

Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) Spray Dried Powder for Controlling Zebra Mussels Adhering to Test Substrates



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Conversion Factors

International System of Units to Inch/Pound

Multiply	Ву	To obtain
	Length	
centimeter (cm)	0.3937	inch (in.)
micrometer (µm)	3.937×10^{-5}	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	1.094	yard (yd)
nanometer (nm)	3.937x10 ⁻⁸	inch (in.)
	Area	
hectare (ha)	2.471	acre
	Volume	
liter (L)	1.057	quart (qt)
milliliter (mL)	0.03382	ounce, fluid (fl. oz)
	Flow rate	
liter per minute (L/min)	0.2642	gallon per minute (gal/min)
milliliter per minute (mL/min)	0.0002642	gallon per minute (gal/min)
	Mass	
gram (g)	0.03527	ounce, avoirdupois (oz)
milligram (mg)	3.527 x10 ⁻⁵	ounce, avoirdupois (oz)

Conductivity is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

Concentrations of chemical constituents in water are given in milligrams per liter (mg/L).

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as °F = $(1.8 \times °C) + 32$.

Abbreviations

AEH Aquatic Ecosystem Health

ASTM American Society for Testing and Material

BI benthic injection
CaCO₃ calcium carbonate

d day(s)

DNR Department of Natural Resources

DO dissolved oxygen

EPA U.S. Environmental Protection Agency

h hour(s)

ID inside diameter

MBI Marrone Bio Innovations

NH₃ un-ionized ammonia

SAS Statistical Analysis Software

SDP spray dried powder
TAN total ammonia nitrogen

Pf-CL145A Pseudomonas fluorescens strain CL145A

UMESC Upper Midwest Environmental Sciences Center

USGS U.S. Geological Survey WWC whole water column

Efficacy of *Pseudomonas fluorescens* (*Pf*–CL145A) Spray Dried Powder for Controlling Zebra Mussels Adhering to Test Substrates

By James A. Luoma, ¹ Todd J. Severson, ¹ Kerry L. Weber, ¹ and Denise A. Mayer²

Abstract

A mobile bioassay trailer was used to assess the efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) spray dried powder (SDP) formulation for controlling zebra mussels (*Dreissena polymorpha*) from two midwestern lakes: Lake Carlos (Alexandria, Minnesota) and Shawano Lake (Shawano, Wisconsin). The effects of SDP exposure concentration and exposure duration on zebra mussel survival were evaluated along with the evaluation of a benthic injection application technique to reduce the amount of SDP required to induce zebra mortality.

Groups of zebra mussels were collected from each lake and allowed to adhere to test substrates for at least 15 days before exposure to SDP. Two independent trials were completed at each lake: (1) a whole water column (WWC) application trial was used to evaluate the effects of SDP exposure concentration and exposure duration on zebra mussel survival; and (2) a benthic injection (BI) application trial in which the SDP was injected into the test tanks to determine the efficacy of a benthic injection application technique to reduce the amount of SDP required to induced zebra mussel mortality. Three exposure durations (6, 9, and 12 hours) were evaluated in the WWC trials and a 12-hour exposure duration was evaluated in the BI trials. All trials contained zebra mussels which were removed at the completion of each exposure duration, consolidated into wire mesh cages, and held in the lake for approximately 30 days before being assessed for survival.

For all trials, treatment was assigned to each test tank according to a randomized block design (n = 3 test tanks per treatment). The treatment groups included (1) an untreated control group, (2) a group that received an application of 50 milligrams of SDP per liter (mg SDP/L), and (3) a group that received an application of 100 mg SDP/L. During the BI trials, SDP was administered to achieve the desired exposure concentration in the bottom 50 percent (175 L) of the test tank. All exposure concentrations are reported as active ingredient.

Approximately 30 days after exposure, zebra mussels were sorted into live and dead, and enumerated. Mean survival of zebra mussels in control treatments exceeded 95 percent. Mean survival of zebra mussels in the Lake Carlos WWC SDP-treated groups ranged from 0.5 to 2.1 percent and when compared at the same exposure duration, no difference was detected in survival between the 50 and 100 milligrams per liter (mg/L) treatment groups. Similarly, mean survival of zebra mussels in the Shawano Lake WWC SDP-treated groups ranged from 2.0 to 12.6 percent and when compared at the same exposure duration, no difference was detected in survival between the 50- and 100-mg/L treatment

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¹ U.S. Geological Survey

² New York State Education Department

groups. Mean survival of zebra mussels in the Lake Carlos BI trial SDP-treated groups did not differ (p=0.93) and was 18.1 and 18.0 percent in the 50- and 100-mg/L treatment groups, respectively. Mean survival of zebra mussels in the Shawano Lake BI trial SDP-treated groups differed (p<0.01) and was 2.9 and 0.9 percent in the 50- and 100-mg/L treatment groups, respectively. Survival of zebra mussels assigned to the SDP-treated groups in the Lake Carlos WWC trial (12-hour exposure duration) differed from the survival of zebra mussels assigned to the SDP-treated groups in the Lake Carlos BI trial; however, after modification of the BI application technique, no difference (p=0.22) was detected between the survival of zebra mussel in the Shawano Lake WWC (12-hour exposure duration) and BI trials.

Introduction

Freshwater mussels native to North America (order Unionoida) are considered the most diverse in the world, consisting of approximately 297 recognized taxa, but they have been declining at an alarming rate due to anthropogenic activities such as pollution, habitat alteration, and over harvest (Williams and others, 1993; Neves and others, 1997). A survey completed by the Nature Conservancy revealed 55 percent of North America's mussels are either extinct or imperiled (Master, 1990). The North American mussel extinction rate is predicted to be 6.4 percent per decade, which equates to the extinction of 127 species in the next 100 years (Ricciardi and Rasmussen, 1999). This prediction may be conservative, as it did not account for the invasion of North American waterways by dreissenid mussels (zebra mussel, *Dreissena polymorpha* and quagga mussel, *Dreissena bugensis*).

Dreissenid mussels are ideal invaders due to their high fecundity and their planktonic larvae, which are capable of dispersal over vast areas (Birnbaum, 2011). Dreissenid mussels pose a serious ecological threat and negatively affect many native aquatic species, particularly freshwater mussels. Dreissenid mussels can quickly inundate freshwater mussels and cause obstruction of valve movement as well as inhibition of feeding and respiration (Burlakova and others, 2000) resulting in an increased cost of metabolism, decreased fitness, and ultimately death (Baker and Hornbach, 1997).

Natural resource managers lack readily available, environmentally safe, and effective tools for controlling dreissenid mussels in open-water environments. One potential tool for limited open-water control of dreissenid mussels is a commercially formulated spray dried powder (SDP) formulation of *Pseudomonas fluorescens* (Zequanox®), produced by Marrone Bio Innovations, Inc. (MBI; Davis, California), which contains nonviable cells of a specific strain (CL145A) of the common soil bacterium *Pseudomonas fluorescens*. The SDP formulation was developed by MBI and registered by the U.S. Environmental Protection Agency for control non-native dreissenid (zebra and quagga) mussels in raw water conduit systems (that is, industrial cooling and irrigation systems, and so forth) and it has recently been approved for use in limited open-water environments.

The objectives of this study were (1) to evaluate the potential use of *Pseudomonas fluorescens* spray dried powder (SDP) formulation for controlling zebra mussels (*Dreissena polymorpha*) in limited open-water environments; and (2) to evaluate the use of a benthic injection (BI) application technique to reduce the amount of SDP required to induce zebra mussel mortality.

The applications for this study were completed in the Upper Midwest Environmental Science Center's (UMESC) mobile bioassay laboratory, which used water and test animals from two midwestern lakes: Lake Carlos (Alexandria, Minnesota) and Shawano Lake (Shawano, Wisconsin). This final study report summarizes four separate field trials with activities carried out from October, 2011 to November, 2013. Applications of SDP were completed on August 15 and 17, 2012 at Lake Carlos and on September 6 and 8, 2012 at Shawano Lake.

Materials and Methods

All methods and materials followed the written protocol and its amendments, except those instances that were identified as deviations (appendix 2, items 1–6). The study protocol and amendments for this study are contained in appendix 1 (items 1–2).

Experimental Design

The study SDP applications were completed within the UMESC mobile bioassay laboratory, which used water and test animals from two midwestern lakes: Lake Carlos (Alexandria, Minn.) and Shawano Lake (Shawano, Wis.). Survival of zebra mussels was assessed approximately 30 days after exposure to SDP. Groups of zebra mussels were collected from each lake and allowed to adhere to perforated aluminum test substrates for at least 15 days before exposure to SDP. Zebra mussels adhering to the test substrates were exposed to SDP in a series of nine 350-liter (L) test. Two independent trials were completed at each test location (1) a whole water column (WWC) application trial, which evaluated the effects of SDP exposure concentration and exposure duration on zebra mussel survival, and (2) a BI application trial, which evaluated the use of a BI application technique to reduce the amount of SDP required to induce zebra mussel mortality.

Treatments were administered in triplicate according to a randomized block design (appendix 3, items 1, 4, 7, and 10) and included (1) an untreated control group, (2) a group that received an application of 50 milligrams SDP per liter (mg SDP/L), and (3) a group that received an application of 100 mg SDP/L. The experimental unit was the individual test tank. Test substrates with adhering zebra mussels were distributed to test tanks according to a random distribution scheme (appendix 3, items 2, 5, 8, and 11).

Each WWC test tank contained nine test substrates with adhering zebra mussels and each BI test tank contained either three (Lake Carlos) or four (Shawano Lake) test substrates with adhering zebra mussels. Upon exposure termination during the WWC trials (6, 9, and 12 hours), three randomly selected test substrates were removed from each test tank. Upon exposure termination during the BI trials (12 hours), all test substrates were removed from each test tank. After exposure, the test substrates with adhering zebra mussels were consolidated into wire mesh cages, which were placed in approximately 2.5 meters (m) of water for the post-exposure period. Approximately 30 days after SDP exposure, zebra mussels were sorted into live and dead, and enumerated. Zebra mussels from one test substrate of each treatment level and exposure duration were retained in 70 percent isopropyl alcohol for length measurement.

Test Article

The test article was a commercially prepared SDP formulation of *Pseudomonas fluorescens*, strain CL145A containing 50 percent active ingredient (weight to weight ratio [w/w] *P. fluorescens*, strain CL145A). The test article was provided by the manufacturer as a mixed lot (401P12163C and 401P12164C; Certificates of Analysis, appendix 4, items 3 and 4). Test article use was documented in the test chemical log books (appendix 4, items 9–13). Concentrations of the test article are reported as active ingredient. Retention of test article biological activity was assessed after exposure by New York State Museum Field Research Laboratory (Cambridge, New York) using their standard dreissenid mussel bioassay (appendix 4, item 8). Results of the biological activity bioassay demonstrated a mean (standard deviation) mortality of 70.7 percent (4.6) at 200 mg/L, which was similar to mean mortality exhibited by the cell fraction positive control which was 73.3 percent (8.3), confirming the biological activity of the test article.

Test Locations

Two midwestern lakes with different water-quality characteristics were the test locations and the source of the test water and test animals. Lake Carlos is a 1,020-hectare (ha) mesotrophic lake located near Alexandria, Minn., and it is the deepest natural lake in Minnesota (excluding Lake Superior), with a maximum depth of 49.7 m. Shawano Lake is a 2,515-ha eutrophic lake located in Shawano, Wis., with a maximum depth of 12 m. Zebra mussels were first reported in Shawano Lake in 2002 and in Lake Carlos in 2009 (Turyk and others, 2008; Engel and others, 2010).

Test System

The test system was a series of nine independent circular test tanks (76 x 95 centimeters (cm), diameter x height; 350 L capacity) contained within the UMESC mobile bioassay laboratory. The test tanks were positioned in two rows with four test tanks in one row and five test tanks in the other (fig. 1). Test substrates were used as the medium to facilitate zebra mussel handling during the study period. The test substrates were constructed of perforated aluminum (4.8 millimeter (mm) hole, 51 percent open area, 1.6 mm thick) folded into trays (15.2 x 15.2 x 2.5 cm, length x width x height [fig. 2]).

Test water was supplied to the test system from a 3-horsepower submersible well pump (ITT Goulds Pumps, Seneca Falls, N.Y., model 18GS30). The water was filtered (200 micrometers [µm]) using a microscreen filtration system (Forstra Filter Inc., Los Angeles, California; model M1-90), delivered to two headboxes (30.5 x 55.9 x 114.3 x 30.5 cm, width x length x height; one headbox per test tank row), and gravity fed to each test tank at approximately 6 liters per minute, providing approximately one tank-exchange per hour. Water flow was interrupted during the exposure period. Untreated water was discharged to the lake; SDP-treated water was collected in frame tanks and removed by a state-licensed septic hauler and disposed of by land application (Minnesota) or discharge to a sanitary sewer system (Wisconsin).

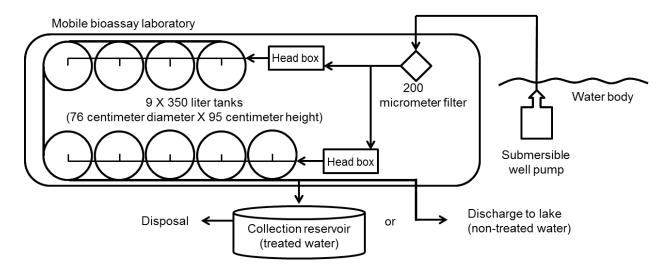


Figure 1. Schematic of mobile bioassay laboratory.







Figure 2. Example of test substrate with zebra mussels during initial placement (left), after adherence (center), and prepared for exposure in a semirigid plastic mesh containment bag (right).

Test Animals

Zebra mussels were collected from existing colonies within each lake and placed on test substrates. Zebra mussels adhering to the test substrates immediately prior to allocation to the test tanks were used as the test animals. Mean shell length for the zebra mussels used in the Lake Carlos trials ranged from 11.26 to 11.85 mm and the mean shell length for the zebra mussels used in the Shawano Lake trials ranged from 18.27 to 18.74 mm (appendix 5, items 2–5).

Test Animal Collection and Initial Placement

In October and November 2011, natural substrates (that is, rocks, sticks, and native mussels) with adhering zebra mussels were collected from each lake and the zebra mussels were removed by severing the byssus with a scalpel. Zebra mussels were held in coolers containing lake water until placed onto the test substrates. Approximately 200 to 300 zebra mussels were indiscriminately selected and placed on each test substrate. After zebra mussel placement, wood spacers (\approx 2 cm thick) were used to separate the test substrates (fig. 3) before they were secured in vertical stacks (\approx 10 substrates per stack). Six stacks were placed in each of three wire mesh cages at each lake (\approx 180 substrates per lake; fig. 3). The wire mesh cages were placed in \approx 2 m of water to allow for zebra mussel adherence through winter. Due to poor overwinter survival, zebra mussels on the Shawano Lake test substrates were replaced in August of 2012 following the procedures previously described. The zebra mussels used in the Shawano Lake trial were allowed to adhere to the test substrates \approx 16 days prior to exposure.





Figure 3. Example of stacked test substrates (left) and wire mesh cage (right).

Preparation and Distribution to the Test System

One day prior to SDP exposure, test substrates were inverted to dislodge non-adhering zebra mussels. Moribund zebra mussels and shell fragments were removed from each test substrate with forceps. Test substrates with adhering zebra mussels were placed into a uniquely identified semirigid plastic mesh containment bags (20.3 x 25.4 x 5.1 cm; 0.32 x 0.42 cm openings) and randomly allocated to test tanks (appendix 3, items 2, 5, 8, and 11). The WWC trials at both lakes received nine test substrates per test tank (three per exposure duration), whereas the BI trials received three (Lake Carlos) or four (Shawano Lake) test substrates per test tank.

Post-Exposure Handling

Upon exposure termination (that is, 6, 9, and 12 hours [h] for WWC; 12 h for BI), test substrates were removed from the test tanks according to a randomization scheme (appendix 3, items 3, 6, 9, and 12) and consolidated in wire mesh cages. Test substrates removed from all test tanks at each exposure duration were indiscriminately placed into a single wire mesh cage (for example, all test substrates removed at 6 h were placed into the same wire mesh cage). The wire mesh cages were placed in ≈ 2.5 m of water, in the respective lake, for the ≈ 30 -day post-exposure period.

Survival Assessment

Zebra mussel survival was assessed 26–27 days after SDP exposure at Lake Carlos and 32–34 days after SDP exposure at Shawano Lake. Survival was determined by examining valve movement in response to mechanical stimuli or resistance to valve pressure by adductor muscle contraction. Zebra mussels < 6 mm were excluded from the analyses because they could readily pass through the plastic

mesh containment bags and because of the potential for inconsistent survival assessment of small mussels (that is, inconsistent assessment of adductor muscle response). Zebra mussels from each test substrate were sorted into groups of live or dead and enumerated. Zebra mussels from one test substrate at each treatment level and exposure duration were indiscriminately selected and retained in 70 percent isopropyl alcohol to measure for shell length with digital calipers.

Dosing

Stock solutions used to administer treatments were prepared by adding pre-weighed aliquots of SDP (appendix 4, items 5 and 6) into known volumes of filtered (200 μ m) lake water and mechanically mixing with a paint mixer attached to an electric drill for 3–5 minutes. The solution was then immediately poured through a mesh colander and any clumps of SDP were pulverized with a pestle and rinsed into the stock solution with filtered lake water. During all trials, control treatments were completed using the same methods as the SDP-treated groups with the exception that no SDP was applied. For all trials, concentrations of SDP are reported as active ingredient.

Whole Water Column Application

Separate stock solutions were prepared for each test tank replicate in the WWC trials. Stock solutions for the WWC were prepared by adding SDP (35 grams [g] for the 50 milligrams per liter [mg/L] treatment; 70 g for the 100-mg/L treatment) to \approx 8 L of water removed from each test tank. Immediately after preparation, each stock was poured into the respective test tank and gently mixed with the test tank water.

Benthic Injection Application

An injection system was constructed to treat the bottom 50 percent (175 L) of each test tank during the BI trials (fig. 4). A peristaltic pump (Masterflex Digi-staltic drive, model 77310; Cole-Parmer, Vernon Hills, Illinois) was used to inject the SDP stock at the selected depth in each test tank through a delivery apparatus consisting of four peristaltic tubing lines (Masterflex L/S 14 tubing; 1.6 mm Inside Diameter [ID]), which terminated with dispersion nozzles designed to disperse test article horizontally in the water column. Each dispersion nozzle was constructed from a modified plastic cylindrical check valve (Penn-Plax, Inc.; model CV1 check-valve/air-filter; Hauppauge, N.Y.) with four 2-mm holes drilled around the circumference (fig. 4). At Shawano Lake, the SDP stock concentrations were diluted, the stock delivery rate was increased, and the injection height was raised to decrease SDP settling.

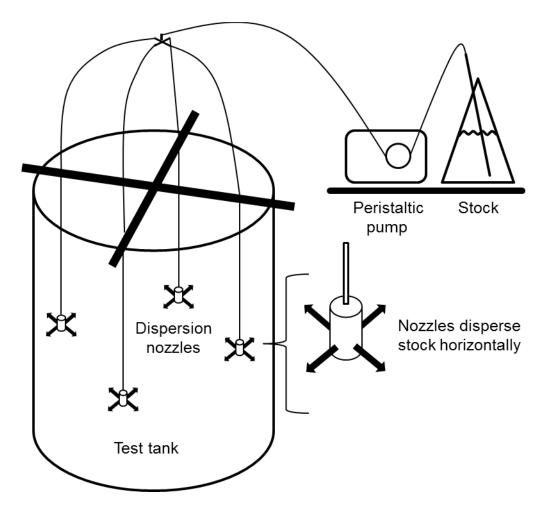


Figure 4. Schematic of benthic injection application system.

Benthic Injection Application at Lake Carlos

Separate 15,000 and 30,000 mg SDP/L stock solutions were prepared for the 50- and 100-mg/L Lake Carlos BI treatment applications, respectively. Approximately 583 milliliters (mL) of the appropriate stock solution was delivered to each test tank at 62 mL/minute, resulting in delivery of $\approx 8,750$ and 17,500 mg of SDP to each 50 and 100 mg/L test tank replicate, respectively. The amount of stock solution injected was the volume required to achieve the target SDP exposure concentration in the bottom 50 percent (175 L) of the test tank. The stock solution was delivered ≈ 19 cm from the bottom of each test tank.

Benthic Injection Application at Shawano Lake

Separate 2,500 and 5,000 mg SDP/L stock solutions were prepared for the 50- and 100-mg/L Shawano Lake BI treatment applications, respectively. Approximately 3,500 mL of the appropriate stock solution was delivered to each test tank at 350 mL/minute, resulting in delivery of \approx 8,750 and 17,500 mg of SDP to each 50 and 100 mg/L test tank replicate, respectively. The amount of stock solution injected was the volume required to achieve the target SDP exposure concentration in the bottom 50 percent (175 L) of the test tank. The stock solution was delivered \approx 38 cm from the bottom of each test tank.

Exposure Concentrations

Water samples were collected for SDP exposure concentration determination from different locations within test tanks depending on application type (WWC or BI) and trial location. Surface samples were collected by submersing a 50-mL beaker below the water surface. Suspended (\approx 15 or 19 cm from the test tank bottom) and bottom samples (Lake Carlos BI trial only) were collected from test tanks using a peristaltic pump (Masterflex Digi-staltic drive, model 77310; Cole-Parmer, Vernon Hills, Ill.) fitted with four 1.6-mm ID collection lines. Approximately 200 mL of exposure water was purged through peristaltic tubing and discarded before sample collection.

Exposure concentrations were determined by comparing the test tank water sample absorbance to a linear regression curve created from known active ingredient concentrations of SDP (25, 50, 100, and 200 mg/L). Absorbance was measured using a Barnstead/Turner SP-830 Plus spectrophotometer (model SM110215) at 660 nanometers (nm). Linear regression equations were fit using the Statistical Analysis Software Proc Reg procedure (SAS® Version 9.3, SAS Institute, Inc., Cary, North Carolina). The exposure concentrations were predicted from the regression analysis (appendix 7, items 2–4, 6–8, 10–12, 14–16). The known concentrations of SDP used to create the linear regression were maintained at approximately 4 degrees Celsius (°C) and measured for absorbance at 6, 9, and 12 h after treatment administration to ensure proper spectrophotometer function with the exception of the Lake Carlos WWC trial, in which the known concentrations were measured at 9 and 12 h.

The SDP exposure concentrations in the Lake Carlos WWC trial were determined from surface water samples at 1, 3, 6, 9, and 12 h and suspended (\approx 15 cm) water samples at 3, 6, 9, and 12 h. The SDP exposure concentrations in the Lake Carlos BI trial were determined from suspended (\approx 19 cm) water samples at 1, 3, 6, 9, and 12 h and from bottom water samples at 6, 9, and 12 h. Because sample absorbance was below the detection limit, samples from control test tanks were not analyzed for SDP concentration during the Lake Carlos trials. Control water samples were analyzed for SDP in the Shawano Lake trials, and were below the detection limit. The SDP exposure concentrations in the Shawano Lake WWC trial were determined from surface water and suspended (\approx 15 cm) water samples at 1, 3, 6, 9, and 12 h. The SDP exposure concentrations in the Shawano Lake BI trial were determined from surface water and suspended (\approx 15 cm) water samples at 1, 3, 6, 9, and 12 h.

Water Chemistry

Dissolved oxygen, pH, temperature, hardness, alkalinity, and conductivity were measured ≈ 1 h prior to treatment administration from filtered lake water samples collected from the distribution headboxes. Dissolved oxygen, pH, and temperature were measured in each test tank within 1 h and ≈ 3 , 6, 9, and 12 h after treatment administration during the WWC and BI trials.

Water samples for total ammonia nitrogen (TAN) analysis were collected 12 h after SDP application during all trials and at 6 and 9 h after SDP application during the Lake Carlos WWC trial. Water samples were filtered (0.45 μ m), acidified with 10 percent sulfuric acid to \leq pH 2.5, and stored at \approx 4 °C until analyzed for TAN by the UMESC water-quality laboratory using the automated phenate method (Standard Method 4500G; American Public Health Association, 2012). Un-ionized ammonia concentrations were calculated from TAN, pH, and temperature from time of sample collection using the formula identified by Emerson and others (1975).

Four data loggers (Onset Inc, Bourne, Massachusetts; HOBO® Pendent Temperature/Light Data Logger, model UA-002064) were attached to the wire mesh cages at each lake and used to measure water temperature four times daily during the post-exposure period.

Data Analysis

Data analyses for water chemistry parameters were limited to simple summary statistics; comparative statistics were not generated. Exposure concentration means were determined using SAS® software version 9.3 (SAS Institute, Inc., Cary, N.C.). The SAS® software Proc Means procedure was used to determine the mean exposure concentration by individual test tank, treatment group, and exposure duration (appendix 7, items 2–4, 6–8, 10–12, 14–16). Because of observations of SDP settling and non-detectable levels of SDP in the suspended water samples, the bottom water sample exposure concentrations for the Lake Carlos BI trial are reported. The suspended water exposure concentrations for Shawano Lake BI trials are reported due to negligible (\leq 3mg/L) SDP exposure concentrations measured in the surface water samples.

Zebra Mussel Survival

Statistical comparisons of zebra mussel survival were completed using SAS software version 9.3. Significance was declared at $\alpha \leq 0.05$. A generalized linear mixed model was used to analyze the survival of zebra mussels in each treatment group (appendix 9, items 1–3). The proportion of mortalities (number of dead zebra mussels compared to the total number of zebra mussels in the sample) was modeled using the SAS software Proc GLIMMIX procedure with a binomial distribution and a logit link function. A scale parameter was added to the model using the SAS software random_residual_statement. Zebra mussel survival in each treatment group was individually compared to the zebra mussel survival in the untreated control group using a two-sided means comparison test.

Results

Water chemistry parameters (dissolved oxygen, pH, and temperature) collected from the test tanks are summarized in table 1 and the water chemistry data are in appendix 6 (items 1–14). Water hardness, alkalinity, and conductivity are summarized in table 2. Dissolved oxygen levels remained above the minimum threshold recommended for freshwater mussels (4.0 mg/L, ASTM International, 2013) and the mean TAN remained below the criterion for acute exposure and below 4-day maximum criterion for chronic exposure during the exposure period (U.S. Environmental Protection Agency, 2013; table 3). Mean daily temperatures ranged from 20.6 to 24.4 °C (Lake Carlos) and from 10.1 to 21.5 °C (Shawano Lake) during the post-exposure period.

Table 1. Mean (standard deviation) water chemistry parameters (dissolved oxygen and temperature) and pH range of each treatment group during the study period.

[mg/L, milligrams per liter; DO, dissolved oxygen; °C, degrees Celsius]

Water chemistry parameter	Treatment group (mg/L)	Pre- exposure ¹	≤1 h	3 h	6 h	9 h	12 h
		Lake Carlos	whole water colu	umn application			
DO (mg/L)	0	8.77 (0.02)	8.72 (0.04)	8.58 (0.09)	8.51 (0.04)	8.25 (0.03)	8.11 (0.01)
	50	8.76 (0.01)	8.66 (0.02)	8.42 (0.01)	8.21 (0.04)	7.80 (0.09)	6.62 (0.13)
	100	8.76 (0.01)	8.64 (0.01)	8.38 (0.04)	8.06 (0.10)	7.74 (0.07)	6.84 (0.07)
pН	0	8.62-8.64	8.60-8.63	8.56-8.58	8.54-8.58	8.25-8.31	8.55-8.58
	50	8.61-8.65	8.57	8.47-8.49	8.47-8.49	8.20-8.21	8.33-8.35
	100	8.60-8.63	8.53	8.37-8.39	8.37-8.39	8.12	8.21-8.24
Temperature (°C)	0	22.2 (<0.1)	22.3 (<0.1)	22.4 (<0.1)	22.5 (<0.1)	22.5 (<0.1)	22.5 (<0.1)
	50	22.1 (<0.1)	22.3 (<0.1)	22.4 (<0.1)	22.5 (0.0)	22.4 (0.1)	22.4 (<0.1)
	100	22.2 (0.0)	22.3 (0.0)	22.4 (<0.1)	22.5 (<0.1)	22.4 (0.1)	22.4 (0.1)
		Shawano Lake	e whole water co	olumn application	1		
DO (mg/L)	0	7.34 (0.02)	7.24 (0.07)	7.07 (0.03)	6.85 (0.06)	6.63 (0.02)	6.43 (0.10)
	50	7.36 (0.02)	7.24 (0.04)	6.97 (0.10)	6.57 (0.08)	5.86 (0.19)	4.22 (0.64)
	100	7.36 (0.01)	7.25 (0.07)	7.01 (0.03)	6.56 (0.08)	6.03 (0.18)	4.79 (0.55)
pH	0	9.31-9.34	9.27-9.28	9.23-9.24	9.14-9.15	9.12-9.16	9.02-9.08
	50	9.33-9.34	9.22	9.11–9.14	9.06-9.08	8.99-9.02	8.73-8.85
	100	9.34	9.14–9.16	9.07-9.08	8.97-9.00	8.87-8.93	8.62-8.73
Temperature (°C)	0	22.6 (0.0)	22.0 (<0.1)	22.0 (0.2)	22.1 (0.3)	22.2 (0.4)	22.0 (0.4)
	50	22.6 (<0.1)	21.9 (0.1)	21.9 (0.1)	21.9 (0.2)	21.9 (0.2)	21.8 (0.2)
	100	22.6 (0.0)	21.9 (<0.1)	21.9 (0.1)	22.0 (0.1)	22.0 (0.1)	21.8 (0.1)
		Lake Carlo	s benthic injection	on application			
DO (mg/L)	0	8.42 (0.01)	7.97 (0.02)	7.97 (0.02)	7.95 (0.03)	7.84 (0.05)	7.79 (0.05)
	50	8.40 (0.02)	7.97 (0.02)	7.97 (0.02)	7.83 (0.05)	7.81 (0.01)	7.16 (0.26)
	100	8.40 (0.03)	7.90 (0.08)	7.95 (0.02)	7.91 (0.02)	7.81 (0.05)	7.24 (0.14)
pН	0	8.70	8.52-8.59	8.51-8.55	8.47-8.50	8.38-8.39	8.55-8.58
	50	8.70	8.60-8.61	8.55	8.48	8.38-8.41	8.12-8.20
	100	8.69-8.70	8.57-8.60	8.52-8.55	8.44-8.48	8.39-8.41	7.18–7.39
Temperature (°C)	0	21.2 (0.0)	21.3 (0.0)	21.2 (0.0)	21.5 (0.1)	21.4 (0.2)	21.0 (0.1)
	50	21.2 (<0.1)	21.3 (0.0)	21.2 (<0.1)	21.7 (0.3)	21.6 (0.3)	21.1 (0.2)
	100	21.2 (0.0)	21.3 (0.1)	21.3 (<0.1)	21.6 (0.1)	21.5 (0.1)	21.1 (0.1)

Water chemistry parameter	Treatment group (mg/L)	Pre- exposure ¹	≤1 h	3 h	6 h	9 h	12 h
		Shawano La	ke benthic inject	tion application			
DO (mg/L)	0	7.41 (0.01)	7.26 (0.01)	7.15 (0.07)	7.02 (0.01)	6.98 (0.04)	6.63 (0.02)
	50	7.43 (<0.1)	7.22 (0.03)	7.23 (0.01)	7.28 (0.02)	7.14 (0.07)	5.11 (0.67)
	100	7.44 (<0.1)	7.17 (0.03)	7.23 (0.03)	7.29 (0.03)	7.24 (0.01)	6.21 (0.34)
pH	0	9.10-9.12	9.05-9.06	9.02-9.03	8.91-8.94	8.64-8.68	8.92-8.94
	50	9.13-9.14	9.02-9.04	9.02-9.04	8.93-8.95	8.69-8.71	8.69-8.88
	100	9.13-9.14	8.99-9.01	9.03	8.95-8.96	8.69-8.71	8.58-8.68
Temperature (°C)	0	19.5 (0.0)	18.2 (0.1)	18.4 (0.3)	18.6 (0.3)	18.5 (0.2)	18.2 (0.2)
	50	19.5 (0.0)	18.2 (<0.1)	18.4 (0.1)	18.5 (0.2)	18.4 (0.2)	18.2 (0.1)
	100	19.5 (0.0)	18.0 (0.1)	18.1 (0.1)	18.2 (0.1)	18.2 (0.1)	17.9 (0.1)

¹Pre-exposure time points were measured approximately 1 h prior to test article application.

Table 2. Mean (standard deviation) hardness, alkalinity, and conductivity of filtered (200 micrometers) source water collected from the delivery system headboxes prior to exposure.

[mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; <, less-than; CaCO3, calcium carbonate; °C, degrees Celsius]

Application type	Hardness (mg/L) ¹	Alkalinity (mg/L) ¹	Conductivity (µS/cm) ²					
Lake Carlos								
Whole water column	177 (1)	163 (1)	395 (1)					
Benthic injection	177 (1)	164 (<1)	363 (3)					
Shawano Lake								
Whole water column	118 (1)	105 (<1)	248 (2)					
Benthic injection	125 (1)	112 (1)	231 (2)					

¹Reported as milligrams per liter CaCO₃.

²Temperature compensated to 25 °C.

Table 3. Mean (standard deviation) total ammonia nitrogen (TAN) and un-ionized ammonia (NH₃) of each treatment group by lake, application type, and exposure duration.

[mg/L, milligrams per liter; h, hours; WWC, whole water column application; BI, benthic injection application; TAN, total ammonia nitrogen; SD, standard deviation; NH_3 , un-ionized ammonia; mg NH_3 -N/L, milligrams un-ionized ammonia nitrogen per liter; -, no sample]

Water chemistry parameter	Treatment group (mg/L)	6 h WWC	9 h WWC	12 h WWC	12 h Bl
		Lake (Carlos		
TAN ¹ (SD)	0	0.17 (<0.01)	0.17 (<0.01)	0.24 (0.01)	0.22 (0.01)
	50	0.22 (0.01)	0.23 (<0.01)	0.33 (0.01)	0.40 (0.01)
	100	0.27 (<0.01)	0.27 (0.00)	0.34 (0.01)	1.37 (0.18)
NH_3 (SD)	0	0.03 (<0.01)	0.01 (<0.01)	0.04 (<0.01)	0.03 (<0.01)
	50	0.03 (<0.01)	0.02 (0.00)	0.03 (<0.01)	0.02 (<0.01)
	100	0.03 (<0.01)	0.02 (0.00)	0.03 (0.00)	0.01 (<0.01)
		Shawar	no Lake		
TAN ¹ (SD)	0	-	-	0.13 (<0.01)	0.06 (0.01)
	50	-	-	0.19 (0.01)	0.11 (0.01)
	100	-	-	0.23 (0.01)	0.16 (0.01)
NH ₃ (SD)	0	-	-	0.04 (<0.01)	0.01 (<0.01)
	50	-	-	0.04 (<0.01)	0.02 (<0.01)
	100	-	-	0.04 (<0.01)	0.02 (<0.01)

¹Total ammonia nitrogen reported as mg NH₃-N/L.

Mean exposure concentrations during the exposure period are shown in figure 5. The SAS® software linear regression, SAS® software predicted exposure concentrations, and data are in appendix 7 (items 1–16). In the Lake Carlos and Shawano Lake WWC trials, the surface water exposure concentrations are reported due to negligible differences between the measured exposure concentrations in the surface water and suspended water samples (mean difference \leq 0.46 and 0.93 mg/L for the 50-and 100-mg/L treatment groups, respectively). Mean test tank SDP exposure concentrations in surface water samples during the Lake Carlos WWC trial (that is, 6-, 9-, and 12-h exposure durations) ranged from 43.9 to 47.3 mg/L and 90.2 to 95.3 mg/L in the 50- and 100-mg/L treatment groups, respectively

(fig. 5). Mean test tank SDP concentrations in surface water samples during the Shawano Lake WWC trial (that is, 6-, 9-, and 12-h exposure durations) ranged from 43.8 to 45.9 mg/L and 93.8 to 99.3 mg/L in the 50- and 100-mg/L treatment groups, respectively.

The SDP concentrations were below the detection limit in the initial suspended samples collected during the Lake Carlos BI trial; therefore, bottom sampling was initiated at 6 hours and continued throughout the duration of the exposure period. The mean SDP concentrations in the bottom samples were 100.3 mg/L for the 50-mg/L treatment group and 234.7 mg/L for the 100-mg/L treatment group. Mean SDP concentrations in suspended samples collected during the Shawano Lake BI trial were 38.8 mg/L for the 50-mg/L treatment group and 92.9 mg/L for the 100-mg/L treatment group.

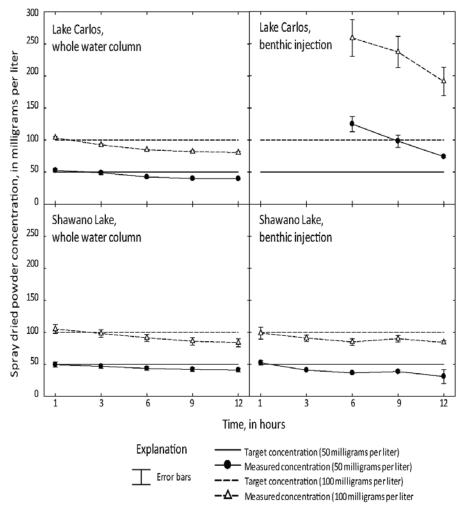


Figure 5. Mean (standard deviation) SDP active ingredient concentration of water samples collected during the exposure period. WWC graphs are from the surface samples; BI graphs are from bottom samples (Lake Carlos) and suspended samples (Shawano Lake)

Zebra Mussel Survival

Zebra mussel survival for all trials is summarized in table 4, statistical analyses are in appendix 9 (items 1–3), and survival data are in appendix 8 (items 1–5). For all trials (that is, WWC at 6, 9, and 12 h; BI at 12 h), mean survival of control groups exceeded 95 percent and zebra mussel survival in the SDP-treated groups differed (p < 0.01) from survival in the control groups.

Table 4. Mean (standard deviation) percent zebra mussel survival for each lake, application type, and exposure duration.

[Means within columns and rows (for each lake) with the same letter are not significantly different (p > 0.05); means were compared by concentration (a-c), exposure duration (m,n) and between whole water column 12 h exposure duration and benthic injection 12 h exposure duration (y,z); mg/L, milligrams per liter; h, hours; WWC, whole water column application; BI, benthic injection application]

Test location	Treatment group (mg/L)	6 h	9 h	12 h	12 h
			WWC		BI
Lake Carlos	0	97.8 ^{am} (2.2)	96.9 ^{am} (1.8)	97.3 ^{amz} (1.0)	97.3 ^{az} (1.4)
	50	1.3 ^{bm} (1.0)	1.1 ^{bm} (1.5)	0.6 ^{bmy} (0.6)	18.1 ^{bz} (7.3)
	100	2.1 ^{bm} (1.2)	0.5 ^{bn} (0.7)	$0.6^{\text{bny}} (0.7)$	18.0 ^{bz} (10.4)
Shawano Lake	0	95.6 ^{am} (2.4)	95.5 ^{am} (1.4)	96.2 ^{amz} (1.3)	95.5 ^{az} (2.3)
	50	12.6 ^{bm} (10.7)	10.3 ^{bm} (9.4)	2.7 ^{bnz} (2.8)	2.9 ^{bz} (1.6)
	100	7.2 ^{bm} (6.6)	4.7 ^{bmn} (5.5)	2.0 ^{bnz} (1.9)	0.9^{cz} (1.0)

Lake Carlos Whole Water Column Trial

Mean survival of zebra mussels in the Lake Carlos WWC SDP-treated groups ranged from 0.5 to 2.1 percent. When compared at the same exposure duration, no difference in zebra mussel survival was detected between the 50- and 100-mg/L treatment groups. When comparing the effects of exposure duration by treatment group, the only difference in zebra mussel survival detected was in the 100-mg/L treatment group, when the 6-h exposure duration group was compared to the 9-h and 12-h exposure duration groups ($p \le 0.01$).

Shawano Lake Whole Water Column Trial

Mean survival of zebra mussels in the Shawano Lake WWC SDP-treated groups ranged from 2.0 to 12.6 percent. When compared at the same exposure duration, no difference (p > 0.11) in zebra mussel survival was detected between the 50- and 100-mg/L treatment groups. When comparing the effects of exposure duration by treatment group, no difference was detected in control group survival and in the 50-mg/L treatment group, no difference was detected when comparing the 6-h exposure duration to the 9-h exposure duration (p = 0.31). Differences were detected in the 50-mg/L treatment group when the 6 and 9-h exposure duration groups were compared to the 12-h exposure duration group $(p \le 0.01)$. Differences were also detected in the 100-mg/L treatment group when the 6-h exposure duration group was compared to the 12-h exposure duration group (p = 0.01). No difference was detected in the 100-mg/L treatment group when comparing the 6-h exposure duration group to the 9-h exposure duration group (p = 0.29) or when comparing the 9-h exposure duration group to the 12-h exposure duration group (p = 0.10).

Benthic Injection Trials

Mean survival of zebra mussels in the Lake Carlos BI trial SDP-treated groups did not differ (p=0.93) and was 18.1 and 18.0 percent in the 50- and 100-mg/L treatment groups, respectively. Mean survival of zebra mussels in the Shawano Lake BI trial SDP-treated groups differed (p<0.01) and was 2.9 and 0.9 percent in the 50- and 100-mg/L treatment groups, respectively. Survival of zebra mussels in BI SDP-treated groups for both trials differed (p<0.01) from zebra mussel survival in the control groups.

The survival of zebra mussels in the BI trials was compared to the survival of zebra mussels in the respective WWC trial 12-h exposure duration group. Survival of zebra mussels assigned to the Lake Carlos 12-h WWC trial SDP-treated groups differed (p < 0.02) from the survival of zebra mussels assigned to the Lake Carlos 12-h BI trial SDP-treated groups; however, after modification of the benthic injection application technique, no difference (p = 0.22) was detected between the survival of zebra mussel assigned to the Shawano Lake WWC 12-h exposure group and the Shawano Lake BI trial.

Conclusions

In this study, the application of the spray dried powder (SDP) formulation of *Pseudomonas fluorescens* (strain CL145A) at 50 and 100 mg/L (based on active ingredient) for 6–12 hours to test tanks containing lake water using either a whole water column (WWC) or benthic injection (BI) application technique significantly reduced the survival of zebra mussels. Mean survival of zebra mussels in the WWC SDP-treated groups did not exceed 12.6 percent for either trial at any exposure duration. No difference in zebra mussel survival was detected between the WWC 50- and 100-mg/L treatment groups in the Lake Carlos trial or in the Shawano Lake trial when compared at the same exposure duration. Mean survival of zebra mussels in the BI SDP-treated groups did not exceed 18.1 percent in the Lake Carlos trial and 2.9 percent in the Shawano Lake trial. After modification of the BI application method for the Shawano Lake trial, survival of zebra mussels in the BI trial did not differ (p = 0.22) compared to survival of zebra mussel in the Shawano lake WWC 12-h exposure group. In this study, the amount of SDP applied during the BI trials was 50 percent of that applied during the WWC trials. This study demonstrates that SDP has potential for use in managing dreissenid mussels in limited, open-water environments and that a benthic injection application technique to reduce the amount of SDP required to induce zebra mussel mortality may be successful in quiescent waters.

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Appendix 1. Study Protocol, Amendments, and Datasheets

Item Number	Item Description	Number of Pages	Report Page Number
1	Protocol: "Efficacy of Pseudomonas fluorescens (Pf-CL145A) SDP for controlling settled zebra mussels on artificial substrates"	28	19
2	Amendment 1: Revision of Study Protocol, Study # AEH-12-PSEUDO-04	7	47
3	"Zebra Mussel Survival" Datasheet	1	54
4	"Zebra Mussel Lengths" Datasheet	1	55
5	"Test Chemical Stock Preparation Data Form" Datasheet	1	56
6	"Conductivity and Hardness - Exposure Initiation" Datasheet	1	57
7	"Alkalinity – Exposure Initiation" Datasheet	1	58
8	"Water Quality - Temperature (°C) Measurements" Datasheet	1	59
9	"Water Quality – pH Measurements" Datasheet	1	60
10	"Water Quality – Dissolved Oxygen (mg/L) Measurements" Datasheet	1	61
11	"Ammonia Sample Collection – Exposure Termination" Datasheet	1	62

Protocol Title:

Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates

Study Number: AEH-12-PSEUDO-04

Test Facilities and Study Sponsor

Upper Midwest Environmental Sciences Center (UMESC)
Mobile Research Laboratory
US Geological Survey
2630 Fanta Reed Rd.
La Crosse, Wisconsin 54603

Proposed Experimental Start Date: August 2012
Proposed Experimental Termination Date: January 2013

File Folder: 3

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1. INTRODUCTION:

Native freshwater mussel populations of North America were historically considered the most diverse in the world with about 297 recognized taxa consisting of 281 species and 16 subspecies (Williams et al., 1993). Mussels are largely sedentary in nature, relying on movement of host fish during glochidial attachment as means of transport. They are thus particularly vulnerable to a variety of anthropogenic influences including habitat degradation and alteration, pollution and overharvest. A Nature Conservancy survey (Master 1990) found 55% of North America's mussels as extinct or imperiled compared to 7% of terrestrial species, even though terrestrial species traditionally receive far greater attention. Projections in 1999 (Ricciadi and Rasmussen, 1999) suggested that at least 127 imperiled mussel species will be lost in the next 100 years — a conservative extinction rate of 6.4% per decade given it did not take into account extirpations caused by invasive dreissenid mussels (zebra *Dreissena polymorpha* and quaqqa *D. bugensis* mussels).

Concerns for native mussels in the Southeast are potentially even greater given that only 25% of the 269 species historically present are reported as stable compared to the 13% presumed extinct and the 28, 14 and 18% listed, respectively, as endangered, threatened or of special concern. (Neves et al,1997)

Many unionid mussels in North America were imperiled prior to epizoic colonization by zebra and quaqqa mussels though the introduction of dreissenid mussels have dramatically heightened concerns for the continued survival of native mussels. Zebra mussels were reported to be responsible for the extirpation of unionids from waters in Europe as early as 1937 (Sebestyen, 1937). Severe declines in unionid abundance in Europe (Karatayev and Burlakova, 1995; Burlakova, 1998) and North America (Haag et al., 1993; Nalepa, 1994; Ricciardi et al., 1996) have since been well documented in the literature.

The 1973 Endangered Species Act (ESA) brought forth the need to recognize, protect and recover rare mussels in the United States. The United States Fish and Wildlife Service (USFWS) develops recovery plans for threatened and endangered species which utilize a range of tools to promote recovery of the species including restoring and acquiring critical habitat, removing introduced or invasive species and captive propagation and release into historic ranges.

As of 2004, mussel propagation work was being conducted in several different facilities in 7 states as well as in Ontario, Canada (Neves, 2004). The Genoa National Fish Hatchery (GNFH) in Wisconsin has been involved in mussel recovery since 2000,

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releasing tens of thousands of propagated subadult Higgins eye pearlymussel (*Lampsilis higginsi*) for recovery efforts. The GNFH produces subadult mussels using cage culture techniques. This technique involves placing glochidia laden host fish into submerged cages within natural water bodies such as the Mississippi and St. Croix Rivers. The fish are released from the cages after mussel excystment and the mussels are allowed to grow on the cage bottom for an additional 6-18 months before being harvested. Areas that were previously successful in rearing mussels using this technique have been abandoned due to the colonization and proliferation of zebra mussels.

Biologists at the New York State Museum (NYSM) Field Research Laboratory have been researching dreissenid mussel control techniques since 1991. They discovered that components of a strain of common bacterium isolated from soils (*Pseudomonas fluorescens* [*Pf*-CL145A]) are capable of causing mortality in zebra mussels. Marrone Bio Innovations (MBI; Davis, CA) is currently developing a spray dried formulation of this bacterium called MBI-401SDP. A formulation of *Pf*-CL145A was recently registered with the USEPA for use within closed systems such as power generating plant cooling systems. The NYSM has partnered with the USFWS (Genoa NFH) and United States Geological Survey's (USGS) Upper Midwest Environmental Sciences Center (UMESC) to determine the suitability of this product for open water zebra mussel control applications including treatment of native mussel propagation cages or native mussel beds.

Naturally occurring surface waters may be unique in their chemical and biological properties which may affect the efficacy of applied control agents such as *Pf*-CL145A. The research to be completed according to this protocol will assess the efficacy of various concentrations and treatment durations of *Pseudomonas fluorescens* (*Pf*-CL145A) for controlling settled zebra mussels (*D. polymorpha*) in open waters.

2. PROTOCOL OBJECTIVE:

To assess the efficacy of various exposure concentrations and treatment durations of *Pseudomonas fluorescens* (*Pf*-CL145A) spray dried powder (SDP) formulation for controlling settled zebra mussels (*D. polymorpha*) in open waters,

3. STUDY SCHEDULE:

- 3.1 Proposed initiation: August 2012
- 3.2 Schedule of events: A proposed schedule of events is provided in Table 1.
- 3.3 Proposed completion date: January 2013

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Table 1. Proposed Schedule of Events

Date	Activity
August 2012-Sept 2012	substrate exposures
August 2012-October 2012	substrate assessment
January 2013	final report submission

4. STUDY DESIGN:

4.1 General Description:

Zebra mussel-encrusted, perforated aluminum substrates (15.2 cm x 15.2 cm x 2.5 cm) previously placed (10-11/2011and/or 5/2012) in two Minnesota and one Wisconsin water body will be exposed to varying concentrations and treatment durations of *Pf*-CL145A SDP formulation. The exposures will be conducted at Lake Carlos and Lake Pepin in Minnesota and Lake Shawano in Wisconsin with the assistance of MN or WI Department of Natural Resources. Replicated exposures will be conducted adjacent to each water body in an enclosed research trailer. Test water will be drawn from the adjacent water body. *Pf*-CL145A SDP formulation will be added to the water in the treatment tanks. The water containing *Pf*-CL145A will be disposed of in compliance with the regulations of the respective DNR. Untreated water used pre- and post-exposure will be returned to the water body. The exposed substrates will be individually tagged and returned to the water body for approximately 3-4 weeks to assess post-exposure latent mortality.

4.2 Experimental Design:

In October and November of 2011 and again in May 2012 (depending on site) zebra mussel attachment substrates (0.063" thick, type 3003, perforated aluminum sheeting [3/16" hole, 51% open area] 15.2 cm x 15.2 cm trays with 2.5 cm sides) were nested together in groups of 10 trays per stack (separated ~ 2 cm with wooden blocking and zipped tied in place). Just prior to nesting, the trays were seeded by placing approximately 100-200 previously collected zebra mussels on the trays. The zebra mussels were collected (≤ 6 -h prior to use) by severing their byssal threads from rocks and other surfaces (e.g., sticks, native mussels, etc) with a scalpel; zebra mussels were maintained in a cooler until placed in an attachment substrate. At each location, approximately 60 nested trays were placed in a wire mesh cage (~ 0.9 m long x 0.6 m wide x 0.45 m high) and placed in ~ 2 m of water for zebra mussel attachment and overwintering.

Substrate trays will be removed from the cages and placed in a semi-rigid plastic mesh bag (\sim 20.3 x 25.4 x 5.1 cm; \sim 0.31 x 0.31 cm openings) and sealed with zip

ties. Each substrate bag will uniquely tagged and randomly assigned to one of 9 test tanks within the mobile research trailer. At least 3 substrate bags and trays will be placed in each test tank containing up to 325 L of filtered (200 μm) surface water. Flowing, filtered surface water will be supplied to the test tanks at a rate sufficient to achieve ≥1 tank exchange per hour. The substrate bags and trays will be acclimated to conditions within the test tanks for ≥ 12-h prior to administering a single Pf-CL145A SDP exposure. Treatment concentration (e.g. 0 [control], 50 or 100 mg/L) will be randomly assigned to each test tank (n=9) and each test tank will serve as an exposure replicate (3 replicates per treatment concentration). For each exposure day, a single treatment duration (ie: 6, 9 or 12-h) will be assigned for all treatment concentrations. At exposure termination the tanks will be drained of treated water, rinsed and refilled with flowing filtered surface water. Within 24 h of exposure termination, the substrate bags and trays will be removed from the test tanks and returned to the wire mesh cages. The cages will then be placed in ~ 2 m of water in the lake or river for a 3-4 week observation period. After 3-4 weeks (dependent on temperature) the cages will be removed from the water body and mussels enumerated for survival. After enumeration all test animals will be euthanized.

Figure 1. Flow chart of major study activities

Substrate trays are removed from the water body, placed in a sealed rigid plastic mesh bag and a unique indentification tag is placed on each bag



Substrate bags containing trays are randomly assigned to 1 of 9 exposure tanks, a minimum of 3 bags/trays are placed in each tank and a constant supply of surface water is supplied to each tank at ≥ 1 tank exchange/h

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Figure 1. Continued.

Bags/trays are acclimated to test conditions for ≥ 12-h; water inflow is ceased and static random exposure treatments are administered by the addition of appropriate amounts of *PF-*CL145A SDP formulation; supplemental aeration is supplied.

Treatments will be a static exposure of 0 (control), 50 or 100 mg/L Pf-CL145A SDP formulation active ingredient (A.I.) with either a 6, 9 or 12-h exposure duration. Exposure concentrations will be randomly assigned. For each exposure day, a single exposure duration (6, 9 or 12-h) will be assigned with 3 replicates for each exposure concentration of 0 (control) 50, or 100 mg/L.



At exposure termination, water flow is resumed, tanks are flushed and rinsed. ≤ 24-h post exposure termination the bags/trays are removed from the exposure tanks and the trays are placed in holding cages in ~ 2m of water



The cage positions are marked with GPS and a buoy, if required. After 3-4 weeks, the cages are removed from the take and each tray is assessed for mortality, after assessment all animals are euthanized.



All equipment is thoroughly decontaminated prior to removal from the test site

5. STUDY PROCEDURES

- 5.1 Test Animals
 - 5.1.1 Description:
 - 5.1.1.1 Age < 18 months
 - 5.1.1.2 Sex Test animals will be used without regard to sex.
 - 5.1.1.3 Species (zebra mussel, *Dreissena polymorpha*)
 - 5.1.2 Number of animals: Approximately 3,000-5,000 mussels, consistent with the objective of the study and contemporary scientific standards.
 - 5.1.3 Source of animals: Animals will be collected from test location surface waters.
 - 5.1.4 Inclusion criterion: Only trays with sufficient numbers (n > 30) of attached zebra mussels in apparent good health will be used.

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- 5.1.5 Acclimation: Mussels will be acclimated to conditions for ≥ 12-h prior to exposure initiation.
- 5.1.6 Distribution to exposure tanks: One bag/tray will be distributed per exposure tank according to a predetermined randomization scheme in separate rounds. A minimum of 3 trays will be placed in each tank using a minimum of 3 distribution rounds.
- 5.1.7 Feeding: No supplemental feed will be offered throughout the acclimation, exposure and post-exposure holding periods.

5.2 Water Chemistry

- 5.2.1 Dissolved oxygen: Dissolved oxygen will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. Dissolved oxygen will be measured and recorded at least once during the pre- and post-exposure periods and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 394 or equivalent).
- 5.2.2 Temperature: Temperature will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. Temperature will be measured and recorded at least once during the pre- and post-exposure periods and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination.
- 5.2.3 pH: pH will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. pH will be measured and recorded at least once during the pre- and post-exposure periods and at least twice during the exposure with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 335 or equivalent).
- 5.2.4 Hardness: Hardness will be measured and recorded prior to exposure initiation (UMESC SOP AEH 712).
- 5.2.5 Alkalinity: Alkalinity will be measured and recorded prior to exposure initiation (UMESC SOP AEH 706).
- 5.2.6 Conductivity: Conductivity will be measured and recorded prior to exposure initiation (UMESC SOP AEH 188 or equivalent).
- 5.2.7 Ammonia: Samples for total ammonia-nitrogen will be collected at the termination of the exposure period for each exposure replicate.

 Ammonia samples will be filtered through a 0.45 micron syringe filter, acidified (~pH 2.5) with sulfuric acid and then stored at ~4°C until analyzed by the UMESC Long Term Resources Monitoring (LTRM) Water Quality Laboratory using the automated phenate method.

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- 5.3 Disposal: All live mussels at the end of the post-exposure observation period will be euthanized and disposed by incineration or according to other state or local requirements.
- 5.4 Study facilities:
- 5.4.1Test Facility
 - U.S. Geological Survey, Upper Midwest Environmental Sciences Center Mobile Research Laboratory
 - 2630 Fanta Reed Rd
 - La Crosse, Wisconsin 54603
 - 5.4.1.1 Test location: Lake Carlos, MN; Lake Pepin, MN; and Lake Shawano, WI
 - 5.4.1.2 Exposure system: The test system consists of nine 76.2 cm diameter x 91.4 cm deep fiberglass circular exposure tanks in two rows of 4 or 5 tanks. The tanks are supplied surface water through a pump, filter and headbox system. Each exposure tank will receive a continuous supply of water from a headbox during the pre- and post-exposure periods. Each tank will be uniquely identified to allow for identification treatment type and replicate number. Coding procedures will be documented in the study records.
 - 5.4.1.3 Aeration: Supplemental aeration will be supplied during the acclimation, *Pf*-CL145A SDP exposures and the post exposure observation periods.
 - 5.4.1.4 Water supply: Filtered surface water will be supplied continuously (~5 L/min) to achieve a ~ tank-volume exchange/h during the pre- and post-exposure periods. Water supply will be interrupted during the Pf-CL145A SDP exposures.
 - 5.4.1.5 Water discharge: Untreated water will be returned to the surface water supply source. Pf-CL145A SDP treated water will be mechanically and/or carbon filtered and/or collected for disposal as required by DNR regulation.
 - 5.4.1.6 Lighting: Overhead lighting (~16 h light:8 h dark) will be provided.
- 5.5 Observations:
- 5.5.1 Mortality: Zebra mussels that are gapping and do respond to tactile stimuli by shell closure will be coded as a mortality. Zebra mussels that have closed shells or respond to tactile stimuli by shell closure will be coded as alive.
- 5.6 Treatment administration:
- 5.6.1 Treatment: Each treatment will consist of three Pf-CL145A SDP concentrations (ie: 0 [control], 50 or 100 mg/L A.l.) with a single exposure

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- duration (6, 9 or 12-h). All treatment concentrations will have three replicate exposure tanks. A minimum of 3 zebra mussel-encrusted substrate trays will be bagged and placed in each test replicate.
- 5.6.2 Route of administration: Exposures will be initiated by addition of an appropriate amount of a *Pf*-CL145A SDP stock solution. The tank will be gently mixed to achieve a uniform distribution of test material.
- 5.6.3 Concentration verification: Concentration will be determined spectrophotometrically. A standard curve will be prepared using a known mass of *Pf*-CL145A SDP. The absorbance of exposure solutions will be compared to the standard curve to determine the exposure concentration. Absorbance will be determined using a Barnstead/Thermolyne Corporation Model: Turner SP-830 Plus Beckman spectrophotometer (UMESC SOP AEH 302).

6. DATA ANALYSIS

- 6.1 Experimental unit: The experiment unit will be the exposure tank.
- 6.2 Number of exposures and replicates: There will be a total of 3 treatment levels (0 [control], 50 and 100 mg Pf-CL145A/L) and 3 treatment durations (6, 9 and 12-h) for each treatment level. There will be a total of 3 independent tanks for each treatment concentration and duration which will serve as the replicates. Each treatment concentration will be run concurrently for a single treatment duration. The trays from all treatment durations will be assessed for mortality at the same post exposure evaluation period.
- 6.3 Statistical methodology:
 - Survival data will be analyzed using a generalized linear mixed model (SAS PROC GLIMMIX). In every analysis, the exposure tank will be treated as the experimental unit. The change in proportion of survivors will be analyzed using a generalized linear mixed model where the distribution is binomial and the link used is the logit function.
 - If a significant effect of treatment is identified then pairwise comparison tests will be completed to compare each treatment group to the control group using unadjusted least squares means.
- 6.4 Statistical significance: Statistical significance will be declared at p < 0.05.
- 6.5 Other data analyses: Statistical methods for other study data collected will include calculation of means, standard deviations and coefficients of variation. The statistical procedures used will be described in detail in the final study report.

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7. PERSONNEL

- 7.1 Study Director: James A. Luoma, B.A.
 - 7.1.1 Address: Upper Midwest Environmental Sciences Center, US Geological Survey, 2630 Fanta Reed Rd., La Crosse, Wisconsin 54603
 - 7.1.2 Contact: Tel: (608) 781-6391, Fax: (608) 783-6066; jluoma@usgs.gov
 - 7.1.3 Training and experience: CV on file at UMESC.
- 7.2 Other personnel involved in study: Technical staff involved in the study will be identified in the study raw data to include study function. UMESC technical staff training and experience will be documented in CVs included in the study raw data.

8. DISPOSITION/STORAGE

8.1 Study Records: All data generated in the study will be recorded in bound laboratory notebooks, electronic files or kept in file folders. All data sheets, file folders, laboratory notebooks and computer disks will be encoded with the study number when the data are generated. Raw data, laboratory notebooks and electronic files (including a CD-ROM containing the annotated SAS program used for the statistical analysis, the data files, SAS log and SAS output files) generated by UMESC and contract laboratory reports will be filed in the UMESC archives (SOP No. GEN 007) of the Upper Midwest Environmental Sciences Center, La Crosse Wisconsin, before the final report is signed by the Study Director. The final report will then be signed and archived.

9. AMENDMENT/DEVIATIONS TO THE PROTOCOL

- 9.1 Protocol amendments: A signed copy of the Study Protocol will be retained on-site. Proposed amendments to the protocol shall be brought to the attention of UMESC Management. When the Study Director and Management agree verbally, the study can proceed with the change. As soon as possible, the Study Director will then prepare a written protocol amendment that is signed by the Study Director and Branch Chief. The amendment then becomes an official part of the protocol.
- 9.2 Protocol deviations: All deviations from this approved protocol will be documented and reviewed by the Study Director. The Study Director will make a judgment on the impact of the deviations. The Study Director will

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notify Management, as soon as possible, of any deviations to the protocol, including their impact on the study.

10. INVESTIGATIONAL TEST ARTICLE

- 10.1 Test Substance(s): Pseudomonas fluorescens (Pf-CL145A) SDP formulation
 - 10.1.1 Chemical name: Pseudomonas fluorescens (Pf-CL145A)
 - 10.1.2 Trade name: Zequanox
 - 10.1.3 Active ingredients: *Pseudomonas fluorescens (Pf*-CL145A) is the sole active ingredient, 50% active by weight.
 - 10.1.4 Source: Marrone Bio Innovations (MBI); Davis, CA
 - 10.1.5 Lot number: Multiple lots are expected to be used during the exposures. Lot number(s) will be included in the test chemical log books, lab notebook, and study files.
 - 10.1.6 Expiration date: As determined by the manufacturer. An aliquot of each lot tested will be returned to the NYSM or MBI at the conclusion of exposures for post-exposure zebra mussel bicassay tests (the standard testing protocol to assess *Pseudomonas fluorescens* [*PF-CL145A*] formulation activity). Results of these confirmation bicassays will be used to validate the retention of activity of the *Pseudomonas fluorescens* (*Pf-CL145A*) SDP and will be included in the study files when available.
 - 10.1.7 Storage during study: test chemical will be stored refrigerated. Test material will be transported in a cooler with ice packs to maintain proper storage temperature (4-10 °C)
 - 10.1.8 A NIOSH approved respirator will be used when preparing stock solutions to avoid inhalation. Protective eyewear, gloves and lab coats will be worn at all times when working with the test substance.
- 11. ADVERSE EVENTS: Any adverse event will be recorded in the study logbook and the Study Director will be notified.

12. BIOSECURITY PROCEDURES

12.1 General Procedures: All personnel involved in the study will review the UMESC biosecurity (UMESC SOP APP 075) and project HACCP plans. Testing will be conducted in a mobile laboratory with controlled access. All treated effluent water will be mechanically and/or carbon filtered and/or collected for contract disposal according to federal, state or local requirements.

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12.2 HACCP Plan: See Appendix 1 for the HACCP plan for this project.

13. STANDARD OPERATING PROCEDURES

A complete list of the standard operating procedures used in the study will be included in the study guide. The follow SOP's were cited in this protocol:

UMESC SOP APP 075 – Procedures to Minimize the Risk of Transfer of Pathogens and Invasive Species

UMESC SOP AEH 188 – Accumet Portable Waterproof Conductivity meter Model # AP75

UMESC SOP AEH 302 - Instrument Operating Procedure:

Barnstead/Thermolyne Corporation Model: Turner SP-830 Plus Beckman spectrophotometer Serial # 1365070560781

UMESC SOP AEH 335 – Beckman Portable pH/mV Meter, Model 250 UMESC SOP AEH 394 – YSI Handheld Dissolved Oxygen Meter, Model 55/12FT, Serials 94C17261 & 97F0837AG

UMESC SOP AEH 706 – Determination of Total Alkalinity by the Titrimetric (pH 4.5) Method

UMESC SOP AEH 712 - Determination of Total Hardness

14. REFERENCES,

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Neves R. J., 2004. Propagation of endangered freshwater mussels in North America. Journal of Conchology, special publication 3:69-80.

Neves, R.J., A.E. Bogan, J.D. Williams, S.A. Ahlstedt, and P.W. Hartfield, 1997. Status of aquatic mollusks in the southeastern United States: a downward spiral of diversity. Pages 43-85 in G.W. Benz and D.E. Collins, editors. Aquatic fauna in peril: the southeastern perspective. Southeastern Aquatic Research Institute, Lenz Design and communications, Decatur, Georgia.

Ricciardi, A. F.G. Whoriskey, and J.B. Rasamussen, 1996. Impact of the *Dreissena* invasion on native unionid bivalves in the upper St. Lawerance River. Can. J. Fish. Aquat. Sci. 53:1434-1444.

Ricciardi A., and J.B. Rasmussen, 1999. Extinction rates of North American freshwater fauna. Conservation Biology. Vol. 13 (5):1220-1222.

Sebestyn, O., 1937. Colonization of two new fauna-elements of Pontus-origin (*Dreissena polymorpha* Pall. And *Corophuim curvispinum* G.O. Sars forma devium Wundsch) in Lake Balaton, Verh. Int. Ver. Theor. Angew. Limnol. 8:169-182 in Burlakova L.E., A.Y. Karatayev and D. K. Padilla. 2000. The impact of Dreissena polymorpha (PALLAS) invasion on Unionid bivalves. Internat. Rev. hydrobiol. 85 (5-6):529-541.

Williams, J.D., M.L. Warren Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. Fisheries 18(9):6-22.

Viral Hemorrhagic Septicemia Furunculosis Aeromanas salmonicida Enteric Redmouth Disease Yersinia ruckeri

NA

Other:

Bacterial Kidney Disease Renibacterium salmoninarum
Other Assorted parasites/pathogens found in the Mississippi River and Great Lakes Basin

15. APPENDIX.

15.1 Appendix 1. HACCP PLAN for the study Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates

Step 1 - Activity Description

Facility: US Geological Survey-Upper Midwest Environmental Sciences | Site: Various -- MN and WI

Center mobile research laboratory	
Site Coordinator: Jim Luoma	Activity: Efficacy of Pseudomonas fluorescens (Pf-CL145A) SDF
Site Manager: Mark Galkowski	for controlling settled zebra mussels on artificial substrates
Address: 2630 Fanta Reed Road	
La Crosse WI, 54601	
Phone: 608-781-6322	
	Project Description
	acy of Pseudomonas fluorescens (PFCL145A) SDP for controlling settled zebra mussels on artificial substrates
Step 2 - Potential Hazards: Species which may potential	ially he mayor fintered used
Vertebrates:	any be moved/indicated
Multiple species of freshwater fish, eggs and gametes f	found in the Miccirciani Physicand Great Lakes Bests
multiple species of freshfater high eggs and Barretes i	outly til tile Mississippi Maci alid Glear Exxes Basili,
invertebrates:	
Zebra mussel (Oreissena polymorpha)	
Faucet snail (Bithynia tentaculata)	
Multiple endemic species found in the Mississippi River	rand Great Lakes Basin
Plants:	
Eurasian water milfoil Myrlophyllum spicatum	
Multiple endemic species found in the Mississippi River	r and Great Lakes Basin
Other biologicals (disease, pathogen, parasite):	
Largemouth Bass Virus	
Spring Viremia of Carp Virus	
Bluegill Virus	
infectious Pancreatic Necrosis Virus	
Viral Hemorrhaeir Septicemia	

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Step 3 – Flow Diagram Flow diagram outlining sequential tasks to complete activity/project

Task 1	UMESC mobile research laboratory is brought to test site and setup, water flow initiated
Task 2	Zebra mussel substrate trays are obtained from surface waters and moved into mobile laboratory
Task 3	Substrate trays are acclimate to test conditions with flowing filtered surface water
Task 4	Substrate trays are exposed to test article
Task 5	Substrate trays are placed in holding cages and returned to surface waters for post-exposure holding
Task 6	Mobile trailer, test tanks, hoses, pump and other equipment is decontaminated and returned to UMESC
1	The second state of the se
Task 7 ↓	Holding cages and substrate trays are removed from surface waters and assessed for zobra mussel survival
Task 8	Zebra mussels are removed from substrate trays and euthanized
Task 9	All remaining equipment, cages and substrate trays are decontaminated and returned to UMESC

1 Tasks (from HACCP Stop 3 - Flow Diagram)	2 Potential hazards Identified in HACCP Step 2	3 Are any potential hazards probable? (yes/no)	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point? (yes/no)
Task 1 UMESC mobile research laboratory is brought to test site and setup, water flow initiated	Vertebrates	yes	Surface water contains multiple vertebrate species	Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces (le: floors, tanks, hoses, pumps, screens, nets, etc) with steam, chemosterilants, or other approved methods prior to removal from previous location. Inspect all equipment prior to set up and repeat decontamination if warranted.	Yes

 Invertebrates	γes	Surface water	Assure the thorough	Yes
}	ł	contains multiple	decontamination all	
		invertebrate species	equipment including	
İ		Include AIS	all Internal and	1
			external potentially	
			wetted surfaces (ie;	
			floors, tanks, hoses,	
			pumps, screens, nets,	ĺ
			etc) with steam,	ļ
			chemosterilants, or	
			other approved	
		1	methods prior to	
			removal from previous	
			location, inspect all	
		'	equipment prior to set	
]	ľ	up and repeat	
			decontamination if	
B) .			warranted,	
Plants	yes	Surface water	Assure the thorough	yes
		contains multiple	decontamination all	
		plant species	equipment including	
ĺ		including AIS	all internal and	
			external potentially	
			wetted surfaces (le:	
	1	ĺ	floors, tanks, hoses,	
	ļ	į.	pumps, screens, nets,	
			etc) with steam,	
ľ			chemosterllants, or	
			other approved	
			methods prior to	
			removal from previous	
			location, inspect all	
			equipment prior to set	
		· ·	up and repeat	
			decontamination if	
		•	warranted.	
Others	yes	Surface water has	Assure the thorough	yes
	'	potential to transfer		yea
			i decontamination all	
		fish diseases	decontamination all equipment including	
			equipment including all internal and external potentially	
			equipment including all internal and external potentially wetted surfaces (ie:	
			equipment including all internal and external potentially wetted surfaces (ie: floors, tanks, hoses,	
			equipment including all internal and external potentially wetted surfaces (ie: floors, tanks, hoses, pumps, screens, nets,	
			equipment including all internal and external potentially wetted surfaces (ie: floors, tanks, hoses, pumps, screens, nets, etc) with steam,	
			equipment including all internal and external potentially wetted surfaces (le: floors, tanks, hoses, pumps, screens, nets, etc) with steam, chemosterilants, or	
			equipment including all internal and external potentially wetted surfaces (le: floors, tanks, hoses, numps, screens, nets, etc) with steam, chemosterilants, or other approved	
			equipment including all internal and external potentially wetted surfaces (le: floors, tanks, hoses, pumps, screens, nets, etc) with steam, chemosterilants, or	
			equipment including all internal and external potentially wetted surfaces (ie: floors, tanks, hoxes, pumps, screens, nets, etc) with steam, chemosterilants, or other approved methods prior to	
			equipment including all internal and external potentially wetted surfaces (le: floors, tanks, hoses, pumps, screens, nets, etc) with stream, chemosterilants, or other approved methods prior to removal from previous	
,			equipment including all internal and external potentially wetted surfaces (ie: floors, tanks, hoxes, pumps, screens, nets, etc.) with steam, chemosterilants, or other approved methods prior to removal from previous location. Inspect all	

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Task 2 Zebra mussel substrate trays are obtained from surface waters and moved into mobile laboratory	Vertebrates	yes	Surface water contains multiple vertebrate species	Physical removal of all visible vertebrates prior to transfer into mobile research laboratory. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	Yes
	Invertebrates	yes	Surface water contains multiple invertebrate species include AIS	Physical removal of all visible invertebrates not required for testing prior to transfer into mobile research laboratory. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from	Yes
	Plants	yes	Surface water contains multiple plant species including AIS	location. Physical removal of all visible plant material prior to transfer into mobile research laboratory. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosteri ants, or other approved methods prior to removal from location.	Yes

	Others	yes	Surface water has	Assure the thorough	Yes
			potential to transfer	decontamination all	
1			fish diseases	equipment including	
				all internal and	
ľ					
				external potentially	
		ļ		wetted surfaces with	
1				steam,	
·]		chemosterilants, or	
	*	i		other approved	
i				, ,	
				methods prior to	
				removal from	
				location.	
Task 3	Vertebrates	γes	Surface water contain	ns Physical removal o	of all no
	İ		multiple vertebrate	visible vertebrates	;
Substrate trays are			species	prior to transfer in	nto
acclimate to test				mobile research	
conditions with		i	1	laboratory,	i
flowing filtered surface				Assure the thorou	eh
water				decontamination	
1				equipment includ	
		1		Internal and exter	
1				potentially wetter	
		ļ	1		
				surfaces with ste	
			1	chemosterilants, o	or
				other approved	
				methods prior to	
	Invertebrates		C. C. C. C. C. C. C. C. C. C. C. C. C. C	removal from loca	
!	riverteorates	yes	Surface water contain	1 5.	
			multiple invertebrate		
1			species include AIS	not required for te	
				prior to transfer in	ito
				mobile research	i
		i		laboratory.	
				Assure the thorou	gh
				decontamination :	3
i		ľ		equipment includi	ng all
				internal and exten	-
Į į		1		potentially wetter	
		1	1	surfaces with ste	
				chemosterilants, o	r
		1 .		other approved	
				methods prior to	
				removal from loca	tlon
	Plants		ff		
	Fidif(5	yes	Surface water contain	1 . 5	
			multiple plant species		
			including AIS	prior to transfer in	to
				mobile research	
		1		laboratory.	
				Assure the thorou	gh
				decontamination a	all
				equipment includi	ng all
				internal and extern	
			i	6	
		[potentially wetted	
j				surfaces with ster	am,
				chemosterilants, c	r
				other approved	
				methods prior to	
1		L	1	removal from loca	นอา.

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Others	yes	Surface water has potential to transfer fish diseases	Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	No
--------	-----	---	--	----

Task 4	Vertebrates	ves	Surface water contains	Physical removal of all	No
	7-7-1410	,00	multiple vertebrate	visible vertebrates	NO
Substrate trays are		İ	species	prior to transfer into	1
exposed to test article	1		apacies	mobile research	
				laboratory.	
				Assure the thorough	
	1			decontamination all	
	İ			equipment including all	
	1			internal and external	
			1	potentially wetted	i
			1	surfaces with steam,	
				chemosterilants, or	· · · · · · · · · · · · · · · · · · ·
		i		other approved	ŀ
				methods prior to	
				removal from location.	
	Invertebrates	yes	Surface water contains	Physical removal of all	No
		1	multiple invertebrate	visib e invertebrates	
			species include AIS	not required for testing	
			apecies mende Als	prior to transfer into	
				mobile research	
				laboratory.	
		,		Assure the thorough	
			1	decontamination all	
				equipment including all	
				interna and external	
				potentially wetted	
				surfaces with steam,	
				chemosterilants, or	
		ŀ		other approved	
				methods prior to	
				removal from location.	1
	Plants	yes	Surface water contains	Physical removal of all	No
			multiple plant species	visible plant material	
			including AIS	prior to transfer into	
				mobile research	
				laboratory.	
:				Assure the thorough	
				decontamination all	
				equipment including all	
			Į.	Internal and external	
				potentially wetted	
				surfaces with steam,	
				chemosterilants, or	
				other approved	
		1		methods prior to	
			1	removal from location.	

