32	35	36	39	35	34	36	34	34.60	

Asterisk (*) indicates values significantly less than control (MEDIUM).

Analysis of Variance

Source	DF	Sum OF Sq.	Mean Sq.	Calc F	F(0.05)
Among	6	88.371	31.395	4.240	0.0012
Within	63	6.200	7.400		
Total	69	0.000			

Analysis of untransformed data

1

12:28 Monday, January 13, 1992

STUDY=CR-ERP JAN94

ST_DATE=012594

PARM=CERR

DUNNETT'S TEST

T = 2.35 ALPHA = 0.05

TREATMENT	N	MEAN	SIGNIFICANT DIFFERENCE
MEDIUM	10	37.40	
CRM 9.0-50%	10	38.20	
CRM 9.0-100%	10	36.90	
PCM 1.0-50%	10	36.50	
PCM 1.0-100%	10	33.00	*
PCM 2.9-50%	10	36.40	
PCM 2.9-100%	10	34.60	

MINIMUM SIGNIFINANT DIFFERENCE = 2.86

THIS REPRESENTS A 7.64 % DECREASE IN SURVIVAL FROM THE CONTROL

12:28 Monday, January 13, 1992

STUDY=CR-ERP JAN94

ST_DATE=012594

PARM=CERR

DUNNETT'S TEST

T = 2.35 ALPHA = 0.05

TREATMENT	REPLICATE										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
1 MEDIUM	41	34	36	35	39	37	40	34	39	39	37.40	
2 CRM 9.0-50%	39	41	38	35	38	37	35	38	40	41	38.20	
3 CRM 9.0-100%	39	41	30	39	38	38	35	40	32	37	36.90	
4 PCM 1.0-50%	36	37	31	34	37	30	37	41	43	39	36.50	
5 PCM 1.0-100%	36	31	32	33	32	31	33	32	35	35	33.00	*
6 PCM 2.9-50%	35	36	33	39	36	38	39	36	35	37	36.40	
7 PCM 2.9-100%	34	31	32	35	36	39	35	34	36	34	34.60	

MINIMUM SIGNIFINANT DIFFERENCE = 2.86

THIS REPRESENTS A 7.64 % DECREASE IN SURVIVAL FROM THE CONTROL

12:28 Monday, January 13, 1992

General Linear Models Procedure

Class Level Information

Class	Levels	Values
TRT	7	CRM 9.0-100% CRM 9.0-50% MEDIUM PCM 1.0-100% PCM 1.0-50% PCM 2.9-100% PCM 2.9-50%

Number of observations in data set = 70

Analysis of untransformed data

4

12:28 Monday, January 13, 1992

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	188.37142857	31.39523810	4.24	0.0012
Error	63	466.20000000	7.40000000		
Corrected Total	69	654.57142857			

R-Square	C.V.	Root MSE	RESP Mean
0.287778	7.526505	2.7202941	36.14285714

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	188.37142857	31.39523810	4.24	0.0012

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	6	188.37142857	31.39523810	4.24	0.0012

Tests of assumptions for untransformed data

1

Test for Normal Distribution

12:25 Monday, January 13, 1992

----- STUDY=CR-ERP JAN94 ST_DATE=012594 PARM=CERR -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	70	Sum Wgts	70
Mean	0	Sum	0
Std Dev	2.599331	Variance	6.756522
Skewness	-0.33935	Kurtosis	0.367667
USS	466.2	CSS	466.2
CV	.	Std Mean	0.310679
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	49	Prob> S	0.7671
Num ^= 0	68		
W:Normal	0.982808	Prob<W	0.7548

Quantiles (Def=5)

100% Max	6.5	99%	6.5
75% Q3	1.8	95%	4.1
50% Med	0	90%	2.9
25% Q1	-1.4	10%	-3.4
0% Min	-6.9	5%	-4.9
		1%	-6.9
Range	13.4		
Q3-Q1	3.2		
Mode	-0.4		

Extremes

Lowest	Obs	Highest	Obs
-6.9(	23)	3.6(	1)
-6.5(	36)	4.1(	22)
-5.5(	33)	4.4(	66)
-4.9(	29)	4.5(	38)
-3.6(	62)	6.5(	39)

Test for Normal Distribution

12:25 Monday, January 13, 1992

----- STUDY=CR-ERP JAN94 ST_DATE=012594 PARM=CERR -----

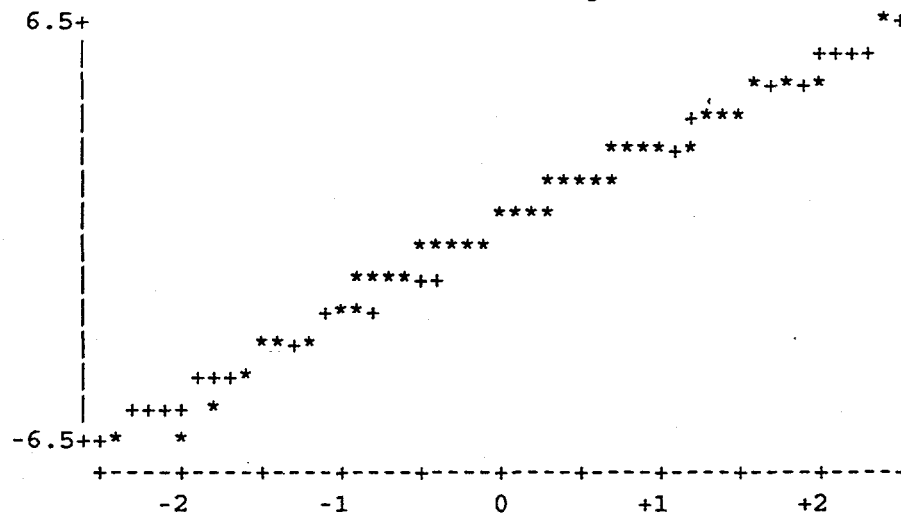
UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
6 5	1	
5		
4 145	3	
3 016	3	
2 0011566688	10	
1 114466668	9	
0 0014455568	10	
-0 66654444222	11	
-1 94442000	8	
-2 65400	5	
-3 644422	6	
-4 9	1	
-5 5	1	
-6 95	2	0

-----+-----+-----+-----+

Normal Probability Plot

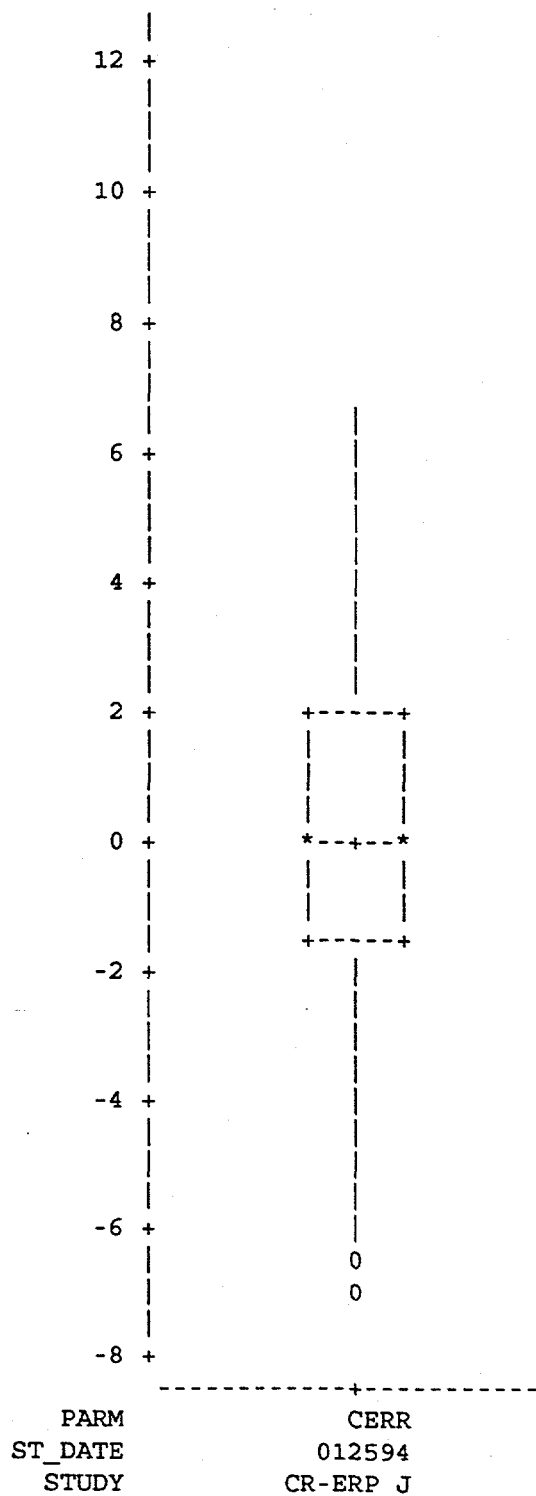


Test for Normal Distribution

12:25 Monday, January 13, 1992

UNIVARIATE PROCEDURE
Schematic Plots

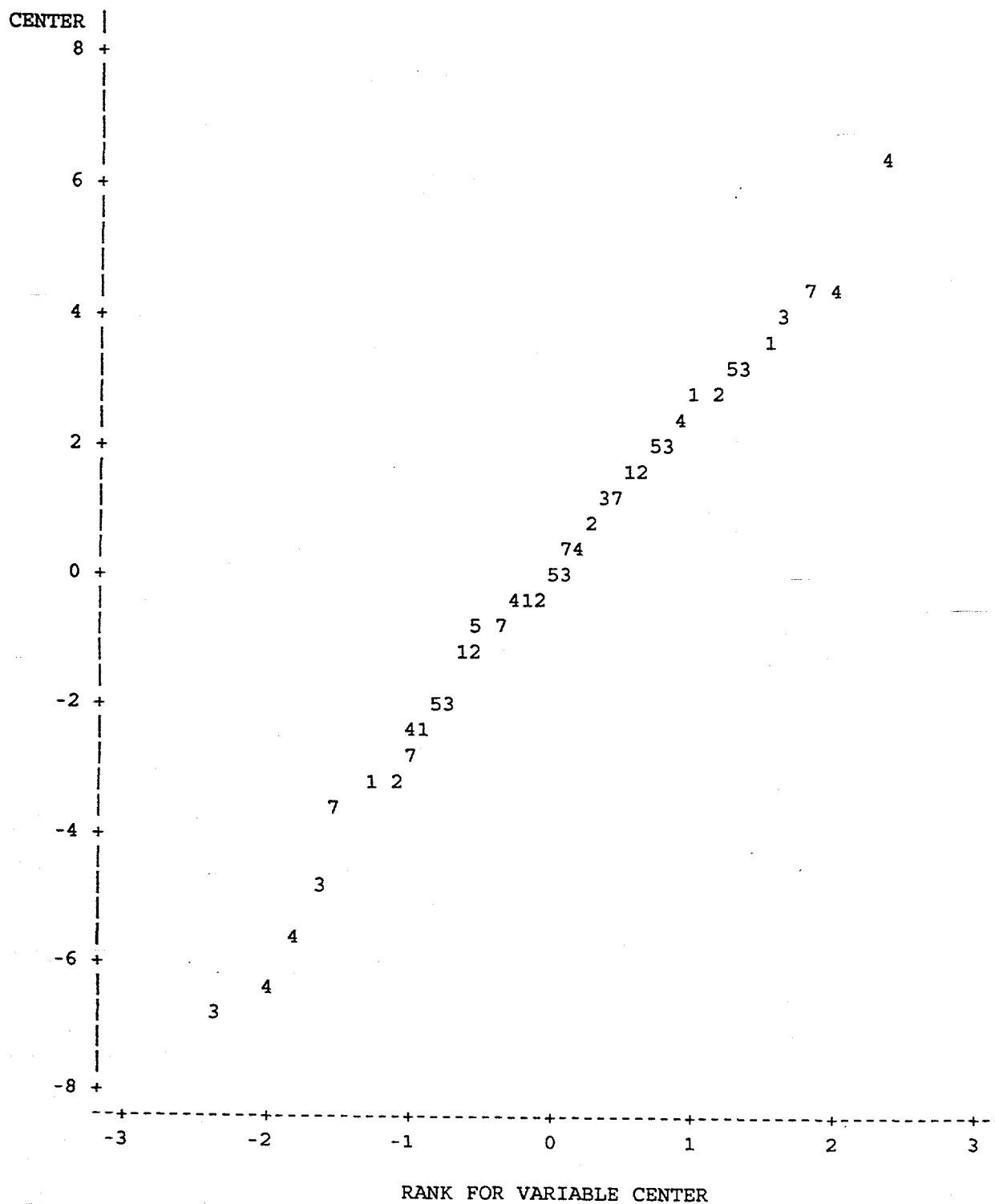
Variable=CENTER



12:25 Monday, January 13, 1992

STUDY=CR-ERP JAN94 ST_DATE=012594 PARM=CERR

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 30 obs hidden.

Tests of assumptions for untransformed data

5

Bartlett's Test for Homogeneous Variance

12:25 Monday, January 13, 1992

STUDY=CR-ERP JAN94

ST_DATE=012594

PARM=CERR

TREATMENT	N	MEAN	VARIANCE
MEDIUM	10	37.40	6.489
CRM 9.0-5	10	38.20	4.622
CRM 9.0-1	10	36.90	12.544
PCM 1.0-5	10	36.50	16.500
PCM 1.0-1	10	33.00	3.111
PCM 2.9-5	10	36.40	3.600
PCM 2.9-1	10	34.60	4.933

BARTLETT'S TEST STATISTIC = 10.921

PROB>B = 0.091

CR-ERP JAN94	012594 CERR	1 MEDIUM	41.00	34.00	36.00	35.00	39.00	37.00	40.00	34.00	39.00	39.00
CR-ERP JAN94	012594 CERR	2 CRM 9.0-50t	39.00	41.00	38.00	35.00	38.00	37.00	35.00	38.00	40.00	41.00
CR-ERP JAN94	012594 CERR	3 CRM 9.0-100t	39.00	41.00	30.00	39.00	38.00	38.00	35.00	40.00	32.00	37.00
CR-ERP JAN94	012594 CERR	4 PCM 1.0-50t	36.00	37.00	31.00	34.00	37.00	30.00	37.00	41.00	43.00	39.00
CR JAN94	012594 CERR	5 PCM 1.0-100t	36.00	31.00	32.00	33.00	32.00	31.00	33.00	32.00	35.00	35.00
CR JAN94	012594 CERR	6 PCM 2.9-50t	35.00	36.00	33.00	39.00	36.00	38.00	39.00	36.00	35.00	37.00
CR-ERP JAN94	012594 CERR	7 PCM 2.9-100t	34.00	31.00	32.00	35.00	36.00	39.00	35.00	34.00	36.00	34.00

THE VALUE OF P IS 25.0

IC₂₅
DOE January 1994
Cek
02-01-94

(ENTER THE NUMBER OF BOOTSTRAP RESAMPLES TO BE TAKEN
(80 IS THE RECOMMENDED NUMBER):

THE NUMBER OF RESAMPLES IS 80

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
-----	-----	-----
.000	37.400	37.400
50.000	36.500	36.500
100.000	33.000	33.000

*** NO LINEAR INTERPOLATION ESTIMATE CAN BE CALCULATED FROM THE INPUT
DATA, SINCE NONE OF THE (POSSIBLY POOLED) GROUP RESPONSE MEANS
WERE LESS THAN 75.0% OF THE CONTROL RESPONSE MEAN.

50.000	36.500	36.500
100.000	33.000	33.000

*** NO LINEAR INTERPOLATION ESTIMATE CAN BE CALCULATED FROM THE INPUT
DATA, SINCE NONE OF THE (POSSIBLY POOLED) GROUP RESPONSE MEANS
WERE LESS THAN 75.0% OF THE CONTROL RESPONSE MEAN.

* BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY *
* OF THE ESTIMATED IC_p *

*** BOOTSTRAP ESTIMATES OF IC_p FOR ALL RESAMPLES WERE ABOVE THE
HIGHEST CONCENTRATION / % EFF.

C:\BOOTSTRP>

1 0	41
1 0	34
1 0	36
1 0	35
1 0	39
1 0	37
1 0	40
1 0	34
1 0	39
1 0	39
2 50.0	36
2 50.0	37
2 50.0	31
2 50.0	34
2 50.0	37
2 50.0	30
2 50.0	37
2 50.0	41
2 50.0	43
2 50.0	39
3 100	36
3 100	31
3 100	32
3 100	33
3 100	32
3 100	31
3 100	33
3 100	32
3 100	35
3 100	35

DOE - 0.1 / 94 -- JANUARY 25-FEBRUARY 1994 -- INITIAL AND FINAL CHEMISTRY

INITIAL CHEMISTRY

MEDIUM (FISH)

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	21.5	25.3	8.4	8.1	321	85.5	62	---
1	22.9	25.4	8.2	8.1	310	85.5	60	---
2	22.5	24.9	8.3	8.2	310	85.5	63	---
3	21.7	25.2	8.4	8.2	310	---	---	---
4	20.7	24.8	8.5	8.1	316	85.5	62	---
5	20.4	24.7	8.5	8.0	325	87.2	61	---
6	20.7	25.1	8.4	8.0	324	---	---	---

MEAN 21.5 25.1 8.4 8.1 317 85.8 62 ---

MIN 20.4 24.7 8.2 8.0 310 85.5 60 ---

MAX 22.9 25.4 8.5 8.2 325 87.2 63 ---

MEDIUM (CERIO)

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	22.1	25.0	8.4	8.1	328	90.6	62	---
1	21.2	25.0	8.3	8.0	326	---	---	---
2	20.8	25.1	8.3	8.0	328	---	---	---
3	21.7	25.0	8.3	8.1	328	---	---	---
4	20.3	24.8	8.3	8.0	330	---	---	---
5	20.3	25.0	8.5	7.9	330	---	---	---
6	---	---	---	---	---	---	---	---

MEAN 21.1 25.0 8.4 8.0 328 90.6 62 ---

MIN 20.3 24.8 8.3 7.9 326 90.6 62 ---

MAX 22.1 25.1 8.5 8.1 330 90.6 62 ---

CRM 9.0 50% W/F-MEDIUM

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	---	25.2	8.4	7.9	290	---	---	---
1	---	25.5	8.3	7.9	286	---	---	---
2	---	25.3	8.4	7.9	287	---	---	---
3	---	25.4	8.3	7.8	287	---	---	---
4	---	25.3	8.4	8.1	286	---	---	---
5	---	25.2	8.4	8.0	290	---	---	---
6	---	25.3	8.4	8.0	291	---	---	---

MEAN 0.0 25.3 8.4 7.9 288 0.0 0 ---

MIN 0.0 25.2 8.3 7.8 286 0.0 0 ---

MAX 0.0 25.5 8.4 8.1 291 0.0 0 ---

PCM 1.0 50% W/C-MEDIUM

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	---	24.9	8.2	7.8	290	---	---	---
1	---	24.9	8.2	7.8	288	---	---	---
2	---	24.8	8.2	7.7	298	---	---	---
3	---	24.8	8.1	7.8	297	---	---	---
4	---	25.0	8.3	7.8	246	---	---	---
5	---	25.1	8.3	7.7	246	---	---	---
6	---	---	---	---	---	---	---	---

MEAN 0.0 24.9 8.2 7.8 278 0.0 0 ---

MIN 0.0 24.8 8.1 7.7 246 0.0 0 ---

MAX 0.0 25.1 8.3 7.8 298 0.0 0 ---

PCM 1.0 100%

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	1.3	25.1	8.4	7.7	254	99.2	71	(0.1
1	2.0	25.4	8.4	7.7	255	---	---	---
2	0.9	25.2	8.4	7.6	272	90.6	63	(0.1
3	3.8	25.2	8.3	7.6	273	---	---	---
4	0.2	24.9	8.2	7.6	164	65.0	42	(0.1
5	2.6	25.1	8.2	7.6	154	---	---	---
6	2.5	25.5	8.3	7.5	163	---	---	---

MEAN 1.9 25.2 8.3 7.6 219 84.9 59 (0.1

MIN 0.2 24.9 8.2 7.5 154 65.0 42 (0.1

MAX 3.8 25.5 8.4 7.7 273 99.2 71 (0.1

PCM 2.9 50% W/F-MEDIUM

INITIAL WARMED								
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	---	25.2	8.3	7.7	288	---	---	---
1	---	25.3	8.3	7.7	283	---	---	---
2	---	25.2	8.4	7.6	270	---	---	---
3	---	25.2	8.3	7.6	270	---	---	---
4	---	25.3	8.4	7.6	237	---	---	---
5	---	25.1	8.4	7.6	240	---	---	---
6	---	25.2	8.4	7.6	240	---	---	---

MEAN 0.0 25.2 8.4 7.6 261 0.0 0 ---

MIN 0.0 25.1 8.3 7.6 237 0.0 0 ---

MAX 0.0 25.3 8.4 7.7 288 0.0 0 ---

CRM 9.0 50% W/C-MEDIUM

		INITIAL WARMED						
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	--	25.1	8.1	8.0	289	---	--	---
1	--	25.3	8.2	7.9	294	---	--	---
2	--	24.8	8.2	7.9	294	---	--	---
3	--	25.3	8.1	7.9	295	---	--	---
4	--	24.9	8.2	8.0	290	---	--	---
5	--	25.0	8.3	8.0	292	---	--	---
6	--	--	--	--	---	---	--	---
MEAN	0.0	25.1	8.2	8.0	292	0.0	0	---
MIN	0.0	24.8	8.1	7.9	289	0.0	0	---
MAX	0.0	25.3	8.3	8.0	295	0.0	0	---

PCM 2.9 50% W/C-MEDIUM

		INITIAL WARMED						
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	--	25.1	8.1	7.8	292	---	--	---
1	--	25.1	8.2	7.8	289	---	--	---
2	--	25.0	8.3	7.7	277	---	--	---
3	--	25.3	8.1	7.7	279	---	--	---
4	--	25.0	8.2	7.8	244	---	--	---
5	--	25.0	8.3	7.7	241	---	--	---
6	--	--	--	--	---	---	--	---
MEAN	0.0	25.1	8.2	7.8	270	0.0	0	---
MIN	0.0	25.0	8.1	7.7	241	0.0	0	---
MAX	0.0	25.3	8.3	7.8	292	0.0	0	---

CRM 9.0 100%

		INITIAL WARMED						
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	1.1	24.9	8.4	7.9	263	116.3	103	<0.1
1	2.8	25.5	8.4	7.9	263	---	--	---
2	2.2	25.3	8.4	7.8	266	116.3	102	<0.1
3	3.9	25.5	8.3	7.8	265	---	--	---
4	0.8	24.9	8.3	8.1	255	111.2	95	<0.1
5	2.4	25.3	8.3	8.0	256	---	--	---
6	2.5	25.2	8.4	8.0	258	---	--	---
MEAN	2.2	25.2	8.4	7.9	261	114.6	100	<0.1
MIN	0.8	24.9	8.3	7.8	255	111.2	95	<0.1
MAX	3.9	25.5	8.4	8.1	266	116.3	103	<0.1

PCM 2.9 100%

		INITIAL WARMED						
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	3.3	25.2	8.3	7.7	256	100.9	74	<0.1
1	1.3	25.1	8.2	7.7	257	---	--	---
2	0.8	25.2	8.4	7.5	228	83.8	53	<0.1
3	1.7	25.1	8.4	7.5	227	---	--	---
4	4.6	25.3	8.2	7.6	153	58.1	37	<0.1
5	1.4	25.1	8.2	7.5	153	---	--	---
6	1.9	25.2	8.3	7.5	152	---	--	---
MEAN	2.1	25.2	8.3	7.6	204	80.9	55	<0.1
MIN	0.8	25.1	8.2	7.5	152	58.1	37	<0.1
MAX	4.6	25.3	8.4	7.7	257	100.9	74	<0.1

PCM 1.0 50% W/F-MEDIUM

		INITIAL WARMED						
DAY	TEMP	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	--	25.0	8.4	7.8	286	---	--	---
1	--	25.2	8.2	7.7	282	---	--	---
2	--	25.2	8.4	7.7	293	---	--	---
3	--	25.3	8.4	7.6	291	---	--	---
4	--	25.4	8.4	7.6	242	---	--	---
5	--	25.3	8.4	7.6	245	---	--	---
6	--	25.3	8.3	7.6	247	---	--	---
MEAN	0.0	25.2	8.4	7.7	269	0.0	0	---
MIN	0.0	25.0	8.2	7.6	242	0.0	0	---
MAX	0.0	25.4	8.4	7.8	293	0.0	0	---

FISH FINAL

CRM 9.0 50% W/F-MEDIUM

CRM 9.0 100%

PCM 1.0 50% W/F-MEDIUM

DAY	TEMP	DO	pH	COND
1	25.6	6.3	7.8	
	25.7	6.6		295
	25.6	6.2		
	25.6	6.5		
2	25.5	5.8		
	25.2	6.2	7.8	
	25.6	5.6		289
	26.3	5.8		
3	25.6	5.6		
	25.9	5.4		
	25.3	5.7	7.8	
	25.5	5.4		291
4	25.3	4.1		292
	24.8	5.8		
	25.3	5.4		
	25.7	5.9	7.8	
5	24.9	5.3	7.6	
	24.5	5.9		292
	25.0	4.6		
	25.1	5.7		
6	24.4	6.2		
	25.2	6.1	7.8	
	24.8	6.2		295
	24.6	6.4		
7	25.0	6.6		
	24.2	6.9		
	24.6	6.6	7.8	
	24.6	6.2		291
MEAN	25.2	5.9	7.8	292
MIN	24.2	4.1	7.6	289
MAX	26.3	6.9	7.8	295