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	Others	yes	Surface water has	Assure the thorough	No
			potential to transfer fish diseases	decontamination all	
			lish diseases	equipment including al	
				Internal and external	
				potentially wetted	[
				surfaces with steam,	
l		İ		chemosterilants, or	
				other approved	i
				methods prior to	
				removal from location,	
		-h			·
Task 5	Vertebrates	yes	Surface water contains	Physical removal of all	No
			multiple vertebrate	visible vertebrates	1
Substrate trays are			species	prior to transfer into	
placed in holding				mobile research	
cages and returned to				laboratory.	
surface waters for				Assure the thorough	
post-exposure holding		f .		decontamination all	
				equipment including all	
				interna and external	
-				potentially wetted	
				surfaces with steam, chemosterilants, or	
				other approved	
				methods prior to	
				removal from location.	
	Invertebrates	yes	Surface water contains	Physical removal of all	No
1	mire teer ques	703	Į.	visible invertebrates	IND
i			multip e invertebrate	not required for testing	
			species include AIS	prior to transfer into	
				mobile research	
				laboratory,	
				Assure the thorough	
				decontamination all	
				· ·	
	*			equipment including all	
				internal and external	
				potentially wetted	
				surfaces with steam,	
			•	chemosterilants, or	
				other approved	
				methods prior to	
				removal from location,	
	Plants	yes	Surface water contains	Physical removal of all	No
Í			multiple plant species	visible plant material	-
		[Including AIS	prior to transfer into	
	•	l	manning rata	mobile research	
	•			laboratory.	
				Assure the thorough	
				decontamination all	
				equipment including all	
!				equipment including all	,
' i				Internal and external	,
' 				Internal and external potentially wetted	
, 			:	Internal and external potentially wetted surfaces with steam,	,
, 	į		Ė	Internal and external potentially wetted	
	İ		:	Internal and external potentially wetted surfaces with steam,	
	i			Internal and external potentially wetted surfaces with steam, chemosterilants, or	

	Others	yes	Surface water has potential to transfer fish diseases	Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	no
Task 6 Mobile trailer, test tanks, hoses, pump and other equipment is decontaminated and returned to UMESC	Vertebrates	yes	Surface water contains multiple vertebrate species	Physical removal of all visible vertebrates. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	Yes
		yes	Surface water contains multiple invertebrate species include AIS	Physical removal of all visible invertebratos. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	Yes
	Plants	yes	Surface water contains multiple plant species Including AIS	Physical removal of all visible plant. Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterillents, or other approved methods prior to removal from location.	Yes
	Others	yes	Surface water has potentia to transfer fish diseases	Assure the thorough decontamination all equipment including all internal and external potentially wetted surfaces with steam, chemosterilants, or other approved methods prior to removal from location.	Yes

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Task 7	Vertebrates	yes	Surface water contains	Physical removal of all	Yes
			multiple vertebrate	visible vertebrates	
Holding cages and			species	prior to transfer into	
substrate trays are				mobile research	
removed from surface		İ		laboratory.	
waters and assessed				Assure the thorough	
for zebra mussel				decontamination all	
survival				equipment including all	
				internal and external	
				potentially wetted	
			1	surfaces with steam,	
				chemosterllants, or	
				other approved	
				methods prior to	
				removal from location.	<u></u>
	Invertebrates	λes	Surface water contains	Physica removal of all	Yes
		1	multiple invertebrate	visible invertebrates	
		!	species include AIS	not required for testing	
				prior to transfer into	
		1	į –	mobile research	
				laboratory.	
	1]	Assure the thorough	
			1	decontamination all	
				equipment including all	
				internal and external	
				potentially wetted	
				surfaces with steam,	
				chemosterilants, or	
				other approved	
				methods prior to	
				removal from location.	
	Plants	yes .	Surface water contains	Physical removal of all	Yes
			multiple plant species	visible plant material	
			Including AIS	prior to transfer into	
		j		mobile research	
		1		laboratory.	
				Assure the thorough	
				decontamination ail	
				equipment including all	
				Internal and external	
			ļ	potentially wetted	
				surfaces with steam,	
	İ			chemosterilants, or	
	I .			other approved	
				methods prior to	
		1		removal from location.	
	Others	yes	Surface water has	Assure the thorough	yes
			potential to transfer	decontamination all	
			fish diseases	equipment including all	
			1		
	l			internal and external	
	İ			potentially wetted	
				surfaces with steam,	
				chemosterilants, or	
		1		other approved	
		I		methods prior to	
			·	removal from location,	
	l		I	removal from location,	

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Task 8	Vertebrates	yes	Surface water contains	Physical removal of all	Yes
		'	multiple vertebrate	visible vertebrates	I *
Zebra mussels are			species	prior to transfer into	
removed from			1 '	mobile research	
substrate trays and				laboratory.	1
euthanized				Assure the thorough	
				decontamination all	
				equipment including all	
				interna and external	
	1			potentially wetted	
	1			surfaces with steam,	
	i			chemosterilants, or	
			1	other approved	
				methods prior to	
				removal from location.	
	Invertebrates	yes	Surface water contains	Physical removal of all	Yes
			multiple invertebrate	visible invertebrates	
		- 1	species include AIS	not required for testing	
		- 1		prior to transfer into	1
			ŀ	mobile research	l
				laboratory.	ŀ
				Assure the thorough	
		- 1		decontamination ali	
		ŀ		equipment including all	
				Internal and external	
				potentially wetted	
				surfaces with steam,	
				chemosterilants, or	
				other approved	
				methods prior to	
				removal from location.	
	Plants	Yes	Surface water contains	Physical removal of all	Yes
			multiple plant species	visible plant material	
			Including AIS	prior to transfer into	
				mobile research	
				laboratory.	•
				Assure the thorough	
	1			decontamination all	
			f	equipment including all	
	1			Internal and external	
	1			potentially wetted	
				1 '	
				surfaces with steam,	
				chemosterilants, or	
				other approved	
				methods prior to	
				removal from location,	
	Others	yes	Surface water has	Assure the thorough	yes
		1.	potential to transfer	decontamination all	1 ***
			fish diseases	equipment including all	
				internal and external	i
				potentially wetted	
				surfaces with steam,	
				chemosterllants, or	i
			1	other approved	
			1	methods prior to	
			1	removal from location.	1
	.1			removal portiocation,	1

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Task 9	Vertebrates	yes	Surface water contains	Physical removal of all	Yes
			multiple vertebrate	visible vertebrates	
All remaining	1		species	prior to transfer into	
equipment, cages and				mobile research	
substrate trays are				laboratory,	
decontaminated and				Assure the thorough	
returned to UMESC				decontamination all	
				equipment including all	
	1			Internal and external	
				potentially wetted	
				surfaces with steam,	
	ł			chemosterilants, or	
			1	other approved	
			ľ	methods prior to	
		ļ		removal from location.	
	Invertebrates	yes	Surface water contains	Physical removal of all	Yes
			multiple invertebrate	visible invertebrates	
	1	1	species include AIS	not required for testing	
		1		prior to transfer into	
		1		mobile research	
		[laboratory.	
		ĺ		Assure the thorough	
				decontamination all	
				equipment including all	
			1	Internal and external	
		1		potentially wetted	
	ļ.	i		surfaces with steam,	
				chemosterilants, or	
				other approved	
				methods prior to	
•				removal from location.	
	Plants	ycs	Surface water contains	Physical removal of all	Yes
			multiple plant species	visible plant material	
			Including AIS	prior to transfer into	
			i madang / no	mobile research	
			ł	aboratory	
				Assure the thorough	
				decontamination all	
				equipment including all	
				Internal and external	
	İ				
				potentially wetted	
				surfaces with steam,	
		1		chemoster#ants, or	
				other approved	
				methods prior to	
		1		removal from location.	
	Others	yes	Surface water has	Assure the thorough	γes
			potential to transfer		1.73
			fish diseases	decontamination all	
				equipment including all	
				Internal and external	
				potentially wetted	
				surfaces with steam,	•
		1		chemosterilants, or	
		1		other approved	
		1		• • • • • • • • • • • • • • • • • • • •	
		İ		methods prior to	
		L		removal from location.	

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				Moni	toring			T
Critical Control Point (CCP)	Significant Hazard(s)	Limits for each Control Measure	What	How	Frequency	Who	Evaluation & Corrective Action(s) (If needed)	Supporting Documentatio (If any)
Tasks 1, 2, 3,6,7,8 & 9	Transfer of endemic and AIS including vertebrates, invertebrates, plants and pathogens	Transfer of vertebrates, Invertebrates, Invertebrates, plants and pathogens must not occur. All equipment must be thoroughly inspected and disinfected prior to site removal and inspected and/or redecontaminated upon setup at new location.	Equipment disinfection	Mechanical cleaning/remo val, pressure washing, steam cleaning, chemosterilant or other approved methods,	Prior to equipment arrival, upon deployment, upon movement from/to surface water and prior to departure		Supervisor and staff are responsible for methodical decontemination using established procedures. Corrective actions required to complete decontamination must be performed prior to any equipment movement from test location. Decontamination and inspection must be completed before equipment removal from test location from test to coation from the completed for test for the second from test for the second from test for the second from test for the second from test for the second for the second from test for the second for the se	Records in log books all procedures use for decontamination
Facility: Upper Midwest Mobile Research Address:	Environmental Si Laboratory	ciences Center	-				monas fluorescens (Pf-C ra mussels on artificial s	
2630 Fanta Reed	Road, La Crosse	e. WI 54601		J				

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File Folder:	_	Kem Hamber.
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United States Department of the Interior

U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

Date: August 13, 2012

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Amendment 1- Amendment to the study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens (Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Revision of Study Protocol, Study # AEH-12-PSEUDO-04 is proposed as detailed on pages 2-7 of this amendment. Revised text is indicated in **bold**.

This amendment details the 1) combining all exposure times into a single exposure bath with removal of substrates replicates at 6, 9 and 12-h; 2) the elimination of supplemental aeration during the exposure period 3) the inclusion of a separate bottom layer treatment exposures if sufficient substrate trays remain after the initial whole tank exposures and 4) the delivery of test material, collection of water samples and water chemistry data.

CINICOO	Mark P. Gaikowski, M.A. Supervisory Biologist Aquatic Ecosystem Health, UMESC ¹	13 Ary 12 Date	Michael Jawson, Ph.D. Center Director, UMESC	13 Avj Date
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Approved by:

File Folder: 3 JMESC Stem Number: 2

¹ UMESC: U.S. Geological Survey, Upper Midwest Environmental Sciences Center

Study# AEH-12-PSEUDO-04 Amendment #1

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Current text:

4.2 Experimental Design:

In October and November of 2011 and again in May 2012 (depending on site) zebra mussel attachment substrates (0.063" thick, type 3003, perforated aluminum sheeting [3/16" hole, 51% open area] 15.2 cm x 15.2 cm trays with 2.5 cm sides) were nested together in groups of 10 trays per stack (separated \sim 2 cm with wooden blocking and zipped tied in place). Just prior to nesting, the trays were seeded by placing approximately 100-200 previously collected zebra mussels on the trays. The zebra mussels were collected (\leq 6-h prior to use) by severing their byssal threads from rocks and other surfaces (e.g., sticks, native mussels, etc) with a scalpel; zebra mussels were maintained in a cooler until placed in an attachment substrate. At each location, approximately 60 nested trays were placed in a wire mesh cage (\sim 0.9 m long x 0.6 m wide x 0.45 m high) and placed in \sim 2 m of water for zebra mussel attachment and overwintering.

Substrate trays will be removed from the cages and placed in a semi-rigid plastic mesh bag (~20.3 x 25.4 x 5.1 cm; ~0.31 x 0.31 cm openings) and sealed with zip ties. Each substrate bag will uniquely tagged and randomly assigned to one of 9 test tanks within the mobile research trailer. At least 3 substrate bags and travs will be placed in each test tank containing up to 325 L of filtered (200 μm) surface water. Flowing, filtered surface water will be supplied to the test tanks at a rate sufficient to achieve ≥1 tank exchange per hour. The substrate bags and trays will be acclimated to conditions within the test tanks for ≥ 12-h prior to administering a single Pf-CL145A SDP exposure. Treatment concentration (e.g. 0 [control], 50 or 100 mg/L) will be randomly assigned to each test tank (n=9) and each test tank will serve as an exposure replicate (3 replicates per treatment concentration). For each exposure day, a single treatment duration (ie: 6, 9 or 12-h) will be assigned for all treatment concentrations. At exposure termination the tanks will be drained of treated water, rinsed and refilled with flowing filtered surface water. Within 24 h of exposure termination, the substrate bags and travs will be removed from the test tanks and returned to the wire mesh cages. The cages will then be placed in ~ 2 m of water in the lake or river for a 3-4 week observation period. After 3-4 weeks (dependent on temperature) the cages will be removed from the water body and mussels enumerated for survival. After enumeration all test animals will be euthanized.

5.2 Water Chemistry

- 5.2.1 Dissolved oxygen: Dissolved oxygen will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. Dissolved oxygen will be measured and recorded at least once during the pre- and post-exposure periods and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 394 or equivalent).
- 5.2.2 Temperature: Temperature will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. Temperature will be measured and recorded at least

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- once during the pre- and post-exposure periods and at least twice during the exposure period with the last measurement observed \leq 30 minutes prior to exposure termination.
- 5.2.3 pH: pH will be measured and recorded in each exposure tank during the acclimation, exposure and post-exposure holding periods. pH will be measured and recorded at least once during the pre- and post-exposure periods and at least twice during the exposure with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 335 or equivalent).
- 5.2.4 Hardness: Hardness will be measured and recorded prior to exposure initiation (UMESC SOP AEH 712).
- Alkalinity: Alkalinity will be measured and recorded prior to exposure initiation (UMESC SOP AEH 706).
- 5.2.6 Conductivity: Conductivity will be measured and recorded prior to exposure initiation (UMESC SOP AEH 188 or equivalent).
- 5.2.7 Ammonia: Samples for total ammonia-nitrogen will be collected at the termination of the exposure period for each exposure replicate. Ammonia samples will be filtered through a 0.45 micron syringe filter, acidified (~pH 2.5) with sulfuric acid and then stored at ~4°C until analyzed by the UMESC Long Term Resources Monitoring (LTRM) Water Quality Laboratory using the automated phenate method.
- 5.3 Disposal: All live mussels at the end of the post-exposure observation period will be euthanized and disposed by incineration or according to other state or local requirements.

5.4 Study facilities:

5.4.1 Test Facility

U.S. Geological Survey, Upper Midwest Environmental Sciences Center Mobile Research Laboratory

2630 Fanta Reed Rd

La Crosse, Wisconsin 54603

- 5.4.1.1 Test location: Lake Carlos, MN; Lake Pepin, MN; and Lake Shawano, WI
- 5.4.1.2 Exposure system: The test system consists of nine 76.2 cm diameter x 91.4 cm deep fiberglass circular exposure tanks in two rows of 4 or 5 tanks. The tanks are supplied surface water through a pump, filter and headbox system. Each exposure tank will receive a continuous supply of water from a headbox during the pre- and post-exposure periods. Each tank will be uniquely identified to allow for identification treatment type and replicate number. Coding procedures will be documented in the study records.
- 5.4.1.3 Aeration: Supplemental aeration will be supplied during the acclimation, *Pf*-CL145A SDP exposures and the post exposure observation periods.

- 5.4.1.4 Water supply: Filtered surface water will be supplied continuously (~5 L/min) to achieve a ~ tank-volume exchange/n during the pre- and post-exposure periods. Water supply will be interrupted during the *Pf*-CL145A SDP exposures.
- 5.4.1.5 Water discharge: Untreated water will be returned to the surface water supply source. Pf-CL145A SDP treated water will be mechanically and/or carbon filtered and/or collected for disposal as required by DNR regulation.
- 5.4.1.6 Lighting: Overhead lighting (~16 h light:8 h dark) will be provided.
- 5.5 Observations:
- 5.5.1 Mortality: Zebra mussels that are gapping and do respond to tactile stimuli by shell closure will be coded as a mortality. Zebra mussels that have closed shells or respond to tactile stimuli by shell closure will be coded as alive.
- 5.6 Treatment administration:
- 5.6.1 Treatment: Each treatment will consist of three Pf-CL145A SDP concentrations (ie: 0 [control], 50 or 100 mg/L A.I.) with a single exposure duration (6, 9 or 12-h). All treatment concentrations will have three replicate exposure tanks. A minimum of 3 zebra mussel-encrusted substrate trays will be bagged and placed in each test replicate.
- 5.6.2 Route of administration: Exposures will be initiated by addition of an appropriate amount of a Pf-CL145A SDP stock solution. The tank will be gently mixed to achieve a uniform distribution of test material.
- 5.6.3 Concentration verification: Concentration will be determined spectrophotometrically. A standard curve will be prepared using a known mass of *Pf*-CL145A SDP. The absorbance of exposure solutions will be compared to the standard curve to determine the exposure concentration. Absorbance will be determined using a Barnstead/Thermolyne Corporation Model: Turner SP-830 Plus Beckman spectrophotometer (UMESC SOP AEH 302).

Revised text (in bold):

4.2 Experimental Design:

In October and November of 2011 and again in May and August 2012 (depending on site and observed mussel condition) zebra mussel attachment substrates (0.063" thick, type 3003, perforated aluminum sheeting [3/16" hole, 51% open area] 15.2 cm x 15.2 cm trays with 2.5 cm sides) were nested together in groups of 10 trays per stack (separated ~ 2 cm with wooden blocking or staggered to allow open corners and zip tied in place). Just prior to nesting, the trays were seeded by placing approximately 100-200 previously collected zebra mussels on the trays. The zebra mussels were collected (≤ 6-h prior to use) by severing their byssal threads from rocks and other surfaces (e.g., sticks, native mussels, etc) with a scalpel; zebra mussels were maintained in a cooler until placed in an attachment substrate. At each location, approximately 60 nested trays were placed in a wire mesh cage (~ 0.9 m long x 0.6 m wide x

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0.45 m high) and placed in ~ 2 m of water for zebra mussel attachment. Substrate trays will be removed from the cages and placed in a semi-rigid plastic mesh bag (~20.3 x 25.4 x 5.1 cm; ~0.31 x 0.31 cm openings) and sealed with zip ties. Each substrate bag will uniquely tagged and randomly assigned to one of 9 test tanks within the mobile research trailer. At least 3 substrate bags and trays will be placed in each test tank containing 350 L of filtered (200 µm) surface water. Flowing, filtered surface water will be supplied to the test tanks at a rate sufficient to achieve ≥1 tank exchange per hour. The substrate bags and trays will be acclimated to conditions within the test tanks for ≥ 12-h prior to administering a single whole tank treatment of Pf-CL145A SDP. Treatment concentration (e.g. 0 [control], 50 or 100 mg/L) will be randomly assigned to each test tank (n=9) and each test tank will serve as an exposure replicate (3 replicates per treatment concentration). For each exposure, 9 travs will be randomly assigned to each of 3 treatment concentration replicates. At each exposure termination time point (6, 9 and 12-h) three randomly selected trays will be immediately removed from each treatment replicate, rinsed with tempered surface water and returned to the wire mesh cages located in ~ 1 m of water in the lake or river. Within 12 h of exposure termination the cages will then be relocated and placed in ~ 2 m of water in the lake or river for a 3-4 week observation period. If sufficient untreated substrate trays remain, an additional exposure will be completed in an identical fashion except that 1) the number of trays per replicate and exposure duration time point will be adjusted according to the number of available substrate and 2) the exposures will be conducted as a bottom layer injection designed to treat the bottom 50% of the water column within the tank. The injection design, number of trays and exposure durations tested will be recorded in the study files. After 3-4 weeks (dependent on temperature) the cages will be removed from the water body and mussels enumerated for survival. After enumeration all test animals will be euthanized.

5.2 Water Chemistry

- 5.2.1 Dissolved oxygen: Dissolved oxygen will be measured and recorded in each exposure tank during the acclimation and exposure periods. Dissolved oxygen will be measured and recorded at least once during the acclimation period and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 394 or equivalent).
- 5.2.2 Temperature: Temperature will be measured and recorded in each exposure tank during the acclimation and exposure period. Temperature will be measured and recorded at least once during the acclimation period and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination.
- 5.2.3 pH: pH will be measured and recorded in each exposure tank during the acclimation and exposure period. pH will be measured and

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- recorded at least once during the acclimation period and at least twice during the exposure period with the last measurement observed ≤ 30 minutes prior to exposure termination (UMESC SOP AEH 335 or equivalent).
- 5.2.4 Hardness: Hardness will be measured and recorded prior to exposure initiation in each headbox (UMESC SOP AEH 712).
- 5.2.5 Alkalinity: Alkalinity will be measured and recorded prior to exposure initiation in each headbox (UMESC SOP AEH 706).
- 5.2.6 Conductivity: Conductivity will be measured and recorded prior to exposure initiation in each headbox (UMESC SOP AEH 188 or equivalent).
- 5.2.7 Ammonia: Samples for total ammonia-nitrogen will be collected at the termination of the exposure period for each exposure replicate. Ammonia samples will be filtered through a 0.45 micron syringe filter, acidified (~pH 2.5) with sulfuric acid and then stored at ~4°C until analyzed by the UMESC Long Term Resources Monitoring (LTRM) Water Quality Laboratory using the automated phenate method.
- 5.3 Disposal: All live mussels at the end of the post-exposure observation period will be euthanized and disposed by incineration or according to other state or local requirements.
- 5.4 Study facilities;
- 5.4.1 Test Facility
 - U.S. Geological Survey, Upper Midwest Environmental Sciences Center Mobile Research Laboratory
 - 2630 Fanta Reed Rd
 - La Crosse, Wisconsin 54603
 - 5.4.1.1 Test location: Lake Carlos, MN; Lake Pepin, MN; and Lake Shawano, WI
 - 5.4.1.2 Exposure system: The test system consists of nine 76.2 cm diameter x 91.4 cm deep fiberglass circular exposure tanks in two rows of 4 or 5 tanks. The tanks are supplied surface water through a pump, filter and headbox system. Each exposure tank will receive a continuous supply of water from a headbox during the acclimation period. Each tank will be uniquely identified to allow for identification treatment type and replicate number. Coding procedures will be documented in the study records.
 - 5.4.1.3 Aeration: Supplemental aeration may be supplied during the acclimation period and will not be supplied during the *Pf*-CL145A SDP exposure period. Use of supplemental aeration will be documented in the study record.

- 5.4.1.4 Water supply: Filtered surface water will be supplied continuously (~5 L/min) to achieve a ~ tank-volume exchange/h during the acclimation period. Water supply will be interrupted during the *Pf*-CL145A SDP exposures.
- 5.4.1.5 Water discharge: Untreated water will be returned to the surface water supply source. Pf-CL145A SDP treated water will be mechanically and/or carbon filtered and/or collected for disposal as required by DNR regulation.
- 5.4.1.6 Lighting: Overhead lighting (~16 h light;8 h dark) will be provided. 5.5 Observations:
- 5.5.1 Mortality: Zebra mussels that are gapping and do respond to tactile stimuli by shell closure will be coded as a mortality. Zebra mussels that have closed shells or respond to tactile stimuli by shell closure will be coded as alive.
- 5.6 Treatment administration:
- 5.6.1 Treatment: Each treatment will consist of three *Pf*-CL145A SDP concentrations (ie: 0 [control], 50 or 100 mg/L A.I.) with multiple exposure durations (6, 9 and 12-h). All treatment concentrations will have three replicate exposure tanks. A minimum of 3 zebra mussel-encrusted substrate trays will be bagged and placed in each test replicate. Randomly selected trays will be removed from each test replicate at the end of each exposure duration, rinsed with tempered surface water and returned to the wire mesh holding cages.
- 5.6.2 Route of administration: Exposures will be initiated by addition of an appropriate amount of a Pf-CL145A SDP stock solution. In whole tank treatments, the tank will be gently mixed to achieve a uniform distribution of test material. In the bottom injection treatments the appropriate amount of a Pf-CL145A SDP stock solution will be delivered with a peristaltic pump at ~1/4 of the water column height (~19 cm) using four suspended delivery tubes.
- 5.6.3 Concentration verification: Concentration will be determined spectrophotometrically. A standard curve will be prepared using a known mass of Pf-CL145A SDP. The absorbance of exposure solutions will be compared to the standard curve to determine the exposure concentration. Absorbance will be determined using a Barnstead/Thermolyne Corporation Model: Turner SP-830 Plus Beckman spectrophotometer (UMESC SOP AEH 302) or equivalent. Samples collected during the whole tank treatments exposures will be collected from the surface of the exposure replicates. Samples collected during the bottom layer injection exposures will be collected with a peristaltic pump from the bottom at ~1/4 of the water column height (~19 cm) using four suspended collection tubes. The collected water from each delivery tube will be pooled for each replicate tank and analyzed for Pf-CL145A SDP concentration. Concentrations will be verified in each replicate within 30 minutes of initial dosing and at 3, 6, 9 and 12-h post-dosing.

Study# AEH-12-PSEUDO-04	Amendment #1		Page 7 of 7
File Folder: 3		Item Number: 2	

Study Number: A	1-4-1	-04	Neviewed by	·	Date: Date:	_
ne roider:	tab t	DOK/pgs:	verified by:		Date;	
		Zebra	Musse	l Surviv	al	
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Sample ID	Exposure Time (h)	Concentration (mg/L)			Comments	Date/Initia
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ile Folder:		Lab book/pg	s:	. Verifled by:	Date:		
		3	Zehra	Mussel	Lengths		
Test Organ	ism: Zehr				E	Vnorura Dator	
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Sample ID	Mussel			Shell Length	Comments	Date	Initial
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Study Number: AEH-12-P				y:		
File Folder:	Lab book/pgs: _		Verified by:		Date:	
Test Chemical Lot #: Test Organism: zek Instruments Used:	401P12163C a ora mussels	cal: <i>Pseudomo</i> nd 401P12164 Test Location:	nas fluroescens <u>C Mix</u> Date Rec'	strain 145A d 7-Aug-12		21-Jun-12
Weights of Chemica	Samples:					
Sample	ID	Sample Weig	ht Co	nments	Date	Initials
NOTE: Chemical sam		d refrigerated	until used for st	ock preparati	on.	
Stock Solution Prepa Sample ID	Dilution Volume (mL)	Dilution Time	Use	Exposure Time	Date	Initials

					E	Initials							
Date:	Date:				Filter size:	Date							
Reviewed by:	Verified by:	Conductivity and Hardness - Exposure Initiation	Instruments:	Exposure Date:	Water filtered: Y / N	Commments							r of 20).
		s - Exposur		Fest Chemical: Pf-CL145A SDP Lot Number: 401P12163C and 401P12164C Mix Exposure Date:	Water filt	Hardness [©] (mg/L CaCO ₃)							© Hardness in :ng/L CaCO ₅ = (mL of 0.001 M Na ₂ EDTA titrant added to the sample) x (multiplication factor of 20). Hardness Sample volume = 50 m.L. Hardness Sample volume = 50 m.L. May all all all all all all all all all a
		Hardnes		401P12163C aı		Multiplication Factor	20	20	20	20	20	20	added to the samp
File Folder:	Lab book/pgs:_	rity and	Test Organism: Zebra mussels Test Location:	Lot Number:		Conductivity mL of 0.01 M (µS/cm) EDTA							vi Na _ž EDTA titrant
Study Number AEH-12-PSEUDO-04		onductiv	bra mussels	CL145A SDP									File Folder:
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Study Nu			Test Org	Test Che	Water Source:	Head Box ID							© Hardness S Hardness S Page / of /

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		Alkalinity - Exposure Initiation		Lot Number: 401P12163C and 401P12164C Mix Exposure Date:	Water filtered: Y/N	Alkalinity [©] (mg/L CaCO ₃)							Sample volume = 100 mL (1) Alkalinity in mg/L CaCO3 = (mL 0.02N H2SO4 used) x (Multiplication Factor of 10)	
		- Exposu		<u> 101P12163C an</u>		Multiplication Factor	10	10	10	10	10	01	ed) x (Multiplica	
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40		AI	5	٩		Initial Temp (°C)							= (mL 0.0	File Folder:
PSEUDO			a musse	145A SD		Initial pH							00 mL 'L CaCO3	Item Number: 5
ber AFH-13			nism: Zebı	nical: Pf-Cl	Trice:	Replicate	1	2	3	1	2	3	olume = 10 vity in mg/	
Study Number AFH-12-PSEUDO-04			Test Organism: Zebra mussels	Test Chemical: Pf-CL145A SDP	Water Source:	Head Box ID							Sample volume = 100 ml	Page/_ of/

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			re:		Exposure 12 hour											
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PSEUDO 04 Lat book/sgs: Date: Date:	Test Location:	Lot Number: 4	Water Type/Source:		Pre-Exposure Pre-Exposure (1) (2) Initial											
H-12-PSEUDO 04 Lab book/2gs: Water O	Tact Organism: Johns Mussels Tact Location:	Text Chemical: Pf-CL145A SDP Lot Number: 401P12163C and 401P12164C Exposure Start Time/Date:	· · · · · · · · · · · · · · · · · · ·		Concentration (mg/L)										Time of reading	Date and Initials
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File Fold	er: _		19			lte	m Nu	mbe	r: <u>6</u>		***	Page	:/	o	f	

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		lity - Dis	Test Location:	Lot Number: 4	Water Type/Source:		Pre-Exposure Pre-Exposure Exposure (1) (2) Initial									
Study Number: AEH-12-PSEUDO-04	Lab book/pgs:	Water Quality - Dissolved Oxygen (mg/L) Measurements	Test Organism: Zebra Mussels Test Location:	Test Chemical: Pf-CL145A SOP Lot Number: 401P12163C and 401P12164C Exposure Start Time/Date:	1):	sed:	Concentration (mg/L)								Time of reading	Date and Initials
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		Fil	e Fo	olde	эг: _		19	 Item	Nun	ber;	8	 Pa	ge_	/	of	1

Date:	ion	Exposure Date:		Location of Sample:		Comments								ne filtered through a 0.45 µm syringe . Temperature and pH will be			
Reviewed by:	on - Exposure Terminat	Test Location: Expos	Lot Number: 401P12163C and 401P12164C Mix	Application Type:	Sampling Time h	Temp (°C) Date / Initials		:						our from each exposure chamber. The samples will L Lof 10% sulfuric acid, and stored at 4°C until analysi			
Study Number: AEH-1,2-PSEUDO-04 File Folder:	Ammonia Sample Collection - Exposure Termination	Test Organism: Zebra mussels Test	Test Chemical: Pf-CL145A SDP Lot Nu	Instruments Used: Applicati	Concentration	Exposure Tank ID								Note: Approximately 5 mL samples will be collected at 24-hour from each exposure chamber. The samples will be filtered through a 0.45 µm syringe filter. 3 mL of the filtered sample will be addiffied with 60 µL of 10% sulfuric acid, and stored at 4°C until analysis. Temperature and pH will be measured when the ammonia samples are collected.			
	Flie	Fo	olde	r: _	10	7	_	Iten	n Nu	mbe	r:	9		Page _	_/	_of	1

Appendix 2. Deviations from the Study Protocol

Item Number	Item Description	Number of Pages	Report Page Number
1	Deviation #1 – Randomization of tank treatment assignment error for Shawano Lake whole water body trial	1	64
2	Deviation #2 - Randomization of substrate removal from tanks error	1	65
3	Deviation #3 – Total ammonia-nitrogen water samples not collected at the 6 and 9 hour termination during the whole water treatment at Lake Shawano	1	66
4	eviation #4 – Control exposure tanks not analyzed for concentration verification at Lake Carlos	1	67
5	Deviation #5 – No curriculum vitae or signature on the verification page for an incidental data collector	1	68
6	Deviation #6 - Removal of Lake Pepin test location	1	69



United States Department of the Interior

U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: November 19, 2013

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 1 to study AEH-12-PSEUDO-04 "Efficacy of Pseudomonas fluorescens (Pf-CL145A) SDP

for controlling settled zebra mussels on artificial substrates"

Deviation #1 - Randomization of Tank Treatment Assignment Error for Shawano Lake whole water body trial

For unknown reasons the randomization prepared for the experimental tank treatment assignment during the Shawano Lake whole water body trial was not followed. The treatments were applied repetitively in chronological order (e.g. tanks 1, 2, and 3 received 0, 50 and 100 mg/L respectively, tanks 4, 5, and 6 received 0, 50 and 100 mg/L respectively, and tanks 7, 8, and 9 received 0, 50 and 100 mg/L respectively). The tank treatment assignment applied to each tank was verified with stock preparation data (File Folder 07), the water chemistry data (File Folder 11b), and the spectrophotometry data (File Folder 11c).

No adverse impacts are anticipated as a result of this deviation as the test animals (ie: bagged mussel trays) were randomly assigned to each treatment tank. Additionally, each treatment level was conducted in triplicate. Any impacts to the study as a result of this deviation will be addressed in the final report.

Kerry ⁻ L. Weber, M.S. Principal Investigator, UMESC	. —	19 novi3 Date
James A. Luoma, B.A. Study Director, UMESC		<i>l1/14/13</i> Date

cc: UMESC QAU		Item Number: 3
File Folder:3	Page 1 of 1	



U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: November 19, 2013

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 2 to study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens (Pf-*CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Deviation #2 - Randomization of Substrate Removal from Tanks Error

Due to a programming and proc print error, the randomizations generated for the removal of substrates from exposure tanks 5, 7 and 9 for each trial (i.e., whole water body and bottom injection application for each testing location) were the same as the randomizations prepared for exposure tank 2 (i.e., the data for tank 2 was printed in error for tanks 5, 7 and 9) from each individual trial. Therefore at 6, 9 and 12 h post-dosing initiation, treated substrates were removed from the same location in exposure tanks 2, 5, 7 and 9.

No adverse impacts are anticipated as a result of this deviation as the test animals (ie: bagged mussel trays) were randomly assigned to each treatment tank. Additionally, each treatment level was conducted in triplicate and was randomly assigned to the exposure tanks. Any impacts to the study as a result of this deviation will be addressed in the final report.

Kerrÿ∕L. Weber, Principal Investi	M.S. gator, UMESC	 1910013 Date
A J Study Director,	, B.A. UMESC	 11/19/13 Date

cc; UMESC QAU		Item Number: 4
File Folder: 3	Page 1 of 1	i



U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: November 20, 2013

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 3 to study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Deviation #3 – Total ammonia-nitrogen water samples not collected at the 6 and 9 hour termination during the whole water treatment at Lake Shawano

Section 5.2.7 of study number AEH-12-PSEUDO-04 amended protocol entitled "Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates" states that "samples for total ammonia-nitrogen will be collected at the termination of the exposure period for each exposure replicate."

Previous studies (AEH-11-PSEUDO-01, AEH-11-PSEUDO-02 and AEH-12-PSEUDO-03) demonstrated that ammonia levels did not appreciably accumulate during 24 hour static treatments of the commercially produced *Pseudomonas fluorescens* (*Pf*-CL145A). Additionally, ammonia accumulation increases with degradation and, therefore, the greatest concentration would be at the 12 hour termination. Therefore, total ammonia-nitrogen water samples were collected only at the 12 hour exposure termination and not at 6 and 9 hour exposure termination times for the whole water treatment at Lake Shawano.

No adverse impacts are anticipated as a result of this deviation as ammonia levels from the static treatments would be highest at 12 hours. The highest observed un-ionized ammonia concentration at the 12 hour termination of the Lake Shawano whole tank treatment was 0.045 mg/L (Tank 2; 50 mg/L treatment group), a level that should not cause acute ammonia toxicity. Any impacts to the study as a result of this deviation will be addressed in the final report.

Kerry L. Weber, M.S.	<u>201/00/13</u>
Principal investigator, UMESC	Date
B.A.	11/20/13
Study Director, UMESC	Date

cc: UMESC QAU		,
		Item Number:
File Folder:3	Page 1 of 1	•



U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: November 20, 2013

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 4 to study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Deviation #4 - Control exposure tanks not analyzed for concentration verification at Lake Carlos

Section 5.6.3 of study number AEH-12-PSEUDO-04 amended protocol entitled "Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates" states that "concentrations will be verified in each replicate within 30 minutes of initial dosing and at 3, 6, 9 and 12-h post-dosing."

Water samples from the control exposure tanks were not analyzed for *Pf*-CL145A concentration during the Lake Carlos whole water treatment (Tanks 2, 3, and 5) or the Lake Carlos bottom injection treatment (Tanks 3, 6 and 7). Samples were analyzed from all treated exposure replicates at 1, 3, 6, 9 and 12 hours for both whole water and bottom injections treatments.

No adverse impacts are anticipated as a result of this deviation as a linear, zero intercept standard curve was created from dilutions prepared from a 2,000 mg/L *Pf*-CL145A stock solution in 200 µm filtered Lake Carlos water and the spectrophotometer was blanked using 200 µm filtered Lake Carlos water. Additionally, all treatment replicates were isolated, static treatments which precluded any cross contamination. Any impacts to the study as a result of this deviation will be addressed in the final report.

impaçis to the study as a result	or this deviation will be addressed in the final report,	
	Kerry Lzweber, IV.S. Principal Investigator, UMESC	Johnov 13 Date
File Folder:3	Al James A. Luoma, B.A. Study Director, UMESC	11/20/13 Date
cc: UMESC QAU		
Item Number:6	Page 1 of 1	



U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: February 10, 2014

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 5 to study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens* (*Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Deviation #5 - No curriculum vitae or signature on the verification page for an incidental data collector

Data entries were recorded on "Zebra Mussel Survival" forms (File Folder 14d) by an individual with the initials "ATM". The individual was Anna T. Morales, a WI DNR scientist working in Shawano County, Wisconsin. Ms. Morales only participated in the enumeration of zebra mussels during the Shawano assessment conducted on October 10, 2012. Ms. Morales worked under the direct supervision of UMESC Biologists, only enumerated three samples, and completed no other study activities. No curriculum vitae or signature on the verification page were obtained; attempts to locate Ms. Morales were unsuccessful.

No adverse impacts are anticipated as a result of this deviation and any impacts to the study as a result of this deviation will be addressed in the final report.

Written by Todd J. Severson, B.S. Biologist, UMESC	10 F6B 2014 Date
ioma, B.A.	2/12/2014
Study Director, UMESC	Date

Item Number: Page 1 of 1



U.S. GEOLOGICAL SURVEY Biological Resources Division Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road La Crosse, Wisconsin 54603

MEMORANDUM

Date: May 30, 2014

To: The Record Study Number AEH-12-PSEUDO-04

Subject: Deviation 6 to study AEH-12-PSEUDO-04 "Efficacy of *Pseudomonas fluorescens (Pf*-CL145A) SDP for controlling settled zebra mussels on artificial substrates"

Deviation #6 - Removal of Lake Pepin test location

File Folder: __3

A wide spread die-off of *Dreissena polymorpha* (zebra mussels) in the Upper Mississippi River system resulted in the need to cancel test exposures at Lake Pepin in Minnesota. Zebra mussel test animals were unavailable, with extremely few animals being found within approximately 5 river miles of the proposed test site. Exposures were successfully completed at two locations (Lake Carlos, Minnesota and Shawano Lake, Wisconsin), which resulted in sufficient data collection.

There were no adverse impacts as a result of this deviation as sufficient data was collected during the two exposures conducted to provide robust and scientifically defensible conclusions.

Kerry L. Weber, M.S. Principal Investigator, UMESC	Join AT JUN Date
James A. Luoma, B.A. Study Director, UMESC	5/3-/20/4 Date

Item Number: $\underline{-8}$

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Appendix 3. Randomization Assignments

Item Number	Item Description	Number of Pages	Report Page Number
1	SAS generated random assignment of treatment to experimental tank (Lake Carlos; whole tank treatment)	4	71
2	SAS generated random assignment of trays to test tank/position (Lake Carlos; whole tank treatment)	8	75
3	SAS generated random assignment of substrate removal from tanks (Lake Carlos; whole tank treatment	30	83
4	SAS generated random assignment of treatment to experimental tank (Lake Carlos; bottom injection treatment)	4	113
5	SAS generated random assignment of trays to test tank/position (Lake Carlos; bottom injection treatment)	8	117
6	SAS generated random assignment of substrate removal from tanks (Lake Carlos; bottom injection treatment	30	125
7	SAS generated random assignment of treatment to experimental tank (Lake Shawano; whole tank treatment)	4	155
8	SAS generated random assignment of trays to test tank/position (Lake Shawano; whole tank treatment)	8	159
9	SAS generated random assignment of substrate removal from tanks (Lake Shawano; whole tank treatment	30	167
10	SAS generated random assignment of treatment to experimental tank (Lake Shawano; bottom injection treatment)	4	197
11	SAS generated random assignment of trays to test tank/position (Lake Shawano; bottom injection treatment)	8	201
12	SAS generated random assignment of substrate removal from tanks (Lake Shawano; bottom injection treatment	30	209

Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrat 1 AEH-12-PSEUDO-04

Random assignment of treatment to experimental tanks $8/\nu/\nu$ Treatment Location/type: Lake Carlos - whole water body

0bs	block	tank	×	tankn	trt	A6914 AB BA
_						AEH-12-P\$EUDO-04
1	1	3	0.04216	Tank 3	control	
2	1	4	0.04661	Tank 4	50	
3	1	7	0.24380	Tank 7	100	
4	1	5	0.34596	Tank 5	control	
5	1	1	0.45411	Tank 1	50	
6	1	6	0.55661	Tank 6	100	
7	1	2	0.68773	Tank 2	control	
8	1	8	0.83316	Tank 8	50	
9	1	9	0.89124	Tank 9	100	•

File Folder: 9a	Item Number:	Page of
THE FORGET:	iosm rumber:	Lafte 01

Analysis performed by J. Luoma SAS version 9.2 08:59 11AUG12

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* Study Number : AEH-12-PSUEDO-04
  Study Director: Jim Luoma
 * date created : 11 August 2012 - JAL 🌾
 * Verified by: _____ (Date:___
                                                      page ____ of ___ AEH-12-PSEUDO-04
 * Random allocation of treatment to tank.sas
 *******************
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Lake Carlos - whole tank exposure*/
data fish;
 do block = 1 to 1 by 1;
  do tank = 1 to 9 by 1;
  x = ranuni(-1);
   output;
  end;
 end;
run;
data fish2: set fish:
 if block = 1 and tank = 1 then tankn = 'Tank 1';
  if block = 1 and tank = 2 then tankn = 'Tank 2';
   if block = 1 and tank = 3 then tankn = 'Tank 3';
   if block = 1 and tank = 4 then tankn = 'Tank 4';
    if block = 1 and tank = 5 then tankn = 'Tank 5';
     if block = 1 and tank = 6 then tankn = 'Tank 6';
      if block = 1 and tank = 7 then tankn = 'Tank 7';
       if block = 1 and tank = 8 then tankn = 'Tank 8';
        if block = 1 and tank = 9 then tankn = 'Tank 9';
     run;
proc sort data=fish2;
 by block x;
run;
data assign_trt_fish; set fish2;
 if _n_ = 1 then trt = 'control';
  if _n_ = 2 then trt = '50';
  if _n_ = 3 then trt = '100';
   if _n_ = 4 then trt = 'control';
 if _n_ = 5 then trt = '50';
 if _n_ = 6 then trt = '100';
  if _n_ = 7 then trt = 'control';
   if _n_ = 8 then trt = '50';
 if _n_ = 9 then trt = '100';
 run;
proc print cata= assign_trt_fish;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of treatment to experimental tanks':
title4 h=1 'Treatment Location/type: Lake Carlos - whole water body';
                                                                      Page 2 of 4
```

```
334 * date created : 11 August 2012 - JAL 3/\mu 335 * Verified by: ______(Date:_____)
336 * Random allocation of treatment to tank.sas
337 ******************************
                                                                              AEH-12-PSEUDO-04
                                                          ********
338 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
339
340 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
342 options /*1s=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
343
344 /*Random assignment of treatment to experimental tanks*/
345 /*Location/exposure type: Lake Carlos - whole tank exposure*/
346 data fish;
347 do block = 1 to 1 by 1;
       do tank = 1 to 9 by 1;
348
349
       x = ranuni(-1);
350
       output;
351
       end;
352
     end;
353 run;
NOTE: The data set WORK.FISH has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.01 seconds
      opu time
                          0.01 seconds
354 data fish2; set fish;
     if block = 1 and tank = 1 then tankn = 'Tank 1';
356
       if block = 1 and tank = 2 then tankn = 'Tank 2';
357
       if block = 1 and tank = 3 then tankn = 'Tank 3';
        if block = 1 and tank = 4 then tankn = 'Tank 4';
359
         if block = 1 and tank = 5 then tankn = 'Tank 5';
          if block = 1 and tank = 6 then tankn = 'Tank 6';
360
361
            if block = 1 and tank = 7 then tankn = 'Tank 7';
            if block = 1 and tank = 8 then tankn = 'Tank 8';
362
363
             if block = 1 and tank = 9 then tankn = 'Tank 9';
364
          run;
NOTE: There were 9 observations read from the data set WORK.FISH.
NOTE: The data set WCRK.FISH2 has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.03 seconds
     opu time
                         0.03 seconds
365 proc sort data=fish2;
    by block x;
366
367 run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
WOTE: PROCEDURE SORT used (Total process time):
     real time
                         0.01 seconds
     opu time
                         0.01 seconds
```

```
368
369 data assign_trt_fish; set fish2;
370    if _n_ = 1 then trt = 'control';
                                                                          AEH-12-PSEUDO-04
      if _n_ = 2 then trt = '50';
371
       if _n_ = 3 then trt = '100';
if _n_ = 4 then trt = 'control';
372
373
      if _n_ = 5 then trt = '50';
374
375
      if _n_ = 6 then trt = '100';
376
       if _n_ = 7 then trt = 'control';
377
        if _n_ = 8 then trt = '50';
378
      if _n = 9 then trt = '100';
       run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
NOTE: The data set WORK.ASSIGN_TRT_FISH has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                  0.03 seconds
      cpu time
                          0.03 seconds
380 proc print data= assign_trt_fish;
381 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
3811 artifical substrates';
382 title2 h=1.5 'AEH-12-PSEUDO-04';
383 title3 h≈1 'Random assignment of treatment to experimental tanks';
384 title4 h=1 'Treatment Location/type: Lake Carlos - whole water body';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_FISH.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                         0.01 seconds
     opu time
                          0.01 seconds
```

FF # _ 9a Item No. _ _ Pg _ 4 _ of _ 4 _ _ Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical s 1 AEH-12-PSUEDO-04

Random assignment of trays to test tank/position

Test Location/type = Lake Carlos/whole water tank treatment

AEH-12-	PSEU	100-04
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								MEI I IE I DEDUCTO
0bs	- round -	Loh 12	position	tank	Х	_row_	tankn	5/2-1- 1500 h Finished 1630h
1	1	2	3	7 2	0.01581	В	V 2B3 ✓	> Fooh
2	1	1	1	5	0.01848	Α	5A1	, ,
3	1	3	3	3	0.01856	C	303	Finished
4	1	3	2	.9	0.02608	C	902	1630h
5	1	2	2	7	0.02978	В	7B2	100-
6	1	3	1	. 7	0.03709	C	₅ 7 C1°	
7	1	1	3	2	0.06534	Ā	2A3	
8	1	2	3	. 8	0.08637	В	:883	
9	1	1	2	9	0.09121	Ā	9A2	
10	1	1	2	.1	0.13514	Α	21 A2 ·	
11	1	1	2	: 7	0.14899	Á	37A2	
12	1	1	2	. 2	0.14907	A	2A2	
13	1	3	1	∞ 6	0.22154	C	601	
14	1	2	3	· 6	0.22497	В	,6B3	
15	1	2	1	7:	0.23740	В	.7B1	
16	1	1	3	٠5	0.24309	Ā	5A3	
17	1	3	3	8	0.24872	C	8C3	
18	1	2	3	1	0.24915	В	1B3	
19	1	1	2	В	0.25031	A	8A2	•
20	1	1	2	5	0.27193	A	5A2	
21	1	1	3	7	0.27954	Α	7A3	
22	1	1	3	1	0.31226	A	1A3	
23	1	3	3	9,	0.31388	C	:9C3	
24	1	1	3	4	0.32192	A	4A3	
25	1	1	1	7	0.32805	Α	7A1 .	
26	1	3	1	. 2	0.33235	С	201	
27	1	3	2	4	0.34771	С	402	
28	1	2	1	× 1	0.35529	В	1B1	
29	1	3	1	e. 9	0.35723	С	∞, 9 C1 =	
30	1	1	1	4	0.36690	Α	4A1 -	
31	1	1	1	12 3	0.37178	Α	3A1	
32	1	1	3	9	0.38632	Α	9A3.	
33	1	1	1	2	0.39205	Α	2A1	
34	1	3	1	1	0.40328	С	101)	
35	1	1 .	. 1	9	0.41738	Α	9A1	
36	1	3	3	6	0.41888	С	603	
37	1	2	1	3	0.42874	В	3B1	
38	1	1	2	6	0.45875	Α	6A2	
39	1	3	1	3	0.45937	С	301	
40	1	3	3	4	0.48106	С	403	
41	1	2	3	3	0.50277	В	3B3	
42	1	2	2	8	0.51279	В	8B2	
43	1	3	1	4	0.52493	C	401	
44	1	3	3	5	0.53590	C	503	
45	1	2	2	3	0.55895	В	3B2	
46	1	2	3	7	0.57234	В	7B3	

46 1 2 3 7 0.57234 B $\frac{10}{10}$ spect Analysis performed by J. Luoma SAS version 9.2 10:48 11AUG12

File Folder: 9a

ttem Number: 2

Page ____ of __8__

Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical $s_i\ 2$ AEH-12-PSUEDO-04

Random assignment of trays to test tank/position

Test Location/type = Lake Carlos/whole water tank treatment 8/1/1252

	1.00 m	2 1 F 16	2 D / 5				- 1 ,	
Obs	round	row	position	tank	×	_row_	tankn	AEH-12-PSEUDO-04
47	1	3	2	. 7	0.59035	С	702	
48	1	1	3	8	0.60064	Α	BA3	
49	1	2	2	···. 4	0.60112	В	4B2	
50	1	2	2	6	0.64896	В	6B2 "	
51	1	1	1	1.	0.65358	Α	1A1.	
52	1	1	1	8	0.65971	Α	8A1 *	
53	1	3	2	3	0.68120	C	3C2	
54	1	1	2	3	0.68828	Α	3A2	
55	1	3	1	8	0.68878	c	8C1	
56	1	2	2	. 2	0.69821	В	2B2 3	
57	1	2	3	9	0.70845	В	9B3	
58	1	3	2	8	0.71981	C	8C2	
5 9	1	3	2	2	0.72917	C	202	
60	1	2	2	-1	0.73674	1. B	1B2	
61	1	3	1	-5	0.74149	C	¢501∴ ∞	
62	1	2	2	. 9	0.74507	В	√9B2	
63	1	3	2	11.1	0.75888	C	102	÷
64	1	3	3	1	0.77048	С	*1C3	
65	1	2	3	. 4	0.77569	В	483	
66	1	2	1	* · 5	0.78253	В	:5B1	
67	1	3	3	2	0.78719	C	·2C3	
68	1	2	3	· 5	0.81481	В	5B3	
69	1	2	1	· 8	0.84781	В	₆ 8B1.	
70	1	1	3	6	0.85703	Α	6A3	
71	1	2	2	. 5	0.87137	В	€5B2-	
72	1	2	1	` 6	0.88824	В	6B1	
73	1	1	3	3	0.89142	A	⊲3A3 ′	
74	1	1	1	- 6	0.89950	Α	6A1 >	
75	1	3	2	6	0.91486	C	6C2 [©]	
76	1	3	2	5	0.93631	С	5C2	
77	1	2	1	4	0.94092	В	4B1	
78	1	3	3	·7	0.97448	С	703	
79	1	1	2	. 4	0.97694	Α	4A2	
80	1	2	1	19	0.98206	B	9B1	
81	1	2	1	2	0.98594	В	2B1	

Analysis performed by J. Luoma SAS	version 9.2 10:48 11AUG12	Page of8
VICTOR CHARGES A STATE OF STAT	Item Number:	File Folder:

```
* Study Number : AEH-12-PSUEDO-04
* Study Director; Jim Luoma
                                                                         AEH-12-PSEUDO-04
* date created : AUGUST 11, 2012 - JAL 🎶
* Verified by: _____(Date:____)
                                                      page ____ of _
* Random allocation of travs to tank, sas
*************************************
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 Analysis performed by J. Luoma SAS version &SYSVER &SYSTIME &SYSDATE;
options /*Is=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random distribution of trays to experimental tanks*/
/* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2, or 3, e
  round = distribution round, place one tray in the assigned position (9 per test replicate - 3 for
/*Location and exposure type: Lake Carlos - Whole tank treatment*/
data glochidia;
 do round = 1 to 1 by 1;
 do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
 end:
 end;
end;
end;
run;
data glochidiadist; set glochidia;
if row = 1 then _{row} = 'A';
if row = 2 then _row_ = 'B';
if row = 3 then _row_ = 'C';
if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
 if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
  if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
   if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
    if row = 2 and tank = 1 and position = 2 then tankn = '1B2';
     if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
      if row = 3 and tank = 1 and position = 1 then tankn = '101';
       if row = 3 and tank = 1 and position = 2 then tankn = '102';
        if row = 3 and tank = 1 and position = 3 then tankn = '103';
if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
 if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
  if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
   if row = 2 and tank = 2 and position = 1 then tankn = '281';
    if row = 2 and tank = 2 and position = 2 then tankn = '282';
     if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
      if row = 3 and tank = 2 and position = 1 then tankn = '201';
                                                                     Page 3 of 8
       if row = 3 and tank = 2 and position = 2 then tankn = '202';
        if row = 3 and tank = 2 and position = 3 then tankn = '203';
if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
 if row = 1 and tank = 3 and position = 2 then tankn_i = "3A2";
```

```
if row = 1 and tank = 3 and position = 3 then tankn = '3A3':
   if row = 2 and tank = 3 and position = 1 then tankn = '3B1';
    if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
     if row = 2 and tank = 3 and position = 3 then tankn = '3B3'
      if row = 3 and tank = 3 and position = 1 then tankn = '301';
       if row = 3 and tank = 3 and position = 2 then tankn = '3C2';
        if row = 3 and tank = 3 and position = 3 then tankn = '3C3';
if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
 if row = 1 and tank = 4 and position = 2 then tankn = ^{1}4A2^{+};
  if row = 1 and tank = 4 and position = 3 then tankn = '4A3':
   if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
    if row = 2 and tank = 4 and position = 2 then tankn = ^44B2^4;
     if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
      if row = 3 and tank = 4 and position = 1 then tankn = '4C1';
       if row = 3 and tank = 4 and position = 2 then tankn = ^{\prime}402^{\prime}:
        if row = 3 and tank = 4 and position = 3 then tankn = '403';
if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
 if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
  if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
   if row = 2 and tank = 5 and position = 1 then tankn = '581';
    if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
     if row = 2 and tank = 5 and position = 3 then tankn = '5B3';
      if row = 3 and tank = 5 and position = 1 then tankn = '501';
       if row = 3 and tank = 5 and position = 2 then tankn = '502';
        if row = 3 and tank = 5 and position = 3 then tankn = '503';
if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
 if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
  if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
   if row = 2 and tank = 6 and position = 1 then tankn = '6B1':
    if row = 2 and tank = 6 and position = 2 then tankn = '6B2';
     if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
      if row = 3 and tank = 6 and position = 1 then tankn = '6C1';
       if row = 3 and tank = 6 and position = 2 then tankn = '602'
        if row = 3 and tank = 6 and position = 3 then tankn = '603';
if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
 if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
  if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
   if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
    if row = 2 and tank = 7 and position = 2 then tankn = '7B2';
     if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
      if row = 3 and tank = 7 and position = 1 then tankn = '701';
       if row = 3 and tank = 7 and position = 2 then tankn = '702';
        if row = 3 and tank = 7 and position = 3 then tankn = '703';
if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
if row = 1 and tank = 8 and position = 2 then tankn = ^{1}8A2^{-};
  if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
   if row = 2 and tank = 8 and position = 1 then tankn = '8B1'
    if row = 2 and tank = 8 and position = 2 then tankn = '8B2':
     if row = 2 and tank = 8 and position = 3 then tankn = '8B3';
      if row = 3 and tank = 8 and position = 1 then tankn = '801';
       if row = 3 and tank = 8 and position = 2 then tankn = '802'
       if row = 3 and tank = 8 and position = 3 then tankn = "8C3";
if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
```

if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
if row = 2 and tank = 9 and position = 1 then tankn = '9B1';

AEH-12-PSEUDO-04

Page ____ of _____

```
if row = 2 and tank = 9 and position = 2 then tankn = ^{1}9B2^{1};
     if row = 2 and tank = 9 and position = 3 then tankn = '983';
      if row = 3 and tank = 9 and position = 1 then tankn = '9C1';
       if row = 3 and tank = 9 and position = 2 then tankn = '9C2';
                                                                             AEH-12-PSEUDO-04
        if row = 3 and tank = 9 and position = 3 then tankn = '903';
Run;
proc sort data= glochidiadist;
by round x;
run;
proc print data = glochidiadist;
title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zeora mussels on artif
title2 h=1.5 'AEH-12-PSUEDO-04';
title3 h=1 'Random assignment of trays to test tank/position';
title4 h=1 'Test Location/type = Lake Carlos/whole water tank treatment';
         8/11/12
          Ja-
```

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```
1030 * date created : AUGUST 11, 2012 - JAL
1031 * Verified by: _____ (Date:____) _____
                                                          page ____ of __
1032 * Random allocation of trays to tank.sas
                                   ********** AEH-12-PSEUDO-04
1033 ****************
1034 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
1035
1036 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalic options or unquoted text.
1037
1038 options /*ls=85 ps=40 formdlim='-' */ pagenc = 1 nocenter nodate nosource2;
1039
1040 /*Random distribution of trays to experimental tanks*/
1041 /* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1,
1041! 2, or 3, etc)
     round = distribution round, place one tray in the assigned position (9 per test
1042! replicate - 3 for each exposure duration) */
1043
1044! ********/
1045
1046 /*Location and exposure type: Lake Carlos - Whole tank treatment*/
1047 data glochidia;
1048
     do round = 1 to 1 by 1;
      do row = 1 to 3 by 1;
1049
      do position = 1 to 3 by 1;
      do tank = 1 to 9 by 1;
1051
1052
       x = ranuni(-1);
1053
       output;
1054
       end:
1055
       end;
1056
      end:
1057
      end:
1058
    run;
NOTE: The data set WORK.GLOCHIDIA has 81 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                 0.01 seconds
     cou time
                       0.01 seconds
1059 data glochidiadist; set glochidia;
1061 if row = 2 then _row_ = 'B';
1063
     if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
       if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
1065
       if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
        if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
1066
1067
         if row = 2 and tank = 1 and position = 2 then tankn = '1B2';
          if row = 2 and tank = 1 and position = 3 then tankn = '183';
1068
1069
           if row = 3 and tank = 1 and position = 1 then tankn = '101';
            if row = 3 and tank = 1 and position = 2 then tankn = '102';
1070
                                                                       Page 6 of 8
            if row = 3 and tank = 1 and position = 3 then tankn = '103';
1072
      if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
1073
      if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
1074
       if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
```

```
1075
           if row = 2 and tank = 2 and position = 1 then tankn = '2B1;
            if row = 2 and tank = 2 and position = 2 then tankn = '282';
1076
1077
             if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
1078
              if row = 3 and tank = 2 and position = 1 then tankn = '2C1';
                                                                                 AEH-12-PSEUDO-04
               if row = 3 and tank = 2 and position = 2 then tankn = '202';
1079
                if row = 3 and tank = 2 and position = 3 then tankn = '203';
1080
1081
        if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
         if row = 1 and tank = 3 and position = 2 then tankn = '3A2';
1082
1083
         if row = 1 and tank = 3 and position = 3 then tankn = '3A3';
           if row = 2 and tank = 3 and position = 1 then tankn = '3B1';
1084
           if row = 2 and tank = 3 and position = 2 then tankn = '332';
1085
             if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
1086
              if row = 3 and tank = 3 and position = 1 then tankn = '3C1';
1087
1088
               if row = 3 and tank = 3 and position = 2 then tankn = '302';
               if row = 3 and tank = 3 and position = 3 then tankn = '303';
1089
1090
       if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
        if row = 1 and tank = 4 and position = 2 then tankn = ^{1}4A2^{1};
1091
1092
         if row = 1 and tank = 4 and position = 3 then tankn = '4A3';
1093
          if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
1094
           if row = 2 and tank = 4 and position = 2 then tankn = '4B2':
1095
            if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
             if row = 3 and tank = 4 and position = 1 then tankn = '401';
1096
              if row = 3 and tank = 4 and position = 2 then tankn \approx '402';
1097
1098
               if now = 3 and tank = 4 and position = 3 then tankn = ^{1}4C3^{\circ};
1099
       if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
1100
        if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
         if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
1101
1102
          if row = 2 and tank = 5 and position = 1 then tankn = '5B1';
           if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
1103
            if row = 2 and tank = 5 and position = 3 then tankn = '583';
1104
1105
             if row = 3 and tank \approx 5 and position = 1 then tankn = 501';
1106
              if row = 3 and tank = 5 and position = 2 then tankn = '502':
1107
               if row = 3 and tank = 5 and position = 3 then tankn = '503';
1108
       if row = 1 and tank = 6 and position = 1 then tankn = '6A1':
1109
        if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
         if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
1110
          if row = 2 and tank = 6 and position = 1 then tankn = '6B1';
1111
1112
           if row = 2 and tank = 6 and position = 2 then tankn = '6B2';
1113
            if row = 2 and tank = 6 and position = 3 then tankn = '6B3':
1114
             if row = 3 and tank = 6 and position = 1 then tankn = '6C1';
              if row = 3 and tank = 6 and position = 2 then tankn = '602';
1115
1116
               if row = 3 and tank = 6 and position = 3 then tankn = '603';
       if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
1117
1118
        if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
1119
         if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
1120
          if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
1121
           if row = 2 and tank = 7 and position = 2 then tankn = '7B2';
            if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
1122
1123
             if row = 3 and tank = 7 and position = 1 then tankn = '701';
              if row = 3 and tank = 7 and position = 2 then tankn = '702';
1124
1125
               if row = 3 and tank = 7 and position = 3 then tankn = '703':
1126
       if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
1127
        if row = 1 and tank = 8 and position = 2 then tankn = '8A2':
                                                                             Page 7 of 8
1128
         if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
1129
          if row = 2 and tank = 8 and position = 1 then tankn = '881';
1130
           if row = 2 and tank = 8 and position = 2 then tankn = '8B2';
```

```
1131
            if row = 2 and tank = 8 and position = 3 then tankn = '8B3';
1132
             if row = 3 and tank = 8 and position = 1 then tankn = '8C1;
1133
              if row = 3 and tank = 8 and position = 2 then tankn = '802';
                                                                                AEH-12-PSEUDO-04
               if row = 3 and tank = 8 and position = 3 then tankn = '8C3';
1134
1135
       if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
1136
        if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
         if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
1137
          if row = 2 and tank = 9 and position = 1 then tankn = '981';
1138
           if row = 2 and tank = 9 and position = 2 then tankn = '9B2';
1139
1140
            if row = 2 and tank = 9 and position = 3 ther tankn = '9B3';
1141
             if row = 3 and tank = 9 and position = 1 then tankn = '9C1';
              if row = 3 and tank = 9 and position = 2 then tankn = '902';
1142
1143
               if row = 3 and tank = 9 and position = 3 then tankn = '903';
1144 Run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIA.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.07 seconds
      cpu time
                          0.07 seconds
1145 proc sort data≃ glochidiadist;
     by round x;
1146
1147
       run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.01 seconds
      cpu time
                         0.01 seconds
1148 proc print data = glochidiadist;
1149 title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra
1149! mussels on artifical substrates';
1150 title2 h=1.5 'AEH-12-PSUEDO-04';
1151 title3 h=1 'Handom assignment of trays to test tank/position';
1152 title4 h=1 'Test Location/type = Lake Carlos/whole water tank treatment';
1153 run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                         0.01 seconds
     opu time
                         0.01 seconds
```

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 1 *** Sight Lake Carlos - Whole water Body Treatment

		•	in .		
obs	row	position	×	tankn	trt
1	2	2	0.02216	1B2	6h
2	1	3	0.16367	1A3	6h
3	1	2	0.21372	1A2	6h
4	3	1	0.27213	1C1	9h
5	1	1	0.29050	1A1	9h
6	2	1 .	0.60999	1B1	9h
7	3	3	0.61991	1C3	12
8	3	2	0.95789	102	12
9	2	3	0.95946	1B3	12

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Item Number: 3

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 2 ***

Lake Carlos - Whole water Body Treatment

AEH-12-PSEUDO-04

Obs	LOM	position	х	tankn	trt
1	2	2	0.05116	2B2	6h
2	1	1	0.15754	2A1	6h
3	3	1	0.19038	201	6h
4	1	3	0.29436	2A3	9h
5	3	3	0.36230	2G3	9h
6	2	3	0.63280	2B3	9h
7	3	2	0.73826	202	12
8	1	2	0.86034	2A2	12
9	2	1	0.87946	281	12

Page amount

Item Number



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Random assignment of substrate removal from tanks *** TANK 3 ***

Lake Carlos - Whole water Body Treatment

AEH-12-PSEUDO-04

0bs	row	position	x	tankn	trt
1	3	3	0.09037	303	6h
2	1	1	0.20055	3A1	6h
3	2	1	0.37245	381	6h
4	3	2	0.38436	302	9h
5	1	.3	0.41454	3A3	9h
6	2	3	0.54343	3B3	9h
7	3	1	0.54506	301	12
8	2	2	0.65481	382	12
9	1	2	0.86888	3A2	12

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AFH-12-PSFUND-04

Random assignment of substrate removal from tanks *** TANK 4 *** Lake Carlos - Whole water Body Treatment

Obs	row	position	×	tankn	trt
1	3	1	0.10801	4C1	6h
2	3	2	0.11324	4C2	6h
3	2	2	0.23268	4B2	6h
4	1	3	0.29166	4A3	9h
5	1	1	0.61787	4A1	9h
6	2	3	0.68056	4B3	9h
7	3	3	0.87818	4C3	12
8	2	1	0.87898	4B 1	12
9	1	2	0.99026	4A2	12

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Random assignment of substrate removal from tanks *** TANK 5 *** Lake Carlos - Whole water Body Treatment

0bs	row	position	X	$\hat{\mathcal{O}}^{ extstyle extstyleeta}$	trt
1	2	2	0.05116	282	6h
2	1	1	0.15754	2A1	6 h
3	3	1	0.19038	2C 1	6h
4	1	3	0.29436	2A3	9h
5	3	3	0.36230	203	9h
6	2	3	0.63280	283	9h
7	3	2	0.73826	202	12
8	1	2	0.86034	2A2	12
9	2	1	0.87946	281	12

OTank numbers should be 5 not 2 km 1544412 See Deviation H2 for fortur claufication. From 19 MOVIS

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 6 *** Lake Carlos - Whole water Body Treatment

Obs	row	position	x	tankn	trt
1	1	3	0.13967	6A3	6h
2	3	3	0.18498	6C3	6h
3	1	2	0.22522	6A2	6h
4	3	1	0.29669	601	9h
5	2	3	0.43557	6B3	9h
6	2	2	0.50443	6B2	9h
7	3	2	0.69851	6C2	12
8	1	1	0.76815	6A1	12
9	2	1	0.83108	6B1	12

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Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 7 *** Lake Carlos - Whole water Body Treatment

Obs	POW	position	x	() ^{tankn}	trt
1	2	2	0.05116	2B2	6h
2	1	1	0.15754	2A1	6h
3	3	1	0.19038	201	6h
4	1	3	0.29436	2A3	9h
5	3	3	0.36230	203	9h
6	2	3	0.63280	2B3	9h
7	3	2	0.73826	202	12
8	1	2	0.86034	2A2	12
9	2	1	0.87946	2B1	12

Otank number should be I not 2. Kw 15744111 See Devation #2 for further clarification. Em 19/10013

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04 $\,$

Handom assignment of substrate removal from tanks *** TANK 8 *** Lake Carlos - Whole water Body Treatment

Obs	row	position	×	tankn	trt
1	2	3	0.21368	883	6h
2	2	2	0.23698	8B2	6h
3	2	1	0.25634	8B1	6h
4	1	3	0.47516	BA3	9h
5	3	1	0.61003	BC1	9h
6	3	3	0.61436	8C3	9h
7	1	2	0.66954	8A2	12
8	3	2	0.93075	802	12
9	1	1	0.93965	8A1	12

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AEH-12-PSEUDO-04

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses l on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 9 *** Lake Carlos - Whole water Body Treatment

0 bs	row	position	x	() ^{tankn}	trt
1	2	2	0.05116	282	6h
2	1	1	0.15754	2A1	6h
3	3	1	0.19038	201	6h
4	1	3	0.29436	2A3	9h
5	3	3	0.36230	203	9h
6	2	3	0.63280	283	9h
7	3	2	0.73826	202	12
8	1	2	0.86034	2A2	12
9	2	1	0.87946	2B1	12

DTank number should be 9 not 2 km 15thus 10 See Deviation #2 for furter clarification. Pur 1910013

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AEH-12-PSEUDO-04

Analysis performed by J. Lucma SAS version 9.2 10:20 13AUG12

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```
* Study Number : AEH-12-PSUEDO-04
  Study Director: Jim Luoma
                                                                         AER-12-PSEUDO-64
* date created : 13 August 2012 - JAL Jam
* Verified by: ______(Date:____)
                                                       page ____ of _
* Random allocation of treatment to tank.sas
**********************
DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options 1s=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanke*/
/*Location/exposure type: Lake Carlos - whole tank treatment*/
data TANK1;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
 end;
run;
data TANK1A; set TANK1;
 if row = 1 and position = 1 then tankn = '!A1';
 if row = 1 and position = 2 then tankn = '1A2';
   if row = 1 and position = 3 then tankn = '1A3';
   if row = 2 and position = 1 then tankn = '181';
    if row = 2 and position = 2 then tankn = '1B2';
     if row = 2 and position = 3 then tankn = '1B3';
      if row = 3 and position = 1 then tankn = '101';
       if row = 3 and position = 2 then tankn = '162';
        if row = 3 and position = 3 then tankn = '103';
    run:
proc sort data=TANK1A;
 by x;
run;
data assign_trt_TANK1A; set TANK1A;
 if [n] = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if | n = 6 then trt = '9h';
  if _n_ = 7 then trt = /12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run:
proc print cata= assign_trt_TANK1A;
title: h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ****;
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
                                                                          Page 11 of 30
```

```
data TANK2:
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
                                                                         AEH-12-PSEUDO-04
  end:
 end;
run;
data TANK2A; set TANK2;
 if row = 1 and position = 1 then tankn = '2A1';
  if row = 1 and position = 2 then tankn = '2A2';
   if row = 1 and position = 3 then tankn = '2A3';
   if row = 2 and position = 1 then tankn = '2B1';
     if row = 2 and position = 2 then tankn = '2B2';
      if row = 2 and position = 3 then tankn = '2B3';
       if row = 3 and position = 1 then tankn = '201';
        if row = 3 and position = 2 then tankn = '202';
        if row = 3 and position = 3 then tankn = '203';
     run;
proc sort data=TANK2A;
by x;
run;
data assign trt TANK2A; set TANK2A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***':
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
run;
data TANK3;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
 end;
end;
run;
data TANK3A; set TANK3;
if row = 1 and position = 1 then tankn = '3A1';
  if row = 1 and position = 2 then tankn = '3A2';
  if row = 1 and position = 3 then tankn = '3A3';
                                                                          Page 10 of 30
   if row = 2 and position = 1 then tankn = '3B1';
    if row = 2 and position = 2 then tankn = '3B2';
     if row = 2 and position = 3 then tankn = '3B3';
```

```
if row = 3 and position = 1 then tankn = '3C1':
        if row = 3 and position = 2 then tankn = '302';
         if row = 3 and position = 3 then tankn = '3C3';
     run:
                                                                             AES-12-PSEUDO-04
proc sort data=TANK3A;
 by x;
run;
data assign_trt_TANK3A; set TANK3A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
  run;
proc print data= assign_trt_TANK3A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
run;
data TANK4;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK4A; set TANK4;
 if row = 1 and position = 1 then tankn = '4A1';
 if row = 1 and position = 2 then tankn = '4A2';
  if row = 1 and position = 3 then tankn = '4A3';
   if row = 2 and position = 1 then tankn = '4B1';
    if row = 2 and position = 2 then tankn = '482';
     if row = 2 and position = 3 then tankn = '4B3';
       if row = 3 and position = 1 then tankn = '401';
        if row = 3 and position = 2 then tankn = '402';
         if row = 3 and position = 3 then tankn = '403';
proc sort data=TANK4A;
by x;
run;
data assign_trt_TANK4A; set TANK4A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
                                                                         Page _ 13 _ of _ 30
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
```

```
if n = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
                                                                            AFE-12-PSEUDO-04
  run;
proc print data= assign_trt_TANK4A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Handom assignment of substrate removal from tanks *** TANK 4 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
run;
data TANK5;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK5A; set TANK5;
 if row = 1 and position = 1 then tankn = '5A1';
  if row = 1 and position = 2 then tankn = '5A2';
   if row = 1 and position = 3 then tankn = '5A3';
    if row = 2 and position = 1 then tankn = '5B1';
     if row = 2 and position = 2 then tankn = '5B2';
      if row = 2 and position = 3 then tankn = '5B3';
       if row = 3 and position = 1 then tankn = '5C1';
        if row = 3 and position = 2 then tankn = '502';
        if row = 3 and position = 3 then tankn = '503';
     run;
proc sort data=TANK5A;
by x;
run;
data assign_trt_TANK5A; set TANK5A;
if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run:
proc print data= assign_trt_TANK2A;
titlet h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrato removal from tanks *** TANK 5 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
run;
data TANK6;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
                                                                           Page M of 30
 x = ranuni(-1);
 output;
 end;
 end;
```

```
run;
data TANK6A; set TANK6;
 if row = 1 and position = 1 then tankn = '6A1';
  if row = 1 and position = 2 then tankn = '6A2';
   if row = 1 and position = 3 then tankn = '6A3';
                                                                           AEH-12-PSEUDO-04
    if row = 2 and position = 1 then tankn = '6Bi';
     if row = 2 and position = 2 then tankn = '6B2';
      if row = 2 and position = 3 then tankn = '6B3';
       if row = 3 and position = 1 then tankn = '601';
        if row = 3 and position = 2 then tankn = '602';
         if row = 3 and position = 3 then tankn = '603';
     run;
proc sort data=TANK6A;
by x;
run;
data assign_trt_TANK6A; set TANK6A;
 if _n_ = ! then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK6A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
run;
data TANK7;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
 end;
 end;
run;
data TANK7A; set TANK7;
if row = 1 and position = 1 then tankn = '7A1';
  if row = 1 and position = 2 then tankn = '7A2';
  if row = 1 and position = 3 then tankn = '7A3';
    if row = 2 and position = 1 then tankn = '7B1';
    if row = 2 and position = 2 then tankn = '782';
     if row = 2 and position = 3 then tankn = '7B3';
      if row = 3 and position = 1 then tankn = '701';
        if row = 3 and position = 2 then tankn = '702';
        if row = 3 and position = 3 then tankn = '703';
     run:
proc sort data=TANK7A;
                                                                        Page 15 of 30
by x;
run;
```

```
data assign_trt_TANK7A; set TANK7A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
                                                                             AEH-12-PSEUDO-04
   if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h ;
 if n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
title4 h=1 Lake Carlos - Whole water Body Treatment ';
data TANKB;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK8A; set TANK8;
 if row = 1 and position = 1 then tankn = '8A1';
  if row = 1 and position = 2 then tankn = '8A2';
  if row = 1 and position = 3 then tankn = '8A3';
    if row = 2 and position = 1 then tankn = '8B1';
     if row = 2 and position = 2 then tankn = '882';
     if row = 2 and position = 3 then tankn = '883';
       if row = 3 and position = 1 then tankn = '8C1';
        if row = 3 and position = 2 then tankn = '802';
         if row = 3 and position = 3 then tankn = '803';
     run;
proc sort data=TANK8A;
by x;
run;
data assign_trt_TANK8A; set TANK8A;
 if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
                                                                          Page 16 of 30
   if _a_ = 8 then trt = '12h';
if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK8A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
```

```
run;
data TANK9;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
                                                                           AEH-12-PSEUDO-04
  output;
  end;
 end;
run;
data TANK9A; set TANK9;
 if row = 1 and position = 1 then tankn = '9A1';
  if row = 1 and position = 2 then tankn = '9A2';
   if row = 1 and position = 3 then tankn = '9A3';
   if row = 2 and position = 1 then tankn = '9B1';
     if row = 2 and position = 2 then tankn = '9B2';
      if row = 2 and position = 3 then tankn = '9B3';
       if row = 3 and position = 1 then tankn = '901';
        if row = 3 and position = 2 then tankn = '902';
         if row = 3 and position = 3 then tankn = '903';
proc sort data=TANK9A;
by x;
run;
data assign_trt_TANK9A; set TANK9A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
title4 h=1 'Lake Carlos - Whole water Body Treatment ';
       8/13/12
        Ja
```

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```
* date created : 13 August 2012 - JAL 50
       Verified by: _____ (Date:____
5
                                                            page ____ of _
     * Random allocation of treatment to tank.sas
6
     7
8
    DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
10
    FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
11
12
    options ls=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
    /*Random assignment of treatment to experimental tanks*/
13
    /*Location/exposure type: Lake Carlos - whole tank treatment*/
15
16
    data TANK1;
17
    do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
18
19
      x = ranuni(-1);
20
      output;
21
      end:
22
      end;
    run;
23
NOTE: The data set WORK.TANK1 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time);
     real time
                        0.01 seconds
                        0.01 seconds
     cpu time
    data TANK1A; set TANK1;
     if row = 1 and position = 1 then tankn = '1A1';
25
26
      if row = 1 and position = 2 then tankn = '1A2';
       if row = 1 and position = 3 then tankn = '1A3';
27
28
        if row = 2 and position = 1 then tankn = '1B1';
29
         if row = 2 and position = 2 then tankn = '1B2';
          if row = 2 and position = 3 then tankn = '1B3';
30
           if row = 3 and position = 1 then tankn = '1C1';
            if row = 3 and position = 2 then tankn = '102';
32
33
            if row = 3 and position = 3 then tankn = '103';
34
NOTE: There were 9 observations read from the data set WORK.TANK1.
NOTE: The data set WORK.TANK1A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.01 seconds
     opu time
                        0.01 seconds
    proc sort data=TANKiA;
36
     by x;
    run;
NOTE: There were 9 observations road from the data set WORK.TANKIA.
                                                                       Page <u>18</u> of 30
NOTE: The data set WORK.TANK1A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
                       0.01 seconds
     cpu time
```

0.01 seconds

```
38
39
     data assign_trt_TANK1A; set TANK1A;
                                                                     AEH-12-PSEUDO-04
40
      if _n_ = 1 then trt = '6h';
       if _n_ = 2 then trt = '6h';
41
42
        if _n_ = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
43
44
      if _n_ = 5 then trt = '9h';
45
      if _n_ = 6 then trt = '9h';
46
        if _n_ = 7 then trt = '12h';
47
         if _n_ = 8 then trt = '12h';
48
      if _{n_{}} = 9 then trt = '12h';
49
       run:
NOTE: There were 9 observations read from the data set WORK.TANK1A.
NOTE: The data set WORK.ASSIGN_TRT_TANK1A has 9 observations and 5 variables.
NCTE: DATA statement used (Total process time):
      real time 0.01 seconds
      opu time
                         0.01 seconds
50 proc print data= assign_trt_TANK1A;
   title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
51 | artifical substrates';
52 title2 h=1.5 'AEH-12-PSEUDO-04';
    title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
   title4 h=1 'Lake Carlos - Whole water Body Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK1A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                      0.09 seconds
      cpu time
                         0.03 seconds
56
57
    data TANK2;
58
    do row = 1 to 3 by 1;
59
     do position = 1 to 3 by 1;
      x = ranuni(-1);
60
61
      output;
      end;
63
     end;
64
    run;
NOTE: The data set WORK.TANK2 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.00 seconds
     opu time
                        0.01 seconds
                                                                    Page 19 of 30
    data TANK2A; set TANK2;
    if row = 1 and position = 1 then tankn = '2A1';
66
67
      if row = 1 and position = 2 then tankn = '2A2';
       if row = 1 and position = 3 then tankn = '2A3';
68
```

```
69 -
         if row = 2 and position = 1 then tankn = '2B1';
70
          if row = 2 and position = 2 then tankn = '2B2';
71
           if row = 2 and position = 3 then tankn = '2B3';
72
            if row = 3 and position = 1 then tankn = '201';
                                                                           AEH-12-PSEUDO-04
73
             if row = 3 and position = 2 then tankn = '202';
74
              if row = 3 and position = 3 then tankn = 1203;
75
NOTE: There were 9 observations read from the data set WORK.TANK2.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time);
      real time
                          0.01 seconds
      cou time
                          0.01 seconds
76
    proc sort data=TANK2A;
     by x;
78
     run:
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.00 seconds
      cpu time
                          0.01 seconds
79
80
     data assign_trt_TANK2A; set TANK2A;
81
     if _n_ = 1 then trt = '6h';
82
       if _n_ = 2 then trt = '6h';
83
       if _n_ = 3 then trt = '6h';
84
         if _n_ = 4 then trt = '9h';
      if _n_ = 5 then trt = '9h';
85
86
       if _n_ = 6 then trt = '9h';
       if _n_ = 7 then trt = '12h';
87
88
        if _n = 8 then trt = '12h';
89
      if _n_ = 9 then trt = '12h';
       run;
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.ASSIGN_TRT_TANK2A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                         0.00 seconds
     opu time
                         0.00 seconds
91  proc print data= assign_trt_TANK2A;
92 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
92 ! artifical substrates';
   title2 h=1.5 'AEH-12-PSEUDO-04';
94
   title3 h=1 'Random assignment of substrate renoval from tanks *** TANK 2 ***':
95 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
                                                                             Page <u>20</u> of <u>30</u>
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
```

```
real time
                          0.00 seconds
      opu time
                          0.01 seconds
                                                                           AEH-12-PSEUDO-04
97
     data TANK3;
98
99
     do row = 1 to 3 by 1;
100
    do position = 1 to 3 by 1;
101
       x = ranuni(-1);
102
       output;
103
       end;
104
      end;
105 run;
NOTE: The data set WORK. TANK3 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                      0.00 seconds
      opu time
                          0.01 seconds
106 data TANK3A; set TANK3;
     if row = 1 and position = 1 then tankn = '3A1';
107
108
       if row = 1 and position = 2 then tankn = '3A2';
        if row = 1 and position = 3 then tankn = ^{1}3A3^{1};
109
110
         if row = 2 and position = 1 then tankn = '3B1';
         if row = 2 and position = 2 then tankn = '3B2';
111
          if row = 2 and position = 3 then tankn = '3B3';
113
           if row = 3 and position = 1 then tankn = '3C1';
114
             if row = 3 and position = 2 then tankn = '302';
115
              if row = 3 and position = 3 then tankn = '303';
116
          run:
NOTE: There were 9 observations read from the data set WORK.TANK3.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time.
                        0.00 seconds
     cpu time
                          0.01 seconds
117 proc sort data=TANK3A;
118 by x;
119 run;
NOTE: There were 9 observations read from the data set WORK.TANK3A.
NOTE: The data set WCRK.TANK3A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                        0.00 seconds
     opu time
                         0.01 seconds
120
121 data assign_trt_TANK3A; set TANK3A;
     if _n_ = 1 then trt = '6h';
122
                                                                           Page <u>21</u> of <u>32</u>
      if _n_ = 2 then trt = '6h';
123
       if _n_ = 3 then trt = '6h';
124
125
        if _n_ = 4 then trt = '9h';
```

```
if _n_ = 5 then trt = '9h';
126
      if _n_ = 6 then trt = '9h';
127
128
        if _n_ = 7 then trt = '12h';
        if _n_ = 8 then trt = '12h';
129
                                                                          AEH-12-PSEUDO-04
130
      if _n_ = 9 then trt = '12h';
131
      run;
NOTE: There were 9 observations read from the data set WORK.TANK3A.
NOTE: The data set WORK.ASSIGN_TRT_TANK3A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0.01 seconds
132 proc print data= assign_trt_TANK3A;
133 title1 h=2 'Efficacy of Pseudomonas flucrescens (Pf-CL145A)for controlling zebra mussesl on
133! artifical substrates';
134 title2 h=1.5 'AEH-12-PSEUDO-04';
135 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
136 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
137 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK3A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                       0.00 seconds
     opu time
                      0.00 seconds
138 data TANK4;
139 do row = 1 to 3 by 1;
140
     do position = 1 to 3 by 1;
141
      x = ranuni(-1);
      output;
142
143
      end;
144 end;
145 run;
NOTE: The data set WORK.TANK4 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.00 seconds
      cpu time
                         0.00 seconds
146 data TANK4A; set TANK4;
     if row = 1 and position = 1 then tankn = '4A1';
148
      if row = 1 and position = 2 then tankn = '4A2';
       if row = 1 and position = 3 then tankn = '4A3';
149
150
        if row = 2 and position = 1 then tankn = '4B1';
151
         if row = 2 and position = 2 then tankn = '4B2';
152
          if row = 2 and position = 3 then tankn = '483';
153
           if row = 3 and position = 1 then tankn = '4C1';
154
            if row = 3 and position = 2 then tankn = '402';
                                                                           Page 22 of 30
155
             if row = 3 and position = 3 then tankn = '403';
156
         run;
```

```
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0.00 seconds
                                                                         AEF-12-PSEUDO-04
157 proc sort data=TANK4A;
158 by x;
159 run;
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                     0.05 seconds
      cpu time
                         0.00 seconds
160
161 data assign_trt_TANK4A; set TANK4A;
     if _n_ = 1 then trt = '6h';
      if _n_ = 2 then trt = '6h';
163
       if _n_ = 3 then trt = '6h';
164
        if _n_ = 4 then trt = '9h';
165
     if _n_ = 5 then trt = '9h';
166
167
      if _n_ = 6 then trt = '9h';
       if _n_ = 7 then trt = '12h';
168
169
        if _n_ = 8 then trt = '12h';
170
     if _n_ = 9 then trt = '12h';
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.ASSIGN_TRT_TANK4A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.00 seconds
     cpu time
                         0.00 seconds
172 proc print data= assign_trt_TANK4A;
173 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on
173! artifical substrates';
174 title2 h=1.5 'AEH-12-PSEUDO-04';
175 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
176 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK4A.
NOTE: PROCEDURE PRINT used (Total process time):
                       0.00 seconds
     cpu time
                        0.01 seconds
178 data TANK5;
179 do row = 1 to 3 by 1;
                                                                           Page 33 of 30
    do position = 1 to 3 by 1;
180
181
      x = ranuni(-1);
      output;
182
```

```
183
       end;
184
      end:
185 run;
                                                                           AEH-12-PSEUDO-04
NOTE: The data set WORK.TANK5 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                          0.01 seconds
186 data TANK5A; set TANK5;
      if row = 1 and position = 1 then tankn = '5A1';
187
       if row = 1 and position = 2 then tankn = '5A2';
189
        if row = 1 and position = 3 then tankn = '5A3';
190
         if row = 2 and position = 1 then tankn = '5B1';
191
          if row = 2 and position = 2 then tankn = '5B2';
192
           if row = 2 and position = 3 then tankn = '5B3';
193
            if row = 3 and position = 1 then tankn = '5C1';
194
             if row = 3 and position = 2 then tankn = '502';
195
              if row = 3 and position = 3 then tankn = '503';
196
          run;
NOTE: There were 9 observations read from the data set WORK.TANK5.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.00 seconds
      opu time
                          0.01 seconds
197 proc sort data=TANK5A;
198
    by x;
199 run;
NOTE: There were 9 observations read from the data set WCRK.TANK5A.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.00 seconds
      opu time
                          0.01 seconds
200
201
     data assign_trt_TANK5A; set TANK5A;
202
      if _n_ = 1 then trt = '6h';
203
       if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
204
         if _n_ = 4 then trt = '9h';
205
      if _n_ = 5 then trt = '9h';
206
207
       if _n_ = 6 then trt = 9h';
208
        if _n_ = 7 then trt = '12h';
         if _n_ = 8 then trt = '12h';
209
210
      if _n_ = 9 then trt = '12h';
211
      run:
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.ASSIGN_TRT_TANK5A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
```

```
cpu time
                          0.01 seconds
                                                                          AEH-12-PSEUDO-04
212 proc print data= assign_trt_TANK2A;
213 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
213! artifical substrates';
214 title2 h=1.5 'AEH-12-PSEUDO-04';
215 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
216 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                      0.00 seconds
      cpu time
                         0.00 seconds
218 data TANK6;
219 do row = 1 to 3 by 1;
    do position = 1 to 3 by 1;
221
      x = ranuni(-1);
222
       output;
223
       end;
224
      end:
225 run;
NOTE: The data set WORK.TANK6 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                    0.00 seconds
      cpu time
                         0.00 seconds
226 data TANK6A; set TANK6;
    if row = 1 and position = 1 then tankn = '6A1';
228
       if row = 1 and position = 2 then tankn = '6A2';
       if row = 1 and position = 3 then tankn = '6A3';
229
230
         if row = 2 and position = 1 then tankn = '6B1';
         if row = 2 and position = 2 then tankn = '6B2';
231
232
          if row = 2 and position = 3 then tankn = '683';
233
           if row = 3 and position = 1 then tankn = '601';
234
             if row = 3 and position = 2 then tankn = '602';
235
             if row = 3 and position = 3 then tankn = '603';
NOTE: There were 9 observations read from the data set WORK.TANK6.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0'.01 seconds
237 proc sort data=TANK6A;
                                                                          Page 25 of 3.
238 by x;
239 run;
```

real time

0.00 seconds

```
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK. TANK6A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
                                                                          AEH-12-PSEUDO-04
      real time
                         0.00 seconds
      cpu time
                         0.01 seconds
240
241 data assign_trt_TANK6A; set TANK6A;
242
     if _n_ = 1 then trt = '6h';
      if _n_ = 2 then trt = '6h';
243
244
       if _n_ = 3 then trt = '6h';
        if _n_ = 4 then trt = '9h';
245
246
      if _n_ = 5 then trt = '9h';
      if _n_ = 6 then trt = '9h';
247
       if _n_ = 7 then trt = '12h';
248
         if _n_ = 8 then trt = '12h';
249
250
      if _n_ = 9 then trt = '12h';
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.ASSIGN_TRT_TANK6A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      opu time
                         0.01 seconds
252 proc print data= assign_trt_TANK6A;
253 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
253! artifical substrates';
254 title2 h=1.5 'AEH-12-PSEUDO-04';
255 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***;
256 title4 h=1 'Lake Carlos - Whole water Body Treatment ;
257 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK6A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                     0.00 seconds
     cpu time
                         0.00 seconds
258 data TANK7;
    do row = 1 to 3 by 1;
260
    do position = 1 to 3 by 1;
261
     x = ranuni(-1);
262
      output;
263
      end:
264
     end;
265 run;
NOTE: The data set WORK.TANK7 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.00 seconds
                                                                          Page 36 of 30
     cpu time
                         0.00 seconds
```

```
266' data'TANK7A; set TANK7;
      if row = 1 and position = 1 then tankn = '7A1';
268
       if row = 1 and position = 2 then tankn = '7A2';
269
       if row = 1 and position = 3 then tankn = '7A3';
                                                                           AEH-12-PSEUDO-04
        if row = 2 and position = 1 then tankn = '7B1';
270
271
         if row = 2 and position = 2 then tankn = '7B2';
272
           if row = 2 and position = 3 then tankn = '7B3':
273
           if row = 3 and position = 1 then tankn = '701';
274
            if row = 3 and position = 2 then tankn = '702';
275
              if row = 3 and position = 3 then tankn = '703';
276
          run:
NOTE: There were 9 observations read from the data set WORK.TANK7.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.00 seconds
      cpu time
                          0.01 seconds
277 proc sort data=TANK7A;
278
    by x;
279 run;
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
                         0.00 seconds
      cpu time
280
281
     data assign_trt_TANK7A; set TANK7A;
      if _n_ = 1 then trt = '6h';
282
       if _n_ = 2 then trt = '6h';
283
284
        if _n_ = 3 then trt = '6h';
        if _n_ = 4 then trt = '9h';
285
     if _n_ = 5 then trt = '9h';
286
       if _n_ = 6 then trt = '9h';
287
288
        if _n_ = 7 then trt = '12h';
289
        if _n_ = 8 then trt = '12h';
     if _n_ = 9 then trt = '12h';
290
291
      run:
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.ASSIGN_TRT_TANK7A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0.01 seconds
                                                                           Page _27 of 30
292 proc print data= assign_trt_TANK2A;
293 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
293! artifical substrates';
294 title2 h=1.5 'AEH-12-PSEUDO-04';
295 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
296 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
```

```
297 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.00 seconds
                                                                            AEH-12-PSEUDO-04
      cpu time
                          0.00 seconds
298 data TANK8;
299 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
301
      x = ranuni(-1);
302
      output;
303
      end;
304
      end;
305 run;
NOTE: The data set WORK.TANK8 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                          0.00 seconds
     data TANK8A; set TANK8;
307
     if row = 1 and position = 1 then tankn = '8A1';
      if row = 1 and position = 2 then tankn = '8A2';
309
       if row = 1 and position = 3 then tankn = '8A3';
310
        if row = 2 and position = 1 then tankn = '8B1';
311
          if row = 2 and position = 2 then tankn = '8B2';
          if row = 2 and position = 3 then tankn = '8B3';
312
313
            if row = 3 and position = 1 then tankn = '8C1';
             if row = 3 and position = 2 then tankn = '802';
314
315
             if row = 3 and position = 3 then tankn = '803';
316
          run;
NOTE: There were 9 observations read from the data set WORK.TANKS.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time);
      real time
                         0.00 seconds
      cpu time
                         0.00 seconds
317 proc sort data=TANK8A;
318 by x;
319 run;
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NOTE: The data set WORK, TANK8A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.00 seconds
     opu time
                         0.01 seconds
                                                                          Page <u>38</u> of <u>30</u>
321 data assign_trt_TANK8A; set TANK8A;
322 if _n_ = 1 then trt = '6h';
```

```
if _n_ = 2 then trt = '6h';
324
       if _n_ = 3 then trt = '6h';
        if _n_ = 4 then trt = '9h';
325
326
      if _n_ = 5 then trt = '9h';
                                                                       AEH-12-PSEUDO-04
      if _n_ = 6 then trt = '9h';
327
       if _n_ = 7 then trt = '12h';
329
      if _n_ = 8 then trt = '12h';
      if _n_ = 9 then trt = '12h';
330
331
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NOTE: The data set WORK.ASSIGN_TRT_TANK8A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      opu time
                         0.01 seconds
332 proc print data= assign_trt_TANK8A;
333 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
3331 artifical substrates';
334 title2 h=1.5 'AEH-12-PSEUDO-04';
335 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
336 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
337 run;
NOTE: There were 9 observations read from the data set WORK, ASSIGN TRT TANK8A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                   0.00 seconds
      opu time
                         0.00 seconds
338 data TANK9;
339 do row = 1 to 3 by 1;
    do position = 1 to 3 by 1;
340
341
      x = ranuni(-1);
342
      output;
343
      end;
344
      end;
345 run;
NOTE: The data set WORK.TANK9 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.00 seconds
     cpu tíre
                        0.00 seconds
346 data TANK9A; set TANK9;
     if row = 1 and position = 1 then tankn = '9A1';
347
      if row = 1 and position = 2 then tankn = '9A2';
349
       if row = 1 and position = 3 then tankn = '9A3';
350
        if row = 2 and position = 1 then tankn = '9B1';
351
         if row = 2 and position = 2 then tankn = '9B2';
                                                                         352
          if row = 2 and position = 3 then tankn = '983';
353
           if row = 3 and position = 1 then tankn = '901';
           if row = 3 and position = 2 then tankn = '902';
354
355
             if row = 3 and position = 3 then tankn = '903';
```

```
356
NOTE: There were 9 observations read from the data set WORK.TANK9.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
                                                                         AER-12-PSEUDO-04
       real time
                          0.00 seconds
       opu time
                           0.00 seconds
357 proc sort data=TANK9A;
358 by x;
359 run;
NOTE: There were 9 observations read from the data set WORK, TANK9A.
NCTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                      0.00 seconds
      opu time
                          0.01 seconds
360
361
     data assign_trt_TANK9A; set TANK9A;
      if _n_ = 1 then trt = '6h';
362
       if _n_ = 2 then trt = '6h';
363
364
        if _n_ = 3 then trt = '6h';
365
         if _n_ = 4 then trt = '9h';
      if _n_ = 5 then trt = '9h';
366
367
       if _n_ = 6 then trt = '9h';
368
       if _n_ = 7 then trt = '12h';
         if _n_ = 8 then trt = '12h';
369
370
      if _n_ = 9 then trt = '12h';
371
NOTE: There were 9 observations read from the data set WORK.TANK9A.
NOTE: The data set WORK.ASSIGN_TRT_TANK9A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.00 seconds
      opu time
                          0.01 seconds
372 proc print data= assign_trt_TANK2Λ;
373 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
373! artifical substrates';
374 title2 h=1.5 'AEH-12-PSEUDO-04';
375 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***':
376 title4 h=1 'Lake Carlos - Whole water Body Treatment ';
377 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                          0.00 seconds
      cpu time
                          0.00 seconds
Shiff To-NCTE: This SAS session is using a registry in WORK. All changes will be lost at the end of this
      session.
```

Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical substrat 1 AEH-12-PSEUDO-04 Random assignment of treatment to experimental tanks S/n/L Treatment Location/type: Lake Carlos - bottom injection

0bs	block	tank	x	tankn	tr t	AS-COUESQ-CN-EEA
1	1	6	0.13335	Tank 6	control	
2	1	1	0.20575	Tank 1	50	
3	1	5	0.28506	Tank 5	100	
4	1	7	0.34557	Tank 7	control	
5	1	4	0.34624	Tank 4	50	
6	1	2	0.55080	Tank 2	100	
7	1	3	0.59072	Tank 3	control	
В	1	8	0.70738	Tank 8	50	
9	1	9	0.89671	Tank 9	100	

File Folder: 12a Item Number: Page of 4

Analysis performed by J. Luoma SAS version 9.2 08:59 11AUG12

```
* Study Number : AEH-12-PSUEDO-04
* Study Director: Jim Luoma
* date created : 11 August 2012 - JAL 💯 🗸
                                                        page ____ of ____ AERK2-PREUDO-04
* Verified by: _____(Date:____)
* Random allocation of treatment to tank.sas
************************
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Lake Carlos - bottom injection exposure*/
data fish;
 do block = 1 to 1 by 1;
 do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
data fish2; set fish;
 if block = 1 and tank = 1 then tankn = 'Tank 1';
 if block = 1 and tank = 2 then tankn = 'Tank 2';
  if block = 1 and tank = 3 then tankn = 'Tank 3';
   if block = 1 and tank = 4 then tankn = 'Tank 4';
    if block = 1 and tank = 5 then tankn = 'Tank 5';
     if block = 1 and tank = 6 then tankn = 'Tank 6';
      if block = 1 and tank = 7 then tankn = 'Tank 7';
       if block = 1 and tank = 8 then tankn = 'Tank 8';
        if block = 1 and tank = 9 then tankn = 'Tank 9';
    run:
proc sort data=fish2;
by block x;
data assign_trt_fish; set fish2;
if _n_ = 1 then trt = 'control';
 if _n_ = 2 then trt = '50';
  if _n_ = 3 then trt = '100';
   if _n; = 4 then trt = 'control';
 if _n_ = 5 then trt = '50';
 if _n_ = 6 then trt = '100'
  if _n_ = 7 then trt = 'control';
   if _n_ = 8 then trt = '50';
if _n_ = 9 then trt = '100';
proc print data= assign_trt_fish;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of treatment to experimental tanks';
title4 h=1 'Treatment Location/type: Lake Carlos - bottom injection';
                                                                       Page a of 4
run:
```

```
609 * date created : 11 August 2012 - JAL Ja-
 610 * Verified by: _____ (Date:___
                                                             page ____ of ___
 611 * Random allocation of treatment to tank, sas
 612 *********** AEI-12-POEUDO-04
 613 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
 615 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
 WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
 617 options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate noscurce2;
 618
· 619 /*Random assignment of treatment to experimental tanks*/
 620 /*Location/exposure type: Lake Carlos - bottom injection exposure*/
 621 data fish;
622
     do block = 1 to 1 by 1;
      do tank = 1 to 9 by 1;
 624
       x = ranuni(-1);
625
        output;
626
       end;
627
      end;
628 run;
NOTE: The data set WORK.FISH has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                      0.01 seconds
      cpu time
                         0.01 seconds
629 data fish2; set fish;
     if block = 1 and tank = 1 then tankn = 'Tank 1';
631
       if block = 1 and tank = 2 then tankn = 'Tank 2':
632
       if block = 1 and tank = 3 then tankn = 'Tank 3';
633
         if block = 1 and tank = 4 then tankn = 'Tank 4';
634
         if block = 1 and tank = 5 then tankn = 'Tank 5';
635
          if block = 1 and tank = 6 then tankn = 'Tank 6';
636
            if block = 1 and tank = 7 then tankn = 'Tank 7';
637
            if block = 1 and tank = 8 then tankn = 'Tank 8';
638
             if block = 1 and tank = 9 then tankn = 'Tank 9';
639
          run:
NOTE: There were 9 observations read from the data set WORK.FISH.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.03 seconds
      cpu time
                         0.03 seconds
640 proc sort data=fish2;
641 by block x;
642 run;
NOTE: There were 9 observations road from the data set WORK.FISH2.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
                                                                      Page 3 of U
NOTE: PROCEDURE SORT used (Total process time):
      real time
                        0.01 seconds
      opu time
                        0.01 seconds
```

```
643
                                                                          AEH-12-P3EUDO-04
644 data assign_trt_fish; set fish2;
     if _n_ = 1 then trt = 'control';
      if _n_ = 2 then trt = '50';
646
        if _n_ = 3 then trt = '100';
if _n_ = 4 then trt = 'control';
648
649
      if _n_ = 5 then trt = '50';
      if _n_ = 6 then trt = '100';
651
       if _n_ = 7 then trt = 'control';
652
        if _n_ = 8 then trt = '50';
653
      if _n_ = 9 then trt = '100';
654
      run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
NOTE: The data set WORK.ASSIGN_TRT_FISH has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                 0.01 seconds
      opu time
                          0.01 seconds
655 proc print data= assign_trt_fish;
656 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on
656! artifical substrates';
657 title2 h=1.5 'AEH-12-PSEUDO-04';
658 title3 h=1 'Random assignment of treatment to experimental tanks';
659 title4 h=1 'Treatment Location/type: Lake Carlos - bottom injection';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_FISH.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                         0.00 seconds
      cpu time
                          0.00 seconds
                       8/11/1
                        Jn-
```

FF # JAA Item No. J Pg 1 of 4 Efficacy of Ω suedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical subs 1 AEH-12-PSUEDO-04
Random assignment of trays to test tank/position
Test Location/type = Lake Carlos/Bottom injection tank treatment

Obs	round ふかのの	row	position	tank	х ,	_row_	tankn	AFH-12-PSEUDO-04
1	1	1	3	6	0.01486	Α	6A3	94.80 (1.1 42)
2	1	1	3	8	0.02061	Α	8A3 V	positions to be used for the 12 h treatment
3	1	3	1	9	0.02926	С	901	positions to be used
4	1	3	1	~ 5	0.03436	С	5C1V	for the 12 in treatment
5	1	3	1	6	0.04324	С	601	Lw.
6	1	2	2	9	0.06133	В	9B2	16 A UG 13
7	1	1 .	3	1	0.08194	Α	1A3	
8	1	3	1	- 1	0.10063	С	1C1	
9	1	3	3	8	0.10670	C	803	
10	1	2	2	6	0.10789	В	6B2	
11	1	3	3	5	0.12424	C	5C3	Began distribution
12	1	3	2	5	0.12608	C	502	
13	1	3	3	3	0.13019	С	*3C3 V	Q. 1020
14	1	3	3	7	0.15140	C	703	Finish distribution @ 1106
15	1	1	2	1	0.15824	Α	1A2	hinish distribution
16	1	2	1	6	0.17372	В	6B1 🗸	@ 110b
17	1	2	2	. 7	0.18856	В	7 B 2	C 1100
18	1	3	3	6	0.20423	C	6C 3	
19	1	2	1	2	0.21778	В	2B1	
20	1	2	1	9	0.22759	В	9B1	
21	1	2	3	5	0.23906	В	₹5B3√	
22	1	1	3	5	0.24018	Α	5A3	
23	1	3	1	· 8	0.26362	C	8C 1	
24	1	2	3	· 3	0.27612	В	3B3	
25	1	3	3	» .1	0.28044	C	103	
2 6	1	2	2	2	0.30348	В	2B2	
27	1	1	1	4	0.33272	Α	4A1	
28	1	1	1	8	0.34190	Α	8A1	
29	1	1	3	;: 4	0.35625	Α	4A3	
30	1	3	3	2	0.35832	C	203 /	
31	1	2	3	9	0.36298	В	∕9B3√	
32	1	1	2	3	0.37363	Α	3A2	
33	1	1	1	5	0.39157	Α	5A1	
34	1	2	2	4	0.39863	В	4B2√	
35	1	1	2	2	0.44104	Α	2A2 /	•
36	1	2	2	1	0.44969	В	1B2√	
37	1	3	3	9	0.47858	C	903	
38	1	1	3	3	0.47917	Α	3A3 /	File Folder: 12a
39	1	1	2	6	0.48418	Α	6A2	
40	1	3	1	4	0.49023	C	401	
41	1	1	2	7	0.49744	Α	7A2	•
42	1	1	2	9	0.49994	Α	9A2	Item Number: 2
43 44	1	3	1	3	0.52922	C	301	THE PARTY OF THE P
44 45	1	2	3	1	0.53076	В	1B3√ '	
46		1 9	Q84 1	7	0.54877	Α	7A1/	· ·
46 47	1	2	3	7	0.59766	В	7B3 🗸	in the form
41	ı	۷	1	8	0.60780	В	8B1	Page of/O 8 35 NV

 $\hbox{ Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical \hbox{ \tt subs} \ 2 } \\$ AEH-12-PSUEDO-04

Random assignment of trays to test tank/position
Test Location/type = Lake Carlos/Bottom injection tank treatment

0bs	rouha?	TITTEW PI	position	tank	x	_row_	tankn	AEH-12-PSEUDO-04
48	1	2	nis h 3	6	0.61277	В	6B3	WELL-18-LOCODO-04
49	1	3	2	8	0.61554	C	802	
50	1	1	3	-2	0.63169	Ä	2A3 /	
51	1	2	3	. 8	0.63320	В	8B3	
52	1	3	2	6	0.64911	C	602	
53	1	1	1	3	0.65102	Α	3A1	
54	1	2	1	5	0.65765	В	5B1 /	
55	1	2	3	4	0.66704	В	4B3	
56	1	3	3	4	0.67056	С	403	
57	1	1	2	8	0.67307	Α	8A2	
58	1	1	2	4	0.69925	Α	4A2	
59	1	1 .	3	7	0.71438	Α	7A3	
60	1	3	2	· 7	0.71487	C	702	
61	1	2	2	8	0.71755	В	8B2	
62	1	1	3	9	0.71982	Α	9A3	
63	1	3	2	3	0.74468	C	302	
64	1	1	1	1	0.78165	Α	1A1 🗸	
65	1	3	1	7	0.78878	С	701	
66	1	1	1	6	0.80236	Α	6A1	
67	1	3	2	4	0.80989	С	4C2	
68	1	2	1	5.7	0.81173	В	7B1	
69	1	1	2	5	0.81727	Α	5A2	
70	1	2	1	4	0.81863	В	4B1	
71	1	. 1	1	9	0.86794	Α	9A1	
72	1	1	1	2	0.87148	Α	2A1	
73	1	3	2	2	0.87686	C	20 2	
74	1	2	2	3	0.89412	В	3B2	
75	1	2	3	2	0.89639	В	2B3	
76	1	3	1	2	0.91321	C	201√	
77	1	2	1	3	0.93071	В	∞3B1√	
78	1	3	2	13.1 9	0.94301	C	902	
79	1	2	2	5	0.94979	В	5B2	
80	1	2	1	-21 1	0.95449	В	1B1	
81	1	3	2	' 1	0.98806	C	102	

File Folder:	
Item Number:	iring fracti
	Page 2 of 168
to enag	

Analysis performed by J. Luoma SAS version 9.2 10:48 11AUG12 \mathcal{J}_{a}

```
* Study Number : AEH-12-PSUEDO-04
  Study Director: Jim Luoma
                                                                     AEH-12-PSEUDO-04
  date created : AUGUST 11, 2012 - JAL 🎾 ¯
* Verified by: _____(Date:____)
                                                     page ____ of _
* Random allocation of trays to tank.sas
********************
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate noscurce2;
/*Random distribution of trays to experimental tanks*/
/* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2, or 3, e
  round = distribution round, place one tray in the assigned position (9 per test replicate - 3 for
_
/*Location and exposure type: Lake Carlos - Bottom injection treatment*/
data glochidia;
 do round = 1 to 1 by 1;
 do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
 end;
 end:
 end;
end;
run;
data glochidiadist; set glochidia;
if row = 1 then _row_ = 'A';
if row = 2 then _row_ = 'B';
if row = 3 then _row_ = 'C';
if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
 if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
  if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
   if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
    if row = 2 and tank = 1 and position = 2 then tankn = '182';
     if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
      if row = 3 and tank = 1 and position = 1 then tankn = '1C1'
       if row = 3 and tank = 1 and position = 2 then tankn = '102':
       if row = 3 and tank = 1 and position = 3 then tankn = '103';
 if row = 1 and tank = 2 and position = 1 then tankn = '2A1;
 if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
  if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
   if row = 2 and tank = 2 and position = 1 then tankn = '281';
    if row = 2 and tank = 2 and position = 2 then tankn = '2B2';
     if row = 2 and tank = 2 and position = 3 then tankn = '2B3':
      if row = 3 and tank = 2 and position = 1 then tankn = '201';
       if row = 3 and tank = 2 and position = 2 then tankn = '202';
       if row = 3 and tank = 2 and position = 3 then tankn = '203';
if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
 if row = 1 and tank = 3 and position = 2 then tankn = '3A2';
```

```
if row = 1 and tank = 3 and position = 3 then tankn = '3A3';
   if row = 2 and tank = 3 and position = 1 then tankn = '3B1';
    if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
     if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
      if row = 3 and tank = 3 and position = 1 then tankn = '3C1'
       if row = 3 and tank = 3 and position = 2 then tankn = '3C2';
        if row = 3 and tank = 3 and position = 3 then tankn = '3C3';
if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
 if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
  if row = 1 and tank = 4 and position = 3 then tankn = 4A3;
   if row = 2 and tank = 4 and position = 1 then tankn = '481';
    if row = 2 and tank = 4 and position = 2 then tankn = 4B2';
     if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
      if row = 3 and tank = 4 and position = 1 then tankn = '4C1';
       if now = 3 and tank = 4 and position = 2 then tankn = '402';
        if row = 3 and tank = 4 and position = 3 then tankn = '403';
if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
 if row = 1 and tank = 5 and position = 2 then tankn = '5A2':
  if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
   if row = 2 and tank = 5 and position = 1 then tankn = '5B1';
    if row = 2 and tank = 5 and position = 2 then tankn = '582';
     if row = 2 and tank = 5 and position = 3 then tankn = ^{1}5B3';
      if row = 3 and tank = 5 and position = 1 then tankn = '501';
       if row = 3 and tank = 5 and position = 2 then tankn = '502';
        if row = 3 and tank = 5 and position = 3 then tankn = '503';
if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
  if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
  if row = 2 and tank = 6 and position = 1 then tankn = '6B1';
    if row = 2 and tank = 6 and position = 2 then tankn = '6B2';
     if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
      if row = 3 and tank = 6 and position = 1 then tankn = '601':
       if row = 3 and tank = 6 and position = 2 then tankn = '602';
        if row = 3 and tank = 6 and position = 3 then tankn = "6C3";
if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
 if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
   if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
    if row = 2 and tank = 7 and position = 2 then tankn = '782':
     if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
     if row = 3 and tank = 7 and position = 1 then tankn = '701';
       if row = 3 and tank = 7 and position = 2 then tankn = '702';
       if row = 3 and tank = 7 and position = 3 then tankn = '703';
if row = 1 and tank = 8 and position = 1 then tankn = '8A1':
if row = 1 and tank = 8 and position = 2 then tankn = '8A2';
 if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
  if row = 2 and tank = 8 and position = 1 then tankn = '881';
   if row = 2 and tank = 8 and position = 2 then tankn = '8B2';
    if row = 2 and tank = 8 and position = 3 then tankn = '883';
     if row = 3 and tank = 8 and position = 1 then tankn = '8C1';
      if row = 3 and tank = 8 and position = 2 then tankn = '8C2':
       if row = 3 and tank = 8 and position = 3 then tankn = '803';
if row = 1 and tank = 9 and position = : then tankn = '9A1':
if row = 1 and tank = 9 and ossition = 2 then tankn = '9A2';
 if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
```

if row = 2 and tank = 9 and position = 1 then tankn = '981';

AEH-12-PSEUDO-04

Page _____ of ____ &___

```
if row = 2 and tank = 9 and position = 2 then tankn = '982';
     if row = 2 and tank = 9 and position = 3 then tankn = '9B3';
       if row = 3 and tank = 9 and position = 1 then tankn = '9C1';
       if row = 3 and tank = 9 and position = 2 then tankn = '902';
                                                                            AEH-12-PSEUDO-04
         if row = 3 and tank = 9 and position = 3 then tankn = '903';
proc sort data= glochidiadist;
by round x;
run;
proc print data = glochidiadist;
title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artif
title2 h=1.5 'AEH-12-PSUEDO-04';
title3 h=1 Random assignment of trays to test tank/position;
title4 h=1 'Test Location/type = Lake Carlos/Bottom injection tank treatment';
run;
              8/11/12
               JA-
```

Page <u>5</u> of <u>8</u>

```
1157 * date created : AUGUST 11, 2012 - JAL
                                      1158 * Verified by: _____ (Date:____
                                                         page ____ of _
1159 * Random allocation of trays to tank.sas
AEH-12-PSEUDO:04
1161 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
1162
1163 FOOTNOTE: 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
1164
1165
     options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate noscurce2:
1166
1167 /*Random distribution of trays to experimental tanks*/
1168 /* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2,
1168! or 3, etc)
        round = distribution round, place one tray in the assigned position (9 per test replicate -
1169! 3 for each exposure duration) */
1171! ******/
1172
1173 /*Location and exposure type: Lake Carlos - Bottom injection treatment*/
1174 data glochidia;
1175 do round = 1 to 1 by 1;
      do row = 1 to 3 by 1;
1176
1177
      do position = 1 to 3 by 1;
     do tank = 1 to 9 by 1;
1178
      x = ranuni(-1);
1180
       output;
1181
       end;
1182
       end;
1183
      end;
1184
      end;
1185 run;
NOTE: The data set WORK.GLOCHIDIA has 81 observations and 5 variables,
NOTE: DATA statement used (Total process time):
     real time
                      0.03 seconds
     cpu time
                       0.03 seconds
1186 data glochidiadist; set glochidia;
1187 if row = 1 then _row_ = 'A';
1189 if row = 3 then _row_ = 'C';
1190 if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
      if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
1192
        if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
        if row = 2 and tank = : and position = 1 then tankn = '1B1';
1193
1194
         if row = 2 and tank = 1 and position = 2 then tankn = '1B2';
1195
          if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
1196
           if row = 3 and tank = 1 and position = 1 then tankn = 101';
            if row = 3 and tank = 1 and position = 2 then tankn = '102';
                                                                        Page 6 of 8
1197
1198
            if row = 3 and tank = 1 and position = 3 then tankn = '103';
     if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
1199
     if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
1201
       if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
```

```
1202
          if row = 2 and tank = 2 and position = 1 then tankn = '2B1';
1203
           if row = 2 and tank = 2 and position = 2 then tankn = '2B2';
1204
            if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
1205
             if row = 3 and tank = 2 and position = 1 then tankn = '201';
1206
              if row = 3 and tank = 2 and position = 2 then tankn = '202';
                                                                                  AEH-12-PSEUDO-04
1207
               if row = 3 and tank = 2 and position = 3 then tankn = '203';
1208
       if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
1209
        if row = 1 and tank = 3 and position = 2 then tankn = '3A2':
1210
         if row = 1 and tank = 3 and position. = 3 then tankn = '3A3';
          if row = 2 and tank = 3 and position = 1 then tankn = '3B1';
1211
1212
           if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
1213
            if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
1214
             if row = 3 and tank = 3 and position = 1 then tankn = '301':
1215
              if row = 3 and tank = 3 and position = 2 then tankn = '302';
               if row = 3 and tank = 3 and position = 3 then tankn = '303';
1216
1217
       if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
1218
        if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
1219
         if row = 1 and tank = 4 and position = 3 then tankn = '4A3';
1220
          if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
           if row = 2 and tank = 4 and position = 2 then tankn = '4B2';
1221
1222
            if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
             if row = 3 and tank = 4 and position = 1 then tankn = '401';
1223
1224
              if row = 3 and tank = 4 and position = 2 then tankn = '402':
1225
               if row = 3 and tank = 4 and position = 3 then tankn = '4C3';
1226
       if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
1227
        if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
1228
         if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
1229
          if row = 2 and tank = 5 and position = 1 then tankn = '5B1';
           if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
1230
            if row = 2 and tank = 5 and position = 3 then tankn = '5B3':
1231
1232
             if row = 3 and tank = 5 and position = 1 then tankn = '5C1';
1233
              if row = 3 and tank = 5 and position = 2 then tankn = '502';
1234
               if row = 3 and tank = 5 and position = 3 then tankn = '503';
       if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
1235
1236
        if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
1237
         if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
1238
          if row = 2 and tank = 6 and position = 1 then tankn = '6B1':
1239
           if row = 2 and tank = 6 and position = 2 then tankn = '6B2';
            if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
1240
             if row = 3 and tank = 6 and position = 1 then tankn = '601';
1241
1242
              if row = 3 and tank = 6 and position = 2 then tankn = '602';
1243
               if row = 3 and tank = 6 and position = 3 then tankn = '603';
1244
       if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
1245
        if row = 1 and tank = 7 and position = 2 then tankn = '7A2':
* 246
         if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
          if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
1247
1248
           if row = 2 and tank = 7 and position = 2 then tankn = '7B2';
            if row = 2 and tank = 7 and position = 3 then tankn = ^{1}7B3^{\circ};
1249
1250
             if row = 3 and tank = 7 and position = 1 then tankn = '701';
1251
              if row = 3 and tank = 7 and position = 2 then tankn = '702';
1252
               if row = 3 and tank = 7 and position = 3 then tankn = '703':
1253
       if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
1254
        if row = 1 and tank = 8 and position = 2 then tankn = '8A2';
                                                                               Page 7 of 8
1255
        if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
1256
          if row = 2 and tank = 8 and position = 1 then tankn = '8B1';
```

if row = 2 and tank = 8 and position = 2 then tankn = '8B2';

1257

```
1258
            if row = 2 and tank = 8 and position = 3 then tankn = '8B3';
1259
             if row = 3 and tank = 8 and position = 1 then tankn = '8C1';
1260
              if row = 3 and tank = 8 and position = 2 then tankn = '802';
1261
               if row = 3 and tank = 8 and position = 3 then tankn = '8C3';
1262
       if row = 1 and tank = 9 and position = 1 then tankn = '9A1':
1263
        if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
         if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
1264
                                                                                AEH-12-PSEUDO-04
1265
          if row = 2 and tank = 9 and position = 1 then tankn = '9B1':
           if row = 2 and tank = 9 and position = 2 then tankn = ^{1}9B2^{\circ};
1266
1267
            if row = 2 and tank = 9 and position = 3 then tankn = '9B3';
1268
             if row = 3 and tank = 9 and position = 1 then tankn = '9C1';
              if row = 3 and tank = 9 and position = 2 then tankn = '962';
1269
1270
               if row = 3 and tank = 9 and position = 3 then tankn = '903';
1271 Run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIA.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.07 seconds
      cpu time
                          0.07 seconds
1272 proc sort data= glochidiadist;
1273 by round x;
1274
     run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1275 proc print data = glochidiadist;
1276 title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels
1276! on artifical substrates';
1277 title2 h=1.5 'AEH-12-PSUEDO-04';
1278 title3 h=1 'Random assignment of trays to test tank/position';
1279 title4 h=1 'Test Location/type = Lake Carlos/Bottom injection tank treatment';
1280 run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                         0.01 seconds
     opu time
                          0.01 seconds
               8/11/1
               J1/2
```

FF# 124 Item No. 3 Pg 8 of 8 Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 1 *** Lake Carlos - bottom injection Treatment

8/17/12 AEH-12-PSEUDO-04

Obs	row	position	х	tankn	trt	Te-
71 2 3 4	3 3 3 1	2 3	0.00578 0.07326 0.24288 0.27838	102 103 101 1A2	6h * 6h 6h 9h	Dosay for bottom injection is occurring for 12 h with no 6 or 9 h sampling. IN 10 AVGD
5	1	3	0.28017	1A3	9h	'
6	2	1	0.53070	1B1	9h	
7	2	2	0.61838	182	12	
8	2	3	0.68756	1B3	12	
9	1	1	0.81146	1A1	12	

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File Folder: 12a

Item Number: 3

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Analysis performed by J. Luoma SAS version $9.2\ 10:20\ 13AUG12$

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates

Lake Carlos - bottom injection Treatment

Obs	row	position	×	tankn	trt
4	1	2	0.11803	2A2	6h
2	2	2	0.62053	282	6h
3	2		0.71937	2B1	6h
4	1	. 3	0.87192	2A3	9h
5	3	2	0.91454	2C2_	9h
6	3	3	0.94135	203	gh
7	2	3	0.95412	283	12
8	1	1	0.97236	2A1	12
9	3	1	0.99390	201	12

Dosing for bottom Injection is occurring for 12 h with no 6 or 9 h sampling.

File Folder.

Mem Number

Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Handom assignment of substrate removal from tanks *** TANK 3 *** Lake Carlos - bottom injection Treatment

obs	row	position	x	tankn	trt
'	3	2	0.19914	302	6h
2	1	2 :	0.28840	3A2	6h
3	2	3	0.38093	3B3	6h
4	3	1 `	0.43250	301	9h
5	1	1	0.57180	3A1	9h
6	2	2	0.66134	3B2	-9 h
7	3	3	0.71983	3C3	12
В	1	3	0.82826	3A3	12
9	2	1	0.88773	3 B1	12

Dosing for bottom injection is occurring for 12 h with no 6 or 9 h Sampling.
MW 1644612

, or see

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AEH-12-PSEUDO-04

Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12

Random assignment of substrate removal from tanks *** TANK 4 *** Lake Carlos - bottom injection Body Treatment

Obs	row	position	x	tankn	trt	
2 3	1 3 3	2 3	0.04712 0.06272 0.14155	4A2 4C3 4C1	6h 6h 6h	Dosty for bottom injection is occurring for 12 h with no 6 or 9 h sampling.
4	3	2	0.28865	402	9h	6 or 9 h sampling.
5	1	1	0.45448	4A1	9h	1/4.3
6	11	3	0.50193	4A3	gh	16AUG12
7	2	1	0.73873	4B1	12	IbV/A-1.
8	2	3	0.88940	4B3	12	
9	2	2	0.94491	4B2	12	

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 5 ***

Lake Carlos - bottom injection Treatment

0bs	row	position	x	\mathcal{O}_{tankn}	trt	
2 3 4 5	1 2 2 1 3 3	2 2 3 2 3	0.11803 0.62053 0.71937 0.87192 0.91454 0.94135	2A2 2B2 2B1 2A3 2C2 2C3	6h 6h 6h 9h 9h	Dosing for bottom injection is occurring for 12 h with no 6 or 9 h sampling. 140 10A0412
7		3	0.95412	2B3	12	-
8	1	1	0.97236	2A1	12	
9	3	1	0.99390	201	12	

OTank 10 should be 5 not 2 km reducing See Deviation #2 for further clarification. 1900 13

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 6 *** Lake Carlos - bottom injection Treatment

Obs	row	position	×	tankn	trt	
2	3	2	0.08423 0.16043	602 603	6h 6h	Dosay for bothm injection is for 12 h with no 6 or 9 h
3	1	8	0.20065	6A3	6h	for 12 h with no bor 9 h
4	1	1	0.29470	6A1	9h	Sampling. 1/w 16 AUG 13
5	2	2	0.30688	6B2	9h	Service 1.
6	2	3 ~	0.35165	6B3	-9h	
7	1	2	0.38714	6A2	12	
8	3	1	0.60130	6C1	12	
9	2	1 .	0.64342	6B1	12	

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Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12

Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04 Random assignment of substrate removal from tanks *** TANK 7 *** Lake Carlos - bottom injection Treatment

0bs	row	position	×	() tankn	trt	Dave bullet and
7~	1	2	0.11803	2A2	6h	Downg for bottom injection in
2	2	2	·0.62053	2B2	6ի	The lak with ho e by 91
3	2		0.71937	2B1	6h	Sampling.
4	1	3	0.87192	2Á3 É	9h	m 16AV41
5	3	2	0.91454	2C2	9h	(··· ··· ·· · · ·
6	3	3	0.94135	203	<u>0</u> h_	
7	2	3	0.95412	2B3	12	
Я	1	1	0.07038	244	10	

OTank D should be 7 not 2 km
16 AUGD

See Deviation #2 for
furter darification. Km 19 MOV 13

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Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 8 *** Lake Carlos - bottom injection Treatment

Obs	row	position	×	tankn	trt	
2 3 4 5 6 7	3 3 2 2 1	1 1 3 1 2 2 2	0.06104 0.13492 0.25814 0.54811 0.66886 0.72715	8C1 8A1 8C3 8B1 8B2 8A2	6h 6h 6h 9h 9h	Dosting for bottom injection is for 12 h with no b or 9 h Sampling. Kno 16 AUG D
8 9	3 1	2 3	0.87980 0.89938	8C2 8A3	12 12	

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AEH-12-PSEUDO-04

AEH-12-PSEUDO-C

Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12 5.2

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 9 *** Lake Carlos - bottom injection Treatment

Obs	row	position	x A	tankn	trt	
4	_ 1	2	0.11803	2A2	6h	
2	2	2	0.62053	282	6h	
3	2	7	0.71937	281	6h	
4	1	3	0.87192	2A3	9h	
5	3	2	0.91454	202	9h	
6	3	3	0.94135	203	-9h_	
7	2	3	0.95412	2B3	12	_
8	1	1	0.97236	2A1	12	
9	3	1	0.99390	201	12	

Dosing for bottom injection is for 13th with no 6 or 9th Sampling. Kno 10 AUG 12

Otank ID Should be 9 not 2.

100 16 AUG B

See Deriation #2 for furtur clarification. Kno 19 novi3

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AEH-12-PSEUDO-04

Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12

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```
* Study Number : AEH-12-PSUEDO-04
  Study Director: Jim Luoma
* date created : 13 August 2012 - JAL 8/17/12
                                                                       AEH-12-PSEUDO-04
* Verified by: _____ (Date:____)
                                                      page ____ of .
* Random allocation of treatment to tank.sas
DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options ls=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks. See little below. Kus 25 APR-14
/*Location/exposure type: Lake Carlos - bottom injection treatment*/
data TANK1;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
 end;
run;
data TANK1A; set TANK1;
 if row = 1 and position = 1 then tankn = '1A1';
 if row = 1 and position = 2 then tankn = '1A2';
  if row = 1 and position = 3 then tankn = '1A3';
   if row = 2 and position = 1 then tankn = '1B1';
    if row = 2 and position = 2 then tankn = '182';
     if row = 2 and position = 3 then tankn = '1B3';
      if row = 3 and position = 1 then tankn = 'iC1';
       if row = 3 and position = 2 then tankn = '102';
        if row = 3 and position = 3 then tankn = '103';
    run;
proc sort data=TANK1A;
by x;
run;
data assign_trt_TANK1A; set TANK1A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK1A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
                                                                       Page 11 of 30
```

```
data TANK2;
do row = 1 \text{ to } 3 \text{ by } 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
                                                                         AEH-12-PSEUDO-04
  output;
  end;
 end;
run;
data TANK2A; set TANK2;
 if row = 1 and position = 1 then tankn = '2A1';
  if row = 1 and position = 2 then tankn = '2A2';
   if row = 1 and position = 3 then tankn = '2A3';
    if row = 2 and position = 1 then tankn = '2B1';
     if row = 2 and position = 2 then tankn = '2B2';
      if row = 2 and position = 3 then tankn = '283';
       if row = 3 and position = 1 then tankn = '2C1';
        if row = 3 and position = 2 then tankn = '202';
         if row = 3 and position = 3 then tankn = '203';
     run:
proc sort data=TANK2A;
by x;
run;
data assign_trt_TANK2A; set TANK2A;
 if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if n = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
run;
data TANK3;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
end;
run;
data TANK3A; set TANK3;
if row = 1 and position = 1 then tankn = '3A1';
 if row = 1 and position = 2 then tankn = '3A2';
  if row = 1 and position = 3 then tankn = '3A3';
                                                                           Page 17 of 30
   if row = 2 and position = 1 then tankn = '3B1';
    if row = 2 and position = 2 then tankn = '3B2';
      if row = 2 and position = 3 then tankn = '3B3';
```

```
if row = 3 and position = 1 then tankn = '3C1';
        if row = 3 and position = 2 then tankn = '302';
         if row = 3 and position = 3 then tankn = '303';
     run:
                                                                             AEH-12-PSEUDO-04
proc sort data=TANK3A;
 by x;
run;
data assign_trt_TANK3A; set TANK3A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _r_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK3A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***':
title4 h=1 'Lake Carlos - bottom injection Treatment ';
data TANK4;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
 end;
 end;
run:
data TANK4A; set TANK4;
 if row = 1 and position = 1 then tankn = '4A1';
 if row = 1 and position = 2 then tankn = '4A2';
   if row = 1 and position = 3 then tankn = '4A3';
   if row = 2 and position = 1 then tankn = '4B1';
     if row = 2 and position = 2 then tankn = '482';
      if row = 2 and position = 3 then tankn = '4B3';
       if row = 3 and position = 1 then tankn = '401';
       if row = 3 and position = 2 then tankn = '402';
         if row = 3 and position = 3 then tankn = '403';
     run;
proc sort data=TANK4A;
by x;
run:
data assign_trt_TANK4A; set TANK4A;
if _n_ = 1 then trt = '6h';
if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
                                                                           Page 13 of 30
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
```

```
if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
                                                                            AEH-12-PSEUDO-04
proc print data= assign_trt_TANK4A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL(45A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04;
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
title4 h=1 'Lake Carlos - bottom injection Body Treatment ';
run:
data TANK5;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK5A; set TANK5;
if row = 1 and position = 1 then tankn = '5A1';
  if row = 1 and position = 2 then tankn'= '5A2';
  if row = 1 and position = 3 then tankn = '5A3';
    if row = 2 and position = 1 then tankn = '5B1';
     if row = 2 and position = 2 then tankn = '5B2';
      if row = 2 and position = 3 then tankn = '5B3';
       if row = 3 and position = 1 then tankn = '501';
       if row = 3 and position = 2 then tankn = '502';
        if row = 3 and position = 3 then tankn = '503';
     run:
proc sort data=TANK5A;
by x;
run;
data assign_trt_TANK5A; set TANK5A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h ;
   if _n_ = 8 then trt = '12h';
if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
run;
data TANK6;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
                                                                         Page 14 of 33
 x = ranuni(-1);
 output;
 end;
```

end;

```
data TANK6A; set TANK6;
 if row = 1 and position = 1 then tankn = '6A1';
  if row = 1 and position = 2 then tankn = '6A2';
                                                                           AEH-12-PSEUDO-04
   if row = 1 and position = 3 then tankn = '6A3';
    if row = 2 and position = 1 then tankn = '6B1';
     if row = 2 and position = 2 then tankn = '6B2';
      if row = 2 and position = 3 then tankn = '6B3':
       if row = 3 and position = 1 then tankn = '601';
        if row = 3 and position = 2 then tankn = '602';
         if row = 3 and position = 3 then tankn = '603';
     run;
proc sort data=TANK6A;
by x;
run:
data assign_trt_TANK6A; set TANK6A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK6A;
title1 h=2 'Efficacy of Psaudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
run;
data TANK7;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
end;
run;
data TANK7A; set TANK7;
if row = 1 and position = 1 then tankn = '7A1';
 if row = 1 and position = 2 then tankn = '7A2';
  if row = 1 and position = 3 then tankn = '7A3';
    if row = 2 and position = 1 then tankn = '7B1';
     if row = 2 and position = 2 then tankn = '782';
     if row = 2 and position = 3 then tankn = '7B3';
      if row = 3 and position = 1 then tankn = '701';
       if row = 3 and position = 2 then tankn = '702';
        if row = 3 and position = 3 them tankn = '703';
     run;
                                                                          Page _ 5 of 3 =
proc sort data=TANK7A;
by x;
```

run;

```
data assign_trt_TANK7A; set TANK7A;
 if n_m = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
                                                                          AEH-12-PSEUDO-04
 if n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt \approx '12h';
  run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
data TANKB;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
  end; .
 end;
run;
data TANK8A; set TANK8;
 if row = 1 and position = 1 then tankn = '8A1';
  if row = 1 and position = 2 then tankn = '8A2';
  if row = 1 and position = 3 then tankn = '8A3';
   if row = 2 and position = 1 then tankn = '8B1';
     if row = 2 and position = 2 then tankn = '8B2';
     if row = 2 and position = 3 then tankn = '8B3';
      if row = 3 and position = 1 then tankn = '8C1';
       if row = 3 and position = 2 then tankn = '802';
        if row = 3 and position = 3 then tankn = '803';
     run;
proc sort data=TANK8A;
by x;
run;
data assign_trt_TANK8A; set TANK8A;
if _n_ = 1 then trt = '6h';
 if n = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
                                                                           Page 16 of 30
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK8A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
```

```
run;
data TANK9;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
                                                                          AEN-12-PSEUDO-04
  output;
  end;
 end;
run;
data TANK9A; set TANK9;
 if row = 1 and position = 1 then tankn = '9A1';
  if row = 1 and position = 2 then tankn = '9A2';
   if row = 1 and position = 3 then tankn = '9A3';
    if row = 2 and position = 1 then tankn = '981';
     if row = 2 and position = 2 then tankn = '9B2';
     if row = 2 and position = 3 then tankn = '983';
       if row = 3 and position = 1 then tankn = '9C1';
        if row = 3 and position = 2 then tankn = '902';
         if row = 3 and position = 3 then tankn = '903';
     run;
proc sort data=TANK9A;
by x;
run;
data assign_trt_TANK9A; set TANK9A;
if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h ;
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign trt TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
title4 h=1 'Lake Carlos - bottom injection Treatment ';
run;
  8/13/12
    Jau
```

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```
381 * date created : 13 August 2012 - JAL 382 * Verified by: _____ (Date:_____) \mathcal{S}_4
                                                              page ____ of
383 * Random allocation of treatment to tank.sas
385 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
386
387 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
388
    options ls=105 ps=54 formdlim='-' pagono = 1 nocenter nodate nosource2;
389
390 Substrak removal from tanks. See title on rext page. Fro Jenpry 391 /*Random assignment of treatment to experimental tanks*/
     /*Location/exposure type: Lake Carlos - bottom injection treatment*/
392
393 data TANK1;
394 do row = 1 to 3 by 1;
395 do position = 1 to 3 by 1;
396
      x = ranuni(-1);
397
      output;
398
      end;
399
     end;
400 run;
NOTE: The data set WORK.TANK1 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                     0.00 seconds
      cou time
                         0.00 seconds
401 data TANK1A; set TANK1;
402
    if row = 1 and position = 1 then tankn = '1A1';
403
      if row = 1 and position = 2 then tankn = '1A2';
404
       if row = 1 and position = 3 then tankn = '1A3';
        if row = 2 and position = 1 then tankn = '1B1';
405
406
         if row = 2 and position = 2 then tankn = '182';
407
          if row = 2 and position = 3 then tankn = '1B3';
           if row = 3 and position = 1 then tankn = '101';
408
409
            if row = 3 and position = 2 then tankn = '102';
410
             if row = 3 and position = 3 then tankn = '103';
NOTE: There were 9 observations read from the data set WORK.TANK1.
NOTE: The data set WORK.TANK1A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.01 seconds
     cpu time
                        0.01 seconds
412 proc sort data=TANK1A;
413 by x;
414 run;
NOTE: There were 9 observations read from the data set WORK.TANK1A.
                                                                         Page 18 of 33_
NOTE: The data set WORK.TANKIA has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     opu time
                        0.01 seconds
```

```
415
416 data assign_trt_TANK1A; set TANK1A;
                                                                          AEH-12-PSEUDO-04
     if _n_ = 1 then trt = '6h';
417
      if _n_ = 2 then trt = '6h';
418
       if _n_ = 3 then trt = 6h';
419
         if _n_ = 4 then trt = '9h';
420
      if _n_ = 5 then trt = '9h';
421
      if _n_ = 6 then trt = '9h';
423
       if _n_ = 7 then trt = '12h';
        if _n_ = 8 then trt = '12h';
424
425
      if _n_ = 9 then trt = '12h';
426
      run:
NOTE: There were 9 observations read from the data set WORK.TANKIA.
NOTE: The data set WORK.ASSIGN_TRT_TANK1A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                 0.01 seconds
      cpu time
                         0.01 seconds
427 proc print data= assign_trt_TANK1A;
428 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
428! artifical substrates';
429 title2 h=1.5 'AEH-12-PSEUDO-04';
430 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
431 title4 h≃1 'Lake Carlos - bottom injection Treatment ';
432 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK1A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                        0.01 seconds
      cpu time
                         0.01 seconds
433
434 data TANK2;
435 do row = 1 to 3 by 1;
436
     do position = 1 to 3 by 1;
      x = ranuni(-1);
437
438
      output;
439
      end:
440 end;
441 run;
NOTE: The data set WORK.TANK2 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
     opu time
                         0.01 seconds
                                                                         Page 9 of 30
442 data TANK2A; set TANK2;
443 if row = 1 and position = 1 then tankn = '2A1';
     if row = 1 and position = 2 then tankn = '2A2';
445
       if row = 1 and position = 3 then tankn = '2A3';
```

```
446
         if row = 2 and position = 1 then tankn = '2B1';
447
           if row = 2 and position = 2 then tankn = '2B2';
448
           if row = 2 and position = 3 then tankn = '2B3';
            if row = 3 and position = 1 then tankn = '201';
449
                                                                              AEH-12-POEUDO-04
450
              if row = 3 and position = 2 then tankn = '202';
451
              if row = 3 and position = 3 then tankn = '203';
NOTE: There were 9 observations read from the data set WORK.TANK2.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time);
                          0.01 seconds
      real time
      opu time
                          0.01 seconds
453 proc sort data=TANK2A;
     by x;
455 run;
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                        0.00 seconds
      cpu time
                          0.00 seconds
456
457
    data assign_trt_TANK2A; set TANK2A;
     if _n_ = 1 then trt = '6h';
458
459
       if _n_ = 2 then trt = '6h';
       if _n_ = 3 then trt = '6h';
460
461
        if _n_ = 4 then trt = '9h';
      if _n_ = 5 then trt = '9h';
462
463
       if _n_ = 6 then trt = '9h';
464
       if _n_ = 7 then trt = '12h';
465
        if _n_ = 8 then trt = '12h';
466
     if _n_ = 9 then trt = '12h';
467
      run;
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.ASSIGN_TRT_TANK2A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpt time
                          0.01 seconds
468 proc print data= assign_trt_TANK2A;
469 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zobra mussesl on
469! artifical substrates';
470 title2 h=1.5 'AEH-12-PSEUDO-04';
471 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
472 title4 h=1 'Lake Carlos - bottom injection Treatment ';
                                                                              Page <u>20</u> of <u>30</u>
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
```

```
0.00 seconds
      cpu time
                         0.00 seconds
                                                                         AEH-12-PCEUDO-04
474
475 data TANK3;
476 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
      x = ranuni(-1);
479
      output;
480
      end:
481
      end;
482 run;
NOTE: The data set WORK.TANK3 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                 0.01 seconds
      cpu time
                         0.01 seconds
483 data TANK3A; set TANK3;
      if row = 1 and position = 1 then tankn = '3A1';
484
485
      if row = 1 and position = 2 then tankn = '3A2';
        if row = 1 and position = 3 then tankn = '3A3';
487
         if row = 2 and position = 1 then tankn = '3B1';
         if row = 2 and position = 2 then tankn = '3B2';
488
           if row = 2 and position = 3 then tankn = '3B3';
489
490
           if row = 3 and position = 1 then tankn = '3C1';
            if row = 3 and position = 2 then tankn = '302';
491
492
             if row = 3 and position = 3 then tankn = '303';
493
NOTE: There were 9 observations read from the data set WORK.TANK3.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables,
NOTE: DATA statement used (Total process time):
      real time
                 0.03 seconds
      cpu time
                         0.03 seconds
494 proc sort data=TANK3A;
495
     by x;
496 run;
NOTE: There were 9 observations read from the data set WORK.TANK3A.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                    0.01 seconds
     opu time
                        0.01 seconds
497
498 data assign_trt_TANK3A; set TANK3A;
                                                                         Page 21 of 3,
499 if _n_ = 1 then trt = '6h';
500
     if _n_ = 2 then trt = '6h';
501
      if _n_ = 3 then trt = 6h';
       if _n_ = 4 then trt = '9h';
```

real time

502

```
503
      if _n_ = 5 then trt = '9h';
       if _n_ = 6 then trt = '9h';
505
        if _n_ = 7 then trt = '12h';
         if _n_ = 8 then trt = '12h';
506
                                                                           AEK-12-POEUDO-04
507
      if _n_ = 9 then trt = '12h';
508
       run:
NOTE: There were 9 observations read from the data set WORK, TANKSA.
NOTE: The data set WORK.ASSIGN_TRT_TANK3A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
509 proc print data= assign_trt_TANK3A;
510 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesi on
510| artifical substrates';
511 title2 h=1.5 'AEH-12-PSEUDO-04';
512 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
513 title4 h=1 'Lake Carlos - bottom injection Treatment ';
514 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK3A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.00 seconds
     cpu time
                         0.00 seconds
515 data TANK4;
516 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
517
518
      x = ranuni(-1);
519
      output;
520
      end;
521
     end;
522 run;
NOTE: The data set WORK.TANK4 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
523 data TANK4A; set TANK4;
     if row = 1 and position = 1 then tankn = '4A1';
524
525
      if row = 1 and position = 2 then tankn = '4A2';
       if row = 1 and position = 3 then tankn = '4A3';
526
        if row = 2 and position = 1 then tankn = '4B1';
527
528
         if row = 2 and position = 2 then tankn = '4B2';
          if row = 2 and position = 3 then tankn = '4B3';
529
530
           if row = 3 and position = 1 then tankn = '401';
531
            if row = 3 and position = 2 then tankn = '4C2';
                                                                          532
             if row = 3 and position = 3 then tankn = '403';
533
         run;
```

NOTE: There were 9 observations read from the data set WORK.TANK4.

```
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
                                                                           AEH-12-PSEUDO-04
534 proc sort data=TANK4A;
535 by x;
536 run;
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
                     0.01 seconds
      real time
      opu time
                         0.01 seconds
537
538 data assign_trt_TANK4A; set TANK4A;
539
    if _n_ = 1 then trt = '6h ;
540
      if _n_ = 2 then trt = '6h';
       if _n_ = 3 then trt = '6h';
541
542
        if _n_ = 4 then trt = '9h';
     if _n_ = 5 then trt = '9h';
543
      if _n_ = 6 then trt = '9h';
       if _n_ = 7 then trt = '12h';
545
        if _n_ = 8 then trt = '12h';
546
     if _{n_{=}} = 9 then trt = '12h';
547
548
     run;
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.ASSIGN_TRT_TANK4A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.03 seconds
      cpu time
                         0.03 seconds
549 proc print data= assign_trt_TANK4A;
550 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
550! artifical substrates';
551 title2 h=1.5 'AEH-12-PSEUDO-04';
552 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
553 title4 h=1 'Lake Carlos - bottom injection Body Treatment ';
554 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANKAA.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                     0.00 seconds
      opu time
                         0.00 seconds
555 data TANK5;
556 do row = 1 to 3 by 1;
                                                                           Page <u>33</u> of <u>30</u>
557 do position = 1 to 3 by 1;
558
     x = ranuni(-1);
559
      output;
```

```
560
       end;
561
      end;
562 run;
                                                                            AER-12-PSEUDO-64
NOTE: The data set WORK.TANK5 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.03 seconds
      cpu time
                          0.03 seconds
563 data TANK5A; set TANK5;
      if row = 1 and position = 1 then tankn = '5A1';
565
       if row = 1 and position = 2 then tankn = '5A2';
        if row = 1 and position = 3 then tankn = '5A3';
566
         if row = 2 and position = 1 then tankn = '581';
568
          if row = 2 and position = 2 then tankn = '582';
           if row = 2 and position = 3 then tankn = '5B3';
569
570
            if row = 3 and position = 1 then tankn = '501';
571
             if row = 3 and position = 2 then tankn = '5C2';
572
              if row = 3 and position = 3 then tankn = '503';
573
          run;
NOTE: There were 9 observations read from the data set WORK.TANK5.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
                         0.01 seconds
      real time
      cpu time
                          0.01 seconds
574 proc sort data=TANK5A;
     by x;
575
576 run;
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      roal time
                         0.00 seconds
      cpu time
                          0.00 seconds
577
578
     data assign_trt_TANK5A; set TANK5A;
579
     if n = 1 then trt = '6h';
      if _n_ = 2 then trt = '6h';
580
     if _n_ = 3 then trt = '6h';
581
     if _n_ = 4 then trt = '9h';
if _n_ = 5 then trt = '9h';
582
583
      if _n_ = 6 then trt = '9h';
584
585
        if _n_ = 7 then trt = '12h';
        if _n_ = 8 then trt = '12h';
586
587
      if _n_ = 9 then trt = '12h';
                                                                             Page 24 of 30
588
      run:
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.ASSIGN_TRT_TANK5A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
```

```
real time
                          0.01 seconds
      cpu time
                          0.01 seconds
                                                                              AEH-12-PSEUDO-04
589 proc print data= assign_trt_TANK2A;
590 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
590! artifical substrates';
591 title2 h=1.5 'AEH-12-PSEUDO-04';
592 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
593 title4 h=1 'Lake Carlos - bottom injection Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                          0.01 seconds
595 data TANK6;
596 do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
597
598
      x = ranuni(-1);
599
       output;
600
       end;
601
      end;
602 run;
NOTE: The data set WORK.TANK6 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
603 data TANK6A; set TANK6;
     if row = 1 and position = 1 then tankn = '6A1';
604
605
       if row = 1 and position = 2 then tankn = '6A2';
606
       if row = 1 and position = 3 then tankn = '6A3';
         if row = 2 and position = 1 then tankn = '6B1';
608
          if row = 2 and position = 2 then tankn = '6B2';
609
          if row = 2 and position = 3 then tankn = '6B3';
610
            if row = 3 and position = 1 then tankn = '6C1';
611
            if row = 3 and position = 2 then tankn = '602';
612
              if row = 3 and position = 3 then tankn = '603';
613
          run;
NOTE: There were 9 observations read from the data set WORK.TANK6.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
                                                                          Page 25_of 30_
614 proc sort data=TANK6A;
615 by x;
616 run;
```

```
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
                        0.01 seconds
      real time
      cpu time
                          0.01 seconds
                                                                           AEH-12-PSEUDO-04
617
618 data assign_trt_TANK6A; set TANK6A;
     if _n_ = 1 then trt = '6h';
       if _n_ = 2 then trt = '6h';
620
621
        if _n_ = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
622
      if _n_ = 5 then trt = '9h';
623
624
       if _n_ = 6 then trt = '9h';
       if _n_ = 7 then trt = '12h';
625
        if _n_ = 8 then trt = '12h';
626
      if _n_ = 9 then trt = '12h';
627
628
      run;
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.ASSIGN_TRT_TANK6A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.03 seconds
      cpu time
                         0.03 seconds
629 proc print data= assign_trt_TANK6A;
630 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
630! artifical substrates';
631 title2 h=1.5 'AEH-12-PSEUDO-04';
632 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***':
633 title4 h=1 'Lake Carlos - bottom injection Treatment ';
634 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK6A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                      0.01 seconds
     cpu time
                         0.01 seconds
635 data TANK7;
636 do row = 1 to 3 by 1:
637 do position = 1 to 3 by 1;
638
     x = ranuni(-1);
639
      output;
640
      end;
641
     end;
642 run;
NOTE: The data set WORK.TANK7 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.01 seconds
                                                                         Page 26 of 30
     opu time
                        0.01 seconds
```

```
643 data TANK7A; set TANK7;
      if row = 1 and position = 1 then tankn = '7A1';
645
       if row = 1 and position = 2 then tankn = 7A2';
        if row = 1 and position = 3 then tankn = '7A3';
647
         if row = 2 and position = 1 then tankn = '7B1';
648
          if row = 2 and position = 2 then tankn = '7B2';
                                                                           AEH-12-PSEUDO-04
           if row = 2 and position = 3 then tankn = '7B3';
649
650
            if row = 3 and position = 1 then tankn = '701';
             if row = 3 and position = 2 then tankn = '7C2';
651
652
              if row = 3 and position = 3 then tankn = '703';
653
NOTE: There were 9 observations read from the data set WORK.TANK7.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
      cpu time
                          0.01 seconds
654 proc sort data=TANK7A;
     by x;
655
656 run;
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      opu time
                          0.01 seconds
657
658 data assign_trt_TANK7A; set TANK7A;
659
     if _n_ = 1 then trt = '6h';
660
       if _n_ = 2 then trt = '6h';
661
       if _{n_{-}} = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
662
     if _n_ = 5 then trt = '9h';
663
664
      if _n_ = 6 then trt = '9h';
665
        if _n_ = 7 then trt = '12h';
666
        if _n_ = 8 then trt = '12h';
667
      if _n_ = 9 then trt = '12h';
668
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.ASSIGN_TRT_TANK7A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                         0.01 seconds
      cpu time
                          0.01 seconds
                                                                           Page 27 of 30
669 proc print data= assign_trt_TANK2A;
670 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on
670! artifical substrates';
671 title2 h=1.5 'AEH-12-PSEUDO-04';
672 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
673 title4 h=1 'Lake Carlos - bottom injection Treatment ';
```

```
674 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.00 seconds
      cpu time
                          0.00 seconds
                                                                             AEH-12-PSEUDO-04
675 data TANK8;
676 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
678
      x = ranuni(-1);
679
       output;
680
      end;
681
     end;
682 run;
NOTE: The data set WCRK.TANK8 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time);
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
683 data TANK8A; set TANK8;
684 if row = 1 and position = 1 then tankn = '8A1';
       if row = 1 and position = 2 then tankn = 8A2';
685
        if row = 1 and position = 3 then tankn = '8A3';
686
         if row = 2 and position = 1 then tankn = '8B1';
687
688
          if row = 2 and position = 2 then tankn = '8B2';
          if row = 2 and position = 3 then tankn = '8B3';
689
690
            if row = 3 and position = 1 then tankn = '801';
691
             if row = 3 and position = 2 then tankn = '802';
692
              if row = 3 and position = 3 then tankn = '803';
          run;
693
NOTE: There were 9 observations read from the data set WORK.TANK8.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.03 seconds
      cpu time
                         0.03 seconds
694 proc sort data=TANK8A;
695
     by x;
696 run;
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
                                                                         Page 28 of 30
698 data assign_trt_TANK8A; set TANK8A;
699 if _{n_{=}} = 1 then trt = '6h';
```

```
if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
701
        if _n_ = 4 then trt = '9h';
702
703
      if _n_ = 5 then trt = '9h';
       if _n_ = 6 then trt = '9h';
704
705
       if _n_ = 7 then trt = 12h';
        if _n_ = 8 then trt = '12h';
706
707
      if _n_ = 9 then trt = '12h';
                                                                            AEH-12-PREUDO-04
708
NOTE: There were 9 observations read from the data set WORK, TANKSA.
NOTE: The data set WORK.ASSIGN_TRT_TANK8A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      opu time
                          0.01 seconds
709 proc print data= assign_trt_TANK8A;
710 title! h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
710! artifical substrates';
711 title2 h=1.5 'AEH-12-PSEUDO-04';
712 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
713 title4 h=1 'Lake Carlos - bottom injection Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK8A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                     0.00 seconds
                         0.00 seconds
      opu time
715 data TANK9;
716 do row = 1 to 3 by 1;
717 do position = 1 to 3 by 1;
      x = ranuni(-1);
718
719
      output;
720
     end:
721
     end;
722 run;
NOTE: The data set WORK.TANK9 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time

    0.01 seconds

     opu time
                         0.01 seconds
723 data TANK9A; set TANK9;
724 if row = 1 and position = 1 then tankn = '9A1';
725
      if row = 1 and position = 2 then tankn = '9A2';
726
       if row = 1 and position = 3 then tankn = '9A3';
727
        if row = 2 and position = 1 then tankn = '9Bi';
728
         if row = 2 and position = 2 then tankn = '982';
                                                                          Page <u>21</u> of <u>3</u>°
          if row = 2 and position = 3 then tankn = '9B3';
729
730
           if row = 3 and position = 1 then tankn = '901';
731
            if row = 3 and position = 2 then tankn = '902';
             if row = 3 and position = 3 then tankn = '903';
```

```
733
          run;
NOTE: There were 9 observations read from the data set WORK.TANK9.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                    0.01 seconds
      cpu time
                          0.01 seconds
                                                                        AEH 42-PREUDO-04
734 proc sort data=TANK9A;
     by x;
736 run;
NOTE: There were 9 observations read from the data set WORK, TANK9A.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                      0.01 seconds
      opu time
                         0.01 seconds
737
738 data assign_trt_TANK9A; set TANK9A;
     if _n_ = 1 then trt = '6h';
      if _n_ = 2 then trt = '6h';
740
741
       if _n_ = 3 then trt = '6h';
        if _n_ = 4 then trt = '9h';
742
     if _n_ = 5 then trt = '9h';
743
      if _n_ = 6 then trt = '9h';
745
       if _n_ = 7 then trt = '12h';
        if _n_ = 8 then trt = '12h';
746
747
      if _n_ = 9 then trt = '12h';
748
      run:
NOTE: There were 9 observations read from the data set WORK.TANK9A.
NOTE: The data set WORK.ASSIGN_TRT_TANK9A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
749 proc print data= assign_trt_TANK2A;
760 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
7501 artifical substrates';
751 title2 h=1.5 'AEH-12-PSEUDO-04';
752 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
753 title4 h=1 'Lake Carlos - bottom injection Treatment ';
                                                                           NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A item Number:
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
                                                                           Pane 30 of 30
                  8/13/12 5~
NOTE: This SAS session is using a registry in WORK. All changes will be lost at the end of this sess:
```

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrat 1 AEH-12-PSEUDO-04

Random assignment of treatment to experimental tanks Treatment Location/type: Shawano - whole water body

0bs	block	tank	x	tankn	trt	
1	1	4	0.30968	Tank 4	control	
2	1	1	0.32204	Tank 1	50	AEH-12-PSEUDO-04
3	1	2	0.36284	Tank 2	100	
4	1	8	0.39961	Tank 8	control	
5	1	9	0.45330	Tank 9	50	
6	1	5	0.58960	Tank 5	100	
7	1	6	0.60667	Tank 6	control	
8	1	7	0.66409	Tank 7	50	
9	1	3	0.99233	Tank 3	100	

Treatments applied to exposure tanks were not as stated. See Deviation #1 for further clarification, 1612 19 MOVIS

File Folder:		.•
The Older,	Item Number:	Page of

Analysis performed by J. Luoma SAS version 9.2 08:59 11AUG12 \int_{a}^{b}

```
* Study Number : AEH-12-PSUEDO-04
 * Study Director: Jim Luoma
* date created : 11 August 2012 - JAL Sign
* Verified by: _____ (Date:____
                                                      page ____ of _
* Random allocation of treatment to tank sas
                                                                         AEN-12-PSEUDO-04
******************
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*1s=85 ps=40 formdlim='- */ pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Shawano - whole tank exposure*/
data fish;
 do block = 1 to 1 by 1;
 do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
 end;
 end;
run:
data fish2; set fish;
 if block = 1 and tank = 1 then tankn = 'Tank 1';
 if block = 1 and tank = 2 then tankn = 'Tank 2';
  if block = 1 and tank = 3 then tankn = 'Tank 3';
   if block = 1 and tank = 4 then tankn = 'Tank 4';
    if block = 1 and tank = 5 then tankn = 'Tank 5';
     if block = 1 and tank = 6 then tankn = 'Tank 6';
      if block = 1 and tank = 7 then tankn = 'Tank 7':
       if block = 1 and tank = 8 then tankn = 'Tank 8';
        if block = 1 and tank = 9 then tankn = 'Tank 9';
    run:
proc sort data=fi.sh2;
by block x;
run;
data assign_trt_fish; set fish2;
if _n_ = 1 then trt = 'control';
 if _n_ = 2 then trt = '50';
  if _n_ = 3 then trt = '100';
   if _n_ = 4 then trt = 'control';
 if _n_ = 5 then trt = '50';
 if _n_ = 6 then trt = '100';
  if _n_ = 7 then trt = 'control;
   if _n_ = 8 then trt = '50';
 if _n_ = 9 then trt = '100';
 run:
proc print data= assign trt fish;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of treatment to experimental tanks';
title4 h=1 'Treatment Location/type: Shawano - whole water body';
                                                                     Page 2 of 4
```

```
444 * date created : 11 August 2012 - JAL JA
445 * Verified by: _____(Date:____)
446 * Random allocation of treatment to tank.sas
AEE-12-POEUDO-04
448 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
450 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
451
   options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
453
454
    /*Random assignment of treatment to experimental tanks*/
455
    /*Location/exposure type: Shawano - whole tank exposure*/
456 data fish:
    do block = 1 to 1 by 1;
458
      do tank = 1 to 9 by 1;
459
       x = ranuni(-1);
460
       output;
461
      end;
462
     end;
463 run;
NOTE: The data set WORK.FISH has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
     opu time
                        0.01 seconds
464 data fish2; set fish;
    if block = 1 and tank = 1 then tankn = 'Tank 1';
465
466
      if block = 1 and tank = 2 then tankn = 'Tank 2';
467
       if block = 1 and tank = 3 then tankn = 'Tank 3';
        if block = 1 and tank = 4 then tankn = 'Tank 4';
468
469
         if block = 1 and tank = 5 then tankn = 'Tank 5';
470
          if block = 1 and tank = 6 then tankn = 'Tank 6';
        if block = 1 and tank = 7 then tankn = 'Tank 7':
472
            if block = 1 and tank = 8 thon tankn = 'Tank 8';
473
            if block = 1 and tank = 9 then tankn = 'Tank 9';
474
         run;
NOTE: There were 9 observations read from the data set WORK.FISH.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.01 seconds
     cpu time
                        0.01 seconds
475 proc sort data=fish2;
476 by block x;
477 run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
                                                                     item No.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                        0.01 seconds
     cpu time
                        0.01 seconds
```

```
478
479 data assign_trt_fish; set fish2;
AER-GERSEUDO-04
      if _n_ = 2 then trt = '50';
481
       if _n_ = 3 then trt = '100';
if _n_ = 4 then trt = 'control';
482
483
      if _n_ = 5 then trt = '50';
484
485
      if _n_ = 6 then trt = '100';
       if _n_ = 7 then trt = 'control';
486
        if _n_ = 8 then trt = '50';
487
488
      if _n_ = 9 then trt = '100';
489
      run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
NOTE: Tre data set WORK.ASSIGN_TRT_FISH has 9 observations and 5 variables.
NCTE: DATA statement used (Total process time):
      real time
                 0.03 seconds
      cpu time
                         0.03 seconds
490 proc print data= assign_trt_fish;
491 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on
491! artifical substrates';
492 title2 h=1.5 'AEH-12-PSEUDO-04';
493 title3 h=1 'Random assignment of treatment to experimental tanks';
494 title4 h=1 'Treatment Location/type: Shawano - whole water body';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_FISH.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
                 8/11/12
                  5/1-
```

FF#_<u>|a</u> |tem No.__| |Pg_4_of_4 Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical subs 1 AEH-12-PSUEDO-04

Ship

Random assignment of trays to test tank/position

Test	Location/type	=	Shawano	whole	water	column	tank	treatment	

	Looutaon	cypo o	Hamano mioz	o nator	OUTUIN CAN	COACMOIN		8 [10]] =
Obs	round	row	position	tank	x	_row_	tankn	SAL AEH-12-PSEUDO-04
1	1	1	1	2	0.00522	Α	2A1	
2	t	2	3	· 3	0.00709	В	3B3	Diethoutur
3	1	3	1	. 1	0.00785	C	101	heave at 1345
4	1	3	2	. 3	0.02229	С	302	1 1 1 (57)
5	1	3	3	1	0.02239	С	103	terminated at
6	1	1	3	.7	0.02452	Α	7A3	Distribution began at 1345 ferminated at 1570 pm 55EPT2012
7	1	2	3	4	0.02735	В	4B3	SSEPTZOIZ
8	1	1	1	4	0.02946	Α	4A1	•
9	1	2	3	5	0.05448	В	5B3	
10	-1	1	2	8	0.06361	Α	8A2	
11	1	2	2	1	0.06658	В	1B2,	
12	1	2	1	8	0.06729	В	881	
13	1	3	3	9	0.06782	С	903	
14	1	3	3	6	0.06930	С	6C3	
15	1	1	2	7	0.07870	Α	7A2	
16	1	2	2	3	0.08066	В	3B2	
17	1	1	3	. 3	0.08124	Α	3A3	
18	1	1	3	-2	0.09097	Α	2A3	
19	1	3	2	. 8	0.09876	С	802	
20	1	2	2	- 7	0.11058	В	∾7B2	
21	1	3	3	5	0.11777	С	503	
22	. 1	3	1	9	0.12717	С	901,	
23	1	2	1	₄ 3	0.13584	В	3B1	
24	1	3	2	7	0.14704	C	702	
25	1 .	3	1	. 7	0.15021	C	701	
26	.1	2	3	2	0.15352	В	2B3 ·	
27	1	1	3	. 4	0.16437	Α	4A3	
28	1	1	2	3	0.19665	Α	3A2	
29	1	2	3	. 9	0.21558	В	9B3	
30	1	3	2	. 4	0.22984	C	402	
31	1	2	Ť	· 7:	0.26785	В	7B1	
32	1	2	2	. 5	0.27061	В	,5B2.	
33	1	3	1	. 2	0.27844	С	201	
34	1	3	3	٠ 4 -	0.29757	С	403.	
35	1	2	2	4	0.32852	В	4B2	
36	1	1	2	5	0.33047	Α	5A2	
37	1	3	3	2	0.36000	С	203	File Folder:
38	1	1	2	2	0.36047	Α	2A2	File Folder:
39	1	1	3	1	0.38105	Α	1A3	
40	1	2	2	6	0.39888	В	6B2	
41	1	1	2	1	0.40441	Α	1A2	**
42	1	2	1	6	0.42695	В	6B1	n
43	1	3	1	8	0.43967	С	801	Item Number:
44	1	1	2	6	0.44954	Α	6A2	
45	1	3	2	6	0.47464	С	602	
46	1.30	1 96	e 9 1	8	0.48023	Α	8A1	•
47	1	1	1	7	0.48398	Α	7A1	Dans 1 at 8