DAY	TEMP	DO	pH	COND
1	25.3	5.9	7.8	
	25.4	5.5		266
	25.2	6.2		
	25.4	6.1		
2	25.4	5.7		
	25.3	6.0	7.9	
	25.4	5.7		267
	25.7	5.9		
3	25.8	5.0		
	25.3	5.7		
	25.8	5.7	7.9	
	25.3	5.4		268
4	25.1	5.9		267
	25.6	5.5		
	26.2	5.6		
	25.3	5.2	7.8	
5	24.9	6.2	7.8	
	24.9	5.1		261
	25.1	6.0		
	24.5	6.1		
6	24.8	6.5		
	24.8	5.9	7.8	
	25.5	6.3		260
	25.4	5.8		
7	24.8	6.6		
	24.8	6.4		
	24.9	6.7	8.0	
	24.6	6.3		257
MEAN	25.2	5.9	7.9	264
MIN	24.5	5.0	7.8	257
MAX	26.2	6.7	8.0	268

DAY	TEMP	DO	pH	COND
1	25.5	6.3	7.7	
	25.4	5.9		288
	25.2	6.0		
	25.4	6.1		
2	25.3	6.2		
	26.0	5.8	7.7	
	25.3	5.6		279
	26.0	5.9		
3	25.7	5.5		
	25.7	5.3		
	25.9	5.6	7.6	
	25.5	5.1		293
4	24.9	5.4		297
	25.9	5.2		
	25.3	5.6		
	25.2	5.3	7.6	
5	24.6	5.6	7.4	
	24.8	5.3		245
	25.2	5.3		
	25.3	5.0		
6	25.1	6.0		
	24.9	6.0	7.5	
	24.7	6.2		247
	25.4	5.8		
7	24.9	6.4		
	24.5	5.8		
	24.6	5.9	7.5	
	25.0	6.4		249
MEAN	25.3	5.7	7.6	271
MIN	24.5	5.0	7.4	245
MAX	26.0	6.4	7.7	297

PCM 1.0 100%

DAY	TEMP	DO	pH	COND
1	25.4	6.0	7.7	
	25.3	6.3		258
	25.5	6.0		
	25.4	6.2		
2	25.3	6.0		
	25.7	6.2	7.7	
	26.0	5.8		257
	25.5	6.2		
3	25.8	4.7		
	25.5	5.8		
	26.0	5.3	7.6	
	25.6	5.0		275
4	25.2	5.4		277
	26.0	4.9		
	26.0	5.1		
	25.2	4.6	7.5	
5	24.6	5.8	7.4	
	24.8	4.7		172
	24.6	5.9		
	25.4	5.2		
6	25.9	5.8		
	25.3	5.9	7.5	
	24.9	5.9		168
	24.5	5.9		
7	24.7	5.9		
	24.7	5.9		
	24.7	6.5	7.5	
	25.0	5.8		166
MEAN	25.3	5.7	7.6	225
MIN	24.5	4.6	7.4	166
MAX	26.0	6.5	7.7	277

PCM 2.9 50% W/F-MEDIUM

DAY	TEMP	DO	pH	COND
1	25.5	6.0	7.7	
	24.9	6.2		278
	25.1	5.9		
	25.4	6.4		
2	21.4	7.7		
	25.8	6.1	7.7	
	25.3	5.9		283
	25.2	5.8		
3	25.5	5.4		
	25.5	5.4		
	25.8	5.5	7.6	
	26.0	5.6		271
4	25.0	5.7		273
	25.3	5.3		
	25.3	5.4		
	25.5	4.4	7.5	
5	25.0	4.8	7.3	
	24.8	5.6		237
	24.4	6.0		
	25.3	5.1		
6	24.6	6.3		
	25.7	6.1	7.5	
	25.3	6.0		241
	24.9	6.2		
7	24.6	6.5		
	25.2	6.4		
	24.5	6.6	7.6	
	25.5	6.3		244
MEAN	25.1	5.9	7.6	261
MIN	21.4	4.4	7.3	237
MAX	26.0	7.7	7.7	283

PCM 2.9 100%

DAY	TEMP	DO	pH	COND
1	25.3	6.3	7.7	
	25.3	5.9		258
	25.2	6.2		
	24.9	5.7		
2	25.6	5.9		
	25.4	6.4	7.8	
	25.2	5.6		258
	25.5	5.9		
3	25.5	5.5		
	25.3	6.1		
	25.1	6.0	7.6	
	25.8	5.5		231
4	25.3	4.9		231
	26.2	4.9		
	25.4	4.7		
	25.1	5.5	7.5	
5	24.5	5.3	7.3	
	25.0	5.2		160
	24.7	5.8		
	24.7	5.6		
6	24.9	5.9		
	24.8	6.1	7.4	
	25.4	5.9		159
	24.5	5.6		
7	24.5	6.4		
	24.8	6.3		
	25.5	6.1	7.5	
	25.4	6.3		156
MEAN	25.2	5.8	7.5	208
MIN	24.5	4.7	7.3	156
MAX	26.2	6.4	7.8	258

MEDIUM

DAY	TEMP	DO	pH	COND
1	25.4	6.4	7.8	325
	25.6	6.7		
	25.8	6.6		
	25.5	6.7		
2	25.4	5.9	7.6	312
	25.2	5.8		
	25.3	5.8		
	25.7	6.0		
3	25.6	5.6	7.8	315
	25.7	5.9		
	25.2	6.1		
	25.5	5.5		
4	25.3	5.5	7.6	314
	25.6	5.9		
	25.5	5.5		
	25.1	4.3		
5	24.7	6.4	7.6	324
	24.9	5.8		
	24.7	5.6		
	25.0	5.5		
6	24.9	6.3	7.7	327
	24.6	6.1		
	24.7	6.0		
	25.5	6.1		
7	24.7	6.7	7.7	322
	24.5	6.6		
	24.5	6.5		
	25.1	6.4		
MEAN	25.2	6.0	7.7	320
MIN	24.5	4.3	7.6	312
MAX	25.8	6.7	7.8	327

MEAN TEMPERATURE 25.2

MINIMUM: 21.4

MAXIMUM: 26.3

CERIO FINAL

CRM 9.0 50%

DAY	DO	pH
1	8.0	8.2
2	7.9	8.2
3	8.1	8.3
4	8.1	8.5
5	8.3	8.3
6	8.0	8.3

MEAN 8.1 8.3

MIN 7.9 8.2

MAX 8.3 8.5

CRM 9.0 100%

DAY	DO	pH
1	8.0	8.2
2	7.9	8.3
3	8.0	8.4
4	8.2	8.5
5	8.4	8.4
6	8.0	8.3

MEAN 8.1 8.4

MIN 7.9 8.2

MAX 8.4 8.5

PCM 1.0 50%

DAY	DO	pH
1	7.9	8.1
2	7.9	8.1
3	8.3	8.2
4	8.1	8.3
5	8.3	8.2
6	8.1	8.1

MEAN 8.1 8.2

MIN 7.9 8.1

MAX 8.3 8.3

PCM 1.0 100%

DAY	DO	pH
1	8.0	8.1
2	8.0	8.2
3	8.4	8.3
4	8.1	8.3
5	8.4	8.0
6	8.1	7.9

MEAN 8.2 8.1

MIN 8.0 7.9

MAX 8.4 8.3

PCM 2.9 50%

DAY	DO	pH
1	8.0	8.1
2	7.9	8.2
3	8.1	8.2
4	8.1	8.3
5	8.4	8.1
6	8.1	8.2

MEAN 8.1 8.2

MIN 7.9 8.1

MAX 8.4 8.3

PCM 2.9 100%

DAY	DO	pH
1	8.1	8.1
2	8.0	8.3
3	8.2	8.1
4	8.1	8.2
5	8.5	8.0
6	8.1	8.0

MEAN 8.2 8.1

MIN 8.0 8.0

MAX 8.5 8.3

MEDIUM

DAY	DO	pH
1	7.9	8.1
2	7.9	8.1
3	7.9	8.1
4	8.0	8.2
5	8.2	8.0
6	8.0	8.0

MEAN 8.0 8.1

MIN 7.9 8.0

MAX 8.2 8.2

FINAL TEMP

25.5	25.2	25.5	24.6	24.7	24.8
25.6	25.0	25.8	25.0	24.7	24.9
25.8	24.9	25.8	25.1	24.5	24.9
25.2	25.7	25.8	25.4	25.8	24.8
25.4	25.5	25.7	25.7	25.8	25.1
25.8	25.2	25.8	25.8	25.5	25.1
25.2	25.8	25.5	25.3	25.8	24.6
25.1	25.7	25.2	25.3	25.9	24.6
25.1	25.5	24.9	24.9	25.6	24.2
25.2	25.1	25.5	25.0	25.2	24.3

MEAN: 25.3

MIN: 24.2

MAX: 25.9

Reviewed by D/S 2-5-94 (DOE-0194)

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Personnel SimbeckBeginning Date 1-20-94
Cen's 1-20-94Date 1-25-94HarawayEnding Date Feb 2-1-94Sesler

By	Wt/Dry	D ^W /D ^W	DH/D ^W	D ^H /D ^W	D ^H /D ^W	TS	D ^H /D ^W	DH	D ^H /D ^W	TS	D ^H /D ^W
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
F-MED # 1576	21.5	25.3	8.4	8.1	321	5.0	85.5	6.2	62		
C-MED # 1577	22.1	25.0	8.4	8.1	328	5.3	90.6	6.2	62		
CRM 9.0 50% F		25.2	10.0	7.7	290						
CRM 9.0 50% C		25.1	9.3	7.8	289						
CRM 9.0 100%	1.1°C	24.9	11.4	7.5	263	6.8	116.3	10.3	103	<0.1	<0.1
ID # 10695											
PCM 1.0 50% F		25.0	9.9	7.5	286						
PCM 1.0 50% C		24.9	9.7	7.6	290						
PCM 1.0 100%	1.3°C	25.1	11.4	7.3	254	5.8	99.2	7.1	71	<0.1	<0.1
ID # 10691											
PCM 2.9 50% F		25.2	9.9	7.5	288						
PCM 2.9 50% C		25.1	9.3	7.6	292						
PCM 2.9 100%	3.3°C	25.2	11.2	7.3	256	5.9	100.9	7.4	74	<0.1	<0.1
ID # 10688											

NOTES:

PLARC501-252

Reviewed By: QTS

INITIAL CHEMISTRY

Study CR-ERP QA JAN '94Personnel SimbeckBeginning Date 1-20-94
25 HJ 1-22-94
Cen 1-30-94Date 1-26-94HorawayEnding Date Fish 2-1-94Kirard, Russell

By	D/S	O/S	O/S	O/S	O/S	GXX	D/S	GXX	Cue		
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
F-MED #1578	22.9	25.4	8.2	8.1	310	5.0 *	85.5	6.0 *	60		
C-MED #1577	21.2	25.0	8.3	8.0	326						
8:14 8:22 CRM 9.0 50% F		25.5	9.9 / 8.0	7.7 / 7.9	286						
8:12/8:14 CRM 9.0 50% C		25.3	9.4 / 8.2	7.8 / 7.9	294						
8:12/8:22 CRM 9.0 100%	2.8	25.5	11.0 / 8.4	7.6 / 7.9	263						
ID # 10695											
3:14/8:22 PCM 1.0 50% F		25.2	10.0 / 8.2	7.5 / 7.7	282						
1:12/8:14 PCM 1.0 50% C		24.9	9.4 / 8.2	7.6 / 7.8	288						
5:12/8:24 PCM 1.0 100%	2.0	25.4	11.6 / 8.4	7.3 / 7.7	255						
ID # 10691											
8:15/8:23 PCM 2.9 50% F		25.3	9.9 / 8.3	7.5 / 7.7	283						
8:12/8:15 PCM 2.9 50% C		25.1	9.2 / 8.2	7.6 / 7.8	289						
8:12/8:23 PCM 2.9 100%	1.3	25.1	10.8 / 8.2	7.3 / 7.7	257						
ID # 10688											

NOTES:

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* recorded originally on PAF initial Data sheet. Cue 01-26-94

Reviewed By: JS/Cue

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Date 1-27-94Personnel SimbeckBeginning Date 1-20-94HersawayEnding Date Fish 2-1-94Sesler

By	D/S	OT	OT	OT	OT	TS	D/S	D/S	D/S	TS	D/S
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
F-MED #1582	22.5	24.9	8.3	8.2	310	5.0	85.5	6.3	63		
C-MED #1577	20.8	25.1	8.3	8.0	328						
0933/940 CRM 9.0 50% F		25.3	9.8/8.4	7.6/7.9	287						
0931/0933 CRM 9.0 50% C		24.8	8.7/8.2	7.8/7.9	294						
0931/943 CRM 9.0 100%	2.2	25.3	11.0/8.4	7.3/7.8	266	6.8	116.3	10.2	102	<0.1	<0.1
ID # 10791											
0933/940 PCM 1.0 50% F		25.2	9.7/8.4	7.4/7.7	293	D/S 1-27-94					
0931/0933 PCM 1.0 50% C		24.8	9.0/8.2	7.6/7.7	298						
0931/943 PCM 1.0 100%	0.9	25.2	10.4/8.4	7.2/7.6	272	5.3	90.6	6.3	63	<0.1	<0.1
ID # 10787											
0933/940 PCM 2.9 50% F		25.2	9.7/8.4	7.3/7.6	270						
0931/0933 PCM 2.9 50% C		25.0	9.2/8.3	7.5/7.7	277						
0931/943 PCM 2.9 100%	0.8	25.2	10.8/8.4	7.1/7.5	228	4.9	83.8	5.3	53	<0.1	<0.1
ID # 10785											

NOTES:

PLARC501-252

Reviewed By: D/S

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Personnel SimbeckBeginning Date 1-20-94
^{25 05 1-20-94}
_{Cen's 1-31-94}Date 1-28-94HarawayEnding Date Fish 2-1-94

By	0/5	0/5	0/5	0/5	0/5						
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
F-MED #1522	21.7	25.2	8.4	8.2	310						
C-MED #1577	21.7	25.0	8.3	8.1	328						
05/8:13 CRM 9.0 50% F		25.4	9.8 8.3	8.2 7.8	287						
03/8:05 CRM 9.0 50% C		25.3	9.3 8.1	7.7 7.9	295						
03/8:14 CRM 9.0 100%	3.9	25.5	11.2 8.3	7.3 7.8	265						
ID #10791											
05/8:10 PCM 1.0 50% F		25.3	9.6 8.4	7.4 7.6	291						
03/8:05 PCM 1.0 50% C		24.8	9.2 8.1	7.6 8.1	297						
03/8:14 PCM 1.0 100%	3.8	25.2	10.4 8.3	7.2 7.6	273						
ID #10787											
05/8:14 PCM 2.4 50% F		25.2	9.7 8.3	7.3 7.6	270						
03/8:05 PCM 2.4 50% C		25.3	9.4 8.1	7.4 7.7	279						
03/8:14 PCM 2.4 100%	1.7	25.1	10.6 8.4	7.0 7.5	227						
ID #10785											

NOTES:

PLARCS01-252

Reviewed By: MS

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Personnel SimbeckDate 1-29-94Beginning Date 1-20-94HersawanyEnding Date 2-1-94

By	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0	
F-MED #1581	20.7	24.8	8.5	8.1	316	5.0	85.5	6.2	62			
C-MED #1577	20.3	24.8	8.3	8.0	330							
1028 1033 CRM 9.0 50% F	20.7	25.3	9.6 8.4	8.0 8.1	286							
1027 1028 CRM 9.0 50% C		24.9	9.0 8.2	8.0 8.0	290							
1027 1038 CRM 9.0 100%	0.8	24.9	10.6 8.3	7.9 8.1	255	6.5	111.2	9.5	95	<0.1	<0.1	
ID # 10900												
1028 1033 PCM 1.0 50% F		25.4	9.6 8.4	7.5 7.6	242							
1027 1028 PCM 1.0 50% C		25.0	9.1 8.3	7.6 7.8	246							
1027 1038 PCM 1.0 100%	0.2	24.9	10.2 8.2	7.1 7.6	164	3.8	65.0	4.2	42	<0.1	<0.1	
ID # 10896												
1028 1035 PCM 2.9 50% F		25.3	9.6 8.4	7.4 7.6	237							
1027 1028 PCM 2.9 50% C		25.0	8.9 8.2	7.5 7.8	244							
1027 1038 PCM 2.9 100%	4.6	25.3	10.0 8.2	7.2 7.6	153	3.4	58.1	3.7	37	<0.1	<0.1	
ID # 10894												

NOTES:

PLARC501-252

Reviewed By: DJS

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Personnel SimbeckBeginning Date 1-20-94
25 DS 1-21-94
(2nd 1-31-94)Date 1-30-94HarawayEnding Date Fish 2-1-94Kinard

By	<u>DS</u>	<u>DS</u>	<u>DS</u>	<u>DS</u>	<u>DS</u>	<u>GKK</u>	<u>DS</u>	<u>GKK</u>	<u>DS</u>		
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
F-MED #1584	20.4	24.7	8.5	8.0	325	5.1	87.2	6.1	61		
C-MED #1577	20.3	25.0	8.5	7.9	330						
<u>1042</u> <u>1047</u> CRM 9.0 50% F		25.2	<u>9.7</u> <u>8.4</u>	<u>7.9</u> <u>8.0</u>	290						
<u>1038</u> <u>1040</u> CRM 9.0 50% C		25.0	<u>9.2</u> <u>8.3</u>	<u>7.9</u> <u>8.0</u>	292						
<u>1038</u> <u>1040</u> CRM 9.0 100%	2.4	25.3	<u>10.8</u> <u>8.3</u>	<u>7.9</u> <u>8.0</u>	256						
ID # 10900											
<u>1040</u> <u>1047</u> PCM 1.0 50% F		25.3	<u>9.6</u> <u>8.4</u>	<u>7.4</u> <u>7.6</u>	245						
<u>1038</u> <u>1040</u> PCM 1.0 50% C		25.1	<u>9.3</u> <u>8.3</u>	<u>7.5</u> <u>7.7</u>	246						
<u>1038</u> <u>1050</u> PCM 1.0 100%	2.6	25.1	<u>10.0</u> <u>8.2</u>	<u>7.0</u> <u>7.6</u>	154						
ID # 10896											
<u>1040</u> <u>1047</u> PCM 2.9 50% F		25.1	<u>9.6</u> <u>8.4</u>	<u>7.5</u> <u>7.6</u>	240						
<u>1038</u> <u>1040</u> PCM 2.9 50% C		25.0	<u>9.1</u> <u>8.3</u>	<u>7.6</u> <u>7.7</u>	241						
<u>1038</u> <u>1050</u> PCM 2.9 100%	1.4	25.1	<u>10.2</u> <u>8.2</u>	<u>7.1</u> <u>7.5</u>	153						
ID # 10894											

NOTES:

PLARC501-252

Reviewed By: DS

INITIAL CHEMISTRY

Study CR-ERP QA JAN 94Personnel SimbeakBeginning Date 1-20-94
^{MS 25 1-21-94}
Carib 1-31-94Date 1-31-94HarawayEnding Date Feb 2-1-94

By	<u>MS</u>	<u>MS</u>	<u>MS</u>	<u>MS</u>	<u>MS</u>						
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
<u>1014</u> <u>1015</u> F-MED # 1584	20.7	25.1	<u>8.6</u> <u>8.4</u>	<u>8.0</u> <u>8.0</u>	324						
C-MED #											
<u>1013</u> <u>10:22</u> CRM 9.0 50% F		25.3	<u>9.9</u> <u>8.4</u>	<u>7.9</u> <u>8.0</u>	291						
CRM 9.0 50% C											
<u>1013</u> <u>10:22</u> CRM 9.0 100%	2.5	25.2	<u>11.2</u> <u>8.4</u>	<u>7.9</u> <u>8.0</u>	258						
ID # 10900											
<u>1013</u> <u>10:20</u> PCM 1.0 50% F		25.3	<u>9.8</u> <u>8.3</u>	<u>7.4</u> <u>7.6</u>	247						
PCM 1.0 50% C											
<u>1013</u> <u>10:23</u> PCM 1.0 100%	2.5	25.5	<u>10.4</u> <u>8.3</u>	<u>7.0</u> <u>7.5</u>	163						
ID # 10896											
<u>1013</u> <u>10:20</u> PCM 2.9 50% F		25.2	<u>9.8</u> <u>8.4</u>	<u>7.4</u> <u>7.6</u>	240						
PCM 2.9 50% C											
<u>1013</u> <u>10:23</u> PCM 2.9 100%	1.9	25.2	<u>10.4</u> <u>8.3</u>	<u>7.1</u> <u>7.5</u>	152						
ID # 10894											

NOTES:

PLARC501-252

Reviewed By: MS

FINAL CHEMISTRY

Page 1 of 7

Study CR-ERP QA JAN 94

Personnel Simbeck

Beginning Date 1-20-94

Date 1-26-94

Ending Date 1-27-94

Haraway
Sesler

Sample ID	By	Fish			
		TS/015	TS/015	TS/015	TS/015
	Rep.	Temp.	DO	pH	Cond.
	1	25.4	6.4	7.8	
F-mED	2	25.4	6.7		325
	3	25.8	6.6		
	4	25.5	6.7		
	1	25.6	6.3	7.8	
CRM 9.0	2	25.7	6.6		295
50%	3	25.6	6.2		
	4	25.6	6.5		
	1	25.3	5.9	7.8	
CRM 9.0	2	25.4	5.5		266
100%	3	25.2	6.2		
	4	25.4	6.1		
	1	25.5	6.3	7.7	
PCM 1.0	2	25.4	5.9		288
50%	3	25.2	6.0		
	4	25.4	6.1		
	1	25.4	6.0	7.7	
PCM 1.0	2	25.3	6.3		258
100%	3	25.5	6.0		
	4	25.4	6.2		
	1	25.5	6.0	7.7	
PCM 2.9	2	24.9	6.2		278
50%	3	25.1	5.9		
	4	25.4	6.4		
	1	25.3	6.3	7.7	
PCM 2.9	2	25.3	5.9		258
100%	3	25.2	6.2		
	4	24.9	5.7		

Ceriodaphnia			
Temp.	Sample ID	DO	pH
25.5	① CRMED	7.9	8.1
25.6	② CRM 9.0 50%	8.0	8.2
25.8	③ CRM 9.0 100%	8.0	8.2
25.2	④ PCM 1.0 50%	7.9	8.1
25.4	⑤ PCM 1.0 100%	8.0	8.1
25.8	⑥ PCM 2.9 50%	8.0	8.1
25.2	⑦ PCM 2.9 100%	8.1	8.1
25.1			
25.1			
25.2			

NOTES:

Reviewed By: by

FINAL CHEMISTRY

Page 2 of 7

Study CR-ERT QA JAN 94
 Beginning Date 1-20-94
 Ending Date 1-27-94

Date 1-27-94

Personnel Simberle
Haraway
Sosler

Sample ID	By	Fish			
		Rep.	Temp.	DO	pH
	1		25.4	5.9	
F-MED	2		25.2	5.8	7.6
	3		25.3	5.8	
	4		25.7	6.0	
	1		25.5	5.8	
CRM 9.0	2		25.2	6.2	7.8
50%	3		25.6	5.6	
	4		26.3	5.8	
	1		25.4	5.7	
CRM 9.0	2		25.3	6.0	7.9
100%	3		25.4	5.7	
	4		25.7	5.9	
	1		25.3	6.2	
PCM 1.0	2		26.0	5.8	7.7
50%	3		25.3	5.6	
	4		26.0	5.9	
	1		25.3	6.0	
PCM 1.0	2		25.7	6.2	7.7
100%	3		26.0	5.8	7.7
	4		25.5	6.2	
	* 1		21.4	7.7	
PCM 2.9	2		25.8	6.1	7.7
50%	3		25.3	5.9	
	4		25.2	5.8	
	1		25.6	5.9	
PCM 2.9	2		25.4	6.4	7.8
100%	3		25.2	5.6	
	4		25.5	5.9	

Ceriodaphnia			
Temp.	Sample ID	DO	pH
25.2	① CRM 9.0	7.9	8.1
25.0	② CRM 9.0 50%	7.9	8.2
24.9	③ CRM 9.0 100%	7.9	8.3
25.7	④ PCM 1.0 50%	7.9	8.1
25.5	⑤ PCM 1.0 100%	8.0	8.2
25.2	⑥ PCM 2.9 50%	7.9	8.2
25.8	⑦ PCM 2.9 100%	8.0	8.3
25.7			
25.5			
25.1			

NOTES: * Beaker inadvertently not placed in incubator after change-out on 1-26-94 - djs

Reviewed By: ES

FINAL CHEMISTRY

Page 3 of 7

Study CR-ERP QA JAN 94
 Beginning Date 1-25-94
 Ending Date 1-27-94

Date 1-28-94

Personnel Simberle
Haraway
Sesler

Sample ID	By	Fish			
		TS/41	TS/04	TS/07	TS/09
	Rep.	Temp.	DO	pH	Cond.
	1	25.6	5.6		
F-mED	2	25.7	5.9		
	3	25.2	6.1	7.8	
	4	25.5	5.5		315
	1	25.6	5.6		
CRM 9.0	2	25.9	5.4		
50%	3	25.3	5.7	7.8	
	4	25.5	5.4		291
	1	25.8	5.0		
CRM 9.0	2	25.3	5.7		
100%	3	25.8	5.7	7.9	
	4	25.3	5.4		268
	1	25.7	5.5		
PCM 1.0	2	25.7	5.3		
50%	3	25.9	5.6	7.6	
	4	25.5	5.1		293
	1	25.8	4.7		
PCM 1.0	2	25.5	5.8		
100%	3	26.0	5.3	7.6	
	4	25.6	5.0		275
	1	25.5	5.4		
PCM 2.9	2	25.5	5.4		
50%	3	25.8	5.5	7.6	
	4	26.0	5.6		271
	1	25.5	5.5		
PCM 2.9	2	25.3	6.1		
100%	3	25.1	6.0	7.6	
	4	25.8	5.5		231

NOTES:

Ceriodaphnia			
Temp.	Sample ID	DO	pH
25.5	① CRM ED	7.9	8.1
25.8	② CRM 9.0 50%	8.1	8.3
25.8	③ CRM 9.0 100%	8.0	8.4
25.8	④ PCM 1.0 50%	8.3	8.2
25.7	⑤ PCM 1.0 100%	8.4	8.3
25.8	⑥ PCM 2.9 50%	8.1	8.2
25.5	⑦ PCM 2.9 100%	8.2	8.1
25.2			
24.9			
25.5			

Reviewed By: hjs

FINAL CHEMISTRY

Page 4 of 47

Study CR-ERP QA JAN 94
 Beginning Date 1-20-94
 Ending Date 1-27-94

Date 1-29-94

Personnel Simberle
Haraway

Sample ID	By	Fish			
		Temp.	DO	pH	Cond.
	1	25.3	5.5		314
F-MED	2	25.6	5.9		
	3	25.5	5.5		
	4	25.1	4.3	7.6	93
	1	25.3	4.1		292
CRM 9.0	2	25.8	5.8		
50%	3	25.3	5.4		
	4	25.2	5.9	7.8	
	1	25.2	5.9		267
CRM 9.0	2	26.0	5.5		
100%	3	26.2	5.6		
	4	25.3	5.2	7.8	
	1	25.3	5.4		297
PCM 1.0	2	24.8	5.2		
50%	3	25.3	5.6		
	4	25.2	5.3	7.6	
	1	25.2	5.4		277
PCM 1.0	2	26.0	4.9		
100%	3	26.2	5.1		
	4	25.2	4.6	7.5	
	1	25.0	5.7		273
PCM 2.9	2	25.3	5.3		
50%	3	25.3	5.4		
	4	25.5	4.4	7.5	
	1	25.3	4.9		231
PCM 2.9	2	26.2	4.9		
100%	3	25.4	4.7		
	4	25.1	5.5	7.5	

Ceriodaphnia			
Temp.	Sample ID	DO	pH
24.6	① CRM 1.0	8.0	8.2
25.0	② CRM 9.0 50%	8.1	8.5
25.1	③ CRM 9.0 100%	8.2	8.5
25.4	④ PCM 1.0 50%	8.1	8.3
25.7	⑤ PCM 1.0 100%	8.1	8.3
25.8	⑥ PCM 2.9 50%	8.1	8.3
25.3	⑦ PCM 2.9 100%	8.1	8.2
25.3			
24.9			
25.0			

NOTES:

Reviewed By: WJ

FINAL CHEMISTRY

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Study CR-ERP QA JAN 94
 Beginning Date 1-25-94
 Ending Date 1-27-94

Date 1-30-94

Personnel Simbeck
Haraway

Sample ID	By	Fish			
		Temp.	DO	pH	Cond.
	1	24.7	6.4	7.6	
F-MED	2	24.9	5.8		324
	3	24.7	5.6		
	4	25.0	5.5		
	1	24.9	5.3	7.6	
CRM 9.0	2	24.5	5.9		292
50%	3	25.0	4.6		
	4	25.1	5.7		
	1	24.9	6.2	7.8	
CRM 9.0	2	24.9	5.1		261
-100%	3	25.1	6.0		
	4	24.5	6.1		
	1	24.6	5.6	7.4	
PCM 1.0	2	24.8	5.3		245
50%	3	25.2	5.3		
	4	25.3	5.0		
	1	24.6	5.8	7.4	
PCM 1.0	2	24.8	4.7		172
100%	3	24.6	5.9		
	4	25.4	5.2		
	1	25.0	4.8	7.3	
PCM 2.9	2	24.8	5.6		237
50%	3	24.4	6.0		
	4	25.3	5.1		
	1	24.5	5.3	7.3	
PCM 2.9	2	25.0	5.2		160
100%	3	24.7	5.8		
	4	24.7	5.6		

Ceriodaphnia			
Temp.	Sample ID	DO	pH
24.7	① CRM 9.0	8.2	8.0
24.7	② CRM 9.0 50%	8.3	8.3
24.5	③ CRM 9.0 100%	8.4	8.4
25.8	④ PCM 1.0 50%	8.3	8.2
25.8	⑤ PCM 1.0 100%	8.4	8.0
25.5	⑥ PCM 2.9 50%	8.4	8.1
25.8	⑦ PCM 2.9 100%	8.5	8.0
25.9			
25.6			
25.2			

NOTES:

Reviewed By: b/s

FINAL CHEMISTRY

Page 6 of 7

Study CR-ERP QA JAN 94

Beginning Date 1-20-94

Ending Date 1-27-94

Date 1-31-94

Personnel Simbeck
Havaway
Sesler

Sample ID	By	Fish			
		Temp.	DO	pH	Cond.
	1	24.9	6.3		
F-mED	2	24.6	6.1	7.7	
	3	24.7	6.0		327
	4	25.5	6.1		
	1	24.4	6.2		
CRM 9.0	2	25.2	6.1	7.8	
50%	3	24.8	6.2		295
	4	24.6	6.4		
	1	24.8	6.5		
CRM 9.2	2	24.8	5.9	7.8	
100%	3	25.5	6.3		260
	4	25.4	5.8		
	1	25.1	6.0		
PCM 1.0	2	24.9	6.0	7.5	
50%	3	24.7	6.2		247
	4	25.4	5.8		
	1	25.9	5.8		
PCM 1.0	2	25.3	5.9	7.5	
100%	3	24.9	5.9		168
	4	24.5	5.9		
	1	24.6	6.3		
PCM 2.9	2	25.7	6.1	7.5	
50%	3	25.3	6.0		241
	4	24.9	6.2		
	1	24.9	5.9		
PCM 2.9	2	24.8	6.1	7.4	159
100%	3	25.4	5.9		159
	4	24.5	5.6		

NOTES:

Ceriodaphnia			
Temp.	Sample ID	DO	pH
24.8	① CRMED	8.0	8.0
24.9	② CRM 9.2 50%	8.0	8.3
24.9	③ CRM 9.0 100%	8.0	8.3
24.8	④ PCM 1.0 50%	8.1	8.1
25.1	⑤ PCM 1.0 100%	8.1	7.9
25.1	⑥ PCM 2.9 50%	8.1	8.2
24.6	⑦ PCM 2.9 100%	8.1	8.0
24.6			
24.2			
24.3			

Reviewed By: Op. J.

FINAL CHEMISTRY

Page 7 of 7

Study CR-ERP QA JAN 94
 Beginning Date 1-25-94
 Ending Date 1-27-94

Date 2-1-94

Personnel Simberle
Haraway
Sesler

Sample ID	By	Fish			
		Rep.	Temp.	DO	pH
	1		24.7	6.7	
F-mED	2		24.5	6.6	
	3		24.5	6.5	7.7
	4		25.1	6.4	
	1		25.0	6.6	
CRM 9.0	2		24.2	6.9	
50%	3		24.6	6.6	7.8
	4		24.6	6.2	
	1		24.8	6.6	
CRM 9.0	2		24.8	6.4	
100%	3		24.9	6.7	8.0
	4		24.6	6.3	
	1		24.9	6.4	
PCM 1.0	2		24.5	5.8	
50%	3		24.6	5.9	7.5
	4		25.0	6.4	
	1		24.7	5.9	
PCM 1.0	2		24.7	5.8	
100%	3		24.7	6.5	7.5
	4		25.0	5.8	
	1		24.6	6.5	
PCM 2.9	2		25.2	6.4	
50%	3		24.5	6.6	7.6
	4		25.5	6.3	
	1		24.5	6.4	
PCM 2.9	2		24.8	6.3	
100%	3		25.5	6.1	7.5
	4		25.4	6.3	

NOTES:

Ceriodaphnia			
Temp.	Sample ID	DO	pH
	① CRM ED		
	② CRM 9.0 50%		
	③ CRM 9.0 100%		
	④ PCM 1.0 50%		
	⑤ PCM 1.0 100%		
	⑥ PCM 2.9 50%		
	⑦ PCM 2.9 100%		

Reviewed By: AS

PLARC501-255

Project Instrument Record Sheet

Project Study CRERP QA JAN 94

Beginning Date 1-28-94
^{25 73 1-28-94}

Ending Date 1-27-94
^{21 83}

DO Meter

Model YSI Model 57

TVA Tag 543349 - #2

Calibration Date 8-10-93

pH Meter(s)

Model Orion Research Model SA250

TVA Tag H 7413 - #6

Calibration Date 10-20-93

Model Orion Research Model 399A

TVA Tag 543347 - #3

Calibration Date 11/16/93

Conductivity Meter

Model YSI Model 32

TVA Tag 577780 - #3

Calibration Date 11/16/93

Thermometer(s)

Model SAMA CT-40

TVA Tag M-205

Calibration Date 5-10-93

Model SAMA CT-40

TVA Tag M-206

Calibration Date 5-20-93

PROJECT REAGENT RECORD SHEET

Project/Study: CR-ERP QA JAN '94
 Personnel: Simbeck, Haraway

Beginning Date: 1-20-94
 Ending Date: 1-27-94
2-1

WINKLER TITRATION METHOD

Alkaline-Iodide-Azide:

Brand Fisher
 Lot # 910062-24
 Exp. 2-93

Manganous Sulfate:

Brand Fisher
 Lot # 910067-24
 Exp. 4-93

Sodium Thiosulfate:

Brand Ricca
 Lot # M158
 Exp. 9-94

Sulfuric Acid:

Brand Mallinckrodt
 Lot # 2876 KJCM
 Exp. NA

Thyodene:

Brand Fisher
 Lot # 912254
 Exp. NA

pH BUFFER SOLUTIONS

pH 7.5 2-1-94

10 Brand Mallinckrodt
 Lot # 0099 KLBB
 Exp. 1-94

pH 7:

Brand Mallinckrodt
 Lot # 0098 KLDB
 Exp. 9-94

pH 10 2-1-94

4 Brand Mallinckrodt
 Lot # 0097 KLEA
 Exp. 9-94

pH 10:

Brand Baxter
 Lot # A168
 Exp. 10-94

CONDUCTIVITY STANDARD SOLUTIONS

200 μ mhos:

Brand Biopharm
 Lot # L292A
 Exp. 1-95

720 μ mhos:

Brand Biopharm
 Lot # B252B
 Exp. 3-94

μ mhos:

Brand _____
 Lot # _____
 Exp. _____

ALKALINITY TITRATION

Sulfuric Acid Solution N/50:

Brand Mallinckrodt
 Lot # H366 KJTH
 Exp. NA

HARDNESS TITRATION

Hardness Titrating Solution:

Brand Calgon
 Lot # R2837700
 Exp. NA

Hardness Indicator:

Brand Calgon
 Lot # O1J9B
 Exp. NA

Hardness Buffer Solution:

Brand Calgon
 Lot # 26C6B
 Exp. NA

CHLORINE TITRATION

DPD Powder Pillows:

Brand Aach
 Lot # 03CM
 Exp. NA

Potassium Iodide: Em Science FAS:

Brand Fisher 975 2-1
 Lot # 9139
 Exp. NA

Brand Ricca
 Lot # J189
 Exp. 2-15-94

TOXICITY TESTING LABORATORY SAMPLE LOG

8

Log No. 0057	343-166 Sample ID: <u>Pond Co. downstream from Dike</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1300</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: <u>0.5 °C</u> Date Discarded: <u>01-24-94</u>
Log No. 0058	344-166 Sample ID: <u>NFERC Indale</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1200</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0059	345-166 Sample ID: <u>Upper Station on Central</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1200</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0060	346-166 Sample ID: <u>Settling Pond Effluent</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1200</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0061	347-166 Sample ID: <u>Andersong Stream Entering Pond</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1400</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0062	348-166 Sample ID: <u>Harvey Stream Effluent</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1400</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0063	Sample ID: <u>Harvey Stream South Dike</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>01-17-94/1400</u> Collected By: <u>Larry K Young</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>I Yesler</u> Comments: _____ Rcvd. Date/Time: <u>01-17-94/1430</u> Arrival Temp: _____ °C Date Discarded: <u>01-24-94</u>
Log No. 0064	Sample ID: <u>CRN 9.0 CREEK - 10665</u> Type: <u>Water - grab</u> No. Containers: <u>1 (1 gal)</u> Collection Date/Time: <u>1-24-94/1230</u> Collected By: <u>J. Stockinger</u> Shipped Via: <u>Field Exp to ITC</u> Rcvd. By: <u>D. Swartz</u> Comments: <u>no sample for Seals hole</u> Rcvd. Date/Time: <u>1-25-94/1015</u> Arrival Temp: <u>1.1 °C</u> Date Discarded: <u>2-3-94</u> <u>in bottom of collection</u>

TOXICITY TESTING LABORATORY SAMPLE LOG

Log No.	0065	Sample ID: <u>PCM 1.0 (CERP-10681)</u> Type: <u>water (grab)</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>1-24-94/1200</u> Collected By: <u>J. Stockburger</u> Shipped Via: <u>Fed Express</u> Rcvd. By: <u>D. Subeck</u> Comments: <u>no security seals</u> Rcvd. Date/Time: <u>1-25-94/1015</u> Arrival Temp: <u>1.3 °C</u> Date Discarded: <u>2-3-94</u>
Log No.	0066	Sample ID: <u>PCM 2.9 (CERP-10682)</u> Type: <u>water (grab)</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>1-24-94/1135</u> Collected By: <u>J. Stockburger</u> Shipped Via: <u>Fed Express</u> Rcvd. By: <u>D. Subeck</u> Comments: <u>no security seals</u> Rcvd. Date/Time: <u>1-25-94/1015</u> Arrival Temp: <u>3.3 °C</u> Date Discarded: <u>2-3-94</u>
Log No.	0067	<u>PAF - 461 A</u> Sample ID: <u>PAF - Raw Water Tank</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>01-25-94/1100</u> Collected By: <u>David Thomas</u> Shipped Via: <u>Field Eng. Truck</u> Rcvd. By: <u>C. Russell</u> Comments: <u>Unit 3 off line, 1/2" of cover and rain in last 24 hr, no seal</u> Rcvd. Date/Time: <u>01-25-94/1545</u> Arrival Temp: <u>2.0 °C</u> Date Discarded: _____
Log No.	0068	<u>PAF - 312 A DSA001</u> Sample ID: <u>PAF - Jacobs Creek Ashpond</u> Type: <u>24 hr Composite</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>01-25-94/1100</u> Collected By: <u>David Thomas</u> Shipped Via: <u>Field Eng. Truck</u> Rcvd. By: <u>C. Russell</u> Comments: <u>Unit 3 off line, 1/2" of cover and rain in last 24 hr, no seal</u> Rcvd. Date/Time: <u>01-25-94/1545</u> Arrival Temp: <u>0.1 °C</u> Date Discarded: _____
Log No.	0069	Sample ID: <u>CRM 9.0 (CERP-10781)</u> Type: <u>water (grab)</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>1-26-94/1200</u> Collected By: <u>J. Stockburger</u> Shipped Via: <u>TVA Mail</u> Rcvd. By: <u>D. Subeck</u> Comments: <u>security seals intact</u> Rcvd. Date/Time: <u>1-27-94/0715</u> Arrival Temp: <u>2.2 °C</u> Date Discarded: <u>2-3-94</u>
Log No.	0070	Sample ID: <u>PCM 1.0 (CERP-10782)</u> Type: <u>water (grab)</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>1-26-94/1130</u> Collected By: <u>J. Stockburger</u> Shipped Via: <u>TVA Mail</u> Rcvd. By: <u>D. Subeck</u> Comments: <u>security seals intact</u> Rcvd. Date/Time: <u>1-27-94/0715</u> Arrival Temp: <u>0.9 °C</u> Date Discarded: <u>2-3-94</u>
Log No.	0071	Sample ID: <u>PCM 2.9 (CERP-10783)</u> Type: <u>water (grab)</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>1-26-94/1100</u> Collected By: <u>J. Stockburger</u> Shipped Via: <u>TVA Mail</u> Rcvd. By: <u>D. Subeck</u> Comments: <u>security seals intact</u> Rcvd. Date/Time: <u>1-27-94/0715</u> Arrival Temp: <u>0.8 °C</u> Date Discarded: <u>2-3-94</u>
Log No.	0072	<u>PAF - 312 - 1-B</u> Sample ID: <u>PAF - Raw Water Tank</u> Type: <u>grab</u> No. Containers: <u>1 (grab)</u> Collection Date/Time: <u>01-26-94/1015</u> Collected By: <u>David F. Elzhang</u> Shipped Via: <u>Field Eng. Truck</u> Rcvd. By: <u>CEK</u> Comments: <u>4 samples were affecting inside down side of container, color and turbidity seals</u> Rcvd. Date/Time: <u>01-26-94/2137</u> Arrival Temp: <u>0.4 °C</u> Date Discarded: _____

TOXICITY TESTING LABORATORY SAMPLE LOG

10

PAF-SHA 2-B

Log No. 0073 Sample ID: PAF-SHA 2-B Composite Type: Composite No. Containers: 1 (1 gal) Collection Date/Time: 01-26-94/1100
 Collected By: David Fitzhugh Shipped Via: Fed Ex Truck to MS Rcvd. By: CEL Comments: cooler had unbroken seals
 Rcvd. Date/Time: 01-26-94/2135 Arrival Temp: 0.2°C Date Discarded: some ice in sample

PAF-SHA 3-A (Upstream)

Log No. 0074 Sample ID: PAF-Raw Water Below Dam Type: grab No. Containers: 1 (1 gal) Collection Date/Time: 01-26-94/1100
 Collected By: David Fitzhugh Shipped Via: Fed Ex Truck to MS Rcvd. By: C. Russell Comments: cooler had unbroken seals
 Rcvd. Date/Time: 01-26-94/2135 Arrival Temp: 0.3°C Date Discarded:

PAF-SHA 1-C

Log No. 0075 Sample ID: PAF-Raw Water Intake Type: Composite No. Containers: 1 (1 gal) Collection Date/Time: 01-27-94/1100
 Collected By: David Thomas Shipped Via: Federal Express Rcvd. By: C. Russell Comments: no seals on cooler or sample
 Rcvd. Date/Time: 01-28-94/1000 Arrival Temp: 0.2°C Date Discarded:

PAF-SHA 2-C DSNOL

Log No. 0076 Sample ID: PAF-Duck Lake Creek Type: Composite No. Containers: 1 (2 1/2 gal) Collection Date/Time: 01-27-94/1100
 Collected By: David Thomas Shipped Via: Federal Express Rcvd. By: C. Russell Comments: no seals on cooler or sample
 Rcvd. Date/Time: 01-28-94/1000 Arrival Temp: 0.3°C Date Discarded:

PAF-SHA 3-B Upstream

Log No. 0077 Sample ID: PAF-Raw Water Below Dam Type: Grab No. Containers: 1 (1 gal) Collection Date/Time: 01-27-94/1030
 Collected By: David Thomas Shipped Via: Federal Express Rcvd. By: C. Russell Comments: no seals on cooler or sample
 Rcvd. Date/Time: 01-28-94/1000 Arrival Temp: 0.3°C Date Discarded:

Log No. 0078 Sample ID: CRM 9.0 (CLEAR 10900) Type: Water (grab) No. Containers: 1 (1 gal) Collection Date/Time: 1-28-94/1215
 Collected By: J. Stockburger Shipped Via: TVA Mail Rcvd. By: D. Henry Comments: Security seals on each cooler intact
 Rcvd. Date/Time: 1-29-94/0630 Arrival Temp: 0.8°C Date Discarded: 2-3-94

Log No. 0079 Sample ID: CRM 1.0 (CLEAR 10896) Type: Water (grab) No. Containers: 1 (1 gal) Collection Date/Time: 1-28-94/1200
 Collected By: J. Stockburger Shipped Via: TVA Mail Rcvd. By: D. Henry Comments: security seals on cooler intact
 Rcvd. Date/Time: 1-29-94/0630 Arrival Temp: 0.2°C Date Discarded: 2-3-94

Log No. 0080 Sample ID: CRM 2.9 (CLEAR 10898) Type: Water (grab) No. Containers: 1 (1 gal) Collection Date/Time: 1-28-94/1130
 Collected By: J. Stockburger Shipped Via: TVA Mail Rcvd. By: D. Henry Comments: security seals on cooler intact
 Rcvd. Date/Time: 1-29-94/0630 Arrival Temp: 4.6°C Date Discarded: 2-3-94



USE THIS AIRBILL FOR SHIPMENTS.
USE THE INTERNATIONAL AIR WAYBILL
QUESTIONS? CALL 800-300-3000

U.S. LOCATIONS

AIRBILL
PACKAGE
TRACKING NUMBER

0791840873

0791840873

RECIPIENT'S COPY

Date 1-24-94		To (Recipient's Name) Please Print TVA AQUATIC RES. LAB-BIRMINGHAM		Recipient's Phone Number (Very Important)	
From (Your Name) Please Print JAMES S. BUCKNER, INC. SERV.		Company TVA		Department/Floor No.	
Street Address 4200 GARDENWAY DRIVE		City KNOXVILLE		State TN	
ZIP Required 37902		City ATTENS		State ALABAMA	
ZIP Required 35611		Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Codes.) Browns Ferry Rd		Department/Floor No.	
YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)					
IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here					
City State ZIP Required					
Emp. No. Date					
Base Charges					
Declared Value Charge					
Other 1					
Other 2					
Total Charges 207.00					
REVISION DATE 12/92 PART #157205 GBFE FORMAT #158					
158					
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PAYMENT 1 ☐ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No.		Bill Credit Card	
5 ☐ Cash 6 ☐ Check			
SERVICES (Check only one box)			
Standard Overnight (Delivery by next business morning)			
11 ☐ OTHER 12 ☐ FEDEX PAK 13 ☐ FEDEX BOX 14 ☐ FEDEX TUBE			
Economy Two-Day (Delivery by second business day)			
30 ☐ ECONOMY 31 ☐ FEDEX PAK 32 ☐ FEDEX BOX 33 ☐ FEDEX TUBE			
Government Overnight (Delivery by next business day)			
40 ☐ GOVT 41 ☐ GOVT PACKAGE			
Freight Service (For packages over 150 lbs.)			
70 ☐ OVERNIGHT 80 ☐ TWO-DAY 90 ☐ FREIGHT			
100 ☐ FREIGHT			
12 ☐ HOLIDAY DELIVERY (If offered)			
DIM SHIPMENT (Check one Weight)			
L X W H			
1 ☐ Regular Stop 2 ☐ On-Call Stop 3 ☐ Drop Box 4 ☐ B.S.S.			
5 ☐ On-Call Stop 6 ☐ B.S.S.			

YOUR DECLARED VALUE (per right)		WEIGHT In Pounds Only		PACKAGES	
1 72		1 41		1 1	
Total 211.3		Total 11.3		Total 1	

FEBRUARY 1994

DAILY RECORD OF EVENTS

WEDNESDAY

2

J. Stodolny -

Shingles taken in all channel
rain on Wednesday
creek rising
Friday heavy flow of debris

Cubitrainer filled in boat and lifted
into cooler. However cubitrainers are
covered with overflow water and
this water is running off when
cubitrainer is picked up. May have
"disguised" the water from the
leaking cubitrainer.