Analysis performed by J. Luoma SAS version 9.2 10:48 11AUG12

Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical subs 2 AEH-12-PSUEDO-04

Random assignment of trays to test tank/position

Test Location/type = Shawano whole water column tank treatment

0bs	round	row	position	tank	x	_row_	tankn	AEH 12-PSEUDO-04
48	1	2	3	. 8	0.48900	В	8B3 '	
49	1	2	2	2	0.50511	В	282	
50	1	2	. 2	8	0.52181	В	-8B2	
51	1	1	3	9	0.52488	Α	9A3	
52	1	2	3	~ ~6	0.53810	В	₀6B 3 ;	
53	1	2	2	9	0.54061	В	982)	
54	1	2	1	. 4	0.56338	В	'4B1⊜	
55	1	3	3	7	0.60611	С	763	
56	1	3	1	. 3	0.60927	C	301	
57	1	1	2	4	0.62026	Α	4A2	
58	1	1	3	5	0.63012	A	6A3	
59	1	1	1	: 6	0.65625	Α	6A1	
60	1	3 -	2	4) 9	0.66940	C	×3902 °	
61	1	3	1	4	0.68710	С	=4C1	•
62	1	3	1	5	0.69054	C	5C1	
63	, 1	1	3	. 6	0.71055	· A	∘6A3 ,	
64	1.	3	2	- 1	0.73661	C	102	
65	1	2	3	s, . 1	0.75311	В	1B3	
66	1	3	1	6	0.76155	C	°6C1 °	
67	1	1	3	8	0.76411	Α	8A3	
68	1	2	1	5	0.76527	B	5B1	
69	1	2	1	2	0.76674	В	2B1)	V 2000
70	1	3	3	8,⋅	0.77423	C	8C3 🖟	
71	1	3	3	3	0.79781	C	3C3	•
72	1	2	3	· 7	0.81154	В	∴78 3 }	
73	1	2	1	a 9	0.82249	В	981	<i>p</i> r
74	1	1	2	9	0.83782	Α	″9A2 »	î
75	1	1	_ 1	^ З	0.85976	Α	3A11	
76	1	3	2	- 5	0.86941	C	502	
7 7	1	1	1	5	0.89111	Α	Ç 5A 1 ∵	·
78	1	2	1	1	0.89793	В	≤1B1™	
79	1	1	1	, 9	0.90048	Α	9A1	
80	1	1	1	1	0.91950	Α	*1A1	·.
B1	1	3	2	, 2	0.98447	C	202	•

150	trons Marchaer	

File Folder:

nalysis performed by J. Luoma SAS version 9.2 10:48 11AUG12

Page 2 of 8

```
* Study Number : AEH-12-PSUEDO-04
* Study Director: Jim Luoma
^* date created : AUGUST 11, 2012 - JAL \mathcal{J}_{^0}
* Verified by: _____ (Date:____
                                   __)
* Random allocation of trays to tank.sas
**********************
                                                                           AEH-12-PSEUDO-04
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT:
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random distribution of trays to experimental tanks*/
/* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2, or 3, e
   round = distribution round, place one tray in the assigned position (9 per test replicate - 3 for
/*Location and exposure type: Shawano - whole water column treatment*/
data glochidia;
 do round = 1 to 1 by 1;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
 end;
 end;
end;
end:
run:
data glochidiadist; set glochidia;
if row = 1 then _row_ = 'A';
if row = 2 then _row_ = 'B';
if row = 3 then _row_ = 'C';
if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
 if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
  if row = 1 and tank = 1 and position = 3 then tankn = '1A3':
   if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
    if row = 2 and tank = 1 and position = 2 then tankn = '1B2';
     if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
      if row = 3 and tank = 1 and position = 1 then tankn = '101'
       if row = 3 and tank = 1 and position = 2 then tankn = '162':
        if row = 3 and tank = 1 and position = 3 then tankn = '103';
if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
 if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
  if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
   if row = 2 and tank = 2 and position = 1 then tankn = '281';
    if row = 2 and tank = 2 and position = 2 then tankn = '2B2';
     if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
      if row = 3 and tank = 2 and position = 1 then tankn = '201';
                                                                      Page 3 of 9
       if row = 3 and tank = 2 and position = 2 then tankn = '202':
       if row = 3 and tank = 2 and position = 3 then tankn = ^{1}203^{\circ};
if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
```

if row = 1 and tank = 3 and position = 2 then tankn = '3A2';

```
if row = 1 and tank = 3 and position = 3 then tankn = 'SA3';
   if row = 2 and tank = 3 and position = 1 then tankn = '381'
    if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
     if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
      if row \approx 3 and tank \approx 3 and position \approx 1 then tankn = '3C1';
        if row = 3 and tank = 3 and position = 2 then tankn = '3C2':
        if row = 3 and tank = 3 and position = 3 then tankn = '303';
if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
 if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
  if row = 1 and tank = 4 and position = 3 then tankn = 4A3';
                                                                             AEN-12-PSEUDO-04
   if row = 2 and tank = 4 and position = 1 then tankn = '4B1':
    if row = 2 and tank = 4 and position = 2 then tankn = '482';
     if row = 2 and tank = 4 and position = 3 then tankn = ^{4}B3':
      if row = 3 and tank = 4 and position = 1 then tankn = '4C1';
       if row = 3 and tank = 4 and position = 2 them tankn = '4C2';
        if row = 3 and tank = 4 and position = 3 then tankn = '403':
if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
 if row = 1 and tank = 5 and position = 2 then tankn = '5A2':
  if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
   if row = 2 and tank = 5 and position = 1 then tankn = ^{\circ}5B1^{\circ};
    if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
     if row = 2 and tank = 5 and position = 3 then tankn = '5B3';
      if row = 3 and tank = 5 and position = 1 then tankn = '5C1':
       if row = 3 and tank = 5 and position = 2 then tankn = '502';
        if row = 3 and tank = 5 and position = 3 then tankn = ^{\circ}503^{\circ};
if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
 if row = 1 and tank = 6 and position = 2 then tankn = ^{\circ}6A2^{\circ};
  if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
   if row = 2 and tank = 6 and position = 1 then tankn = '6B1';
    if row = 2 and tank = 6 and position = 2 then tankn = '6B2':
     if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
      if row = 3 and tank = 6 and position = 1 then tankn = '601';
       if row = 3 and tank = 6 and position = 2 then tankn = '602';
        if row = 3 and tank = 6 and position = 3 then tankn = ^{\circ}603^{\circ};
if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
  if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
   if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
    if row = 2 and tank = 7 and position = 2 then tankn = 782^{\circ};
     if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
      if row = 3 and tank = 7 and position = 1 then tankn = '7C1';
       if row = 3 and tank = 7 and position = 2 then tankn = '762':
        if row = 3 and tank = 7 and position = 3 then tankn = '703';
if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
 if row = 1 and tank = 8 and position = 2 then tankn = '8A2';
 if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
  if row = 2 and tank = 8 and position = 1 them tankn = '8B1';
   if row = 2 and tank = 8 and position = 2 then tankn = '8B2';
     if row = 2 and tank = 8 and position = 3 then tankn = '8B3':
     if row = 3 and tank = 8 and position = 1 then tankn = '8C1';
      if row = 3 and tank = 8 and position = 2 then tankn = '8C2';
        if row = 3 and tank = 8 and position = 3 then tankn = '803';
if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
                                                                        Page 4 of 8
 if row = 1 and tank = 9 and position = 3 then tankn = '9A3'
```

if row = 2 and tank = 9 and position = 1 then tankn = '9B1';

```
if row = 2 and tank = 9 and position = 2 then tankn = '9B2';
      if row = 2 and tank = 9 and position = 3 then tankn = '9B3';
       if row = 3 and tank = 9 and position = 1 then tankn = '901';
        if row = 3 and tank = 9 and position = 2 then tankn = '902';
         if row = 3 and tank = 9 and position = 3 then tankn = ^{1}9C3^{1};
                                                                           AEH-12-PSEUDO-04
Run;
proc sort data= glochidiadist;
by round x;
run;
proc print data = glochidiadist;
title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artif
title2 h=1.5 'AEH-12-PSUEDO-04';
title3 h=1 'Random assignment of trays to test tank/position';
title4 h=1 'Test Location/type = Shawano whole water column tank troatment';
          8/11/12
            51-
```

Page _ 5 of _ 6

```
1538 * date created : AUGUST 11, 2012 - JAL
1539 * Verified by: _____(Date:____)
1540 * Random allocation of trays to tank.sas
1542 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
                                                                         ASS142-PSEUDO-04
1543
1544 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
1545
1546 options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
1547
1548 /*Random distribution of trays to experimental tanks*/
1549 /* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2,
1549! or 3, etc)
        round = distribution round, place one tray in the assigned position (9 per test replicate -
1550! 3 for each exposure duration) */
1552! *******/
1553
1554 /*Location and exposure type: Shawano - whole water column treatment*/
1555 data glochidia;
1556
     do round = 1 to 1 by 1;
1557
      do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
      do tank = 1 to 9 by 1;
1559
1560
       x = ranuni(-1);
1561
        output;
1562
       end;
1563
       end;
1564
      end;
1565
      end;
1566 run;
NOTE: The data set WORK.GLOCHIDIA has 81 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                    0.03 seconds
     cpu time
                       0.03 seconds
1567 data glochidiadist; set glochidia;
1568 if row = 1 then _row_ = 'A;
1569 if row = 2 then _row_ = 'B';
1570 if row = 3 then _row_ = 'C';
1571
     if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
       if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
1572
        if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
1573
        if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
1575
         if row = 2 and tank = 1 and position = 2 then tankn = '182';
          if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
1576
1577
           if row = 3 and tank = 1 and position = 1 then tankn = '1C1':
            if row = 3 and tank = 1 and position = 2 then tankn = '102';
1578
            if row = 3 and tank = 1 and position = 3 then tankn = '103'; Page 6 of 8
1579
1580
      if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
1581
       if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
1582
       if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
```

```
1583
           if row = 2 and tank = 2 and position = 1 then tankn = '2B1':
            if row = 2 and tank = 2 and position = 2 then tankn = '2B2';
1584
1585
             if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
1586
              if row = 3 and tank = 2 and position = 1 then tankn = '201';
1587
               if row = 3 and tank = 2 and position = 2 then tankn = '202';
1588
                if row = 3 and tank = 2 and position = 3 then tankn = '203';
       if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
1589
                                                                                 ASH 12-POBUDO-04
        if row = 1 and tank = 3 and position = 2 then tankn = ^{4}3A2^{4};
1590
         if row = 1 and tank = 3 and position = 3 then tankn = '3A3';
1591
1592
          if row = 2 and tank = 3 and position = 1 then tankn = '3B1':
1593
           if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
            if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
1594
              if row = 3 and tank = 3 and position = 1 then tankn = '3C1';
1595
              if row = 3 and tank = 3 and position = 2 then tankn = '302';
1596
               if row = 3 and tank = 3 and position = 3 then tankn = '303';
1597
1598
       if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
        if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
1599
1600
         if row = 1 and tank = 4 and position = 3 then tankn = '4A3';
          if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
1601
1602
           if row = 2 and tank = 4 and position = 2 then tankn = '4B2';
1603
            if row = 2 and tank = 4 and position = 3 then tankn = '483';
1604
             if row = 3 and tank = 4 and position = 1 then tankn = '401';
1605
              if row = 3 and tank = 4 and position = 2 then tankn = '402';
1606
               if row = 3 and tank = 4 and position = 3 then tankn = '403';
1607
       if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
1608
        if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
         if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
1609
1610
          if row = 2 and tank = 5 and position = 1 then tankn = '5B1';
           if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
1611
1612
            if row = 2 and tank = 5 and position = 3 then tankn = '5B3';
             if row = 3 and tank = 5 and position = 1 then tankn = '501';
1613
1614
              if row = 3 and tank = 5 and position = 2 then tankn = '502';
1615
               if row = 3 and tank = 5 and position = 3 then tankn = '5C3';
1616
       if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
1617
        if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
         if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
1618
          if row = 2 and tank = 6 and position = 1 then tankn = '6B1';
1619
1620
           if row = 2 and tank = 6 and position = 2 then tankn = '682';
1621
            if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
1622
             if row = 3 and tank = 6 and position = 1 then tankn = '6C1';
              if row = 3 and tank = 6 and position = 2 then tankn = '602';
1623
1624
               if row = 3 and tank = 6 and position = 3 then tankn = '603';
       if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
1625
1626
        if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
1627
         if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
1628
          if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
1629
           if row = 2 and tank = 7 and position = 2 then tankn = '7B2';
1630
            if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
1631
             if row = 3 and tank = 7 and position = 1 then tankn = '701';
              if row = 3 and tank = 7 and position = 2 then tankn = '702';
1632
1633
               if row = 3 and tank = 7 and position = 3 then tankn = '703';
1634
       if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
1635
        if row = 1 and tank = 8 and position = 2 then tankn = '8A2';
                                                                              Page 7 of 8
1636
         if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
1637
          if row = 2 and tank = 8 and position = 1 then tankn = '8B1';
1638
           if row = 2 and tank = 8 and position = 2 then tankn = '8B2';
```

```
1639
            if row = 2 and tank = 8 and position = 3 then tankn = ^{1}8B3';
1640
             if row = 3 and tank = 8 and position = 1 then tankn = '801';
              if row = 3 and tank = 8 and position = 2 then tankn = '802'
1641
1642
               if row = 3 and tank = 8 and position = 3 then tankn = '803';
1643
       if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
1644
        if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
                                                                             AER-12-PSEUDO-04
1645
         if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
          if row = 2 and tank = 9 and position = 1 then tankn = ^{1}9B1;
1646
1647
           if row = 2 and tank = 9 and position = 2 then tankn = '9B2';
            if row = 2 and tank = 9 and position = 3 then tankn = '983';
1648
             if row = 3 and tank = 9 and position = 1 then tankn = '901';
1649
1650
              if row = 3 and tank = 9 and position = 2 then tankn = '902';
               if row = 3 and tank = 9 and position = 3 then tankn = '903';
1651
1652 Run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIA.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables,
NOTE: DATA statement used (Total process time):
      real time
                          0.07 seconds
      cpu time
                         0.07 seconds
1653 proc sort data= glochidiadist;
1654
     by round x;
1655
      run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1656 proc print data = glochidiadist;
1657 title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels
1657! on artifical substrates';
1658 title2 h=1.5 'AEH-12-PSUEDO-04';
1659 title3 h=1 'Random assignment of trays to test tank/position';
1660 title4 h=1 'Test Location/type = Shawano whole water column tank treatment';
1661 run;
NOTE: There were 81 observations read from the data set WORK, GLOCHIDIADIST.
NOTE: PROCEDURE PRINT used (Total process time):
                         0.01 seconds
      real time
      cpu time
                          0.01 seconds
```

8/11/12

FF# <u>| || ~</u> |tem No. _ | | |Pg _ | | 6 of _ 8 Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 1 *** Shawano - whole water body Treatment

AEH-12-PSEUDO-04

0bs	row	position	· x	tankn	trt	Ja	AEH-12-PS
1	1	1	0.03194	1A 1	6h		
2	2	1	0.03514	181	6h		
3	2	2	0.28180	182	6h		
4	3	1	0.49047	101	9h		
5	1	3	0.70588	1A3	9h		
6	2	3	0.72184	1B3	9h		
7	3	3	0.75338	103	12		
8	3	2	0.80186	102	12		
9	1	2	0.95124	1A2	12		

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Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 2 ***

Shawano - whole water body Treatment

AEH-12-PSEUDO-04

0bs	row	position	x	tankn	trt
1	1	1	0.19283	2A1	6h
2	2	1	0.22382	2B1	6h
3	3	1	0.24148	201	6h
4	2	2	0.28394	2B2	9h
5	1	3	0.29763	2A3	9h
6	3	3	0.62146	203	9h
7	3	2	0.71062	202	12
8	1	2	0.79088	2A2	12
9	2	3	0.98840	283	12

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Page of	item Number:	File Folder:

Random assignment of substrate removal from tanks *** TANK 3 *** Shawano - whole water body Treatment

0bs	row	positíon	х	tankn	trt	AEH-12-P8EUDO-04
1	2	3	0.25496	3B3	6h	
2	2	2	0.28609	382	6h	
3	1	1	0.35372	3A1	6h	
4	2	1	0.41249	3B1	9h	
5	3	3	0.48955	303	9h	
6	3	2	0.61938	3C2	9h	
7	1	2	0.63052	3A2	12	
8	1	3	0.88938	SAE	12	
9	3	1	0.99249	301	12	

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 $\begin{tabular}{ll} Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04 \\ \end{tabular}$

Random assignment of substrate removal from tanks *** TANK 4 ***

Shawano - whole water body Treatment

AEH-12-PSEUDO-04

Obs	row	position	x	tankn	trt
1	1	1	0.23640	4A1	6h
2	2	1	0.26349	4B1	6h
3	1	2	0.38924	4A2	6h
4	1	3	0.56305	4A3	9h
5	2	2	0.56965	4B2	9h
6	3	1	0.70154	4C1	9h
7	3	2	0,70889	4C2	12
8	2	3	0.76343	4B3	12
9	3	3	0.83244	403	12

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 5 *** Shawanc - whole water body Treatment

AEB-12-PSEUDO-04

0bs	row	position	x	tankn	trt
				\triangle	
1	1	1	0.19283	2A1	6h
2	2	1	0.22382	2B1	6h
3	3	1	0.24148	201	6h
4	2	2	0.28394	2B2	9h
5	1	3	0.29763	2A3	9h
6	3	3	0.62146	203	9h
7	3	2	0.71062	202	12
8	1	2	0.79088	2A2	12
9	2	3	0.98840	2B3	12

Tank numbers should be 5 not 2. Km losepria See Deviation #2 for further Clarification. Km 19 NUV13

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AEH-12-PSEUDQ-04

Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Handom assignment of substrate removal from tanks *** TANK 6 *** Shawano - whole water body Treatment

0bs	row	position	x	tankn	trt
1	1	2	0.14871	6A2	6 h
2	1	3	0.45067	6A3	6h
3	1	1	0.47774	6A1	6h
4	2	1 .	0.54650	6B1	9h
5	3	2	0.57203	6C2	9h
6	2	2	0.57288	6B2	9h
7	3	3	0.63457	6C3	12
В	2	3	0.66328	6B3	12
9	3	1	0.82805	601	12

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 7 *** Shawano - whole water body Treatment

0bs	row	position	x	tankn	trt	
1 2	1 2	1	0.19283 0.22382	1 2A1 2B1	6h 6h	OTank numbers should be
3	3	1	0.24148	201	6h	7 not 2. Km 6SEPTIA
4 5	2 1	2 3	0.28394 0.29763	2B2 2A3	9h 9h	
6	3	3	0.62146	203	9h	See Deviation H2 for fund Christian. 1900
7	3	2	0.71062	202	12	Gutur clarification low
8 9	2	2 3	0.79088 0.98840	2A2 2B3	12 12	19 novis

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 8 *** Shawano - whole water body Treatment

0bs	row	position	, x	tankn	trt
1	2	3	0.12552	8B3	6h
2	1	3	0.14940	8A3	6h
3	3	1	0.28780	BC1	6h
4	1	1	0.31796	8A1	9h
5	3	2	0.36760	8C2	9h
6	2	1	0.45120	8B1	9h
7	1	2	0.48872	8A2	12
8	3	3	0.73228	803	12
9	2	2	0.93485	8B2	12

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Random assignment of substrate removal from tanks *** TANK 9 *** Shawano - whole water body Treatment

0bs	row	position	х	tankn	trt	
1	1	1	0.19283	(I) 2A1	6h	OTank numbers should be
2	2	1	0.22382	∠ 2B1	6h	O JUNE MUMBOS Should be
3	3	1	0.24148	201	6h	9 not 2. Km 6 SEPTI2
4	2	2	0.28394	282	9h	I has a low a script
5	1	3	0.29763	2A3	9h	0 \ 120
6	3	3	0.62146	203	9h	See Deviation # 2 for
7	3	2	0.71062	202	12	0 1 1 0 40
8	1	2	0.79088	2A2	12	furtur clarification
9	2	3	0.98840	2B3	12	,

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1/2H-12-P\$EUDO-04

Analysis performed by J. Luoma SAS version $9.2\ 10:20\ 13AUG12$

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```
* Study Number : AEH-12-PSUEDO-04
* Study Director: Jim Luoma
* date created : 13 August 2012 - JAL \int_{a}
* Verified by: _____(Date:____)
                                                       page ____ of .
* Random allocation of treatment to tank, sas
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options 1s=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Shawano - whole tank treatment*/
data TANK1;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 ·end;
 end:
run;
data TANK1A; set TANK1;
 if row = 1 and position = 1 then tankn = '1A1';
 if row = 1 and position = 2 then tankn = '1A2';
  if row = 1 and position = 3 then tankn = '1A3';
   if row = 2 and position = 1 then tankn = '1B1';
    if row = 2 and position = 2 then tankn = '1B2';
     if row = 2 and position = 3 then tankn = '1B3';
      if row = 3 and position = 1 then tankn = '101';
       if row = 3 and position = 2 then tankn = '102';
        if row = 3 and position = 3 then tankn = '103';
    run:
proc sort data=TANK1A;
by x;
nun;
data assign_trt_TANK1A; set TANK1A;
if _n_ = 1 then trt = '6h';
 if _n = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h':
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK1A;
title! h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
title4 h=1 'Shawano - whole water body Treatment ';
```

run:

```
data TANK2;
do now = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK2A; set TANK2;
 if row = 1 and position = 1 then tankn = '2A1';
  if row = 1 and position = 2 then tankn = '2A2';
   if row = 1 and position = 3 then tankn = '2A3';
    if row = 2 and position = 1 then tankn = '2B1';
     if row = 2 and position = 2 then tankn = '282';
      if row = 2 and position = 3 then tankn = '2B3';
       if row = 3 and position = 1 then tankn = '201';
        if row = 3 and position = 2 then tankn = '202';
         if row = 3 and position = 3 then tankn = '203';
     run;
proc sort data=TANK2A;
 by x;
run;
data assign_trt_TANK2A; set TANK2A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run:
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run;
data TANK3;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
end;
run;
data TANK3A; set TANK3;
if row = 1 and position = 1 then tankn = '3A1';
 if row = 1 and position = 2 then tankn = '3A2';
                                                                          Page 10 of 30
  if row = 1 and position = 3 then tankn = '3A3';
   if row = 2 and position = 1 then tankn = '3B1';
    if row = 2 and position = 2 then tankn = '3B2';
     if row = 2 and position = 3 then tankn = '3B3';
```

```
if row = 3 and position = 1 then tankn = '3C1';
        if row = 3 and position = 2 then tankn = '302':
         if row = 3 and position = 3 then tankn = '303';
     run:
proc sort data=TANK3A;
 by x;
                                                                          AEH-12-PSEUDO-DA
run:
data assign_trt_TANK3A; set TANK3A;
 if n = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
if _r_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign trt TANK3A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run;
data TANK4;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
 end:
 end;
run;
data TANK4A; set TANK4;
 if row = 1 and position = 1 then tankn = '4A1';
  if row = 1 and position = 2 then tankn = '4A2';
   if row = 1 and position = 3 then tankn = '4A3';
   if row = 2 and position = 1 then tankn = '4B1';
     if row = 2 and position = 2 then tankn = '4B2';
      if row = 2 and position = 3 then tankn = '4B3';
       if row = 3 and position = 1 then tankn = '401';
        if row = 3 and position = 2 then tankn = '402';
        if row = 3 and position = 3 then tankn = '403';
     run;
proc sort data=TANK4A;
by x;
run;
data assign trt_TANK4A; set TANK4A;
if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
                                                                           Page 13 of 30
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
```

```
if _n_ = 8 then trt = '12h ;
 if _n_ = 9 then trt = '12h';
                                                                           AEH-12-PSEUDO-04
 run;
proc print data≃ assign_trt_TANK4A;
title1 h=2 Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run;
data TANK5;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK5A; set TANK5;
 if row = 1 and position = 1 then tankn = '5A1';
 if row = 1 and position = 2 then tankn = '5A2';
  if row = 1 and position = 3 then tankn = '5A3';
   if row = 2 and position = 1 then tankn = '5B1';
    if row = 2 and position = 2 then tankn = '582';
     if row = 2 and position = 3 then tankn = '5B3';
      if row = 3 and position = 1 then tankn = '501';
       if row = 3 and position = 2 then tankn = '502';
        if row = 3 and position = 3 then tankn = '503';
proc sort data=TANK5A;
by x;
run:
data assign_trt_TANK5A; set TANK5A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt \approx '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run;
data TANK6;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
                                                                         Page M of 30
 output;
 ond:
end;
```

```
cun:
data TANK6A; set TANK6;
 if row = 1 and position = 1 then tankn = '6A1';
  if row = 1 and position = 2 then tankn = '6A2';
   if row = 1 and position = 3 then tankn = '6A3';
                                                                          AEH-12-PSEUDO-04
    if row = 2 and position = 1 then tankn = '6B1';
     if row = 2 and position = 2 then tankn = '6B2';
      if row = 2 and position = 3 then tankn = '683';
       if row = 3 and position = 1 then tankn = '601';
        if row = 3 and position = 2 then tankn = '602';
         if row = 3 and position = 3 then tankn = '603';
     run;
proc sort data=TANK6A;
 by x;
run;
data assign_trt_TANK6A; set TANK6A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 thon trt = '12h';
  run;
proc print data= assign_trt_TANK6A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
title4 h=1 'Shawano - whole water body Treatment ';
data TANK7;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
  end:
 end;
run;
data TANK7A; set TANK7;
 if row = 1 and position = 1 then tankn = '7A1';
 if row = 1 and position = 2 then tankn = 7A2';
   if row = 1 and position = 3 then tankn = '7A3';
   if row = 2 and position = 1 then tankn = '7B1';
    if row = 2 and position = 2 then tankn = '782';
      if row = 2 and position = 3 then tankn = '7B3';
       if row = 3 and position = 1 then tankn = '701';
        if row = 3 and position = 2 then tankn = '702';
        if row = 3 and position = 3 then tankn = '703';
                                                                          Page 15 of 30
proc sort data=TANK7A;
by x;
run;
```

```
data assign_trt_TANK7A; set TANK7A;
 if _n_ = 1 then trt = '6h';
  if n = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
                                                                             AEH-12-PSEUDO-04
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12fi';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run:
data TANK8;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK8A; set TANK8;
 if row = 1 and position = 1 then tankn = '8A1';
  if row = 1 and position = 2 then tankn = '8A2';
   if row = 1 and position = 3 then tankn = '8A3';
    if row = 2 and position = 1 then tankn = '881';
     if row = 2 and position = 2 then tankn = '8B2';
      if row = 2 and position = 3 then tankn = '8B3';
       if row = 3 and position = 1 then tankn = '8C1';
        if row = 3 and position = 2 then tankn = '802';
         if row = 3 and position = 3 then tankn = '803';
     run:
proc sort data=TANK8A;
by x;
run;
data assign_trt_TANK8A; set TANK8A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
                                                                          Page <u>\\</u> of <u>3</u>∘
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK8A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04;
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
title4 h=1 'Shawano - whole water body Treatment ';
```

```
ruπ;
data TANK9;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
                                                                             AEH-12-PSEUDO-04
  output;
  end;
 end;
run;
data TANK9A; set TANK9;
 if row = 1 and position = 1 then tankn = 9A1';
  if row = 1 and position = 2 then tankn = '9A2';
   if row = 1 and position = 3 then tankn = '9A3';
    if row = 2 and position = 1 then tankn = '981';
     if row = 2 and position = 2 then tankn = '9B2';
      if row = 2 and position = 3 then tankn = '9B3';
      if row = 3 and position = 1 then tankn = '9C1';
        if row = 3 and position = 2 then tankn = '902';
         if row = 3 and position = 3 then tankn = '903';
     run;
proc sort data=TANK9A;
by x;
run;
data assign_trt_TANK9A; set TANK9A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
title4 h=1 'Shawano - whole water body Treatment ';
run;
    8/13/12
     J.n.
```

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```
1512 * date created : 13 August 2012 - JAL 7
 1513 * Verified by: _____ (Date:_
                                                               page ____ of _
 1514 * Random allocation of treatment to tank.sas
 AEH-12-PSEUDO-04
1516 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
1517
1518 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
1519
1520 options ls=105 ps=54 fcrmdlim='-' pageno = 1 nocenter nodate nosource2;
1521 Substrak removed from tracks. See title on next page . Kow 28 HDR14
1522 /*Random assignment of treatment to experimental tanks*/
1523 /*Location/exposure type: Shawano - whole tank treatment*/
1524 data TANK1;
1525 do row = 1 to 3 by 1;
1526
      do position = 1 to 3 by 1;
1527
       x ≂ ranuni(-1);
       output;
1529
       end;
1530
      end;
1531 run;
NOTE: The data set WORK.TANK1 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
1532 data TANK1A; set TANK1;
      if row = 1 and position = 1 then tankn = '1A1';
       if row = 1 and position = 2 then tankn = '1A2';
1534
        if row = 1 and position = 3 then tankn = '1A3';
1536
          if row = 2 and position = 1 then tankn = '1B1';
1537
           if row = 2 and position = 2 then tankn = '1B2';
1538
           if row = 2 and position = 3 then tankn = '1B3';
1539
            if row = 3 and position = 1 then tankn = '1C1';
             if row = 3 and position = 2 then tankn = '102':
1541
              if row = 3 and position = 3 then tankn = '103';
1542
          run;
NOTE: There were 9 observations read from the data set WORK.TANK1.
NOTE: The data set WORK.TANKIA has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
     cou time
                         0.01 seconds
1543 proc sort data=TANK1A;
1544
     by x;
1545 run;
                                                                         Page 18 of 30
NOTE: There were 9 observations read from the data set WORK, TANKIA,
NOTE: The data set WORK.TANK1A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                       0.01 seconds
     opu time
                        0.01 seconds
```

```
1546
1547 data assign_trt_TANK1A; set TANK1A;
1548
      if _n_ = 1 then trt = '6h';
                                                                         AEH-12-PSEUDO-04
       if _n_ = 2 then trt = '6h';
1549
        if _n_ = 3 then trt = '6h';
1550
         if _n_ = 4 then trt = '9h';
1551
       if _n_ = 5 then trt \simeq '9h';
1552
1553
        if _n_ = 6 then trt = '9h ;
        if _n_ = 7 then trt = '12h';
1554
         if _n_ = 8 then trt = '12h';
1555
1556
       if _n_ = 9 then trt = '12h';
1557
NOTE: There were 9 observations read from the data set WORK.TANK1A.
NOTE: The data set WORK.ASSIGN_TRT_TANK1A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time);
      real time
                         0.01 seconds
      opu time
                         0.01 seconds
1658 proc print data= assign_trt_TANK1A;
1559 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
1559! artifical substrates';
1560 title2 h=1.5 'AEH-12-PSEUDO-04';
1561 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
1562 title4 h=1 'Shawano - whole water body Treatment ';
1563 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK1A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                 0.00 seconds
      opu time
                         0.00 seconds
1564
     data TANK2;
1565
     do row = 1 to 3 by 1;
1567
      do position = 1 to 3 by 1;
1568
      x = ranuni(-1);
1569
       output;
1570
       end;
1571
      end;
1572 run;
NOTE: The data set WORK. TANK2 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.00 seconds
                         0.00 seconds
      cpu time
                                                                          Page 14 of 30
1573 data TANK2A; set TANK2;
1574 if row = 1 and position = 1 then tankn = '2A1';
1575
      if row = 1 and position = 2 then tankn = '2A2';
        if row = 1 and position = 3 then tankn = '2A3';
1576
```

```
1577
          if row = 2 and position = 1 then tankn = '2B1';
1578
           if row = 2 and position = 2 then tankn = '2B2';
1579
            if row = 2 and position = 3 then tankn = '2B3';
                                                                          AEH-12-PSEUDO-04
1580
             if row = 3 and position = 1 then tankn = '201';
              if row = 3 and position = 2 then tankn = '202';
1581
1582
               if row = 3 and position = 3 then tankn = '203';
1583
NOTE: There were 9 observations read from the data set WORK.TANK2.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      opu time
                          0.01 seconds
1584 proc sort data=TANK2A;
1585 by x;
1586 run;
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      opu time
                         0.01 seconds
1588 data assign_trt_TANK2A; set TANK2A;
      if _n_ = 1 then trt = '6h';
1589
1590
        if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
1591
1592
         if _n_ = 4 then trt = '9h';
1593
      if _n_ = 5 then trt = '9h';
       if _n_ = 6 then trt = 9h';
1594
        if _n_ = 7 then trt = '12h';
1595
         if _n_ = 8 then trt = '12h';
1596
1597
       if _n_ = 9 then trt = '12h';
1598
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.ASSIGN_TAT_TANK2A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                    0.01 seconds
      cpu time
                         0.01 seconds
1599 proc print data= assign_trt_TANK2A;
1600 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
16001 artifical substrates';
1601 title2 h=1.5 'AEH-12-PSEUDO-04';
1602 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
1603 title4 h=1 'Shawano - whole water body Treatment ';
                                                                             NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
```

```
real time
                          0.01 seconds
      opu time
                          0.01 seconds
                                                                       AEH-12-PSEUDO-04
1605
1606 data TANK3;
1607 do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
       x = ranuni(-1);
1609
1610
        output;
1611
        end;
1612
      end;
1613 run;
NOTE: The data set WORK.TANK3 has 9 observations and 3 variables.
NCTE: DATA statement used (Total process time):
      real time
                 0.01 seconds
      opu time
                         0.01 seconds
1614 data TANK3A; set TANK3;
     if row = 1 and position = 1 then tankn = '3A1';
1616
       if row = 1 and position = 2 then tankn = '3A2';
        if row = 1 and position = 3 then tankn = '3A3';
1617
1618
         if row = 2 and position = 1 then tankn = '3B1':
1619
          if row = 2 and position = 2 then tankn = '3B2';
           if row = 2 and position = 3 then tankn = '3B3';
1621
            if row = 3 and position = 1 then tankn = '301';
1622
             if row = 3 and position = 2 then tankn = '3C2';
1623
              if row = 3 and position = 3 then tankn = '3C3';
1624
NOTE: There were 9 observations read from the data set WORK.TANKS.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.01 seconds
      cpu time
                         0.0° seconds
1625 proc sort data=TANK3A;
1626 by x;
1627 run;
NOTE: There were 9 observations read from the data set WORK.TANKSA.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                        0.01 seconds
     opu time
                         0.01 seconds
1628
1629 data assign_trt_TANK3A; set TANK3A;
                                                                        Page 21 of 30___
1630
      if _n_ = 1 then trt = '6h';
1631
      if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
1632
         if _n_ = 4 then trt = '9h';
1633
```

```
if _n_ = 5 then trt = '9n';
       if _n_ = 6 then trt = '9h';
1636
        if _n_ = 7 then trt = '12h';
                                                                         AEH-12-PSEUDO-04
1637
         if _n_ = 8 then trt = '12h';
1638
       if _n_ = 9 then trt = '12h ;
1639
       run:
NOTE: There were 9 observations read from the data set WORK. TANK3A.
NOTE: The data set WORK.ASSIGN_TRT_TANK3A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                 0.03 seconds
      opu time
                          0.03 seconds
1640 proc print data= assign_trt_TANK3A;
1641 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
16411 artifical substrates';
1642 title2 h=1.5 'AEH-12-PSEUDO-04';
1643 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
1644 title4 h=1 'Shawano - whole water body Treatment ';
1645 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK3A.
NOTE: PROCEDURE PRINT used (Total process time):
                       '0.00 seconds
      real time
      opu time
                         0.00 seconds
1646 data TANK4;
1647 do row = 1 to 3 by 1;
1648 do position = 1 to 3 by 1;
1649
      x = ranuni(-1);
1650
       output;
1651
       end;
1652
     end;
1653 run;
NOTE: The data set WORK.TANK4 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                     0.01 seconds
     cpu time
                         0.01 seconds
1654 data TANK4A; set TANK4;
     if row = 1 and position = 1 then tankn = '4A1';
1656
       if row = 1 and position = 2 then tankn = '4A2';
1657
        if row = 1 and position = 3 then tankn = '4A3';
1658
         if row = 2 and position = 1 then tankn = '481';
1659
          if row = 2 and position = 2 then tankn = '4B2';
1660
           if row = 2 and position = 3 then tankn = '483';
1661
            if row = 3 and position = 1 then tankn = '4C1';
             if row = 3 and position = 2 then tankn = '4C2';
1662
                                                                          Page \partial \partial of 3\circ
1663
              if row = 3 and position = 3 then tankn = '403';
1664
          run:
```

NOTE: There were 9 observations read from the data set WORK.TANK4.

```
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
                                                                          AEH-12-PSEUDO-0-4
      cpu time
                         0.01 seconds
1665 proc sort data=TANK4A;
1666 by x;
1667 run;
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                 0.01 seconds
      cpu time
                         0.01 seconds
1668
1669 data assign_trt_TANK4A; set TANK4A;
1670
      if _n_ = 1 them trt = '6h';
       if _n_ = 2 then trt = '6h';
1671
        if _n_ = 3 then trt = '6h';
1673
         if _n_ = 4 then trt = '9h';
1674
      if _n_ = 5 then trt = '9h';
1675
       if _n_ = 6 then trt = '9h';
        if _n_ = 7 then trt = '12h';
1676
         if _n_ = 8 then trt = '12h';
      if _n_ = 9 then trt = '12h';
1678
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.ASSIGN_TRT_TANK4A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
1680 proc print data= assign_trt_TANK4A;
1681 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
1681! artifical substrates';
1682 title2 h=1.5 'AEH-12-PSEUDO-04';
1683 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
1684 title4 h=1 'Shawano - whole water body Treatment ';
1685 run:
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK4A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
1686 data TANK5;
                                                                         Page 23 of 20
1687
     do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
1688
      x = ranuni(-1);
1690
      cutput;
```

```
1691
        end;
1692
       end;
1693 run;
                                                                             AEH-12-PSEUDO-04
NOTE: The data set WORK.TANK5 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1694
     data TANK5A; set TANK5;
      if row = 1 and position = 1 then tankn = '5A1';
1696
        if row = 1 and position = 2 then tankn = '5A2';
1697
         if row = 1 and position = 3 then tankn = '5A3';
1698
          if row = 2 and position = 1 then tankn = '5B1';
           if row = 2 and position = 2 then tankn = '5B2';
1699
            if row = 2 and position = 3 then tankn = '5B3';
1700
1701
             if row = 3 and position = 1 then tankn = '501';
1702
              if row = 3 and position = 2 then tankn = '502';
1703
               if row = 3 and position = 3 then tankn = '503';
1704
           run;
NOTE: There were 9 observations read from the data set WORK.TANK5.
NOTE: The data set WORK, TANK5A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.03 seconds
      opu time
                          0.03 seconds
1705 proc sort data=TANK5A;
1706 by x;
1707 run;
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1708
1709
      data assign_trt_TANK5A; set TANK5A;
1710
      if _n_ = 1 then trt = '6n';
1711
        if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
1712
1713
         if _n_ = 4 then trt = '9h';
      if _n_ = 5 then trt = '9h';
1714
1715
       if _n_ = 6 then trt = '9h ;
         if _n_ = 7 then trt = '12h';
1716
         if _n_ = 8 then trt = '12h';
1717
1718
       if _n_ = 9 then trt = '12h';
                                                                             Page <u>24</u> of <u>30</u>
1719
        run;
NOTE: There were 9 observations read from the data set WORK. TANK5A.
NOTE: The data set WORK.ASSIGN_TRT TANK5A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
```

```
AEH-12-PSEUDO-04
1720 proc print data= assign_trt_TANK2A;
1721 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
1721! artifical substrates';
1722 title2 h=1.5 'AEH-12-PSEUDO-04';
1723 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
1724 title4 h=1 'Shawano - whole water body Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                  0.00 seconds
      cpu time
                        0.00 seconds
1726 data TANK6;
1727 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
       x = ranuni(-1);
       output;
       end;
      end:
1733 run;
NOTE: The data set WORK.TANK6 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                 0.01 seconds
     cpu time
                         0.01 seconds
1734 data TANK6A; set TANK6;
```

```
NOTE: There were 9 observations read from the data set WORK.TANK6.
NOTE: The data set WORK.TANKGA has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.03 seconds
     cpu time
                         0.03 seconds
```

if row = 1 and position = 1 then tankn = '6A1'; if row = 1 and position = 2 then tankn = '6A2';

if row = 1 and position = 3 then tankn = '6A3';

if row = 2 and position = 1 then tankn = '6B1';

if row = 2 and position = 2 then tankn = '6B2';if row = 2 and position = 3 then tankn = '6B3';

if row = 3 and position = 1 then tankn = '6C1';

if row = 3 and position = 2 then tankn = '602';

if row = 3 and position = 3 then tankn = '603';

```
1745 proc sort data=TANK6A;
1746 by x;
1747 run;
```

real time

cpu time

1729

1730

1731

1732

1736

1737 1738

1739

1740 1741

1742

1743

1744

0.01 seconds

0.01 seconds

Page <u>25</u> of <u>39</u>

```
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                          0.01 seconds
                                                                          AEH-12-PSEUDO-04
1748
1749 data assign_trt_TANK6A; set TANK6A;
1750
      if _n_ = 1 then trt = '6h';
        if _n_ = 2 then trt = '6h';
1751
1752
         if \underline{n} = 3 then trt = '6h';
1753
         if _n_ = 4 then trt = '9h';
       if _n_ = 5 then trt = '9h';
1754
        if _n_ = 6 then trt = '9h';
1755
        if _n_ = 7 then trt = '12h';
1756
1757
          if _n_ = 8 then trt = '12h';
       if _n_ = 9 then trt = '12h';
1758
1759
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.ASSIGN_TRT_TANK6A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time.
                          0.03 seconds
      opu time
                          0.03 seconds
1760 proc print data= assign_trt_TANK6A;
1761 title1 h≃2 'Efficacy of Pseudomonas fluorescens (Pf-C'_145A)for controlling zebra mussesl on
1761! artifical substrates';
1762 title2 h=1.5 'AEH-12-PSEUDO-04';
1763 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
1764 title4 h=1 'Shawano - whole water body Treatment ';
1765 run;
NOTE: There were 9 observations read from the data sct WORK.ASSIGN_TRT_TANK6A.
NOTE: PROCEDURE PHINT used (Total process time):
      real time
                         0.00 seconds
     opu time
                         0.00 seconds
1766 data TANK7; .
1767 do row = 1 to 3 by 1;
1768 do position = 1 to 3 by 1;
      x = ranuni(-1);
1769
1770
       output;
1771
       end:
1772
       end;
1773 run;
NOTE: The data set WORK, TANK7 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
                                                                           Page 76 of 30
     real time
                        0.01 seconds
     opu time
                         0.01 seconds
```

```
1774 data TANK7A; set TANK7;
      if row = 1 and position = 1 then tankn = '7A1':
1776
        if row = 1 and position = 2 then tankn = '7A2';
         if row = 1 and position = 3 then tankn = '7A3';
                                                                           AEH-12-PSEUDO-0.4
1778
          if row = 2 and position = 1 then tankn = '7B1';
           if row = 2 and position = 2 then tankn = '7B2';
1779
1780
            if row = 2 and position = 3 then tankn = '7B3';
1781
             if row = 3 and position = 1 then tankn = '7C1';
              if row = 3 and position = 2 then tankn = '702';
1782
1783
               if row = 3 and position = 3 then tankn = '703';
1784
           run:
NOTE: There were 9 observations read from the data set WORK, TANK7.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1785 proc sort data=TANK7A;
1786 by x;
1787 run;
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
1788
1789
      data assign_trt_TANK7A; set TANK7A;
1790
       if _n_ = 1 then trt = '6h';
        if _n_ = 2 then trt = '6h';
1791
        if _n_ = 3 then trt = '6h';
1792
1793
         if _n_ = 4 then trt = '9h';
       if \underline{r} = 5 then trt = '9h';
1794
1795
        if _n_ = 6 then trt = '9h';
1796
         if _n_ = 7 then trt = '12h';
1797
         if _n_ = 8 then trt = '12h';
1798
       if _n_ = 9 then trt = '12h';
1799
NOTE: There were 9 observations read from the data set WORK, TANK7A.
NOTE: The data set WORK.ASSIGN_TRT_TANK7A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.03 seconds
      opu time
                          0.03 seconds
                                                                             Page <u>24</u> of 30
1800 proc print data= assign_trt_TANK2A;
1801 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
1801! artifical substrates';
1802 title2 h=1.5 'AEH-12-PSEUDO-04';
1803 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
1804 title4 h=1 'Shawano - whole water body Treatment ';
```

```
1805 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                     0.01 seconds
      cpu time
                         0.01 seconds
                                                                           AEH-12-PSEUDO-04
1806 data TANK8;
1807 do row = 1 to 3 by 1;
     do position = 1 to 3 by 1;
1809
       x = ranuni(-1);
1810
       output;
1811
       end;
1812
      end;
1813 run;
NOTE: The data set WORK.TANK8 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time);
      real timo
                 0.01 seconds
      cpu time
                         0.01 seconds
1814 data TANK8A; set TANK8;
      if row = 1 and position = 1 then tankn = '8A1';
1816
       if row = 1 and position = 2 then tankn = '8A2';
        if row = 1 and position = 3 then tankn = '8A3';
1817
1818
         if row = 2 and position = 1 then tankn = '8B1';
          if row = 2 and position = 2 then tankn = '8B2';
1819
           if row = 2 and position = 3 then tankn = '883';
            if row = 3 and position = 1 then tankn = '8C1';
1821
             if row = 3 and position = 2 then tankn = '802';
1822
1823
              if row = 3 and position = 3 then tankn = '803';
1824
NOTE: There were 9 observations read from the data set WORK.TANK8.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.01 seconds
                         0.01 seconds
     cpu time
1825 proc sort data=TANK8A;
1826 by x;
1827 run;
NOTE: There were 9 observations read from the data set WORK, TANK8A.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
                                                                          Page 28 of 30
1828
1829 data assign_trt_TANK8A; set TANK8A;
1830    if _n_ = 1 then trt = '6h';
```

```
if _n_ = 2 then trt = '6h';
 1832
         if _n_ = 3 then trt = '6h';
1833
          if _n_ = 4 then trt = '9h';
1834
       if _n_ = 5 then trt = '9h';
                                                                            AEH-12-PSEUDO-0.4
       if _n_ = 6 then trt = '9h';
1835
        if _n_ = 7 then trt = '12h';
1837
         if _n_ = 8 then trt = '12h';
1838
       if _n_ = 9 then trt = '12h';
1839
        run;
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NOTE: The data set WORK.ASSIGN_TRT_TANK8A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      roal time
                         0.01 seconds
      opu time
                          0.01 seconds
1840 proc print data= assign_trt_TANK8A;
1841 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on
1841! artifical substrates';
1842 title2 h=1.5 'AEH-12-PSEUDO-04';
1843 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
1844 title4 h=1 'Shawano - whole water body Treatment ';
1845 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK8A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.01 seconds
      cou time
                         0.01 seconds
1846 data TANK9;
1847 do row = 1 to 3 by 1;
1848 do position = 1 to 3 by 1;
      x = ranuni(-1);
1850
      output;
1851
      end;
1852
      end;
1853 run;
NOTE: The data set WORK.TANK9 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                         0.03 seconds
                         0.03 seconds
     opu time
1854 data TANK9A; set TANK9;
1855
     if row = 1 and position = 1 then tankn = '9A1';
      if row = 1 and position = 2 then tankn = '9A2';
1857
        if row = 1 and position = 3 then tankn = 9A3;
         if row = 2 and position = 1 then tankn = '9B1';
1858
1859
          if row = 2 and position = 2 then tankn = '982';
                                                                          Page 29 of 30
1860
           if row = 2 and position = 3 then tankn = '983';
            if row = 3 and position = 1 then tankn = '901';
1861
1862
             if row = 3 and position = 2 then tankn = '902';
              if row = 3 and position = 3 then tankn = '903';
1863
```

```
1864
            run;
 NOTE: There were 9 observations read from the data set WORK. TANK9.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
                                                                          AEH-12-PSEUDO-04
      real time
                          0.03 seconds
      cpu time
                          0.03 seconds
1865 proc sort data=TANK9A;
1866 by x;
1867 run;
NOTE: There were 9 observations read from the data set WORK.TANK9A.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                          0.01 seconds
1868
1869 data assign_trt_TANK9A; set TANK9A;
1870
      if _n_ = 1 then trt = '6h';
       if _n_ = 2 then trt = '6h';
1871
1872
        if _n_ = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
1873
       if _n_ = 5 then trt = '9h';
1874
       if _n_ = 6 then trt = '9h';
1875
        if _n_ = 7 then trt = '12h';
1877
         if _n_ = 8 then trt = '12h';
1878
       if _n_ = 9 then trt = '12h';
1879
NOTE: There were 9 observations read from the data set WORK.TANK9A.
NOTE: The data set WORK.ASSIGN_TRT_TANK9A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
1880 proc print data= assign_trt_TANK2A;
1881 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on
1881! artifical substrates;
1882 title2 h=1.5 'AEH-12-PSEUDO-04';
1883 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
1884 title4 h=1 'Snawano - whole water body Treatment ';
1885 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                         0.00 seconds
     opu time
                         0.00 seconds
              8/13/1-JA-
NOTE: This SAS session is using a registry in WORK. All changes will be lost at the end of this sess
```

Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrat 1 AEH-12-PSEUDO-04

control

50

100

Random assignment of treatment to experimental tanks Treatment Location/type: Shawano - bottom injection

8/11/12

AEH-12-PSEUDO-04

0bs block tank 0.13021 Tank 9 control 2 0.15287 Tank 2 50 0.23351 Tank 4 100 0.26174 Tank 1 control 0.29656 Tank 7 50 0.52465 Tank 5 100

0.67430

0.91450

0.99600

Tank 8

Tank 3

Tank 6

File Folder: 14a Item Number: 1 Page 1 of 4

Analysis performed by J. Luoma SAS version 9.2 08:59 11AUG12

```
* Study Number : AEH-12-PSUEDO-04
   Study Director: Jim Luoma
* date created : 11 August 2012 - JAL)
                                                                         AEH-12-PSEUDO-04
 * Verified by:
                     __ (Date:__
                                                      page
                                                               of
* Random allocation of treatment to tank.sas
***********
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Shawano - bottom injection exposure*/
data fish;
 ao block = 1 to 1 by 1;
  do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data fish2; set fish;
 if block = 1 and tank = 1 then tankn = 'Tank 1';
  if block = 1 and tank = 2 then tankn = 'Tank 2';
  if block = 1 and tank = 3 then tankn = 'Tank 3';
   if block = 1 and tank = 4 then tankn = 'Tank 4';
    if block = 1 and tank = 5 then tankn = 'Tank 5';
     if block = 1 and tank = 6 then tankn = 'Tank 6';
      if block = 1 and tank = 7 then tankn = 'Tank 7';
       if block = 1 and tank = 8 then tankn = 'Tank 8';
        if block = 1 and tank = 9 then tankn = 'Tank 9';
    run:
proc sort data≒fish2;
 by block x;
run;
data assign_trt_fish; set fish2;
 if n = 1 then trt = 'control';
 if _n_ = 2 then trt = '50';
  if n_ = 3 then trt = '100';
   if _n_ = 4 then trt = 'control';
 if _n_ = 5 then trt = '50';
 if _n_ = 6 then trt = '100';
  if _n_ = 7 then trt = 'control';
   if _n = 8 then trt = '50';
 if _n_ = 9 then trt = '100';
proc print data= assign_trt_fish;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of treatment to experimental tanks';
title4 h=1 'Treatment Location/type: Shawano - bottom injection';
                                                                 Page 7 of 4
```

```
499 * date created : 11 August 2012 - JAL 54
500 * Verified by: _____ (Date:___
                                                             page ____ of ___
501 * Random allocation of treatment to tank.sas
502 - ************ AEH-12-PSEUDO-0.1
503 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
504
505 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
506
507 options /*ls=85 ps=40 formdlim='-' */ pageno \approx 1 nocenter nodate noscurce2;
508
509 /*Random assignment of treatment to experimental tanks*/
510 /*Location/exposure type: Shawano - bottom injection exposure*/
511 data fish;
512 do block = 1 to 1 by 1;
      do tank = 1 to 9 by 1;
513
514
       x = ranuni(-1);
515
       output;
516
       end;
517
      end:
518 run;
NOTE: The data set WORK.FISH has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.00 seconds
      opu time
                         0.00 seconds
519 data fish2; set fish;
    if block = 1 and tank = 1 then tankn = 'Tank 1';
521
      if block = 1 and tank = 2 then tankn = 'Tank 2';
522
       if block = 1 and tank = 3 then tankn = 'Tank 3';
         if block = 1 and tank = 4 then tankn = 'Tank 4';
523
         if block = 1 and tank = 5 then tankn = 'Tank 5';
524
          if block = 1 and tank = 6 then tankn = Tank 6';
526
           if block = 1 and tank = 7 then tankn = 'Tank 7';
            if block = 1 and tank = 8 then tankn = 'Tank 8';
527
528
             if block = 1 and tank = 9 then tankn = 'Tank 9':
529
         run:
NOTE: There were 9 observations read from the data set WORK.FISH.
NOTE: The data set WORK.FISH2 has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
530 proc sort data=fish2;
531 by block x;
532 run;
                                                                        FF# 14a
NCTE: There were 9 observations read from the data set WORK.FISH2.
                                                                        Pg <u>5</u> of <u>4</u>
NCTE: The data set WORK.fISH2 has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                         0.01 seconds
```

0.01 seconds

cpu time

```
533
534 data assign_trt_fish; set fish2;
535
     if _n_ = 1 then trt = 'control';
536
       if _n_ = 2 then trt = '50';
                                                                         AEH-12-PSEUDO-04
537
        if _n_ = 3 then trt = '100';
        if _n_ = 4 then trt = 'control';
538
      if _n_ = 5 then trt = '50';
539
540
       if _n_ = 6 then trt = '100';
541
       if _n_ = 7 then trt = 'control';
        if _n_ = 8 then trt = '50';
543
      if _n_ = 9 then trt = '100';
      run;
NOTE: There were 9 observations read from the data set WORK.FISH2.
NOTE: The data set WORK.ASSIGN_TRT_FISH has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.06 seconds
      opu time
                          0.01 seconds
545 proc print data= assign_trt_fish;
546 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
5461 artifical substrates';
547 title2 h=1.5 'AEH-12-PSEUDO-04';
548 title3 h=1 'Random assignment of treatment to experimental tanks';
549 title4 h=1 'Treatment Location/type: Shawano - bottom injection';
NOTE: There were 9 observations read from the data set WCRK.ASSIGN_TRT_FISH.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                        0.01 seconds
      cpu time
                         0.01 seconds
              8/11/12
```

FF#<u>|Ya</u> |tem No. <u>\</u> |Pg <u>\</u> of <u>\</u>

Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical subs 1.

Rande Test	om assign Location,	nent of type =	trays to te Shawano bot	st tank/ tom inje	position ction tank	treatment	8/1/hr.	
Obs	round	row	position	tank	x	_row_	tankn	AEH-12-PSEUDO-04
1	1	1	2	8	0.00810	Α	8A2	
2	1	3	3	2	0.03556	C	203	
3	, .1.	1	2	6	0.03743	Α	6A2 /	2 9 1 18 1 1
4	1 // 1	7 201	ે 1	5	0.03887	В	5B1 V	indicates bag positions to be
5	1	1	1	2	0.06626	Ā	2A1	Positions to be
6.	1	2	1	. 2	0.06878	В	2B1V	used for 12.h
7	1	1	1	1	0.08357	Ā	1A1	treatment.
8	1	1	2	e -1	0.09108	Ä	1A2	pho
9	1	2	2	9	0.12185	В	9B2 V	
10	1	2	3	1	0.12192	В	1B3	7 SEPT12
11	1	3	1	4	0.14635	Č	4C1	
12	1	1	2	2.	0.17909	Ä	2A2	
13	1	1	3	6	0.19369	Ā	6A3	
14	1	1	3	4	0.19825	Ā	4A3	Distribution
15	1	2	2	6	0.20476	В	6B2.) () () () () () () () () () () () () ()
16	1	2	3	В	0.21165	В	8B3	began of
17	1	3	1	- 6	0.22199	C	6C1	began at
18	1	3	3	- 5	0.22663	c		10.101
19	1	3	3	1	0.23721	C	5C3	Distribution complete at 1033. Km 756P12
20	1	2	3	4	0.23995	В		1)(8) Mach
21	1	2	2	· 1	0.25274	В	4B3√	complete at
22	í	1	3	7	0.25274	A	1B2	1032 KW
23	1	1	3	5	0.27644	A	7A3	758812
24	1	3	2	2	0.27738	Č	5A3	,
25	1	- 3	2	4	0.28281	C	202	
26	1	1	3	≠ . 8	0.28295		402	
27	1	3	2	5	0.29153	A	8A3 V	
28	1	3	1	2		C	502	· ·
29	1	1	2	5	0.30627	C	201	
30	i	2	1	1	0.32998	A	⊴5A2 √	
31	1	1	3	1	0.33341	В	1B1	
32	1	2	3	7	0.34612	A	1A3V	
33	1	2	3	. ,	0.36184	В	7B3 🗸	
34	1	3	3	. 7	0.43563	В	9B3.	
35	1	1	1	5	0.44991	C	703	
36	1	1	3		0.47095	A	5A1	
37	1	2	3	2 3	0.47688	A	2A3	File Folder: 149
38	1	3	3		0.47977	В	3B3	File Polder:
39	1	2	2	4 7	0.55220	C	403	
40	1	1	1		0.55570	В	7B2 🗸	
41	1	3	3	6	0.56422	A	6A1	
42	1	2		3	0.56430	C	303	
43	1	3	1 2	9	0.56500	В	981√	Item Number: 2
44	1 .	1	_	8	0.57148	С	8C2	
44		***************************************	ogs ^e	4	0.60142	Α	4A2V	
46	1	_	2	8	0.60482	В	8B2✓	•
47	1 1	1 2	3 3	3 .	0.60611	A	3A3	+ 0
71	'	۷	J	5	0.62329	В	5B3√	Page of8

Analysis performed by J. Luoma SAS version 9.2 10:48 11AUG12

Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels on artifical suba 2 \pm H-12-PSUEDO-04

Random assignment of trays to test tank/position

Fest Location/type = Shawano bottom injection tank treatment

Obs	round.	. row	position.	tank	×	_row_	tankn	AGH-12-30-0-1
48	1	1	1	7	0.65077	Α	7A1	Woedow
49	1	1	1	4	0.67036	Α	4A1	Same
50	1	3	4 3 .	9	0.67289	С	903	
51	1	2	1	. 6	0.68660	8	6B1	AEH-12-PSEUDO-04
52	1	2	2	3	0.70985	B	3B2	
53	. 1	1	2	3	0.71071	Α	3A2√	
54	1	3	1	5	0.74940	C	5C1 /	
55	1 .	2	3	6	0.75203	В	6B3 ❖	
56	1	3	1	9	0.75647	C	901	
57	1	1	1	3	0.76245	Α	3A1 /	
58	1	2	2	4	0.76310	В	4B2	
59	1	2	3	.2	0.76913	B	2B3\/	
60	1	1	1	9	0.77002	A	9A 1	
61	1	2	2	2	0.77972	В	282	
62	1	1	3	· 9	0.81719	Α	9A3	
63	1	3	1	× 37	0.82828	С	7C1 /	
64	1	1	2	9	0.83206	Α	19A2V	
65	1	3	1	1	0.83905	C	1.01	
66	1	3	3	8	0.86796	C	803 /	
67	1	3	2	5 A	0.88677	C	102	0
68	1	2	2	5	0.89956	В	₹5B2√	
69	1	1	1	8	0.90778	Α	8A1	
70	1	3	1	3	0.91931	C	3C1	
71	1	2	1	4	0.92470	В	4B1	•
72	1	2	1	В	0.92861	В	-881V	
73	1	3	2	∂ 3	0.94083	C	302	
74	1	2	1	3	0.94313	В	381	
75	1	3	1	8	0.95355	C	801	
76	1	2	1	7.	0.95623	В	7B1	*
77	1	3	2	9	0.97167	C	902	
78	, 1	3	3	6:	0.97857	С	603	
79	1	3	2	6	0.98284	С	6C2¥	
80	1	3	2	Ł 7	0.99054	C	702	
81	1	1	2	7	0.99696	Α	7A2√	

File Folder:	्रदेशकार्थी . १८ ४५ १	
item Number	N.	
	. 왕 (15년) - 전 왕	Page 2 of 8

Analysis performed by J. Luoma SAS version 9.2 10:48 11AUG12

Page 01

```
* Study Number : AEH-12-PSUEDO-04

    Study Director: Jim Luoma

  date created : AUGUST 11, 2012 - JAL Jan
  Verified by: _____
                       (Date:____)
* Random allocation of trays to tank.sas
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE:
options /*ls=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2;
/*Random distribution of trays to experimental tanks*/
/* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2, or 3, e
   round = distribution round, place one tray in the assigned position (9 per test replicate - 3 for -
/*Location and exposure type: Shawano - bottom injection treatment*/
data glochidia;
 do round = 1 to 1 by 1;
 do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 do tank = 1 to 9 by 1;
  x = ranuni(-1);
  output;
 end;
 end:
end;
end;
data glochidiadist; set glochidia;
if row = 1 then _row_ = 'A';
if row = 2 then _{row} = 'B';
if row = 3 then _row_ = 'C';
if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
 if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
  if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
   if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
    if row = 2 and tank = 1 and position = 2 then tankn = '182';
     if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
      if row = 3 and tank = 1 and position = 1 then tankn = '1C1';
       if row = 3 and tank = 1 and position = 2 then tankn = '102';
        if row = 3 and tank = 1 and position = 3 then tankn = '103';
if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
 if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
  if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
   if row = 2 and tank = 2 and position = 1 then tankn = '281';
    if row = 2 and tank = 2 and position = 2 then tankn = '282';
     if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
      if row = 3 and tank = 2 and position = 1 then tankn = '201';
       if row = 3 and tank = 2 and position = 2 then tankn = '202';
       if row = 3 and tank = 2 and position = 3 then tankn = '203';
if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
```

if row = 1 and tank = 3 and position = 2 then tankn = '3A2';

```
if row = 1 and tank = 3 and position = 3 then tankn = '3A3';
   if row = 2 and tank = 3 and position = 1 then tankn = '3B1':
    if row = 2 and tank = 3 and position = 2 then tankn = '3B2';
     if row = 2 and tank = 3 and position = 3 then tankn = '3B3';
      if row = 3 and tank = 3 and position = 1 then tankn = '301';
       if row = 3 and tank = 3 and position = 2 then tankn = '302';
        if row = 3 and tank = 3 and position = 3 then tankn = '3C3';
if row = 1 and tank = 4 and position = 1 then tankn = '4A1';
 if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
  if row = 1 and tank = 4 and position = 3 then tankn = '4A3';
   if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
    if row = 2 and tank = 4 and position = 2 then tankn = '4B2';
     if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
      if row = 3 and tank = 4 and position = 1 then tankn = ^{1}4C1^{\circ};
       if row = 3 and tank = 4 and position = 2 then tankn = '402';
        if row = 3 and tank = 4 and position = 3 then tankn = '403;
if row = 1 and tank = 5 and position = 1 then tankn = '5A1':
 if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
  if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
   if row = 2 and tank = 5 and position = 1 then tankn = '5B1';
   if row = 2 and tank = 5 and position = 2 then tankn = '5B2';
     if row = 2 and tank = 5 and position = 3 then tankn = '5B3';
      if row = 3 and tank = 5 and position = 1 then tankn = '501';
      if row = 3 and tank = 5 and position = 2 then tankn = '502';
        if row = 3 and tank = 5 and position = 3 then tankn = '503';
if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
if row = 1 and tank = 6 and position = 2 then tankn = '6A2';
 if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
   if row = 2 and tank = 6 and position = 1 then tankn = '6B1';
   if row = 2 and tank = 6 and position = 2 then tankn = '6B2'
    if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
      if row = 3 and tank = 6 and position = 1 then tankn = '601';
      if row = 3 and tank = 6 and position = 2 then tankn = '602';
       if row = 3 and tank = 6 and position = 3 then tankn = '603':
if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
if row = 1 and tank = 7 and position = 2 then tankn = '7A2':
 if row = 1 and tank = 7 and position = 3 then tankn = '7A3';
  if row = 2 and tank = 7 and position = 1 then tankn = '731';
   if row = 2 and tank = 7 and position = 2 then tankn = 7B2';
    if row = 2 and tank = 7 and position = 3 then tankn = '7B3';
      if row = 3 and tank = 7 and position = 1 then tankn = '701';
      if row = 3 and tank = 7 and position = 2 then tankn = '702';
       if row = 3 and tank = 7 and position = 3 then tankn = '703';
if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
if row = f and tank = 8 and position = 2 then tankn = '8A2';
 if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
  if row = 2 and tank = 8 and position = 1 then tankn = '8B1';
   if row = 2 and tank = 8 and position = 2 then tankn = '8B2';
    if row = 2 and tank = 8 and position = 3 then tankn = '8B3';
     if row = 3 and tank = 8 and position = 1 then tankn = '801':
      if row = 3 and tank = 8 and position = 2 then tankn = '802';
       if row = 3 and tank = 8 and position = 3 then tankn = '8C3';
if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
If row = 1 and tank = 9 and position = 2 then tankn = '9A2';
```

if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
if row = 2 and tank = 9 and position = 1 then tankn = '9B1';

AEH-12-PSEUDO-04

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```
if row = 2 and tank = 9 and position = 2 then tankn = '982';
      if row = 2 and tank = 9 and position = 3 then tankn = '9B3';
       if row = 3 and tank = 9 and position = 1 then tankn = '901';
        if row = 3 and tank = 9 and position = 2 then tankn = ^{\circ}902^{\circ};
                                                                             AEH-12-PSEUDO-04
         if row = 3 and tank = 9 and position = 3 then tankn = '903';
Run;
proc sort data= glochidiadist;
by round x;
run;
proc print data = glochidiadist;
title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)$DP for controlling zebra mussels on artif
title2 h=1.5 'AEH-12-PSUEDO-04';
title3 h=1 'Random assignment of trays to test tank/position';
title4 h=1 'Test Location/type = Shawano bottom injection tank treatment';
          8/11/12
          Jan
```

Page _ 5_ of _ 8__

```
1665 * date created : AUGUST 11, 2012 - JAL ந்ட
1666 * Verified by: _____ (Date:____)
                                                          page ____ of _
1667 * Random allocation of trays to tank.sas
AEH-12-PSEUDO-04
1669 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
1670
1671 FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
1672
1673
    options /*1s=85 ps=40 formdlim='-' */ pageno = 1 nocenter nodate nosource2:
1674
1675 /*Random distribution of trays to experimental tanks*/
1676 /* tanks 1 to 9 = tank 1 row A,B,C, each row has 3 positions (ie: Tank 1 row A position 1, 2,
16761 or 3, etc)
        round = distribution round, place one tray in the assigned position (9 per test replicate -
1677
1677!
      3 for each exposure duration) */
1678
16791 *******/
1680
1681 /*Location and exposure type: Shawano - bottom injection treatment*/
1682 data glochidia:
1683 do round = 1 to 1 by 1;
1684
     do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
1686
      do tank = 1 to 9 by 1;
1687
       x = ranuni(-1);
1688
       output;
1689
       end:
1690
       end:
1691
      end:
1692
     end;
1693 run;
NOTE: The data set WORK.GLOCHIDIA has 81 observations and 5 variables.
NOTE: DATA statement used (Total process time):
                       0.03 seconds
     cou time
                       0.03 seconds
1694 data glochidiadist; set glochidia;
1695 if row = 1 then _row_ = 'A';
1696 if row = 2 then row_ = 'B';
1697    if row = 3 then _row_ = 'C';
1698
     if row = 1 and tank = 1 and position = 1 then tankn = '1A1';
      if row = 1 and tank = 1 and position = 2 then tankn = '1A2';
1700
        if row = 1 and tank = 1 and position = 3 then tankn = '1A3';
1701
        if row = 2 and tank = 1 and position = 1 then tankn = '1B1';
1702
         if row = 2 and tank = 1 and position = 2 then tankn = '1B2';
1703
          if row = 2 and tank = 1 and position = 3 then tankn = '1B3';
           if row = 3 and tank = 1 and position = 1 then tankn = '101';
1705
            if row = 3 and tank = 1 and position = 2 then tankn = '162';
            if row = 3 and tank = 1 and position = 3 then tankn = '103'; Page 6 of 8
1706
1707
      if row = 1 and tank = 2 and position = 1 then tankn = '2A1';
    if row = 1 and tank = 2 and position = 2 then tankn = '2A2';
1708
1709
        if row = 1 and tank = 2 and position = 3 then tankn = '2A3';
```

```
1710
           if row = 2 and tank = 2 and position = 1 then tankn = '281';
1711
            if row = 2 and tank = 2 and position = 2 then tankn = '282':
1712
             if row = 2 and tank = 2 and position = 3 then tankn = '2B3';
              if row = 3 and tank = 2 and position = 1 then tankn = '201';
1714
               if row = 3 and tank = 2 and position = 2 then tankn = '202';
1715
                if row = 3 and tank = 2 and position = 3 then tankn = '203';
                                                                                  AEH-12-PSEUDO-04
        if row = 1 and tank = 3 and position = 1 then tankn = '3A1';
1716
1717
         if row = 1 and tank = 3 and position = 2 then tankn = '3A2';
         if row = 1 and tank = 3 and position = 3 then tankn = '3A3';
1718
1719
          if row = 2 and tank = 3 and position = 1 then tankn = '381';
1720
            if row = 2 and tank = 3 and position = 2 then tankn = "3B2";
1721
             if row = 2 and tank = 3 and position = 3 then tankn = '3B3':
1722
              if row = 3 and tank = 3 and position = 1 then tankn = '3C1':
               if row = 3 and tank = 3 and position = 2 then tankn = 3C2;
1723
1724
                if row = 3 and tank = 3 and position = 3 then tankn = '3C3';
       if row = 1 and tank = 4 and position = 1 then tankn = ^{1}4A1^{+};
1725
         if row = 1 and tank = 4 and position = 2 then tankn = '4A2';
1726
1727
         if row = 1 and tank = 4 and position = 3 then tankn = '4A3';
          if row = 2 and tank = 4 and position = 1 then tankn = '4B1';
1728
           if row = 2 and tank = 4 and position = 2 then tankn = '4B2';
1729
             if row = 2 and tank = 4 and position = 3 then tankn = '4B3';
1730
1731
              if row = 3 and tank = 4 and position = ! then tankn = '4C1';
1732
              if row = 3 and tank = 4 and position = 2 then tankn = '402';
1733
               if row = 3 and tank = 4 and position = 3 then tankn = '463';
1734
       if row = 1 and tank = 5 and position = 1 then tankn = '5A1';
1735
        if row = 1 and tank = 5 and position = 2 then tankn = '5A2';
1736
         if row = 1 and tank = 5 and position = 3 then tankn = '5A3';
1737
          if row = 2 and tank = 5 and position = 1 then tankn = '581';
           if row = 2 and tank = 5 and position = 2 then tankn = '5B2;
1738
1739
            if row = 2 and tank = 5 and position = 3 then tankn = 5B3';
1740
             if row = 3 and tank = 5 and position = 1 then tankn = '501'
1741
              if row = 3 and tank = 5 and position = 2 then tankn = '502';
               if row = 3 and tank = 5 and position = 3 then tankn = ^{1}5C3';
1742
       if row = 1 and tank = 6 and position = 1 then tankn = '6A1';
1743
1744
        if row = 1 and tank = 6 and position = 2 then tankn = ^{\circ}6A2^{\circ};
1745
         if row = 1 and tank = 6 and position = 3 then tankn = '6A3';
1746
          if row = 2 and tank = 6 and position = 'then tankn = '6B1';
1747
           if row = 2 and tank = 6 and position = 2 then tankn = '682';
1748
            if row = 2 and tank = 6 and position = 3 then tankn = '6B3';
1749
             if row = 3 and tank = 6 and position = 1 then tankn = '6C1'
1750
              if row = 3 and tank = 6 and position = 2 then tankn = '602';
1751
              .if row = 3 and tank = 6 and position = 3 then tankn = '603';
1752
       if row = 1 and tank = 7 and position = 1 then tankn = '7A1';
1753
        if row = 1 and tank = 7 and position = 2 then tankn = '7A2';
1754
         if row = 1 and tank = 7 and position = 3 then tankn = ^{1}7A3^{1};
          if row = 2 and tank = 7 and position = 1 then tankn = '7B1';
1755
1756
           if row = 2 and tank = 7 and position = 2 then tankn = '7B2';
            if row = 2 and tank = 7 and position = 3 then tankn = '783';
1757
             if row = 3 and tank = 7 and position = 1 then tankn = 701';
1758
1759
              if row = 3 and tank = 7 and position = 2 then tankn = ^{1}702^{\circ}:
1760
               if row = 3 and tank = 7 and position = 3 then tankn = '703';
                                                                               Page <u>7</u> of 8
       if row = 1 and tank = 8 and position = 1 then tankn = '8A1';
1761
        if row = 1 and tank = 8 and position = 2 then tankn = '8A2';
1762
         if row = 1 and tank = 8 and position = 3 then tankn = '8A3';
1763
          if row = 2 and tank = 8 and position = 1 then tankn = '8B1';
1764
```

if row = 2 and tank = 8 and position = 2 then tankn = '8B2';

1765

```
1766
            if row = 2 and tank = 8 and position = 3 then tankn = '883';
1767
             if row = 3 and tank = 8 and position = 1 then tankn = '8C1';
              if row = 3 and tank = 8 and position = 2 then tankn = '802';
1768
1769
               if row = 3 and tank = 8 and position = 3 then tankn = '803';
       if row = 1 and tank = 9 and position = 1 then tankn = '9A1';
1770
        if row = 1 and tank = 9 and position = 2 then tankn = '9A2';
1771
1772
         if row = 1 and tank = 9 and position = 3 then tankn = '9A3';
                                                                             AEH-12-PSEUDO-04
          if row = 2 and tank = 9 and position = 1 then tankn = '981';
1773
1774
           if row = 2 and tank = 9 and position = 2 then tankn = '9B2';
            if row = 2 and tank = 9 and position = 3 then tankn = '9B3';
1775
1776
             if row = 3 and tank = 9 and position = 1 then tankn = '901';
1777
              if row = 3 and tank = 9 and position = 2 then tankn = '902';
1778
               if row = 3 and tank = 9 and position = 3 then tankn = '903';
1779 Run:
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIA.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.07 seconds
      cpu time
                          0.07 seconds
1780 proc sort data= glochidiadist;
1781
      by round x;
1782
      run;
NOTE: There were 81 observations read from the data set WORK.GLOCHICIADIST.
NOTE: The data set WORK.GLOCHIDIADIST has 81 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      opu time
                         0.01 seconds
1783 proc print data = glochidiadist;
1784 title1 h=2 'Efficacy of Psuedomonas fluorescens (Pf-CL145A)SDP for controlling zebra mussels
1784! on artifical substrates';
1785 title2 h=1.5 'AEH-12-PSUEDO-04';
1786 title3 h=1 'Random assignment of trays to test tank/position';
1787 title4 h=1 'Test Location/type = Shawano bottom injection tank treatment';
1788 run;
NOTE: There were 81 observations read from the data set WORK.GLOCHIDIADIST.
NOTE: PROCEDURE PRINT used (Total process time):
                         0.01 seconds
     cpu time
                         0.01 seconds
                      8/11/12
```

FF # 14 a Item No. _ 3 Pg & of _ 8 Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 1 *** Shawano - bottom injection Treatment

		A11 (2)	• •			
0bs	row	position	х	tankn	trt	
-	_					
1		1	0.00558	1A1	6h	
2	2		0.07369	1B1	6h	
3	2	3	0.10023	1B3	6h	
4	2	2	0.27940	1B2_	9h	
. 5	1	2	0.37473	1A2	9h	
6	1	3	0.48168	1A3	9h	
7	3	2	0.62620	102	12	
8	3	3	0.84572	1C3	12	
9	3	1	0.87154	101	12	

Dosing for bottom injection 16 for 12h only. Extra bag from ah will be used but removed at 12h. Yw 75EPTI2

AEH-12-PSEUDO-04

File Folder: 14a

Item Number: __3__

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Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12 JA

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 2 *** Shawano - bottom injection Treatment

AEH-12-PSEUDO-04

Obs	row	position	×	tankn	trt		
	_						
1	1	3	0.26233	2A3	6h		
2	3	7	0.28933	2C 1	6h		
3	3	3 `	0.41823	203	6h	X	See note on pagel
4	1	1	0.56759	2A1	9h	16.	of the randomitation
5	3	2	0.60252	202	9b_		OT THE randomitation
6	1	2	0.63382	2A2	9h	_	FW 7-SEPTIO
7	2	1	0.64069	281	12		, , , , , ,
8	2	3	0.80439	2B3	12		
9	2	2	0.92279	2B2	12		

Page _____et___et____... Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 3 ***

Shawano - bottom injection Treatment

AEH-12-PSEUDO-04

Obs	row .	position	x	tankn	trt	
1		4	0.10700	244		
1		'	0.16703	3A1	6h	
2	3	3-	0.19671	303	6h	* See note on page 1
3	1	3	0-21867	3A3	6h	* See note on page 1 of randomitation the
4	2	3	0.23119	-3B3	9h	of landomitation pour
. 5	3		0.72793	3C1	-0 h_	758912
6	1	2	0.80420	3A2	9h	
7	2	1	0.80905	3B1	12	
8	3	2	0.88712	3 C 2	12	
9	2	2	0.96360	3B2	12	

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 4 *** Shawano - bottom injection Treatment

Obs	row	position	x	tankn	trt	AEH-12-PSEUDO-04
1		3	0.06803	4A3	6h	
2	1		0.08714	4A1	6 h	x s. will on
3	2	1	0.26140	4B1	6h	T See Marc or
4	3	2	0.28491	-4C2	9 h	page of randomitalin
ຸ 5	3	1	0.45781	4C1	9h	* See note or page of randomitedun
6	2	3	0.46232	4B3	9h	75812
7	1	2	0.47420	4A2	12	+ 1110
8	2	2	0.64459	4B2	12	
9	3	3	0.74556	403	12 ~	

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Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 5 *** Shawano - bottom injection Treatment

0bs	row	position	х	tankn	trt	
Cim				Λ		
1	1	. 3	0.26233	O 2A3	6h	
2	3	1	0.28933	201	6h	
3	3	3.	0.41823	203	6h	
4	1	1	0.56769	-2A1	9h	
5	3	2	0.60252	202	9b_	
6	1	2	0.63382	2A2	9n	-
7	2	1	0.64069	2B1	12	
8	2	3	0.80439	283	12	
9	2	2	0.92279	2B2	12	

* See note on page
1 of vandonization
Fru
7 SEP13

OTank nombers should be 5 not 2. km 75EPI2 See Deciation #2 for furter clarification. Funding

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10 epsq

AEH-12-PSEUDO-04

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04 $\,$

Random assignment of substrate removal from tanks *** TANK 6 *** Shawano - bottom injection Treatment

Obs	row	position	x	tankn	trt	
1	2	1	0.18641	6B1	6h	W.C 1
2	3		0.22996	6C1	6h	I see note on page 1 of
3	1	3	0.40217	6A3	6h	* See note on page 1 of randomitation Kun 75EP12
4	1	2	0.48348	6A2	9h	" Whitachh pu
, 5	1	1	0.48881	6A1	gb_	450712
6	3	2	0.70464	6C2	9h	
7	2	3	0.76432	6B3	12	
8	3	3	0.93288	6C3	12	
9	2	2	0.96790	6B2	12	

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Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 7 *** Shawano - bottom injection Treatment

Obs	row	position	x	tankn	trt
1	1	3	0.26233	\mathcal{O}_{2A3}	6h
2	3	1	0.28933	201	6h
3	3	3	0.41823	203	6h
4	1	• 1	0.56759	2A1_	9h
5	3	2	0.60252	2C2	9 h_
6	1	2	0.63382	2A2	9h
7	2	1	0.64069	2B1	12
8	2	3	0.80439	283	12
8	2	2	0.92279	2B2	12

* See note on page 1 of randomization Fin 755712

OTank numbers should be I not 2 Kew 75EP12

See Deviation #2 for further clarification.

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[171013

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AEH-12-PSEUDO-C4

Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG127

Random assignment of substrate removal from tanks *** TANK 8 *** Shawano - bottom injection Treatment

Obs	row	position	x	tankn	trt	
-		_				
1	-8	_ 2	0.05681	802	6h	¥ 5-1
2	1	2	0.07331	8A2	6h	" see note on page
3	3	1	9-33534	8C1	6h	of rails in
4	3	3	0.41579	8C3	9h	* See note on page of randomization. Kn
5	1	1	0.48937	8A1	-eh_	
6	1	3	0.54741	8A3	9h	
7	2	3	0.62872	8B3	12	
8	2	2	0.64996	8B2	12	
9	2	1	0.73310	8B1	12	

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Analysis performed by J. Luoma SAS version 9.2 10:20 13AUG12 \int_{Λ}^{Λ}

Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on artifical substrates AEH-12-PSEUDO-04

Random assignment of substrate removal from tanks *** TANK 9 *** Shawano - bottom injection Treatment

(Obs	row	position	x	tankn	trt	
<							
	1		3	0.26233	//)2A3	6h	
	2	3	1	0.28933	201	6h	
	3	3	3	0.41823	203	6h	
	4	1	1	0.56759	2A1	9h	
	5	3_	2	0.60252	2C2	9h	
	6	1	2	D.63382	2A2	9h	_
	7	2	1	0.64069	2B1	12	
	8	2	3	0.80439	2B3	12	
	9	2	2	0.92279	282	12	

* See note on page 1 of randomitation For 75EPI2

Tank numbers should be 9 not 2. 1/w 75EP12 See Deviation #2 for tur clarification,

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```
* Study Number : AEH-12-PSUEDO-04
  Study Director: Jim Luoma
 ^* date created : 13 August 2012 - JAL \int_\Lambda \smile
 * Verified by: _____ (Date:___
                                  ___)
  Random allocation of treatment to tank.sas
                                                                          AEH-12-PSEUDO-0
 ************
DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT:
FOOTNOTE1 'Analysis performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options ls=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
                       Substrate removal from tanks. Sec title below. For DEAPPLY
/*Random assignment of treatment to experimental tanks*/
/*Location/exposure type: Shawano - bottom injection treatment*/
data TANK1;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK1A; set TANK1;
 if row = 1 and position = 1 then tankn = '1A1';
  if row = 1 and position = 2 then tankn = '1A2';
   if row = 1 and position = 3 then tankn = '1A3';
    if row = 2 and position = 1 then tankn = '1B1';
    if row = 2 and position = 2 then tankn = '1B2';
      if row = 2 and position = 3 then tankn = '183';
      if row = 3 and position = 1 then tankn = '1C1';
       if row = 3 and position = 2 then tankn = '102';
        if row = 3 and position = 3 then tankn = '103';
proc sort data=TANK1A;
by x;
run;
data assign_trt_TANK1A; set TANK1A;
 if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
  if n = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
                                                                    Page 11 of 3
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK1A;
title1 h=2 'Efficacy of Pseudomonas flucrescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
```

```
data TANK2;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
                                                                       AEH-12-PSEUDO-0:
  end;
 end;
run;
data TANK2A; set TANK2;
 if row = 1 and position = 1 then tankn = 2A1';
  if row = 1 and position = 2 then tankn = '2A2';
   if row = 1 and position = 3 then tankn = '2A3';
    if row = 2 and position = 1 then tankn = '2B1';
     if row = 2 and position = 2 then tankn = '2B2';
      if row = 2 and position = 3 then tankn = '2B3';
       if row = 3 and position = 1 then tankn = '201';
        if row = 3 and position = 2 then tankn = '202';
         if row = 3 and position = 3 then tankn = '203';
     run:
proc sort data=TANK2A;
by x;
run;
data assign_trt_TANK2A; set TANK2A;
 if _n_ = 1 then trt = '6h';
  if _{n_{}} = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if n = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
title4 h=1 'Shawano - bottom injection Treatment';
run:
data TANK3;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end:
end;
run;
data TANK3A; set TANK3;
 if row = 1 and position = 1 then tankn = '3A1';
 if row = 1 and position = 2 then tankn = '3A2';
                                                                           Page 12 of 30
  if row = 1 and position = 3 then tankn = '3A3';
   if row = 2 and position = 1 then tankn = '3B1';
     if row = 2 and position = 2 then tankn = '3B2';
     if row = 2 and position = 3 then tankn = '3B3';
```

```
if row = 3 and position = 1 then tankn = '3C1';
        if row = 3 and position = 2 then tankn = '302';
         if row = 3 and position = 3 then tankn = '303';
     run:
                                                                           AEH-12-PSEUDO-03
proc sort data=TANK3A;
 by x;
run:
data assign_trt_TANK3A; set TANK3A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run:
proc print data= assign_trt_TANK3A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
run;
data TANK4;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
 x = ranuni(-1);
 output;
 end;
end;
run;
data TANK4A; set TANK4;
if row = 1 and position = 1 then tankn = '4A1';
 if row = 1 and position = 2 then tankn = '4A2';
  if row = 1 and position = 3 then tankn = '4A3':
   if row = 2 and position = 1 then tankn = '4B1';
    if row = 2 and position = 2 then tankn = '4B2';
     if row = 2 and position = 3 then tankn = '4B3';
      if row = 3 and position = 1 then tankn = '4C1';
       if row = 3 and position = 2 then tankn = '402';
        if row = 3 and position = 3 then tankn = '403';
proc sort data≃TANK4A;
by x;
run;
data assign_trt_TANK4A; set TANK4A;
if _n_ = 1 then trt = '6h';
 if _n_ = 2 then trt = '6h';
                                                                          Page 13 of 30
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
```

```
if _n_ = 8 then trt = '12h ;
 if _n_ = 9 then trt = '12h';
  run;
                                                                            AEH-12-PSEUDO-04
proc print data= assign_trt_TANK4A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
data TANK5;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
 x = ranuni(-1);
  output;
  end;
 end;
run;
data TANK5A; set TANK5;
 if row = 1 and position = 1 then tankn = '5A1';
  if row = 1 and position = 2 then tankn = '5A2';
  if row = 1 and position = 3 then tankn = '5A3';
   if row = 2 and position = 1 then tankn = '5B1';
    if row = 2 and position = 2 then tankn = '582';
     if row = 2 and position = 3 then tankn = '5B3';
       if row = 3 and position = 1 then tankn = '501';
        if row = 3 and position = 2 then tankn = '502';
         if row = 3 and position = 3 then tankn = '503';
     run:
proc sort data-TANK5A;
by x;
run;
data assign_trt_TANK5A; set TANK5A;
 if _n_ = 1 then trt = '6h';
 if _n = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
run;
data TANK6;
do row = 1 to 3 by 1;
do position = 1 to 3 by 1;
                                                                          Page 14 of 30
 x = ranuni(-1);
 output;
 end;
end:
```

```
data TANK6A; set TANK6;
 if row = 1 and position = 1 then tankn = '6A1';
  if row = 1 and position = 2 then tankn = '6A2';
                                                                             AEH-12-PSEUDO-04
   if row = 1 and position = 3 then tankn = '6A3';
    if row = 2 and position = 1 then tankn = '6B1';
     if row = 2 and position = 2 then tankn = '6B2';
      if row = 2 and position = 3 then tankn = '6B3';
       if row = 3 and position = 1 then tankn = '6C1';
        if row = 3 and position = 2 then tankn = '602';
         if row = 3 and position = 3 then tankn = '603';
     run:
proc sort data=TANK6A;
 by x;
run;
data assign_trt_TANK6A; set TANK6A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
  run:
proc print data= assign_trt_TANK6A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
run;
data TANK7;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
run:
data TANK7A; set TANK7;
 if row = 1 and position = 1 then tankn = '7A1';
  if row = 1 and position = 2 then tankn = '7A2':
   if row = 1 and position = 3 then tankn = '7A3';
   if row = 2 and position = 1 then tankn = '7B1';
     if row = 2 and position = 2 then tankn = '782';
      if row = 2 and position = 3 then tankn = '7B3';
       if row = 3 and position = 1 then tankn = '701';
        if row = 3 and position = 2 then tankn = '702';
        if row = 3 and position = 3 then tankn = '703';
                                                                           Page __!5 of _30
     run;
proc sort data=TANK7A;
by x;
run;
```

```
data assign_trt_TANK7A; set TANK7A;
 if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
                                                                            AEH-12-PSEUDO-04
   if _n_ = 3 then trt = '6h';
    if _n_ = 4 then trt = '9h';
  if _n_ = 5 then trt = '9h';
  if _n_ = 6 then trt = '9h';
   if _n_ = 7 then trt = '12h';
    if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
  run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
title4 h=1 'Shawano' - bottom injection Treatment ';
run;
data TANK8;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
  x = ranuni(-1);
  output;
  end;
 end;
data TANK8A; set TANK8;
 if row = 1 and position = 1 then tankn = '8A1':
  if row = 1 and position = 2 then tankn = '8A2';
   if row = 1 and position = 3 then tankn = '8A3';
    if row = 2 and position = 1 then tankn = '8B1';
     if row = 2 and position = 2 then tankn = '8B2';
      if row = 2 and position = 3 then tankn = '8B3';
       if row = 3 and position = 1 then tankn = '8C1';
        if row = 3 and position = 2 then tankn = '802';
         if row = 3 and position = 3 then tankn = '803';
     run:
proc sort data=TANK8A;
by x;
run;
data assign_trt_TANK8A; set TANK8A;
if _n_ = 1 then trt = 6h';
 if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
  if _n_ = 7 then trt = '12h';
                                                                          Page 16 of 30
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
proc print data= assign_trt_TANK8A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
```

```
run;
data TANK9;
do row = 1 to 3 by 1;
 do position = 1 to 3 by 1;
                                                                           AEH-12-PSEUDO-03
  x = ranuni(-1);
  output;
  end;
 end;
run:
data TANK9A; set TANK9;
 if row = 1 and position = 1 then tankn = '9A1';
  if row = 1 and position = 2 then tankn = '9A2';
   if row = 1 and position = 3 then tankn = '9A3';
    if row = 2 and position = 1 then tankn = '9B1';
     if row = 2 and position = 2 then tankn = '9B2';
      if row = 2 and position = 3 then tankn = '983';
       if row = 3 and position = 1 then tankn = '901';
        if row = 3 and position = 2 then tankn = '902';
         if row = 3 and position = 3 then tankn = '903';
     run;
proc sort data=TANK9A;
by x;
run;
data assign_trt_TANK9A; set TANK9A;
if _n_ = 1 then trt = '6h';
  if _n_ = 2 then trt = '6h';
  if _n_ = 3 then trt = '6h';
   if _n_ = 4 then trt = '9h';
 if _n_ = 5 then trt = '9h';
 if _n_ = 6 then trt = '9h';
if _n_ = 7 then trt = '12h';
   if _n_ = 8 then trt = '12h';
 if _n_ = 9 then trt = '12h';
 run;
proc print data= assign_trt_TANK2A;
title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on artifical
title2 h=1.5 'AEH-12-PSEUDO-04';
title3 h=1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
title4 h=1 'Shawano - bottom injection Treatment ';
          8/13/12
```

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```
1889 * date created : 13 August 2012 - JAL 1890 * Verified by: _____ (Date:____)
                                                              page ____ of ___
1891 * Random allocation of treatment to tank.sas
$$1.0-CQUDD-0:
1893 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
1894
1895
     FOOTNOTE1 'Analysis performed by J. Lucma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
1896
      options ls=105 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
1897
     /*Random assignment of treatment to experimental tanker/
1898
1899
      /*Location/exposure type: Shawano - bottom injection treatment*/
1900
      data TANK1;
1901
1902 do row = 1 to 3 by 1;
1903
      do position = 1 to 3 by 1;
       x = ranuni(-1);
1904
1905
       output;
1906
       end;
1907
       end;
1908 run;
NOTE: The data set WORK. TANK! has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
      cpu time
                         0.01 seconds
1909 data TANK1A; set TANK1:
1910 if row = 1 and position = 1 then tankn = '1A1';
       if row = 1 and position = 2 then tankn = '1A2';
1911
1912
        if row = 1 and position = 3 then tankn = 1A3';
         if row = 2 and position = 1 then tankn = '1B1';
1913
          if row = 2 and position = 2 then tankn = '182';
1915
           if row = 2 and position = 3 then tankn = '1B3';
            if row = 3 and position = 1 then tankn = '1C1';
1916
             if row = 3 and position = 2 then tankn = '102';
1917
1918
              if row = 3 and position = 3 then tankn = '103';
1919
          run;
NOTE: There were 9 observations read from the data set WORK. TANK1.
NOTE: The data set WORK.TANK1A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
                        0.01 seconds
     opu time
                        0.01 seconds
1920 proc sort data=TANK1A;
1921 by x;
1922 run;
                                                                           Page 18 of 30
NOTE: There were 9 observations read from the data set WORK.TANK1A.
NOTE: The data set WORK.TANKIA has 9 observations and 4 variables.
NCTE: PROCEDURE SORT used (Total process time):
     real time
                       0.01 seconds
     opu time
                        0.01 seconds
```

```
1923
     data assign_trt_TANK1A; set TANK1A;
1924
                                                                          AEH-12-PSEUDO-04
1925
      if _n_ = 1 then trt = '6h';
1926
        if __n_ = 2 then trt = '6h';
1927
         if _n_ = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
1928
       if _n_ = 5 then trt = '9h';
        if _n_ = 6 then trt = '9h';
1930
        if _n_ = 7 then trt = '12h';
1931
         if _n_ = 8 then trt = '12h';
1932
       if _n_ = 9 then trt = '12h ;
1933
1934
NOTE: There were 9 observations read from the data set WORK.TANK1A.
NOTE: The data set WORK.ASSIGN_TRT_TANK1A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.03 seconds
      cpu time :
                         0.03 seconds
1935 proc print data= assign_trt_TANK1A;
1936 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
1936! artifical substrates';
1937 title2 h=1.5 'AEH-12-PSEUDO-04';
1938 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 1 ***';
1939 title4 h=1 'Shawano - bottom injection Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK1A.
NOTE: PROCEDURE PRINT used (Total process time):
                     0.01 seconds
     cpu time
                        0.01 seconds
1941
1942 data TANK2;
1943 do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
1945
       x = ranuni(-1);
1946
       output;
1947
       end;
1948
      end;
NOTE: The data set WORK.TANK2 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                  0.01 seconds
     cpu time
                         0.01 seconds
                                                                     1950 data TANK2A; set TANK2;
      if row = 1 and position = 1 then tankn = '2A1';
1951
1952
       if row = 1 and position = 2 then tankn = '2\Lambda2';
       if row = 1 and position = 3 then tankn = '2A3';
1953
```

```
1954
          if row = 2 and position = 1 then tankn = '2B1':
           if row = 2 and position = 2 then tankn = '282';
1955
            if row = 2 and position = 3 then tankn = '2B3';
1956
1957
             if row = 3 and position = 1 then tankn = '2C1';
1958
              if row = 3 and position = 2 then tankn = '202';
                                                                           AEH-12-PSEUDO-03
               if row = 3 and position = 3 then tankn = '203';
1959
1960
NOTE: There were 9 observations read from the data set WORK, TANK2.
NOTE: The data set WCRK.TANK2A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
      cpu time
                         0.01 seconds
1961 proc sort data=TANK2A;
1962 by x;
1963 run;
NOTE: There were 9 observations read from the data set WORK.TANK2A.
NOTE: The data set WORK.TANK2A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                     0.00 seconds
      cpu time
                         0.00 seconds
1964
1965
      data assign_trt_TANK2A; set TANK2A;
1966
      if _n_ = 1 then trt = '6h';
       if _n = 2 then trt = '6h';
1968
       if _n_ = 3 then trt = '6h';
1969
         if _n_ = 4 then trt = '9h';
1970
      if n_ = 5 then trt = '9h';
1971
       if _n_ = 6 then trt = '9h';
1972
       if _n_ = 7 then trt = '12h';
1973
         if _n_ = 8 then trt = '12h';
1974
       if _n_ = 9 then trt = '12h';
1975
       run;
NOTE: There were 9 observations read from the data set WORK, TANK2A.
NOTE: The data set WORK.ASSIGN_TRT_TANK2A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.01 seconds
     opu time
                         0.01 seconds
1976 proc print data= assign_trt_TANK2A;
1977 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
1977! artifical substrates';
1978 title2 h=1.5 'AEH-12-PSEUDO-04';
1979 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 2 ***';
1980 title4 h=1 'Shawano - bottom injection Treatment ';
1981 run;
                                                                              Page <u>}</u>0 of <u>}</u>
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
```

```
real time
                          0.00 seconds
      cpu time
                          0.00 seconds
                                                                              AEH-12-PSEUDO-04
1982
1983
     data TANK3;
1984
      do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
1985
1986
       x = ranuni(-1);
1987
        output;
1988
        end;
1989
       end;
1990
     run;
NOTE: The data set WORK.TANK3 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                     0.01 seconds
      opu time
                          0.01 seconds
      data TANK3A; set TANK3;
      if row = 1 and position = 1 then tankn = '3A1';
1992
       if row = 1 and position = 2 then tankn = '3A2';
1994
         if row = 1 and position = 3 then tankn = '3A3';
         if row = 2 and position = 1 then tankn = '3B1';
1995
1996
           if row = 2 and position = 2 then tankn = '3B2';
1997
            if row = 2 and position = 3 then tankn = '3B3';
             if row = 3 and position = 1 then tankn = '3C1';
1998
1999
              if row = 3 and position = 2 then tankn = '302';
2000
              if row = 3 and position = 3 then tankn = '303';
2001
           run:
NOTE: There were 9 observations read from the data set WORK.TANK3.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.03 seconds
      opu time
                         0.03 seconds
2002 proc sort data=TANK3A;
2003 by x;
2004 run;
NOTE: There were 9 observations read from the data set WORK.TANKBA.
NOTE: The data set WORK.TANK3A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                      0.01 seconds
                         0.01 seconds
     cpu time
2005
2006
     data assign_trt_TANK3A; set TANK3A;
2007
      if _n_ = 1 then trt = '6h';
                                                                   Page _ 2\ __ of _30
2008
       if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
if _n_ = 4 then trt = '9h';
2009
```

2010

```
2011 if _n_ = 5 then trt = '9h';
        if _n_ = 6 then trt = '9h';
 2012
 2013
         if _n_ = 7 then trt = '12h';
 2014
          if _n_ = 8 then trt = '12h';
                                                                            AEH-12-PSEUDO-04
      if _n_ = 9 then trt = '12h';
 2015
2016
       run;
NOTE: There were 9 observations read from the data set WORK.TANKSA.
NOTE: The data set WORK.ASSIGN_TRT_TANK3A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.01 seconds
      cpu time
                         0.01 seconds
2017 proc print data= assign_trt_TANK3A;
2018 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on
2018 | artifical substrates';
2019 title2 h=1.5 'AEH-12-PSEUDO-04';
2020 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 3 ***';
2021 title4 h=1 'Shawano - bottom injection Treatment';
2022 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN TRI TANKSA.
NOTE: PROCEDURE PRINT used (Total process time):
                         0.00 seconds
      cpu time
                         0.00 seconds
2023 data TANK4;
2024 do row = 1 to 3 by 1;
2025
      do position = 1 to 3 by 1;
2026
       x = ranuni(-1);
2027
       output;
2028
       end;
2029
      end;
NOTE: The data set WORK.TANK4 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                 0.01 seconds
      cpu time
                         0.01 seconds
2031 data TANK4A; set TANK4;
2032
      if row = 1 and position = 1 then tankn = '4A1';
2033
       if row = 1 and position = 2 then tankn = '4A2';
        if row = 1 and position = 3 then tankn = '4A3';
2034
         if row = 2 and position = 1 then tankn = '4B1';
2036
          if row = 2 and position = 2 then tankn = '4B2';
           if row = 2 and position = 3 then tankn = '4B3';
2037
            if row = 3 and position = 1 then tankn = '401';
2038
2039
             if row = 3 and position = 2 then tankn = '402';
                                                                        Page 77 of 30
2040
              if row = 3 and position = 3 then tankn = '403';
2041
```

NOTE: There were 9 observations read from the data set WORK.TANK4.

```
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      opu time
                         0.01 seconds
                                                                          AEH-12-PSEUDO-01
2042 proc sort data=TANK4A;
2043 by x;
2044 run;
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK.TANK4A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                     0.01 seconds
      cpu time
                         0.01 seconds
2045
2046 data assign_trt_TANK4A; set TANK4A;
2047
      if _n_ = 1 then trt = '6h';
      if _n_ = 2 then trt = '6h';
2048
2049
       if _n_ = 3 then trt = '6h';
         if _n_ = 4 then trt = '9h';
2050
      if _n_ = 5 then trt = '9h';
2051
2052
      if _n_ = 6 then trt = '9h';
2053
       if _n_ = 7 then trt = '12h';
2054
         if _n_ = 8 then trt = '12h';
2055
      if _n_ = 9 then trt = '12h';
NOTE: There were 9 observations read from the data set WORK.TANK4A.
NOTE: The data set WORK. ASSIGN_TRT_TANK4A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                       0.01 seconds
     cpu time
                         0.01 seconds
2057 proc print data= assign_trt_TANK4A;
2058 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
2058; artifical substrates';
2059 title2 h=1.5 'AEH-12-PSEUDO-04';
2060 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 4 ***';
2061 title4 h=1 'Shawaro - bottom injection Treatment ';
2062 run;
NOTE: There were 9 observations read from the data set WORK, ASSIGN_TRT_TANK4A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                  0.00 seconds
     cpu time
                         0.00 seconds
2063 data TANK5;
                                                                      Page <u>35</u> of 30
2064 do now = 1 to 3 by 1;
     do position = 1 to 3 by 1;
2065
2066
      x = ranuni(-1);
```

2067

output;

```
2068
        end;
2069
       end;
2070 run;
                                                                             AEH-12-PSEUDO-04
NOTE: The data set WORK.TANK5 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
                          0.01 seconds
      cpu time
                          0.01 seconds
2071 data TANK5A; set TANK5;
       if row = 1 and position = 1 then tankn = '5A1';
2073
        if row = 1 and position = 2 then tankn = '5A2';
         if row = 1 and position = 3 then tankn = '5A3';
2074
2075
          if row = 2 and position = 1 then tankn = '5B1':
2076
           if row = 2 and position = 2 then tankn = '5B2';
2077
            if row = 2 and position = 3 then tankn = '5B3';
2078
             if row = 3 and position = 1 then tankn = '5C1';
              if row = 3 and position = 2 then tankn = '502';
2079
               if row = 3 and position = 3 then tankn = '503';
2080
2081
           run:
NOTE: There were 9 observations read from the data set WORK.TANKS.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
2082 proc sort data=TANK5A;
2083
      by x;
2084 run;
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.TANK5A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                          0.00 seconds
      cpu time
                          0.00 seconds
2085
2086
     data assign_trt_TANK5A; set TANK5A;
      if _n_ = 1 then trt = '6h';
2087
2088
        if _n_ = 2 then trt = '6h';
2089
        if _n_ = 3 then trt = '6h';
2090
         if _n_ = 4 then trt = 9h';
2091
       if _n_ = 5 then trt = '9h';
       if _n_ = 6 then trt = '9h';
2093
        if _{n_{}} = 7 then trt = '12h';
2094
         if _n_ = 8 then trt = '12h';
2095
       if _n_ = 9 then trt = '12h';
                                                                             Page 24 of 30
2096
       run:
NOTE: There were 9 observations read from the data set WORK.TANK5A.
NOTE: The data set WORK.ASSIGN_TRT_TANK5A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
```

```
real time
                          0.01 seconds
       cpu time
                          0.01 seconds
                                                                            AEH-12-PSEUDO-CA
 2097 proc print data= assign_trt_TANK2A;
 2098 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra musses1 on
 2098! artifical substrates';
 2099 title2 h=1.5 'AEH-12-PSEUDO-04';
 2100 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 5 ***';
2101 title4 h=1 'Shawano - bottom injection Treatment ';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
2103 data TANK6;
2104 do row = 1 to 3 by 1;
2105 do position = 1 to 3 by 1;
2106
       x = ranuni(-1);
2107
       output;
2108
       end;
2109
      end;
2110 run;
NOTE: The data set WORK.TANK6 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                    0.01 seconds
      opu time
                         0.01 seconds
2111 data TANK6A; set TANK6;
2112 if row = 1 and position = 1 then tankn = ^{1}6A1^{1};
       if row = 1 and position = 2 then tankn = '6A2';
2113
2114
        if row = 1 and position = 3 then tankn = '6A3';
         if row = 2 and position = 1 then tankn = '6B1';
2116
           if row = 2 and position = 2 then tankn = '6B2';
           if row = 2 and position = 3 then tankn = '6B3';
2117
             if row = 3 and position = 1 then tankn = '601';
2118
2119
             if row = 3 and position = 2 then tankn = '602';
2120
              if row = 3 and position = 3 then tankn = '603';
2121
           run:
NOTE: There were 9 observations read from the data set WORK.TANK6.
NOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.01 seconds
      cpu time
                         0.01 seconds
                                                                       Page 25 of 3.
2122 proc sort data=TANK6A;
2123 by x;
2124 run;
```

```
NOTE: There were 9 observations read from the data set WORK, TANK6A.
MOTE: The data set WORK.TANK6A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                 0.00 seconds
                                                                          AEH-12-PSEUDO-01
                        0.00 seconds
      cpu time
2125
2126 data assign_trt_TANK6A; set TANK6A;
      if _n_ = 1 then trt = '6h';
       if _n_ = 2 then trt = '6h ;
2128
        if _n_ = 3 then trt = '6h';
2129
         if _n_ = 4 then trt = '9h';
2130
      if _n_ = 5 then trt = '9h';
2131
       if n = 6 then trt = '9h';
        if _n_ = 7 then trt = '12h';
2133
         if _n_ = 8 then trt = '12h';
2134
2135
       if _n_ = 9 then trt = '12h';
2136
       run;
NOTE: There were 9 observations read from the data set WORK.TANK6A.
NOTE: The data set WORK.ASSIGN_TRT_TANK6A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                0.01 seconds
      cpu time
                        0.01 seconds
2137 proc print data= assign_trt_TANK6A;
2138 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra musses1 on
2138! artifical substrates';
2139 title2 h=1.5 'AEH-12-PSEUDO-04';
2140 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 6 ***';
2141 title4 h=1 'Shawano - bottom injection Treatment';
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK6A.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                     0.00 seconds
     cpu time
                        0.00 seconds
2143 data TANK7;
2144 do row = 1 to 3 by 1;
2145 do position = 1 to 3 by 1;
      x = ranuni(-1);
2:46
2147
       output;
2148
       end:
2149
      end;
2150 run;
NOTE: The data set WORK.TANK7 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
                                                                        Page Jo of 30
                      0.01 seconds
     opu time
                        0.01 seconds
```

```
2151 data TANK7A; set TANK7;
       if row = 1 and position = 1 then tankn = '7A1';
       if row = 1 and position = 2 then tankn = '7A2';
2153
         if row = 1 and position = 3 then tankn = '7A3';
                                                                            AEH-12-PSEUDO-C:
2155
          if row = 2 and position = 1 then tankn = '7B1';
           if row = 2 and position = 2 then tankn = '7B2';
2156
            if row = 2 and position = 3 then tankn = '7B3';
2157
2158
             if row = 3 and position = 1 then tankn = '701';
2159
              if row = 3 and position = 2 then tankn = '702';
2160
               if row = 3 and position = 3 then tankn = '703';
2161
           run;
NOTE: There were 9 observations read from the data set WORK.TANK7.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
      real time
                          0.01 seconds
      cpu time
                          0.01 seconds
2162 proc sort data=TANK7A;
2163
      by x;
2164 run;
NCTE: There were 9 observations read from the data set WORK, TANK7A.
NOTE: The data set WORK.TANK7A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.00 seconds
      cpu time
                          0.00 seconds
2165
2166 data assign_trt_TANK7A; set TANK7A;
      if _n_ = 1 then trt = '6h';
2168
       if _n_ = 2 then trt = '6h';
        if _n_ = 3 then trt = '6h';
2169
2170
         if _n_ = 4 then trt = '9h';
       if _n_ = 5 then trt = '9h';
2171
2172
       if _n_ = 6 then trt = '9h';
        if _n_ = 7 then trt = '12h';
2173
2174
         if _n_ = 8 then trt = '12h';
2175
       if _n_ = 9 then trt = '12h';
2176
       run:
NOTE: There were 9 observations read from the data set WORK.TANK7A.
NOTE: The data set WORK.ASSIGN_TRT_TANK7A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.01 seconds
     cpu time
                         0.01 seconds
                                                                         Page 27 of 30
2177 proc print data= assign_trt_TANK2A;
2178 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
2178! artifical substrates';
2179 title2 h=1.5 'AEH-12-PSEUDO-04';
2180 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 7 ***';
2181 title4 h=1 'Shawano - bottom injection Treatment ';
```

```
2182 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                     0.00 seconds
      cpu time
                         0.00 seconds
                                                                          AEH-12-PSEUDO-01
2183 data TANK8;
2184 do row = 1 to 3 by 1;
2185 do position = 1 to 3 by 1;
2186
       x = ranuni(-1);
2187
       output;
2188
      end;
2189
      end;
NOTE: The data set WORK.TANK8 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time
                 0.01 seconds
      cpu time
                         0.01 seconds
2191 data TANK8A; set TANK8;
      if row = 1 and position = : then tankn = '8A1';
2192
       if row = 1 and position = 2 then tankn = '8A2';
2194
        if row = 1 and position = 3 then tankn = '8A3';
         if row = 2 and position = 1 then tankn = '8B1';
2195
2196
          if row = 2 and position = 2 then tankn = '8B2';
           if row = 2 and position = 3 then tankn = '8B3';
2197
            if row = 3 and position = 1 then tankn = '8C1';
2198
             if row = 3 and position = 2 then tankn = '802';
2199
2200
              if row = 3 and position = 3 then tankn = '803';
2201
NOTE: There were 9 observations read from the data set WORK.TANK8.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.01 seconds
     cpu time
                        0.01 seconds
2202 proc sort data=TANK8A;
2203 by x;
2204 run;
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NOTE: The data set WORK.TANK8A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time);
     real time
                        0.00 seconds
     opu time
                        0.00 seconds
                                                                  Page 28 of 30
2205
2206 data assign_trt_TANK8A; set TANK8A;
2207 if _n_ = 1 then trt = '6h';
```

```
if _n_ = 2 then trt = '6h';
         if _n_ = 3 then trt = '6h';
2209
          if _n_ = 4 then trt = '9h';
2210
2211
       if _n_ = 5 then trt = '9h';
2212
       if _n_ = 6 then trt = '9h';
                                                                           AEH-12-PSEUDO-01
         if _n_ = 7 then trt = '12h';
2213
          if _n_ = 8 then trt = '12h';
2214
2215
       if _n_ = 9 then trt = '12h';
2216
        run;
NOTE: There were 9 observations read from the data set WORK.TANK8A.
NCTE: The data set WORK.ASSIGN_TRT_TANK8A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time);
      real time
                          0.01 seconds
      opu time
                          0.01 seconds
2217 proc print data= assign_trt_TANK8A;
2218 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A) for controlling zebra mussesl on
22181 artifical substrates';
2219 title2 h=1.5 'AEH-12-PSEUDO-04';
2220 title3 h=1 'Random assignment of substrate removal from tanks *** TANK 8 ***;
2221 title4 h≃1 'Shawano - bottom injection Treatment ';
2222 run:
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK8A.
NOTE: PROCEDURE PRINT used (Total process time):
                         0.01 seconds
      cou time
                         0.01 seconds
2223 data TANK9:
2224 do row = 1 to 3 by 1;
      do position = 1 to 3 by 1;
2225
2226
       x = ranuni(-1);
2227
       output;
2228
       end;
2229
      end;
2230 run:
NOTE: The data set WORK.TANK9 has 9 observations and 3 variables.
NOTE: DATA statement used (Total process time):
     real time
                         0.03 seconds
     opu time
                         0.03 seconds
2231 data TANK9A; set TANK9;
2232. if row = 1 and position = 1 then tankn = '9A1';
       if row = 1 and position = 2 then tankn = '9A2';
2233
2234
        if row = 1 and position = 3 then tankn = '9A3';
         if row = 2 and position = 1 then tankn = '9B1';
2235
2236
          if row = 2 and position = 2 then tankn = '9B2';
                                                                       Page 29 of 30
2237
           if row = 2 and position = 3 then tankn = '9B3';
2238
            if row = 3 and position = 1 then tankn = '9C1';
2239
             if row = 3 and position = 2 then tankn = '902';
              if row = 3 and position = 3 then tankn = '903';
2240
```