ATTACHMENT III

**CR-ERP AMBIENT WATER TOXICITY STUDY
Meter Calibration - Copies of Logbook Pages**

DO-METER STANDARDIZATION

27

METER ID: 2

DATE: 1/18/93 TIME: 0655 BY: TS
 INITIAL READING: 9.4
 WATER TEMP: 17.3
 WINKLER #1: 9.5 #2: 9.4
 X: 9.45
 CORRECTED READING: 9.4

DATE: 1/18/94 TIME: 1150 BY: TS
 INITIAL READING: 14.0 9.4
 WATER TEMP: 18.0
 WINKLER #1: 9.4 #2: 9.5
 X: 9.45
 CORRECTED READING: 9.4

NOTES: _____

DATE: 1/19/94 TIME: 0835 BY: TS
 INITIAL READING: 9.4
 WATER TEMP: 17.5
 WINKLER #1: 9.3 #2: 9.4
 X: 9.35
 CORRECTED READING: 9.4

DATE: _____ TIME: _____ BY: _____
 INITIAL READING: _____
 WATER TEMP: _____
 WINKLER #1: _____ #2: _____
 X: _____
 CORRECTED READING: _____

NOTES: used within 1 hr of standardization

DATE: 1/25/94 TIME: 0800 BY: TS
 INITIAL READING: 8.5
 WATER TEMP: 20.8°C
 WINKLER #1: 8.5 #2: 8.4
 X: 8.45
 CORRECTED READING: 8.5

DATE: 1-25-94 TIME: 1:32 BY: DT
 INITIAL READING: 8.2
 WATER TEMP: 21.6
 WINKLER #1: 8.2 #2: 8.3
 X: 8.25
 CORRECTED READING: 8.2

NOTES: _____

DATE: 1-26-94 TIME: 7:07 BY: DT
 INITIAL READING: 8.1
 WATER TEMP: 21.0°C
 WINKLER #1: 8.1 #2: 8.1
 X: 8.1
 CORRECTED READING: 8.1

DATE: 01-26-94 TIME: 1335 BY: _____
 INITIAL READING: 8.1
 WATER TEMP: 20.9°C
 WINKLER #1: 8.1 #2: 8.2
 X: 8.15
 CORRECTED READING: 8.1

NOTES: _____

DATE: 1-27-94 TIME: 8:54 BY: DT
 INITIAL READING: 9.1
 WATER TEMP: 20.8
 WINKLER #1: 9.1 #2: 9.1
 X: 9.1
 CORRECTED READING: 9.1

DATE: 1/27/94 TIME: 1400 BY: TS
 INITIAL READING: 8.9
 WATER TEMP: 21.3
 WINKLER #1: 8.9 #2: 9.0
 X: 8.95
 CORRECTED READING: 8.9

NOTES: _____

DO METER STANDARDIZATION

28

METER ID: 2

DATE: 1-28-94 TIME: 7:18 BY: DH
INITIAL READING: 8.6
WATER TEMP: 20.3
WINKLER #1: 8.6 #2: 8.6
X: 8.6
CORRECTED READING: 8.6

NOTES: _____

DATE: 01-28-94 TIME: 1425 BY: Cue
INITIAL READING: 8.5
WATER TEMP: 21.1 °C
WINKLER #1: 8.5 #2: 8.6
X: 8.55
CORRECTED READING: 8.5

DATE: 1-29-94 TIME: 8:07 BY: DH
INITIAL READING: 8.4
WATER TEMP: 19.4
WINKLER #1: 8.3 #2: 8.3
X: 8.3
CORRECTED READING: 8.3

NOTES: _____

DATE: 01-29-94 TIME: 1655 BY: Cue
INITIAL READING: 8.3
WATER TEMP: 20.2 °C
WINKLER #1: 8.3 #2: 8.3
X: 8.3
CORRECTED READING: 8.3

DATE: 1-30-94 TIME: 8:07 BY: DH
INITIAL READING: 9.1
WATER TEMP: 18.9
WINKLER #1: 9.1 #2: 9.1
X: 9.1
CORRECTED READING: 9.1

NOTES: _____

DATE: 1-30-94 TIME: 1250 BY: AS
INITIAL READING: 9.1
WATER TEMP: 19.2
WINKLER #1: 9.2 #2: 9.1
X: 9.15
CORRECTED READING: 9.1

DATE: 1-31-94 TIME: 7:15 BY: ON
INITIAL READING: 9.0
WATER TEMP: 18.8
WINKLER #1: 8.9 #2: 8.9
X: 8.9
CORRECTED READING: 8.9

NOTES: _____

DATE: 01-31-94 TIME: 1355 BY: Cue
INITIAL READING: 8.9
WATER TEMP: 19.4 °C
WINKLER #1: 9.0 #2: 8.9
X: 8.95
CORRECTED READING: 8.9

DATE: 2-1-94 TIME: 7:56 BY: DH
INITIAL READING: 8.9
WATER TEMP: 18.6
WINKLER #1: 8.9 #2: 8.9
X: 8.9
CORRECTED READING: 8.9

NOTES: _____

DATE: 2-1-94 TIME: 1400 BY: JHP
INITIAL READING: 9.0
WATER TEMP: 19.1 °C
WINKLER #1: 8.8 #2: 9.0
X: 8.9
CORRECTED READING: -

PH METER STANDARDIZATION

22

METER ID: #3

DATE: <u>1/13/94</u> TIME: <u>1300</u> BY: <u>TS</u>	DATE: <u>1/14/94</u> TIME: <u>01020</u> BY: <u>MLB</u>
Buffer Temp: <u>21.4</u>	Buffer Temp: <u>20.2 - leaked to 25</u>
pH 7.0 BUFFER Initial Reading: <u>7.0</u>	pH 7.0 BUFFER Initial Reading: <u>7.6.95</u>
Corrected Reading: <u>7.0</u>	Corrected Reading: <u>7.00</u>
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>	pH 4.0/10.0 BUFFER Initial Reading: <u>4.00</u>
Corrected Reading: <u>4.0</u>	Corrected Reading: <u>4.00</u>
% Slope: <u>99%</u>	% Slope: <u>99%</u>
ADDITIONAL Reading -15 Sec: <u>7.4</u>	ADDITIONAL Reading -15 Sec: <u>8.00</u>
STANDARD Reading - 1 Min: <u>7.45</u>	STANDARD Reading - 1 Min: <u>8.05</u>
NOTES: <u>used within one hr. of calibration</u>	

DATE: <u>1/14/94</u> TIME: <u>1410</u> BY: <u>TS</u>	DATE: <u>1/15/94</u> TIME: <u>0855</u> BY: <u>TS</u>
Buffer Temp: <u>19.5</u>	Buffer Temp: <u>7.0 15.6</u>
pH 7.0 BUFFER Initial Reading: <u>7.0</u>	pH 7.0 BUFFER Initial Reading: <u>7.0</u>
Corrected Reading: <u>7.0</u>	Corrected Reading: <u>4.05 7.0</u>
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>	pH 4.0/10.0 BUFFER Initial Reading: <u>4.05</u>
Corrected Reading: <u>4.0</u>	Corrected Reading: <u>4.0</u>
% Slope: <u>99%</u>	% Slope: <u>99%</u>
ADDITIONAL Reading -15 Sec: <u>7.45</u>	ADDITIONAL Reading -15 Sec: <u>7.45</u>
STANDARD Reading - 1 Min: <u>7.55</u>	STANDARD Reading - 1 Min: <u>7.55</u>
NOTES: <u>used within one hr. of calib.</u>	

DATE: <u>1/16/94</u> TIME: <u>0855</u> BY: <u>TS</u>	DATE: <u>1/17</u> TIME: <u>0910</u> BY: <u>TS</u>
Buffer Temp: <u>19.3</u>	Buffer Temp: <u>20.8</u>
pH 7.0 BUFFER Initial Reading: <u>7.1</u>	pH 7.0 BUFFER Initial Reading: <u>7.0</u>
Corrected Reading: <u>7.0</u>	Corrected Reading: <u>7.0</u>
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>	pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>
Corrected Reading: <u>4.0</u>	Corrected Reading: <u>4.0</u>
% Slope: <u>99%</u>	% Slope: <u>98.5</u>
ADDITIONAL Reading -15 Sec: <u>8.20</u>	ADDITIONAL Reading -15 Sec: <u>7.55</u>
STANDARD Reading - 1 Min: <u>8.25</u>	STANDARD Reading - 1 Min: <u>7.55</u>
NOTES: <u>used within one hr. of calib.</u>	

DATE: <u>1/18</u> TIME: <u>0940</u> BY: <u>TS</u>	DATE: <u>1-25-94</u> TIME: <u>1003</u> BY: <u>DM</u>
Buffer Temp: <u>16.4</u>	Buffer Temp: <u>23.0</u>
pH 7.0 BUFFER Initial Reading: <u>7.0</u>	pH 7.0 BUFFER Initial Reading: <u>7.0</u>
Corrected Reading: <u>7.0</u>	Corrected Reading: <u>7.0</u>
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>	pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>
Corrected Reading: <u>4.0</u>	Corrected Reading: <u>4.0</u>
% Slope: <u>100%</u>	% Slope: <u>98.5%</u>
ADDITIONAL Reading -15 Sec: <u>7.45</u>	ADDITIONAL Reading -15 Sec: <u>7.7</u>
STANDARD Reading - 1 Min: <u>7.45</u>	STANDARD Reading - 1 Min: <u>7.7</u>
NOTES: <u>used within one hr. of calib.</u>	

DATE: <u>01-26-94</u> TIME: <u>1250</u> BY: <u>GKK</u>	DATE: <u>1-27-94</u> TIME: <u>1320</u> BY: <u>aps</u>
Buffer Temp: <u>21.9</u>	Buffer Temp: <u>21.0</u>
pH 7.0 BUFFER Initial Reading: <u>7.0</u>	pH 7.0 BUFFER Initial Reading: <u>7.0</u>
Corrected Reading: <u>7.0</u>	Corrected Reading: <u>7.0</u>
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>	pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>
Corrected Reading: <u>4.0</u>	Corrected Reading: <u>4.0</u>
% Slope: <u>99%</u>	% Slope: <u>99.5%</u>
ADDITIONAL Reading -15 Sec: <u>7.2</u>	ADDITIONAL Reading -15 Sec: <u>7.6</u>
STANDARD Reading - 1 Min: <u>7.4</u>	STANDARD Reading - 1 Min: <u>7.7</u>
NOTES: <u>used within one hour of Standardization</u>	

PH. METER STANDARDIZATION

23

METER ID: #3

DATE: <u>01-27-94</u>	TIME: <u>1435</u>	BY: <u>GKK</u>	DATE: <u>1-28-94</u>	TIME: <u>12:14</u>	BY: <u>D.6</u>
Buffer Temp: <u>81.1°C</u>			Buffer Temp: <u>72.0°C</u>		
pH 7.0 BUFFER Initial Reading: <u>7.2</u>			pH 7.0 BUFFER Initial Reading: <u>7.0</u>		
Corrected Reading: <u>7.0</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>			pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>		
Corrected Reading: <u>4.0</u>			Corrected Reading: <u>4.0</u>		
% Slope: <u>99.5%</u>			% Slope: <u>99.5%</u>		
ADDITIONAL Reading -15 Sec: <u>7.6</u>			ADDITIONAL Reading -15 Sec: <u>7.6</u>		
STANDARD Reading - 1 Min: <u>7.7</u>			STANDARD Reading - 1 Min: <u>7.6</u>		

NOTES:

DATE: <u>01-28-94</u>	TIME: <u>1430</u>	BY: <u>GKK</u>	DATE: <u>1-29-94</u>	TIME: <u>1045</u>	BY: <u>WJS</u>
Buffer Temp: <u>21.7°C</u>			Buffer Temp: <u>19.8°C</u>		
pH 7.0 BUFFER Initial Reading: <u>7.0</u>			pH 7.0 BUFFER Initial Reading: <u>7.0</u>		
Corrected Reading: <u>7.0</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>			pH 4.0/10.0 BUFFER Initial Reading: <u>4.1</u>		
Corrected Reading: <u>4.0</u>			Corrected Reading: <u>4.0</u>		
% Slope: <u>99.5%</u>			% Slope: <u>98%</u>		
ADDITIONAL Reading -15 Sec: <u>7.5</u>			ADDITIONAL Reading -15 Sec: <u>7.6</u>		
STANDARD Reading - 1 Min: <u>7.6</u>			STANDARD Reading - 1 Min: <u>7.6</u>		

NOTES:

DATE: <u>1-29-94</u>	TIME: <u>1640</u>	BY: <u>GKK</u>	DATE: <u>1-30-94</u>	TIME: <u>1035</u>	BY: <u>GKK</u>
Buffer Temp: <u>21.2°C</u>			Buffer Temp: <u>18.2°C</u>		
pH 7.0 BUFFER Initial Reading: <u>7.0</u>			pH 7.0 BUFFER Initial Reading: <u>7.0</u>		
Corrected Reading: <u>7.0</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>			pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>		
Corrected Reading: <u>4.0</u>			Corrected Reading: <u>4.0</u>		
% Slope: <u>98.5%</u>			% Slope: <u>98.5%</u>		
ADDITIONAL Reading -15 Sec: <u>7.3</u>			ADDITIONAL Reading -15 Sec: <u>7.1</u>		
STANDARD Reading - 1 Min: <u>7.4</u>			STANDARD Reading - 1 Min: <u>7.3</u>		

NOTES:

Used within 1 hr. of Standardization

DATE: <u>1-31-94</u>	TIME: <u>1310</u>	BY: <u>G</u>	DATE: <u>2-01-94</u>	TIME: <u>1250</u>	BY: <u>GKK</u>
Buffer Temp: <u>19.5°C</u>			Buffer Temp: <u>19.7</u>		
pH 7.0 BUFFER Initial Reading: <u>7.0</u>			pH 7.0 BUFFER Initial Reading: <u>7.0</u>		
Corrected Reading: <u>7.0</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>			pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>		
Corrected Reading: <u>4.0</u>			Corrected Reading: <u>4.0</u>		
% Slope: <u>99%</u>			% Slope: <u>99%</u>		
ADDITIONAL Reading -15 Sec: <u>7.2</u>			ADDITIONAL Reading -15 Sec: <u>7.2</u>		
STANDARD Reading - 1 Min: <u>7.3</u>			STANDARD Reading - 1 Min: <u>7.3</u>		

NOTES:

*Used within 1 hr.**cleaned probe 02-01-94 and used within 1 hr. of std.*

DATE: <u>2-2-94</u>	TIME: <u>12:09</u>	BY: <u>OH</u>	DATE: <u>2-2-94</u>	TIME: <u>1430</u>	BY: <u>JPP</u>
Buffer Temp: <u>20.5</u>			Buffer Temp: <u>22.8°C</u>		
pH 7.0 BUFFER Initial Reading: <u>7.0</u>			pH 7.0 BUFFER Initial Reading: <u>6.9</u>		
Corrected Reading: <u>7.0</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>			pH 4.0/10.0 BUFFER Initial Reading: <u>4.0</u>		
Corrected Reading: <u>4.0</u>			Corrected Reading: <u>4.0</u>		
% Slope: <u>99</u>			% Slope: <u>98.0%</u>		
ADDITIONAL Reading -15 Sec: <u>7.4</u>			ADDITIONAL Reading -15 Sec: <u>7.4</u>		
STANDARD Reading - 1 Min: <u>7.45</u>			STANDARD Reading - 1 Min: <u>7.5</u>		

NOTES:

used within 1 hr. of calib.

pH METER STANDARDIZATION

METER ID: #6

DATE: <u>1-24-94</u>	TIME: <u>1205</u>	BY: <u>MJA</u>	DATE: <u>1-25-94</u>	TIME: <u>0815</u>	BY: <u>MS</u>
Buffer Temp: <u>21.4</u>			Buffer Temp: <u>20.6</u>		
pH 7.0 BUFFER Initial Reading: <u>7.08</u>			pH 7.0 BUFFER Initial Reading: <u>6.99</u>		
Corrected Reading: <u>7.00</u>			Corrected Reading: <u>7.00</u>		
pH 4.0/10.0 Initial Reading: <u>9.98</u>			pH 4.0/10.0 Initial Reading: <u>10.00</u>		
BUFFER Corrected Reading: <u>10.00</u>			BUFFER Corrected Reading: <u>10.00</u>		
% Slope: <u>99.4</u>			% Slope: <u>99.6%</u>		
ADDITIONAL Reading -15 Sec: <u>7.92</u>			ADDITIONAL Reading -15 Sec: <u>7.97</u>		
STANDARD Reading - 1 Min: <u>8.00</u>			STANDARD Reading - 1 Min: <u>7.97</u>		
NOTES:					

DATE: <u>1-25-94</u>	TIME: <u>1219</u>	BY: <u>MAB</u>	DATE: <u>1-26-94</u>	TIME: <u>7:29</u>	BY: <u>DH</u>
Buffer Temp: <u>21.5</u>			Buffer Temp: <u>21.6</u>		
pH 7.0 BUFFER Initial Reading: <u>7.01</u>			pH 7.0 BUFFER Initial Reading: <u>7.0</u>		
Corrected Reading: <u>7.00</u>			Corrected Reading: <u>7.0</u>		
pH 4.0/10.0 Initial Reading: <u>9.99</u>			pH 4.0/10.0 Initial Reading: <u>10.01</u>		
BUFFER Corrected Reading: <u>10.00</u>			BUFFER Corrected Reading: <u>10.00</u>		
% Slope: <u>99.4</u>			% Slope: <u>99.3</u>		
ADDITIONAL Reading -15 Sec: <u>8.18</u>			ADDITIONAL Reading -15 Sec: <u>7.72</u>		
STANDARD Reading - 1 Min: <u></u>			STANDARD Reading - 1 Min: <u>7.74</u>		
NOTES:					

DATE: <u>1-26-94</u>	TIME: <u>1150</u>	BY: <u>MAB</u>	DATE: <u>1-27-94</u>	TIME: <u>9:04</u>	BY: <u>JA</u>
Buffer Temp: <u>18.8</u>			Buffer Temp: <u>20.1</u>		
pH 7.0 BUFFER Initial Reading: <u>6.99</u>			pH 7.0 BUFFER Initial Reading: <u>6.98</u>		
Corrected Reading: <u>7.00</u>			Corrected Reading: <u>7.00</u>		
pH 4.0/10.0 Initial Reading: <u>10.00</u>			pH 4.0/10.0 Initial Reading: <u>9.98</u>		
BUFFER Corrected Reading: <u>10.00</u>			BUFFER Corrected Reading: <u>10.00</u>		
% Slope: <u>99.5%</u>			% Slope: <u>99.5%</u>		
ADDITIONAL Reading -15 Sec: <u>8.37</u>			ADDITIONAL Reading -15 Sec: <u>7.68</u>		
STANDARD Reading - 1 Min: <u>8.36</u>			STANDARD Reading - 1 Min: <u>7.68</u>		
NOTES:					

DATE: <u>1-27-94</u>	TIME: <u>1210</u>	BY: <u>JPP</u>	DATE: <u>01-27-94</u>	TIME: <u>1420</u>	BY: <u>CK</u>
Buffer Temp: <u>20.70C</u>			Buffer Temp: <u>21.3C</u>		
pH 7.0 BUFFER Initial Reading: <u>7.01</u>			pH 7.0 BUFFER Initial Reading: <u>7.00</u>		
Corrected Reading: <u>7.00</u>			Corrected Reading: <u>7.00</u>		
pH 4.0/10.0 Initial Reading: <u>10.00</u>			pH 4.0/10.0 Initial Reading: <u>10.00</u>		
BUFFER Corrected Reading: <u>10.00</u>			BUFFER Corrected Reading: <u>10.00</u>		
% Slope: <u>99.5%</u>			% Slope: <u>99.6%</u>		
ADDITIONAL Reading -15 Sec: <u>7.66</u>			ADDITIONAL Reading -15 Sec: <u>7.60</u>		
STANDARD Reading - 1 Min: <u>7.68</u>			STANDARD Reading - 1 Min: <u>7.63</u>		
NOTES:					

DATE: <u>1-28-94</u>	TIME: <u>7:07</u>	BY: <u>DH</u>	DATE: <u>1-28-94</u>	TIME: <u>1245</u>	BY: <u>MS</u>
Buffer Temp: <u>19.5</u>			Buffer Temp: <u>22.0C</u>		
pH 7.0 BUFFER Initial Reading: <u>6.98</u>			pH 7.0 BUFFER Initial Reading: <u>7.00</u>		
Corrected Reading: <u>7.00</u>			Corrected Reading: <u>7.00</u>		
pH 4.0/10.0 Initial Reading: <u>10.01</u>			pH 4.0/10.0 Initial Reading: <u>9.98</u>		
BUFFER Corrected Reading: <u>10.00</u>			BUFFER Corrected Reading: <u>10.00</u>		
% Slope: <u>100.3</u>			% Slope: <u>99.6%</u>		
ADDITIONAL Reading -15 Sec: <u>7.65</u>			ADDITIONAL Reading -15 Sec: <u>7.67</u>		
STANDARD Reading - 1 Min: <u>7.69</u>			STANDARD Reading - 1 Min: <u>7.68</u>		
NOTES:					

pH METER STANDARDIZATION

63

METER ID: 6

DATE: <u>1-29-94</u> TIME: <u>8:30</u> BY: <u>DA</u> Buffer Temp: <u>18.0</u> pH 7.0 BUFFER Initial Reading: <u>7.00</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>9.97</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.530</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.59</u> Reading - 1 Min: <u>7.58</u> NOTES:	DATE: <u>01-29-94</u> TIME: <u>1647</u> BY: <u>CNK</u> Buffer Temp: <u>20.0°C</u> pH 7.0 BUFFER Initial Reading: <u>7.01</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>9.98</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.0%</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.39</u> Reading - 1 Min: <u>7.49</u> NOTES: <u>cleaned probe 01-29-94 CNK</u>
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DATE: <u>1-30-94</u> TIME: <u>8:34</u> BY: <u>DA</u> Buffer Temp: <u>16.5</u> pH 7.0 BUFFER Initial Reading: <u>7.05</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.01</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.8</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.54</u> Reading - 1 Min: <u>7.55</u> NOTES:	DATE: <u>1-30-94</u> TIME: <u>1245</u> BY: <u>DA</u> Buffer Temp: <u>19.6</u> pH 7.0 BUFFER Initial Reading: <u>6.99</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>9.99</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.8</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.43</u> Reading - 1 Min: <u>7.46</u> NOTES:
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DATE: <u>1-31-94</u> TIME: <u>7:43</u> BY: <u>DA</u> Buffer Temp: <u>17.8</u> pH 7.0 BUFFER Initial Reading: <u>6.98</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.00</u> Corrected Reading: <u>10.00</u> % Slope: <u>101.2</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.46</u> Reading - 1 Min: <u>7.49</u> NOTES:	DATE: <u>1-31-94</u> TIME: <u>1210</u> BY: <u>DA</u> Buffer Temp: <u>17.0</u> pH 7.0 BUFFER Initial Reading: <u>7.02</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>9.98</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.7</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.65</u> Reading - 1 Min: <u>7.68</u> NOTES:
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DATE: <u>01-31-94</u> TIME: <u>1350</u> BY: <u>CNK</u> Buffer Temp: <u>16.0°C</u> pH 7.0 BUFFER Initial Reading: <u>6.99</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.00</u> Corrected Reading: <u>10.00</u> % Slope: <u>100.9%</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.33</u> Reading - 1 Min: <u>7.37</u> NOTES:	DATE: <u>2-1-94</u> TIME: <u>8:48</u> BY: <u>DA</u> Buffer Temp: <u>19.0</u> pH 7.0 BUFFER Initial Reading: <u>6.98</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.01</u> Corrected Reading: <u>10.00</u> % Slope: <u>101.150</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.38</u> Reading - 1 Min: <u>7.40</u> NOTES:
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DATE: <u>2-1-94</u> TIME: <u>1240</u> BY: <u>DA</u> Buffer Temp: <u>16.5</u> pH 7.0 BUFFER Initial Reading: <u>7.03</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.00</u> Corrected Reading: <u>10.00</u> % Slope: <u>101.4</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.53</u> Reading - 1 Min: <u>7.52</u> NOTES: <u>cleaned probe 02-01-94 CNK</u>	DATE: <u>2-2-93</u> TIME: <u>0730</u> BY: <u>GKK</u> Buffer Temp: <u>15.0</u> pH 7.0 BUFFER Initial Reading: <u>7.07</u> Corrected Reading: <u>7.00</u> pH 4.0/10.0 BUFFER Initial Reading: <u>10.01</u> Corrected Reading: <u>10.00</u> % Slope: <u>102.1</u> ADDITIONAL STANDARD Reading -15 Sec: <u>7.38</u> Reading - 1 Min: <u>7.43</u> NOTES:
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CONDUCTIVITY METER STANDARDIZATION

35

METER ID: A3

DATE: 1/19/94 TIME: 0840 BY: TS DATE: 1/25/94 TIME: 0813 BY: WJS

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 17.8
METER READING 199
720 μ Mho STD. TEMP 17.6
METER READING 712

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 21.7
METER READING 199
720 μ Mho STD. TEMP 21.8
METER READING 716

NOTES: Low wetting of standardization

DATE: 1/25/94 TIME: 1320 BY: TS DATE: 1-26-94 TIME: 7:35 BY: DN

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 23.3
METER READING 200
720 μ Mho STD. TEMP 23.1
METER READING 716

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 21.8
METER READING 198
720 μ Mho STD. TEMP 21.6
METER READING 714

NOTES: _____

DATE: 01-26-94 TIME: 1330 BY: Cue DATE: 1-27-94 TIME: 9:02 BY: DN

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 21.7°C
METER READING 198.2
720 μ Mho STD. TEMP 21.7°C
METER READING 711 mhos

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 21.1
METER READING 196
720 μ Mho STD. TEMP 20.9
METER READING 705

NOTES: _____

DATE: 1-27-94 TIME: 1210 BY: JPP DATE: 1-29-94 TIME: 7:07 BY: DN

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 22.2°C
METER READING 198
720 μ Mho STD. TEMP 22.1°C
METER READING 708

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 20.1
METER READING 199
720 μ Mho STD. TEMP 20.3
METER READING 715

NOTES: _____

DATE: 01-28-94 TIME: 1435 BY: Cue DATE: 1-29-94 TIME: 8:35 BY: DN

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 21.1°C
METER READING 200 mhos
720 μ Mho STD. TEMP 21.1°C
METER READING 718 mhos

75 μ Mho STD. TEMP _____
METER READING _____
200 μ Mho STD. TEMP 19.5
METER READING 197
720 μ Mho STD. TEMP 19.4
METER READING 715

NOTES: _____

ATTACHMENT IV

**CR-ERP AMBIENT WATER TOXICITY STUDY
Reference Toxicant Test Information**

Fathead Minnow IC25- Control Chart For Chronic Test

For TTL

Test#	Source	Date	IC25	Mean	S	2S	Mean-2s	Mean+2S	Corrective Action Taken and Notes
27	TTL	01/09 1992	0.0109						
28	TTL	01/29 1992	0.0089	0.0099	0.001414	0.0028	0.0071	0.0127	
29	TTL	02/27 1992	0.0067	0.0088	0.002101	0.0042	0.0046	0.0130	
30	TTL	04/06 1992	0.0059	0.0081	0.002257	0.0045	0.0036	0.0126	
31	TTL	04/30 1992	0.0085	0.0082	0.001963	0.0039	0.0043	0.0121	
32	TTL	05/27 1992	0.0100	0.0085	0.001906	0.0038	0.0047	0.0123	
33	TTL	07/07 1992	0.0059	0.0081	0.001995	0.0040	0.0041	0.0121	
34	TTL	07/28 1992	0.0078	0.0081	0.001851	0.0037	0.0044	0.0118	
35	TTL	08/27 1992	0.0061	0.0079	0.001852	0.0037	0.0042	0.0116	
36	TTL	09/29 1992	0.0061	0.0077	0.001832	0.0037	0.0040	0.0113	09-29-92 started using
37	TTL	10/27 1992	0.006	0.0075	0.001811	0.0036	0.0039	0.0111	<24 hrs old fish
38	TTL	12/01 1992	0.0068	0.0075	0.001739	0.0035	0.0040	0.0109	
39	TTL	01/05 1993	0.0056	0.0073	0.001744	0.0035	0.0038	0.0108	
40	TTL	01/26 1993	0.0039	0.0071	0.001909	0.0038	0.0033	0.0109	
41	TTL	02/24 1993	0.0052	0.0070	0.001902	0.0038	0.0031	0.0108	
42	TTL	03/23 1993	0.0056	0.0069	0.001869	0.0037	0.0031	0.0106	
43	TTL	04/26 1993	0.0055	0.0068	0.001839	0.0037	0.0031	0.0105	
44	TTL	06/01 1993	0.0074	0.0068	0.001790	0.0036	0.0032	0.0104	
45	TTL	07/06 1993	0.0119	0.0071	0.002094	0.0042	0.0029	0.0113	fish age 24hrs & 53mins
46	TTL	08/04 1993	0.0054	0.0070	0.002073	0.0041	0.0029	0.0112	
47	TTL	09/08 1993	0.0057	0.0069	0.002040	0.0041	0.0029	0.0110	
48	TTL	09/30 1993	0.006	0.0069	0.002001	0.0040	0.0029	0.0109	
49	TTL	10/28 1993	0.0049	0.0068	0.001999	0.0040	0.0028	0.0108	
50	TTL	12/02 1993	0.0085	0.0069	0.001985	0.0040	0.0029	0.0109	
51	TTL	01/05 1994	0.0077	0.0069	0.001950	0.0039	0.0030	0.0108	
52	TTL	02/03 1994 ⁴ Cal 02-28-94	0.0067	0.0069	0.001911	0.0038	0.0031	0.0107	

Chronic Reference Toxicant Test

Fathead Minnows TTL

Test #	Date	Survival		Growth		IC25	Mean Dry		Corrective Action Taken
		LOEC	NOEC	LOEC	NOEC		Weight for	Control (mg)	
1	01/18/90	0.05	0.02	<0.008	0.008	1	1	1	
2	02/08/90	0.02	0.008	<0.008	0.008	1	1	1	
3	02/21/90	0.125	0.05	0.02	0.008	1	1	1	
4	03/07/90	0.05	0.02	0.008	0.003	1	1	1	
5	03/28/90	0.05	0.02	0.008	0.003	1	1	1	
6	04/23/90	0.05	0.02	0.02	0.008	1	1	1	
7	05/10/90	0.05	0.02	0.02	0.008	1	1	1	
8	06/06/90	0.05	0.02	0.02	0.008	1	1	1	
9	07/09/90	0.05	0.02	0.02	0.008	1	1	1	
10	08/02/90	0.05	0.02	0.008	0.003	1	1	1	
11	09/06/90	0.05	0.02	0.02	0.008	1	1	1	
12	10/10/90	0.05	0.02	0.008	0.003	1	1	1	
13	10/31/90	0.02	0.008	0.008	0.003	1	1	1	
14	11/27/90	0.05	0.02	0.02	0.008	1	1	1	
15	01/03/91	0.05	0.02	0.008	0.003	1	1	1	
16	02/06/91	0.125	0.05	0.02	0.008	1	1	1	
17	02/28/91	0.05	0.02	0.008	0.003	1	1	1	
18	03/25/91	0.05	0.02	0.008	0.003	1	1	1	
19	05/02/91	0.02	0.008	0.008	0.003	1	1	1	
20	05/30/91	0.02	0.008	0.008	0.003	1	1	1	
21	07/12/91	0.05	0.02	0.008	0.003	1	1	1	
22	08/02/91	0.05	0.02	0.008	0.003	1	1	1	
23	09/03/91	0.05	0.02	0.008	0.003	1	1	1	
24	10/02/91	0.02	0.008	0.008	0.003	1	1	1	
25	10/30/91	<0.0	0.05	0.008	0.003	1	1	1	
26	12/02/91	0.05	0.02	0.008	0.003	1	1	1	
27	01/09/92	0.05	0.02	0.02	0.008	0.0109	0.54	1	
28	01/29/92	0.05	0.02	0.008	0.003	0.0089	0.60	1	
29	02/27/92	0.05	0.02	0.008	0.003	0.0067	0.45	1	
30	04/06/92	0.02	0.008	0.008	0.003	0.0059	0.67	1	
31	04/30/92	0.02	0.008	0.008	0.003	0.0085	0.51	1	
32	05/27/92	0.05	0.02	0.02	0.008	0.01	0.60	1	*0.003 was significant
33	07/07/92	0.02	0.008	0.008	0.003	0.0059	0.60	1	
34	07/28/92	0.05	0.02	0.008	0.003	0.0078	0.56	1	
35	08/27/92	0.02	0.008	0.008	0.003	0.0061	0.59	1	
36	09/29/92*	0.02	0.008	0.008	0.003	0.0061	0.49	1	* started using less than
37	10/27/92*	0.02	0.008	0.008	0.003	0.006	0.58	1	24hr old fish
38	12/01/92*	0.05	0.02	0.008	0.003	0.0068	0.54	1	
39	01/05/93*	0.02	0.008	0.008	0.003	0.0056	0.45	1	
40	01/26/93*	0.008	0.003	0.008	0.003	0.0039	0.32	1	
41	02/24/93*	0.02	0.008	0.008	0.003	0.0052	0.47	1	
42	03/23/93*	0.05	0.02	0.008	0.003	0.0056	0.34	1	
43	04/26/93*	0.02	0.008	0.008	0.003	0.0055	0.35	1	
44	06/01/93*	0.05	0.02	0.008	0.003	0.0074	0.47	1	
45	07/06/93**	0.05	0.02	0.02	0.008	0.0119	0.42	1	**fish were 24hrs & 53mins old
46	08/04/93*	0.02	0.008	0.008	0.003	0.0054	0.48	1	
47	09/08/93*	0.02	0.008	0.008	0.003	0.0057	0.36	1	
48	09/30/93*	0.02	0.008	0.008	0.003	0.006	0.39	1	

Chronic Reference Toxicant-Test

Fathead Minnows TTL

Test #	Date	Survival		!	Growth		!	IC25	!	Mean Dry		!	Corrective Action Taken
		LOEC	NOEC		LOEC	NOEC				Weight for	Control (mg)		
				!			!		!			!	
49	10/28/93*	0.05	0.02	!	0.008	0.003	!	0.0049	!	0.45		!	
50	12/02/93*	0.02	0.008	!	0.02	0.008	!	0.0085	!	0.37		!	
51	01/05/94*	0.02	0.008	!	0.008	0.003	!	0.0077	!	0.40		!	
52	02/03/94*	0.02	0.008	!	0.008	0.003	!	0.0067	!	0.36		!	

TTL CHRONIC TOXICITY TEST MASTER CHECKLIST

CL # 0012Study: Ref Tox - FH - Jan.Test Dates: 01-05-94 - 01-12-94

Date Issued: _____ To: _____

Report Due: _____ By: _____

1. Test organism availability: FH Minnows-T.L.* ✓ C.U.† ✓ Date 1/4/94
 Daphnids - T.L. NA C.U. — Date —

2. Sample Collection Coordination: Date NA By — With —

3. Glassware availability: T.L. TS Tech. — Date 1/4/94

4. Glassware prep. complete: Date 1/4/94 By JP

5. Data Sheet prep. complete: Date 1/4/94 By JP

6. Test organism availability verification: FH-OK? ✓ Daphnids-OK? NA

7. Culture Medium Availability: Date 1/4/94 By TS With —

8. FH Minnow acclimation:

Day 1 2

By TS TS 224 hr old

CR 01-08-94
01-08-94

9. Test Initiation: FH-Date/Time 1/5/94; 0945 Daphnid-Date/Time NA

Initial FH Sample TS

10. Daily:	Day #:	0	1	2	3	4	5	6	7
Initial Chem. - T.L.		<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>CK</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>—</u>
T.M.*		<u>JP</u>	<u>—</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>—</u>
Final Chem. - T.L.		<u>—</u>	<u>TS</u>	<u>CK</u>	<u>CK</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>
T.M.		<u>—</u>	<u>JP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>
F.H. - T.L.		<u>TS</u>	<u>TS</u>	<u>CK</u>	<u>CK</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>	<u>TS</u>
T.M.		<u>JP</u>	<u>JP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>—</u>	<u>—</u>	<u>JPP</u>
Daphnid - T.L.		<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
T.M.		<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
Log Samples - T.L.		<u>NA</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
T.M.		<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

11. Test Termination: FH-Date/Time 1/2/94; Daphnid-Date/Time NA

Clean-up, By: TS

12. Weigh Fish: Date 01-13-94 By JPP

13. Run Stats: Date 01-20-94 By CK

14. Report Prep.: Assigned To _____ Date _____ By _____

(Central Chart)

15. Report Final: Date 01-20-94 By _____ Approved: _____

*Team Leader †Culture Unit *Team Member

PLARC501-1266(1)(Rev 12/93)

Chronic Reference Toxicant Record Sheet

Study Cu Ref tox
Test Organism Fatheads
Beginning Date/Time 1/5/94; 0945
Ending Date/Time 1/12/94; 0930
Personnel Susler, Paseny

Toxicant Cu
Source EPA
Lot # 188
Concentration 50mg/ml

Stock Concentration(s) C, 0.3, 0.9, 2.4, 6.0, 15.0 mg/l Cu
Test Concentrations C, 0.001, 0.003, 0.008, 0.02, 0.05
Dilution Water F-Med # 1557

Spawn Date	Tile #	Hatch Date
<u>12/31</u>	<u>13, 21, 22, 23, 25, 26</u>	<u>1/4 AF 1045</u>
	<u>27, 28</u>	<u>BF 0650 1/5</u>

Test # 51
NOEC 0.003
LOEC 0.008

Notes:

$IC_{25} \Rightarrow 0.0077$

$\bar{x}$ dry weight for control $\Rightarrow 0.40$ mg

FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

Study Jan Ref Tox

Page 1 of 1
Personnel Silva
Posey

Beginning Date/Time 1-5-94/0945 Ending Date/Time 1/12/94; 0930
-- Number Alive --

Treatment	Rep	- Day -						
		1	2	3	4	5	6	7
<u>Control</u>	1	^{TS} 10 25.1	10	10	10	10	10	10
	2	^{TS} 10 24.10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	JPP	JPP	JPP	TS	TS	TS
<u>0.001</u>	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	JPP	JPP	JPP	TS	TS	TS
<u>0.003</u>	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS	JPP	JPP	JPP	TS	TS	TS
<u>0.008</u>	1	10	10	10	10	10	10	10
	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10
	4	10	10	10	10	10	10	10
	By:	TS/JPP	CUR	CUR	CUR	JPP	JPP	JPP
<u>0.02</u>	1	10	10	10	10	9	9	8
	2	10	10	9	9	8	8	8
	3	10	10	10	10	8	8	8
	4	10	10	9	9	9	8	8
	By:	JPP	CUR	CUR	CUR	JPP	JPP	JPP
<u>0.05</u>	1	10	9	9	7	7	6	6
	2	10	9	7	5	7	5	^{SP} 4
	3	10	9	5	7	7	^{SP} 5	5
	4	10	10	10	9	7	7	6
	By:	JPP	CUR	CUR	CUR	JPP	JPP	JPP

Notes:

* killed one

Fed- Time/By: 0955/TS 1010/CUR 1020/CUR 1045/TS 1055/TS 1105/TS 1135/TS 1155/TS

1000/TS 1020/SP 1040/SP 1055/SP 1035/TS 1055/TS
1565/CUR 1455/JPP 1515/10H 1435/CUR 1250/JPP 1530/10H 1505/TS

Dilution Water ID: 1557 1563 1565 1565 1562 1567 1569
(PLARC501-257) Reviewed By: TS CUR CUR CUR TS TS TS

CEL 01-20-94

Analysis of Survival

REPTOX #51

Starting Date: 01/05/94

Survival (%) Data

Treatment	Replicate										Mean
	1	2	3	4	5	6	7	8	9	10	
CONTROL	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
0.001	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
0.003	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
0.008	1.00	1.00	1.00	1.00	.	.	.	.	.	.	1.00
0.02	0.80	0.80	0.80	0.80	.	.	.	.	.	.	0.80
0.05	0.60	0.40	0.56	0.60	.	.	.	.	.	.	0.54

Steel's Many-One Rank Test

Treatment	No. of Replicates	Critical Rank Sum	Rank Sum*
0.001	4	10	18
0.003	4	10	18
0.008	4	10	18
0.02	4	10	10 *
0.05	4	10	10 *

* Values less than Critical Rank Sum significantly less than the control (CONTROL).

Non-parametric analysis of toxicity data

2

1:25 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS TEST=STEEL -----

OBS	TREATMENT	N CONTROL	N EFFLUENT	RANK SUM	CRITICAL RANK SUM	SIGNIFICANT DIFFERENCE
1	0.001	4	4	18	10	
2	0.003	4	4	18	10	
3	0.008	4	4	18	10	
4	0.02	4	4	10	10	*
5	0.05	4	4	10	10	*

Non-parametric analysis of toxicity data

1

1:25 Sunday, January 5, 1992

		S																	S
		T																	U
	S																		M
	T	D	P	C	Y	R	C	M	C	M									R
O	U	A	A	O	P	E	O	E	I	O	A	T							A
B	D	T	R	M	E	Q	N	F	N	N	X	R							N
S	Y	E	M	P			T	F	N	T	N	T	K						K

1	REFTOX	#51	010594	MINS	2	0	10	4	4	4	4	4	5	5	STEEL	1	0.001	18
2	REFTOX	#51	010594	MINS	2	0	10	4	4	4	4	4	5	5	STEEL	2	0.001	18
3	REFTOX	#51	010594	MINS	3	0	10	4	4	4	4	4	5	5	STEEL	1	0.003	18
4	REFTOX	#51	010594	MINS	3	0	10	4	4	4	4	4	5	5	STEEL	3	0.003	18
5	REFTOX	#51	010594	MINS	4	0	10	4	4	4	4	4	5	5	STEEL	1	0.008	18
6	REFTOX	#51	010594	MINS	4	0	10	4	4	4	4	4	5	5	STEEL	4	0.008	18
7	REFTOX	#51	010594	MINS	5	0	10	4	4	4	4	4	5	5	STEEL	1	0.02	26
8	REFTOX	#51	010594	MINS	5	0	10	4	4	4	4	4	5	5	STEEL	5	0.02	10
9	REFTOX	#51	010594	MINS	6	0	10	4	4	4	4	4	5	5	STEEL	1	0.05	26
10	REFTOX	#51	010594	MINS	6	0	10	4	4	4	4	4	5	5	STEEL	6	0.05	10

TEST FOR NORMAL DISTRIBUTION

1:20 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	24	Sum Wgts	24
Mean	0	Sum	0
Std Dev	0.034513	Variance	0.001191
Skewness	-2.60562	Kurtosis	12.89963
USS	0.027397	CSS	0.027397
CV	.	Std Mean	0.007045
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	1	Prob> S	0.8750
Num ^= 0	4		
W:Normal	0.472833	Prob<W	0.0001

Quantiles (Def=5)

100% Max	0.061592	99%	0.061592
75% Q3	0	95%	0.061592
50% Med	0	90%	0.016583
25% Q1	0	10%	0
0% Min	-0.13977	5%	0
		1%	-0.13977
Range	0.201358		
Q3-Q1	0		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.13977(	52)	0(	43)
0(	44)	0(	44)
0(	43)	0.016583(	53)
0(	42)	0.061592(	51)
0(	41)	0.061592(	54)

Missing Value	.
Count	36
% Count/Nobs	60.00

TEST FOR NORMAL DISTRIBUTION

1:20 Sunday, January 5, 1992

STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS

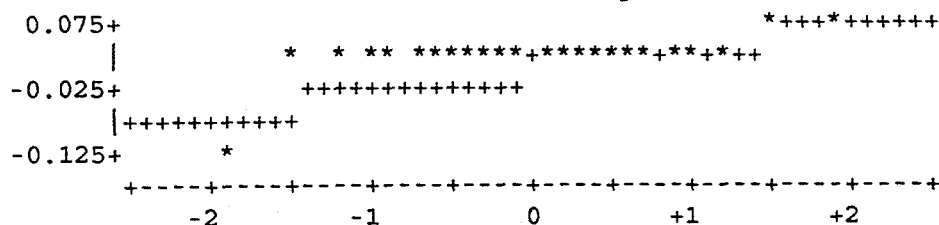
UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
0 66	2	*
0 0000000000000000000002	21	+--*--+
-0		
-0		
-1 4	1	*

Multiply Stem.Leaf by 10**-1

Normal Probability Plot

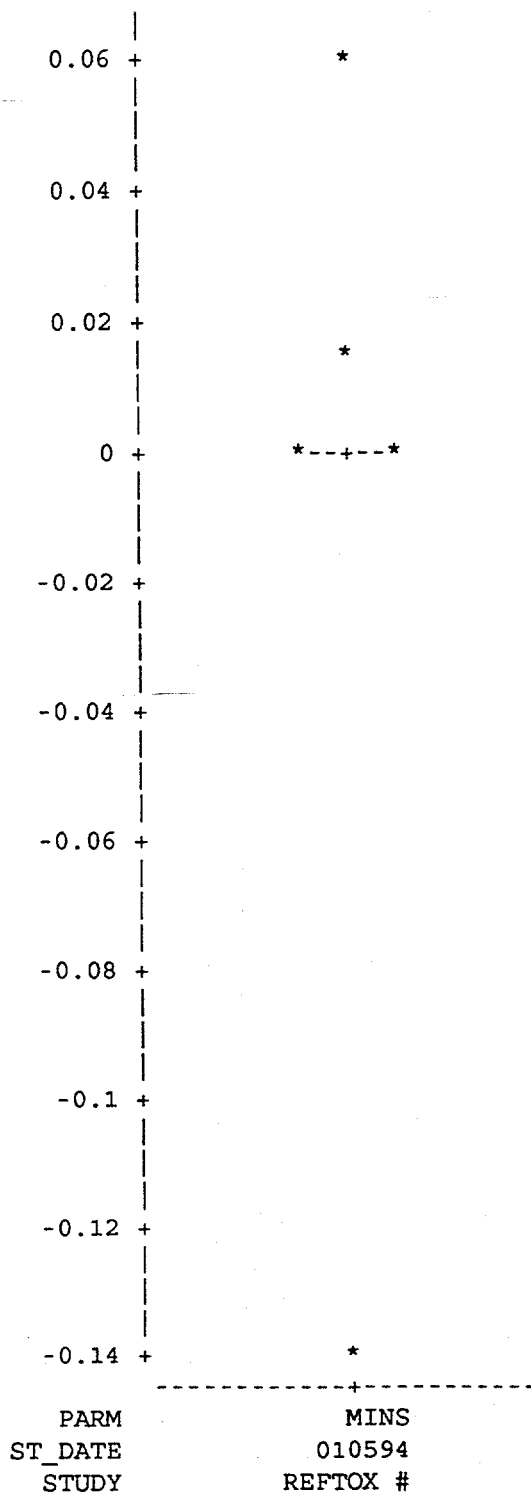


TEST FOR NORMAL DISTRIBUTION

1:20 Sunday, January 5, 1992

UNIVARIATE PROCEDURE
Schematic Plots

Variable=CENTER

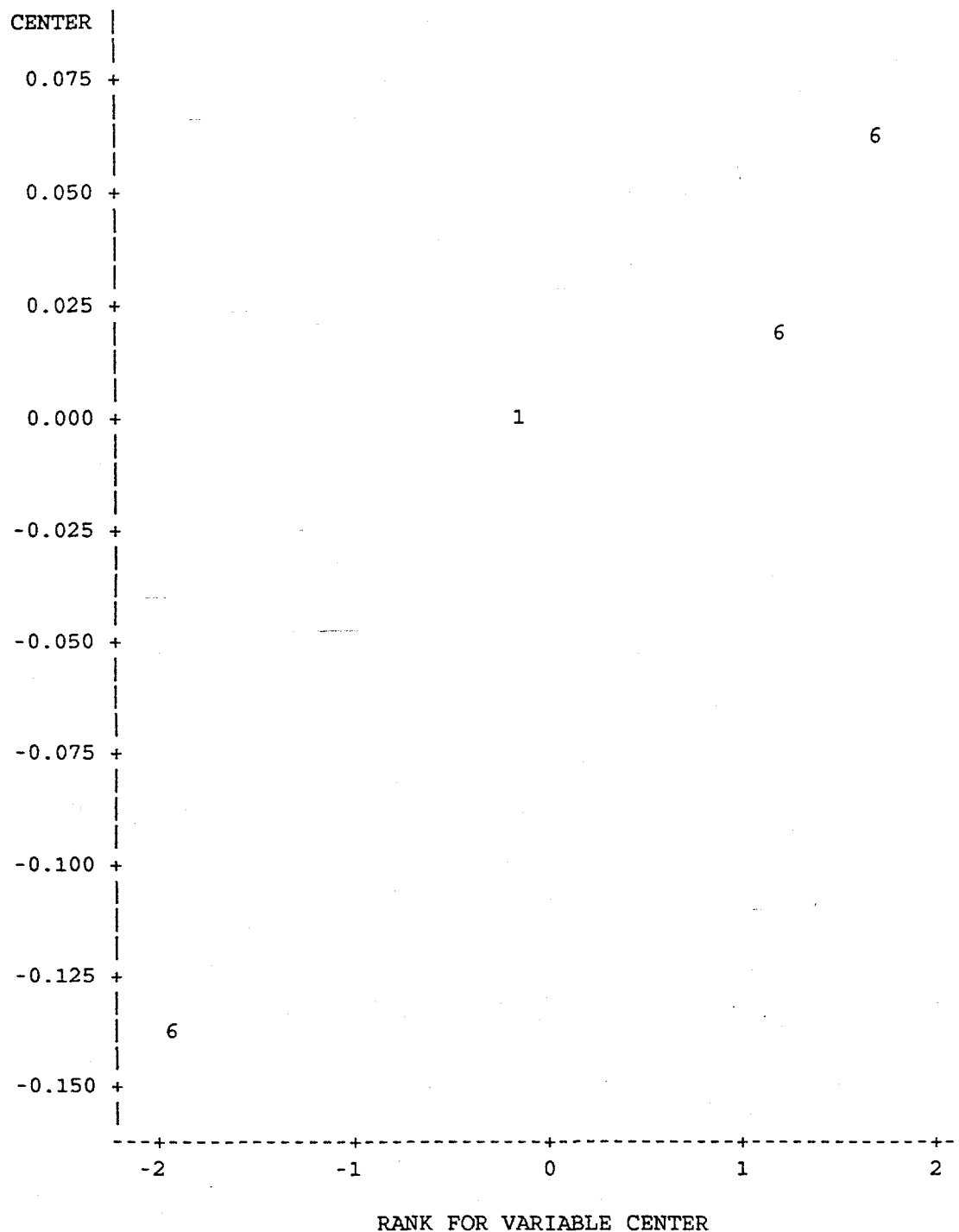


TEST FOR NORMAL DISTRIBUTION

1:20 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS -----

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 36 obs had missing values. 20 obs hidden.

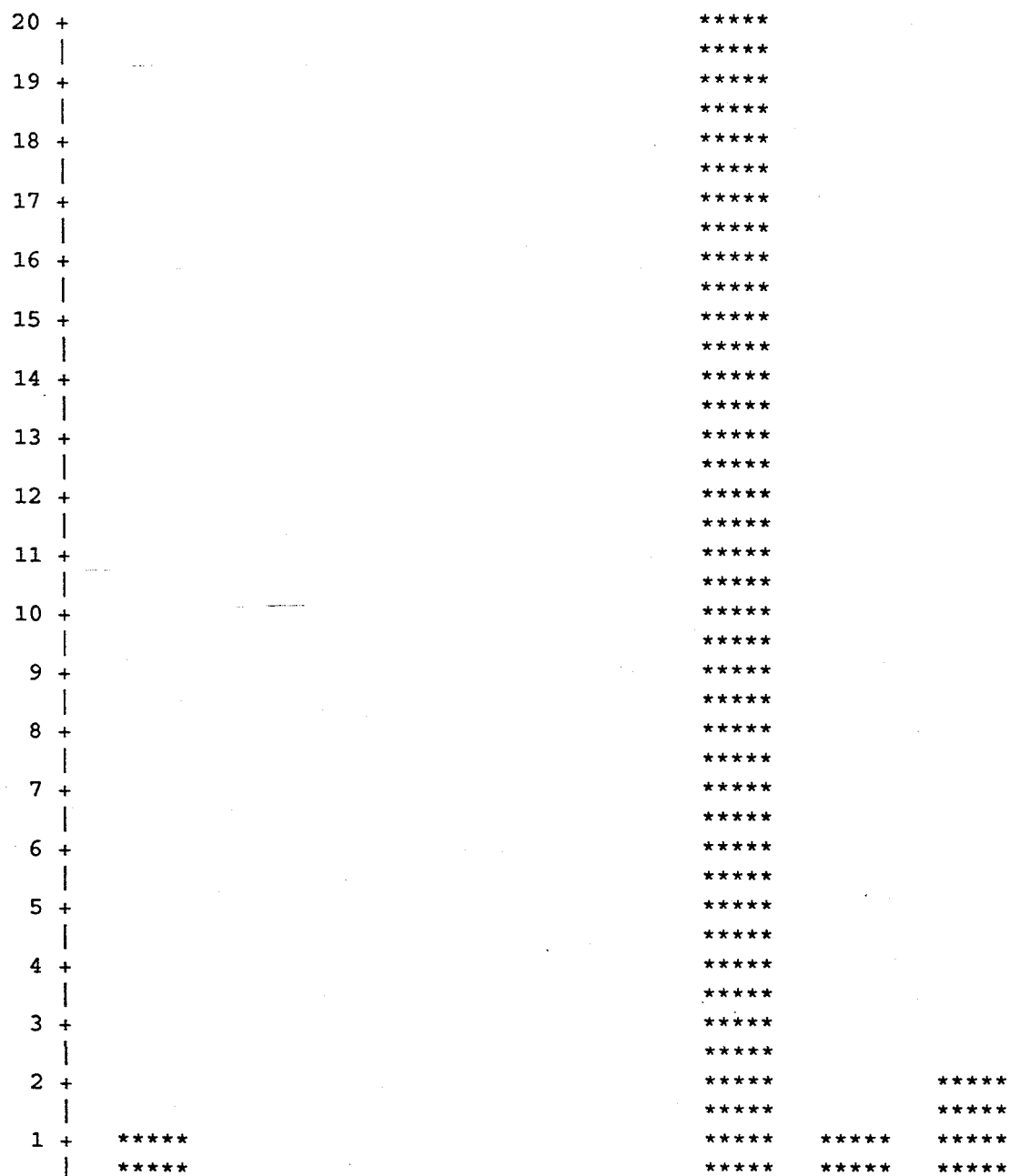
TEST FOR NORMAL DISTRIBUTION

1:20 Sunday, January 5, 1992

STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS

FREQUENCY OF CENTER

FREQUENCY



CENTER MIDPOINT

1:20 Sunday, January 5, 1992

VARIANCE EQUAL TO ZERO FOR ONE OR MORE TREATMENTS
BARTLETT'S TEST CAN NOT BE CALCULATED

LEVENE'S TEST WILL BE USED

Tests of assumptions for survival data (arcsine transformed)

7

LEVENE'S TEST FOR HOMOGENEITY OF VARIANCE

1:20 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS -----

General Linear Models Procedure

Class Level Information

Class	Levels	Values
TRT	6	0.001 0.003 0.008 0.02 0.05 CONTROL

Number of observations in by group = 60

NOTE: Due to missing values, only 24 observations can be used in this analysis.