```
2241
NOTE: There were 9 observations read from the data set WORK, TANK9.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: DATA statement used (Total process time):
                                                                            AEH-12-PSEUDO-04
      real time
                          0.03 seconds
      opu time
                          0.03 seconds
2242 proc sort data=TANK9A:
2243
      by x;
2244 run;
NOTE: There were 9 observations read from the data set WORK.TANK9A.
NOTE: The data set WORK.TANK9A has 9 observations and 4 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                        0.01 seconds
      cpu time
                          0.01 seconds
2245
2246 data assign_trt_TANK9A; set TANK9A;
2247
      if _n_ = 1 then trt = '6h';
       if _n_ = 2 then trt = '6h';
2248
        if _n_ = 3 then trt = '6h';
2249
2250
         if _n_ = 4 then trt = '9h';
2251
       if _n_ = 5 then trt = '9h';
2252
       if _n_ = 6 then trt = '9h';
        if _n_ = 7 then trt = '12h';
2253
2254
         if _n_ = 8 then trt = '12h';
2255
       if _n_ = 9 then trt = '12h';
2256
NOTE: There were 9 observations read from the data set WCRK.TANK9A.
NOTE: The data set WORK.ASSIGN_TRT_TANK9A has 9 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
      opu time
                         0.01 seconds
2257 proc print data= assign_trt_TANK2A;
2258 title1 h=2 'Efficacy of Pseudomonas fluorescens (Pf-CL145A)for controlling zebra mussesl on
2258! artifical substrates';
2259 title2 h=1.5 'AEH-12-PSEUDO-04';
2260 title3 h≈1 'Random assignment of substrate removal from tanks *** TANK 9 ***';
2261 title4 h=1 'Shawano - bottom injection Treatment ';
2262 run;
NOTE: There were 9 observations read from the data set WORK.ASSIGN_TRT_TANK2A.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                        0.00 seconds
     cpu time
                         0.00 seconds
                                                                          Item No. 3
                                                                          Pg 30 of 30
        8/13/252
```

NOTE: This SAS session is using a registry in WORK. All changes will be lost at the end of this sess

Appendix 4. Test Article Information

Item Number	Item Description	Number of Pages	Report Page Number
1	Material Safety Data Sheet: MBI-401 SDP	2	240
2	MBI-401 SDP (lots # 401P12163C and 401P12164C) Test Article: UPS Next Day Air Label (shipped to Jim Luoma)	1	242
3	MBI-401 SDP (lot # 401P12163C) Test Article: Certificate of Analysis	1	243
4	MBI-401 SDP (lot # 401P12164C) Test Article: Certificate of Analysis	1	244
5	"Test Chemical Stock Preparation Data Form" Datasheet (Lake Carlos)	1	245
6	"Test Chemical Stock Preparation Data Form" Datasheet (Lake Shawano)	1	246
7	FedEx Priority Overnight Airbill (shipped to Denise Mayer) for post-treatment product validation – dated January 8, 2013	1	247
8	NYSM Post –Treatment Product Validation Assay MBI-401 SDP lot #(s) 401P12163C and 401P12164C Mix	3	248
9	Copy of test article log book for MBI-401 SDP; lot #(s) 401P12163C and 401P12164C Mix; Container 1 of 6 (Used for Lake Carlos)	5	251
10	Copy of test article log book for MBI-401 SDP; lot #(s) 401P12163C and 401P12164C Mix; Container 2 of 6 (Used for Lake Carlos)	4	256
11	Copy of test article log book for MBI-401 SDP; lot #(s) 401P12163C and 401P12164C Mix; Container 3 of 6 (Used for Lake Shawano)	4	260
12	Copy of test article log book for MBI-401 SDP; lot #(s) 401P12163C and 401P12164C Mix; Container 4 of 6 (Used for Lake Shawano)	4	264
13	Copy of test article log book for MBI-401 SDP; lot #(s) 401P12163C and 401P12164C Mix; Container 6 of 6 (Used for Lake Carlos water analysis by RMB Environmental Laboratories)	4	268

	MATERIAL SAFETY DATA SHEET	DATA.	SHEET
31 Spray Dried Powder, August 2010			Page 1 of 2
ct Name: MBI-401 SDP		ntact:	Contact: Marrone Bio Innovations, 2121 Second Street, Suite B-107, Davis, CA 95618
ames/Synonyms:	MBI-401 SDP		Phone (Business hours): 530-750-2800
gistration Number:	None, Experimental		www.marroncbioinnovations.com
Research Authorization #: 0030-RP-10	0030-RP-10		For emergencies such as leaks or spills call CHEMTREC 24-hour
· Hazarde	Ta hallstion		toll-free hotline at 1.800.424.9300

EDITION SOLEY ENTER FOWER, AUGUST 2010	Page Lorz	
roduct Name: MBI-401 SDP	Contact: Marrone Bio Innovations, 2121 Second Street, Suite B-107. Davis, CA 95618	
rade names/ Synonyms: MBI-401 SDP	Phone (Business hours): 530-750-2800	
Ħ	www.marronebioinnovations.com	
Authorization #:	For emergencies such as leaks or spills call CHEMTREC 24-hour	
ECTION I: MATERIAL IDENTIFICATION	SECTION 5: HEALTH HAZARDS	
-1	9	
ommon Name: CL145A strain of Pseudomonas fluorescens		
folecular Formula; Not applicable		
AS Number: Not applicable		
ercent , 50%	Skin/ Eye Irritation: May be irritating to skin and eyes for some individuals.	
THER INGREDIENTS: inert, non-reactive	Effects of Overexposure: If product comes in contact with eyes or skin,	
PHYSIC	Toxicity: None of the components of this product are listed	
	as carcinogenic by NTP, IARC, OSHA	Ц
ulk Density: 0.78 g/ml	Acute studies:	
Vater:	Acute Oral LD ₅₀ (Rat): >5,000 mg/kg (very low toxicity)	
rance:	The section of the se	
•	Primary Dermal Irritation Slight Irritation, Class 4	
שמינים, ווננגניץ		
ECTION 3: FIRE AND EXPLOSION DATA	Inhalarion: >2.25 g/ml, Class 4	
int:		
Aethod: Not applicable	SECTION OF FIRST AID	
Extinguishing Media: Use extinguishing media appropriate for the surrounding fire	If in eyes: Hold eye open and rinse slowly and gently with water for 15-20	
pecial Fire Fighting	minutes. Remove contact lenses, if present, after the first 5	
rocedures: None	minutes, then continue rinsing eye. Call a poison control center	
	of doctor for treatment advice.	
Aplosion Hazards: None	If inhaled: Move person to fresh air. If person is not breathing, call 911 or	
ECTION 4: REACTIVITY	an ambulance, then give artificial respiration, preferably mouth-	
tability: Material is non-reactive	If on skin: Take off contaminated clothing. Rinse skin immediately with	П
olymerization: Does not occur	plenty of water for 13-20 minutes. Call a poison control center	
acompatibility: None known	or doctor for further treatment advice.	
mposition	If swallowed: Call a poison control center or doctor immediately for treatment	
	advice. Have person sip a glass of water if able to swallow. Do	
Conditions to avoid: None known	not induce vomiting unless told to by a poison control center or	_
	doctor. Do not give anything by mouth to an unconscious person.	

File Folder: Item Number: _

MATERIAL SAFETY DATA SHEET

MBI-401 Spray Dried Powder, August 2010 SECTION 7: SPILL LEAK AND DISPOSAL PROCEDURES Steps to be taken in case material is released or spilled: SECTION 10: SHIPPING REGULATIONS None

Weste disposal method: Dispose of in accordance with all applicable federal, state, and local environmental regulations. Wear suitable protective clothing such as long-sleeved shirt, pants, waterproof gloves and shoes with socks. Carefully mop or sweep up spill and place in a closed container for disposal.

For emergencies such as leaks or spills, call CHEMTREC 24-hour toll-free hotline at 1.800.424.9300.

SPECIAL HANDLING

mixing/loading the product. Use a NIOSH approved respirator with any N-95, P-95, R-95 or HE filter for biological products when

Wear gloves made of Latex or other impervious Safety goggles or safety glasses with side shields

Eye protection:

Protective gloves:

Other protective clothes: Clothing to prevent prolonged skin contact as needed such as long-sleeved shirt, long pants and shoes with socks.

biological products when mixing/loading the product Use a NIOSH approved respirator with any N-95, P-95, R-95 or HE filter for Precautions to be taken in handling and storing: SPECIAL PRECAUTIONS

Empty container completely and dispose of in accordance with all applicable

Keep container closed when not in use.

Store in a dry area inaccessible to children. Store in original containers only

federal, state, and local environmental regulations.

Wash any contamination from skin or eyes immediately. Wash hands and

exposed skin before eating, drinking, smoking after work or using the toilet

Flammability: Reactivity: Inc. (MBI) believes to be accurate. No warranty, expressed or implied, is intended. The information is provided solely for your information and consideration and MBI assumes no legal responsibility for use or reliance This document set forth is based on information that Marrone Bio Innovations,

Proper shipping name:
DOT Label (s) Required:
Freight Classification: Sudden Release of Pressure: National Fire Protection Association Rating: Health: None Immediate (acute) Health: SARA Title III Hazard Classification: Delayed (chronic) Health: None None None Insecticides, Fungicides N.O.I., Other Than Poisons. NMFC 102120 Class 60

Marrone Bio Innovations

File Folder:

Item Number:

THE STATE EDUCATION DEPARTMENT / OFFICE OF CULTURAL EDUCATION



New York State Museum Field Research Laboratory 51 Fish Hatchery Road Cambridge, NY 12816 Tel. 518-677-8245 Fax 518-677-5236 E-mail: dmayer@mail.nysed.gov

AEH-12-PSEUDO-04

PACKING LIST DATE OF SHIPMENT - 2012/08/06

Ship from:
Denise Mayer
New York State Museum
Field Research Laboratory
51 Fish Hatchery Road
Cambridge, NY 12816

Ship To: Jim Luoma USGS UMESC 2630 Fanta Reed Road La Crosse, WI 54603

Shipping Method: UPS Next Day Air Required by: 2012/08/07

Item Description:

MBI-401 SDP Lot # 401P12163C and 401P12164C Mix in six containers of approximately 0.5 Kg each (total weight 3 Kg):

Packaged by D. Mayer. Shipped on ice. Store at 4°C, protected from light.

Manufactured: 06-21-2012 Expiration date 06-21-2013

		•				
File Folder:	Item Number:		Page	ì	of	ì



AEH-12-PSEUDO-04

CERTIFICATE OF ANALYSIS

•	Name of Product:	MBI-401 SDP
	Active Ingredient:	100% Pseudomonas fluorescens strain CL145A cells and spent fermentation media
	Percent Active Ingredient:	50% by weight
	Viable Cfu/g;	0 cfu/g. Pseudomonas fluorescens strain CL145A
	Lot Number:	401P12163C
	Mussel Bioassay:	Pass
	Appearance:	Tan powder
	Storage Conditions:	4 °C, protected from light
	Date of Manufacture:	21 June 2012
	Expiration Date:	21 June 2013
	Quality Control:	Date: 01 August 2012
	2121 Second Street, Suite	B-107 • Davis, CA 95618 • Phone: 530-750-2800 wrong item number: 127 14 Item Number: 12 275 correct 175 127 14
File Fol	lder:	Item Number: 12 2 15 Page of



AEH-12-PSEUDO-04

CERTIFICATE OF ANALYSIS

Name of Product:	MBI-401 SDP
Active Ingredient:	100% Pseudomonas fluorescens strain CL145A cells and spent fermentation media
Percent Active Ingredient;	50% by weight
Viable Cfu/g:	0 cfu/g Pseudomonas fluorescens strain CL145A
Lot Number:	401P12164C
Mussel Bioassay:	Pass
Appearance:	Tan powder
Storage Conditions:	4 °C, protected from light
Date of Manufacture:	21 June 2012
Expiration Date:	21 June 2013
Quality Control:	Date: 01 August 2012
2121 Second Street, Suite 1	3-107 • Davis, CA 95618 • Phone: 530-750-2800
File Folder:	Item Number: 3 Page 1 of 1

Study Number: AEH-12-PSE			Reviewed by: _	77 5	Date: /6JAN14
File Folder:	Lab book/pgs: _E	-log pages!	Verifled by:	ブル	Date:///_/

Test Chemical Stock Preparation Data Form

Test Chemical: Pseudomonas fluroescens strain 145A

Test Chemical Lot #: 401P12163C and 401P12164C Mix Date Rec'd 7-Aug-12 Exp. Date 21-Jun-12

Test Organism: zebra mussels Test Location: Lake Carlos Alexandrisgiu U

Instruments Used: Metiller Toledo PG 200-5 S/N 118470288

Sertorios CPA 205D S/N 21450130

Weights of Chemical Samples:

Sample ID	Sample Weight	Comments	Date	Initials
Analytical #1	2.600075	whole water body KW 15AUGID.	12 AUG 12	KW
Analytical #2	2.000353	/		1
Stock #1	35,000			
Stock #2	35,039	7		
Stock#3	35.049			
Stock H4	70.01a			
Stuck #5	70.000			
Short #6	70.04			
Stock#7	75.015	17	V	
Stock#8	150.054	/	id plug b	In

<u>NOTE:</u> Chemical samples to be stored refrigerated until used for stock preparation.

Stock Solution Preparation:

Sample ID	Dilution Volume (mL)	Dilution Time	Use	Exposure Time	Date	Initials
Analytical #	500	0800	by storded care was	ody —	GANGIA	ŧω
Stock#1	8000	00945	Tank I whole body	0945	1	_7
Stock#2	8000	o	Tank & whole body	0954		
Stock#3	8000	0-	Tank 4 whole body	0958		
Stock #4	8000	0	Tank 9 whole body	l .		
Stock 45	8000	0 —	Tank 7 wholebody	1010	↓	_
Stock#6	COOS	0	Tank le wholeborly	1015	15mu612	ku
Analytical #2	500	0830	year to make diliners		17-14412	fn
Stock #8	2500	0940	100mg/L tanks	<u> </u>	17AUG 12	Kw
Stock #7	2500	1015	Stong/ takes	Ø	17/14/12	Fa

Ostock was not diluted. Mixed with tank water and poured back into tank. For 15Augus	
BTANK 9-1008 Tank 1-1006 Tank 3-1031 Tank 5-1030 Tank 1-1106 Tank 1-1106	
Tank 2 - 1031 Line 1 - 1096	
Tank 5-130 Tank 1 wal work over Rul7 to 12 Item Number: 5 Page 1 of	

Study Numbe	r: AEH-1	L2-PSEUDO-04	Reviewed by: 775	Date: 163AN/4
File Folder:	7	Lab book/ogs: E-log Pages 20-2]	Verified by: Jay	Date; 2/11/14

Test Chemical Stock Preparation Data Form

Test Chemical: Pseudomonas fluroescens strain 145A

Test Chemical Lot #: 401P12163C and 401P12164C Mix Date Rec'd 7-Aug-12 Exp. Date 21-Jun-12

Test Organism: zebra mussels Test Location: Shawaho
Instruments Used: Methler Toledo PG 202-5 5/N 11847088
Sartinis CPA 2050 5/N 26450930

Weights of Chemical Samples:

Sample ID	Sample Weight	Comments	Date	Initials
Analytical #1	2,000924	/	2724412	KW
Analytical #2	2.000290		1	
Stock #1	35.105			
Stock#2	35,069			
Stock#3	35.079			
Stock#5	70.029		<u> </u>	
Shok#5	70.049			
Stock#6	70.024			
Stock#6 Stock#1	60A09		V	J
Stock H8	120.07	/	291445	Yev

NOTE: Chemical samples to be stored refrigerated until used for stock preparation.

Stock Solution Preparation:

Sample ID	Dilution Volume (mL)	Dilution Time	Use	Exposure Time	Date	Initials
Analytical #1	500	0800	Standard curve for whole tank	While	65ER12	plw
Stock#1	8000	0855	Tank 2 whole	09001	1	1
Shockad	8000	0902	Tank 8 whole	0905		
Shock #3	8000	0906	Tank & whole	0909		
Stockary	8700	0913	Tank-9 body	0915		
Stock#5	8000	0917	Tan K 3 whole	6970	<u> </u>	₩
Stock #6	8000	0922	Tank & buly	0925	6SEP12	pen
Anay litical to a	50o	0745	Standard for bottom	bottom	85EPIA	Fu
Stor #7	12000	0809	50my/Ltanks	0841-090	1	1
Shak #8	12000	0900	100mg/L tanks	0907-0939	850P17	Kw

Item Number:	7	Page	of	
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CALLED ONLANDON	NIA REED RI	WEW Package Express US Airbill From Please forth and press forth Therm Please forth and press forth Account Number Set 15 TAN 2013 Account Number Set 15 T
A Party Conditional Conditions of Testing Agency and Conditional Conditions of Testing Agency and Conditional Cond	Packaging - Including and Delivery Signature Options	1) F. Supers Fooles Service Transmission Problems State Light Service Transmission Problems Service Transmission Problems Service Service Transmission Problems Service Servic
File Folder:	Item Number:8_	Page of

NYSM Post-Treatment Product Validation Assay

MBI-401 SDP 401P12163C and 401P12164C Mix (USGS Study #AEH-1/2-PSEUDO-04 Field trials at Shawano and Carlos in 2012)

Involved Study number. Connect study number is AEH-12-B @Wo-04. From 27771W2014

Date product received from USGS: 2013/01/09 Date of start of test; 2013/01/09

AEH-12-P\$EUDO-04

BACKGROUND: As standard protocol for the USEPA project, each time a batch of Zequanox product is used in a test a UMESC, a portion of the product is bioassayed by the NYSM to validate toxicity post-treatment.

- MBI-401 SDP 401P12163C and 401P12164C Mix

o USGS Study #AEH-13- PSEUDO-04 Field trials at Shawano and Carlos in 2012

Interest 31-10 postupo of the 37th word

PURPOSE: Post-test product validation of MBI-401 SDP 401P12163C and 401P12164C Mix used in AEH-13-PSEUDO-04 Field Trials at lakes Shawano and Carlos.

MATERIALS AND METHODS:

Preparation of product for testing:

Product was shipped under cold conditions and held in the laboratory refrigerator at 4°C until use. Within 30 min of treatment application, prepare each at treatment stock of each MBI-401 formulated product:

MBI-401 SDP 401P12163C and 401P12164C Mix (SDP - 50% active ingredient): 3 g of the powder from each sample was added slowly to a beaker with dilution water with stirring on a stir plate for even suspension and then the total volume was adjusted to 30 ml with dilution water. The suspension was transferred to a 50 ml centrifuge and stored in refrigerator until ready to use. The suspension, when evenly dispersed was 100 mg product/ml or 50 mg a.i./ml. For 200 ppm a.i. treatments in testing jars, 2 ml were added to each testing jar (500 ml).

Cambridge CF (Standard for Positive Controls):

As an efficacy standard, we used Pf-CL145A killed CF that was maintained at -80°C (Cambridge CF). Since its production in 2005, this material has been valuable as a reference standard. The Cambridge CF was produced in 2005 (2005-0027) in 100-L batches 10, 11 and 12 and E-beamed to kill the cells. The solution, at 110 mg/ml dry weight, is stored in 1 cm thick sheets in the Cambridge ultrafreezer at -80°C. A section of the sheet was broken off and weighed to determine volume (ca. 1 g = 1 ml).

For this bioassay, a positive control suspension was produced on 06/18/2012 from the frozen blocks described above and dispensed into multiple 50-ml centrifuge tubes for single-use treatment of bioassays. The dry weight of the material was 68.15 mg/ml; therefore 1.5 ml was added to each testing jar to treat at 200 ppm.

Mussel collections:

Mussels were scraped from substrates (rocks) in the field and brought back to the lab in coolers. Mussels were held unchlorinated water in aquaria with aeration and filtration (Whisper filters) at 10±2°C. Approximately one week before the test, jars of mussels were placed in aquaria containing 10±2°C tap water with low aeration in the laboratory, wrapped in towels to slow warming, and allowed to warm to ambient laboratory temperature (20±1°C), after which filtration and high aeration was applied to the aquarium. One day prior to treatment exposure, mussels were carefully examined and placed into testing jars and allowed to attach overnight at ambient laboratory temperature (ca. 20°C).

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File Folder:	Item Number: 79 79AR	4 Page of

2013-0001 MBI-401 SDP 401P12163C and 64C Mix Post-test from 2012 field trials Validation - 2 -

AEH-12-PSEUDO-04

77	witsser confection and handring.					
	Species	Collection site	Collection date	Date in lab (20°C)	Picked for test	
	Zebra	Hedges Lake	11/07/2012	01/02/2013	01/08/2013	
	mussels	(Washington County)				

Experimental design:

For validation of efficacy the following treatments will be set up:

Zebra mussels (25 mussels/jar):

- 3 Untreated Control (A, B, C)
- 3 200 ppm (a.i.) Cambridge CF Positive Control (Pf-CL145A killed cells) (A, B, C)
- 3-200 ppm (a.i.) 401P12163C and 401P12164C Mixed (A, B, C)

Total of 9 testing jars.

Testing jar bioassay protocol:

On the day prior to treatment (01/08/2013) mussels were carefully examined and 25 mussels placed into each testing jar containing ca. 100 ml aerated hard water and allowed to attach overnight. The next morning (01/09/2013), unattached mussels were removed and replaced with attached mussels from an extra glass Petri dish. Water was replaced with 500 ml fresh aerated hard water.

After at least one hour, the treatment was applied. The optical density of each jar was measured in duplicate (A_{660 nm} Genesys Spectrophotometer).

After 24 hr of treatment, mussel mortality was checked and mussels were transferred to square plastic dishes with fresh aerated hard water. Mortality was checked and recorded each day with water replacements, for an additional 7 days (8 days total). On the final day of mortality checks, 20 mussels were measured from the untreated controls using a caliper.

Results

Mussel length: Zebra mussels 19.65 ± 2.36 mm.

Optical density of treatments;

Spirodi delibit) of treatments,	
Treatment	Mean (±SD) OD (A _{660 nm})
Untreated Control	0.001 ± 0.001
Cambridge CF (Positive Control)	0.171 ± 0.010
MBI-401 SDP 401P12163C and 401P12164	IC Mixed 0.226 ± 0.004

Zebra mussel mortality: Mussels were treated in triplicate testing jars (500 ml) at 20°C for 24 hr and mortality was recorded for a total of 55 days.

Treatment	Mean % mortality (±SD)
Untreated Control	$0.0 \pm 0.0\%$
Cambridge CF (Positive Control)	73.3 ± 8.3%
MBI-401 SDP 401P12163C and 401P12164C Mixed	70.7 ± 4.6%

Page 2 of 3

AEH-12-PSEUDO-04

2013-0001 MBI-401 SDP 401P12163C and 64C Mix Post-test from 2012 field trials Validation

MBI-401 SDP 401P12163C and 401P12164C Mixed PASSED the post-test bioassay validation (71% mortality). Untreated control mortality was 0%.

File Folder: 7 | Item Number: 79 | Page 3 of 3

CHEMICAL LOG BOOK



MBI-401 SDP

Marrone Bio Innovations Davis, California

LOT NUMBERS:
401P12163C
and
401P12164C
(Received Mixed in Containers)

Container 1 of 6

File Folder; 7a	1	Pageof5
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SIGNATURE PAGE

All personnel making an entry in this log must fill out the form below in accordance with SOP GEN 009

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SOP No. GEN 012.3 Page 5 of 7

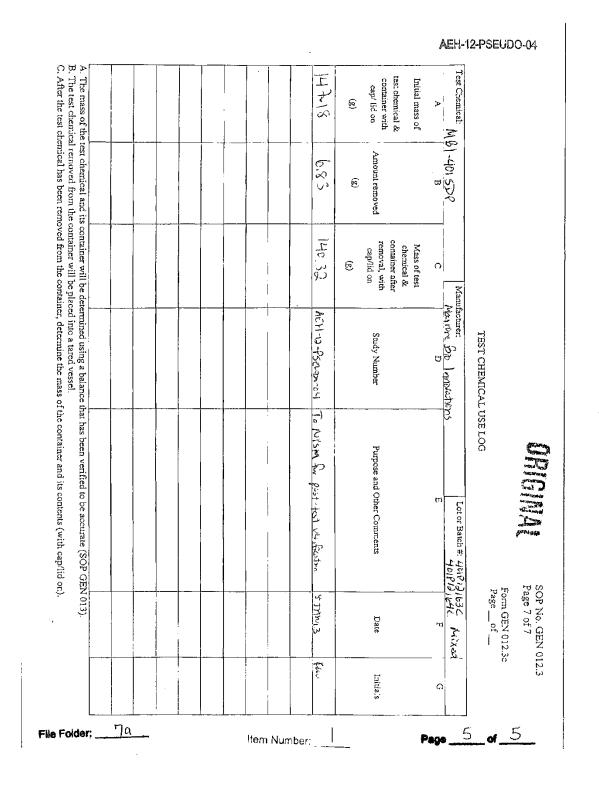
> Form GEN 012.3a Page 1 of 1

TEST CHEMICAL DATA FORM

Test Chemical (Chemical Name) MD1-401 SD6
Circle oue: (Test Article) Control Article
Trade Name of Test Chemical (Synonyms) PF-CL 145A; Texpushex
Source of Test Chemical (Manufacturer) Nature Bro Intilivations
Storage Location Refrigerater
Date Received 01 Aut 10 Few Date Opened 13 Aut 11 Few Expiration Date 21 TWO 3013 (5 years unless otherwise stated) Lie 1 Post 1820 Test Chemical Lot Number 40 Post 1820 Purity of Chemical 50%, Amount of Test Chemical Available or Received (if known) 500 Initial Mass (with cover on) of Test Chemical and Container 541.45c Characterization of Test Chemical: Color 7 Aug Physical State: liquid solid Solid Solid Form: powder crystal pellet
Chemical Abstract Service Number VIA
Manufacturer Certificate of Analysis Yes X No
Additional Comments about the Test Chemical:
OTEST Chemical was mixed by manufacturer and shipped to us in Containers Klw 09 Aucild
Sample Placed in Archives: Yes No 🔀 (Entries should also be made on Form GEN 012.b)
Archive Location Material Safety Data Sheet Available: Yes X No
Signature of Study Director or designee initiating Test Chemical Use Log and date:
Signature Date OF AUG 12
2

			TEST CHEMICAL USE LOG	LUSE LOG	Form GEN 012.3b Page 1 of 1	
Test Chemical: ルルール 5つい	401 SDC	C Man	Manufacturer: " 1/1/12 1/1	1000 (200 Batch # 140 18 18 18 18 18 18 18 18 18 18 18 18 18	HOLDING Hixey	Ω:
Initial mass of test chemical & container with		Mass of test chemical & container after				
cap/ ird on (g)	Amount removed (g)	removal, with cap/lid on (g)	Study Number	Purpose and Other Comments	Date	Initials
No avan	AC MONTH AS	archive served related as this	is not a	*Archived Sample	CFHOGIO	Kin
ļ).000c+	537.44	W.DECK	AND RAI STAKE	CI WILL	f-~
14,18.5	25,000.0	537.40		Anglistical Stock #2	→	=>
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502,42	35,03	467.36		(3) of the forth		
467.36	35,01	432.32		State 3 for take Carlos		
432.32	70.01	36230		Strik #4 for lake lands		-
	70,00	397.36		Short # 5 for lake Co. 15		
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Page **254** of **519**



AEH-12-PSEUDO-04

CHEMICAL LOG BOOK

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Marrone Bio Innovations
Davis, California

LOT NUMBERS:
401P12163C
and
401P12164C
(Received Mixed in Containers)

Container 2 of 6

File Folder; 7a	Item Number: 2	Page 1 of 4
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SIGNATURE PAGE

All personnel making an entry in this log must fill out the form below in accordance with SOP GEN 009.

PRINTED NAME	SIGNATURE	INITIALS	DATE
Serry L. Weber		Klu	O1 H441
Kling L. Weber JAMES A Luoma		KIW	9/13/13
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"This Use and Maintenance Log Book has been inspected	ed <u> and found to be in compliance with</u> SOP GEN 009
Inspected and sealed on Acres y 9, 2003	Dy Quality Assurance Unit

Page _____ of _____

ORIGINAL

AEH-12-PSEUDO-04

SOP No. GEN 012.3 Page 5 of 7

> Form GEN 012.3a Page 1 of 1

TEST CHEMICAL DATA FORM

Test Chemical (Chemical Name) MB -401 SDS
Circle ouc: Test Article Control Article
Trade Name of Test Chemical (Synonyms) Pf-CL 145h · Lequence
Source of Test Chemical (Manufacturer) Marking Bie Innex horis
Storage Location Resignator
Date Received Of Aul 1) Van Date Opened 1) Hul 1) Van Expiration Date 21 70 3013 (5 years unless otherwise stated)
Test Chemical Lot Number 49, Plub 42 Purity of Chemical 50%
Amount of Test Chemical Available or Received (if known) 2500
Initial Mass (with cover on) of Test Chemical and Container 556.520
Characterization of Test Chemical: Color
Chemical Abstract Service Number W/A
Manufacturer Certificate of Analysis Yes X No
Additional Comments about the Test Chemical:
Officered mixed from manufactures the cities in
Sample Placed in Archives: Yes No X (Entries should also be made on Form GEN 012.b)
Archive Location Material Safety Data Sheet Available; Yes X No
Signature of Study Director or designee initiating Test Chemical Use Log and date:
Signature Date C4 ACG 12

Page 3 of 4

SOP No. GEN 012.3 Page 6 of 7

Form GEN 012.3b Page I of I

TEST CHEMICAL USE LOG

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بهد	G	Initials	rec	tec	3	٣						Z	steined o
SIETE PRIXE	ű.,	Date	CEHICE 13	13 13 (13-	27.04.00 12	4						27-19-412	NO13). 1). (, ~ () [let) / () (, ") advok of
Andreway to personal	-	Purpose and Other Comments	*Archived Sample	Shu48 to lake Co.13	Analytical #1 for Cale Proin	Analytical #2 for lake Repin	Shot # Por iak Proin 0 3	Stock #3 for take from 3	Stut #3 for lake Pair @	Start #4 for cake fear, 0	Stock #5 for lake Pan 3	AAT-13-PRUDON STACK #6 For Lak Pean 3	* = The first entry should be the test chemical sample placed in the Chemical Archives. Follow GEN 011. 1 = The initial mass is also entered on Form GEN 012.a. A. The mass of the test chemical and its container will be determined using a balance that has been verified to be accurate (SOP GEN 013). B. The test chemical removed from the container will be placed into a tared vessel. C. After the test chemical has been removed from the container, determine the mass of the container and its contents (with caplid on). C. After the test chemical has been removed from the container, determine the mass of the container and its contents (with caplid on). C. After the test chemical has been removed from the container, determine the mass of the container and its contents (with caplid on).
Mercial Da Innovations	Q	Study Number		Azil-12-Asuzo cy	AEH12-PSO-Do-D4	¥					\	ACH-13-PSEUDUH	* = The first entry should be the test chemical sample placed in the Chemical Archives. Follow GEN 011. I = The initial mass is also entered on Form GEN 012.a. A. The mass of the test chemical and its container will be determined using a balance that has been verified B. The test chemical removed from the container will be placed into a tared vessel. C. After the test chemical has been removed from the container, determine the mass of the container and its DAPA ID APA LAPA APA APA APA APA APA APA APA AP
	၁	Mass of test chemical & container after removal, with cap/lid on (g)	* avilabe	406.44	404.38	402.35	36233	32719	292.30	232.12	151.95	58.18	orm GEN 012.a. container will be det container will be plac container will be plac yed from the contain ya. Han 37844 13
5 75 200	8	Amount rencoved (g)	Leinical placed in averbace	150.051	2.0009	2.00096	35.05	35.03	35.00	70,05	お. ま.	70.07	* = The first entry should be the test chemical sample pl. [= The initial mass is also entered on Form GEN 012.a. 4. The mass of the test chemical and its container will be 3. The test chemical removed from the container will be 0. After the test chemical has been removed from the co Diplied \$\sum_{\infty} \infty \text{LL} \forall \text{Phy} \text{LL} \forall \fo
ME 701	¥	Initial mass of test chemical & container with cap/ lid on (g)	*1 *3 *5 *5	556.55	40c. 35	404, 38	402.35	36233	327.19	08.6KE	222.12	151.95	* = The first entry? I = The initial mass. A. The mass of the B. The test chemica C. After the test che (\$\int_{\infty} \rightarrow \infty \righta

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2 Item Number:

CHEMICAL LOG BOOK

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MBI-401 SDP

Marrone Bio Innovations
Davis, California

LOT NUMBERS:
401P12163C
and
401P12164C
(Received Mixed in Containers)

Container 3 of 6

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Item Number: 3

Page of

SIGNATURE PAGE

All personnel making an entry in this log must fill out the form below in accordance with SOP GEN 009.

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JAMES A. LUOMA		NIW SAL	9/13/13
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"This Use and Maintenance Log Book has been inspe	cted and found to be in compliance with SOP GEN 00
Inspected and sealed on No. 434 9. 2013	by ."
Date	Quality Assurance Unit

ORIGINAL

AEH-12-PSEUDO-04 SOP No. GEN 012.3 Page 5 of 7

Form GEN 012.3a Page 1 of 1

TEST CHEMICAL DATA FORM

Test Chemical (Chemical Name) MB1-401 SDF
Circle one: Test Article Control Article
Trade Name of Test Chemical (Synonyms) Pf-CL 141574; Zegnana
Source of Test Chemical (Manufacturer) Marrone Bio Invavations
Storage Location Refrigerator
Date Received OFAUGINED Date Opened FAUGING Expiration Date 1 Trin 2013 (5 years unless otherwise stated)
Test Chemical Lot Number 40181416 Purity of Chemical 50%
Amount of Test Chemical Available or Received (if known)
Initial Mass (with cover on) of Test Chemical and Container 536.879
Characterization of Test Chemical: Color Tan Physical State: liquid solid
Solid Form: powder <u>x</u> crystal _ pellet Chemical Abstract Service Number
Manufacturer Certificate of Analysis Yes X_ No
Additional Comments about the Test Chemical:
Ofereived mixed from mondacturer hu DAMAID
Sample Placed in Archives: Yes NoX_ (Entries should also be made on Form GEN 012.b)
Archive Location Material Safety Data Sheet Available: Yes X No
Signature of Study Director or designee initiating Test Chemical Use Log and date:
Signatur Date 69 AUG 12

Page 3 of 4

B. The test chemical removed from the container will be placed into a tared vessel.

C. After the test chemical has been removed from the container, determine the mass of the container and its contents (with capital on).

(1) Shocks not used only the first of first was conceiled on the first only the special of the first of the AEH-12-PSEUDO-04 Initials O だら 艺 Lot or Batch #: 401913 1656 Alixed STAUG 3 OSTATION 13. 27 Acc, 12 Date A. The mass of the test chemical and its container will be determined using a balance that has been verified to be accurate (SOP GEN 013). for Shawane 0 Per Shiwaro Shewano #2 for shavano Shut #8 for Lake Rein for Lake Prom #3 for Shawane * = The first entry should be the test chemical sample placed in the Chemical Archives. Follow GEN 011.

A. The mass of the test chemical. Stark #4 to Shaware Purpose and Other Comments Analytra 41 Amaly had # 2 Cher # 17. *Archived Sample Str. + #7 Stock Stock Bir Innovertures HEH-13-PSENDEDY Study Number Manufacturec. container after removal, with in eschive 476.77 352.59 356.65 354,60 317.49 282.43 Mass of test chemical & cap/lid on 247.33 177.39 3 1) Stacks not a set in C. No lest chemical placed Amount removed 2.00072 120,07 2.00029 35.06 70,07 35.07 35.10 Test Chemical: HBJ-401 509 B **6**9 60.08 Initial mass of test 北部九 317.49 536.86 247.33 35259 container with 383,43 356.65 chemical & 354.60 cap/ lid on 3

SOP No. GEN 012.3 Page 6 of 7

Form GEN 012.3b

TEST CHEMICAL USE LOG

Ma

File Folder; _

item Number:

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of __

Page

AEH-12-PSEUDO-64

CHEMICAL LOG BOOK

MBI-401 SDP

Marrone Bio Innovations Davis, California



LOT NUMBERS: 401P12163C and 401P12164C

(Received Mixed in Containers)

Container 4 of 6

File Folder; 7a | Item Number: 4 | Page 1 of 4

SIGNATURE PAGE

All personnel making an entry in this log must fill out the form below in accordance with SOP GEN 009.

PRINTED NAME	SIGNATURE	INITIALS	DATE
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"This Use and Maintenance Log Book has been inspected and for	and to be in compliance w	ith SOP GEN	009.
Inspected and scaled on Active 9 2012 by	Quality Assurance Unit	, 11	
Janu	educity Abburunou onk	п	/1

ORIGINAL

AEH-12-PSEUDO-04 SOP No. GEN 012.3 Page 5 of 7

> Form GEN 012.3a Page 1 of 1

TEST CHEMICAL DATA FORM

Test Chemical (Chemical Name) MBI-41 SDY
Circle oue: (cst Article Control Article
Trade Name of Test Chemical (Synonyms) ff-11 14574; Feagurix
Source of Test Chemical (Manufacturer) Linguis B. Innuntures
Storage Location Le frigerale-
Date Received 67-ALA(1) In Date Opened 27-AUG 2013 (5 years unless otherwise stated)
Test Chemical Lot Number 4010 1636 Purity of Chemical 50%
Amount of Test Chemical Available or Received (if known)
Initial Mass (with cover on) of Test Chemical and Container 540.345
Characterization of Test Chemical: Color Tarn Physical State: liquidsolid & Solid Form: powder & crystalpellet
Chemical Abstract Service Number 10/14
Manufacturer Certificate of Analysis Yes K No
Additional Comments about the Test Chemical:
ORECEIVED Mixed from Manufacturer. Have 19 AUG 13
Sample Placed in Archives: Yes NoX_ (Entries should also be made on Form GEN 012.b)
Archive Location Material Safety Data Sheet Available: Yes <u>K</u> No
Signature of Study Director or designee initiating Test Chemical Use Log and date:
Signature Date D9 A0613

Page 3 of 4

SOP No. GEN 012.3 Page 6 of 7 Form GEN 012.3b Page I of 1

					_	Γ-		ı	· · · · · · · · · · · · · · · · · · ·		AEH-	-12-PSE	UDO-04	
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Page 6 of 7 Form GEN 012.3b Page 1 of 1	YNPIDIEZE MIXED	ដ	746	- CANTOCA 1) 37 MVA 13	€ ≥	37Musi3	OS SEP 13	10000 10000		!		N 013).	.) .	
antificial of the second of th	Lot or Baich #:	E	* A resisted Samula	AEH-13-BADEEN STOCK#6 Per SHALLENE	Stock #7 for Shawing	AEH-12-Pervicey Start #8-for Starrans 370	Ownite over "Me CRATON" 35 FER 13	Dimonut Study number is I ACH- 13-4610				dould be the test chemical sample placed in the Chemical Archives. Follow GEN 011. is also entered on Form GEN 012.a. est chemical and its container will be determined using a balance that has been verified to be accurate (SOP GEN 013).	5. I.f. else charactar removed from the container will be placed into a tared vessel. C. After the test chemical has been removed from the container, determine the mass of the container and its contents (with cap/lid on).	
TEST CHEMICAL USE LOG	Manufacturer: Kanthe Bu Innochum	O Critical Manager	TOTTINK FAMOU	AEH-13-BADGE	⇔	MEH-12-Pervision	13-42H-13-48-61	2 PATA				 The first entry should be the test chemical sample placed in the Chemical Archives. The initial mass is also entered on Form GEN 012.a. The mass of the test chemical and its container will be determined using a balance that the mass of the test chemical and its container will be determined using a balance that 	ed into a tared vessel. ler, determine the mass of ti	
		C Mass of test chemical & container after removal, with	cap/lid on (g)	in archive 470.36	410.05	310.10	42.00	90.96				mical sample placed orm GEN 012.a. containe: will be det	ontamer will be plac ved from the contain	
	MB1-401 SDO	B Amount removed	(8)	70.03 470.36	60.0C	120.07	100.05	100.03				hould be the test chemical sample pla is also entered on Form GEN 012.a. est chemical and its container will be	removed from the c mical has been remo	
	ical:	A Initial mass of test chemical & container with cap/ lid on	١,	No test CH 540.40	470.36	710.35	190.30	190.3]				* = The first entry sl 1 = The initial mass A. The mass of the tr	5. Lie test chemical C. After the test chem	
File Folder;		7a	Ite	m Numl	ber: _	4				Page	4		4	

Page **267** of **519**

AEH-12-PSEUDO-04

CHEMICAL LOG BOOK

MBI-401 SDP

Marrone Bio Innovations Davis, California

> LOT NUMBERS: 401P12163C and

401P12164C (Received Mixed in Containers)

Container 6 of 6

File Folder: 7a Item Number: 5 Page 1 of 4

SIGNATURE PAGE

All personnel making an entry in this log must fill out the form below in accordance with SOP GEN 009.

PRINTED NAME	COMATURE	INITIALS	DATE
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Keing Liwelzon Jiognes L. Lasma		ブルー	2/4/0
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and and assailed on A say	Date	Quality Assur	ance Unit		<u> </u>	
			Page	2	of	4

ORIGINAL

SOP No. GEN 012-PSEUDO-04 Page 5 of 7

> Form GEN 012.3a Page 1 of 1

TEST CHEMICAL DATA FORM Test Chemical (Chemical Name) MBI-401 5DP Test Article Control Article Circle one: Trade Name of Test Chemical (Synonyms) PF-LL 1457; Harring Source of Test Chemical (Manufacturer) Majone Bo necestions Storage Location_ Date Received 07 Aug 12 few Date Opened 14 AUG 2012 Expiration Date 21 TWO 13 (5 years unless otherwise stated) Test Chemical Lot Number 4019191634 Purity of Chemical Initial Mass (with cover on) of Test Chemical and Container $\underline{539.20a}$ Characterization of Test Chemical: Color Chemical Abstract Service Number _ NJA Manufacturer Certificate of Analysis Yes X No _ Additional Comments about the Test Chemical: Sample Placed in Archives: Yes __No X (Entries should also be made on Form GEN 012.b) ___Material Safety Data Sheet Available: Yes 🔨 No ___ Signature of Study Director or designee initiating Test Chemical Use Log and date: Date 09/1041) Signature

Page _ 3 _ of _ 4

5		G Iritials	Free	#w	Ja-		At	EH-12-PSEUD
SOP No. GEN 012.3 Page 6 of 7 Form GEN 012.3b Page 1 of 1	1 7 1	Date	हा होसा	4844	4/143			(013).
	Sto. https://doi.or. Batch #: 401 (1) 163C.	E Pupose and Other Comments	*Archivec Sample	Sample to make stock for lab tosity	injection methods development			* = The first entry should be the test chemical sample placed in the Chemical Archives. Follow GEN 011. 1 = The initial mass is also entered on Form GEN 012.a. A. The mass of the test chemical and its container will be determined using a balance that has been verified to be accurate (SOP GEN 013). B. The test chemical removed from the container will be blaced into a tared vessel.
TEST CHEMICAL USE LOG	Manufacturer: Majory Bo			(五-1) 2800000	AELY-13-WASCAGOR-31			nould be the test chemical sample placed in the Chemical Archives. Follow GEN 011. is also entered on Form GEN 012.a. est chemical aci its container will be determined using a balance that has been verified removed from the comisting will be classed into a tared vessel.
		C Mass of test chemical & container after removal, with cap/lid on	* in auchille	528.0	726.41			rnical sample placed orn GEN 012.a. cortainer will be det
	भेन्ना अर	B Amount removed (g)	* Anial place	[.o	312.10			* The first entry should be the test chemical sample ple 1 = The initial mass is also entered on Form GEN 012.a. The mass of the test chemical and its container will by B. The test chemical removed from the container will be
	Test Chemical: L(G)	A Initial mass of test chemical & container with cap/ lid on (g)	*! Vo test CL	539.1	538.51			* = The first entry si 1 = The initial mass A. The mass of the tt

Appendix 5. Test Animal Information

Item Number	Item Description	Number of Pages	Report Page Number
1	Approval for Housing and Care of Test Animals During Experiments	1	273
2	Zebra Mussel Lengths – Lake Carlos (Whole Water Column) – Data Summary	4	274
3	Zebra Mussel Lengths – Lake Carlos (Bottom Injection) – Data Summary	2	278
4	Zebra Mussel Lengths – Lake Shawano (Whole Water Column) – Data Summary	4	280
5	Zebra Mussel Lengths - Lake Shawano (Bottom Injection) - Data Summary	2	284



SOP No. GEN 134.4 Page 4 of 4

Form GEN 134.4a Page 1 of 1

APPROVAL FOR HOUSING AND CARE OF TEST ANIMALS DURING EXPERIMENTS

This protocol has been examined by the Animal Care and Use Committee for consistency with the Animal Welfare Act (7 U.S.C. 2131 \underline{et} . \underline{seq} .) and with rules governing the use of test animals at the Upper Midwest environmental Sciences Center, La Crosse.

	Imber: AE N-12-PSEUDD-04	
Principal I	investigator: James A. Luoma	<u> </u>
Study Direc	eton:	
Protocol Ti	itle: Elficary of Pseudomor	vas Guovescens (Pf-CL1454)
	itle: Efficacy of Pseudomor in controlling settled gelna	mussels on artificial
substra.	les	
	Chair Signature, Title	<u>5-1-12</u> Date
No ade	ditional ACU review needed la	ecause no vertebrates are
-part	of This Sturb. Signature Pitle	Date
	Signature, Title	Date
•	Signature, Title	Date
* File the	e original signed copy of this form Chair, Animal Care and Use Committ	

Study Number: AEH-12-PSEUDO-04	Action Date	Initials
Electronic Lab Notebook (pages 30)	Created 28-Oct-13	KLW OF
Data Source: File Folder: 15	Revised 12-Feb-14	TIS 135
Forms: "Zebra Mussel Lengths"	Reviewed 12 FEB 14	175
	Certified 2/19/19	JIL
File Name: See filenames as stated below	,	

Zebra Mussel Lengths - Lake Carlos (Whole Water Column)

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SOP)] Article Lot #: 401P12163C and 401P12164C Mlx Exposure Date: August 15, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Whole Tark

Overall Data Summary:

		6h			9 h			ר 12	
	0 mg/L	50 mg/L	100 mg/L	0 mg/L	50 mg/L	100 mg/l,	_0 mg/L	50 mg/L	100 mg/L
Mean (mm)	11.51	12.41	10.65	11.26	11.64	11.37	11.79	11.33	10.67
(STD)	(2.41)	(2.64)	(2.85)	(2.44)	(2.61)	(2.74)	(2.76)	(2.82)	(2.48)
Minimum	6.15	6.94	6.00	6.43	6.70	6.43	6.19	6.04	6.02
Maximum	19.47	17.79	18.33	17.17	18.10	18.19	19.03	24.27	17.78
Grand Mean		11.53			11.42			11.26	
(STD)		(0.71)			[0.16]			(0.46)	

Data Explanation:

After survival analysis, one tray from each treatment level (0, 50 and 100 mg/L) at each exposure termination time point (6, 9 and 12 h) was retained for mussel length analysis. All animals were measured for length. All lengths were reported except for those from mussels with broken shells or those 66 mm.

6 h Mussel Length Oata I:\AEH-12-PSEUOO-04\Data Summaries\[Lake Car as Lengths (Whola Tank).xlsx]Sh Length Data

9 h Mussel Length Data

It\AEH-12-PSEUDO-04\Data Summaries\[Lake Carlos Lengths (Whole Tank).xlsx]9h Length Data

I:\AEH-12-PSEUDO-04\Data Summarles\[Lake Carlos Lengths (Whole Tank).xlsx]12h Length Data

Data anomalies and deviations:

File Folder: ___\5

Item Number_

Test Antice (188 40), SCP (17-CL 145A (SOP))
Anticle Lot? + 401921362 one 441912154C Mix
Export Meta-August 51, 2012
Test Loston Like Gorba, August 54, 2017
Test Loston Like Gorba, August 54, MN
Treatment Type: Whole Tank

Study Numbert AEH-12-PSEUDC-tud Electronic Lab Notabook (bages 30) Data Source: File Folder: 13 Forms: "Zebra Mussel Lengshs"

6 hour Mussel Length Data

Treatment Level	Sample	2										Lengths (mm)	£ ~										Mean (STD)
		L	6.15	98'5	6.51	5.52	5.57	5.70	7.08	7.30	7.56	7.83	7.90	7.96	7.97	7.99	8.10	8.25	8.27	8.33	8,39	8,50	
		_	8.58	3.58	3.62	8.63	8.67	8.74	3,78	8.94	8.95	8.96	8.97	9.02	9.04	90'6	9.12	9.13	9.15	9.79	9.30	9.42	
			9.43	9.53	9.66	9.69	9.81	9.82	9.85	9.86	9.94	10.10	10,11	10.16	10.18	30.18	10.18	10.23	10.28	10.29	10.37	10.40	
			10.48	12	10.55	10.57	10.73	10.74	10.75	10.89	10.91	10.94	10.94	11.07	11.16	11.16	11.18	11.19	11.23	11.24	11.24	11.28	11.51
D.ma/L	WSCI	183	11.29	11.32	11.33	11.35	11.39	11.42	11.50	11.50	11.52	11.53	11.56	11.58	11.60	11.60	11.60	11.63	11.64	11.71	11.75	11.80	(2.41)
3		ŀ	11.81	11.81	11.82	11.83	11.85	11.85	11.86	11.95	11.98	12.00	12.03	12.09	12.11	12.11	12.13	12.30	12.32	12.4	12.47	12.48	
			12.49	12.52	12.53	12.53	12.53	12.66	12.70	12.71	12.79	12.81	12.82	12.82	12.85	12.87	12.90	12.94	12.54	12.97	13.04	13.05	
			13.17	13.18	13.26	13.28	13.31	13,47	13,48	13.58	13.62	13.72	13.73	13.76	13.77	13.88	14.06	14,10	34.15	14.16	14.17	14.28	
	-		14.33	14.35	14.42	14.49	14.49	14.50	14.51	14,73	14.87	15.08	1521	15.37	15.44	15.50	15.59	15.63	15.82	16.02	16.14	16.22	
			16.48	18.63	19.47										į								
			6.94	7.22	7.45	7.48	7.50	7.70	7.87	8.03	8,04	8.15	8.15	8.28	8.28	8.66	8.77	8.78	8.89	26.8	8.98	9.10	
			5.12	9.14	9.33	9.36	9.37	9.49	9.56	9.70	9.85	9.99	10.00	10.02	10.13	10.14	10.17	61.01	10.28	10.28	10.49	10.52	
			10.58	10.61	10.66	10.81	10.88	10.88	10.88	10.91	16.01	10.91	10.96	11.10	17.71	11.26	11.27	1138	11.44	11.50	11 52	11.63	12.41
(/am/5	WIAR	152	11.68	11.89	31.93	12.05	12.09	12.17	12.24	27 27	12.32	12,36	12.37	12.42	12.47	12.50	12.56	12.60	12.62	12.64	12.68	12.76	(2.64)
-	1	i	12.78	12.81	12.81	32.92	12.99	13.19	13.19	13.23	13.43	13.44	13.45	13.48	13,53	13.55	13.58	13.65	13.69	13.73	13.83	13.80	
			13.84	13.86	13.87	13.50	13.91	13.58	13.58	14.03	34.04	14.11	14.13	14.13	14.14	14.17	14.18	14.20	14.25	14.26	14.30	14.36	
			14.38	14.44	14.45	14.45	14.59	14.60	14,61	14,62	14.80	14.82	14.89	14.91	14.98	15.07	15.31	15.49	15.56	15.60	16.19	16.21	
			16.36	16.99	17.17	17.21	17.31	17.42	17.65	17.65	17.70	17.71	17.79	17.79									
			6.00	6.02	6.15	6.21	6.24	6.26	6.32	6.39	6.45	6.53	6.54	6.57	6.58	6.52	6.63	6.83	5.37	6.59	2.00	2.05	
			7.12	7.12	7.15	7.18	7.21	7.21	7.26	7.30	7.31	7,34	7.40	7.41	7,43	7.43	7.44	7,45	7.50	7.53	7.57	7.57	
			7.57	7.58	7.65	7.65	7.76	7.86	7.87	7.88	7.68	7.88	06.7	7.92	7.92	7.92	\$67	7.95	7.96	7.98	8.07	8.07	
			8.08	3.12	8.15	8.17	8.17	81.8	8.20	8.2.	8.22	8.24	8.29	8.29	8.32	8.32	8.34	8.34	8.40	8.47	8.42	8.47	
			8.47	8,49	8,49	8.57	25 25	8.67	8.70	8.73	8.74	8.78	8.79	8.82	8.82	8.88	8.97	9.30	9.00	9.02	5.07	9.08	
			9.13	9.14	9.16	9.20	9.20	9.28	9.35	937	9.44	9.45	9.46	9.47	9.49	9.49	9.51	9.52	9.54	9.56	9.58	19.6	10.66
100 me/l	W782	27.1	9.65	29.67	9.67	9.70	9.72	9.73	9.76	9.76	9.77	6.80	9.81	9.87	58.6	96'6	10.01	10.07	10.21	15,01	10.32	10.33	(2.85)
3		;	10.37	10.38	10.43	10.45	10.65	10.68	10.71	10.74	10.76	10.84	10.84	10.85	10.01	10.92	11.04	11.04	11.17	11.25	11.31	11.37	
			11.37	11.43	11.43	11.49	11.53	11.54	11.56	11.59	5	11.63	11.76	11.77	11.78	11.78	11.80	11.82	11.82	11.85	11.38	11.91	
	_		11.93	11.94	11.95	12.05	12.09	12.20	12.23	12.23	12.26	57.75	12.35	12.46	12,47	12.57	12.60	12.60	12.69	17.71	12.73	17.73	
			12.74	12.77	12.77	12.80	12.83	13.02	13.09	13.13	13.24	13.25	13.25	13.25	13.25	13.28	13.29	13.94	13.40	13.49	13.49	13.50	
			13.53	13.61	13.73	13.74	13.86	13.89	13.93	13.97	14.00	14.00	14.05	14.05	14.05	14.07	14.16	14.24	14.26	14.30	14.46	14.73	
			14.75	14.75	14.79	14.79	14.91	15.00	15.09	15.10	15.14	15.16	15.22	15.23	15.39	15.41	15.49	15 53	15.57	15.57	15.62	15.73	
			15.98	16.03	16.03	16.31	16.40	16.43	16.50	16.62	16.80	17.08	18.33										

em Number

Grand Mean 11.53 (STD) (0.71)

Sruby Number, AEH-12-PSEUDO-04 Ebert unit Lab Norbebook (pages 33) Data Source: File Folder: 15 Forms: "Zabra Mussel Lengths" 9 hour Mussel Length Data

Then Arther, MBI 403 50P (pf. CL 145A (50P))
Article Lett #. APPLEGGCENE 40D21346CMix
Exposure Date: August 15, 2012
Test Localion: Lake Carlog, Alboratoria, MM
Freatment Types: Whole Tonk

Treatment	Sample	z										Lengths (mm)	,				!					Mean
			6.43	6.48	6.52	6.57	6.78	7.09	7.12	7.20	7.20	7.27	7.28	7.36	7.52	7.62 7.	7.65 7	7, 191	7.36	95.7 7.99	8.03	
			8.07	8.11	8.14	8.15	8.17	8.19	8.20	8.35	8.37	8.37	8.38	8.43	8.70 8	8,79		_				
			8.97	9.04	9.07	9.10	9.10	9.33	9.53	3.55	9.60	9.61	3.66	9.6/	9.77.9							
			9.97	9.33	10.02	10.07	00.00	10.22	10.23	10.27	CE-01	10.34	10.38	10.39	10.39 1	10.41 IC	10.41	10.52 10	10.52 10.	10.55 10.56	56 10.61	
0 mg/L	W583	193	10.67	10.75	10,75	10.85	10.92	10.92	10.94	10.94	10,98	13.99	11.05 1	11.08	11.14 11	11.26 11	11.28 11	11.32 11	11.33 11.	11.35 11.44		(2.44)
			11.47	11.51	11.55	11.57	11.57	11.58	11.58	11.59	11.59	11.62	11.65	17.67	11.69 1:	11.69 11	11.73	11.81	11.82 11.			_
			12.01	12.01	12.05	12.17	12.19	12.23	12.25	12.29	22.30	12.31	12.40	12.42	12,43 L	12.46 12	12.46 12	12.55 12				
			12.67	12.58	12.73	12.74	12.80	12.84	12.98	13.07	13.11	13.12	13.21	13.24	13.37	13.33 13	•					
			13.79	13.87	13.91	13.91	13.99	14 12	14.35	14.45	14.50	14.57	14.59 1	14.62 1	14.74	14.77 14	14.80 14	14.32 14	14.85 14,	14.87 14.87		
			15.06	۲. ۲	15.45	15.48	15.60	15.67	15.75	15.91	15.96	15.98	16.02	16.49	17.17							
			6.70	6.81	6.85	7.05	57.	7.33	7.34	7.37	7.42	7.42	7,44	745	7.45 7		7.67	7.80 7.	7.87 784	7.86	7.89	L
			7.90		8.11	41.8	8.15	8.16	8.24	17.8	8.30	8.30	8.31 8	8.32 8	8.36 8	8.39 8.		8.41 8,		8.49 8.57		
			3,60	8.63	3.65	8,66	8.67	8.77	8.79	8.81	8.91	8.92	8.94	9.04	9.05	9.10 9.	9.10	9.12 9.	9.16 9,22			
			9.29	9.30	9.30	9.31	9.32	9,33	68.8	8.38	9.41	9.52	9.53	9.58	5.58	9.62 9.						
		_ -	9.79	9.81	25.6	9,84	9.86	9.96	3.38	10.10	10.15	10.23	10.26	10.31	10.32 II	10.33 10	10.40 10	10.42 ID	10.50 10.	10.53 10.54		
			10.63	10.66	10.68	10.68	10.70	10.76	10,79	10.88	10.91	10.94	10.98	1.04	11.08	11.11	11.13 11	11.15 11.		11.16 11.20		(2.61)
1/am CS	WARR	264	11.29	11.30	11.30	11.36	11.39	11.39	11.51	11.55	11.55	11.56	11.57	11.68 1	11.71	11 11	11.77 11	11.78 11	11.79 11.79			
3	!		11.91	11.95	12.11	12.11	12.13	12.15	12.17	12.17	11.23	12.24	12.31 1	12.32	12.36 12	12.39 12	12.44 12	12.47 12.	12.49 12.54			
			12.65	12.56	12.70	12.71	27.73	12.80	12.84	12.84	12.87	12.87	17.96 1	12.38	13.02	13.02	13.02 13	13.04 13.	13.05 13.13	11 13.12		
			13.14	13.16	13.19	13.24	13.30	13.34	13.34	13.36	13.45	13.47	13.55 1	13.56 1	13.60 13	13.61 13	13.64 13	13.64 13.	13.65 13.65	65 13.66	•	
			13.57	13.74	13.76	13.78	13.85	13.86	13.91	13.92	14.07	14.11	14.11 1	14.13	14.14 14	14.17 14	14.17 14	14.19 14.	14.22 14.24	24 14.24	4 14.27	
			14.27	14.30	14.39	14.40	14.43	14.44	14.45	14.47	14.52	14.55 1	(4.55 1	14.62	14.64 14	14.69 14	14.77 14	14.80 14.	14.83 14.0	14.89 14.92	2 15,13	
			15.18	15.23	15.25	15.26	15.36	15.45	15.47	15.52	15.80	15.83 1	15.84	15.99	16.03 16	16.08 15	16.21	16.35 15.	15.54 15.53	68 16.72	•	
			16.94	17.84	18.09	18.10																
•	_		6.43	6.57	6.71	6.78	6.85	2.05	7.16	7.16	7.23	7.35	7.53 7			7. 88.7	.7 57.7	7 27.4	777 7.80	0 7.88	3 7.93	
			7.53	8.02	8.02	8.05	8.11	8.13	8.14	8.32	8.32					8.56 8.	8.59 8.	8.74 8.77	77 8.77	7 8.82	8.87	
			58.88 58.88	8.91	8.92	8.95	8.55	9.13	9.15	9.35	17'6		9,51	3.55	9.59	6 09'6	9.61 9.	3,65	57.6 07.6	3 9.75	5.73	
			5.73	9.79	9.30	9.91	9.93	66'6	10,12	10.13	10.14	10.16	10.17	10.20		10.22 10.	10.26 10	10.31 10.	10.33 10.39	39 10.47	7 10.53	_
100 mg/L	W682	189	10.61	10.67	10.75	10.84	10.84	10.85	10.86	10.88						10.97 10.	10.98 10	10.99 11.	11.07 11.11	11.16	6 11.21	(2.74)
\$			11.23	11.23	11.28	11.30	11.34	11.34	11.39			-		11.55	11.56 12	11.59 11.		11.80 11.	11.87 12.10	12.11	1 12.15	
			12.19	12.21	12.24	12.25	12.30	12.35	12.39				12.89 L	12.93		13.08 13.		13.21 13.	13.26 13.36	36 13.36	6 13.39	
		_	13.48	13.52	13.53	13.62	13.63	13.66	13.69	13.74		13.78	13.91	13.96	14.15 14	14.29 14.	14.30 14	14.46 14.	14.48 14.50	50 14.53	3 14.53	
			14.58	14,60	14.73	14.83	14.87	14.87	14.90	15.03	15.05	15.08 1	15.10	15.16	15.27 15	15.35 15.	15.49 15	15.59 15.	15.60 16.05	16.11	1 16.16	
			16.19	16.53	16.70	16.71	17.12	17.75	17.83	17.84	18.19											_
																				GP	Grand Mean	11.42
											•										(213)	(0.16)
								,	-	ner Number	,									ı		1

12 hour Mussel Length Data

WARE Care	Treatment Sa	Sample	z										Lengths	tł:			İ							Mean
1, 10, 11, 11, 11, 11, 11, 11, 11, 11,	- 1	2	I										Ě							ļ				Ê
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,				6.19	6.27	6.38	6.38	6,43	6.51	6,57	29.9	6.77	88	598	7.33	7.36	7.42	7.46	750	7.59	7.83	7.87	7.91	
1,1,2, 11,1, 11,				3.10	3.12	8,15	8.19	8.23	8.23	8,24	6.27	8.36	8.42	8.44	8.78	80.6	9.13	다.	57.5	9.48	9.52	555	85.6	
1.02 1.02 1.02 1.02 1.02 1.02 1.05				9.62	3.65	9.66	9.78	9.85	9.90	966	9.99	1018	10.23	20.26	10.27	10.27	10.30	10.38	10,39	10,45	10.45	10.51	10.52	
1.22 1.27 1.28			_	10.52	10.56	10.58	10.58	10,60	10.65	10.66	10.66	10.67	10.73	20.75	10.81	10.89	10.96	11.05	11.15	11,26	11.30	1.40	11.41	11.75
1.27 11.1 11.2 12.1 12.1 12.1 12.1 12.1	- 5	V3AZ	183	7777	11.51	31,51	11.63	11.67	11.68	11.68	11.75	11.73	11.78	11.78	11.81	12.83	11.91	21.9	11.95	11.97	1200	12.03	12.08	(2.76)
12,72 12,77 12,77 12,75 13,9				777	12.17	12.23	12.26	12.27	12.30	12.34	12.36	12.42	12.48	12.49	17.50	12.54	12.55	12.57	12.61	2.67	12.68	12.71	12,73	
1,15 1,15				12.73	12.77	17.86	13.04	13.04	13.07	13.15	13.16	13.24	13.26	13.27	13.27	13.33	13.34 24.	13.37	13.46	13.50	13.53	13.54	13.65	
16.77 16.75 16.85 17.25 17.45 18.65 16.9				13.69	13.79	13.82	33.56	13.90	14.03	14.05	14.12	14.13	14.24	14.35	14.37	14.41	14.42	14.57	14.57	14.61	14.62	14.69	14.71	
1,5,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1		_		14.72	14.75	14.76	14.85	14,87	14.93	15.07	15.09	15.26	15.32	15.35	15.41	15.43	15,55	15.63	15,78	5.83	15,83	16.31	16.53	
10,00 6,05 6,15	- 1	1		16.71	16.78	16.83	:7.28	17.30	17.4	1811	19.03													
1, 10, 10, 11, 11, 11, 11, 11, 11, 11,		_		8,	90.9	6.15	6.건	6.31	6.32	8 14	6,43	6.43	6.60	6.64	69.9	6.71	6.77	83	6.94	16.9	6.92	697	7.04	
1, 10, 10, 10, 10, 10, 10, 10, 10, 10,				7.08	7.16	1.25	/33	7.51	7.52	7.66	7.70	17.7	7.87	7.85	7.92	7.99	8.00	8.00	8.03	12,8	8,25	8.27	8.73	
1,000 1,00				6.35	8.47	8.48	8.51	χ, Έ	8.55	8.73	8.76	8 79	8.80	8.82	8.83	8.85	8.39	16.8	391	36.95	5.02	9.02	906	
10,47 11,19 11,1				9.03	9.13	9.25 22.5	9.32	\$ 6	9.35	9.37	ф Д	9.42	9.43	9.45	9.45	9.48	15.6	9.55	9.60	9.64	3.65	9.66	9,68	
10.07 10.19 10.24 10.2				89.6	9.63	9.72	9.73	9.74	9.75	9.78	9.79	5.84	986	68.6	06.6	9.93	9. 9.	96'6	78'6	9.99	10.03	10.07	10.07	
120 127 128				10.17	10.19	10.19	10.25	10.31	10.33	10.33	10.33	10.35	10.37	10.38	10.45	10.46	10.46	13.46	10.50	10.54	10.57	10.62	10.63	
123 128	\$	Ö	267	20.70	10.77	10.77	10.85	10.86	10.91	10.93	30.93	10.94	10 95	10.95	10.98	11.00	11.03	11.06	11.08	11.11	11.19	11.19	11.24	17.33
122 127 128			-	1130	11.30	11,39	11.43	11.48	G II	11.66	11.72	11,74	11.84	11.89	11.91	11.94	11.94	36,11	11.99	11.99	12.00	12.04	12.12	(2.82)
1245 1267		_		12.23	12.27	12.28	12.29	12.33	12.33	12.35	1241	12.43	12.45	12.48	12.49	12.50	12.51	12.60	12.61	12.63	12.64	12.67	12.63	
1344 1344 1444 1444 1445 1445 1445 1447 1447 1445				12.81	12.82	12.85	12.87	12.87	12.38	12.92	12.98	13.06	13.08	13.09	13.23	13,26	13.25	13.31	13.33	13.34	13.37	13,42	13.42	
1407 1404 1408 1414				13.43	13,43	13.44	13.45	13.49	13.59	13.67	13.78	13.80	15.83	13.86	13.86	13.87	13.87	13.88	13,89	13.90	13.30	13.92	13.93	
1,646 1,444 1,44				14.02	34.04	14.08	14.15	14.22	14.2	14.32	14.87	14.43	14 43	14.45	14.46	14.48	14.55	14.56	14.62	14.77	14.81	24.86	14.37	
1,666, 1665 1,657 1,757 1,754				14.89	14.94	14.96	15.03	15.03	15.12	15.22	15.23	35.24	15.35	15.39	15.57	8,5	15.74	15.98	16.21	16.46	16.47	16.51	16.54	
6.02 6.02 6.02 6.03 6.07 6.07 755 755 755 755 755 755 755 757 757 755 757	. !	7		16.64	16.55	17.01	17.35	17.54	7,71	24.27								i						
7.53 7.44 7.45 7.47 7.55 7.52 7.55				6.02	6.02	6.03	6.2.	6.74	8,3	5.32	6.35	6.53	6.73	6.77	6.90	6.30	6.92	6.92	6.96	7.00	7,05	70.7	7.25	
8.56 8.06 8.06 8.07 8.77 8.08 8.10 8.12 8.13 8.14 8.14 8.15 8.05 8.17 8.14 8.15 8.00 8.17 8.14 8.15 8.00 8.10 8.14 8.14 8.15 8.00 8.15 8.14 8.14 8.15 8.00 8.15 8.14 8.14 8.15 8.00 8.15 8.14 8.14 8.15 8.00 8.15 8.14 8.14 8.15 8.00 8.15 8.14 8.14 8.14 8.15 8.14 8.14 8.14 8.14 8.14 8.14 8.14 8.14				7.33	741	7.45	7,47	7.55	7.62	7.65	7.66	7.67	7.69	7.75	7.76	7.80	7.85	7.86	7.86	7.87	7.96	7.97	8.02	
13 13 13 13 13 13 13 13				8.05	8.06	8.07	8.07	8.08	8.10	8.12	£.3	8.14	8.14	8.14	8.15	8.15	3.18	8.20	8.20	8.24	8.30	331	8.31	
\$5.66 \$6.08 \$1.00 \$1.0 \$1.51			-	3.33	838	8.43	4	8.45	90.00	8.55	8.56	8.67	89 190 190 190 190 190 190 190 190 190 19	8,68	3.69	8.71	8.74	8.78	3.81	3.36	26.9	8.93	8.96	
255 5.56 9.56 9.51 9.55 5.56 9.50 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1				8.96	9.03	9.11	9.13	5.13	9.14	9.15	9.5	9.17	9.18	9.19	អ្ន	976	9.38	9.32	9,34	9.39	65,6	9.41	9.49	
150 10.00 10.08 10.05				950	9.50	9.51	9.92	59:5	6.69	9.70	9.75	4.6	9.79	9.79	9.81	9.85	5.87	5	9.95	96'6	9.96	88	_	10.07
10.65 10.67 10.69 10.64 10.6	Š	199,	275	10.01	10.08	10.18	10.15	10.15	10.15	10.17	10.21	10.22	10.31	10.31	10.35	10,41	20.42	10.48	10,49	10.50	10.57	35.01		[2.43]
1122 1139 1139 1139 1139 1130 1130 1130 1130				30.65	10.67	. D.69	10.69	10,77	67.01	10.81	10.61	10.83	10.84	10.87	10.87	10.93	10.95	10.96	11.00	11.07	11.15	31.12		
1.88 1.99 1.99 1.19 1.20				11.21	11.22	17.24	11.25	11.25	11.27	11.27	11.29	1135	11.33	11.37	11.45	11.47	11.49	11.49	13.53	11.58	11.58	11.66	11.66	
12.57 2.59 2.29 12.54 12.54 12.56 12.67 12.67 12.74 12.74 12.77 12.30 12.54 12.59 12				11.88	11.88	17.90	11.91	11.39	12.00	12.00	12.32	12.03	12.05	35.51	12,09	12.18	12.18	12.23	12.27	12.28	12.28	12,33	12.36	
1500 1306 1211 1213 1313 1312 1312 1312 1315 1328 1328 1339 1315 1315 1315 1315 1315 1315 1315				12.37	12.37	12.39	12.39	12.46	12.56	17.65	12.67	1268	12.72	12.74	12.74	12.78	12.80	12.84	22.85	12.83	12.69	12.89	12.96	
1150 1362 1358 1378 1379 1354 1355 1359 1359 1457 1455 1718 1778 1455 1467 1457 1455 1759 1457 1457 1457 1457 1457 1457 1457 1457		-		13.00	13.02	13.06	13.11	13.13	13.18	13.20	다	19.23	13,22	13,26	13,28	13.28	13.34	13.36	19.37	3.43	13,41	13.43	13.45	
14.88 15.01 15.04 15.25 25.42 15.48 15.50 16.92 16.35 16.34 16.71 16.86 17.19 17.79 Grand Mean Grand Mean Grand Mean (Grand Me			_	13.46	13.50	13 62	13.62	13.78	13.79	13.82	13.84	13.85	13.87	13.99	14.13	34.14	14.16	14.35	14.36	14.37	14.55	14.67	14.67	
	- 1		7	14 74	14.89	15.01	15.04	15.25	19.61	15.48	15.50	15.92	16.25	16.34	16.71	16.96	17.18	17.78						
																						Grand Iv		178
													,									65	_	(0.46)

tem Number

File Folder: 15

Study Number: AEH-12-PSEU DO-04 Electronic Lab Notebook (pages 30) Data Source: File Folder: 15

Forms: "Zebra Mussel Lengths"

Action Date In tials
Created 28-Oct-13 KLW 416
Revised 12-Feb-14 TJS 136
Reviewed ... 12-Feb-14 TJS 136
Revised 12-Feb-14 TJS 136 Certifled... \\ \(\lambda / | 4 | 14 \) \(\sigma \)

File Name: I:\AEH-12-PSEUDO-04\Data Summarles\(Lake Carlos Lengths (Bottom Injection).xlsx)12li Length Data

Zebra Mussel Lengths - Lake Carlos (Bottom Injection)

Test Article: MBI 401 SDP (Pseudomonas fluorescens Pf-CL 145A (SDP)) Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 17, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Bottom Injection

Overall Data Summary:

ſ		12 h	
	0 mg/L	50 mg/L	100 mg/L
Mean (mm)	12.34	11.22	11.99
(STD)	(2.70)	(2.66)	(2.88)
Minimum	6.20	6.37	6.18
Maximum	20.71	20.06	18.94
Grand Mean		11.85	
(STD)		(0.47)	

<u>Data Explanation:</u>
After survival analysis, one tray from each treatment level (0, 50 and 100 mg/L) from the 12 h exposure termination time point was retained for mussel length analysis. All animals were measured for length. All lengths were reported except for those from mussels with broken shells or those < 6 mm.

Data anomalies and deviations: NONE

File Folder: _

Item Number_____2_ Page __1___of __2__

number, kerszerzez jour. onic Lab Notebook (pages 30) Source: File foliaer 15

Test Article, MB1421 SOP (97-CL MSA (30P))
Article Lot & 4D1P12185C and 4D1P21361 Mix
Begoure Doors, August 77, 2012
Test Location: Lete, Order, Alexandris, MN
Treatment Type: Bottom injection

										ı		ŀ										ĺ	ļ
Treatment	Sample	Z										(mm)	ž ÷										Mean
			6.23	6.49	6.75	6.96	6.97	6.39	7.15	7.58	7,94	8.02	8.21	8.27	8.30	8.34	8.41	8,54	8.58	8.58	İ	╟	
			3.75	8.79	8.96	86.96 86.96	100	9.02	9.03	200	9.15	9.19	9.21	9.55	9.55	9.59	9.63	29	8 8	9.66	9.73	9.78	
			9.85	3 6	10.36	10.27	10.33	10.39	10.42	10.45	10,53	10.65	10.66	10.66	10.72	10.75	10.83	10.62	10.93	10.94	11.11	11.15	
	_		11.28	11.32	11.38	11.39	11.47	11.50	11.50	11.51	11.61	11.69	11.77	11.78	11.78	11.82	11.85	11.87	11.90	12.02	12.04	22.02	12.34
C me/L	1298	. 25	12.06	12.15	12.16	12.23	12.23	12,31	12.37	12,40	12.41	1243	55.55	12.59	17.62	12.74	12.79	12.80	13.21				(2.70)
à		i 	12.90	12.93	12.95	12.97	13.08	13.08	13.12	13.14	13.15	13.16	13.18	13,23	13.25	3.28	13.28	13.31	13.33		13.35		
			13.53	13.55	13.55	13.57	13.61	13,66	13.67	13.68	13.73	13.78	19.78	13.78	13.83	13.84	13.85	13 87	15.90			24.10	
			14.10	14.15	14.18	14,24	14.37	14.39	14.47	34.53	14.58	14.58	14.84	15.32	15.22	:5.24	15.29	15.33	15.41			15.49	
			15.56	15.56	15.59	15.62	15.70	15.79	15.86	15.89	15.98	16.00	16.D6	16.18	16.29	16.51	16.74	16.91	17.15			07.30	
	-		17.53	17.74	17.75	20.71																-	
			6.37	6.41	£.	6.47	6.6.	6.64	6.67	6.92	6.92	6.95	7.05	117	7.15	7.17	7.19	7.21	7,33	7.35		7.39	
			7.40	7.53	7.57	7.58	7.53	7.69	7.78	1.70	7.72	7.80	7.82	7.85	7.86	7.87	7.91	7.94	797	7.98	8.02	8.04	
			8.05	8.07	8.08	8.09	8.13	8.15	8.26	8.27	873	8.32	8.36	8.47	8.49	8.64	8.68	8.69	8.73	7,7		27.0	
			8.92	8.96	85.39	60	41.6	9.15	9.15	9.24	933	9.40	9.40	9.68	9.74	9.79	9.32	58.5	986	D6:0		96.6	
-			9.99	10.01	10.02	10.03	10.08	10.10	10.24	10,34	10,42	10.42	10.43	13,46	10.57	10.58	10,61	10.62	20.66			0.82	
			10.84	10.88	10.92	10.95	10.95	10.96	10.98	10.99	3T'00	11.01	11.02	11.33	11.10	11.11	11.12	11.20	:1.23			133	
50 mg/L	8462	246	11.35	11.41	11.42	11.43	11.43	11.45	11,45	11,48	31.50	11.52	11.52	11.52	11.54	21.55	11.59	11.63	23.70	11.70	11.74	97.11	11.22
	_	_	11.76	11.85	11.87	11.89	16.11	11.93	11.95	11.95	11.99	12.03	12.03	37,35	12.09	12.11	12.11	12.15	22.16	12.18	12.19		(2.66)
		_	275	12.23	12.23	22.81	12.32	12,33	12.37	12.40	12.42	12.43	12.45	12.45	12.47	12.65	12,69	12.70	12.71		12.79		
			12.88	12.89	12,93	.2.95	12.97	12,99	12.39	13.00	13,02	13.04	13.05	13.15	13.26	23°52	13.47	13,49	13.50	13.53	13.56	3.63	
			13.65	13.71	13.74	.3,80	14.00	14.02	14,03	14.03	14.36	14.16	14.27	14.36	14,46	14.47	14,47	14.48	14.54	14.54	14.57	14.57	
,			14.61	14.64	14.70	14.78	14.87	14.95	14.96	15.04	15.12	15.18	15.30	15.3.	15.39	15.52	15.62	15.88	15.89	15.91	16.26 1	16.30	
			16.47	16.34	16.94	17.40	17.53	20.06								į							
			5.18	6.20	6.24	6.38	5.45	6.48	6.56	6.58	6.78	7.01	7.05	7.09	7.11	17.	7.23	7.23	7.28	7.30	7.44	7.51	
			7,60	7.70	7.81	7.87	7.88	7.95	1,96	B.04	9.06	8.15	3.15	8.29	8.30	8.3	8.38	8.45	850			62	
			593	3,67	8.69	8,70	8,70	3.74	80.00 10.00	8.83	8.96	9.03	90%	5.07	9.08	9.15	9.76	9.39	9.29		9.30	9.41	
			3.45	9.43	196 6	9.68	9.53	9.71	9.74	9.74	3.81	9.84	9.95	10.09	10.09	10.09	10.13	10.25	10.27	10.28	10.47	10.49	
			10.54	10,54	10.58	10.61	10.63	10,69	10.75	10.79	10.83	10.84	10,84	10.84	10.85	10.86	10.83	10.95	1036		12.09	110	
			11.13	11.14	11.18	11.25	11.28	11.3	£1.39	11.41	11.42	11.45	11,47	11.50	11.52	11.60	11.62	11.64	11.67	11.72	11.75		11.99
100 000	1498	36	11.88	11.90	17.90	11.52	11.92	11.93	12.01	15.04	12.07	12.13	12.18	17.71	22.22	12.22	12.29	12.33	12.35	12.40	17.43	32.45	(2.88)
,	!		12,48	12.49	12.50	17.60	12.60	12.60	12.60	72.62	17.63	17.64	12.67	17.71	57.73	12.77	12.78	12.86	32.88	12.89	13.03	13.04	
-			13.07	13.08	13.10	e e	13.18	13.15	13.27	13.31	13.34 34	13.35	13.36	13.39	13.39	13.42	13.44	13.46	34	13.54	13.57	13.63	
			13.63	13,63	13.70	13.76	13.77	13.79	13.80	13.81	13.93	14.01	14.03	14.06	14.12	14.15	14.20	14.33	14.34	14.38 1	14.45 1	4.46	
			14,46	14.50	14.54	14.55	14.57	14.59	14.60	14.60	14,62	14.67	14.72	14.72	14.76	14.81	14.82	14.88	14.93	14.95	14.97	15.01	
			15.02	15,03	15.04	15.08	15.09	15.12	15.17	15.18	15.21	15.24	15.25	38	15.38	15.62	35.65	15.73	15.81	15.82	15.91	15.94	
-			15.96	16.03	16.04	16.05	15.06	16.13	16.17	1621	15.24	16.55	16.59	16.67	16.82	16.84	16.98	16.95	17.00	17.36	17.74	18.18	
			18 56	18 94																		_	

Page 2 of

Page **279** of **519**

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 30) Data Source: Flie Folder: 16 Forms: "Zebra Mussel Lengths" File Name: See filenames as stated below

Zebra Mussel Lengths - Lake Shawano (Whole Water Column)

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A [SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Whole Tank

Overall Data Summary:

		6 h			9 h			12 h	
	0 mg/L	50 mg/L	100 mg/L	0 mg/l,	50 mg/L	100 mg/L	0 mg/L	50 mg/L	100 mg/L
Mean (mm)	18.33	18.88	18.80	18.65	18.67	18.89	18.67	17.87	18.28
(STD)	(3.10)	(3.21)	(2.77)	(2.64)	(2.71)	(2.94)	(2.52)	(2.82)	(3.22)
Minimum	7.49	8.13	11.64	8.33	11.02	6,23	13.28	7.57	6.55
Maximum	26.57	35.04	26,34	27.72	25.42	27.77	25,44	26.62	29.30
Grand Mean		18,67	i		18.74			18.27	
(STD)		(0.24)			(0.11)			(0.33)	

<u>Data Explanation:</u>
After survival analysis, one tray from each treatment level (0, 50 and 100 mg/L) at each exposure termination time point (6, 9 and 12 h) was retained for mussel length analysis. All animals were measured for length. All lengths were reported except for those from mussels with broken she is or those < 6 mm.

6 h Mussel Length Data
I:\AEH-12-PSEUDO-04\Data Summarles\[Lake Shawano Lengths (Whole Tank),xisxj6h Length Data

9 h Mussel Length Data

I:\AEH-12-PSEL.DO-04\Data Summar es\(Lake Shawano Lengths (Whole Tank).xlsx)9h Length Data

i:\AEH-12-PSEUDO-04\Data Summarles\[Lake Shawano Lengths (Whole Tank).xisx]12h Length Data

Data anomalies and deviations:

File Folder:

Study Numbers ABH 122 PSEUDO 04
Thermonic Lab Probook (jagge 30)
Thermonic Lab Fedder Lab
Ores Source: File Fedder La
Forms-"Zabra Moscal Lengths"

Test Article: MISI 401 509 (8/-CL MSA (504))
Article for 8t-AUTP-ZTISC and 4UTP/ZTISC MIX
Exposus 2012-25 Service 6, 2012
Test Location, Like St Privator, Stewarto, Mix
Test Iment 7 yose Whyole Tank

6 hour Mussel Length Data

Treatment	Sample	2										Length	FI.										Mean
Level	6	•										(mm)	9										Ē
			7.49	7.54	10.86	11.65	7972	14.26	34,45	15.16	15.34	15.88	15.94	16.03	16.21	16.22	16.28	16.29	16.46	16.51	15.61	16.81	ı
0 me/l	W/781	8	17.25	17.27	17.30	17.41	17.47	17.48	17.57	17.57	17.60	17.61	17.95	17.96	18.22	18.31	18.39	18.45	18.47	18.53	18.63	18.66	18.33
			18.72	18.92	19.02	19.06	19.16	19.16	19.19	19.25	19.26	19.27	19.32	1937	19.47	19.54	19.58	19.60	19.67	19.67	19.88	19.92	(3.10)
			19.95	19.96	19.97	20.10	20.26	20.30	20.39	20.57	20.66	21.51	21.62	21.92	21.97	22.07	22.46	22.54	22.72	23.62	23.79	26.57	
			8,13	8.16	10.19	13.19	13.73	13.90	14.13	14.22	14.53	14.75	15.00	15.05	15.40	15.71	15.72	15.75	15.86	15.99	16.05	16.12	
			16.22	16.25	16.39	16.57	16.74	16.83	16.86	17.05	17.10	17.13	17.15	17.31	17.33	17.34	17.38	17.38	17,41	17.45	17.48	17.58	
			17.62	17.57	17.78	17,78	17.83	17.86	17.88	1731	18.04	13.09	18.11	18,15	18.22	18.28	18.33	18.46	18.53	18.53	18.54	18.57	13.88
50 mg/L	W8G	137	18.57	18.61	18.62	18.73	18.81	18.84	18.84	18.88	18.96	18.97	18.97	39.08	19.0g	19.10	19.16	19.19	96 61	19.27	19.37	19.43	(3.21)
			19.45	19.46	19.47	19.55	19.61	19.62	19 .63	19.72	19.78	19.83	19.93	19.95	19.96	19.97	26.93	20.00	20.04	20.11	20.15	20.39	
			20.30	20.30	20.33	20.38	20.38	20.41	20.48	20 62	20.64	20.65	20.65	20.82	20.83	20.97	21.00	23.10	21.16	21.25	21.39	21.56	
			21.72	21.82	21.92	21.97	22.12	22.28	22.30	22.58	22.87	22.90	22.98	23.70	24.97	25.17	27.07	28.74	35.04				
			11.64	13.09	13.98	14.64	14.71	15.33	15.38	15.55	15.74	15.76	15.76	15.77	15.20	15.30	16.11	16.45	16.63	15.87	17.13	17.19	
100 me/(W9A1	ĸ	17.43	17.46	17.74	17.86	17.87	17.92	17.96	17.38	18,22	1825	18.31	18.33	19.47	18.47	18.55	18.59	13.60	18.67	18.54	18.96	18.80
,		:	19.06	19.03	19.22	19.29	19.33	19.35	19.39	19.42	19.73	19.92	20.13	20.20	20.42	20.58	20.80	20.82	20.92	20.93	51.09	21.17	12.77
•			21.23	21.38	21.42	21.74	21.57	21.87	22.05	22.98	23.27	23.33	24.01	26.03	26.34								

n Number /

Study Number: ABH-12-DSEJDDO-04 Fleetronic Lish Morebook (Seges 30) Duta-Source: File Folder: 16 Forms: "Zebra Musse" Lengthe"

9 hour Mussel Length Data

Test Ander Will 401 SOP 197-42, 545A (SOP)]
Antie Lue 4, 4017121365 und 401P22154C M/x
Departure Date 1 Soften-Pres (\$ 2021
Test Location: Lies Sheware, Sheware, WI
Testement Prose: Whole Tank

Mean Mean	Transme	Samela											1	1										
12.2 12.1 12.2	Level	Q	z	_									(mr	ê										Mean (STD)
No. 15 16.5			L	8.33	12.12	12.21	12.69	12.91	12.96	13.00	14.05	14.30	14.72	14.76	14.92	14.36	15.30	15.60	15.63	15.69	1. 1.2	5833	16.10	
No. 12, 20,				16.29	16.30	16.37	16.39	16,46	16.49	16.59	16.75	16.81	16.89	16.98	17.02	17.02	17.03	17.04	17.17	17.23	27.25	17.26	17.27	
Wilson 156 1860				17.28	17.30	17.39	17.42	17.48	17.49	17.54	17.54	17.63	17.68	17.68	17.68	17.71	17.82	17.83	17.91	17.95	27.98	18.00	18.01	
1851 1849 1859 1859 1859 1857 1850 1950 1950 1950 1951 1951 1952 1952 1952 1955 1952 1955 1952 1955	0 mg/L	WIA3	156	18.03	18.03	18.05	18.05	18.07	18.08	18.09	18.20	18.20	18.25	18.43	18.49	18.51	18.54	18.66	18.68	18.72	18.81	18.85	18.88	18.65
1845 1946 1949 1949 1949 1949 1949 1949 1949				18.91	18.93	18.95	18.96	18.97	19.02	19.04	19.10	19.11	19.15	19.17	19.20	19.21	19.24	19.24	19.25	19.26	19.27	19.37	19.38	(2.64)
12.62 12.64 12.64 12.64 12.75 12.75 12.7				19.43	19.46	19,49	19.55	19.61	19.69	19.61	19.81	19.95	20.09	20.23	20.27	20.30	20.32	20.32	20.33	20.36	2C.43	20.45	20.50	
12.45 7157 7157 2166 7172 2169 2124 2120 2124 2127 2136 2125 2129				20.62	20.6Z	20.64	20.72	20.73	20.78	20.82	20.85	20.89	20.89	20.90	20.94	20.96	27.00	21.03	21.09	21.15	21.18	21.20	21.35	
1102 1229 1152 1152 1152 1152 1152 1152 115				21.49	71.51	21.57	27 66	22.72	21.90	21.97	22.00	22.16	22.24	22.72	23,04	23,55	25.71	26.93	27.72					
12.56 11.59 11.50 11.59 15.61 16.52 15.53 15.45 15.51 15.51 15.52 15.55 15.57 15.75 15.7				11.02	12.22	12.62	13.81	14.22	14.21	14.25	14.30	14.73	24.75	24.92	14.99	14,99	15,01	15.03	15.12	15.12	15.19	15.20	15.33	
1706 1711 1718 1728 1725 1726 1726 1726 1725 1726 1727				15.36	15.69	15.99	16.01	16.32	16,33	16.49	16.51	16.51	16.53	16.56	16.58	16.71	16.75	16.76	16.78	16.80	16.82	16.84	16.97	
WebL 147 1954 1959 1959 1959 1850 1840 1840 1840 1840 1840 1840 1840 1840 1840 1850			_	17.03	17.11	17.18	17.34	17.35	17.36	17.41	17.47	17.50	17.58	17.58	77.62	:7.63	17.70	17.73	17.76	17.77	17.92	17.52	17.92	18.67
1967 1968 1969 1960 1960 1960 1961 1951 1951 1952 1957 1957 1958 1955 1957 1958 1958 1958 1958 1958 1958 1958 1959 1959	50 mg/L	W841	147	17.94	17.97	17.97	18.03	18.03	13.10	18.18	18.45	18.47	18.56	18.57	65 KT	18.73	18.78	18.78	18.92	18.94	18.96	18.96	19.03	2,7
2021 2102 2022 2102 2024 2025 2024 2025 2024 2025 2025 20	3	!	•	19.02	19.03	19.05	19.07	19.09	19,11	19.16	19.21	19.28	19.32	19.37	19.38	19.56	29.62	19.70	19.72	78.5.	20.00	20.12	20,14	
Accordance Acc				20.21	20.22	20.24	20.26	20.29	20.41	20,44	20.46	20.49	20.50	20.55	20.59	20.64	20.65	20.69	20.70	20.76	20.61	20.82	20.88	
23.17 23.66 24.71 25.06 25.05 25.89 56.27 2.07 25.00 17.34 17.35 15.75 15.78 15.27 15.78 15.27 15.05 15.47 15.27 15.87 1				20.92	21.01	21,13	21.28	21.28	21.39	22.42	21.45	21.46	21.55	21.61	21.69	21.79	21.79	21.94	22.12	22.25	22.36	22.47	22.83	
6.23 5.74 12.84 12.89 6.84 15.99 15.94 15.45 15.54 15.54 15.75 15.77 15.77 15.78 15.72 15.78 15.77 15.72 15.79 15.72 15.79 15.72 15.79 15.				23.17	33.86	24,71	25.04	25.05	25.89	26.42														
12.65 16.68 16.72 16.78 16.84 16.89 16.8				6.23	7.37	12.34	14.93	14.94	:5.39	15.39	15.44	15.45	15.53	15,77	15.78	15.82	15.86	15.98	16,01	16.03	16.27	16.28	16.47	
1768 1768 1773 1759				26.52	16.63	16.72	7.6.78	16.82	16.84	16.89	16.89	16.91	16.52	16.58	17.00	17.14	17.20	17.21	27.30	17.34	17.41	17.52	17.53	
W9C3 123 1284 5-905 5-905 5-905 5-915 5-917 12-22 5-325 19-85 19-85 19-85 19-55 19-7				.7.68	27.69	:7.73	27.90	27.90	17.91	27.93	17.94	28.13	18.15	18.26	18.27	18.40	18.56	18.63	18.65	18.67	18.69	18.71	18.72	
2018 2019 2027 2044 2044 2045 2054 2076 2080 2080 2083 2020 2010 1101 2104 2111 2118 2128 2134 1137 2119 2118 2128 2140 2119 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2119 2118 2128 2140 2118 2128 2128 2128 2128 2128 2128 212	100 mg/L	Wac:	133	.8.84	39.05	39.05	39.08	39.16	.9.17	19.21	27.53	19.23	19.35	19.38	19.38	19.49	19.57	19.72	78.51	19.94	19.64	20.00	20.04	18.89
1134 1137 21.50 21.51 21.54 21.55 21.56 21.64 21.88 22.20 22.38 22.45 22.46 22.98 22.11 22.13 23.55 24.1A 25.75 27.77 (5770)				20.16	20.18	20.19	20.27	20.44	20.44	2C.45	20.64	20.76	20.80	20.80	20.83	20.90	20,90	21.00	21.01	21,04	21.11	21.13	21.23	(2.94)
25.75 27.77 Grand Mean (5770)				21.27	21.34	21.37	21.50	21.51	21.54	21.55	21.56	21.63	21.64	21.88	22.20	22.38	22.43	22.46	22.98	23.11	23.13	23.55	24.14	
				25.19	25.75	77.72																		
╗																						Grand 3	Меап	18.74
																						Æ	~	(0.2.1)

Study Number, AGH-12-PSEUDO-04 Electronic Lab Nurebook (pages 30) Data Source: File Folder: 16 Forms: "Zebe Mussel Langths"

12 hour Mussel Length Data

Test Antider MBI 407 197-197-1, 1454, (509)]
Africe Latt & All PEZISSE, enc. 420/221.87C Min
Sugrave Dise: September 6; 2027.
Test Loorifort Lat Swivene, Shavene, Wil
Testernent Type: Whole Tenk

Treatment	Sample	2						!				Lengths	ths										Mean
Level	5									ı		(mm)	6					İ					Ę
			13.28	13.74	14.07	14.22	14.27	14.28	14,94	15.04	15,09	15.18	15.49	15.63	15.73	16.03	16.35	1637	16.58	16.77	16.78	16,81	
			16.87	17.14	17.15	17.20	17.20	17 21	17.25	17.26	17.26	17.44	17.45	17.46	17.48	17.58	17,65	17.68	17.69	17.72	17.73	17.74	.8.67
0 mg/L	WJAZ	66	17.71	17.86	18.01	13.02	18.11	18.15	18.17	18.24	18.24	18.33	18.53	18.57	18.57	18.67	18.72	18.72	18.83	18.85	18.87	18.91	(2.52)
			18.91	19.05	19.42	19,48	19.67	19.72	19.79	19.85	19.88	19.95	19.96	20.10	20.23	20.30	20.39	20.51	20.58	20.59	20.69	20.72	
			20.80	20.84	20.92	21.19	21.38	21.42	21.45	21.53	21.68	27.75	21.77	21.83	22.31	23.56	23.86	24.15	24.62	24.92	25.44		
		_	7.57	8.58	12.73	13.13	13.29	13.74	13.82	14.08	14.43	14.47	14.78	14.90	14.98	14.99	15.38	15.54	15.61	15.84	15.88	15.90	
			15.91	16.01	16.06	16.08	16.20	16.36	16.37	16.56	16.58	16.77	16.87	16.94	16.95	16,99	17.03	17.04	17.08	17.15	17.31	17.37	17.87
50 mg/L	W2A2	. 83	17.46	17.67	17.75	17.75	17.79	17.92	17.92	17.94	18.07	18.10	18.16	18.23	18.34	18.34	18.36	18,36	18.40	18.46	18.52	18 53	(2.82)
			18,51	18,74	18.75	18.78	18.78	18.90	19.10	19.23	19.25	19.52	19.54	19.72	19.92	19.92	19.99	20.02	20.15	20.35	20.37	20.40	
			20,42	20 42	20.53	20.56	20.57	20.73	20.80	21.30	21.02	23.54	21.59	21.83	22.07	22.13	22.37	23.65	26.62				
			6.55	6.74	7.99	30.6	10.53	11.69	13.15	13.38	14.07	14.53	14.63	14.80	15.08	15.10	15.19	15.31	15.39	15.50	13.67	15.90	ĺ
			15.99	16,11	16.11	16.35	16.36	16.49	16.53	10.74	16.97	16.97	16.99	17.17	17.26	17.26	17.29	17.34	17.36	17.47	17.47	17.56	
			17.51	17.52	17.65	17.68	17.72	17.73	17.79	17.81	17.84	18.02	18.05	18.07	18.15	18.17	18.25	18.30	18.32	18.38	18.41	18.49	18.28
100 mg/L	W3A3	27	18.49	18.52	18.52	18.52	18.58	18.60	18.62	18.63	18.64	18.75	18.78	18.81	18.81	18.83	18.86	18.98	19.00	19.03	19.04	19.08	(3.22)
			19.13	19.18	19.21	19.22	19.29	19.39	19.40	19.44	19.47	19.50	19.51	19.52	19.56	19.56	19.58	19.63	19.56	19.70	19.79	19.81	
			19.84	20.06	20.18	20.22	20.33	20.42	20.47	20.51	20.62	20.66	20.83	20.83	20.91	21.01	21.35	21.46	21.66	21.82	21.58	22.17	
			22.73	22.74	22.76	22.80	22.82	23.57	23.66	75,97	29.30												

tem Number / of 4

File Folder: 6

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 30) Data Source: File Folder: 16 Forms: "Zebra Mussel Lengths" File Name: I:\AEH-12-PSEUDO-04\Data Summaries\[Lake Shawano Lengths (Bottom Injection).xisx]12h Length Data

Zebra Mussel Lengths - Lake Shawano (Bottom Injection)

Test Article: MBI 401 SDP [Pseudomanas fluorescens Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 8, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Bottom Injection

Overall Data Summary:

		12 h	
	0 mg/L	50 mg/L	100 mg/L
Mean (mm)	18.92	18,59	18.52
(STD)	(2.58)	(2.71)	(2.81)
Minimum	13.68	9.86	9.00
Maximum	30.12	29.01	30.72
Grand Mean		18.68	
(STD)		(0.18)	

<u>Data Explanation:</u>
After survival analysis, one tray from each treatment level (0, 50 and 100 mg/L) from the 12 h exposure termination time point was retained for mussel length analysis. All animals were measured for length. All lengths were reported except for those from mussels with broken shells or those < 6 mm.

Data anomalies and deviations: NONE

File Folder: _____

Item Number

Stacy Number: ACH-12-PSEUDO-09
Electronic Lab Morebook (pages \$0)
Date Source: file "piden: 16
Forms: "Zebra Mussel (angths"

									12 h	our M	ussel 1	12 hour Mussel Length Data	Data							:	,		
Treatment	Sample	z										lengths	<u>.</u>										Mean
		_	33.68	13.72	13.86	14,17	14.20	14.78	14.91	15.00	15.27	15.64	15.83	18.08	15.10	11.3	, 0130	9		200	-	-1	Ē
			26,46	16.53	16.55	16.56	16.71	16.74	16.91	16.98	17.05	17.08	17.14	17.16	7, 7,	1				9 1		20 1	
			:7.59	17.65	17.59	17,70	17.78	17.78	17.82	17.92	17,92	17.92	17.94	37.96	17.98	1796			70.71	2 2		20 5	
l/am (5	9/1	28.16	18.28	18,37	18.40	15.41	18.45	18.43	18.61	13.61	18.66	18.77	18.73	18.74	18.74			7 0	9 6		7 :	1
]	į	19.03	19.08	19.15	15.26	19.30	19.37	19.32	19.34	19.36	19.37	X9'51	19.29	97 01	10.00			0000	55.07		20.70	76.87
_			8	19.76	19,76	15.80	19.20	19.61	19.92	20.03	20.12	0.00	41.00	14.14	1 2	200	•			7.1		4.0	(5.53)
			20.64	20.66	20,70	20.74	20.30	21.04	21.13	21.13	1 2	, K	200 17	20.00		20.07				4 :		20.61	
		_	25.46	26.12	26.42	26,55	30.12				i		7	3	7		ĵ	27	75.77	4.27	24.55	K K	
			98'6	10.42	11.40	328	13.77	4.0	14.24	34.45	14.43	15.27	15.24	15.34	15.49	15.74	16.03	80	1	100	ļ	!	T
			16.57	15.60	16.61	:6.63	16.39	17.06	17.23	17.25	17.25	17.37								2001		79.47	_
50 me/	Ç		18.04	18.12	18.18	18.20	18.21	18.22	18.30	18.31	18.34	18.38	18.75							3 3		8	-
		-	19.02	19.06	19.15	19.15	19.17	19.20	19.23	19.25	19.32	15.32	16.43			·							65.55
			20.03	71,02	20.25	20,30	20.38	20.43	20.47	20.49	20.51	20,58								1 2			7.7
			21.61	21.75	21.00	22.17	22.29	22.34	22.51	22.75	22.97	8					•	•		1	•	7	_
			9,36	12.02	13.46	13,77	13.78	13.93	14.19	14.	14.51	14.6		15.08	15.79	15.24	27 75	15.76	8	20.01	00 31	12	
			16.07	15.11	16.22	16.47	16.50	16.57	16.74	16.83	16.97	16.99										3 6	
_			17.34	17.37	17.39	17.40	17.44	17.45	17.54	17.56	17.57	17.61											2
100 mg/L	88 83 83 83 83 83 83 83 83 83 83 83 83 8	52	18.31	16.37	18.40	13.41	13.43	18.47	18.49	18.51	18.56	18.67			-							_	7007
			19.06	19.07	19.10	15.13	19.24	13.30	19.31	19.37	19.42	19,44	19.45	19.46								_	-
		_	20.44	20.48	20.62	20.63	20.31	20.82	20.82	23.86	20,58	21.13	27.22	21.28								20.00	
			22.42	22.48	22.62	22.62	23.05	23.36	23.47	28.73	20.72						•			•		7	

File Folder:

Appendix 6. Water Quality

Item Number	Item Description	Number of Pages	Report Page Number
1	Pre-Exposure Water Chemistry – Lake Carlos – Whole Tank – Data Summary	2	287
2	Exposure Water Chemistry – Lake Carlos – Whole Tank – Data Summary	2	289
3	Exposure Un-ionized Ammonia – Lake Carlos – Whole Tank – Data Summary	3	291
4	Pre-Exposure Water Chemistry – Lake Shawano – Whole Tank – Data Summary	2	294
5	Exposure Water Chemistry – Lake Shawano – Whole Tank – Data Summary	2	296
6	Exposure Un-ionized Ammonia – Lake Shawano – Whole Tank – Data Summary	3	298
7	Pre-Exposure Water Chemistry – Lake Carlos – Bottom Injection – Data Summary	2	301
8	Exposure Water Chemistry – Lake Carlos – Bottom Injection – Data Summary	2	303
9	Exposure Un-ionized Ammonia – Lake Carlos – Bottom Injection – Data Summary	3	305
10	Pre-Exposure Water Chemistry – Lake Shawano – Bottom Injection – Data Summary	2	308
11	Exposure Water Chemistry – Lake Shawano – Bottom Injection – Data Summary	2	310
12	Exposure Un-ionized Ammonia – Lake Shawano – Bottom Injection – Data Summary	3	312
13	Temperature Data Loggers (HOBOs) Summary – Lake Carlos	2	315
14	Temperature Data Loggers (HOBOs) Summary – Lake Shawano	2	317

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 10) Data Source: File Folder: 9b

Forms: See form names as stated below

Action Date Initialș 19-Oct-13 KLW / W Created,..... 10-Dec-14 Revised.... Reviewed... IDECIY W Certified... 12/10/11/4 51

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\[Lake Carlos Water Chem (Whole Tank) 11-26-14.xlsx]Pre-Exposure Water Chem

Pre-Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C MIx Exposure Date: August 15, 2012 Test Location: Lake Car os, Alexandria, MN Treatment Type: Whole Tank

Data Explanation:

Forms titled "Conductivity and Hardness - Exposure Initiation" and "Alkalinity - Exposure Initiation": Conductivity, hardness, and alkalinity were measured prior to dosing. Samples were collected from both headboxes used to fill individual tanks. Samples were analyzed in triplicate.

Forms titled "Water Quality - Temperature (*C) Measurements", "Water Quality - pH Measurements" and "Water Quality - Dissolved Oxygen (mg/L) Measurements": Temperature, pH and dissolved oxygen levels were measured prior to dosing. Measurements were observed in each exposure tank.

Data anomalies and deviations:

File Folder: 9b

Test Article: MBI 401.SDP [6f-CL 145A [5DP]]
Article Loc-#: 402121585 can 401P12164C Mix
Exposure Dete: Atgust 15, 2012
Test Location: Lake Carlos, alexandria, MN
Treatment Type: Whole Tank

Pre-Exposure Water Chemistry

Headbox	Designation of	Conductivity	Hardness	Alkalintty
O.	reparate	(Std)	(mg/l of CaCO ₃)	$mg/1$ of $CaCO_3$) $\{mg/1$ of $CaCO_3\}$
	1	394	1/8	163
⋴	7	396	176	163
	ĸ	394	176	162
	1	396	178	163
7	7	393	178	162
	3	397	176	162
Me	Mean	568	77.1	163
'n	STD	-	н	н
įrįM	Minimum	393	176	162
Mex	Maximum	397	178	163

Data Forms: "Conductivity and Nardness - Exposure Initiation" and "Alkalinity - Exposure Initiation"

Treatment	Test Tank	00	Ę	Тетар.
Level	ō	(mg/r)	Ę	(7.0
	7	8.74	8.64	22.1
0	m	8.76	8.63	22.2
	Ŋ	8.80	8.62	22.2
Меал		8.77	8.63	22.17
Std		0.02	0.01	0.05
	ı	8.76	8.65	22.1
S	4	8.75	8.63	22.2
	50	8.77	8.61	22.1
Mean		8.76	8.63	22.13
æ		0.01	0.02	0.05
	9	8.75	8.60	22.2
300		8.76	19.8	27.72
	on.	8.78	8.63	22.2
Mean		8.76	8.61	22.20
Std		0.01	0.01	0.00
Grand	Srand Mean	8.76	8.62	22.17
S	ρ	00:0	3.11	C.03
Minin	Minimum	8.74	8.60	22.10
Max	veximum	8.80	8.65	22.20

Maximum 8.80 22.20

Jahmerus calculated on high open in concentrations plantand development of white base on plantand of the base of the concentration of th

Page of of or

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 10) Data Source: Tile Folder: 9b Forms: See Table Footnotes

File Folder: 9b

Study Number: AEH-12-F	SEUDO-04		Action	Date	Initials
Electronic Lab Notebook	(page 11)		Created	19-Oct-13	KLW WK
Data Source: File Folder:	9b		Revised	10-Dec-14	
Forms:	"Water Quality - Temperature (°C) Measurements"		Reviewed	10 DELIY	W
	"Water Quality - pH Measurements"		Certifled	12/10/14	57-
	"Water Quality - Dissolved Oxygen (mg/L) Measurements	s"		,	

Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-C., 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: August 15, 2012
Test Location: Lake Carlos, Alexandria, MN
Treatment Type: Whole Tank

Data Explanation:

Water chemistry measurements (dissolved oxygen, oH and temperature) were observed for all test tanks at 0, 3, 6, 9 and 12 h after dosing.

NOTE: 0 h measurements were observed from 30 minutes to 1 h after dosing.

File Name: I:\AEH-12-PSEUDO-04\Data Summarles\Water chem\(Lake Carlos Water Chem (Whole Tank) 11-26-14.xlsx)Exposure Water Chem

Data anomalies and deviations:

NONE

	9b
File Folder:	<u> </u>

Item Number Of Of O

Test Article: MBI 401 SDP [9f -CI 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: August 15, 2012
Test Location: Lake Carlos, Alexandria, MN
Treatment Type: Whole Tank

Study Number: AEH-12-PSEUDO-04
Electronic Lab Notebook (page 11)
Data Source: File Folder: 9b
Forms: "Water Quality - Temperature ("C) Meastrements"
"Water Quality - pf: Measurements"
"Water Quality - pf: Measurements"
"Water Quality - pf: Measurements"

Exposure Water Chemistry

Toot Took		0 hour			3 Hour			6 Hour			9 Hour			12 Hour	
<u> </u>	8	7	Temp.	00	177	Тетр.	g	40.	Temp.	00	7	Temp.	00	1,1	Temp.
·	(mg/L)	Ē	(בי)	(mg/L)	E.	(2)	(mg/L)	пd	(,0)	(mg/r)	Ĕ	()	(mg/J)	E.	õ
2	8.68	8.60	22.3	8.47	8.56	22.4	8.46	8.55	22.5	8.24	8.25	22.5	8.12	8.54	22.5
m	8.72	8.62	22.3	857	8.57	22.4	8.50	8.54	22.5	8.22	8.79	22.5	8.11	8.56	22.5
5	8.77	8.63	22.4	8.70	8.58	22.5	8.56	8.58	22.6	8.30	8.31	22.4	8.10	8.57	22.4
	8.72	8.62	22.3	8.58	8.57	22.4	8.51	8.56	225	8.25	8.28	22.5	8.11	8.56	225
	0.04	0.01	0.05	60.0	0.01	0.05	9.04	0.02	90.02	0.03	0.02	0.05	0.01	0.01	0.05
п	8.68	8.57	22.2	8.40	8.49	22.4	8.17	8.47	22.5	7.86	8.20	22.5	6.75	8.33	22.5
4	8.65	8.57	22.3	8.43	8.48	22.5	8.26	8.49	22.5	7.86	8.20	37.6	6.68	8.34	22.5
8	8.64	8.57	22.3	8.42	8.47	22.4	8.19	8.48	22.5	7.67	8.21	22.4	6.44	8.35	22.4
Mean	99'8	8.57	22.3	8.42	8.48	22.4	8.21	8.48	22.5	7.80	8.20	22.5	6.62	8.34	22.5
	0.02	0.00	0.05	0.01	0.01	0.05	0.04	0.01	0:00	0.09	0.00	C.08	0.13	0.01	0.05
9	8.65	8.53	22.3	8.43	8.39	22.5	8.20	8.37	22.5	7.84	8.12	22.4	6.93	8.21	22.4
^	8.63	8.53	22.3	8.39	8.38	22.4	7.97	8.39	22.4	7.70	8.12	22.3	6.84	8.24	22.3
6	8.65	8.53	22.3	8.33	8.37	22.4	8.02	8.39	22.5	7.68	8.12	22.5	6.76	8.23	22.5
Mean	8.64	8.53	22.3	8.38	8.38	22.4	8.06	8.38	22.5	7.74	8.12	22.4	6.84	8.23	22.4
	0.01	0.00	0.00	2.04	0.01	0.05	0.10	0.01	0.05	0.07	0.00	0.08	0.07	10.0	0.08
Grand Mean	8.67	8.57	77.3	8.45	8.48	22.4	8.76	8.48	22.5	7.93	8.21	22.5	7.19	8.40	22.4
STO	0.04	0.04	0.03	60.0	0.08	0.00	0.18	0.07	0.03	0.23	0.07	0.04	0.66	0.14	0.03
Minimum	8.63	8.53	22.2	8.33	8.37	22.4	7.97	8.37	22.4	1914	8.12	22.3	6.44	8.21	22.3
Maximum	8.77	8.63	22.4	8.70	8.58	22.5	8.56	8.58	22.6	8.30	8.31	22.6	8.12	8.57	22.5

² pH means caiculated on hydrogen ion concentration; pH standard deviations calculated on pH values

File Folder: 4b

Exposure Un-ionized Ammonia

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix

Exposure Date: August 15, 2012

Test Location: Lake Carlos, Alexandria, MN

Treatment Type: Whole Tank

Data Explanation:

1) Water samples were collected at 6, 9 and 12 h from each exposure tank. Samples were 0.45 µm filtered, acidified with sulfuric acid, and analyzed by the 4500-NH₃ G. Automated Phenate Method (Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005) on a Technicon Autoanalyzer II by the UMESC water quality laboratory.

2) The un-ionized ammonia fractions were calculated using the sample pH and temperature according to the formula in Emerson et al. (1975).

<u>Data Anomalles and Deviations:</u> NONE

•		
Item Number	File Folder: 95	
Page of	File Folder:	

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 11) TAN Data Source: LTRMP Report (File Folder 17) pH and Temperature Data Source: Water Quality Forms (File Folder 9b) Test Artic e: MB: 401 SDP (Pf-CL 145A (SDP)) Article Lot #: 401P32169C and 401P12164C Mix Exposure Date: August 15, 2012 Test Location: Lake Carlos, Alexandria, MN Freatment Type: Whole Tank

Exposure Un-ionized Ammonia

Sample	Treatment Lovel	Test Tank	μH ^t	Temperature	TAN	Un-lon zed	NH ₃
Time	(eng/L)	ID	l	(°C)	as NH ₂ -N (mg/L)	Fraction ²	(mg/t) ³
		2	8.55	22.5	0.174	0.144	0.025
	0	3	8.54	22.5	0.172	0.141	0.024
		5	8.58	22,6	0.167	0.154	0,026
	Mean		8.56	22.5	0.171	0.146	0.025
	std		0.02	0.0	0.003	0.005	0.001
		1	8,47	22.5	0,225	0,123	0.02B
6	50	4	8.49	22.5	0.229	0.128	0.029
	***************************************	8	8.48	22.5	0.215	0.125	0.027
	Mean		8.48	22,5	0.223	0,125	0.028
	std		0,01	0.0	0.006	0.002	0,001
	4.00	6	8.37	22.5	0.262	0.100	0.026
	100	7	8,39 8,39	22,4 22,5	0.272 0.270	0.104 0.104	0,028
		9	ł	22.5	0.268	0.1C3	0,028
	Mean std		8.38 0.01	0.0	0.004	0.103	0.028
	3(0	2	8.25	22.5	0.171	0.078	0.013
	0	3	8.29	22.5	0.169	0.085	0.014
	·	5	8.31	22.4	0.180	0.088	0.015
	Mean		8,28	22.5	0,173	0.083	0.014
	std		0.02	0.0	0.005	0.004	0.001
		1	8.20	22,5	0.225	0.070	0.015
9	50	4	8.20	22.6	0.223	0.070	0.015
		8	8.21	22.4	0.231	0.071	0.016
	Mean		8.20	22.5	0.226	0.070	0,015
	std		0.00	C.1	0.003	0.000	0.000
		6	8.12	22.4	0.273	0.058	0.015
	100	7	8.12	22.3	0.273	0.058	0.015
		9	8,12	22.5	0.273	0.059	0.015
	Mean		8.12	22.4	0.273	0.058	0.015
	std		0.00	0.1	0.000	0.000	0.000
		2	8,54	22.5	0.224	0.141	0.032
	0	3	8.56	22.5	0.254	0.147	0.037
		5	8.57	22.4	0.256	0.149	0.038
	Mean		8.56	22.5	0.245	0.146	0.036
			0.01	0.0	0.015	0.003	0.003
	std					+	
		1	8,33	22.5	0.318	0,092	0.029
12	50	4	8.34	22.5	0.331	0.094	0.031
		8	8.35	22.4	0.334	0.095	0.032
	Mean		8.34	22.5	0.328	0.094	0.031
	std		0.01	0.0	0.007	0.001	0.001
	***********	6	8,21	22.4	0,354	0.071	0.025
	100	7	8.24	22.3	0.339	0.075	0.025
		9	8.23	22.5	0.333	0.075	0.025
	Moon					. •	
	Mean		8.23	22.4	0.342	0.074	0.025
	std		0.01	0.1	0.009	0.002	0.000

 $^{^3}$ Un-ionized ammonia is calculated based on the following formula: Un-ionized ammonia = f * TAN (mg/L)

	Α	В	С	D	E	F	G	н
	itudy Numl	ber: AEH-12	PSEUDO-0	4			Tost Articlet MDI 401 SDP [2]-CL 14SA [SDP)]	
2 E	lectronic (ab Noteboo	k (page 11)	1			Article Lot #: 403P12169C and 401P12164C Mix	
3 T	AN Deta S	ovrce; LTRIV	P Raport (I	File Folder 17)			Exposure Date: August 15, 2012	
4 p	H and Ten	perature Da	ita Source;	Water Quality Forms (File Folder 9b)			Test Location: Lake Carlos, Alexandria, MN	
5							Treatment Type: Whole Tank	
6								
7					Exposure Un-lo	nized Ammonia		
8								
9								
10	Sample	Treatment						
11	Sample Time	Level (mg/L)	Test Tenk		Temperatura (*C1	TAN as NH-N (mg/L)	Un-lantzed Fraction ²	NH ₃ (mg/L) ¹
		(ID.	PH ³ 8.55	22.5	0.174		
12 13 14 15		D	2	8.54	22.5	0.174	x=1/(10^(0.09018+(2729.92/(273.15+E12))-D12]+1) x=1/(10^(0.09018+(2729.92/(273.15+E13))-D13]+1)	x=G12*f12 x=G13*f13
14		•	5	8,58	22,6	0.167	x=1/(10*(0.09018*(2729.92/(273.15*F14))-014)+1)	x=G14*f14
15		Mean		x=(LOG10((13^D12+10^D19+10^D14)/3))	x=AVERAGE(E12:E14)	x=AVERAGE(F12:F14)	x=AVERAGE(G12:G:4)	x=AVERAGE(H12:H14)
15 17		std		x=STDEV.P(D12:D14)	x=STDEV.P(E12:E14)	x=STDEV.P(F12:F14)	x=STDEV.P(G12;G14)	x=STDEV.P(H12:H14)
17	6		1	8,47	22.5	0,225	x=1/(10^(0.09018+(2729.92/(273.15+E17))-017]+1)	x=G17*F17
13	ь	50	4	8.49	22.5	0.229	x=1/(10^(0.09018+(2729.92/(273.15+E18))-D18)+1)	x=G18*F18
79		Mean	. 8	8.48 x=(LOG10((10^D17+10^D18+10^D19)/3))	22.5 x=AVERAGE(E17:E19)	0,215 x=AVERAGE(F17:F19)	x=1/(10^(0.09018+(2729.92/(273.15+E19()-D19)+1) x=AVERAGE(G17:G19)	x=G19*F19 x=AVERAGE(H17;H19)
18 19 20 21 22		std		x=(tOS10((10-017+10-018110-019)(3)) x=STDEV.P(D17;D19)	x=STDEV.P(E17:E19)	x=STDEV.P(F17:F19)	x=XVEIOGE(G17;G19) x=STDEV.P(G17;G19)	x=STDEV.P(H17:H19)
22			6	8,37	22,5	0.262	x=1/(10^(0.09018+(2729,92/(273.15+E22))-D22)+1)	x=G22*F22
23		100	7	8.39	22.4	0.272	x=1/(10^(0.09018+(2729.92/(273.15+E23))-D23)+1)	x=G23*F23
23 24 25 25 27 28 29 30 31 32 33 34		Mean	9	8.39 x=(LOG10((10^D22+10^D23+10^D24)/3))	22.5 x=AVERAGE(E22:E24)	0.270 x=AVERAGE(F22:F24)	x=1/(10^(0.09018+(2729.92/(273.15+E24))-D24)+1)	x=G24*F24 x=AVEFAGE(H22;H24)
1		std	- 1	x=(LOG10((10*D22+10*D23+10*D24)/3)) x=S*DEV.P(D22;D24)	x=STDEV P(622:E24)	x=STDEV.P(F22:F24)	x=AVERAGE(G22:G24) x=STDEV.P(G22:G24)	x=AVERAGE(H22;H24) x=STDEV.P(H22;H24)
27			2	8.25	22,5	0.171	x=1/(10^(0.09018+(2729.92/(273.15+E27)]-D27)+1)	x=G27*F27
28		0	3	8.29	22.5	0.169	x=1/(10^(0.09018+(2729.92/(273.15+F28))-D28)+1)	x=G28*F28
29			55	8.31	22.4	0,180	x=1/(10^(0.09018+(2/29.92/(2/3.15+129))-029)+1)	x=G29*129
30		Mean		x={LOG10((10^D27+10^D28+10^D29)/3}) x=STDEV.P(D27:D29)	x=AVERAGE(E27:E29) x=STDEV.P(E27:E29)	x=AVERAGE(F27:F29) x=STDEV,P(F27:F29)	x=AVERAGE[G27:G29) x=STDEV.P(G27:G29)	x=AVERAGE(H27:H29) x=STDEV.P(H27:H29)
35		std	1	8.20	22.5	0.225	x=1/(10^(0.09018+(2729.92/(273.15+E32)) D32)+1)	x=G32*F32
33	9	50	4	8.20	22.6	0.223	x=1/(10^(0.09018+(2729,92/(273,15+E33))-D33)+1)	x=G33*F33
34			8	8,21	22,4	0,231	x=1/(10^(0,09018+(2729.92/(273.15+[34)]-D34)+1)	x=G34*F34
35		Mean		x=(LOG10((10^D32+10^D33+10^D34)/3))	x=AVERAGE(E32:E34)	x=AVERAGE(F32:F34)	x=AVERAGE(G32:G34)	x=AVERAGE(H32:H34)
36		std	6	x=STDEV.P(D32;D34) 8.12	x=STDEV.P(E32;E34) 22.4	x=STDEV.P(F32:F34) 0.273	x=570EV.P(692:6341 x=1/(10^(0.09018+(2729.92/(273.15+E37))-D37)+1)	x=STDEV.P(H32:H34) x=G37*F37
35 36 37 38		100	7	8.12	22.3	0,273	x=1/(10*(0.09018+(2729.92/(273.15+657))-D37)+1) x=1/(10*(0.09018+(2729.92/(273.15+637))-D38)+1)	x=G38*f38
39		200	و و	8.12	22.5	0.273	x=1/(10^(0,09018+(2729.92/(273.15+E39))-D39)+1)	x=G39*f39
40		Mean		x=(LOG10((10^D37+10^D38+10^D39)/3))	x=AVERAGE(E37;E39)	x=AVERAGE(F37:F59)	x=AVERAGE(G37;G39)	x=AVERAGE(H37;H39)
41		stal		x=STDEV.P(D37:D39)	x=STDEV.P(E37:E39)	x=STDEV.P(F37 F39)	x=STDEV.P(G37:G39)	x=STDEV.P(H37:H39)
42			2	8.S4	22.5	0.224	x=1/(10^(0.09018+(2729.92/(273.15+E42))-D42)+1)	x=G42*F42
43		a	3	8,56	22.5	0.254	x=1/(10^(0.09018+(2729.92/(273.15+E43))-D43)+1)	x=G43*F43
44			5	8,57	22.4	0,256	x-1/(10^(0.09018+(2729.92/(273.15+E44))-D44)+1)	x-G44*f44
45		Mean		x=(LOG10((10^D42+10^D43+10^D44)/3))	x=AVERAGE(E42:E44)	x=AVERAGE(F42:F44)	x=AVERAGE[G42:G44)	x=AVERAGE(H42:H44)
46		stal		x=STDEV.P(D42;D44)	x=STOFV.P(E42:E44)	x=STDEV.P(F42 F44)	x=STDEV.P(G42;G44)	x=STDEV.P(H42:H44)
47			1	8.33	22.5	0.318	x=1/(10^(0.09018+(2729.92/(273.15+E47))-D47)+1)	x=G47*F47
48	12	SO	4	8.34	22.5	0.331	x=1/(10^(0,09018+(2729,92/(273.15+E48j)-D48)+1)	x=G48*F48
49			8	8,35	22.4	0,334	x=1/(10^(0,09018+(2729.92/(273.15+E49))-D49)+1)	xG49*F49
50		Mean		x=(LCG10((10^D47+10^D48+10^D49)/3))	x=AVERAGE(E47;E49)	x=AVERAGE(F47:F49)	x=AVERAGE[G47:G49)	x=AVERAGE(H47:H49)
51		staf	į	x=51DEV.P(D47:D49)	x=STDEV,P(E47:E49)	x=STDEV.P(147 F49)	x=SYDEV.P(G47:G49)	x=STDEV.P(H47:H49)
52			6	8.21	22.4	0,354	x=1/(10^(0.09018+(2729.97/(273.15+E52))-057)+1)	x=G52*F52
53		100	7	8.24	22 3	0.339	x=1/(10^(0.09018+(2729.92/(273.15+E53))-D53)+1)	x=G53*F53
54			9	8,23	22 5	0.333	x=1/(10^(0.05018+(2729.92/(273.15+E54))-D54)+1)	x=G54*f54
55		Mean		x=(LOG10((10^D52+10^D53+10^D54)/3))	x=AVERAGE(E52:E54)	x=AVERAGE(F52:F54)	x=AVERAGE(G52:G54)	x=AVERAGE(H52:H54)
56		std		x=STDEV.P(D52:D54)	K=STDEV.P(E52:854)	x=STDEV.P(F52.F54)	x=STDEV.P(G52:G54)	x=STDEV.P(H52:H54)
57 1	pH means	calculated o	n Fydrogei	ion concentration; pH standard deviations calcula	ated on pH values			
58	-			1 27390	91			
	Ju-ionachiach	mont' à les désembles	nyassayı ildə ildə	lovingformula (Emersoret al. 1975): $f = \frac{\rho K n \approx 0.090 B1 ^{-12.5}}{\zeta}$				l
50 51 7.	FT + 77315	8.090.0 ≈ u'2n	2729.92	The first calculation used is then: f = 100	-			
52	4	,	(2°3.15 + 7;)	The find calculation used is then: $f = \frac{10^{\left(\frac{2-3812}{1200 \log 4}\right)^{\frac{3}{2}+1}}}{10^{\left(\frac{2-3812}{1200 \log 4}\right)^{\frac{3}{2}+1}}}$	l			l
63				[In]	1			
54					•			
		ammonia i	s calculated	d based on the following formula: Un-lonized amm	ionia x= f * TAN (mg/L)			l
	Un-lonized							
66	Un-jonized							
66 67	Un-lonized							İ
66 67 68	Un- onizec							
66 67	Un- onized					3		
66 67 68 69	Un- onized				ltem Nurgber	3		
66 67 68 69 70	Un-Jonizee				ltem Nurober Page	3 _or_3		

File Folder: 9b

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 21)

Data Source: File Folder: 11b

Forms: See form names as stated below

		Initials
Created	19-Oct-13	KLW /
Revised	10-Dec-14	KLW W
Reviewed	WASH	w
Certifled	12/10/14	Jaw

File Name: I:\AEF-12-PSEUDO-04\Data Summaries\Water chem\(Lake Shawano Water Chem (Whole Tank) 11-26-14.xlsx)Pre-Exposure Water Chem

Pre-Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A [SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Whole Tank

Forms titled "Conductivity and Hardness - Exposure Initiation" and "A kalinity - Exposure Initiation": Conductivity, hardness, and alkalinity were measured prior to dosing. Samples were collected from both headboxes used to fill individual tanks. Samples were analyzed in triplicate,

Forms Litled "Water Quality - Temperature (°C) Measurements", "Water Quality - pH Measurements" and "Water Quality - Dissoived Oxygen (mg/L) Measurements": Temperature, pH and classolved oxygen levels were measured prior to dosing. Measurements were observed in each exposure tank.

<u>Data anomalles and deviations:</u> NONE

File Folder: 15

Item Number_

Test Article: MBI 401 SDP [P]-CL 149A [SDP];
Article Lot if -0.0P12165C and 40P12164C Mix
Associate Detect September 6, 2012
Text Location: Lake Shawano, Shawano, WI
Treatment Type: Whole Tank

Pre-Exposure Water Chemistry

Headbox	o o o o	Conductivity	Hardness	Alkalinity
Ð	neparate	(Srl)	{mg/L of CaCO ₃ }	(mg/L of CaCO ₃) (mg/L of CaCO ₃)
		248	118	105
1	2	248	118	106
	nn	248	118	105
	Ŧ	245	118	106
7	7	247	120	105
	m	251	118	105
Ž	Mean	248	118	105
S	(STD)	(2)	Œ	(0)
Mini	mum	245	118	105
Maxi	Maximum	25.	120	106

Data Forms, "Conductivity and Hardness - Exposure Initiation" and "Alkelinity - Exposure Initiation"

Treatment	Test Tank	8	7.7	Temp.
Level	Q	(mg/t)	E	(,d
	П	7.32	9.31	22.6
0	4	7.36	9.33	22.6
	7	7.35	9.34	22.6
Mean		7.34	9.33	22.60
stq		0.02	0.01	0.00
	2	7.37	9.33	22.7
55	2	7.38	9.33	22.6
	8	7.34	9.34	22.6
Mean		7.36	9.33	22.63
stq		0.02	0.00	0.05
	m	7.35	9.34	22.6
100	ø	7.36	9.34	22.6
	O)	7.37	9.34	22.6
Mean		7.36	9.34	22.60
眜		0.01	0.00	00:00
Grand	Grand Mean	7.36	9.33	22.61
is:	Sto	10.0	10.0	0.02
Mîri	Minimum	7.32	15.8	22.60
Max	Maximum	7.38	9.34	22.70

File Folder: 113

Maskinder: 1,20

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Item Number

Study Number: AEH-12-PSEUDO-04
Electronic Lab Notebook (page 2.1)
Data Source: File Folder: 1.15
Forms: See table footnotes

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 21 to 23)

Data Source: File Folder: 11b

Forms: "Water Quality - Temperature (°C) Measurements"

"Water Quality - pH Measurements"

"Water Quality - Dissolved Oxygen (mg/L) Measurements"

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water Chem\{Lake Snawano Water Chem (Whole Tank) 11-26-14.xlsx)Exposure Water Chem

Action	Date	Initials
Created	19-Oct-13	KLW W
Revised	10-Dec-14	KLWW/W)
Reviewed	LODER 14	TOW
Certified	12/10/19	30 -

Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Whole Tank

Data Explanation:

Water chemistry measurements (dissolved oxygen, pH and temperature) were observed for all test tanks at 0, 3, 6, 9 and 12 h after dosing. NOTE: 0 h measurements were observed from 30 minutes to 1 h after dosing.

<u>Data anomalies and deviations:</u> NONE

File Folder: 11b

Test Article: MBI 401 SDP [19'-CL 145A [5DP]]
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: September 6, 2012
Test Location: Lake Shawano, Shawano, WI
Treatment Type: Whole Tank

Study Number: AEH-12-PSEUDD-0-04
Electronic Lab Notebook (pages 21 - 23)
Data Source: File Folder: 11b
Forms: "Water Quality - Temperature ("C) Measurements"
"Water Quality - PH Measurements"
"Water Quality - PH Measurements"
"Water Quality - PH Stsolwed Oxygen (mg/L) Measurements"

Exposure Water Chemistry

_			_							_	_					_	_				
	Тетр.	(JC)	22.6	22.0	21.5	22.0	0.45	22.1	21.6	21.7	21.8	0.22	71.9	21.7	21.7	21.8	0.09	21.9	0.12	21.5	22.6
12 Hour	101	C C	6.02	9.06	80.6	9.05	0.02	8.83	8.85	8.73	8.81	0.05	8.73	8.68	8.62	8.68	0.04	8.88	0.16	8.62	9.08
	8	(mg/L)	- 6.30	6.52	6.48	6.43	0.10	4.65	4.69	3.31	4.22	0.64	5.07	5.29	4.02	4.79	0.55	5.15	0.94	3.31	6.52
	Temp.	(20)	77.7	22.1	21.7	22.2	0.41	22.1	21.7	21.8	21.9	0.17	22.0	21.8	22.1	22.0	0.12	22.0	0.12	21.7	7.72
9 Hour	rn.	E.	9.12	9.16	9.15	9.14	0.02	9.02	8.02	8.99	9.01	0.01	8.91	8.93	8.87	8.90	0.02	9.03	0.10	8.87	9.16
	00	(mg/l)	6.61	6.65	6.63	6.53	0.02	6.01	5.98	5.59	5.86	0.19	6.03	6.25	5.80	6.03	0.18	6.17	0.33	5.59	6.65
	Temp.	(,c)	22.6	22.0	21.8	22.1	0.34	222	21.7	21.8	21.9	0.22	22.0	21.8	22.1	22.0	0.12	22.0	0.10	21.7	22.6
6 Hour	-11	במ	9.14	9.15	9.15	9.15	0.00	9.08	9.07	9.06	9.07	0.01	86.8	9.00	8.97	8.98	0.01	9.07	0.07	8.97	9.15
	00	mg/L)	6.78	6.93	6.83	6.85	90:0	6.67	6.58	6.47	6.57	80.0	6.50	6.68	6.50	6.56	0.08	99'9	0.13	5.47	6.93
_	lemp.	<u>.</u>	2.3	2.0	8.1	2.0	.21	22.0	81.8	1.9	91.9	80.0	27.0	8.1.8	6.17	1.9	3.08	21.9	90:0	1.8	22.3
ur																					
3 Hour	£1.	<u> </u>	9.2	9.2	9.2	9.2	0.0	9.12	9.1	9.1	9.1	0.0	9.0	9.0	9.0	0.6	0.0	9.1	0.0	9.0	9.2
	8	(mg/L)	7.02	7.10	7.08	7.07	0.03	7.11	6.92	68.9	6.97	0.10	76'9	7.04	7.02	7.01	0.03	7.02	0.04	68.9	7.11
	Temp.	5	22.0	22.0	21.9	22.0	0.05	22.0	21.8	21.9	21.9	0.08	22.0	21.9	21.9	21.9	0.05	22.9	0.03	21.8	22.0
0 hour	-1-	E.	1776	9.28	9.28	97.5	0.00	9.22	9.22	9.22	9.22	00:0	9.14	9.14	9.16	9.15	0.01	9.22	0.05	9.14	9.28
	2	(mg/t)	7.71	7.34	7.18	7.24	70.0	7.26	7.27	7.18	7.24	9.0	7.16	7.29	7.31	7.25	0.07	7.24	0.01	7.16	7.34
1		2	-	4		-		2	5	-	_		m	φ	6	_		fean	_	E	En
Treatment	Level	(mg/r)		0		Mean	Std		50		Mean	Std		100		Mean	Std	Grand Mean	(STD)	Minimum	Maximum

 $^{\mathtt{1}}$ pH means calculated on hydrogen ion concentration, pH standard deviations calculated on pH values

Item Number of 3

File Folder: 11b

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 23)

TAN Data Source: LTRMP Report (File Folder 17)

pH and Temperature Data Source: Water Quality Forms (File Folder 11b)

Action	Date	Initials
Created	19-Oct-13	
Revised	10-Dec-14	KLW IW
Reviewed	JODEN	W
Certified	12/10/14	37AL

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\[Lake Shawano Water Chem (Whole Tank) 11-26-14.xlsx

Exposure Un-ionized Ammonia

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A (SDP)]

Article Lot #: 401P12163C and 401P12164C Mix

Exposure Date: September 6, 2012

Test Location: Lake Shawano, Shawano, WI

Treatment Type: Whole Tank

Data Explanation:

1) Water samples were collected at 12 h from each exposure tank. Samples were 0.45 μ m filtered, acidified with sulfuric acid, and analyzed by the 4500-NH₈ G. Automated Phenate Method (Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005) on a Technicon Autoanalyzer II by the UMESC water quality laboratory.

2) The un-ionized ammonia fractions were calculated using the sample pH and temperature according to the formula in Emerson et al. (1975).

Data Anomalies and Deviations:

1) Water samples were not collected at 6 and 9 h from the exposure tanks for un-ionized ammonia analysis. See Deviation #3 for further clarification.

File Folder:	116
Item Number_	3
Page (of _ >

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 23)

TAN Data Source: LTRMP Report (File Folder 17)

pH and Temperature Data Source: Water Quality Forms (File Folder 11b)

Test Article: MB 401 SDP [Pf-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: September 6, 2012
Test Location: Lake Shawano, Shawano, WI

Treatment Type: Whole Tank

Exposure Un-ionized Ammonia

Treatment Level	Test Tank	pH ³	Temperature	TAN	Un-ionized	NHa
(mg/L)	ΙĎ		(°C)	as NH ₃ -N (mg/L)	Fraction ²	(mg/l) ⁵
	1	9.02	22.6	0.133	0.334	0.044
0	4	9,06	22.0	0.126	0.344	0.043
	7	9.08	21.5	0.123	0.347	0.043
Mean		9.05	22,0	0.127	0.342	0.043
Std		0.02	0.4	0.004	0.006	0.001
	2	8.83	22.1	0.188	0.238	0,045
50	5	8.85	21.6	0.176	0.239	0.042
	8	8.73	21.7	0.198	0.194	0.038
Mean		8.81	21.8	0.187	0.224	0.042
Std		0.05	0.2	0.009	0.021	0.003
	3	8.73	21.9	0.226	0.196	0.044
100	6	8.68	21.7	0.223	0.177	0.039
	9	8.62	21.7	0.241	0.157	0.038
Mean		8.68	21.8	0.230	0.177	0.041
Std		0.04	0.1	0.008	0.016	0.003

¹ pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values

$$^{2} \text{ Un-ionized fraction}(f) \text{ is calculated based on the following formula} \\ \text{(Emerson tal.} 1973; \\ f = \frac{1}{(10^{8G} f^{H}) + 1}; \\ pKc = 0.09018; \\ \frac{272992}{7}$$

$$T_k = T_c + 273.15; \ pKa = 0.09018 + \frac{2729.92}{\left(273.15 + T_c\right)}; \ \text{The final calculation used is then} : f = \frac{1}{\left\{\left[0^{\left(\frac{8.29815}{(273.154T_c)}\right)^2, \, pH}\right] + 1\right\}}$$

 $^{^3}$ Un-ionized ammonia is calculated based on the following formula: Un-ionized ammonia x= f * TAN (mg/L)

1	A	O	Q	E	Д.	9
٦ ٢	Study Number: AEH-12-PSEUDO-04	PSEUDO-04			Test Article: MBI 401 SDP [<i>Pf</i> -Cl. 145A (SOP)]	
4 6	Electronic Lab Notebook (page 23) TAN Data Source: LTBMP Report (File	k (page 23) IP Report (file Folder 17)			Article Lot #: 403P12363C and 401P12164C Mix	
4	pH and Temperature Da	physical Source: Linking Report (* 1885 - 1974). physical Temperature Data Source: Water Quality Forms (File Folder 11b).			exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, Wl	
5					Treatment Type: Whole Tank	
æ						
~ 8			Exposure U	Exposure Un-ionized Ammonia		
0	Treatment Fest Jank		Temperature	TAN	In Southwest	2
ដ		rHd.	ξ)	as NH _x -N (mg/L)	Fraction ²	(mg/Ll)
뒴	H	9.02	22.6	0.133	x=1/(10^(0.09018+(2729.92/(273.15+F11))-E11)+1)	x=H11*G11
77	0 4	90'6	22.0	0.126	x=1/(10^(0.09018+(2729.92/(273.15+F12))-E12)+1)	x=H12*G12
띩	7	80.6	21.5	0.123	x-1/(10^(0.09018+(2729.92/(273.15+F13))-E13)+1)	x=H13 ⁻ G13
77	_	x=(LOG10((10^E11)10^E12+10^E13)/3))	x=AVERAGE(F11:F13)	x=AVERAGE(G11:G13)	x=AVERAGE(H11:H13)	x=AVERAGE(111:113)
끘	Stg	x=STDEV.P(E11:E13)	x=STDEV.P(F11:F13)	x=STDEV.P(G11:G13)	x=STDEV.P(H11:H13)	x=STDEV.P(111:113)
16		8.83	22.1	0.188	x=1/(10^(0.09018+(2729.92/(273.15+F16))-E16)+1)	x=H16 [*] G15
77	50	8.85	21.6	0.176	$x=1/(10^{\circ}(0.09018+(2729.92/(273.15+F17))-E17)+1)$	x=H17*G17
띩		8.73	21.7	0.198	$x=1/(10^{(0.09018+(2729.92/(273.15+118))-118)+1)}$	x=H18*G18
5	_	x=(LOG10((10^E15+10^E17+10^E18)/3))	x=AVFRAGE(F16:F18)	x=AVERAGE(G16:G18)	x=AVERAGE(H16:H18)	x=AVERAGE(116:118)
웨	Std	x=STDEV.P(E16:E18)	x=STDEV.P(F16:F18)	x=STDEV.P(G16:G18)	x=S1DEV.P(H16:H18)	x=STDEV.P(116:118)
77		8.73	21.9	0.226	x=1/(10^(0.09018+(2729.92/(273.15+F21))-E21)+1)	x=H21*G21
긺	100	8.68	21.7	0.223	$x=1/(10^{\circ}(0.09018+(2729.92/(273.15+F22))-E22)+1)$	x-H22*G22
23		8.62	21.7	0.241	$x=1/(10^{\circ}(0.09018+(2729.92/(273.15+F23))-E23)+1)$	x=H23*G23
72	Mean	x=(LOG10((10^E21+10^E22+10^E23)/3))	x=AVERAGE(F21:F23)	x=AVERAGE(G21:G23)	x=AVERAGE(H21:H23)	x=AVERAGE(121:123)
12	Std	x=STDEV.P(E21:E23)	x=STDEV.P(F21:F23)	x=STDEV.P(G21:G23)	x=S10EV.P(HZ1:HZ3)	x=STDEV.P(121:123)
26	н	pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values	tions calculated on p.4 value	8		
7			1 272992			
28		Unitable transfer of the calculated based on the following formula ($\frac{1}{2}$) is calculated based on the following formula ($\frac{1}{2}$	$(10^{86-pt})+1$ $pKa=0.09018+$			
2 %	Ę	7				
띪	$V_k = V_o + 2/3.12$; $p_k a = 0.09018 + \frac{7}{(273.15 + 1)^2}$	$9018+\frac{7}{(275.15+T_c)}$; The first calculation used is then: $f = \frac{9018+\frac{7}{4}}{(275.15+T_c)}$	[[22922]]_m]]			
32	·		{ 10 ((073) 97c))] +1}			
8						
쏬	3 Un-fonized ammonia i	3 Un-fonized ammonia is calculated based on the following formula: Un-ionized ammonia $x=f^*$ TAN (mg/t)	nized ammonîa x= f * TAN (mg/L)		
X X						
3 12						
8	•					
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₹			Item Number	1 '		
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Study Number: AErl-12-PSEUDO-04 Electronic Lab Notebock (page 14)

Data Source: File Folder: 12b

Forms: See form names as stated below

Action Date Initials
Created...... 19-Oct-13 KLW JW
Revised..... 10-Dec-14 KLW JW
Certified... 11-19-14 JW

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\(Lake Carlos Water Chem (Bottom Injection) 11-26-14.xlsx|Pre-Exposure Water Chem

Pre-Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C MIX
Exposure Date: August 17, 2012
Test Location: Lake Car os, Alexandria, MN
Treatment Type: Bottom Injection

Data Explanation:

Forms titled "Conductivity and Hardness - Exposure Initiation" and "Alkalinity - Exposure Initiation": Conductivity, hardness, and alkalinity were measured prior to dosing. Samples were collected from both headboxes used to fill individual tanks. Samples were analyzed in triplicate.

Forms titled "Water Quality - Temperature (*C) Measurements", "Water Quality - pH Measurements" and "Water Quality - Dissolved Oxygen (mg/L) Measurements": Temperature, pH and dissolved oxygen levels were measured prior to dosing. Measurements were observed in each exposure tank.

Data anomalies and deviations:

NON

File Folder: 195

Item Number 1

Text Article: M3i 401 50P [Jf-Ct 145A [5DP]]
Article Lot # 4011201585C and 401P12164C Mix
Expoxure Date: August 17, 2012
Test Loration: Like Carlos, Alexandria, MN
Treatment Type: Bottom Injection

Pre-Exposure Water Chemistry

Headbox	Doglanto	Conductivity	Hardness	Alkalinity
10	nepilicate	(इत)	(mg/L of CaCO _s)	mg/Lof CaCO ₃) (mg/Lof CaCO ₃
	1	298	176	164
н	7	359	178	164
	m	360	178	164
		365	178	164
7	7	368	176	164
	3	362	178	163
₩	Mean	363	171	164
15	(STD)	(3)	Ξ	(O)
Z.	Minimum	359	176	163
Max	Maximum	368	178	15

Data Funns, "Conductivity and Hardress - Exposure Initiation" and "Alkalinity - Exposure Initiation"

Treatment	Test Tank	o		Temp.
Level	Ð	(mg/L)	H	(,c)
	~	8.42	8.70	217
0	Q	8.40	8.70	21.2
	7	8.43	8.70	21.2
Mean		8.42	8.70	27.20
æ		0.01	0.00	0.00
	ы	8.39	8.70	21.2
20	4	8.43	8.70	217
	8	8.39	8.70	21.1
Mean		8.40	8.70	21.17
Std		0.02	0.00	0.05
	2	8.43	8.70	21.2
700	N	8.36	8.69	21.2
	a	8.40	8.69	21.2
Mean		8.40	8.69	21.20
Std		0.03	0.00	0.00
Grand Mean	Mean	8.41	8.70	21.19
ţ	B	0.01	0.00	0.02
Minimum	murr	8.36	8.69	21.10
Maxi	Maximum	8.43	8.73	21.20

Waterinetin Control of the Control o

tem Number

Study Number AEH 12 PSEUDO 04
Electronic Lab Norabook [page 14]
Data Source: File Folder: 12b
Forns: See table footnotes

File Folder, 125

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 15 to 16)

Data Source: File Folder: 12b

Forms: "Water Quality - Temperature (°C) Measurements"

"Water Quality - pH Measurements"

"Water Quality - Dissolved Oxygen (mg/L) Measurements"

File Vame: I:\AFH-12-PSEUDO-04\Data Summaries\Water chem\(Lake Carlos Water Chem (Bottom :njection) 11-26-14.xlsx]Exposure Water Chem

Action Date Initials Created...... 19-Oct-13 KLW //// Revised..... 10-Dec-14 KLW // Reviewed.... (DFLW /// Certified.... ////// //

Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C MIx
Exposure Date: August 17, 2012
Test Location: Lake Carlos, Alexandria, MN
Treatment Type: Bottom injection

Data Explanation:

Water chemistry measurements (dissolved oxygen, pH and temperature) were observed for all test tanks at 0, 3, 6, 9 and 12 h after dosing.

NOTE: 0 n measurements were observed from 30 minutes to 1 h after dosing.

Data anomalies and deviations:

File Folder: 136

Item Number of 3

Test Article: MBI 401 SDP [Pf-C1 145A (SDP)]
Article Lot II: 401P12163C and 401P12164C Mix
Exposure Date: August 15, 2012
Test Location: Lake Carlos, Alexandria, MN
Trestment Type: Bottom Injection

Stricy Number: AEH-22-PSEUDO-04
Electronic Lab Notebook (pages 15 to 16)
Data Source: File Folder: 12b
Forms: "Water Quality - Temperature ("C) Measurements"
"Water Quality - pif Measurements"
"Water Quality - pif Measurements"
"Water Quality - Dissolved Ongen (ingl't) Measurements"

Exposure Water Chemistry

eatment		0 hour			3 Hour			6 Hour			9 Hour			12 Hour	
Level rest Tank	00	7,1	Temp.	8	1	Temp.	20	7	Тетр.	8	1,71	Тетр.	8	f.Fi	Теппр.
(mg/t)	(mg/L)	5	ō	(mg/L)	<u>.</u>	(C)	(mg/L)	L	(3)	(mg/L)	<u>.</u>	(.c)	(mg/L)	E.	(°C)
8	7.95	8.52	21.3	7.94	8.51	21.2	7.91	8.47	21.6	77.7	8:38	21.6	7.72	8.55	21.1
9	7.98	8.57	21.3	7.98	8.54	21.2	7.94	8.49	71.5	7.86	8.39	21.3	7.80	8.57	71.D
_	7.99	8.59	21.3	7.98	8.55	21.2	7.95	8.50	21.3	7.88	8.39	21.2	7.84	8.58	20.9
Меал	7.97	8.56	21.30	7.97	8.53	21.20	7.95	8.49	21.47	7.84	8.39	21.37	7.79	8.57	21.00
E	0.02	0.03	0.00	0.02	0.02	0.00	0.03	0.01	0.12	0.05	0.00	0.17	0.05	0.01	0.08
1	7.94	8.60	21.3	7.95	8.55	21.2	7.79	8.48	21.8	7.80	8.38	21.7	6.83	8.12	21.3
50 4	8.00	8.61	21.3	7.99	8.55	21.3	7.80	8.48	21.9	7.80	8.39	21.8	7.21	8.19	21.3
80	7.97	8.60	21.3	7.96	8.55	21.2	7.90	8.48	21.3	7.83	8.41	21.2	7.45	8.20	20.8
Mean	7.97	8.60	21.30	7.57	8.55	21.23	68.7	8.48	7977	7.81	8.39	21.57	7.16	8.17	21.13
ST	0.02	0.00	00.0	0.02	0.00	0.05	0.05	0.00	0.26	0.01	0.01	0.26	0.26	0.04	0.24
2	8.00	8.50	21.2	7.98	8.55	21.2	7.93	8.48	21.7	7.87	8.41	21.6	7.44	7.18	21.2
2 001	08.7	8.58	21.4	7.92	8.54	21.3	7.89	8.46	21.5	7.74	8.39	21.4	7.13	7.39	21.1
6	7.90	8.57	21.3	7.96	8.52	21.3	7.91	8.44	21.5	7.82	8.40	21.4	7.14	7.34	21.0
Mean	7.90	8.58	21.30	7.95	8.54	21.27	7.91	8.46	21.57	7.81	8.40	21.47	7.24	7.31	21.10
ars	C.08	0.01	80:0	0.02	0.01	0.05	0.02	0.02	0.09	0.05	0.01	0.09	0.14	0.09	0.08
Grand Mean	7.95	8.58	21.3	96.7	8.54	21.2	7.90	8.48	21.6	7.87	8.39	21.5	7.40	8.75	71.1
STD	0.03	0.02	0.00	0.01	0.01	0.03	0.05	0.01	90.0	0.01	0.01	0.08	0.28	0.52	0.06
Minimum	7.80	8.52	21.2	7.92	8.51	21.2	7.79	8.44	21.3	7.74	8.38	21.2	6.83	7.18	20.8
Maximum	8.00	8.61	21.4	7.99	8.55	21.3	7.59	8.50	21.9	7.88	8.41	21.8	7.84	8.58	21.3

 4 pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values

File Folder: 125

Item Number

Page **304** of **519**

Study Number: AEH-12-PSEUDO-04	Action	Date	Initials
Electronic Lab Notebook (page 16)	Created	19-Oct-13	
TAN Data Source: LTRMP Report (File Folder 17)	Revised	10-Dec-14	KLWW
pH and Temperature Data Source: Water Quality Forms (File Folder 12b)	Reviewed	LODEIM	w
	Certified	12/10/14	511-
			
File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\(Lake Carlos Water Chem: (Be	ottom Injection) 11-26-14.xlsx]/	Ammonia Da	ıta

Exposure Un-ionized Ammonia

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]

Article Lot #: 401P12163C and 4C1P12164C Mix

Exposure Date: August 17, 2012

Test Location: Lake Carlos, Alexandria, MN Treatment Type: Bottom Injection

Data Explanation:

- 1) Water samples were collected at 12 h from each exposure tank. Samples were 0.45 µm filtered, acidified with sulfuric acid, and analyzed by the 4500-NH₃ G. Automated Phenate Method (Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005) on a Technicon Autoanalyzer II by the UMESC water quality laboratory.
- 2) The un-ionized ammonia fractions were calculated using the sample pH and temperature according to the formula in Emerson et al. (1975).

Data Anomalles and Deviations:

File Folder: 12b

Item Number 3
Page of 3

Study Number: AEH-12-PSEUDO-03 Electronic Lab Notebook (page 16)

TAN Data Source: LTRMP Report (File Folder 17)

pH and Temperature Data Source: Water Quality Forms (File Folder 12B)

Test Article: MBI 401 SDP [Pf -CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 17, 2012

Test Location: Lake Carlos, Alexandria, MN Treatment Type: Bottom Injection

Exposure Un-ionized Ammonia

Treatment Level	Test Tank ID	pH ¹	Temperature (°C)	TAN as NH ₃ -N (mg/L)	Un-lonized Fraction ²	NH _s (mg/L) ³
	3	8.55	21.1	0.232	0.132	0.031
0	6	8.57	21.0	0.207	0.137	0.028
	7	8.58	20.9	0.210	0.138	0.029
Mean		8.57	21.0	0.216	0.136	0.029
stď		0.01	0.08	0.01	0.00	0.00
	1	8.12	21,3	0.403	0.054	0.022
50	4	8.19	21.3	0.415	0.063	0.026
	8	8.20	20.8	0.385	0.062	0.024
Mean		8.17	21.1	0.401	0.060	0.024
stď		0.04	0.24	0.01	0.00	0.00
	2	7,18	21.2	1.486	0.006	0.010
100	5	7.39	21.1	1.123	0.010	0.012
	9	7.34	21.0	1.504	0.009	0.014
Mean		7.31	21.1	1.371	0.009	0.012
std		0.09	80.0	0.18	0,00	0.00

 $^{^{\}mathbf{1}}$ pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values

$$T_k = T_c + 273.15; \ pKa = 0.09018 + \frac{2729.92}{(273.15 + T_c)}; \ \text{The final calculation used is then} : f = \frac{1}{\left[\left[0^{\left(\frac{10000184\left(\frac{271592}{(273.154T_c)}\right)}{(273.154T_c)}\right)\right] - pH}\right] + 1\right\}}$$

² Un-ionized fraction(f) is calculated based on the following formula (Emersonetal. 1975): $f = \frac{1}{(10^{-Ka-pH})+1}$: $pKa = 0.09018 + \frac{272992}{T}$

 $^{^3}$ Un-ionized ammonia is calculated based on the following formula: Un-ionized ammonia = f * TAN (mg/L)

	Α	m	C	n o	ш	ш.	9
-	Study Number: AEH-12-PSEUDO-03	r: AEH-12-J	PSEUDO-03			Test Article: MBI $401\mathrm{SDP}[Pf\text{-CL}145A\{\mathrm{SDP}\}]$	
	Electronic Lab Notebook (page 16)	o Notebook	k (page 16)			Article Lot #: 401P12163C and 401P12164C Mix	
	TAN Data Sou	rce: LTRM)	TAN Data Source: LTRMP Report (File Folder 17)			Exposure Date: August 17, 2012	
	pH and Temp.	erature Da	pH and Temperature Data Source: Water Quality Forms (File Folder 128)			Test Location: Lake Carlos, Alexandria, MN	
w						Treatment Type: Bottom Injection	
9							
r «				Exposure U	Exposure Un-ionized Ammonia		
·	restment						
თ	Tevel .	Test Tank		Temperature	TAN	Un-jonized	NH,
10	(mg/l·)	ũ	pH ²	Đ	as NH ₃ -N (mg/L)	Fraction ²	(mg/L) ³
11		m	8.55	21.1	0.232	x=1/(10^(0.09018+(2729.92/(273.15+F11))-£11)+1)	x=H11*G11
12	0	9	8.57	21.0	0.207	x=1/(10^(0.09018+(2729.92/(273.15+F12))-E12)+1)	x=H12*G12
13		7	8.58	20.9	0.210	x=1/(10^(0.09018+(2729.92/(2/3.15++13))-£13)+1)	X=H13+G13
14	Mean		x=(LOG10((10^E11+10^E12+10^E13)/3))	x=AVERAGE(F11:F13)	x=AVERAGE(G11:G13)	x=AVERAGE(H11:H13)	x=AVERAGE(11:113)
15	std		x=STDEV.P(E11:E13)	x=STDEV.P(F11:F13)	x=STDEV.P(G11:G13)	x=STDEV.P(H11:H13)	x=STDEV.P(!11:113)
16		1	8.12	21.3	0.403	x=1/(10^(0.09018+(2729.92/(273,15+F16))-E16)+1)	x=H16*G16
17	20	4	8.19	21.3	0.415	x=1/(10^(0.09018+(2729.92/(273.15+F17)}-E17)+1)	x=H17*G17
18		8	8.20	20.8	0.385	x=1/(10^(0.09018+(2729.92/(273.15+F18)}-E18)+1)	x=H18*G18
19	Mean		x=(LOG10((10^E16+10^E17+10^E18)/3))	x=AVERAGE(F16:F18)	x=AVERAGE(G16:G18)	x=AVERAGE(H16:H18)	x=AVERAGE(116:118)
ន	Stq		x=STDEV.P(E16:E18)	x=STDEV.P(F16:F18)	x=STDEV.P(G16:G18)	x=STDEV.P(H16:H18)	x=STDEV.P(116:118)
21		7	7.18	21.2	1.486	x=1/(10^(0.09018+(2729.92/(273.15+F21))-E21)+1)	x=H21*G21
22	100	5	7.39	21.1	1.123	x=1/(10^(0.09018+(2729.92/(273.15+f22)}-E22}+1)	x=H22*G22
23		6	7.34	21.0	1.504	x=1/(10^(0.09018+(2729.92/(273.15+F23))-E23)+1)	x=H23*G23
24	Mean		x={LOG10((10^E21+10^E22+10^E23)/3})	x=AVERAGE(F21:F23)	x=AVERAGE(G21:G23)	x=AVERAGE(H21:H23)	x=AVERAGE(121:123)
25	std		x=STDEV.P(E21:E23)	x=\$TDEV.P(F21:F23)	x=STDEV.P(G21:G23)	x=STDEV.P(H21:H23)	x=STDEV.P(i21:123)
	1 pH means ຜ	alculated o	¹ pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values	ions calculated on pH value	ก		
27	² Un-ionized fr	action(1) is ea	2 Un-ionized fraction (f) is calculated basedon the following formula (Emersonetal.1973): $f=-$	$= \frac{1}{(10^{86-5H})+1} \cdot pKa = 0.09018; \frac{272992}{U}$	272992 T		
3 8 E		.5; pKa=0	$T_1 = T_c + 273.15$; $pKa = 0.09018 + \frac{2729.92}{(273.15 - T)}$. The final calculation used is then $J = \frac{1}{2} =$	$\lim_{t \to \infty} f = \int_{\mathbb{R}^{n}} \int_{\mathbb{R}^{n}} \frac{1}{x^{n + n + n}}$			
32				{ 10 (((273.1847c))) ***	+1}		
发	J Un-tonized &	smmonia is	U-ionized ammonia is calculated based on the following formula: Un-ionized ammonia x= f * TAN (mg/L).	nized ammonia x= f * TAN	(mg/L)		
8			1		· 1		
37			•				
88 89 89			Cl replaced				
6				1	Ø		
4 5				Item Number	- 1		
77				- Age	. J. UI . J.		

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 25)

Data Source: File Folder: 14b

Forms: See form names as stated below

Action	Date	Initials
Created	19-Oct-13	KLWIN
Revised	10-Dec-14	KLW WW
Reviewed	LODECH!	pw
Certif ed	hlisly	3~

File Name: I:\AEH-12-PSEUDO-04\Data Summarles\Water chem\[Lake Shawano Water Chem (Bottom Injection) 11-26-14.xlsx]?re-Exposure Water Chem

Pre-Exposure Water Chemistry

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: September 8, 2012
Test Location: Lake Shawano, Shawano, WI
Treatment Type: Bottom Injection

Data Explanation:

Forms titled "Conductivity and Hardness - Exposure initiation" and "Alkalinity - Exposure Initiation": Conductivity, hardness, and alkalinity were measured prior to desing. Samples were collected from both headboxes used to fill individual tanks. Samples were analyzed in triplicate.

Forms titled "Water Quality - Temperature ("C) Measurements", "Water Quality - pH Measurements" and "Water Quality - Dissolved Oxygen (mg/L) Measurements": Temperature, pH and dissolved oxygen levels were measured prior to dosing. Measurements were observed in each exposure tank.

Data anomalles and deviations:

NONE

File Folder: 145

Item Number of _____

Test Article: MBI 401 SDP [tg-c1 145A (SDP)]
Article Loc. #: 401P2165C and 401P12164C Mix
Exposure Date: September 8, 2012
Test (costion: Lake Shawano, Shawano, MI
Treatment Type: Bottom Injection

Pre-Exposure Water Chemistry

Headbox	Bantimer	Conductivity	Hardness	Alkalinity
Ω	Vebilday	(SII)	[mg/L of CaCO ₃]	mg/L of CaCO ₃] (mg/L of CaCO ₃)
	7	227	124	112
н	2	233	124	. 111
	m	231	124	112
	ef	234	126	2112
7	2	233	126	111
	3	230	126	131
Me	Mean	787	521	211
S	(d:s)	(2)	(3)	Ð
Mini	Minimum	227	124	111
Maxi	Maximum	234	126	312

Data Forms: "Conductivity and Hardness - Exposure Initiation" and "Alkalinity - Exposure Initiation"

Treatment	Test Tank	8	4	Temp.
Level	9	(mg/r)	Ľ.	5
	7	7.40	9.30	19.5
0	o,	7.40	9.11	19.5
	00	7.42	9.12	19.5
Mean		7.41	9.11	19.50
şg		0.01	10:0	00:0
	7	7.43	9.13	19.5
20	m	7.42	9.13	19.5
	^	7.43	9.14	19.5
Mean		7.43	9.13	19.50
돲		0.00	0.00	0.00
	4	7.44	9.14	19.5
100	9	7.44	9.14	19.5
	5	7.45	9.13	19.5
Mean		7.44	9.14	19.50
std		0.00	0.00	0.00
Crand	Grand Mean	7.43	9.13	19,50
	Ste	10.0	0.01	000
Min	Мілітит	7.40	9.10	19.50
Maximire	2	30.4	5.0	0.0

¹ pi mens calculated on hydrogen ion concentration; pH sandard deviations calculated on pH values Data Forms "Water Quality - Temperature (**) Measurements, "Water Quality- pH Measurements" and "Water Quality - Dissolved Owigen (mg/L) Measurements"

ltem Number____ Page _ み__ o

File Folder: _

Sudy Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 25)
Data Sourse: File Folder: 14b
Forns: See table footnoces

Study Number: AEH-12-PSEUDO-04	Action	Date	Initials
Electronic Lab Notebook (pages 26 - 27)	Created	19-Oct-13	
Data Source: File Folder: 14b	Revised	10-Dec-14	KLW W
Forms: "Water Quality - Temperature (°C) Measurements"	Reviewed	10 DECIT	in
"Water Quality - pH Measurements"	Certified	12/11/14	200
"Water Quality - Dissolved Oxygen (mg/L) Measurements"			

Exposure Water Chemistry

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\[Lake Shawano Water Chem (Bottom Injection) 11-26-14.xisx]Exposure Water Chem

Test Article: MBI 4C1 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mlx
Exposure Date: Exptember 8, 2012
Test Location: Lake Shawano, Shawano, Wl
Treatment Type: Bottom injection

Data Explanation:

Water chemistry measurements (dissolved oxygen, pH and temperature) were observed for all test tanks at 0, 3, 6, 9 and 12 h after dosing.

NOTE: 0 h measurements were observed from 30 minutes to 1 h after dosing.

<u>Data anomalies and deviations:</u> NONE

File Folder: 146

Item Number

Test Article: MBI 401 SDP [t]-Ct. 145A [SDP]]
A-ticle Lot #: 401P12163C and 401P12164C Mix
Exposure Date: September 8, 2012
Test Location: Lake Shawano, Shawano, WI
Treatment Type: Bottom hijection

Study Number. AEH-12-PSEUDO-04
Electronic tab Notobook (pages 26 to 27)
Data Source: File Folder: 14th
Forms: "Water Quality - Temperature ("C) Measurements"
"Water Quality - pH Measurements"
"Water Quality - pH Measurements"

Exposure Water Chemistry

O hour	0 hour	0 hour			3 Hour			6 Hour			9 Haur			12 Hour	
DO Lui Temp.	Temp. DO	Temp. DO	8	Į,		Temp.	90	T ₁	Temp.	00	£1,4	Тетр.	00		Тетр.
(mg/L) ("C) (mg/L)	("CC) (mg/L)	("C) (mg/L)	(mg/L)	TIM.		(2)	(mg/L)	Š.	Ď	(mg/L)	<u>S</u>	Ş	(mg/r)	<u>5</u> .	5
9.05 18.3 7.06	9.05 18.3 7.06	18.3 7.06	7.06	9.02		18.8	7.01	8.91	19.0	6.98	8.64	18.8	6.61	8.92	18.5
9.06 18.0 7.20	9.06 18.0 7.20	18.0 7.20	7.20	9.03		18.2	7.03	8.92	18.4	7.03	8.68	18.4	6.65	8.94	18.1
9.06 18.2 7.20	9.06 18.2 7.20	18.2 7.2C	7.20	9.03	- 1	18.2	7.01	8.94	18.4	6.93	89.8	18.3	6.62	8.92	18.1
9.06 18.2 7.15	9.06 18.2 7.15	18.2 7.15	7.15	9.03		18.4	7.02	8.92	18.6	86.9	8.67	18.5	6.63	8.93	18.2
0.00 0.12 0.07	0.00 0.12 0.07	0.12 0.07	0.07	0.00	ı	0.28	10.01	0.01	0.28	0.04	0.02	0.22	0.02	0.01	0.19
2 7.27 9.02 18.2 7.24 9.02	9.02 18.2 7.24	18.2 7.24	7.24	9.05		18.5	7.26	8.93	18.7	7.19	8.71	18.6	4.55	8.69	18.3
9,04 18.3 7.24	9,04 18.3 7.24	18.3 7.24	7.24	9.04		18.4	7.31	8.95	18.5	7.20	8.71	18.4	4.74	8.88	18.3
9.04 18.2 7.21	9.04 18.2 7.21	18.2 7.21	7.21	9.04		18.2	121	8.95	18.2	7.04	8.69	18.1	6.05	8.84	18.0
9.03 18.2 7.23	9.03 18.2 7.23	18.2 7.23	7.23	9.03		18.4	7.28	8.94	18.5	7.14	8.70	18.4	5.11	8.81	18.2
0.01 0.05 0.01	0.01 0.05 0.01	0.05 0.01	0.01	0.01		0.12	0.02	0.01	0.21	20.0	0.01	0.21	0.67	0.08	0.14
8.99 18.1 7.27	8.99 18.1 7.27	18.1 7.27	7.27	9.03		18.2	7.34	8.95	18.3	7.24	8.71	18.3	6.65	89'8	18.0
9.01 18.1 7.21	9.01 18.1 7.21	18.1 7.21	7.21	9.03		18.2	7.27	8.96	1.8.1	7.25	8.69	18.2	6.15	8-58	17.8
9.01 17.9 7.22	9.01 17.9 7.22	17.9 7.22	7.22	9.03	i	18.0	7.27	8.96	18.2	7.22	8.71	18.0	5.83	8.59	18.0
9.00 18.0 7.23	9.00 18.0 7.23	18.0 7.23	7.23	9.03		18.1	7.29	8.96	18.2	7.24	8.70	18.2	6.21	8.62	17.9
0.01 0.09 0.03	0.01 0.09 0.03	0.09 0.03	0.03	0.00		0.09	0.03	0.00	80.0	0.01	10.0	0.12	0.34	0.04	0.09
18.1 7.21	9.03 18.1 7.21	18.1 7.21	7.21	9.03		18.3	7.20	8.94	18.4	7.12	8.69	18.3	5.98	8.80	18.1
0.02 0.08 0.04	0.02 0.08 0.04	0.08 0.04	0.04	0.00		0.12	0.13	0.01	0.17	0.11	0.02	0.14	0.64	0.13	0.13
8.99 17.9 7.06	8.99 17.9 7.06	17.9 7.06	7.06	8.02		18.0	7.01	8.91	18.1	6.93	8.64	18.0	4.55	8.58	17.8
18.3 7.27	9.06 18.3 7.27	18.3 7.27	7.27	9.04		18.8	7.34	8.96	19.0	7.25	8.71	18.8	6.65	8.94	18.5

 $^{\mathtt{t}}$ pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values

Item Numbe Page

File 145___

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 27)

TAN Data Source: LTRMP Report (File Folder 17)

pH and Temperature Data Source: Water Quality Forms (File Folder 14b)

Date	Initials
10-Dec-14	KLW W
LODECH	W
12/10/14	50-
	19-Oct-13 10-Dec-14 (ODECH

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\Water chem\[Lake Shawano Water Chem (Bottom Injection) 11-26-14

Exposure Un-ionized Ammonia

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)]

Article Lot #: 401P12163C and 401P12164C Mix

Exposure Date: September 8, 2012

Test Location: Lake Shawano, Shawano, WI

Treatment Type: Bottom injection

Data Explanation:

1) Water samples were collected at 12 h from each exposure tank. Samples were 0.45 μ m filtered, acidified with sulfuric acid, and analyzed by the 4500-NH₃ G. Automated Phenate Method (Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005) on a Technicon Autoanalyzer II by the UMESC water quality laboratory.

2) The un-ionized ammonia fractions were calculated using the sample pH and temperature according to the formula in Emerson et al. (1975).

Data Anomalies and Deviations:

NONE

File Folder: 145

Item Number 5
Page 1 of 3

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (page 27)

TAN Data Source: LTRMP Report (File Folder 17)

pH and Temperature Data Source: Water Quality Forms (File Folder 14b)

Test Article: MBI 401 SDP [*Pf*-CL 145A (SDP)]
Article Lot #: 401P12163C and 401P12164C Mix

Exposure Date: September 8, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Bottom Injection

Exposure Un-ionized Ammonia

Treatment Level	Test Tank	pH ¹	Temperature	TAN	Un-ionized	NH₃
(mg/L)	D	p.v.	(°C)	as VH ₃ -N (mg/L)	Fraction ²	(mg/L) ³
	1	8.92	18.5	0.061	0.228	0.014
0	9	8.94	18.1	0.072	0.231	0.017
	8	8.92	18.1	0.056	0.223	0.012
Mean		8,93	18.2	0.063	0.227	0.014
std		0.01	0.19	0.007	0.003	0.002
	2	8.69	18.3	0.113	0.146	0.017
50	3	8.88	18.3	0.120	0.209	0.025
	7	8.84	18.0	0.094	0.191	0.018
Mean		8.81	18.2	0.109	0.182	0.020
std		0.08	0.14	0.011	0.027	0.004
	4	8.68	18,0	0.158	0.141	0.022
100	6	8.58	17.8	0.145	0.113	0.016
	5	8.59	18.0	0.163	0.117	0.019
Mean		8.62	17.9	0.155	0.124	0.019
std		0.04	0.09	0.008	0.012	0.002

^a pH means calculated on hydrogen ion concentration; pH standard deviations calculated on pH values

$$T_{c} = T_{c} + 273.15; \ pKa = 0.09018 + \frac{2729.92}{\left(273.15 + T_{c}\right)^{2}}; \text{ The final calculation used is then:} f = \frac{1}{\left\{\left[10^{\left(0.090118\left(\frac{272992}{\left(273.15 + T_{c}\right)^{2}\right)^{2}}\right)^{1/2}}\right] + 1\right\}}$$

 $^{^{2} \}text{ Un-ionized fraction} (f') \text{ is calculated based on the following form. Ja} (\text{Emerson tal. 1973}; f = \frac{1}{(10^{\kappa_0-\mu t})+1}; pKa = 0.09018 + \frac{272992}{T}$

 $^{^3}$ Un-ionized ammonia is calculated based on the following formula: Un-ionized ammonia = f * TAN (mg/L)

	•		·		-		
	4	ב		٥	ш	+ 	פ
Н	Study Number: AEH-12-PSEUDO-09	er: AEH-12	-PSEUDO-04			Test Article: MBI 401 SDP [Pf-CL 145A (SDP)]	
7	Electronic Lab Notebook (page 27)	b Noteboo	k (page 27)			Article Lot #: 401P12163C and 401P12164C Mix	
m		urce: LTRN	TAN Data Source: LTRMP Report (File Folder 17)			Exposure Date: September 8, 2012	
4	pH and Temp	perature Da	4 pH and Temperature Data Source: Water Quality Forms (File Folder 14b)			Test Location: Lake Shawano, Shawano, WI	
rV.						Treatment Type: Bottom Injection	
9 1					rice and American American		
- 00				exposition	On-Tomiced Affiliations		
თ	Treatment	Test Tank		emperature	IAN	Un-joniyed	HZ.
10	(T/9iL)	ō	PH ¹	D.	as NH ₂ -N (mg/L)	Fraction ²	{(1/Bw)
11		ᠳ	8.92	18.5	0.061	x=1/(10^(0.09018+(2729.92/(273.15+011))-C11)+1)	x=F11*E11
12	0	თ	8.94	18.1	0.072	$x=1/(10^{(0.09018+(2729.92/(273.15+D12))-C12)+1)}$	x=F12*E12
13		œ	8.92	18.1	0.056	x=1/(10^(0.09018+(2729.92/(273.15+013)) C13)+1)	x=F13*E13
14	Mean		x-(LOG10((10^C11+10^C12+10^C13)/3)) x=AVERAGE(D11:D13)	x=AVERAGE(D11:D13)	x=AVERAGE(E11:E13)	x=AVERAGE(F11:F13)	x=AVERAGE(G11:G13)
15	stq		x=STDEV.P(C11:C13)	x=STDEV.P(D11:D13)	x=STDEV.P(E11:E13)	x=STDEV.P(F11:F13)	x=STDEV.P(G11:G13)
16		7	8.69	18.3	0.113	x=1/(10^(0.09018+(2729.92/(273.15+D16))-C16)+1)	x=F16*E16
17	જ જ	m	8.38	18.3	0.120	$x=1/(10^{(0.09018+(2729.92/(273.15+017))-C17)+1)}$	x=F17*E17
18		7		18.0	0.094	x=1/(10^(0.09018+(2729.92/(273.15+D18))-C18)+1)	x=F18*E18
13	Mean		0^C18)/3))	x=AVERAGE(D16:D18)	x=AVERAGE(E16:E18)	x=AVFRAGF(F16:F18)	x=AVERAGE(G16:G18)
20	stď		x=STDEV.P(C16:C18)	x=STDEV.P(D16:D18)	x=STDEV.P(E16:E18)	x=STDEV.P(F16:F18)	x=STDEV.P(G16:G18)
21		4	8.68	18.0	0.158	$x=1/(10^{4}(0.09018+(2729.92/(273.15+D21))-C21)+1)$	x=F21*E21
22	100	9	8.58	17.8	0.145	x=1/(10^(0.09018+(2729.92/(273.15+022))-(222)+1)	x=1-22*L22
23		Ŋ	8.59	18.0	0.163	x=1/(10^(0.09018+(2729.92/(273.15+023))-C23)+1)	x=F23*E23
24			x=(LOG10((10^C21+10^C22+10^C23)/3)) x=AVERAGE(D21:D23)	x=AVERAGE(D21:D23)	x=AVERAGE(E21:E23)	x=AVERAGE(F21:F23)	x=AVERAGE(G21:G23)
22				x=STDEV.P(D21:D23)	x=STDEV.P(E21:E23)	x=STDEV.P(F21:F23)	x-STDEV.P(G21:G23)
56	pH means calculated on hydrogen	calculated (on hydrogen ion concentration; pH standard deviations calculated on pH values	ations calculated on pH va	ilues		
27		action(f) is c	. Un-ionized fraction () is calculated based on the following formula (Emersoretal 1.973; f =-	$=\frac{1}{(10^{8}K_{P,M})_{1,1}}$; $pKa=0.09018$; $\frac{272992}{T}$	7		
ğ			2779 92	(10)±1	-dr		
8		.S; pKa=0.0	$T_c = T_c + 273.15$; $\rho K \sigma = 0.09018 + \frac{273.15 + T_c}{(273.15 + T_c)}$; The final calculation used is then : $f = 0.09018 + \frac{1}{12}$	f = \(\left\{ \frac{2729922}{(278.1472)}\right\} \right\} \right\} \right\{ \left\{ \frac{272992}{(278.1472)}\right\} \right\} \right\}	<u> </u>		
31				÷ .	~		
7 5		,					
34	Un-ionized ammonia is calculated	ammonia	is calculated based on the following formula: Un-Ionized ammonia x=f = 1AN (mg/L)	ionized ammonia x= t ~ 1.4	in (mg/L)		
88							
37	.,				t _Y		
88 88			File Folder. 145	Item Number	imber /		
40							

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 13 & 17)

Data Source: File Folder: 17a Forms:

Onset HO30 Datafile output from HO80 Temperature Loggers (File Folder 18)

(I:\AEH-12-PSEUDO-04\Data\Hobos\Lake Car. os HOBO Files)

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\[Lake Carlos Lake Temperature Data Loggers.xlsx]Temp Data

Actlon Date Initials 4-Feb-14 TJS 775 Created.... 19-Feb-14 TJS 715 Revised... Reviewed. Certified...

Temperature Data Loggers (HOBOs)

Test Article: M8I 401 SDP [Pseudomonas fluorescens Pf -Cl. 145A (SDP)]

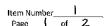
Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 15 and 17, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Whole Tank and Bottom Injection

<u>Data Explanation:</u>
Upon exposure termination on August 15, 2012 (whole tank) and August 17, 2012 (bottom injection) at Lake Carlos, four wire mesh cages containing test animals were placed into Lake Carlos for a post-exposure holding period. Each cage was fitted with a HOBO temperature logger programmed to record water temperature every six hours (four times per day). Mean daily temperature (*C) and standard deviation were calculated from all daily measurements.

Data Logger	Seria!		Treatment	Treatment
Number	Number	Lake	Туре	Duration
1.	10020131	Carlos	Whole Tank	6h
2	10020140	Carlos	Whole Tank	9h
3	10020139	Carlos	Whole Tank	. 12h
4	10020133	Carlos	Bottom Injection	12h

	Mean	
Date	Temperature (°C)	(STD)
8/17/2012	22.61	0.61
8/18/2012	22.53	0.50
8/19/2012	22.59	0.39
8/20/2012	22.38	0.32
8/21/2012	22.81	0.47
8/22/2012	23.09	0.59
8/23/2012	23.37	0.47
8/24/2012	24.18	0.64
8/25/2012	23.76	0.27
8/26/2012	23.93	0.53
8/27/2012	24.39	0.58
8/28/2012	24.19	0.29
8/29/2012	24.07	0.48
8/30/2012	24.01	0.25
8/31/2012	23.51	0.34
9/1/2012	23.27	0.36
9/2/2012	23.06	0.29
9/3/2012	23.39	0.38
9/4/2012	23.39	0.25
9/5/2012	23.22	0.40
9/6/2012	22,65	0.30
9/7/2012	22.16	0.37
9/8/2012	21.12	0.48
9/9/2012	20.97	0.46
9/10/2012	20.84	0.22
9/11/2012	20.63	0.35

<u>Data anomalies and deviations:</u>
Temperature readings from the first and last days of recorder deployment (prior to August 17 and after September 11, 2012 for whole tank; prior to August 19 and after September 11, 2012 for bottom injection) were omitted from data analysis. The temperature recorders may have sampled ambient air temperature during these time points. These entire days will be omitted as diumal temperature flucuation skew the mean daily temperature. The mean temperature for August 17 and 18, 2012 was calculated using only the three data loggers (#1, 2, and 3) from whole tank treatments.



File Folder: 174

Study Number: AEH-12-P5EUDO-04 Electronic Lab Notebook (pages 13 & 17) Data Source: File Folder: 17a

Forms: HOBO Output in Excel "Lake Carlos 6h whole tank", "Lake Carlos 9h whole tank"

"Lake Carlos 12h whole tank", "Lake Carlos 12h bottom injection" Location: I:\AEH-12-PSEUDO-04\Data\Hobos\Carlos and Shawano in Excel

Test Article: MBI 401 SDP [Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 15 & 17, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Whole Tank and Bottom Injection

Post-Exposure Holding Period Water Temperature

		Data Logg	er Number		}			Data Logg	er Number		
Date	1	2	3	4	Mean	Date	1	2	3	4	Mean
Time (GMT-05:00)		Tempera	ture (°C)		(STD)	Time (GMT-05:00)		Tempera	ture (°C)		(STO)
8/17/2012 4:00	21.855	21.951	22.046			8/30/2012 4:00	23.677	23,773	23.869	23.773	
8/17/2012 10:00	22.429	22,621	22.238		22.61	8/30/2012 10:00	24,351	24.158	24.255	24.062	24.01
8/17/2012 16:00	23.484	23.484	23,773		(0.61)	8/30/2012 16:00	24.255	24,158	24.255	24,448	(0.25)
8/17/2012 22:00	22.429	22.525	22,525	,		8/30/2012 22:00	23.677	23,773	23,773	23,966	
8/18/2012 4:00	21.951	21.951	22.142	,		8/31/2012 4:00	23.196	23.196	23.292	23.581	
8/18/2012 10:00	22.521	22.429	22.238		22.53	8/31/2012 10:00	23.966	23.773	23.388	22.908	23.51
8/18/2012 16:00	23.292	22.908	23.677		(0.50)	8/31/2012 16:00	23.869	23,773	23.869	24.158	(0.34)
8/18/2012 22:00	22.333	22,429	22.429		,	8/31/2012 22:00	23,196	23,292	23.388	23.388	,
8/19/2012 4:00	21.951	22.046	22.142	22.238		9/1/2012 4:00	22,908	23,004	23,004	23.1	***********
8/19/2012 10:00	22.717	22.621	22.525	22.333	22,59	9/1/2012 10:00	23.581	23,196	23,196	22,908	23.27
8/19/2012 16:00	23.1	23.1	23,196	23,196	(0.39)	9/1/2012 16:00	23.581	23,869	23.966	23.869	(0.36)
8/19/2012 22:00	22.429	22.429	22.525	22.812	(0.00)	9/1/2012 22:00	22.908	23.004	23.1	23.196	(0.55)
8/20/2012 4:00	21.855	21.951	22.046	22.142		9/2/2012 4:00	22.621	22.717	22.717	22.812	
8/20/2012 10:00	22,525	22.429	22.333	21.951	22.38	9/2/2012 10:00	23.292	23.004	23.004	22.717	23.06
8/20/2012 16:00	22.717	22.717	23.004	22.717	(0.32)	9/2/2012 16:00	23,388	23.388	23.581	23,388	(0.29)
8/20/2012 10:00	22.333	22.429	22.429	22.525	(0.32)	9/2/2012 22:00	22,908	23.004	23.1	23.292	(0.23)
8/21/2012 4:00	22.238	22,333	22,429	22,429		9/3/2012 4:00	22,812	22,812	22,908	22.908	
8/21/2012 10:00	22.812	22.525	22,429	22,429	22,81	9/3/2012 10:00	23.677	23.388	23.388	23.004	23.39
8/21/2012 16:00	23.484	23.388	23.869	23.484	(0.47)	9/3/2012 16:00	23.677	23.677	23.773	24.062	
				22,908	(0.47)						(88.0)
8/21/2012 22:00	22.717	22.717	22.812		*-^**	9/3/2012 22:00	23,388	23,484	23.581	23.773	
8/22/2012 4:00	22.142	22.238	22.333	22.429	00.00	9/4/2012 4:00	23.1	23.196	23.196	23.388	
8/22/2012 10:00	23.581	23.1	23.1	22.717	23.09	9/4/2012 10:00	23.484	23.292	23.196	23.1	23.39
8/22/2012 16:00	23,869	23,869	23.966	23.869	(0.59)	9/4/2012 16:00	23.484	23.773	23.869	23.869	(0.25)
8/22/2012 22:00	23.004	23.004	23.1	23.1		9/4/2012 22:00	23.196	23.292	23.292	23,484	
8/23/2012 4:00	22.908	22.908	23.004	23.004		9/5/2012 4:00	22.812	22.812	22.908	23.1	
8/23/2012 10:00	23.484	23.1	23.1	22.525	23.37	9/5/2012 10:00	23.484	23.196	23.292	23.1	23.22
8/23/2012 16:00	24.062	23.869	24.448	23.581	(0.47)	9/5/2012 16:00	23.484	23.773	24.158	23.7/3	(0.40)
8/23/2012 22:00	23.388	23.388	23,581	23.581		9/5/2012 22:00	22,812	22.812	22.908	23.1	
8/24/2012 4:00	23.388	23.484	23,581	23,581		9/6/2012 4:00	22,142	22.238	22,238	22.812	
8/24/2012 10:00	24.255	23.869	23.869	23.484	24,18	9/6/2012 10:00	22.812	22./1/	22.621	22.429	22.65
8/24/2012 16:00	24.835	24.738	25.708	25.125	(0.64)	9/6/2012 16:00	22.908	22.812	22.908	23.388	(0.30)
8/24/2012 22:00	24.062	24.158	24.255	24.448		9/6/2012 22:00	22.525	22.525	22.621	22.717	
8/25/2012 4:00	23.581	23.581	23.677	23.869		9/7/2012 4:00	21.951	22.046	22.046	22.429	
8/25/2012 10:00	23.292	23.388	23.388	23.484	23.76	9/7/2012 10:00	22.812	22.621	22,525	21.855	22.16
8/25/2012 16:00	24.062	23.966	24.158	23.773	(0.27)	9/7/2012 16:00	22.333	22.238	22.333	22.621	(0.37)
8/25/2012 22:00	23,869	23.966	23.966	24.158	***************************************	9/7/2012 22:00	21.664	21.76	21.76	21.569	
8/26/2012 4:00	23,484	23.581	23.677	23.388		9/8/2012 4:00	20.805	20.901	20.901	21.091	
8/26/2012 10:00	23.677	23.484	23.581	23.292	23,93	9/8/2012 10:00	20,996	20.901	20.996	20.805	21.12
8/26/2012 16:00	24.641	24,738	24.931	24.835	(0.53)	9/8/2012 16:00	21.664	21.76	21.855	22.238	(0.48)
8/26/2012 22:00	23,773	23.869	23.966	23.966		9/8/2012 22:00	20.519	20.71	20.615	21.187	
8/27/2012 4:00	23.677	23.677	23.773	23.869	24.20	9/9/2012 4:00	20.329	20.424	20.519	20.519	70.03
8/27/2012 10:00	24.641	24.158	24.158 25.513	23.773 25.222	24.39	9/9/2012 10:00 9/9/2012 16:00	20.901 21.091	20.805 21.473	20.71 21.76	20.424	20.97
8/27/2012 16:00	25.222 24.351	25,028 24,158	25.513	25.222 24.44 8	(0.58)	9/9/2012 15:00	21.091	21.4/3	21.76 21.187	21.855 21.282	(0.46)
8/27/2012 22:00 8/28/2012 4:00	23.869	23.955	24.543	24.448		9/10/2012 4:00	20.615	20.71	20.805	20.71	
8/28/2012 4:00	24.351	23.869	23,966	23.773	24.19	9/10/2012 10:00	20,913	20.71	20.901	20.71	20.84
8/28/2012 16:00	24.545	24.541	24.738	24.545	(0.29)	9/10/2012 16:00	20,901	21.187	21.187	21.282	(0.22)
8/28/2012 18:00	24.343	24.062	24.758	24.255	10.231	9/10/2012 10:00	20.501	20.615	20.71	20.71	(0.22)
8/29/2012 4:00	23.484	23.581	23.677	23.869		9/11/2012 4:00	20.234	2C.329	20.424	20.519	
8/29/2012 10:00	24.158	23.773	23,773	23.484	24.07	9/11/2012 10:00	20.519	20.525	20.424	20.319	20.63
8/29/2012 16:00	24,641	24.835	25.125	24.641	(0.48)	9/11/2012 16:00	21.091	21.282	21.187	21.282	(0.35)
8/29/2012 22:00	23.869	23.955	24.062	24,158	,,	9/11/2012 22:00	20.329	20.329	20,424	20.519	(0.00)
0/52/2017 55:00	Z2.003	Z3.700	24.002	24,130	l	3/11/2017 55:00	20.323	20.323	ZUITZT	20.515	

File Folder: ______

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 24 & 28)

Data Source: File Folder: 17a

Forms: Onset HOBO Datafile output from HOBO Temperature Loggers (File Folder 18)

(I:\AEH-12-PSEUDO-04\Data\Hopos\Lake Shawaro HOBO Files)

File Name: I:\AEH-12-PSEUDO-04\Data Summaries\[Lake Shawano Lake Temperature Data Loggers.xlsx]Temp Data

Action Date Initials 4-Feb-14 TJS 775 19-Feb-14 TJS 775 19-Feb-14 TJS 775 Createc. Revised.. Reviewed.. Certified... 2/14/14 Je-

Temperature Data Loggers (HOBOs)

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6 and 8, 2012 Test Location: Lake Shawano, Shawano, WI

Treatment Type: Whole Tank and Bottom injection

Data Explanation:

Upon exposure termination on September 6, 2012 (whole tank) and September 8, 2012 (bottom injection) at Lake Shawano, four wire mesh cages containing test animals were placed into Lake Shawano for a post-exposure holding period. Each cage was fitted with a HOBO temperature logger programmed to record water temperature every six hours (four times per day). Mean daily temperature (°C) and standard deviation were calculated from all daily

Data Logger Number	Serial Number	Lake	Treatment Type	Treatment Duration
1	10020137	Shawano	Whole Tank	6h
2	10020138	Shawano	Whole Tank	9h
3	10020134	Shawano	Whole Tank	12h
4	10020136	Shawano	Bottom Injection	12h

	Mean	
Date	Temperature (°C)	(STD)
9/8/2012	21.49	0.65
9/9/2012	20.16	0.39
9/10/2012	20.95	0.78
9/11/2012	20,93	0.61
9/12/2012	20.69	0.24
9/13/2012	19.81	0.39
9/14/2012	19.44	0.43
9/15/2012	19.29	0.68
9/16/2012	19.91	0.30
9/17/2012	18.96	0.49
9/18/2012	17.17	0.43
9/19/2012	16.20	0.09
9/20/2012	15.47	0.29
9/21/2012	15.17	0.19
9/22/2012	14.39	0.43
9/23/2012	13.94	0.31
9/24/2012	13.41	0.15
9/25/2012	13.54	0.52
9/26/2012	14.43	0.36
9/27/2012	14.33	0.37
9/28/2012	15.08	0.25
9/29/2012	15.50	0.34
9/30/2012	15.02	0.41
10/1/2012	15.58	0.39
10/2/2012	15.81	0.33
10/3/2012	16.08	0.30
10/4/2012	16.33	0.24
10/5/2012	13.58	0.67
10/6/2012	11.20	0.60
10/7/2012	11.04	0.66
10/8/2012	10.52	0.53
10/9/2012	10.07	0.27

<u>Data anomalies and deviations;</u>
Temperature reacings from the first and last days of recorder deployment (prior to September 8 and after October 9, 2012 for whole tank; prior to September 10 and after October 9, 2012 for bottom injection) were omitted from data analysis. The temperature recorders may have sampled ambient air temperature during these time points. These entire days will be omitted as diurnal temperature flucuation skew the mean daily temperature. The mean temperature for September 8 and 9, 2012 was calculated using only the three data loggers (#1, 2, and 3) from whole tank treatments.

Item Number 2
Page 1 of 2

File Folder: 17a

Study Number: AEH-12-PSEUDO-04 E ectronic Lab Notebook (pages 24 & 28) Data Source:

File Folder: 17a

Forms: HOBO Output in Excel "Lake Shawano 6h whole tank", 'Lake Shawano 9h whole tank' "Lake Shawano 12h whole tank", "Lake Shawano 12h bottom injection"

Location: I:\AEH-12-PSEUDO-04\Data\Hobos\Carlos and Shawaro in Excel

Test Article: MBI 401 SDP [Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6 and 8, 2012 Test Location: Lake Shawano, Shawano, Wi Treatment Type: Whole Tank and Bottom Injection

Post-Exposure Holding Period Water Temperature

		Data Logg	er Number					Data Logge	r Number		}
Date	1	2	3	4	Mean	Date	1	2	3	4	Mean
Time (GMT-05:00)	04.407		ature (°C)		(STD)	Time (GMT-05:00)		Tempera			(STD)
9/8/2012 3:23	21.187	21.187	21,091			9/24/2012 3:23	13.461	13.461	13.365	13.654	
9/8/2012 9:23 9/8/2012 15:23	20.71 22.429	20.71 22.429	20.615 22,429		21.49	9/24/2012 9:23	13.173	13.173	13.076	13.365	13.41
9/8/2012 15:23	21.76	21,664	21.664		(0,65)	9/24/2012 15:23	13.461	13.461	13.365	13.365	(0.15)
9/9/2012 3:23	20.519	20.519	20.519		*****	9/24/2012 21:23 9/25/2012 3:23	13.558 13.173	13.558 13.173	13.461 13.173	13.558	
9/9/2012 9:23	19.567	19.472	19.472		20.16	9/25/2012 9:23	12.883	12,883	12.787	13.461 12.883	10:4
9/9/2012 15:23	20.329	20.329	20.234		(C.39)	9/25/2012 15:23	14.23	14.134	14.038	13.75	13.54 (0.52)
9/9/2012 21:23	20.329	20.424	20.234		(0.55)	9/25/2012 21:23	14.038	14.134	13.942	13.942	(0.32)
9/10/2012 3:23	20.424	20,424	20.329	20.234		9/26/2012 3:23	14,421	14.517	14,421	13.846	
9/10/2012 9:23	20,138	20.138	20.043	20.043	20.95	9/26/2012 9:23	14.038	14.134	13,942	13.942	14.43
9/10/2012 15:23	21.951	21.951	21,855	20.805	(0.78)	9/26/2012 15:23	14.996	14.804	14.9	14.23	(0.36)
9/10/2012 21:23	21.554	21.569	21.569	22,046		9/26/2012 21:23	14.709	14.709	14.613	14.709	
9/11/2012 3:23	20.805	20.71	20.71	21.187		9/27/2012 3:23	14.038	14.038	13.942	14.325	***************************************
9/11/2012 9:23	20.043	20.043	19.948	20.329	20.93	9/27/2012 9:23	13. 9 42	14.038	13.846	13.846	14.33
9/11/2012 15:23	21.569	21.473	21.473	20.424	(0.61)	9/27/2012 15:23	14.996	14.709	14.804	14.325	(0.37)
9/11/2012 21:23	21.473	21.473	21.473	21.76		9/27/2012 21:23	14.613	14,804	14.517	14.517	
9/12/2012 3:23	20.805	20.805	20.71	21.187		9/28/2012 3:23	14.996	14.996	14.9	15.187	
9/12/2012 9:23	20,329 20,805	20.329	20.234	20.519	20.69	9/28/2012 9:23	14.804	14.9	14.709	14.709	15.08
9/12/2012 15:23 9/12/2012 21:23	20.805	20.901 20.901	20.71 20.805	20.519 20.615	(0.24)	9/28/2012 15:23	15.569	15.378	15.378	14.9	(0.25)
9/13/2012 3;23	20.329	20.424	20.329	20.519		9/28/2012 21:23 9/29/2012 3:23	15.187 15.378	15.282 15.378	15.187 15.282	15.187	
9/13/2012 9:23	19.472	19,472	19.377	20.043	19,81	9/29/2012 9:23	15,282	15.378	15.282	15.187 15.187	15,50
9/13/2012 15:23	19.758	19.758	19.662	19.282	(0.39)	9/29/2012 15:23	16.141	15.951	16.046	15.569	(0.34)
9/13/2012 21:23	19.567	19.557	19.567	19.758	(0.00)	9/29/2012 21:23	15.378	15.378	15.187	16.141	(0.54)
9/14/2012 3:23	19.187	19,187	19.092	19.377		9/30/2012 3:23	14.9	14.9	14.804	14.996	
9/14/2012 9:23	18.996	18.996	18.901	18.901	19.44	9/30/2012 9:23	14,517	14.613	14.421	14.517	15.02
9/14/2012 15:23	19.948	20.234	19.853	19.187	(0.43)	9/30/2012 15:23	15.378	15.187	15.282	14.804	(0.41)
9/14/2012 21:23	19.758	20.043	19.758	19.567		9/30/2012 21:23	15.569	15.855	15.569	14.996	,
9/15/2012 3:23	19.187	19.187	19.092	19.472		10/1/2012 3:23	15.187	15.282	15.187	15.473	
9/15/2012 9:23	18.331	18.331	18.236	18.521	19.29	10/1/2012 9:23	15.282	15.282	15.187	14.996	15.58
9/15/2012 15:23	19.662	20.138	19.567	18.711	(0.68)	10/1/2012 15:23	16,141	16.046	15.951	15.473	(0.39)
9/15/2012 21:23	19.853	20.519	19.948	19,853		10/1/2012 21:23	16.046	16.141	15.951	15.664	
9/16/2012 3:23 9/16/2012 9:23	19.948 19.472	19.853 19.472	19.853	20.138		10/2/2012 3:23	15.664	15.664	15.569	15,664	
9/16/2012 15:23	20.379	20.329	19,377 20,234	19.567 19.758	19.91	10/2/2012 9:23	15.473	15.473	15.378	15.473	15,81
9/16/2012 21:23	20.043	20.043	19.948	20.138	(0.30)	10/2/2012 15:23 10/2/2012 21:23	16.237 16.332	16.046	16.046	15,569	(0.33)
9/17/2012 3:23	19,472	19,472	19,472	19.758		10/3/2012 3:23	15.951	16.332 15.855	16.237 15.855	15.855 15.046	
9/17/2012 9:23	19,092	19.092	18,996	19.187	18.96	10/3/2012 9:29	15.76	15.76	15.664	15.76	16.08
9/17/2012 15:23	18,996	18.996	18.901	18.996	(0.49)	10/3/2012 15:23	16.618	16.332	16.427	15.855	(0.30)
9/17/2012 21:23	18.14	18.14	18.045	18.616	(4.15)	10/3/2012 21:23	16.332	16.523	16.332	15.237	(0.50)
9/18/2012 3:23	17,284	17.284	17.189	17.855		10/4/2012 3:23	16.237	16.332	16.237	16,237	
9/18/2012 9:23	16.808	16.808	16.713	16.903	17.17	10/4/2012 9:23	16.237	16.237	16.141	15.141	16.33
9/18/2012 15:23	17.76	17.76	17.665	16.713	(0.43)	10/4/2012 15:23	16,713	16.713	16.618	16.523	(0.24)
9/18/2012 21:23	16.808	16.713	16.713	17.665		10/4/2012 21:23	16.046	16.046	16.046	15.713	
9/19/2012 3:23	16.141	16.141	16.141	16.141		10/5/2012 3:23	14,421	14.421	14.325	15.282	
9/19/2012 9:23	16.141	16.141	16.046	16.141	16.20	10/5/2012 9:23	13.461	13.461	13.365	13.461	13,58
9/19/2012 15:23	16.332	16.332	16.237	16.141	(0.09)	10/5/2012 15:23	13.461	13.461	13.365	12.98	(0.67)
9/19/2012 21:23	16,237	16,237	16.237	16.427		10/5/2012 21:23	12.883	12,883	12.787	13.269	
9/20/2012 3:23 9/20/2012 9:23	15.855 15.282	15.855	15.76	16.046	4.7.47	10/6/2012 3:23	11.334	11.431	11.236	12.401	
9/20/2012 9:23	15.282 15.569	15.282 15.473	15.1 8 7 15.473	15.76 15.187	15.47	10/6/2012 9:23	10.748	10.748	10.651	10.553	11,20
9/20/2012 13:23	15.187	15.187	15.473	15.282	(0.29)	10/6/2012 15:23 10/6/2012 21:23	12.013 10.553	12.013	11.916	11.236	(0.60)
9/21/2012 3:23	15.091	15.091	15.091	15.091		10/6/2012 21:23	10.553	10.553 10.455	10.553 10.357	11.334 10.748	
9/21/2012 9:23	15.187	15.187	15.091	14.996	15.17	10/7/2012 5:23	10.455	10.455	10.455	10.748	11.04
9/21/2012 15:23	15.569	15,473	15.473	15.378	(0.19)	10/7/2012 15:23	12,207	12.207	12,11	11.139	(0.66)
9/21/2012 21:23	14.996	14.996	14.9	15.187	//	10/7/2012 21:23	11.139	11,139	11.041	11.722	[0.00]
9/22/2012 3:23	14.325	14.325	14.325	14.804		10/8/2012 3:23	10.259	10.357	10.259	10.748	
9/22/2012 9:23	13.75	13.75	13.654	14.038	14.39	10/8/2012 9:23	9.866	9.866	9.768	9.768	10.52
9/22/2012 15:23	14.9	14.804	14.804	13.942	(0.43)	10/8/2012 15:23	11.334	11.334	11.236	10.553	(0.53)
9/22/2012 21:29	14.613	14.613	14.517	14.996		10/8/2012 21:23	10.651	10.651	10.553	11.139	' '
9/23/2012 3:23	14.23	14.134	14.134	14.23		10/9/2012 3:23	10.357	10.357	10.259	10.651	
9/23/2012 9:23	13.461	13.461	13.365	13.846	13,94	10/9/2012 9:23	10.063	10.063	9.965	10.259	10.07
9/23/2012 15:23	14.421	14.23	14.23	13.75	(0.31)	10/9/2012 15:23	10.161	10.161	10.063	10.063	(0,27)
9/23/2012 21:23	13.846	13.846	13.75	14.134		10/9/2012 21:23	9.768	9.768	9.669	9.571	

2 Item Number

File Folder: 17a

Appendix 7. Spectrophotometric Summary, SAS Program, Output and Log

Item Number	Item Description	Number of Pages	Report Page Number
1	Spectrophotometric Data - Lake Carlos - Whole Tank - Data Summary	3	320
2	SAS program for spectrophotometric data analysis - Lake Carlos - Whole Tank	3	323
3	SAS log for spectrophotometric data analysis - Lake Carlos - Whole Tank	8	326
4	SAS output for spectrophotometric data analysis - Lake Carlos - Whole Tank	15	334
5	Spectrophotometric Data - Lake Shawano - Whole Tank - Data Summary	4	349
6	SAS program for spectrophotometric data analysis – Lake Shawano – Whole Tank	4	353
7	SAS log for spectrophotometric data analysis – Lake Shawano – Whole Tank	8	357
8	SAS output for spectrophotometric data analysis – Lake Shawano – Whole Tank	19	365
9	Spectrophotometric Data - Lake Carlos - Bottom Injection - Data Summary	3	384
10	SAS program for spectrophotometric data analysis – Lake Carlos – Bottom Injection	2	387
11	SAS log for spectrophotometric data analysis – Lake Carlos – Bottom Injection	5	389
12	SAS output for spectrophotometric data analysis – Lake Carlos – Bottom Injection	13	394
13	Spectrophotometric Data – Lake Shawano – Bottom Injection – Data Summary	4	407
14	SAS program for spectrophotometric data analysis – Lake Shawano – Bottom Injection	2	411
15	SAS log for spectrophotometric data analysis – Lake Shawano – Bottom Injection	5	413
16	SAS Output for spectrophotometric data analysis – Lake Shawano – Bottom Injection	18	418

Study Number: AEH-12-PSEUDO-04 Action Action Date
Created..... 6-Feb-14 TIS PW
Revised.... 23-Apr-14 KLWY-3
Reviewed... 23NP2-34 VW Electronic Lab Notebook (pages 10 - 12) Data Source: File Folder: 9c Forms: "Sample Absorbance Readings" Data Sheet Certified 17/27/17 Ja File Name: See filenames as stated below

Spectrophotometric Data

Test Article: Zequanox 6 (MBI-401 SDP) Test Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 17, 2012 Lest Location: Lake Carlos, Alexandria, MN Treatment Type: Whole Tank

Data Explanation:
1) The absorbance of triplicate samples of 25, 50, 103, and 200 mg/L dilutions of a 2,000 mg/L active ingredient (A.I.) stock prepared from Analytical Stock #1 were measured to prepare a standard curve

2) Standard checks were performed at 9 and 12 hours by comparing the 25, 50, 100, and 200 mg/L (A.I.) dilutions to the linear curve.

3) Data codes used within SAS

tank = Tank ID (1 through 9)

thero = Theoretical or target concentration (mg/L) time = Sample Time (0, 1, 3, 6, 9, and 12 h after treatment)

loc = Sample Location

sus = Suspended Sample (sampled ~15 cm from bottom of rank)

sur = Surface Sample abs = measured absorbance of sample

conc = concentration (Img/L), only used for standards used for regression)
4) information that is not relevant to a sample (i.e., tank ID for standards) or that will be calculated by SAS (i.e., predicted concentration for standard checks and samples) Is denoted by a "." In the SAS input and output files.

1) A linear regression was completed in SAS using the absorbance values obtained from the spectrophotometer of 3 replicate dilutions of 25, 50, 100 and 200 mg/L

2) Standard checks and treatment sample concentrations were predicted in SAS by comparing the observed absorbances with the linear regression.

The following mean treatment concentrations were determined in SAS:
 3a) Mean (standard deviation) concentration by tank for all sampling times.

3b) Mean (standard deviation) concentration by treatment group for all sampling times 3c) Mean (standard deviation) concentration by treatment group and sampling times

3d) Mean (standard deviation) concentrations for 25, 50, 100, and 200 mg/L (A.L.) dilutions for all sampling times

File Names:

Spectrophotometric Data for SAS Input

I:\AEH-12-PSEUDO-04\Data Summaries\spec\[Lake Carlos Whole Tank Spec Summary,xisx|Spec Data for SAS

SAS Program/Code

I:\AEH-12-PSEUDO-04\SAS-Spec\carlos whole water program file

SAS Log

I:\AEH-12-PSEUDO-04\SAS-Spec\carlos whole water log file

SAS Output

I:\AEH-12-PSEUDO-04\SAS-Spec\carlos whole water results file

Data Anomalies and Deviations:

1) One exposure tank of a different concentration and sample location was sampled in triplicate to evaluate variability of spectrophotometer curing each sampling time. The mean absorbance of the triplicate samples was imported into SAS for use in the analysis.

2) Samples were collected by submerging a collection beaker below the surface of each exposure tank. Care was taken to avoid foam or particles from surface

a) Some mean absorbances for triplicate samples may be recorded incorrectly on "Sample Absorbance Readings" data forms as proper significant figure rules may not have been observed. Additionally, concentrations recorded on "Sample Absorbance Readings" data forms were not used in the analysis as the initial linear regression equation that was used for these calculations was derived using rounded absorbance values in Excel. All absorbances and concentrations used in SAS calculations and reported within Spectrophotometric Data Summary have been corrected.

Item Number File Folder: 9C

tank	thero	time	loc	abs	conc	
	25	0		0.038	25	
	50	0		0.077	50	AEH-12-PSEUDO-04
	100	0		0.152	100	1 2 2000 104
	200	0		0.291	200	
	25	0		0.040	25	
1	50	0		0.077	50	
	100	0		0.149	100	
,	200	0		0.291	200	
	25	0		0.040	25	
	50	0	,	0.076	50	
	100	0		0.148	100	
	200	0		0.290	200	
	25	9		0.035		
•	50	9		0.069	•	
	100	9		0.139		
	200	9		0.269		
	25	12		0.034		
	50	12		0.074		
	100	12		0.136		
	200	12	•	0.266		
1	50	1	sur	0.077	•	
4	50	1	sur	0.078	,	
8	50	1	sur	0.084		
6	100	1	sur	0.160		
7	100	1	sur	0.155		
9	100	1	sur	0.154	•	
1	50	3	sus	0.071		
4	50	3	sus	0.074		
8	50	3	sus	0.078		
6	100	3	sus	0.142		
7	100	3	sus	0.138		
9	100	3	sus	0.139		
1	50	3	sur	0.070		
4	50	3	sur	0.073		
8	50	3	sur	0.078		
6	100	3	sür	0.142		
7	100	3	sur	0.137		
9	100	3	sur	0.140		
1	50	6	sus	0.065		
4	50	6	sus	0.063		
8	50	6	sus	0.065		
6	100	6	sus	0.132		
7	100	6	sus	0.131	•	•
9	100	6	sus	0.133		Page <u>2</u> of <u>3</u>
1	50	6	sur	0.063		aye _d_ or _>
4	50	6	sur	0.062		
					•	•

8	50	6	sur	0.067		
6	100	6	sur	0.127		
7	100	6	sur	0.128		AEH-12-PSEUDO-04
9	100	6	sur	0.129		AE(1-12-F3E000-04
1	50	9	sus	0.063		
4	50	9	sus	0.061		
8	50	9	sus	0.065		
6	100	9	sus	0.126		
7	100	9	sus	0.126		
9	100	9	sus	0.126		
1	50	9	sur	0.059		
4	50	9	sur	0.059		
8	50	9	sur	0.063		
6	100	9	sur	0.126		
7	100	9	sur	0.122		
9	100	9	sur	0.124		
1	50	12	sus	0.058		
4	50	12	sus	0.057		
8	50	12	sus	0.062		
6	100	12	sus	0.124		
7	100	12	sus	0.121	•	
9	100	12	sus	0.118		
1	50	12	sur	0.060		
4	50	12	sur	0.058		
8	50	12	sur	0.062		
6	100	12	sur	0.125	•	
7	100	1 2	sur	0.120	*	
9	100	12	sur	0.120	•	

FF # <u>9</u>C Item No. <u>1</u> Pa 3 of 3