LEVENE'S TEST FOR HOMOGENEITY OF VARIANCE

1:20 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MINS -----

General Linear Models Procedure

Dependent Variable: ABS_VAL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.01627886	0.00325577	7.45	0.0006
Error	18	0.00786205	0.00043678		
Corrected Total	23	0.02414090			
	R-Square	C.V.	Root MSE	ABS_VAL Mean	
	0.674327	179.4363	0.020899	0.01164719	

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	5	0.01627886	0.00325577	7.45	0.0006

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	5	0.01627886	0.00325577	7.45	0.0006

FATHEAD DRY WEIGHT RECORD SHEET

Study/Date: Reftox #51

Personnel: JPP

Pans:Date/Time of Drying: 01-12-94/0935

Fish:Date/Time of Drying: 01-13-94/1010

Pans:Date/Time of Weighing: 01-12-94/1500

Fish:Date/Time of Weighing: 01-13-94/1335

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt. grams	Mean Wt. Difference	Mean Wt. mg	Notes:
1.	1.13248	1.13346	0.00098	10	0.000098	-	-	
Initial 2.	1.00859	1.00938	0.00079	10	0.000079	-	-	
3.	1.01060	1.01150	0.00090	10	0.000090	-	-	
4.	1.02310	1.02374	0.00064	10	0.000064	-	-	
Initial						0.00008275		
Mean Wt.								
1.	1.00078	1.00462	0.00384	10	0.000384	0.000301	0.384	
CONTROL 2.	1.03910	1.04364	0.00454	10	0.000454	0.000371	0.454	
3.	1.05614	1.05991	0.00377	10	0.000377	0.000294	0.377	
4.	1.07525	1.07926	0.00401	10	0.000401	0.000318	0.401	
1.	1.10932	1.11269	0.00337	10	0.000337	0.000254	0.337	
0.001 2.	0.99112	0.99459	0.00347	10	0.000347	0.000264	0.347	
3.	1.12822	1.13235	0.00413	10	0.000413	0.000330	0.413	
4.	1.10067	1.10456	0.00389	10	0.000389	0.000306	0.389	
1.	1.05141	1.05517	0.00376	10	0.000376	0.000293	0.376	
0.003 2.	1.04321	1.04633	0.00312	10	0.000312	0.000229	0.312	
3.	1.02369	1.02729	0.00360	10	0.000360	0.000277	0.360	

Revised

	4.	1.05830	1.06212	0.00382	10	0.000382	0.000299	0.382
	1.	1.01936	1.02201	0.00265	10	0.000265	0.000182	0.265
0.008	2.	1.07683	1.08014	0.00331	10	0.000331	0.000248	0.331
	3.	0.98977	0.99264	0.00287	10	0.000287	0.000204	0.287
	4.	1.03453	1.03769	0.00316	10	0.000316	0.000233	0.316
	1.	1.06219	1.06319	0.00100	8	0.000125	0.000042	0.125
0.02	2.	1.01514	1.01595	0.00081	8	0.000101	0.000018	0.101
	3.	1.06326	1.06425	0.00099	8	0.000124	0.000041	0.124
	4.	1.05988	1.06107	0.00119	8	0.000149	0.000066	0.149
	1.	1.06377	1.06409	0.00032	6	0.000053	-0.000029	0.053
0.05	2.	0.99934	0.99952	0.00018	4	0.000045	-0.000038	0.045
	3.	1.01270	1.01302	0.00032	5	0.000064	-0.000019	0.064
	4.	0.99827	0.99866	0.00039	6	0.000065	-0.000018	0.065

Review

Review

Reviewed By: Russell

CER 01-20-94

FATHREAD DRY WEIGHT RECORD SHEET

Page 1 of 1

Study/Date Jan Ref Tox
 Pans: Date/Time of Drying 1-12-94/0935
 Pans: Date/Time of Weighing 1-12-94/1500

Fish: Date/Time of Drying 1-13-94/1010
 Fish: Date/Time of Weighing 1-13-94/1535

Personnel Posny

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt.	Mean Wt. Difference
Initial	1.	1.13248	1.13346	10		
	2.	1.00859	1.00938	10		
	3.	1.01060	1.01150	10		
	4.	1.02310	1.02374	10		
Initial Mean Wt.						
con	1.	1.00078	1.00462	10		
	2.	1.03910	1.04364	10		
	3.	1.05614	1.05991	10		
	4.	1.07525	1.07926	10		
0.001	1.	1.10932	1.11269	10		
	2.	0.99112	0.99459	10		
	3.	1.12822	1.13235	10		
	4.	1.10067	1.10456	10		
0.003	1.	1.05141	1.05517	10		
	2.	1.04321	1.04633	10		
	3.	1.02369	1.02729	10		
	4.	1.05830	1.06212	10		
0.008	1.	1.01936	1.02201	10		
	2.	1.07683	1.08014	10		
	3.	0.98977	0.99264	10		
	4.	1.03453	1.03769	10		
0.02	1.	1.06219	1.06319	8		
	2.	1.01514	1.01595	8		
	3.	1.06326	1.06425	8		
	4.	1.05988	1.06107	8		
0.05	1.	1.06377	1.06409	6		
	2.	0.99934	0.99952	4		
	3.	1.01270	1.01302	5		
	4.	0.99827	0.99866	6		

Notes:

Reviewed By: Cue

FATHEAD DRY WEIGHT RECORD SHEET

Study/Date: Reftox #51 REWEIGH

Personnel: JPP

Pans:Date/Time of Drying: 01-31-94/0940

Fish:Date/Time of Drying: 01-31-94/1315

Pans:Date/Time of Weighing: 01-31-94/1250

Fish:Date/Time of Weighing: 01-31-94/1530

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt. grams	Mean Wt. Difference	Mean Wt. mg
1.	1.01357	1.01417	0.00060	10	0.000060	-	-
Initial 2.	1.00859	1.00938	0.00079	10	0.000079	-	-
3.	1.01060	1.01150	0.00090	10	0.000090	-	-
4.	1.03027	1.03080	0.00053	10	0.000053	-	-
Initial						0.0000705	
Mean Wt.							
1.	1.00078	1.00462	0.00384	10	0.000384	0.000314	0.384
CONTROL 2.	1.03910	1.04364	0.00454	10	0.000454	0.000384	0.454
3.	1.05614	1.05991	0.00377	10	0.000377	0.000306	0.377
4.	1.07525	1.07926	0.00401	10	0.000401	0.000331	0.401
1.	1.10932	1.11269	0.00337	10	0.000337	0.000266	0.337
0.001 2.	0.99112	0.99459	0.00347	10	0.000347	0.000277	0.347
3.	1.12822	1.13235	0.00413	10	0.000413	0.000343	0.413
4.	1.10067	1.10456	0.00389	10	0.000389	0.000318	0.389
1.	1.05141	1.05517	0.00376	10	0.000376	0.000306	0.376
0.003 2.	1.04321	1.04633	0.00312	10	0.000312	0.000242	0.312
3.	1.02369	1.02729	0.00360	10	0.000360	0.000290	0.360

Notes:

	4.	1.05830	1.06212	0.00382	10	0.000382	0.000311	0.382
=====								
	1.	1.01936	1.02201	0.00265	10	0.000265	0.000195	0.265
0.008	2.	1.07683	1.08014	0.00331	10	0.000331	0.000261	0.331
	3.	0.98977	0.99264	0.00287	10	0.000287	0.000216	0.287
	4.	1.03453	1.03769	0.00316	10	0.000316	0.000246	0.316
=====								
	1.	1.06219	1.06319	0.00100	8	0.000125	0.000055	0.125
0.02	2.	1.01470	1.01564	0.00094	8	0.000118	0.000047	0.118
	3.	1.06326	1.06425	0.00099	8	0.000124	0.000053	0.124
	4.	1.07000	1.07119	0.00119	8	0.000149	0.000078	0.149
=====								
	1.	1.06377	1.06409	0.00032	6	0.000053	-0.000017	0.053
0.05	2.	1.01478	1.01502	0.00024	4	0.000060	-0.000010	0.060
	3.	1.01270	1.01302	0.00032	5	0.000064	-0.000006	0.064
	4.	1.00364	1.00388	0.00024	6	0.000040	-0.000030	0.040
=====								

Reviewed By: Russell

02-08-94 CR

FATHEAD DRY WEIGHT RECORD SHEET

Page 1 of 1

Study/Date Reftay #51

Personnel JAP

Pans:Date/Time of Drying 1-31-94/0940

Fish:Date/Time of Drying 1-31-94/1315

Pans:Date/Time of Weighing 1-31-94/1250

Fish:Date/Time of Weighing 1-31-94/1530

Sample ID	Tare Wt.	Tare + Fish Wt.	Fish Wt.	# Fish	Mean Wt.	Mean Wt. Difference
Initial						
①	1.01357	1.01417	0.00060	10		
2.						
3.						
④	1.03037	1.03080	0.00053	10		
Initial Mean Wt.						
1.						
0.02						
①	1.01470	1.01564	0.00094	8		
3.						
①	1.07000	1.07119	0.00119	8		
1.						
0.05						
①	1.01478	1.01502	0.00024	4		
3.						
①	1.00364	1.00388	0.00024	6		
1.						
2.						
3.						
4.						
1.						
2.						
3.						
4.						
1.						
2.						
3.						
4.						
1.						
2.						
3.						
4.						

Notes:

Reviewed By: Cue

Analysis of 7-day Larval Growth Test

REFTOX #51

Starting Date: 01/05/94

Analysis of Dry Weight (mg) Data Dunnett's Test

No transformation applied before data analysis.

For this set of data, the minimum significant difference is 0.05

This represents a 13.15 % reduction in Dry Weight (mg).

$$T = 2.29 \text{ ALPHA} = 0.05$$

 Dry Weight (mg) Data

TREATMENT	Replicate										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
1 CONTROL	0.38	0.45	0.38	0.40	.	.	.	.	.	.	0.40	
2 0.001	0.34	0.35	0.41	0.39	.	.	.	.	.	.	0.37	
3 0.003	0.38	0.31	0.36	0.38	.	.	.	.	.	.	0.36	
4 0.008	0.26	0.33	0.29	0.32	.	.	.	.	.	.	0.30	*

Asterisk (*) indicates values significantly less than control (CONTROL).

 Analysis of Variance

Source	DF	Sum OF Sq.	Mean Sq.	Calc F	F(0.05)
Among	3	0.022	0.007	6.930	0.0058
Within	12	0.013	0.001		
Total	15	0.000			

Analysis of untransformed data

1

1:36 Sunday, January 5, 1992

STUDY=REFTOX #51

ST_DATE=010594

PARM=MING

DUNNETT'S TEST

T = 2.29 ALPHA = 0.05

TREATMENT	N	MEAN	SIGNIFICANT DIFFERENCE
CONTROL	4	0.40	
0.001	4	0.37	
0.003	4	0.36	
0.008	4	0.30	*

MINIMUM SIGNIFINANT DIFFERENCE = 0.05

THIS REPRESENTS A 13.15 % DECREASE IN SURVIVAL FROM THE CONTROL

Analysis of untransformed data

2

1:36 Sunday, January 5, 1992

STUDY=REFTOX #51

ST_DATE=010594

PARM=MING

DUNNETT'S TEST

T = 2.29 ALPHA = 0.05

TREATMENT	REPLICATE										MEAN	S
	1	2	3	4	5	6	7	8	9	10		
1 CONTROL	0.38	0.45	0.38	0.40	.	.	.	.	.	.	0.40	
2 0.001	0.34	0.35	0.41	0.39	.	.	.	.	.	.	0.37	
3 0.003	0.38	0.31	0.36	0.38	.	.	.	.	.	.	0.36	
4 0.008	0.26	0.33	0.29	0.32	.	.	.	.	.	.	0.30	*

MINIMUM SIGNIFINANT DIFFERENCE = 0.05

THIS REPRESENTS A 13.15 % DECREASE IN SURVIVAL FROM THE CONTROL

Analysis of untransformed data

3

1:36 Sunday, January 5, 1992

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	0.001 0.003 0.008 CONTROL

Number of observations in data set = 40

NOTE: Due to missing values, only 16 observations can be used in this analysis.

1:36 Sunday, January 5, 1992

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.02221875	0.00740625	6.93	0.0058
Error	12	0.01282500	0.00106875		
Corrected Total	15	0.03504375			

R-Square	C.V.	Root MSE	RESP Mean
0.634029	9.128584	0.0326917	0.35812500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	3	0.02221875	0.00740625	6.93	0.0058

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	3	0.02221875	0.00740625	6.93	0.0058

Tests of assumptions for untransformed data

1

Test for Normal Distribution

1:34 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MING -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	16	Sum Wgts	16
Mean	0	Sum	0
Std Dev	0.02924	Variance	0.000855
Skewness	-0.05371	Kurtosis	-1.22964
USS	0.012825	CSS	0.012825
CV	.	Std Mean	0.00731
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	2	Prob> S	0.9292
Num ^= 0	16		
W:Normal	0.953912	Prob<W	0.5377

Quantiles (Def=5)

100% Max	0.0475	99%	0.0475
75% Q3	0.0225	95%	0.0475
50% Med	5.55E-17	90%	0.0375
25% Q1	-0.0225	10%	-0.04
0% Min	-0.0475	5%	-0.0475
		1%	-0.0475
Range	0.095		
Q3-Q1	0.045		
Mode	-0.0225		

Extremes

Lowest	Obs	Highest	Obs
-0.0475(	22)	0.0225(	21)
-0.04(	31)	0.0225(	24)
-0.0325(	11)	0.03(	32)
-0.0225(	12)	0.0375(	13)
-0.0225(	3)	0.0475(	2)

Missing Value

Count	24
% Count/Nobs	60.00

Test for Normal Distribution

1:34 Sunday, January 5, 1992

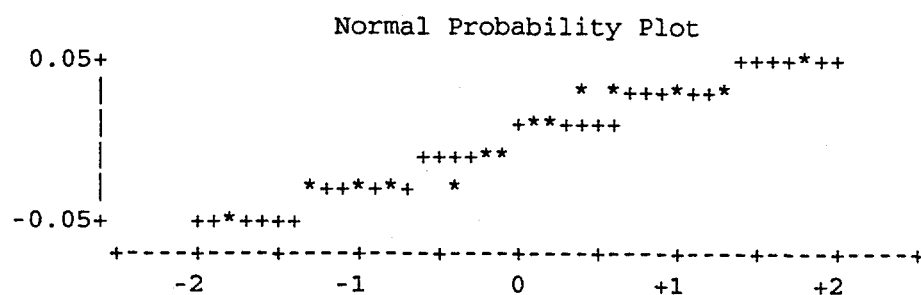
----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MING -----

UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
4 8	1	
2 02208	5	+-----+
0 28	2	*---+---*
-0 02	2	
-2 2222	4	+-----+
-4 80	2	

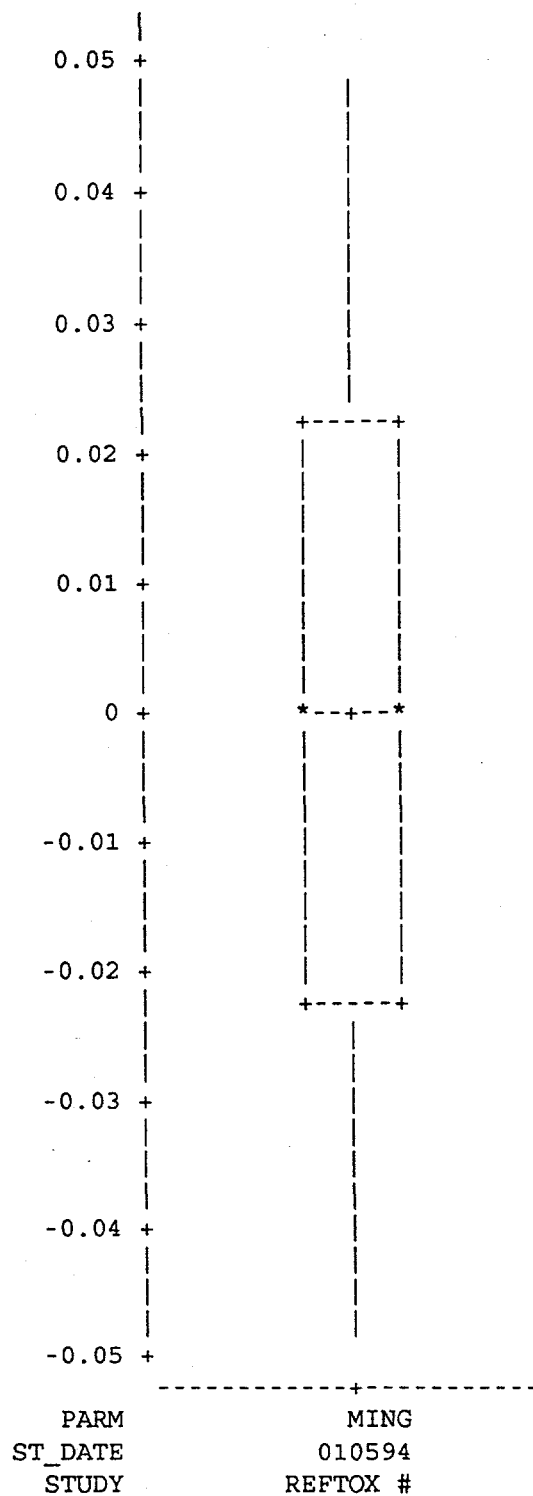
-----+-----+-----+-----+
 Multiply Stem.Leaf by 10**-2



1:34 Sunday, January 5, 1992

UNIVARIATE PROCEDURE
Schematic Plots

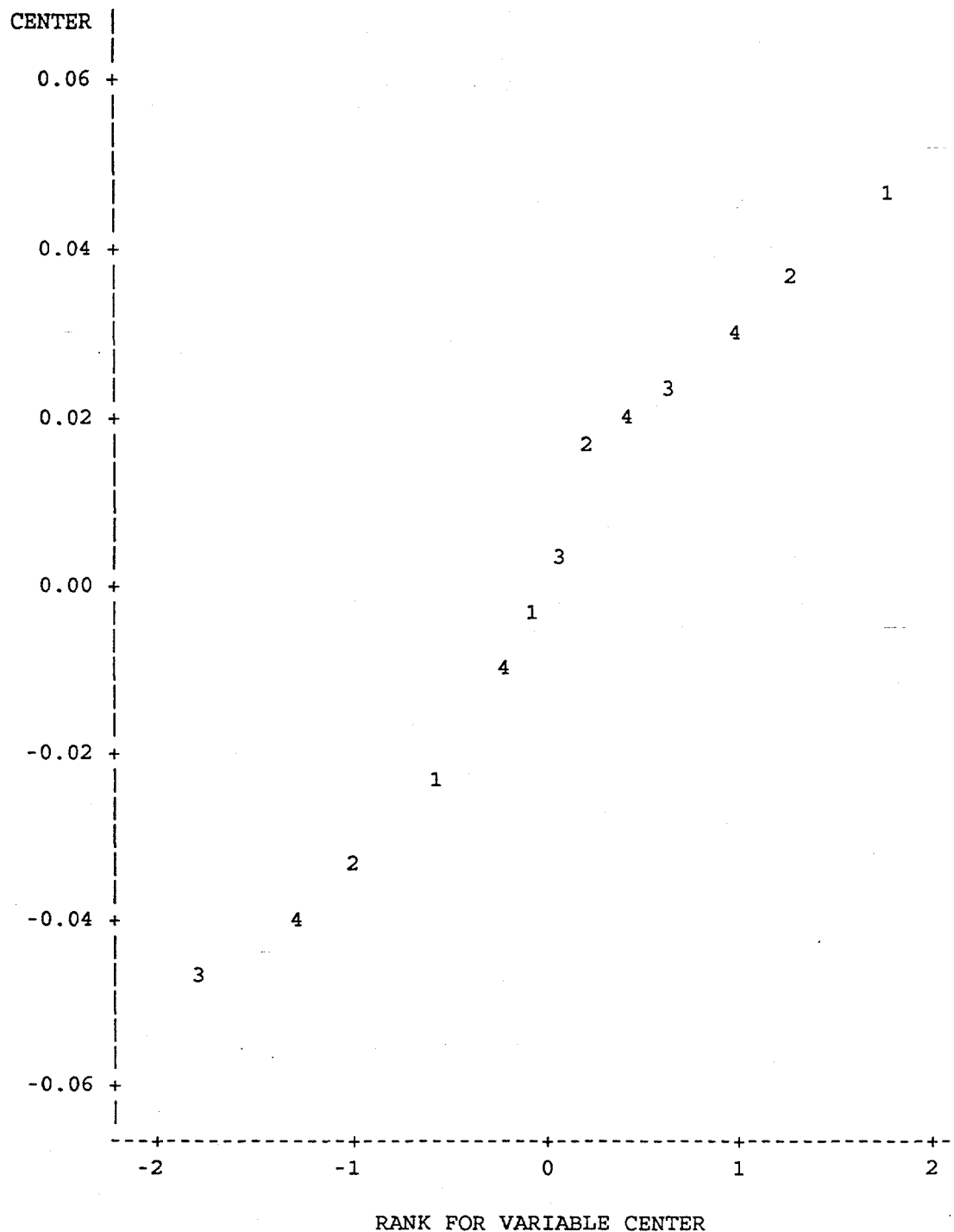
Variable=CENTER



1:34 Sunday, January 5, 1992

----- STUDY=REFTOX #51 ST_DATE=010594 PARM=MING -----

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 24 obs had missing values. 3 obs hidden.

Tests of assumptions for untransformed data
Bartlett's Test for Homogeneous Variance

5

1:34 Sunday, January 5, 1992

STUDY=REFTOX #51
ST_DATE=010594
PARM=MING

TREATMENT	N	MEAN	VARIANCE
CONTROL	4	0.40	0.001
0.001	4	0.37	0.001
0.003	4	0.36	0.001
0.008	4	0.30	0.001

BARTLETT'S TEST STATISTIC = 0.007
PROB>B = 1.000

Rottex Fish #51

IC₂₅ 01.20.94
civ

THE NUMBER OF RESAMPLES IS 80

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
-----	-----	-----
.000	.404	.404
.001	.372	.372
.003	.357	.357
.008	.300	.300
.020	.125	.125
.050	.057	.057

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0077.

.050	.057	.057
------	------	------

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0077.

* BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY *
* OF THE ESTIMATED ICp *

THE MEAN OF THE BOOTSTRAP ESTIMATES IS .0077.

THE STANDARD DEVIATION OF THE BOOTSTRAP ESTIMATES IS .0011.

AN EMPIRICAL 95.0% CONFIDENCE INTERVAL FOR THE
BOOTSTRAP ESTIMATE IS (.0054, .0095).

C:\BOOTSTRP>

THE NUMBER OF RESAMPLES IS 80

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
.000	.404	.404
.001	.372	.372
.003	.357	.357
.008	.300	.300
.020	.129	.129
.050	.054	.054

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0077.

.050	.054	.054
------	------	------

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0077.

* BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY *
* OF THE ESTIMATED ICp *

THE MEAN OF THE BOOTSTRAP ESTIMATES IS .0077.

THE STANDARD DEVIATION OF THE BOOTSTRAP ESTIMATES IS .0011.

AN EMPIRICAL 95.0% CONFIDENCE INTERVAL FOR THE
BOOTSTRAP ESTIMATE IS (.0054, .0095).

C:\BOOTSTRP>

REFSIF.TX8

Retta Fiat #51 Reweigh

02-08-94

Cue

10	.384
10	.454
10	.377
10	.401
2 .001	.337
2 .001	.347
2 .001	.413
2 .001	.389
3 .003	.376
3 .003	.312
3 .003	.360
3 .003	.382
4 .008	.265
4 .008	.331
4 .008	.287
4 .008	.316
5 .02	.125
5 .02	.118
5 .02	.124
5 .02	.149
6 .05	.053
6 .05	.060
6 .05	.064
6 .05	.040

REFTOX #51	010594 MINS	1 CONTROL	10.00	10.00	10.00	10.00
	INITIAL NUMBER		10.00	10.00	10.00	10.00
REFTOX #51	010594 MINS	2 0.001	10.00	10.00	10.00	10.00
	INITIAL NUMBER		10.00	10.00	10.00	10.00
REFTOX #51	010594 MINS	3 0.003	10.00	10.00	10.00	10.00
	INITIAL NUMBER		10.00	10.00	10.00	10.00
REFTOX #51	010594 MINS	4 0.008	10.00	10.00	10.00	10.00
	INITIAL NUMBER		10.00	10.00	10.00	10.00
REFTOX #51	010594 MINS	5 0.02	8.00	8.00	8.00	8.00
	INITIAL NUMBER		10.00	10.00	10.00	10.00
REFTOX #51	010594 MINS	6 0.05	6.00	4.00	5.00	6.00
	INITIAL NUMBER		10.00	10.00	9.00	10.00

REFTOX #51	010594 MING	1 CONTROL	0.38	0.45	0.38	0.40
REFTOX #51	010594 MING	2 0.001	0.34	0.35	0.41	0.39
REFTOX #51	010594 MING	3 0.003	0.38	0.31	0.36	0.38
REFTOX #51	010594 MING	4 0.008	0.26	0.33	0.29	0.32

1 0	.384
1 0	.454
1 0	.377
1 0	.401
2 .001	.337
2 .001	.347
2 .001	.413
2 .001	.389
3 .003	.376
3 .003	.312
3 .003	.360
3 .003	.382
4 .008	.265
4 .008	.331
4 .008	.287
4 .008	.316
5 .02	.125
5 .02	.101
5 .02	.124
5 .02	.149
6 .05	.053
6 .05	.045
6 .05	.064
6 .05	.065

Reflex fish #51

Ref 51f.TX8

Cue 01-20-94

INITIAL CHEMISTRY

Study Fathead Minnow Jan Ref ToxPersonnel IslerBeginning Date 1-5-94Date 1/10/94Ending Date 01-12-94Pacey

By	TS	TS	TS	TS	TS	TS	ur	TS	ur		
Sample ID	Initial Temp.	Warmed Temp.	DO	pH	Cond.	Hard	x17.1	Alk	x10	TRC	x 1.0
<u>Control</u>	<u>21.5</u>	<u>25.6</u>	<u>8.5</u>	<u>7.1</u>	<u>331</u>	<u>5.0</u>	<u>85.5</u>	<u>5.3</u>	<u>53</u>		
		<u>2</u>									
<u>0.001</u>		<u>25.5</u>		<u>7.1</u>	<u>332</u>	<u>5.0</u>	<u>85.5</u>	<u>5.3</u>	<u>53</u>		
<u>0.003</u>		<u>25.7</u>		<u>7.1</u>	<u>332</u>						
<u>0.008</u>		<u>25.7</u>		<u>7.1</u>	<u>333</u>						
<u>0.02</u>		<u>25.7</u>		<u>7.1</u>	<u>333</u>						
<u>0.05</u>	<u>✓</u>	<u>25.4</u>	<u>✓</u>	<u>7.1</u>	<u>334</u>	<u>5.0</u>	<u>85.5</u>	<u>5.4</u>	<u>54</u>		

NOTES:

PLARC501-252

Reviewed By: TS

Personnel Sesler

Date 1/11/94

100

[illegible]

PLARC501-252

Reviewed By: TS

Personnel Sesler
Bozey

[illegible]

Reviewed By: TS

FINAL CHEMISTRY

Page 1 of 1

Study Jan Ref Tox
 Beginning Date 1-5-94
 Ending Date 01-12-94

Date 1-8-94

Personnel Posey
Russell

Sample ID	By	Fish			
		JPP/Cur	JPP/Cur	JPP/Cur	JPP/Cur
	Rep.	Temp.	DO	pH	Cond.
<u>Control</u>	1	24.7	4.3		
	2	25.1	4.7		
	3	24.6	5.0	7.3	
	4	24.7	5.2		334
<u>0.001</u>	1	24.9	4.2		
	2	25.0	5.0		
	3	24.8	4.8	7.3	
	4	24.8	4.4		337
<u>0.003</u>	1	24.6	4.7		
	2	25.0	4.5		
	3	24.6	5.2	7.3	
	4	24.8	5.2		337
<u>0.008</u>	1	24.7	5.6		
	2	24.8	4.9		
	3	24.8	5.5	7.3	
	4	24.8	5.2		336
<u>0.02</u>	1	24.5	5.9		
	2	24.9	5.4		
	3	24.7	5.6	7.3	
	4	24.7	5.7		336
<u>0.05</u>	1	24.5	6.1		
	2	24.5	6.1		
	3	24.9	6.3	7.4	
	4	24.8	6.2		336
	1				
	2				
	3				
	4				

NOTES:

Ceriodaphnia			
Temp.	Sample ID	DO	pH

Reviewed By: JPP/Cur

FINAL CHEMISTRY

Page 1 of 1

Study Jan Ref Tox
 Beginning Date 1-5-94
 Ending Date 01-12-94

Date 01-09-94

Personnel Perez
Russell

Sample ID	By Rep.	Fish			
		JPP Circ	JPP Circ	JPP Circ	JPP Circ
		Temp.	DO	pH	Cond.
<u>Control</u>	1	24.5	6.4		338
	2	24.7	6.5		
	3	24.5	6.3		
	4	24.5	6.4	7.6	
<u>0.001</u>	1	24.4	6.5		338
	2	24.4	6.6		
	3	25.1	6.2		
	4	24.8	6.4	7.5	
<u>0.003</u>	1	24.9	6.4		340
	2	24.8	6.4		
	3	24.8	6.5		
	4	24.9	6.1	7.5	
<u>0.008</u>	1	24.7	6.6		339
	2	24.5	6.5		
	3	24.6	6.6		
	4	24.5	6.6	7.5	
<u>0.02</u>	1	24.6	7.0		337
	2	24.8	6.8		
	3	24.8	6.9		
	4	24.8	6.8	7.6	
<u>0.05</u>	1	24.6	7.1		337
	2	24.6	7.1		
	3	24.7	7.2		
	4	24.5	6.9	7.6	
	1				
	2				
	3				
	4				

NOTES:

Ceriodaphnia			
Temp.	Sample ID	DO	pH

Reviewed By: JPP/Circ

Date 1-10-44

Personnel Sesler
Possey

Sample ID	By Rep.	Fish			
		TS/300 F/	TS/500 F/	TS/	TS/
		Temp.	DO	pH	Cond.
Control	1	24.7	6.1	7.7	
	2	24.6	6.0		337
	3	24.7	6.1		
	4	24.7	6.3		
0.001	1	24.5	5.9	7.7	
	2	24.5	6.5		338
	3	24.5 ⁵⁸	5.9		
	4	24.8	5.6		
0.003	1	24.3	6.2	7.7	
	2	24.5	6.4		337
	3	24.7	6.2		
	4	24.7	6.1		
0.008	1	24.6	6.5	7.7	
	2	24.6	6.2		338
	3	24.7	6.5		
	4	24.8	6.3		
0.02	1	24.6	6.6	7.7	
	2	24.5	7.0		336
	3	25.0	6.6		
	4	24.8	7.0		
0.05	1	24.5	7.2	7.7	
	2	24.5	7.2		337
	3	24.9	7.8		
	4	24.5	7.1		
	1				
	2				
	3				
	4				

NOTES:

[illegible]

Reviewed By: JPP

Date 1-11-94

Personnel Decker
Posay

[illegible]

Reviewed By: JPP/

Personnel Sister
Poser

[illegible]

Reviewed By: TS

PROJECT REAGENT RECORD SHEET

Project/Study: Cu Ref tox Jan 94
 Personnel: Sealer Perry

Beginning Date: 01-05-94
 Ending Date: 01-12-94

WINKLER TITRATION METHOD

Alkaline-Iodide-Azide:

Brand Fisher
 Lot # 910062-24
 Exp. NA

Manganous Sulfate:

Brand Fisher
 Lot # 910067-24
 Exp. NA

Sodium Thiosulfate:

Brand Ricca
 Lot # M158
 Exp. 9/94

Sulfuric Acid:

Brand Fisher
 Lot # 2876 KJCM
 Exp. NA

Thyodene:

Brand Fisher
 Lot # 912254
 Exp. NA

pH BUFFER SOLUTIONS

pH 4:

Brand Mallinckrodt
 Lot # 0097 KLEA
 Exp. 9/94

pH 7:

Brand Mallinckrodt
 Lot # 0098 KLOL
 Exp. 9/94

pH 10:

Brand Mallinckrodt
 Lot # 0099 KLB8
 Exp. 1/94

pH _____:

Brand _____
 Lot # _____
 Exp. _____

CONDUCTIVITY STANDARD SOLUTIONS

200 μ hos:

Brand Biopharm
 Lot # B252B
 Exp. 3/94

720 μ hos:

Brand Biopharm
 Lot # L292A ; C303B
 Exp. 1/95 ; 4/95

_____ μ hos:

Brand _____
 Lot # _____
 Exp. _____

ALKALINITY TITRATION

Sulfuric Acid Solution N/50:

Brand Mallinckrodt
 Lot # H366 KJTH
 Exp. NA

HARDNESS TITRATION

Hardness Titrating Solution:

Brand Calgon
 Lot # B2037700
 Exp. NA

Hardness Indicator:

Brand Calgon
 Lot # 01F9B
 Exp. NA

Hardness Buffer Solution:

Brand Calgon
 Lot # 2606B
 Exp. NA

CHLORINE TITRATION

DPD Powder Pillows:

Brand NA
 Lot # _____
 Exp. _____

Potassium Iodide:

Brand NA
 Lot # _____
 Exp. _____

FAS:

Brand NA
 Lot # _____
 Exp. _____

Project Instrument Record Sheet

Project Study San Ref Tax 25% w/o

Beginning Date 01-05-94

Ending Date 01-12-94

DO Meter

Model 451 57

TVA Tag 543348

Calibration Date 8/10/93

pH Meter(s)

Model SA 250

TVA Tag 8147

Calibration Date 11/1/93

Model 407A

TVA Tag 472857

Calibration Date 10/20/93

Conductivity Meter

Model 32

TVA Tag 577779

Calibration Date 9/14/93

Thermometer(s)

Model SAMA -CP 40

TVA Tag M217

Calibration Date 11/30/93

Model _____

TVA Tag _____

Calibration Date _____

Cerio IC25- Control Chart For Chronic Test

New animals received from CTI on 10-22-93

Test#	Source	Date	IC25	Mean	S	2S	Mean-2s	Mean+2S
25	TTL	01/09 1992	0.0157					
26	TTL	01/29 1992	0.0119	0.0138	0.002687	0.0054	0.0084	0.0192
27	TTL	02/27 1992	0.0107	0.0128	0.002610	0.0052	0.0075	0.0180
28	TTL	04/07 1992	0.0220	0.0151	0.005085	0.0102	0.0049	0.0252
29	TTL	05/01 1992	0.0185	0.0158	0.004662	0.0093	0.0064	0.0251
30	TTL	05/28 1992	0.0111	0.0150	0.004584	0.0092	0.0058	0.0242
31	TTL	07/07 1992	0.0254	0.0165	0.005745	0.0115	0.0050	0.0280
32	TTL	07/31 1992	0.0275	0.0179	0.006595	0.0132	0.0047	0.0310
33	TTL	08/27 1992	0.0275	0.0189	0.006958	0.0139	0.0050	0.0328
34	TTL	09/30 1992	0.0272	0.0198	0.007063	0.0141	0.0056	0.0339
35	TTL	10/27 1992	0.0229	0.0200	0.006767	0.0135	0.0065	0.0336
36	TTL	12/01 1992	0.0284	0.0207	0.006889	0.0138	0.0070	0.0345
37	TTL	01/05 1993	0.0116	0.0200	0.007066	0.0141	0.0059	0.0342
38	TTL	01/26 1993	0.0187	0.0199	0.006798	0.0136	0.0063	0.0335
39	TTL	02/24 1993	0.0258	0.0203	0.006723	0.0134	0.0069	0.0338
40	TTL	03/23 1993	0.0123	0.0198	0.006798	0.0136	0.0062	0.0334
41	TTL	04/27 1993	0.0141	0.0195	0.006727	0.0135	0.0060	0.0329
42	TTL	06/01 1993	0.0297	0.0201	0.006956	0.0139	0.0061	0.0340
43	TTL	07/12 1993	0.0255	0.0203	0.006874	0.0137	0.0066	0.0341
44	TTL	08/04 1993	0.0275	0.0207	0.006880	0.0138	0.0069	0.0345
45	TTL	08/19 1993	0.0063	0.0200	0.007405	0.0148	0.0052	0.0348
46	TTL	09/10 1993	0.0121	0.0197	0.007421	0.0148	0.0048	0.0345
47	TTL	09/20 1993	0.0107	0.0193	0.007487	0.0150	0.0043	0.0342
48	TTL	11/18 1993	0.0258	0.0195	0.007443	0.0149	0.0047	0.0344
49	TTL	12/01 1993	0.0251	0.0198	0.007371	0.0147	0.0050	0.0345
50	TTL	12/03 1993	0.0230	0.0199	0.007250	0.0145	0.0054	0.0344
51	TTL	12/10 1993	0.0244	0.0201	0.007162	0.0143	0.0057	0.0344
52	TTL	12/17 1993	0.0273	0.0203	0.007160	0.0143	0.0060	0.0346
53	TTL	01/05 1994	0.0160	0.0202	0.007077	0.0142	0.0060	0.0343
54	TTL	02/03 1994	0.0259	0.0204	0.007032	0.0141	0.0063	0.0344

Chronic Reference Toxicant Test

Received new animals from CTI 10-22-93

Cerio - ARL

Test #	Date	Survival		Reproduction		IC25	Mean # Young/	LC50	Corrective Action Taken	
		LOEC	NOEC	LOEC	NOEC	!	Female in	!	and Notes	
										!
1	01/24/90	0.02	0.008	!	>0.008	0.008	!	!	!	
2	03/23/90	0.05	0.02	!	0.05	0.02	!	!	!	
3	03/29/90	0.05	0.02	!	0.05	0.02	!	!	!	
4	05/05/90	void		!		!	!	!	!	
5	05/10/90	0.05	0.02	!	0.05	0.02	!	!	!	
		void		!		!	!	!	!	
6	06/11/90	void		!		!	!	!	!	
7	07/06/90	void		!		!	!	!	!	
8	07/17/90	0.05	0.02	!	0.008	0.02	!	!	!	
9	08/01/90	0.05	0.02	!	0.02	0.008	!	!	!	
10	09/06/90	0.02	0.008	!	0.008	0.003	!	!	!	
11	11/06/90	0.05	0.02	!	0.05	0.02	!	!	!	
12	11/27/90	0.05	0.02	!	0.02	0.008	!	!	!	
13	01/10/91	0.05	0.02	!	0.02	0.008	!	!	!	
14	02/8/91	0.05	0.02	!	0.02	0.008	!	!	!	
15	03/16/91	0.05	0.02	!	0.02	0.008	!	!	!	
16	03/27/91	0.05	0.02	!	0.05	0.02	!	!	!	
17	05/02/91	0.05	0.02	!	0.05	0.02	!	!	!	
18	05/31/91	0.05	0.02	!	0.02	0.008	!	!	!	
19	07/12/91	0.05	0.02	!	0.02	0.008	!	!	!	
20	08/01/91	0.05	0.02	!	0.02	0.008	!	!	!	
21	09/04/91	0.05	0.02	!	0.02	0.008	!	!	!	
22	10/03/91	0.05	0.02	!	0.02	0.008	!	!	!	
23	10/30/91	0.05	0.02	!	0.02	0.008	!	!	!	
24	12/03/91	0.05	0.02	!	0.05	0.02	!	!	!	
25	01/09/92	0.05	0.02	!	0.02	0.008	!	0.0157	!	28.40
26	01/29/92	0.05	0.02	!	0.02	0.008	!	0.0119	!	34.90
27	02/27/92	0.05	0.02	!	0.02	0.008	!	0.0107	!	31.90
28	04/07/92	0.05	0.02	!	0.02	0.02	!	0.022	!	20.10
29	05/01/92	0.05	0.02	!	0.008	0.003	!	0.0185	!	26.60
30	05/28/92	0.05	0.02	!	0.02	0.008	!	0.0111	!	31.50
31	07/07/92	0.05	0.02	!	0.05	0.02	!	0.0254	!	25.30
32	07/31/92	0.05	0.02	!	0.05	0.02	!	0.0275	!	21.50
33	08/27/92	0.05	0.02	!	0.05	0.02	!	0.0275	!	20.11
34	09/30/92	0.05	0.02	!	0.05	0.02	!	0.0272	!	22.30
35	10/27/92	0.05	0.02	!	0.05	0.02	!	0.0229	!	22.10
36	12/01/92	0.05	0.02	!	0.05	0.02	!	0.0284	!	21.30
37	01/05/93	0.05	0.02	!	0.02	0.008	!	0.0116	!	23.40
38	01/26/93	0.05	0.02	!	0.02	0.008	!	0.0187	!	24.90
39	02/24/93	0.05	0.02	!	0.05	0.02	!	0.0258	!	25.10
40	03/23/93	0.05	0.02	!	0.02	0.008	!	0.0123	!	36.0
41	04/27/93	>0.05	0.05	!	0.02	0.008	!	0.0141	!	18.70
42	06/01/93	0.05	0.02	!	0.05	0.02	!	0.0297	!	20.40
43	07/12/93	0.05	0.02	!	0.05	0.02	!	0.0255	!	15.70
44	08/04/93*	0.05	0.02	!	0.05	0.02	!	0.0275	!	8.3
45	08/19/93*	0.05	0.02	!	0.02	0.008	!	0.0063	!	9.4
46	09/10/93	0.02	0.008	!	0.02	0.008	!	0.0121	!	20.90
47	09/20/93	0.05	0.02	!	0.05	0.02	!	0.0107	!	20.30

* WAS INCLUDED IN THE CONTROL CHART
EVEN THOUGH THIS TEST DID NOT
MEET ACCEPTABLE TEST CRITERIA

Chronic Reference Toxicant Test

Received new animals from CTI 10-22-93

Cerio - TTL

Test #	Date	Survival		Reproduction		IC25	Mean # Young/		LC50	Corrective Action Taken
		LOEC	NOEC	LOEC	NOEC		Female in	Control		
48	11/18/93	0.05	0.02	0.05	0.02	0.0258	28.20			## animals from w/edta
49	12/01/93	0.05	0.02	0.02	0.008	0.0251	42.00	0.0380		## animals from w/edta
50	12/03/93	0.05	0.02	<0.003	<0.003	0.023	38.40	0.0416		## animals from w/edta
51	12/10/93	0.05	0.02	0.008	0.003	0.0244	39.10	0.0548		## animals from w/edta
52	12/17/93	0.05	0.02	0.05	0.02	0.0273	35.80	0.0416		## animals from w/edta
53	01/05/94	0.05	0.02	0.02	0.008	0.016	38.50			## animals from w/edta
54	02/03/94	0.05	0.02	0.05	0.02	0.0259	36.10			## animals from w/edta

TTL CHRONIC TOXICITY TEST MASTER CHECKLIST

CL # 0013Study: Let Tox - Cerio - 25% - JanTest Dates: 1-5-94 - 01-11-94Date Issued: 1-4-94 To: Pasey

Report Due: _____ By: _____

1. Test organism availability: FH Minnows-T.L.* N/A C.U.[†] - Date -
Daphnids - T.L. - C.U. - Date 1-5-94
2. Sample Collection Coordination: Date N/A By - With -
3. Glassware availability: T.L. - Tech. - Date 1-5-94
4. Glassware prep. complete: Date 1-5-94 By JPP
5. Data Sheet prep. complete: Date 1-4-94 By JPP
6. Test organism availability verification: FH-OK? N/A Daphnids-OK? ✓
7. Culture Medium Availability: Date 1-5-94 By JPP With DRH
8. FH Minnow acclimation:
Day 1 2
By N/A

9. Test Initiation: FH-Date/Time 1-5-94^{SP} N/A Daphnid-Date/Time 1-5-94/1245
Initial FH Sample N/A

10. Daily:	Day #:	0	1	2	3	4	5	6	7
Initial Chem. - T.L.									
T.M.*		<u>JPP</u>		<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>N/A</u>	
Final Chem. - T.L.									
T.M.		<u>JPP</u>	<u>2</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	
F.H. - T.L.		<u>N/A</u>	<u>N/A</u>						
T.M.									
Daphnid - T.L.									
T.M.		<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	<u>JPP</u>	
Log Samples - T.L.		<u>N/A</u>	<u>N/A</u>						
T.M.									

11. Test Termination: FH-Date/Time N/A Daphnid-Date/Time 1-11-94/1245
Clean-up, By: JPP

12. Weigh Fish: Date _____ By _____ 13. Run Stats: Date _____ By _____

14. Report Prep.: Assigned To _____ Date _____ By _____

15. Report Final: Date 01-19-94 By Cue
^{Control Chart} Approved: _____

*Team Leader †Culture Unit *Team Member

PLARC501-1266(1)(Rev 12/93)

Chronic Reference Toxicant Record Sheet

Study Cu Ref Tox (25% w/o EDTA)
 Test Organism Ceriod 125% w/EDTA
 Beginning Date/Time 1/5/94; 1245
 Ending Date/Time 1/11/94; 1245
 Personnel Sieder, Poseny

Toxicant Cu
 Source EPA
 Lot # 188
 Concentration 50 mg/ml

Stock Concentration(s) con, 0.3, 0.9, 2.4, 6.0, 15.0 mg/l Cu
 Test Concentrations C, 0.001, 0.003, 0.008, 0.02, 0.05
 Dilution Water C-med (25% w/o EDTA) #'s 1559, 1564

Released From		To	
Date	Time	Date	Time
<u>01-04-94</u>	<u>1600</u>	<u>01-04-94</u>	<u>2100</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Test # 53
 NOEC 0.009
 LOEC 0.02

Notes: IC₂₅ = 0.016

#53
 Study: Jan Ref Tox 259
 Beginning Date: 1-5-94
 Ending Date: 1-11-94

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

 Page 1 of 2
 Personnel: Posey

 Time: 1245
 Time: 1245

Number of Young/Day

Treatment	By Rep.	JPP	JPP	JPP	JPP	JPP	JPP			Total Young
		1	2	3	4	5	6	7	8	
① <u>Control</u>	1	0	0	5	9	5	23			42
	2			4	8	0	15			27
	3			5	0	11	19			35
	4			6	11	0	20			37
	5			4	0	13	20			37
	6			7	11	0	17			35
	7			5	10	0	23			38
	8			6	12	10	20			48
	9			5	0	13	24			42
	10	✓	✓	6	0	15	23			44
② <u>0.001</u>	1	0	0	5	10	0	20			35
	2			5	0	11	19			35
	3			6	12	0	21			39
	4			5	12	0	21			38
	5			5	11	1	20			37
	6			6	0	13	22			41
	7			6	11	1	22			40
	8			5	0	10	21			36
	9			5	0	12	22			39
	10	✓	✓	3	0/0					3
③ <u>0.003</u>	1	0	0	6	11	0	19			36
	2			4	12	0	16			32
	3			5	9	4	15			33
	4			6	13	0	19			38
	5			4	10	0	17			31
	6			6	10	0	18			34
	7			6	11	0	19			36
	8			5	0	0	21			26
	9			6	0	12	21			39
	10	✓	✓	5	0	12	18			35
④ <u>0.008</u>	1	0	0	5	10	0	19			34
	2			5	10	0	18			33
	3			6	0	12	17			35
	4			4	11	0	18			33
	5			4	0	11	16			31
	6			7	11	1	20			39
	7			5	9	0	21			35
	8			5	0	12	17			34
	9			5	0	13	20			38
	10	✓	✓	7	0	14	19			40

0 1 2 3 4 5 6 7 8

 Chow ID#: CF16-3 CF16-4 CF16-4 CF16-4 CF16-4 CF16-4

 Algae ID#: A0524 A0524 A0525 A0525 A0525 A0525

 Dilution Water ID#: 1559 1559 1559 1564 1564 1564

 Reviewed By: JPP JPP JPP JPP JPP JPP

Notes:

PLARC501-310

On day 5-JPP discovered that there was a mix up when she was changing out rows 1,2, first part of 3. Rep 8 & 9 for tit 2 were not changed out (we did make up 2 extra cups and changed them out). We believe that there might have been a mix between tit 3 and tit 2 but only on 9,10. Did count and record young. Cnr 01-10-94. Row 1 was determined to be OK.

 Cnr *etc*

#53

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Page 2 of 2

Study: Jan Ref Tox 25%Personnel: poseyBeginning Date: 1-5-94Time: 1245Ending Date: 1-11-94Time: 1245

Number of Young/Day

Treatment	By Rep.	SPP SPP SPP SPP SPP SPP SPP SPP								Total Young
		1	2	3	4	5	6	7	8	
⑤ 0.02	1	0	0	4	9	0	20			33
	2		0	4	0	11	13			28
	3		D/O							0
	4		0	6	9	0	15			30
	5		0	5	0	8	16			29
	6		0	5	0	10	17			32
	7	✓	0	6	14	0	21			41
	8	D/O								0
	9	0	0	3	0	10	16			29
	10	0	0	5	0	12	22			39
⑥ 0.05	1	*0	D/O							0
	2	0	0	D/O						0
	3	0	D/O							0
	4	*0	D/O							0
	5	D/O								0
	6	D/O								0
	7	D/O								0
	8	D/O								0
	9	D/O								0
	10	D/O								0
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									

0 1 2 3 4 5 6 7 8

Chow ID#: CF16-3 CF16-4 CF16-4 CF16-4 CF16-4Algae ID#: A0524 A0524 A0525 A0525 A0525 A0525Dilution Water ID#: 1559 1559 1559 1564 1564 1564Reviewed By: JPR JPR JPR JPR JPR JPR

Notes:

* slow

PLARC501-310

OK att

Analysis of Reproduction (# young/female/6 days)

REFTOX #53

Starting Date: 01/05/94

Reproduction (# young/female/6 days) Data

Treatment	Replicate										Mean
	1	2	3	4	5	6	7	8	9	10	
1 CONTROL	42.0	27.0	35.0	37.0	37.0	35.0	38.0	48.0	42.0	44.0	38.50
2 0.001	35.0	35.0	39.0	38.0	37.0	41.0	40.0	36.0	39.0	3.0	34.30
3 0.003	36.0	32.0	33.0	38.0	31.0	34.0	36.0	26.0	39.0	35.0	34.00
4 0.008	34.0	33.0	35.0	33.0	31.0	39.0	35.0	34.0	38.0	40.0	35.20
5 0.02	33.0	28.0	0.0	30.0	29.0	32.0	41.0	0.0	29.0	39.0	26.10

Steel's Many-One Rank Test

Treatment	No. of Replicates	Critical Rank Sum	Rank Sum*
0.001	10	76	95.5
0.003	10	76	78.5
0.008	10	76	81.5
0.02	10	76	73.0 *

* Values less than Critical Rank Sum significantly less than the control (CONTROL).

Non-parametric analysis of toxicity data

2

3:16 Saturday, January 4, 1992

----- STUDY=REFTOX #53 ST_DATE=010594 PARM=CERR TEST=STEEL -----

OBS	TREATMENT	N CONTROL	N EFFLUENT	RANK SUM	CRITICAL RANK SUM	SIGNIFICANT DIFFERENCE
1	0.001	10	10	95.5	76	
2	0.003	10	10	78.5	76	
3	0.008	10	10	81.5	76	
4	0.02	10	10	73.0	76	*

:

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	S	T		P	C	Y	R	C	M	C	M	N	N	T	R	S	U
O	U	A	A	O	P	E	O	E	I	O	A	T	E	T	T	A	R
B	D	T	R	M	E	Q	N	F	N	N	X	R	S	N	R	N	N
S	Y	E	M	P	-	-	T	F	N	T	N	T	K	T	O	T	K
1	REFTOX	#53	010594	CERR	2	0	10	10	10	10	10	4	4	STEEL	1	0.001	114.5
2	REFTOX	#53	010594	CERR	2	0	10	10	10	10	10	4	4	STEEL	2	0.001	95.5
3	REFTOX	#53	010594	CERR	3	0	10	10	10	10	10	4	4	STEEL	1	0.003	131.5
4	REFTOX	#53	010594	CERR	3	0	10	10	10	10	10	4	4	STEEL	3	0.003	78.5
5	REFTOX	#53	010594	CERR	4	0	10	10	10	10	10	4	4	STEEL	1	0.008	128.5
6	REFTOX	#53	010594	CERR	4	0	10	10	10	10	10	4	4	STEEL	4	0.008	81.5
7	REFTOX	#53	010594	CERR	5	0	10	10	10	10	10	4	4	STEEL	1	0.02	137.0
8	REFTOX	#53	010594	CERR	5	0	10	10	10	10	10	4	4	STEEL	5	0.02	73.0

Test for Normal Distribution

3:13 Saturday, January 4, 1992

----- STUDY=REFTOX #53 ST_DATE=010594 PARM=CERR -----

UNIVARIATE PROCEDURE

Variable=CENTER

Moments

N	50	Sum Wgts	50
Mean	0	Sum	0
Std Dev	8.457698	Variance	71.53265
Skewness	-2.11207	Kurtosis	5.852558
USS	3505.1	CSS	3505.1
CV	.	Std Mean	1.196099
T:Mean=0	0	Prob> T	1.0000
Sgn Rank	176	Prob> S	0.0798
Num ^= 0	49		
W:Normal	0.779024	Prob<W	0.0001

Quantiles(Def=5)

100% Max	14.9	99%	14.9
75% Q3	4	95%	9.5
50% Med	1.8	90%	6.3
25% Q1	-1.5	10%	-6.1
0% Min	-31.3	5%	-26.1
		1%	-31.3
Range	46.2		
Q3-Q1	5.5		
Mode	-26.1		

Extremes

Lowest	Obs	Highest	Obs
-31.3(	20)	6.7(	16)
-26.1(	48)	6.9(	41)
-26.1(	43)	9.5(	8)
-11.5(	2)	12.9(	50)
-8(	28)	14.9(	47)

Tests of assumptions for untransformed data
 Test for Normal Distribution

2

3:13 Saturday, January 4, 1992

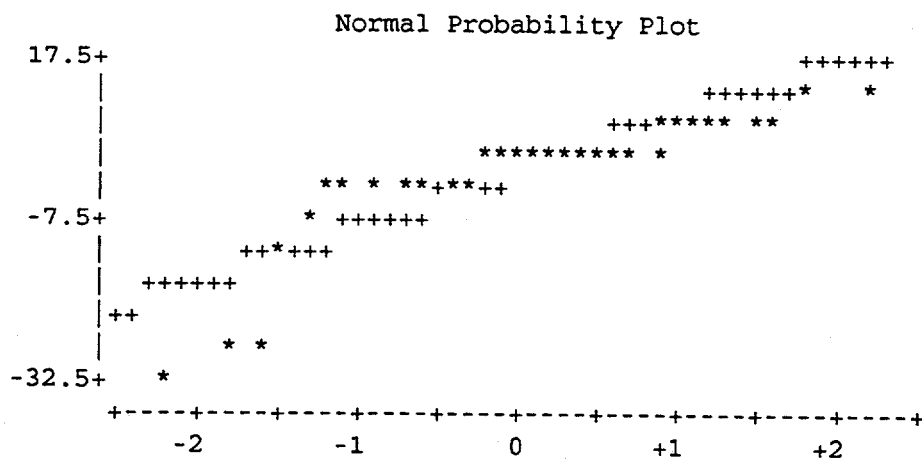
----- STUDY=REFTOX #53 ST_DATE=010594 PARM=CERR -----

UNIVARIATE PROCEDURE

Variable=CENTER

Stem Leaf	#	Boxplot
1 5	1	0
1 03	2	0
0 555566677	9	
0 011122223333444444	18	+---+---+
-0 444322222111000	15	+-----+
-0 8	1	
-1 2	1	0
-1		
-2		
-2 66	2	*
-3 1	1	*

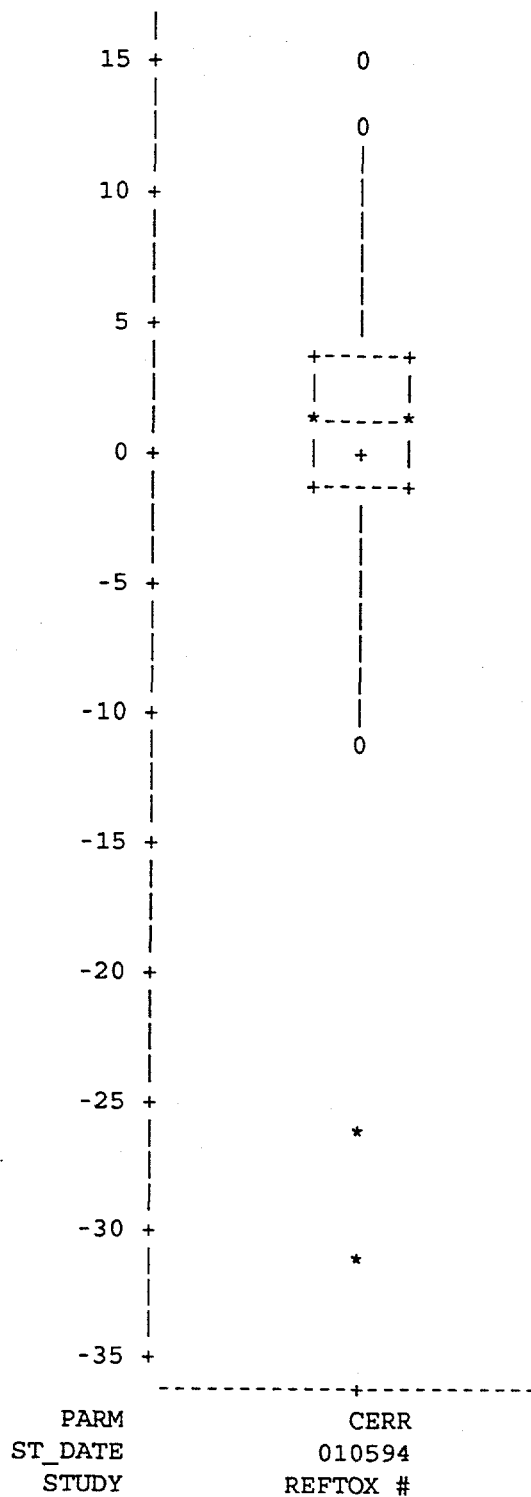
-----+-----+-----+-----+
 Multiply Stem.Leaf by 10**+1



3:13 Saturday, January 4, 1992

UNIVARIATE PROCEDURE
Schematic Plots

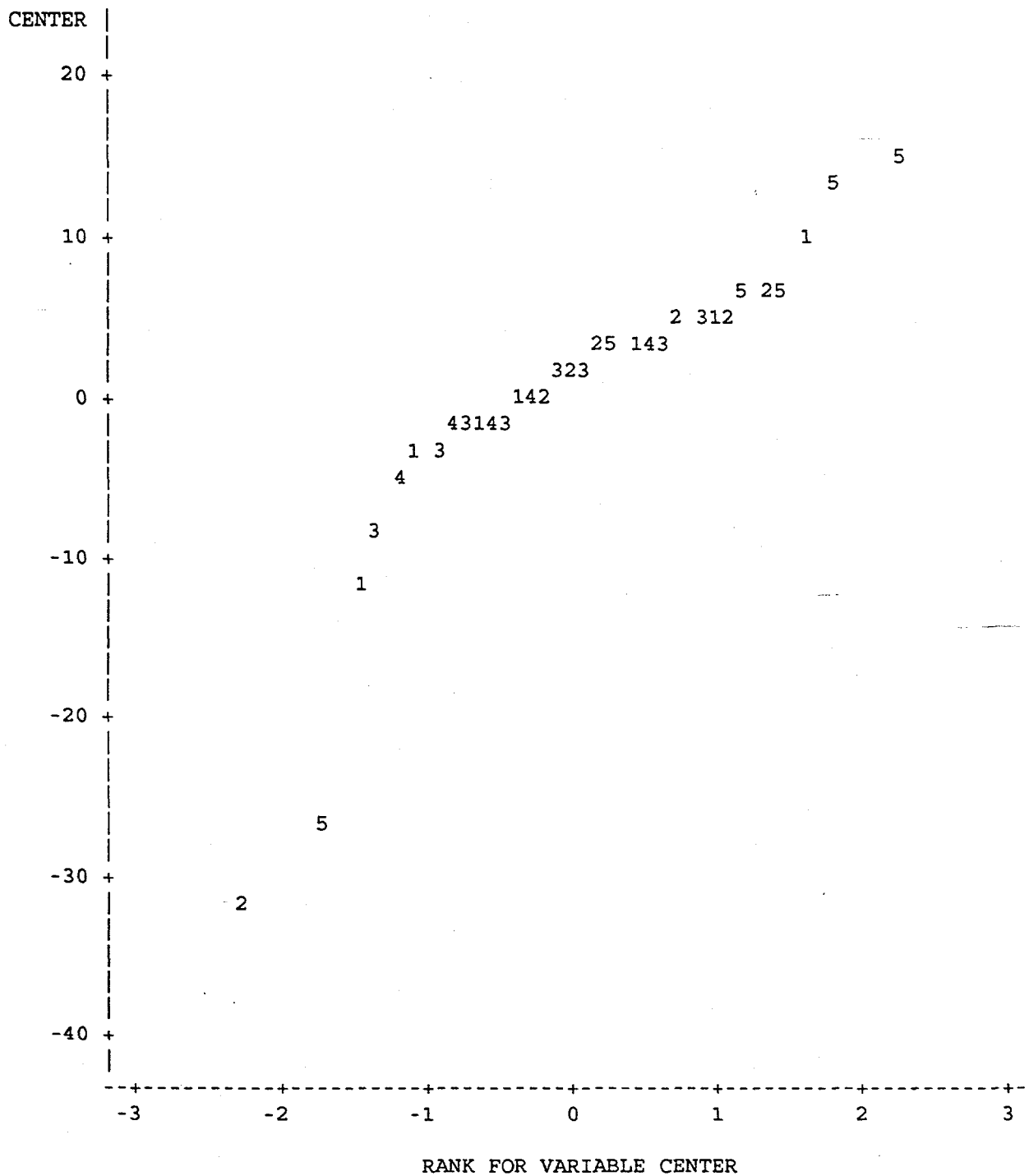
Variable=CENTER



3:13 Saturday, January 4, 1992

----- STUDY=REFTOX #53 ST_DATE=010594 PARM=CERR -----

Plot of CENTER*RANKIT. Symbol is value of TRT_NO.



NOTE: 17 obs hidden.

Tests of assumptions for untransformed data
Bartlett's Test for Homogeneous Variance

5

3:13 Saturday, January 4, 1992

STUDY=REFTOX #53
ST_DATE=010594
PARM=CERR

TREATMENT	N	MEAN	VARIANCE
CONTROL	10	38.50	34.056
0.001	10	34.30	125.122
0.003	10	34.00	14.222
0.008	10	35.20	8.400
0.02	10	26.10	207.656

BARTLETT'S TEST STATISTIC = 28.439
PROB>B = 0.000

THE NUMBER OF RESAMPLES IS 80

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
.000	38.500	38.500
.001	34.300	34.500
.003	34.000	34.500
.008	35.200	34.500
.020	26.100	26.100
.050	.000	.000

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0160.

.050	.000	.000
------	------	------

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS .0160.

* BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY *
* OF THE ESTIMATED IC_p *

THE MEAN OF THE BOOTSTRAP ESTIMATES IS .0165.

THE STANDARD DEVIATION OF THE BOOTSTRAP ESTIMATES IS .0036.

AN EMPIRICAL 95.0% CONFIDENCE INTERVAL FOR THE
BOOTSTRAP ESTIMATE IS (.0114, .0242).

C:\BOOTSTRP>

Ref 53C.TXR

Cenio Reflox #53

1 0	42
1 0	27
1 0	35
1 0	37
1 0	37
1 0	35
1 0	38
1 0	48
1 0	42
1 0	44
2 .001	35
2 .001	35
2 .001	39
2 .001	38
2 .001	37
2 .001	41
2 .001	40
2 .001	36
2 .001	39
2 .001	3
3 .003	36
3 .003	32
3 .003	33
3 .003	38
3 .003	31
3 .003	34
3 .003	36
3 .003	26
3 .003	39
3 .003	35
4 .008	34
4 .008	33
4 .008	35
4 .008	33
4 .008	31
4 .008	39
4 .008	35
4 .008	34
4 .008	38
4 .008	40
5 .02	33
5 .02	28
5 .02	0
5 .02	30
5 .02	29
5 .02	32
5 .02	41
5 .02	0
5 .02	29

[illegible]

REPTOX #53	010594 CERR 1 CONTROL	42.00	27.00	35.00	37.00	37.00	35.00	38.00	48.00	42.00	44.00
REPTOX #53	010594 CERR 2 0.001	35.00	35.00	39.00	38.00	37.00	41.00	40.00	36.00	39.00	3.00
REPTOX #53	010594 CERR 3 0.003	36.00	32.00	33.00	38.00	31.00	34.00	36.00	26.00	39.00	35.00
REPTOX #53	010594 CERR 4 0.008	34.00	33.00	35.00	33.00	31.00	39.00	35.00	34.00	38.00	40.00
REPTOX #53	010594 CERR 5 0.02	33.00	28.00	0.00	30.00	29.00	32.00	41.00	0.00	29.00	39.00

CERIODAPNIA RANDOMIZATION

Study Jan Ref Tox 25%

Personnel

Beginning Date 1-5-94

Pasey

Ending Date 1-11-94

Treatment									
10	6	4	1	7	5	3	2		
9	4	3	6	1	5	2	7		
8	1	7	5	3	2	4	6		
7	7	5	1	2	3	6	4		
6	6	4	5	3	1	2	7		
5	2	3	7	1	6	4	5		
4	1	7	2	5	4	3	6		
3	3	2	4	6	5	7	1		
2	4	5	2	3	7	1	6		
1	2	7	1	4	3	5	6		

Treatment Identification:

Notes:

1. control

2. 0.001

3. 0.003

4. 0.008

5. 0.02

6. 0.05

7. _____

8. _____

9. _____

10. _____

with EDTA

CERIODAPHNIA BROOD RECORD SHEET

Batch ID: A099

Tray #: 5

Personnel: UCB

Row	<u>A</u>	Brood Source	<u>B089 / C 2 / 8</u>	(# Young)											
10			6 11 12 0 13 19 22												
9			6 11 12 0 13 19 22												
8			6 11 12 0 13 19 22												
7			6 11 12 0 13 19 22												
6			6 11 12 0 13 19 22												
5			6 11 12 0 13 19 22												
4			6 11 12 0 13 19 22												
3			6 11 12 0 13 19 22												
2			6 11 12 0 13 19 22												
1			6 11 12 0 13 19 22												
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	B	Brood Source							3090/E-4/8		# Young				
10						3	9	11	0	13	20	18			
9						3	9	0	0	12	13	5			
8						6	8	14	0	17	19	21	22		
7						5	9	13	0	12	21	20	14	17	
6						4	10	12	0	13	18	4	24	21	
5						5	7	14	0	12	19	5	28	3	16
4						6	7	12	0	13	15	19	25	2	21
3						4	9	10	0	12	20	4	18	4	
2						5	11	13	0	12	21	1	22		17
1					0	6	10	12	0	12	16	5	26	1	17
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Row	C	Brood Source B089 / A 5 / 8										# Young				
10					6	8	15	0	13 23	4 9	23					
9					6	8	9	0	13 20	4 9	16	12				
8					5	6	16	0	12 18	4 9	24 6	18				
7					3	8	16	0	12 23	4 9	24					
6					3	9	1	0	12 18	24 25	3	22				
5					5	9	12	0	12 17	24 25	4 9	24				
4					4	9	13	0	12 23	4 9	12	23				
3					4	10	13	0	12 18	8 4 9	5	18				
2					5	9	16	0	12 21	23 25	5	23				
1					3	10	16	0	12 21	17	24	25				
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	

Time	27	28	29	30	31	1	2	3	4	5	6	count + hours
Temp	18:30	8:45	7:52	7:40	7:55	9:35	8:30	8:25	9:00			
Med.	240	1553	24.3	25.0	25.0	25.0	25.0	25.0	24.5			
Food	1553	1558	1558	1558	1558	1558	1558	1560				
Alga	CF163	CF163	CF163	CF163	CF163	CF163	CF163	CF163				
	10520	10521	10522	10523	10523	10523	10523	10524				

NOTES:

with EDTA
1555

CF 16.2 10521

1/5 Chronic (10% EDTA)

1/5 Chronic (25% EDTA)

+ = Young present in brood cup at 3 days or more than one brood present in individual cup at renewal.

Batch ID: A100 Tray #: 5 Personnel: MLD

NOTES: _____

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FINAL CHEMISTRY

Page 1 of 1

Study Ref Tox (Jan) 25% w/o Date 1-6-94
 Beginning Date 1-5-94
 Ending Date 1-11-94

Personnel Posey

Sample ID	Fish					
	By					
	Rep.	Temp.	DO	pH	Cond.	
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					

NOTES:

Ceriodaphnia			
JPP		JPP	JPP
Temp.	Sample ID	DO	pH
25.0	Control	7.5	8.0
25.2	0.001	7.5	8.0
25.2	0.003	7.4	8.0
25.1	0.008	7.4	8.0
25.1	0.02	7.4	8.0
25.1	0.05	7.5	8.0
25.3			
25.0			
25.0			
24.8			

Reviewed By: JPP

FINAL CHEMISTRY

Page 1 of 1

Study Ref Tox (Jan) 25% w/o
 Beginning Date 1-5-94 Date 1-7-94
 Ending Date 1-11-94

Personnel Posey

Sample ID	By Rep.	Fish			
		Temp.	DO	pH	Cond.
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				

NOTES:

Ceriodaphnia			
JPP	JPP	JPP	JPP
Temp.	Sample ID	DO	pH
24.8	Control	7.4	7.9
25.3	0.001	7.4	7.9
25.3	0.003	7.4	7.9
25.2	0.008	7.4	7.9
25.2	0.02	7.4	7.9
25.3	0.05	7.5	7.9
25.4			
25.2			
25.1			
25.0			

Reviewed By: JPP

FINAL CHEMISTRY

Page 1 of 1

Study Ref Tok (Jan) 25% w/o Date 1-8-94
 Beginning Date 1-5-94
 Ending Date 1-11-94

Personnel Poey

Sample ID	By	Fish				
		Rep.	Temp.	DO	pH	Cond.
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					
	1					
	2					
	3					
	4					

Ceriodaphnia			
JPP		JPP	JIP
Temp.	Sample ID	DO	pH
24.8	Control	7.9	7.8
25.0	0.001	7.8	7.8
25.1	0.003	7.8	7.8
25.1	0.008	7.8	7.8
25.1	0.02	7.8	7.8
25.2	0.05	7.8	7.8
25.3			
25.0			
25.1			
24.8			

NOTES:

Reviewed By: JPP

FINAL CHEMISTRY

Page 1 of 1

Study Ref Tok (Jan) 25% w/o
 Beginning Date 1-5-94 Date 1-9-94
 Ending Date 1-11-94

Personnel Posey

Sample ID	By	Fish			
		Rep.	Temp.	DO	pH
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				

Ceriodaphnia			
JPP	JPP	JPP	JPP
Temp.	Sample ID	DO	pH
25.0	Control	7.7	7.8
25.0	0.001	7.6	7.9
25.0	0.003	7.6	7.9
24.9	0.008	7.6	7.8
24.8	0.02	7.6	7.9
25.0	0.05	—	—
25.1			
24.8			
24.9			
24.6			

NOTES:

Reviewed By: JPP

FINAL CHEMISTRY

Page 1 of 1

Study Ref Tox (Jan) 25% w/o
 Beginning Date 1-5-94 Date 1-10-94
 Ending Date 1-11-94

Personnel Porey

Sample ID	Fish				
	By				
	Rep.	Temp.	DO	pH	Cond.
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				

Ceriodaphnia			
JPP		JPP	JPP
Temp.	Sample ID	DO	pH
24.9	Control	7.9	7.9
24.7	0.001	7.9	7.9
25.0	0.003	7.9	7.9
25.0	0.008	7.9	7.9
25.0	0.02	7.9	7.9
25.1	0.05	7.9	7.9
25.0			
24.8			
24.8			
24.5			

NOTES:

Reviewed By: JPP

FINAL CHEMISTRY

Page 1 of 1

Study Ref Tox (Jan) 25% w/o
 Beginning Date 1-5-94 Date 1-11-94
 Ending Date 1-11-94

Personnel Poser

Sample ID	Fish				
	By				
	Rep.	Temp.	DO	pH	Cond.
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				
	1				
	2				
	3				
	4				

NOTES:

Ceriodaphnia			
JPP		JPP	JPP
Temp.	Sample ID	DO	pH
25.3	Control	7.7	7.8
25.1	0.001	7.7	7.8
25.1	0.003	7.6	7.8
25.0	0.008	7.6	7.8
24.9	0.02	7.6	7.8
25.0	0.05	-	-
25.2			
25.0			
25.2			
24.8			

Reviewed By: JPP

Project Instrument Record Sheet

Project Study Cerio Reflex #53

Beginning Date 01-05-94

Ending Date 01-11-94

DO Meter

Model VSI model 57

TVA Tag 543344

Calibration Date Aug 10, 1993

pH Meter(s)

Model Lonclay / model 399M

TVA Tag 543347

Calibration Date Nov 16, 1993

Model Orion SA250

TVA Tag 7413

Calibration Date Nov 20, 1993

Conductivity Meter

Model VSI model 32

TVA Tag 577780

Calibration Date Nov 1, 1993

Thermometer(s)

Model Sama CT-40 Ertco

TVA Tag m205

Calibration Date May 10, 1993

Model _____

TVA Tag _____

Calibration Date _____

PROJECT REAGENT RECORD SHEET

Project/Study: Cenio Ref #53
 Personnel: Russell

Beginning Date: 01-05-94
 Ending Date: 01-11-94

WINKLER TITRATION METHOD

Alkaline-Iodide-Azide:

Brand Fisher
 Lot # 91006224
 Exp. Int

Manganous Sulfate:

Brand Fisher
 Lot # 91006724
 Exp. Int

Sodium Thiosulfate:

Brand Ricca
 Lot # M158
 Exp. Sept 1994

Sulfuric Acid:

Brand Mallinckrodt
 Lot # 2876 KCM
 Exp. Int

Thyodene:

Brand Fisher
 Lot # 912254
 Exp. Int

pH BUFFER SOLUTIONS

pH 4:

Brand Mallinckrodt
 Lot # 0097 KLEA
 Exp. Sept 1994

pH 7:

Brand Mallinckrodt
 Lot # 0098 KLDX
 Exp. Sept 1994

pH 10:

Brand Mallinckrodt
 Lot # 0099 KLB8
 Exp. Jan 1994

pH _____:

Brand _____
 Lot # _____
 Exp. _____

CONDUCTIVITY STANDARD SOLUTIONS

200 μ mhos:

Brand Biopharm
 Lot # L292A
 Exp. Jan 1995

720 μ mhos:

Brand Biopharm
 Lot # E052A/L222C
 Exp. May 1994 / Dec 1994

_____ μ mhos:

Brand _____
 Lot # _____
 Exp. _____

ALKALINITY TITRATION

Sulfuric Acid Solution N/50:

Brand Mallinckrodt
 Lot # H341-K5TH
 Exp. Int

HARDNESS TITRATION

Hardness Titrating Solution:

Brand Calgon
 Lot # R2037700
 Exp. Int

Hardness Indicator:

Brand Calgon
 Lot # 011918
 Exp. Int

Hardness Buffer Solution:

Brand Calgon
 Lot # 26C10B
 Exp. Int

CHLORINE TITRATION

DPD Powder Pillows:

Brand Hach
 Lot # 073F
 Exp. Int

Potassium Iodide:

Brand EM Science
 Lot # 9139
 Exp. Int

FAS:

Brand Ricca
 Lot # D228
 Exp. Jan 19, 1994