```
AEH-12-PSEUDO-04
```

```
ods html close; /* close previous */;
ods html; /* open new */;
ods graphics on;
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Performed by K. Weber SAS version ' &SYSVER &SYSTIME &SYSDATE:
options 1s=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
title1 h=1 | Standard Curve Linear Regression and sample concentrations';
title2 h=1 'Study # AEH-12-PSUEDO-04';
title3 h=1 'Lake Carlos-whole water treatment';
title4 h=1 'SAS v. 9.3 Analysis completion date: 23APR2014 Analysis prepare
* SAS ver 9.3 Analysis prepared by: KLW WW Page ___ of __

* Analysis completion date: 23 April 2014 23APL7cH
data Zeq; set carlos.carloswhole;
run;
proc sort;
by tank time loc; run;
run;
oroc gplot data= zeq;
plot abs * conc;
run;
proc reg data = zeq;
model conc = abs /edf;
output out=output_out p=predicted_ppm;
run;
proc sort;
by time tank loc;
proc print data=output_out;
data zeq2; set output_out;
if tank = "." then delete;
if time = "0" then delete;
if loc =".' then delete;
run;
proc sort;
by tank loc;
^{\star} This procedure produces the mean concentrations for each treatment replicat
```

```
* by the the sampling location
 * i.e. It gives the mean concentration of each treatment tank over the entire
 * location (i.e. surface vs suspended sampling
 title "Mean treatment concentration by treatment tank and sampling location (s
proc means data = zeq2 mean std lclm uclm fw=8;
by tank loc:
var predicted_ppm;
run;
proc sort;
by thero time loc;
\boldsymbol{\star} This procedure produces the mean concentrations for each treatment group ov
 * by the sampling location
 * i.e. It gives the mean concentration of the 3 50ppm & 100ppm treatment tank
 * sampling location (surface/suspended) over the entire exposure
title "Wean treatment concentration by treatment group and sampling location f
proc sort:
by thero loc time;
proc means data = zeq2 mean std lclm uclm fw=8;
by thero loc;
var predicted_ppm;
run;
data time9; set zeq2;
if time > 9 then delete;
run;
proc sort:
by thero loc time;
* This procedure produces the mean concentrations for each treatment group th
* i.e. Mean concentration of the 3 50ppm & 100ppm \, treatment tanks through th
title "Mean treatment concentration by treatment group and sampling location t
proc means data = time9 mean std lclm uclm fw=8;
by thero loc;
var predicted_ppm;
run;
data time6; set zeq2;
if time > 6 then delete;
run;
proc sort;
                                                 Page \frac{3}{2} of \frac{3}{2}
```

```
AEI-12-PSEUDO-04
by thero loc time;
 \star This procedure produces the mean concentrations for each treatment group th
 \star i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks through th
 ********************
title "Mean treatment concentration by treatment group and sampling location \boldsymbol{t}
proc means data = time6 mean std lclm uclm fw=8;
by there loc;
var predicted_ppm;
run;
^{\star} This procedure produces the mean concentrations for each treatment group by
 * i.e. It gives the mean conc. of the 3 50ppm & 100ppm treatment tanks at ti
 title 'Mean treatment concentration for each treatment group for each sampling
proc sort;
by there loc time;
proc means data = zeq2 mean std lclm uclm fw=8;
by there loc time;
var predicted_ppm;
run;
data zeq3; set output out;
if conc > 1 then delete;
if tank > 0.5 then delete;
if thero = "." then delete;
run;
proc sort;
by there:
^{\star} This procedure produces the mean concentrations for the standard checks for
^{\star} i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 9 and
title "Mean concentration for standard checks for all sampling times";
proc means data = zeq3 mean std lelm uclm fw=8;
by thera;
var predicted_ppm;
run;
quit;
                                                 FF# 9c
```

Item No. a

```
AEH-12-PSEUDO-04
```

```
DM LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
4
5
6
    . FOOTNOTE1 'Performed by K. Weber SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or
         unquoted text.
8
     options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
9
10
    title1 h=1 'Standard Curve Linear Regressior and sample concentrations';
11
     title2 h=1 'Study # AEH-12-PSUEDO-04';
    title3 h=1 'Lake Carlos-whole water treatment';
12
    title4 h=1 'SAS v. 9.3 Analysis completion date: 23APR2014 Analysis pr
14
15
    16
17
18
19
20
     data Zeg; set carlos.carloswhole;
21
     run;
NOTE: There were 74 observations read from the data set CARLOS.CARLOSWHOLE.
NOTE: The data set WORK.ZEQ has 74 observations and 6 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.01 seconds
      opu time
                        0.01 seconds
22 proc sort;
    by tank time loc; run;
NOTE: There were 74 observations read from the data set WORK.ZEQ.
NOTE: The data set WORK.ZEQ has 74 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                       0.01 seconds
     cpu time
                        0.01 seconds
24
25
    run;
26
    proc gplot data= zeq;
27
    plot abs * conc;
28
    run:
NOTE: 62 observation(s) contained a MISSING value for the abs * conc request.
NOTE: 4 records written to C:\Users\klweber\gplot.png.
```

```
NOTE: There were 74 observations read from the data set WORK.ZEQ.
NOTE: PROCEDURE GPLOT used (Total process time):
      real time
                         0.82 seconds
      cpu time
                         0.50 seconds
29 proc reg data = zeq;
    model conc = abs /edf;
31
     output out=output_out p=predicted_ppm;
32 run;
NOTE: The data set WORK.OUTPUT_OUT has 74 observations and 7 variables.
NOTE; PROCEDURE REG used (Total process time);
      real time 2.60 seconds
      cpu time
                         0.62 seconds
33
     proc sort;
     by time tank loc;
NOTE: There were 74 observations read from the data set WORK.OUTPUT OUT.
NOTE: The data set WORK.OUTPUT_OUT has 74 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                        0.01 seconds
     cpu time
                         0.01 seconds
   proc print data=output_out;
36
   run;
NOTE: There were 74 observations read from the data set WORK.OUTPUT OUT.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                     0.12 seconds
     cpu time
                        0.06 seconds
   data zeq2; set output_out;
   if tank = "." then delete;
    if time = "0" then delete;
   if loc ="." then delete;
40
41
   run;
NOTE: Character values have been converted to numeric values at the places giv
      (Line):(Column).
```

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```
39:11
NOTE: There were 74 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ2 has 54 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time 0.01 seconds
     opu time
                      0.01 seconds
42
    proc sort;
43
    by tank loc;
44
    run;
NOTE: There were 54 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 54 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                    0.00 seconds
     cpu time
                      0.00 seconds
   45 ! *********
   * This procedure produces the mean concentrations for each treatment rep
46 ! sampling times *
47
     * by the the sampling location
47 1
    * i.e. It gives the mean concentration of each treatment tank over the \epsilon
48 ! the sampling *
49
     * location [i.e. surface vs suspended sampling
49 l
50 ***********************
50 ! ***********/
51 title "Mean treatment concentration by treatment tank and sampling locati
51 (surface/suspended) for all sampling times':
52 proc means data = zeq2 mean std lclm uclm fw=8;
   by tank loc;
54
   var predicted_ppm;
55
   run;
NOTE: There were 54 observations read from the data sct WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                      0.12 seconds
     cpu time
                      0.04 seconds
56 proc sort;
    by there time loc;
```

```
58 /********************************
58 ! **********
    * This procedure produces the mean concentrations for each treatment gro
59
59 ! sampling times
60
      * by the sampling location
60 J
      \ensuremath{^{*}} i.e. It gives the mean concentration of the 3 50ppm & 100ppm treatment
61 !
62
      {}^{\star} sampling location (surface/suspended) over the entire exposure
62 |
63
63 | ***********/
64 title "Mean treatment concentration by treatment group and sampling locat
64 | sampling times';
NOTE: There were 54 observations read from the data set WORK, ZEQ2.
NOTE: The data set WORK.ZEQ2 has 54 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time 0.01 seconds
      cpu time
                        0.01 seconds
    proc sort;
66
    by thero loc time;
NOTE: There were 54 observations read from the data set WORK.ZEO2.
NOTE: The data set WORK.ZEQ2 has 54 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     cpu time
                        0.01 seconds
68 proc means data = zeg2 mean std lclm uclm fw=8;
69 by there loc;
70
    var predicted_ppm;
    run;
NOTE: There were 54 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                   0.09 seconds
     opu time
                        0.01 seconds
72
73
    data time9; set zeq2;
```

```
AEH-12-PSEUDO-04
```

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```
74 if time > 9 then delete;
75 run;
NOTE: There were 54 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.TIME9 has 42 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time 0.01 seconds
     cpu time
                     0.01 seconds
76 proc sort;
77 by thero loc time;
78 | *************
79 * This procedure produces the mean concentrations for each treatment gro
79 ! sample location *
    * i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks throu
80 I by sample location *
     81 ! ****************
82 title "Mean treatment concentration by treatment group and sampling locat
82 | exposure";
NOTE: There were 42 observations read from the data set WORK.TIME9.
NOTE: The data set WORK.TIME9 has 42 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     opu timo
                     0.01 seconds
83 proc means data = time9 mean std lolm uclm fw=8;
    by there loc;
85
    var predicted_ppm;
86
    run;
NOTE: There were 42 observations read from the data set WORK.TIME9.
NOTE: PROCEDURE MEANS used (Total process time):
     real time 0.09 seconds
                    0.01 seconds
     cpu time
87
88
89 data time6; set zeq2;
90 if time > 6 then delete;
91
```

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```
NOTE: There were 54 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.TIME6 has 30 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time
                     0.01 seconds
     cpu time
                     0.01 seconds
92 proc sort;93 by thero loc time;
94 | *************
^{\rm *} This procedure produces the mean concentrations for each treatment gro
95 ! sample location
96 * i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks throu
96 ! by sample location *
     97 ! *************
98 title "Mean treatment concentration by treatment group and sampling locat
98 ! exposure";
NOTE: There were 30 observations read from the data set WORK.TIMES.
NOTE: The data set WORK.TIME6 has 30 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
    real time 0.0' seconds
     cpu time
                    0.01 seconds
99 proc means data = time6 mean std lclm uclm fw=8;
100 by thero loc;
101 var predicted_ppm;
102 run;
NOTE: There were 30 observations read from the data set WORK.TIME6.
NOTE: PROCEDURE MEANS used (Total process time):
    real time 0.23 seconds
                     0.03 seconds
     cpu time
103
104! *********
105 \, * This procedure produces the mean concentrations for each treatment grc
106 * i.e. It gives the mean conc. of the 3 50ppm & 100ppm treatment tanks
106! and 12h
```

```
1071 **********/
  108 title "Mean treatment concentration for each treatment group for each san
  109 proc sort;
  110 by thero loc time;
  MOTE: Input data set is already sorted, no sorting done.
  NOTE: PROCEDURE SORT used (Total process time):
       real time
                    0.01 seconds
        cpu time
                         0.01 seconds
  112 proc means data = zeq2 mean std lclm uclm fw=8;
  113 by thero loc time;
  114 var oredicted_ppm;
  115 run;
  NOTE: There were 54 observations read from the data set WORK.ZEQ2.
  NOTE: PROCEDURE MEANS used (Total process time):
        real time
                    0.17 seconds
       cpu time
                         0.06 seconds
. 116
  117 data zeq3; set output_out;
  118 if conc > 1 then delete;
  119 if tank > 0.5 then delete;
  120 if thero = "." then delete;
  121 run;
  NOTE: Character values have been converted to numeric values at the places giv
        (Line);(Column),
        119:4
               120:12
  NOTE: There were 74 observations read from the data set WORK.OUTPUT_OUT.
  NOTE: The data set WORK.ZEQ3 has 8 observations and 7 variables.
  NOTE: DATA statement used (Total process time);
       real time
                  0.01 seconds
                         0.01 seconds
       opu time
  122
  123 proc sort;
  124 by thero;
  125| *********
```

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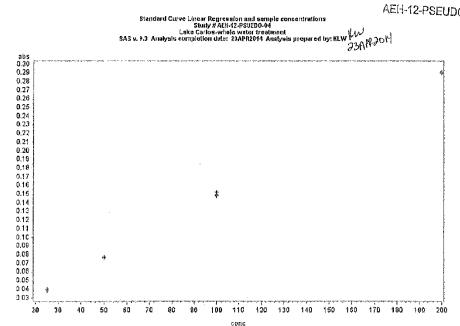
```
AEH-12-PSEUDO-04
* This procedure produces the mean concentrations for the standard check
126! periods *
127 * i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at
128! **********/
129 title 'Mean concentration for standard checks for all sampling times";
NOTE: There were 8 observations read from the data set WORK. ZEQ3.
NOTE: The data set WORK.ZEQ3 has 8 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                0.01 seconds
     cpu time
                       0.01 seconds
130 proc means data = zeq3 mean std lclm uclm fw=8;
131 by thero;
132 var predicted_ppm;
NOTE: There were 8 observations read from the data set WORK.ZEQ3.
NOTE: PROCEDURE MEANS used (Total process time):
     real time 0.10 seconds
                      0.04 seconds
     cpu time
```

134 quit;

FF # <u>9</u> Item No. <u>3</u> Pg <u>&</u> of <u>&</u> SAS Output

AEH-12-PSEUDO-04

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Performed by K. Weber SAS version 9.3 09:49 23APR14

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AEH-12-PSEUDO-04

Standard Curva Linear Regression and sample concentrations
Study # AEH-12-HSUEDU-04
Lake Carios-whole water treatment
SAS v. 8.3 Analysis completion date: 23APR2014 Analysis prepared by: KLW

The REG Procedure Model: MODEL1 Dependent Variable: conc conc

Number of Observations Read	74
	12
Number of Observations with Missing Values	62

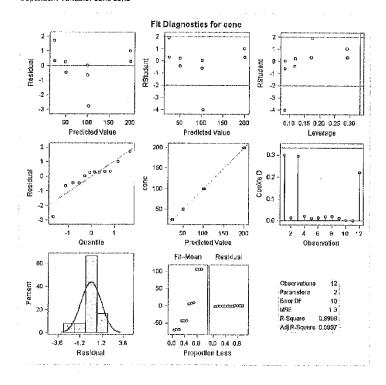
Analysis of Variance											
Source DF Squares Square F Value Pr > F											
Model	1	53893	53893	41456,9	<.0001						
Error	10	12,99981	1.29998	:							
Corrected Total	11	53906									

Root MSE	1.14017	R-Square	0.9998
Dependent Mean	93.75000	Adj R-Sq	0.9997
Coeff Var	1.21618		

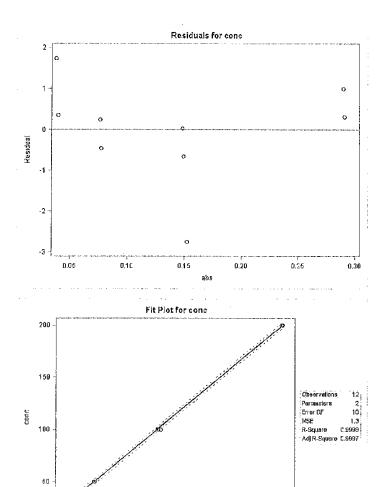
Parameter Estimates											
Variable Label DF Estimate Error t Value Pr > t											
Intercept	Intercept	1	-3.24187	0.57901	-5.60	0.0002					
abs	abs	1	697.36515	3.42501	203.61	<.0001					

Standard Curve Linear Regrossion and samale concentrations Study RAEH-12-PSUEDD-04 Lake Carlos-Note water treatment SAS v. 9.3 Analysis completion date: 23APR2014 Analysis prepared by: KLW

The REG Procedure Model: MODEL1 Dependent Variable: conc conc



AER-12-PSEUDO-0;



Performed by K. Weber SAS version 9.3 09:49 23APR14

0.10

0.05

0.15

----- Fit D 95% Confidence Limits ----- 95% Prediction Um ts

0.20

0.25

0.30

file:///C:/Users/klweber/sashtml.htm

Standard Ctrvo Linear Regression and sample concentrations
Study # AEH-12-PSUED0-04
Lake Carlos-Wole water treatment
SAS v. 9.3 Analysis completion date: 23APR2014 Analysis prepared by: KLW

Obs	tank	thero	time	loc	abs	conc	predicted_ppm
. 1		25	0		0.038	1	23.258
2		50	. 0		0.077	50	50,455
3	41	100	0		0,152	100	102.758
4		200		•••	0,291	200	199.691
5	·	25			0.040	25	24.653
6	i :	50	0		0.077	50	50.455
7		100	0	·	0.149	100	100.666
		200	0		0.291	200	199,691
9		25		•	0.040	26	24.653
10		50	0	· · · ·	0.076		49.758
11		100	0	·	0.148	100	99.968
12		200	0	: .	0.290	200	198.994
13	1	50	1	sur	0.077	2.00	50,455
14		50	: :	sur	0.077		51,153
15	6	100		sur	0.160	. :	108,337
16	7	100		sur	0.166		104,850
17	8	50		sur	0.084	نا	55.337
18	9	100	1	sur	0.154	;	104,152
19	1	50	3	sur	0.070		45.574
20	1	50	3	SUS	0.071		46.271
21	4	50	3	sur	0.073		47,666
22	4	50	3	SUS	0.074		48.363
23	6	100	3	sur	0.142		95.784
24	6	10C	3	sus	0.142		95,784
25	7	100	3	SUN	0.137		92.297
26	7	100	3	SUS	0.138		92.995
27	8	50	3.	sur :	0.078	. ::	51.153
28	8	50	3	sus	0.078		51.153
29	9,	100	3	sur	0.140	Ġ	94.389
30	9	100	3	sus	0.139		93,692
31	1	50	6	sur	0.063		40,692
32	1	50	6	SUS	0,085		42.087
33	4	50	}	sur	0.062		39.995
34	4	50	6	sus.	0.063		40.692
35	6	100		sur	0.127	.]	85.324
36	6	100	6	sus	0.132		88.810
37 -	7	100	6	sur			86,021
38	7	100	6		C.131		88.113
•	:		-	;		•	

file:///C:/Users/klweber/sashtml.htm

AEH-12-PSEUDO-0:

39	8	50	6	sur	0 067		43.482
40	8	50	6	sus	0.065		42,087
41	9	100	. 6	sur	0.129		86.718
42	9	100	6	sus	0.133		89.508
43		25	9		0.035		21.166
44	: -	50	9		0.069		44.876
45	j	100	9		0.139		93.692
46		200	9		0.269		184.349
47	1	50	9	sur	0.059		37.903
48	1	50	9	sus	0.063		40.692
49	4	50	9	sur	0.059		37.903
50	4	50	9	sus	0.061		39.297
51	6	100	9	sur	0.126	,	84.626
52	6	100	9	sus	0.126		84.626
53	7	100	9	sur	0.122		81.837
54	7	100	9	SUS	0.126		84.626
56	8	5C	9	sur	0.063		40.692
56	8	50	9	sus	0.065		42.087
57	9	100	9	sur	0.124		83.231
58	9	100	9 '	sus	0.126		84.626
59	Lin er	25	12		0.034		20.469
60		50	12 :		0.074		48.363
61		100	12		0.136		91.600
62		200	12		0,266		182.257
63	1	50	12	sur	0.060	. :	38.600
64	1	50	12	sus	0.058		37.205
65	4	50	12	sur	C.058		37.205
86	4	50	12	ยแร	0.057		36,508
67	6	100	12 :	sur	0.125		83.929
68	6	100	12	SUS	0.124		83,231
69	7	100	12	sur	0.120		80,442
70	7	190	12	sus	0.121	;	81,139
71	8	50	12	sur	0.062		3 9. 9 95
72	8	50	12	sus	0.062		39.995
73	9	100	12	sur	0.120		80.442
74	9	100	12	sus	0.118		79.047

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AEE-12-PSEUDO-01

Mean treatment concentration by treatment tank and sampling location (surface/suspended) for all sampling times

The MEANS Procedure

tank=1 loc=sur

Analysis Variable : predicted_ppm Predicted . Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
42,6448	5,2972	36.0674	49.2221

tank=1 loc=sus

	Va	lue of conc	
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mear
41.5638	3.7500	35.5967	47,5310

tank=4 loc=sur

Analysis	Analysis Variable ; predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
42,7842	6,2569	35.0153	50,5532	

tank=4 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
41.2152	5.0729	33.1430	49.2873

tank=6 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
91.5998	10.5415	78.5108	104,7

tank=6 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95%. CL for Mean
88.1130	5.6387	79.1437	97.0823

tank=7 loc≃sur

Analysis Variable : predicted_ppm Predicted

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SAS Output

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AEE-12-PSEUDO-6:

		Value of conc			
Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
9.9433	76.7431	101.4			
		Lower 95% CL for Mean 9.9433 76.7431			

Analysis Variable : predicted_ppm Predicted : Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
86.7182	5.0609	78.6652	94.7713

tank=8 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
46.1316	6.7863	37.7052	54.5579

tank=8 loc≂sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
43.8303	4.9802	35.9057	51.7549

tank=9 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
89.7866	9.5821	77.8889	101.7

tank≃9 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
86,7182	6.3149	76.6698	96.7667

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AER-12-PSEUDO-01

Mean treatment concentration by treatment group and sampling location for all sampling times

The MEANS Procedure

thero=50 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
43.8535	5.9283	40.5705	47,1365	

thero=50 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
42.2031	4.3686	. 39.4274	44.9787	

thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Moan	
90.1586	9.3504	84.9805	95.3367	

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev		Upper 95% CL for Mean
87 1831	5.1960	83.8818	90.4845

AER-12-PSEUDO-01

Mean treatment concentration by treatment group and sampling location through the 9 h exposure

The MEANS Procedure

thero=50 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
45.1669	5.9133	41.4098	48.9240	

thero=50 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
43.6366	4.0178	40.5482	46.7250	

thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
92.2972	9.2516	86.4190	98.1753

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
89.1978	4.2148	85.9580	92.4375	

Mean treatment concentration by treatment group and sampling location through the 6 h exposure

The MEANS Procedure

thero=50 loc≃sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev		Upper 95% CL for Mean	
47.2784	5.2315	4 3. 257 1	51.2997	

thero=50 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
45.1088	4.1531	40.7504	19.4672

thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
95.3191	8.7240	88.6132	102.0

thero≕100 loc≂sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
91.4836	3,1005	88.2298	94.7373	

AER-12-PSEUDO-CT

Mean treatment concentration for each treatment group for each sampling time

The MEANS Procedure

thero=50 loc=sur time=1

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev		Upper 95% CL for Mean
52,3149	2.6402	45.7563	58.8735

thero=50 loc=sur time=3

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
48.1307	2.8184	41.1295	55.1319	

thero=50 loc=sur time=6

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
41.3895	1.8451	36.8061	45.9729	

thero=50 loc=sur time=9

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean		Lower 95% CL for Mean	Upper 95% CL for Mean	
38.8325	1.6105	34.8318	42.8332	

thero=50 loc≃sur time=12

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
38,6000	1.3947	35.1353	42.0647

thero=50 loc=sus time=3

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean				

thero=50 loc=sus time=6

Analysis Variable : predicted ppm Predicted Value of conc

file:///C:/Users/klweber/sashtml.htm

AEE-12-PSEUDO-CO

Mean Std Dev	Lower 95% CL for Mean	Upper 95% GL for Mean
41.6220 0.8052	39.6216	43.6223
thoro=50 loc=sus t		
Analysis Variable	: predicted_palue of conc	pm Predicted
Mean Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
40.6921 1.3947	37.2274	a francisco de la compania del compania del compania de la compania del compania del compania de la compania de la compania de la compania de la compania del c
thero=50 loc=sus t	lme≃12	
Analysis Variable Va	: predicted_p	
Mean Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
37.9027 1.8451		42.4860
thero=100 loc=sur	time=1	
Analysis Variable Va		pm Predicted
Mean Std Dev	Lower 95%	Upper 95% CL for Mean
105.8 2.2417	100.2	111.3
thero=100 loc=sur	time=3	
Analysis Variable Va	: predicted_p	
Mean Std Dev	Lower 95% CL for Mean	CL for Mean
94,1568 1,7650	89.7971	98.5165
thero=100 loc=sur	time=6	
	lue of conc	
Mean Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean 37.7532
86,0209 0.6974	84.2885	87.7532
thero=100 loc=sur	time=9	
Analysis Variable Va	lue of conc	
Mean Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
83.2314 1.3947	79.7667	86.6961
thero=100 loc=sur t	tline≖12	
Analysis Variable	: predicted_p lue of conc	pm Predicted

file:///C:/Users/klweber/sashtml.htm

Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
81,6042	2.0131	76.6034	86,6051

thero=100 loc=sus time=3

Analysis Variable : predicted_ppm Predicted Value of conc					
Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean					
94.1568	1.4517	90,5506	97.7630		

thero=100 loc=sus time=6

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
88.8103	0,6974	87,0780	90,5427	

thero=100 loc=sus time=9

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean Std Dev CL for Mean CL for Mean					
84.6261	. 0				

thero=100 loc=sus time=12

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
81,1393	2,0921	75,9423	86,3364

Performed by K. Weber SAS version 9.3 09:49 23APR14

AEE-12-PSEUDC-(14

Mean concentration for standard checks for all sampling times The MEANS Procedure thero=25 Analysis Variable : predicted_ppm Predicted Value of conc

Lower 95% Upper 95%
Mean Std Dev CL for Mean CL for Mean 20.8172 0.4931 16.3868 thero=50 Analysis Variable : predicted_ppm Predicted Value of conc Mean Std Dev CL for Mean CL for Mean 24.4676 46.6197 2.4656 68.7719 thero=100 Analysis Variable : predicted_ppm Predicted Value of conc Mean Std Dev | Lower 95% | Upper 95% | CL for Mean 92.8458 1.4793 79.3545 105.9 thero≃200 Analysis Variable : predicted_ppm Predicted Value of conc
 Mean
 Std Dev
 Lower 95% CL for Mean
 Upper 95% CL for Mean

 183.3
 1.4793
 170.0
 196.6

> FF # _ 9 \cdot Item No. _4 Pg _ 15 of _K

file:///C:/Users/klweber/sashtml.htm

Study Number: AEH-12-PSEUDO-04	Action Date	te	Initials
Electronic Lab Notebook (pages 17 - 73)	Created	6-Feb-14	T.S -735
Data Source: File Folder: 11c		12-Feb-14	
Forms: "Sample Absorbance Readings" Data Sheet			
	Certifled 2	119/19	51-
File Name: See filenames as stated below		. —	

Spectrophotometric Data

Test Article: Zequanox 8 (MBI-401 SDP) Test Article Lot #: 401P12163C and 401P12164C MIx Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, Wi Treatment Type: Whole Tank

- Data Explanation:

 1) The absorbance of triplicate samples of 25, 50, 100, and 200 mg/L dilutions of a 2,000 mg/L active ingred ent (A.I.) stock prepared from Analytical Stock #1 were
- measured to prepare a standard curve.
 2) Standard checks were performed at 6, 9, and 12 hours by comparing the 25, 50, 100, and 200 mg/L (A.I.) dilutions to the linear curve.
- 3) Data codes used within SAS

tank = Tank ID (1 through 9)

thero = Theoret'cal or target concentration (mg/L) time = Sample Time (0, 1, 3, 6, 9, and 12 h after treatment)

loc = Sample Location

sus = Suspended Sample (sampled *15 cm from bottom of tank)

sur = Surface Sample abs = measured absorbance of sample

concerconstruction ([mg/L], only used for standards used for regression)

4) Information that is not relevant to a sample (i.e., tank ID for standards) or that will be calculated by SAS (i.e., predicted concentration for standard checks and samples) is denoted by a "." in the SAS Input and output files.

- 1) A linear regression was completed in SAS using the absorbance values obtained from the spectrophotometer of 3 replicate dilutions of 25, 50, 100 and 200 mg/E.
- 2) Standard checks and treatment sample concentrations were predicted in SAS by comparing the observed absorbances with the linear regression.
- 3) The following mean treatment concentrations were determined in SAS:
 - 3a) Mean (standard deviation) concentration by tank and location for all sampling times
 - 3b) Mean (standard deviation) concentration by treatment group and location for all samping times
 - 3c) Mean (standard deviation) concentration by treatment group and sampling times for both locations 3d) Mean (standard deviation) concentrations for 25, 50, 100, and 200 mg/L (A.I.) dilutions for all sampling times

Spectrophotometric Data for SAS Input

E\AEH-12-PSECDO-04\Data Summarles\spec\(Lake Shawano Whole Tank Spec Summary.xlsx)Spec Data for SA5

SAS Program/Code

I:\AEH-12-PSEUDO-04\SAS-Spec\shawano whole water program file

SAS Log

E\AEH-12-PSEUDO-04\SAS-Spec\shawano whole water log file

SAS Output

I:\AEH-12 PSEUDO-04\SAS-Spec\shawano whole water results file

- Data Anomalies and Deviations:

 1) One exposure tank of a different concentration and sample location was sampled in triplicate to evaluate variability of spectrophotometer during each sampling time. The mean absorbance of the triplicate samples was imported into SAS for use in the analysis
- 2) Surface samples (sur) were collected by submerging a collection beaker below the surface of each exposure tank; suspended samples (sus) were collected ~15 cm from

the exposure tank bottom for all sampling thres.

3) Some mean absorbances for triplicate samples may be recorded incorrectly on "Sample Absorbance Readings" data forms as proper significant figure rules may not have been observed. Additionally, concentrations recorded on "Sample Absorbance Readings" data forms were not used in the analysis as the initial linear regression equation that was used for these calculations was derived using rounded absorbance values in Excel. All absorbances and concentrations used in SAS calculations and reported within Spectrophotometric Data Summary have been corrected.

> File Folder: Page ____ of _ 나

tank	thero	time	loc	abs	conc	
	25	0		0.034	25	
	50	0		0.069	50	AEH-12-PSEUDO-04
	100	0		0.135	100	EL11-12-1 OEODO-04
	200	0		0.263	200	
	25	0		0.034	25	
	50	0		0.069	50	
	100	0		0.135	100	
	200	0		0.263	200	
	25	. 0	,	0.034	25	
	50	0		0.069	50	
	100	0		0.137	100	
	200	0		0.263	200	
	25	6		0.033		
•	50	6		0.068		
	100	6		0.13		
•	200	6	•	0.247		
	25	9		0.033		
	50	9		0.063		
	100	9		0.127		
	200	9	,	0.248		
	25	12	•	0.035		
	50	12		0.068		
	100	12	•	0.129		
•	200	12		0.249		
1	0	1	sur	0.000		
4	0	1	sur	0.0 01	ì	
7	0	1	sur	0.001	•	
2	50	1	sur	0.061	•	
5	50	1	sur	0.072		
8	50	1	sur	0.067		
3	1.00	1	sur	0.144		
6	100	1	sur	0.150		
9	100	1	sur	0.132		
1	0	1	sus	0.001		
4	0	1	sus	0.000		
7	0	1	sus	0.000		
2	50	1	sus	0.064		
5	50	1	sus	0.073		
8	50	1	sus	0.065		
3	100	1	sus	0.144		
6	100	1	sus	0.149	•	
9	100	1	sus	0.133		1
1	0	3	sur	0.001		
4	0	3	sur	0.003		Page 2 of 4
7	0	3	sur	0.000		
2	50	3	sur	0.059	•	

5	50	3	sur	0.068		
8	50	3	sur	0.063		
3	100	3	sur	0.134		AEH-12-PSEUDO-04
6	100	3	sur	0.140		
9	100	3	sur	0.124		
1	0	3	sus	0.002		
4	0	3	sus	0.001		
7	0	3	sus	0.000		
2	50	3	sus	0.060		
5	50	3	sus	0.068	-	
8	50	3	sus	0.062		
3	100	3	sus	0.134		
6	100	3	sus	0.141	,	
9	100	3	sus	0.124		
1	0	6	sur	0.002		
4	0	6	sur	0.002	•	
7	0	6	sur	0.001		
2	50	6	sur	D.055		
5	50	6	sur	0.064		
8	50	6	sur	0.058		
3	1.00	6	sur	0.123	•	
6	100	6	sur	0.131		
9	100	6	sur	0.116		
1	0	6	sus	0.001	•	
4	0	6	sus	0.002		
7	0	6	sus	0.003		
2	50	6	sus	0.054		
5	50	6	sus	0.065		
8	50	6	sus	0.060		
3	100	6	sus	0.127		
6	100	6	5US	0.132		
9	100	6	sus	0.115		
1	0	9	5Ur	0.004		
4	0	9	sur	0.003		
7	0	9	sur	0.005		
2	50	9	sur	0.053		
5	50	9	sur	0.061	•	
8	50	9	sur	0.056		
3	100	9	sur	0.117	F	
6	100	9	sur	0.123		
9	100	9	sur	0.108	•	
1	0	9	sus	0.005		•
4	0	9	sus	0.004		Page 3 of 4
7	0	9	sus	0.004	•	. ugo
2	50	9	sus	0.053		
5	50	9	sus	0.059	•	
8	50	9	sus	0.055	•	

		0.119	sus	9	100	3
	•	0.125	sus	9	100	6
AEH-12-PSEUDO-04		0.108	sus	9	100	9
		0.005	sur	12	0	1
		0.004	sur	12	0	4
		0.004	sur	12	0	7
		0.051	sur	12	50	2
		0.059	sur	12	50	5
		0.056	sur	12	50	8
		0.113	sur	12	100	3
		0.122	sur	12	100	6
	•	0.105	sur	12	100	9
		0.006	sus	12	0	1
		0.004	sus	12	0	4
		0.005	sus	12	0	7
		0.053	sus	12	50	2
		0.059	sus	12	50	5
		0.054	sus	12	50	8
		0.115	sus	12	100	3
		0.120	sus	12	100	6
		0.106	sus	12	100	9

File Folder: 1/C	Item Number: 1	Page	4	of	Ц	
		Paga	- 1	OΤ	9	

```
ods html close; /* close previous */;
ods html; /* open new */;
ods graphics on;
DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
title1 h=1 'Standard Curve Linear Regression and sample concentrations';
title2 h=1 'Study # AEH-12-PSUEDO-04';
title3 h=1 'Shawano Lake-whole water treatment';
title4 h=1 'SAS v. 9.3 Analysis completion date: 26MAR2014 Analysis prepare
* SAS ver 9.3 Analysis prepared by: JAL 5.- Page ___ of ___
* Analysis completion date: 26MAR2014
.
.
data Zeq; set shawano.shawanowhole;
proc sort;
by tank time loc; run;
run;
proc gplot data= zeq;
plot abs * conc;
proc reg data = zeq;
model conc = abs /edf;
output out=output_out p=predicted_ppm;
proc sort;
by time tank loc;
proc print data=output_out;
run:
data zeq2; set output_out;
if tank = "." then delete;
if tank = " " then delete;
if loc ="." then delete;
if time = "O" then delete;
run;
proc sort;
by tank loc;
                                                    Item No._
```

```
* This procedure produces the mean concentrations for each treatment replicat
 * by the the sampling location
 ^{\star} i.e. It gives the mean concentration of each treatment tank over the entire
 * location [i.e. surface vs suspended sampling
 *******************
title "Mean treatment concentration by treatment tank and sampling location (\epsilon
proc means data = zeq2 mean std lclm uclm fw=8;
by tank loc:
var predicted_ppm;
run;
proc sort;
by thero time loc;
* This procedure produces the mean concentrations for each treatment group ov
* by the sampling location
 * i.e. It gives the mean concentration of the 3 control, 50ppm & 100ppm treat
 * sampling location (surface/suspended) over the entire exposure
title "Mean treatment concentration by treatment group and sampling location f
proc sort;
by there loc time;
proc means data = zeq2 mean std lclm uclm fw=8;
by there loc;
var predicted_ppm;
run;
data time9; set zeq2;
if time > 9 then delete;
run;
proc sort;
by there loc time;
* This procedure produces the mean concentrations for each treatment group th
* i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks through th
****************
title "Mean treatment concentration by treatment group and sampling location \boldsymbol{t}
proc means data = time9 mean std lclm uclm fw=8;
by there loc;
var predicted_ppm;
run;
data time6; set zeq2;
if time > 6 then delete;
run:
```

```
proc sort;
by there loc time;
* This procedure produces the mean concentrations for each treatment group th
\star i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks through th
title "Mean treatment concentration by treatment group and sampling location t
proc means data = time6 mean std lclm uclm fw=8;
by thero loc;
var predicted_ppm;
run;
\boldsymbol{\star} This procedure produces the mean concentrations for each treatment group by
* i.e. It gives the mean conc. of the 3 control,50ppm & 100ppm treatment tar
*********************
title "Mean treatment concentration for each treatment group for each sampling
proc sort;
by thero loc time;
proc means data = zeq2 mean std lclm uclm fw=8;
by there loc time;
var predicted_ppm;
run;
data zeq3; set output_out;
if conc > 1 then delete;
if tank > 0.5 then delete;
if thero = "." then delete;
run;
proc sort;
by thero;
\boldsymbol{\star} This procedure produces the mean concentrations for the standard checks for
st i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 6, 9
****************
title "Mean concentration for standard checks for all sampling times';
proc means data = zeq3 mean std lclm uclm fw=8;
by there:
var predicted_ppm;
                                               Page 3 of 4
```

3-26-14 Ja-

run; quit; run;

AEH-12-PSEUDO-04

FF# 11C Item No. 2 Pg 4 of 4

```
DM LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
4
5
6
     FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE
6!;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or
        unquoted text.
7
    options 1s=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
8
9
10 title1 h=1 'Standard Curve Linear Regression and sample concentrations';
    title2 h=1 'Study # AEH-12-PSUEDO-04';
11
    title3 h=1 'Shawano Lake-whole water treatment';
    title4 h=1 'SAS v. 9.3 Analysis completion date: 26MAR2014 Analysis pr
۳3
14
    15
    * SAS ver 9.3 Analysis prepared by: JAL
16
    17
18
19
20
   data Zeq; set shawano.shawanowhole;
NOTE: There were 115 observations read from the data set SHAWANO.SHAWANOWHOLE.
NOTE: The data set WORK.ZEQ has 115 observations and 6 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.03 seconds
                      0.03 seconds
     opu time
    proc sort;
    by tank time loc; run;
NOTE: There were 115 observations read from the data set WORK.ZEQ.
NOTE: The data set WORK.ZEQ has 115 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     cpu time
                      0.01 seconds
24
25
    run;
26
   proc gplot data= zeq;
27
    plot abs * conc;
NOTE: 103 observation(s) contained a MISSING value for the abs * conc request.
                                                   FF# <u>1/C</u>
Item No. <u>3</u>
Pg / of <u>8</u>
```

```
AEH-12-PSEUDO-04
NOTE: 4 records written to C:\Users\klweber\gplot.png.
NOTE: There were 115 observations read from the data set WORK.ZEQ.
NOTE: PROCEDURE GPLOT used (Total process time):
                   0.65 seconds
      real time
      cpu time
                        0.49 seconds
29 proc reg data = zeq;
30 model conc = abs /edf;
31
     output out=output_out p=predicted_ppm;
32
NOTE: The data set WORK.OUTPUT\_OUT has 115 observations and 7 variables.
NOTE: PROCEDURE REG used (Total process time):
                   4.49 seconds
      real time
      opu time
                        0.63 seconds
    proc sort;
    by time tank loc;
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.OUTPUT_OUT has 115 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                      0.01 seconds
      cpu time
                        0.01 seconds
35
    proc print data=output_out;
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: PROCEDURE PRINT used (Total process time):
     real time 0.15 seconds
      cpu time
                       0.07 seconds
37  data zeq2; set output_out;
   if tank = "." then delete;
   if tank = " " then delete;
39
    if loc ="." then delete;
41 if time = "0" then delete;
    run;
```

Page <u>2</u> of <u>8</u>

AEH-12-PSEUDO-04

```
NOTE: Character values have been converted to numeric values at the places giv
      (Line):(Column).
      41:11
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ2 has 90 observations and 7 variables.
NOTE: DATA statement used (Total process time);
                 0.01 seconds
      real time
      cpu time
                        0.01 seconds
43
    proc sort;
44
    by tank loc;
45
    run;
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 90 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time . 0.01 seconds
      cpu tíme
                        0.01 seconds
46 ! *********
47
     \ ^{\star} This procedure produces the mean concentrations for each treatment rep
47 ! sampling times *
48
     * by the the sampling location
48 1
49
     * i.e. It gives the mean corcentration of each treatment tank over the \epsilon
49 ! the sampling *
      * location [i.e. surface vs suspended sampling
50 1
51 ***************************
51 ! ***********/
52 title "Mean treatment concentration by treatment tank and sampling locati
52 | (surface/suspended) for all sampling times";
53 proc means data = zeq2 mean std lolm uclm fw=8;
   by tank loc;
55
   var predicted_ppm;
    run;
NOTE: There were 90 observations read from the data set WORK. ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                        0.15 seconds
     cpu time
                        0.06 seconds
```

Page 3 of 8

```
AEH-12-PSEUDO-04
57 proc sort;
58 by thero time loc;
     59 | *********
* This procedure produces the mean concentrations for each treatment gro
60 ! sampling times
61
     * by the sampling location
61 !
62
     * i.e. It gives the mean concentration of the 3 control, 50ppm & 100ppm
63
      \ensuremath{^{\star}} sampling location (surface/suspended) over the entire exposure
63 !
64
64 ! ***********/
   title "Mean treatment concentration by treatment group and sampling locat
65 ! sampling times";
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 90 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     cpu time
                       0.01 seconds
66
     proc sort;
67
     by there loc time;
68
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 90 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     cpu time
                        0.01 seconds
69 proc means data = zeq2 mean std lclm uclm fw=8;
70 by there loc;
71
    var predicted_ppm;
    run;
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                       0.10 seconds
     opu time
                       0.01 seconds
```

```
EH-12-PSEUCO-A/
73 data time9; set zeq2;
74
    if time > 9 then delete;
75
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.TIME9 has 72 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time
                     0.01 seconds
     cpu time
                     0.01 seconds
76 proc sort;
77 by there loc time;
  78 | *************
^{*} This procedure produces the mean concentrations for each treatment gro
79 ! sample location
* i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks throu
80 | by sample location *
    81
81 | ***************
82 title "Mean treatment concentration by treatment group and sampling locat
82 | exposure*;
NOTE: There were 72 observations read from the data set WORK.TIME9.
NOTE: The data set WORK.TIME9 has 72 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.01 seconds
     cpu time
                     0.01 seconds
    proc means data = time9 mean std lclm uclm fw=8;
    by thero loc;
85
86
    var predicted_ppm;
87
    run;
NOTE: There were 72 observations read from the data set WORK.TIME9.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                   0.10 seconds
     cpu time
                     0.01 seconds
    data time6; set zeq2;
89
   if time > 6 then delete;
                                                 Page 5 of 8
```

```
AEH-12-PSEUDO-04
91 run;
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.TIME6 has 54 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.00 seconds
                      0.00 seconds
     cpu time
93 proc sort;
94
    by thero loc time;
95
96 /********************************
96 | ************
^{\rm 47} This procedure produces the mean concentrations for each treatment gro
97 | sample location
98 * i.e. Mean concentration of the 3 50ppm & 100ppm treatment tanks throu
98 ! by sample location *
     *****************
99 | ****************
100 title "Mean treatment concentration by treatment group and sampling locat
100! exposure";
NOTE: There were 54 observations read from the data set WORK.TIME6.
NOTE: The data set WORK.TIME6 has 54 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                     0.01 seconds
     cpu time
                      0.01 seconds
102 proc means data = time6 mean std lclm uclm fw=8;
103 by there loc;
104 var predicted_ppm;
105 run;
NOTE: There were 54 observations read from the data set WORK.TIME6.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                   0.14 seconds
                      0.03 seconds
     opu time
106
107
```

Page ____6__ of ___8

```
108! *************
109
     * This procedure produces the mean concentrations for each treatment gro
109!
110 \, * i.e. It gives the mean conc. of the 3 control,50ppm & 100ppm \, treatmer
1101 3, 6, 9 and 12h
     111
112 title "Mean treatment concentration for each treatment group for each sam
113
114 proc scrt;
115
    by there loc time;
116
117
NOTE: Input data set is already sorted, no sorting done.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                       0.01 seconds
     cpu time
                       0.01 seconds
118 proc means data = zeq2 mean std lclm uclm fw=8;
119 by thero loc time;
120 var predicted_ppm;
121 run;
NOTE: There were 90 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                      0.15 seconds
     cpu time
                       0.07 seconds
122
123 data zeq3; set output_out;
124 if conc > 1 then delete;
125 if tank > 0.5 then delete;
126 if thero = "." then delete;
NOTE: Character values have been converted to numeric values at the places giv
     (Line):(Column).
     125:4 126:12
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: DATA statement used (Total process time):
                      0.01 seconds
     real time
     cpu time
                       0.01 seconds
```

```
3-26-14
52 C
AEH-12-PSEUDO-04
```

```
128
129 proc sort;
131! **********
133 * i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at
133!
134! ***********/
135 title "Mean concentration for standard checks for all sampling times";
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
    real time
               0.01 seconds
    opu time
                 0.01 seconds
136 proc means data = zeq3 mean std lclm uclm fw=8;
137 by thero;
138 var predicted_ppm;
139 run;
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: PROCEDURE MEANS used (Total process time):
    real time 0.10 seconds
                 0.03 seconds
    cpu time
140 quit;
141 run;
```

FF # <u>//C</u> Item No. <u>3</u> Pg <u>8</u> of <u>8</u> SAS Output Page 1 of 19

AEH-12-PSEUDO-04

Standard Curve Linear Regression and sample concentrations Study #ARH-12-PSUEDO-0-4 Shawano Lake-whole water treatment SAS v. 9.3 Analysis completion date: 26MAR2014 Analysis prepared by: JAL JA

8.38 0.27 0.28 0.29 0.20 0.19 0.16 0.16 0.15 0.15 0.11 0.15 0.19 0.10 0.00

Performed by J. Luema-SAS version 9,3 07;40 26MAR14

FF# 11C Item No. __ 4 Pg _1_ of _19

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Standard Curve Linear Regression and sample concentrations Study #AEH-12-PSUED0-04 Shawaro Lake-whole water treatment SAS v. 9.3 Analysis completion date: 28MAR2014 Analysis prepared by: JAL The REG Procedure Model: MODEL1 Dependent Variable: conc conc Number of Observations Read Number of Observations Used 12 Number of Observations with Missing Values 103 Analysis of Variance Sum of Mean . DF Squares Square | F Value | Pr > F Source Model 1 53889 53889 31334.2 <.0001 Error 10 17.19816 1.71982 Corrected Total 11 53906 Root MSE 1.31142 R-Square 0.9997 Dependent Mean 93.75000 Adj R-Sq 0.9996 Coeff Var 1.39885 Parameter Estimates

Performed by J. Luoma SAS version 9.3 07;40 26MAR14

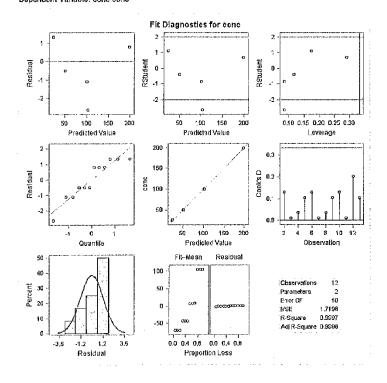
 Variable
 Label
 DF
 Parameter Estimate
 Standard Error
 t Value
 Pr≻ Iți

 Intercept
 Intercept
 1
 -2.38065
 0.66200
 -3.60
 0.0049

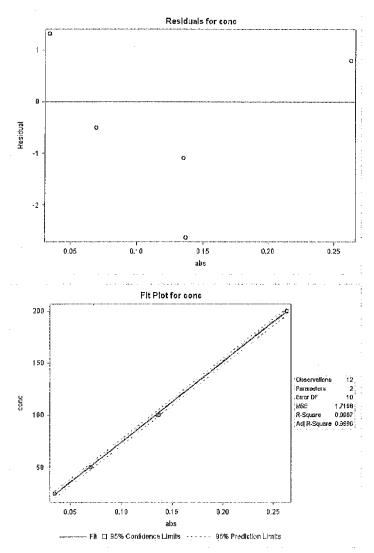
1 766.49020 4.33009 177.01 <.0001

Standard Curve Linear Regression and sample concentrations
Study M AEH-12-PSUEDO-04
Shawen Lake-whole water treatment
SAS v. 9.3 Analysis completion date: 25MAR2014 Analysis prepared by: JAL

The REG Procedure Model: MODEL1 Dependent Variable: conc conc



AEH-12-PSEUDO-04



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Standard Curve Linear Regression and sample concentrations
8tudy # AEH-12-PSUEDO-04
Stawamo Lake-whole water treatment
3A5 y. 9.3 Analysis completion date: 28MAR2014 Analysis prepared by: JAL

und V.	,	, aid 100111		·····			a prepared by: JAL
Obs	tank	thero	time	loc	abs	conc	predicted_ppm
1							
2		25	0		0.034	25	23.680
3		50	0		0.069	50	50.507
4		100	0		0.135	100	101.096
5		200	0	٠	0.263	200	199.206
6		25	0		0.034	25	23.680
7		50	0		0.069	50	50.507
В		100	. 0		0.135	100	101.096
9		200	0		0.263	200	199.206
10		25	0		0.034	25	23.680
11		50	0		0.069	50	50,507
12		100	0		0.137	100	102,629
13	-	200	0		0.263	200	199,206
14	1	0	1	sur	0.000		-2.381
15	1	0	1	SUS	0.001		-1.614
16	2	50	1	sur	0.061		44.375
17	2	50	1	sus	0.064		46.675
18	3	100	1	sur	0.144		107.994
19	3	100	1	sus	0.144		107.994
20	4	0	1	sur	0.001		-1.614
- 21	4	0	í	sus	0.000	• :	-2.381
22	5	50	1	sur	0.072		52,807
23	5	50	1	sus	0,073		53.573
24	6	100	1	sur	0.150		112.593
25	6	100	1	sus	0.149		111.826
26	7	Ô	1	sur	0.001		-1.614
27	7	0	1 ³	sus	0.000		-2.381
28	8	50	1	sur	0.067		48.974
29	8	50	-1	sus	0.065	· · · · · · i	47.441
30	9	100	1	sur	0.132		98.796
31	9 .	100		sus	0.133		99.563
32	1	0	3	sur	0.001		-1.614
33	1	C.	3	SUS	0.002		-0.848
34	2	50	3	sur	0.059		42.842
35	2	5C	3	sus	0.060		43.609
36	3	100	3	sur	0.134		100.329
37	3	100	3	SUS	0.134		100.329
38		0	3	sur	0.003		-0.081
		-	-				

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AEH-12-PSEU00-04

39	4	. 0	3	sus	0.001	1:	-1.614
40	5	. 50	3	sur	0.068		49,741
41	5	50	3	SUS	0.068		49.741
42	6	100	3	sur	: 0.140		104.928
43	6	100	3	sus	0.141		105.694
44	7	0	3	sur	0.000		-2,381
45	7	0	3	sus	0,000	i	-2.381
46	8	50	3	sur	0.063		45.908
47	8	50	3	sus	0.062		45,142
48	9	100	3	sur	0.124		92.664
49	9	100	3	sus	0.124		92,664
50		25	6		0 033		22.914
. 51		50	6	. •	0.068		49.741
52	1.	100	6	ļ	0.130		97.263
53	1	200	6		0.247		186.942
54	1	. 0:	6	sur	0.002		-0.848
55	1	0	6	sus	0,001		-1.614
56	2	50	6	sur	0.055		39.776
57	2	50	6	sus	0.054		39.010
58	3	100	6	sur	0.123	*1	91.898
59	3	100	6	sus	0.127		94,964
60	4	0	6	sur	0.002		-0.848
61	4	0	6	sus	0,002	• • • • •	-0.848
62	5	50	6	sur	0.064	* 1	46,675
63	5	50	6	sus	0,065		47.441
84	6	100 .	6	sur	0,131	-1	98.030
65	6	100	6	sus	0.132		98.796
66	7	0	ดิ	sur	0.001		-1.614
67	7	0	6	sus	0,003	· ,i	-0.081
68	8	5C	В	sur	0.058		42.076
69	8	5C	6	sus	0.060	•	43.609
70	9	10C	6	sur	0.116	• 1	86.532
71	9	100	6	sus	0.115		85.766
72		25	9		0.033		22.914
73		50	9		0.063	*:	45.908
74		100	9		0,127	,	94,964
75		- 200	9		0.248		187.709
76	1	0	9	sur	0.004		0.685
77	1	0	9	SUS	0,005	.'	1.452
78	2	50	9	sur	0.053	• • • • • • • • • • • • • • • • • • • •	38.243
79	2	50	9	sus	0.053	*.	38,243
80	3	100	9	SUL	0.117		87,299
81		*				:	:

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AEH-12-PSEUDO-04

	3	100	9	808	0.119	88.832
82	ļ., .	. 0	9	sur	0.003	-0.081
83	4	0	9	sus		0.685
84	5	50	9	sur	0.061	. 44.375
85		50	9	5US	0,059	42.842
86		100	9	sur	0.123	91.898
. 87	Ì	100	9	sus	0.125	93.431
88	7	0	9	sur	0.005	1.452
89	, 7		9	k	0.004	0.685
90	В	50	9	sur	0.056	40,543
91	8	50			0.055	39.776
92	9	100	9			80.400
93	9	100		sur	0.108	
94		25	12		C.108	80.400
95		50	12			49,741
				:	0.068	The second second is
96	:	100	12	•	0.129	96.497
97		200	12		0.249	188,475
98	1	0	12	sur	0.005	1.452
99	1 .	. 0	12	sus	0.006	2.218
100		50	12	sur	0.051	36,710
101	2	50	. 12		0.053	38,243
102	3	100			0.113	. 84.233
103	3	100	12	sus .	0.115	85.766
104	1	. 0	12	sur	0.004	0.685
105	4	0		รนร	0.004	0.685
106	5	50	12	sur :	0.059	42.842
107	5	50	12	SUS	0.059	42.842
108	6	100	12	sur	0,122	91,131
109	6	100	12	SUS	0.120	. 89.598
110	7	0	12	sur	0.004	. 0,685
111	7	0	12	SUS	0.005	1.452
112	8	50	12	sur :	0.056	40.543
113	8	50	12	sus	0.054	39.010
114	9	100	12	sur	0.105	78.101
115	9	100	12	8118	0.106	78.867

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Mean treatment concentration by treatment tank and sampling location (surface/suspended) for all sampling times The MEANS Procedure tank=1 loc=sur Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean -0.5411 1.5894 -2.5146 1.4325 tank≃1 loc≃sus Analysis Variable : predicted_ppm Predicted Value of conc

| Lower 95% | Upper 95% |
| Mean | Std Dev | CL for Mean | CL for Mean |
|-0.0812 | 1.7976 | -2.3132 | 2,1508 tank=2 loc=sur Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% | Upper 95% Mean Std Dev CL for Mean CL for Mean 40,3895 3.1789 36.4424 44,3366 tank=2 loc=sus Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 45,8860 41.1560 3.8094 36.4260 tank≖3 loc≔sur Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95%
Mean Std Dev CL for Mean CL for Mean 94.3504 9.7468 82.2482 106.5

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Analysis Variable : predicted_ppm Predicted Value of conc Mean Std Dov CL for Mean CL for Mean

Analysis Variable : predicted_ppm Predicted

B4.4901

106,7

tank=3 loc=sus

95.5768 8.9289

tank≃4 loc≈sur

AEH-12-PSEUDO-04

V	alue of conc	
		Upper 95%
Mean Std Dev	Lower 95% CL for Mean	CL for Mean
-0.3878 0,8739	-1,4729	0.6974
tank=4 loc=sus		
Analysis Variable Va	alue of conc	•
Mean Std Dev	Lower 95%	Upper 95%
Mean Std Dev	CL for Mean	GL for Mean
-0.6944 1,3711	-2.3969	1.0081
tank=5 loc=sur		
Analysis Variable Va	: predicted_palue of conc	pm Predicted
	Lower 95%	Upper 95%
Mean Std Dev	CL for Mean	CL for Mean
47.2879 4.0341	42.2789	52.2969
tank=5 loc=sus		
Analysis Variable Va	: predicted_p alue of conc	pm Predicted
	Lower 95% CL for Mean	Upper 95%
Mean Std Dev	GL for lylean	53,0141
47,2879 4,6117	41.5617	93,0141
tank=6 loc=sur		
Analysis Variable Va	: predicted_p	pm Predicted
Mean Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
99.7158 9.0919	88.4268	
tank=6 loc=sus		
Analysis Variable Va	: predicted_p	pm Predicted
Mean Std Dev	Lower 95%	Upper 95% CL for Mean
99,8691 9,0140	88.6768	111.1
tank=7 loc=sur		
Analysis Variable Va	: predicted_pp	om Predicted
Mean Std Dev	Lower 95%	Upper 95%
-0.6944 1.6617	-2,7577	1.3689
tank=7 loc≃sus		
Analysis Variable	: predicted_p	om Predi cte d

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	Va	lue of conc	
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-0.5411	1.7646	-2.7321	1.6500
ank≃8 lo			
Analysis	Variable Va	: predicted_p	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
43,6088	3.7157	38,9951	48.2224
Analysis		: predicted_p lue of conc	pm Predicted
		lue of conc	· · · · · · · · · · · · · · · · · · ·
Mean	Std Dev	CL for Mean	Upper 95% CL for Mean
42.9956	3,5706	38.5621	47.4290
ınk≕9 lo	c=sur Variable	; predicted_p	
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
87.2987	8.5696	76.6581	97.9393
ank≂9 lo	c≓sus		
Analysis		: predicted_p lue of conc	pm Predicted
Mean	Std Dev	CL for Mean	Upper 95% CL for Mean
87.4520	8.6617	76.6971	98,2069
		ıma SAS versio	

Mean treatment concentration by treatment group and sampling location for all sampling times

The MEANS Procedure

thero≈0 loc≃sur

thero=0 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc

Lower 95% Upper 95% CL for Mean Cl. for Mean

-0.4389 1.5565 -1.3008 0.4231

thero=50 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc

Lower 95% | Upper 95% Mean Std Dev CL for Mean CL for Mean 43.7621 4.4712 41.2860 46.2382

thero=50 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc

| Lower 95% | Upper 95% | Washing Std Dev | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean | CL for Mean

thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc

Lower 95% Upper 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 93,7883 9,9722 88,2659 99,3108

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted
Value of conc

| Lower 95% | Upper 95% |
| Mean | Std Dev | CL for Mean | CL for Mean |
| 94,2993 | 9,7896 | 88,8780 | 99,7206

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AEM-12-PORULL :

Mean treatment concentration by treatment group and sampling location through the 9 h exposure

The MEANS Procedure

thero=0 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean

-0.9115 1.1990 -1.6734 -0.1497

thero≃0 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc Mean Std Dev CL for Mean CL for Mean -0.9115 1.3259 -1.7540 -0.0691

there=50 loc=sur

Analysis Variable ; predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 44.6946 4,3539 41.9283 47.4609

thero≃50 loc≂sus

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean

41,8699 47.6471

44.7585 4.5464 thero=100 loc=stir

Analysis Variable: predicted_ppm ...
Value of conc

Lower 95% Upper 95%

Mean Std Dev CL for Mean CL for Mean

0 4528 90,1074 102.1

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc

Lower 95% Upper 95% Mean Std Dey CL for Mean CL for Mean 96.6882 9.2449 90.8143

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Mean treatment concentration by treatment group and sampling location through the 6 h exposure The MEANS Procedure thero≃0 loc≂sur Analysis Variable : predicted_ppm Predicted Value of conc Value of conc

Lower 95% Upper 95%

Mean Std Dev CL for Mean CL for Mean -1.4438 0.7449 -2.0164 thero=0 loc=sus Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean -1.5290 0.8080 -2.1500 thero=50 log=sur Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 45.9082 4.1277 42.7354 49.0810 thero=50 loc=sus Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 46.2489 4.1297 43.0746 49.4232 thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted
Value of conc

Lower 95% Upper 95%
Mean Std Dev : CL for Mean CL for Mean 92.9409 105.7 99,3071 8.2820

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 99.7329 8.0552 93,5411

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AEH-12-PSEUDO-04 Mean treatment concentration for each treatment group for each sampling time The MEANS Procedure thero=0 loc=sur time=1 Analysis Variable : predicted_ppm Predicted | Value of conc Mean Std Dev CL for Mean CL for Mean -1.8697 0.4425 -2.9690 -0.7703 thero=0 loc=sur time=3 Analysis Variable : predicted_ppm Predicted
Value of cone

Lower 95% | Upper 95%
Mean | Std Dev | CL for Mean | CL for Mean -1.3587 1.1708 -4.2672 thero=0 loc=sur time=6 Analysis Variable : predicted_ppm Predicted Value of conc Mean Std Dev CL for Mean CL for Mean -1.1032 0.4425 -2.2025 -0.00385 thero=0 loc=sur time=9 Analysis Variable : predicted_ppm Predicted
Value of conc

Lower 95% | Upper 95%
Mean | Std Dev | CL for Mean | CL for Mean

0.6853 0.7665 thero=0 loc=sur time=12

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95%
Mean Std Dev CL for Mean CL for Mean

-1.2188

-0.1585

2.5894

0.9408 D.4425 thero=0 loc≃sus time=1

Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean -2.1251 0,4425 -3.2245

thero=0 loc=sus time=3

Analysis Variable : predicted_ppm Predicted Value of conc

file://C:\Users\klweber\sashtml.htm

A 79-12-PSEUDO-04

		Lower 95%	Upper 95%
Mean	Std Dev	CL for Mean	CL for Mea
-1.8142	0.7665	-3,5182	0,289
thero≖0 l	oc≔sus tir	ne≃6	
Analysis	Variable	: predicted_p	pm Predicter
Mean	Std Dev	Lower 95% CL for Mean	CL for Mea
-0.8477	0.7665	-2.7517	1.056
thero=0 l	oc=sus fir	ne≕9	
Analysis	Varlable Va	: predicted_p	pm Predicted
			Honor 959
Mean	Std Dev	Lower 95% CL for Mean	CL for Mean
0.9408		-0.1585	2.040
thero=0 le	oc≔sus tir	ne=12	
Analysis	Variable Va	: predicted_p; lue of conc	pm Predicte
		Lower 95%	Unner 95%
Mean	Std Dev	CL for Mean	CL for Mea
1.4518	0.7665	-0.4523	
	0.7665 loc≓surti	-0,4523	
thero=50	loc≍sur ti s Varlable	-0,4523	3.355
thero≂50 Analysis	loc≕sur tl s Varlable Va	-0,4523 me=1 ; predicted_p	3.355
thero≂50 Analysis	loc≕sur tl s Varlable Va	-0.4523 me=1 : predicted_p due of conc	3.3556 pm Predicte Upper 957 CL for Mea
Analysis Mean 48.7187	loc≓sur ti s Varlable Va Std Dev	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Maan 38.2319	3.3556 pm Predicte Upper 957 CL for Mea
Mean 48.7187 thero=50	Std Dev 4.2215	-0.4523 me=1 : predicted_p tlue of conc Lower 95% CL for Moan 38.2319	3.355 pm Predicte Upper 85 CL for Mea 59.205
Mean 48.7187 thero=50	oc≔sur ti Variable Va Std Dev 4.2215 Ioc=sur ti	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Maan 38.2319	3.355 pm Predicte Upper 85 CL for Mea 59.205
Mean 48.7187 thero=50 Analysis	loc≓sur ti s Variable Va Std Dev 4.2215 loc=sur ti s Variable Va	-0.4523 me=1 : predicted_p tlue of conc Lower 95% . CL for Moan 38.2319 me=3 : predicted_p tlue of conc Lower 95%	3.355 pm Predicte Upper 95' CL for Mea 59.205 pm Predicte Upper 95'
Mean 48.7187 thero=50 Analysis	oc≔sur ti Variable Va Std Dev 4.2215 Ioc=sur ti	-0.4523 me=1 : predicted_p tlue of conc Lower 95% CL for Moan 38.2319 me=3 : predicted_p tlue of conc Lower 95% CL for Mean	3.355 ppm Predicte Upper 85' CL for Mea 59.205 pm Predicte Upper 95' CL for Mea
Mean 48.7187 thero=50 Analysis Moan 46.1637	loc≓sur ti s Variable Va Std Dev 4.2215 loc=sur ti s Variable Va Std Dev	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Moan 38.2319 me=3 : predicted_p due of conc Lower 95% CL for Mean 37.5778	3.355 ppm Predicte Upper 85' CL for Mea 59.205 pm Predicte Upper 95' CL for Mea
Mean 48.7187 thero=50 Analysis Mean 46.1637 thero=50	Std Dev 4.2215 Std Dev 4.2215 Std Dev 3.4563 Std Dev 3.4563	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Moan 38.2319 me=3 : predicted_p due of conc Lower 95% CL for Mean 37.5778 me=6 : predicted_p;	Upper 85° CL for Mea 59.205 Dipper 95° GL for Mea 54.749
Mean 48.7187 thero=50 Analysis Mean 46.1637 thero=50	Std Dev 4.2215 loc=sur tl 5 Variable Va Std Dev 3.4563 loc=sur tl 5 Variable Va	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Moan 38.2319 me=3 : predicted_p due of conc Lower 95% CL for Mean 37.5778 me=6 : predicted_p	3.3556 pm Predicte Upper 95 CL for Mea 59.205 Upper 95 GL for Mea 54.749
Mean 48.7187 thero=50 Analysis Moan 48.1637 thero=50 Analysis	Std Dev 4.2215 loc=sur tl 3 Verlable Va Std Dev 3.4563 loc=sur t' 4 Verlable Va Std Dev	-0.4523 me=1 : predicted_p due of conc Lower 95% CL for Moan 38.2319 me=3 : predicted_p due of conc Lower 95% CL for Mean 37.5778 me=6 : predicted_p;	Jpper 95° GL for Mea Upper 95° GL for Mea 54.749 Upper 95° CL for Mea
Mean 48.7187 thero=50 Analysis Moan 46.1637 thero=50 Analysis Mean 42.8423	Std Dev 4.2215 loc=sur tl 3 Verlable Va Std Dev 3.4563 loc=sur t' 4 Verlable Va Std Dev	-0.4523 me=1 : predicted_p tlue of conc Lower 95%, CL for Moan 38.2319 me=3 : predicted_p tlue of conc Lower 95% CL for Mean 37.5778 me=6 : predicted_p tlue of conc Lower 95% CC for Mean 37.5778	Jpper 95° GL for Mea Upper 95° GL for Mea 54.749 Upper 95° GL for Mea

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Mean Std Dev	Lower 95% Upper 95% CL for Mean
41.0538 3.0977	7 33.3586 48.7490
thero≖50 loc=sur	
Analysis Variable	e : predicted_ppm Predicted /alue of conc
Mann Std Day	Lower 95% Upper 95% CL for Mean CL for Mean
40,0318 : 3.0977	
thero=50 loc=sus	flma=1
	e : predicted_ppm Predicted /alue of conc
Mean Std Dov	Lower 95% Upper 95% CL for Mean CL for Mean
49.2297 3.7810	ang arrang and a contract and a second and a second and a second and a second as a second
thero=50 loc=sus	tlme=3
Analysis Variable V	e : predicted_ppm Predicted /alue of conc
	Lower 95% Upper 95% CL for Mean CL for Mean
46.1637 3.1912	38.2365 54.0910
thero=50 loc=sus	
Analysis Variable	e : predicted_ppm Predicted falue of conc
	Lower 95% Upper 95% CL for Mean CL for Mean
Mean Std Dev 43.3533 4.2215	re agramma and a company of the comp
thero=50 loc=sus	
thero=50 loc≂sus Analysis Variable	
thero=50 loc≃sus Analysis Variable V	time=9 e : predicted_ppm Predicted /alue of conc
thero=50 loc≃sus Analysis Variable V Mean Std Dev	time=9 e: predicted_ppm Predicted/alue of conc Lower 95% Upper 95% c CL for Mean
thero=50 loc≃sus Analysis Variable V	time=9 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% / CL for Mean / 34,4703 46,1043
thero=50 loc=sus Analysis Variable V Mean Std Dev 40.2873 2.3417 thero=50 loc=sus Analysis Variable	time=9 e: predicted_ppm Predicted fatue of conc Lower 95% Upper 95% r CL for Mean r 34.4703 45.1043 time=12 e: predicted_ppm Predicted
thero=50 loc=sus Analysis Variable V Mean Std Dev 40.2873 2.3417 thero=50 loc=sus Analysis Variable V	time=9 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% / CL for Mean CL for Mean / 34.4703 46.1043 time=12 e: predicted_ppm Predicted falue of conc
thero=50 loc=sus Analysis Variable V Mean Std Dev 40.2873 2.3417 thero=50 loc=sus Analysis Variable V	time=9 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% / CL for Mean CL for Mean / 34.4703 46.1043 time=12 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% / CL for Mean CL for Mean
thero=50 loc=sus Analysis Variable V Mean Std Dev 40.2873 2.3417 thero=50 loc=sus Analysis Variable V Mean Std Dev	time=9 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% r CL for Mean r 34.4703 45.1043 time=12 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% r CL for Mean cL for Mean cl for Mean cl for Mean cl for Mean cl for Mean cl for Mean
thero=50 loc=sus Analysis Variable V Mean Std Dev 40.2873 2.3417 thero=50 loc=sus Analysis Variable V Mean Std Dev 40.0318 2.4639 thero=100 loc=sus	time=9 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% r CL for Mean r 34.4703 45.1043 time=12 e: predicted_ppm Predicted falue of conc Lower 95% Upper 95% r CL for Mean cL for Mean cl for Mean cl for Mean cl for Mean cl for Mean cl for Mean

AEH-12-PSEUTOCC4

	Lower 95% L for Mean	Upper 95% CL for Mean
106.5 7,0250	89.0099	123.9
thero=100 loc=sur til	ne≕3	
Analysis Variable : Valu	predicted_p	pm Predicted
* * 1 1 1		Upper 95%
Mean Std Dev 0	CL for Mean	CL for Mean
99.3071 6.1955	83.9167	114,7
thero=100 loc=sur tie	ne=6	
Analysis Variable : Valu	predicted_p	pm Predicted
Marin Bull Barry	Lower 95%	Upper 95% CL for Mean
Mean Std Dev 0	77.8621	106.4
		1.
thero≃100 loc=sur th	ne=9	
	ie of conc	
Mean Std Dev (Lower 95%	Upper 95%
86.5322 5.7869	72,1568	100.9
thero=100 loc=sur tir		i
Anafysis Variable : Valu	ie of cone	
Mean Std Dev (Lower 95%	Upper 95%
84.4882 6.5189	68.2943	100.7
thero=100 loc=sus ti		
Analysis Variable : Valu	predicted_p; ie of conc	om Predicted
Mean Std Dev C	_ower 95% L for Mean	Upper 95% CL for Mean
106.5 6.2740	90.8755	122,0
thero=100 loc=sus ti		
Analysis Variable ; Valu	predicted_p	
Mean Std Dov	Lower 95%	Upper 95%
99,5626 6,5489	83.2942	115.8
thero=100 oc=sus t		, 10.5
Analysis Variable :	nradicted s	nm Predicted
Valu	le of conc	,
1		(

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##-42-FOEUDO@4

Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
6,6967		

thero=100 loc=sus time=9

Analysis Variable : predicted_ppm Predicted Value of conc

| Lower 95% | Upper 95% |
| Mean | Std Dev | CL for Mean | CL for Mean |
| 87.5542 | 6.6084 | 71.1379 | 104.0

thero=100 loc=sus time=12

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Sid Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
84.7437	5.4379	71.2351	98.2523	

Performed by J. Luoma SAS version 9.3 07:40 26MAR14

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3-26-14 Mean concentration for standard checks for all sampling times JA ... The MEANS Procedure thero≃25 Analysis Variable : predicted_ppm Predicted
Value of conc

Lower 95% Upper 95%
Mean Std Dev CL for Mean CL for Mean 23.4245 0.8851 21.2259 25.6232 thero=50 Analysis Variable : predicted_ppm Predicted Value of conc Lower 95% | Upper 95% Mean | Std Dev | CL for Mean | CL for Mean 42.9666 53.9598 48.4632 2.2127 thero=100 Analysis Variable : prodicted_ppm Prodicted Value of conc Lower 95% Upper 95% Mean Std Dev CL for Mean CL for Mean 96 2411 1.1708 93.3326 99.1496 thero=200 Analysis Variable : predicted_ppm Predicted Value of conc
Lower 95% Upper 95%
Mean Std Dev CL for Mean CL for Mean 185.8 189.6 187.7 0,7665

Performed by J. Luoma SAS version 9,3 07;40 26MAR14

FF # 11C Item No. _ 4 Pg 19 of 19

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Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 14 - 17)

Data Scurce: File Folder: 12c

Forms: "Sample Absorbance Readings" Data Sheet

<u>A</u>ction initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials | Initials

File Name: See filenames as stated below

Spectrophotometric Data

Test Article: Zequanox ^a (MBI-401 SDP) Test Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 17, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Bottom Injection

<u>Data Explanation;</u>
1) The absorbance of triplicate samples of 25, 5C, 100, and 200 mg/L dilutions of a 2,000 mg/L active ingredient (A.I.) stock prepared from Analytical Stock II2 were measured to prepare a standard curve.

2) Standard checks were performed at 6, 9, and 12 hours by comparing the 25, 50, 100, and 200 mg/L (A.I.) dilutions to the linear curve.

3) Data codes used within SAS

tank = Tank ID (1 through 9)

thero = Theoret'ca: or target concentration (mg/L)

time = Sample Time (0, 1, 3, 6, 9, and 12 h after treatment)

loc = Sample Location

sus = Suspended Sample (sampled ~19 cm from bottom of tank)

bot = Bottom Sample (sampled from bottom of tank)

abs = measured absorbance of sample conc = concentration ([mg/L], only used for standards used for regression)

4) Information that is not relevant to a sample (i.e., tank ID for standards) or that will be calculated by SAS (i.e., predicted concentration for standard checks and samples) is denoted by a "." In the SAS input and output files.

1) A linear regression was completed in SAS using the absorbance values obtained from the spectrophotometer of 3 replicate dictions of 25, 50, 100 and 200 mg/L Zequanox

2) Standard checks and treatment sample concentrations were predicted in SAS by comparing the observed absorbances with the linear regression.

3) The following mean treatment concentrations were determined in SAS:

3a) Mean (standard deviation) concentration by tank and location for all sampling times

36) Mean (standard deviation) concentration by treatment group and location for all sampling times

30) Mean (stendard deviation) concentration by treatment group and uncausin or an sampting stimes.
3d) Mean (standard: deviation) concentration by treatment group and sampling times for both locations.
3d) Mean (standard: deviation) concentrations for 25, 50, 100, and 200 right (A.I.) dilutions for all sampling times.

File Names:

Spectrophotometric Data for SAS input

It\AEH-12-PSELDO-04\Data 5ummarles\spec\flake Carlos Bottom Injection Spec Summary.xisxjSpec Data for SAS

SAS Program/Code

It\AEH-12-PSEUDO-04\SAS-Spec\carlos injection program file

SAS Log

I:\AEH-12-PSEUDO-04\SAS-Spec\carlos Injection for file

SAS Output

I:\AEH-12-PSFUDO-04\SAS-Spec\carlos Injection results file

Data Anomalies and Deviations:

1) One exposure tank of a different concentration and sample location was sampled in triplicate to evaluate variability of spectrophotometer during each sampling time. The mean of the triplicates was used within the analysis.

2) Suspended samples (sus) were collected ~19 cm from the tank bottoms for all sampling times; tank bottom (bot) samples were collected at 6, 9 and 12 h sampling times. Test article settling was observed in the 1 and 3 h samples resulting in lower than expected concentrations. Samples collected from the tank bottoms at 6, 9 and 12 h confirmed test article settling as indicated by higher than expected concentrations.

3) Some mean absorbances for triplicate samples may be recorded incorrectly on "Sample Absorbance Readings" data forms as proper significant figure rules may not have been observed. Additionally, concentrations recorded on "Sample Absorbance Readings" data forms were not used in the analysis as the initial linear regression equation that was used for those calculations was derived using rounded absorbance values in Excel. All absorbances and concentrations used in SAS calculations and reported within Spectrophotometric Data Summary have been corrected.

File Folder:

tank	thero	time	loc	abs	conc	
	25	0		0.039	25	AEH-12-PSEUDO-04
	50	0		0.076	50	AEN-12-F6L0D0-04
	100	0		0.151	100	
	200	0		0.295	200	
	25	0		0.039	25	
	50	O		0.075	50	
•	100	0		0.150	100	
	200	0		0.294	200	
	25	0		0.039	25	
	50	0		0.074	50	
	100	D		0.150	100	•
	200	0		0.295	200	
	25	6		0.036		
•	50	6		0.065		
•	100	6		0.135		
	200	6		0.270		
•	25	9		0.033		
•	50	9		0.069	•	
	100	9		0.135	•	
	200	9		0.265		
	25	12	•	0.034	•	
•	50	12	•	0.068		
•	100	12	•	0.135	•	
•	200	12	•	0.265		
1	50	1	sus	0.000		
4	50	1	sus	0.002	•	
8 2	50 100	1 1	sus	0.001	•	
5	100 100	1	sus	0.009	•	
9	100	1	sus	0.003		
1	50	3	sus	0.036	•	
4	5 0	3	sus	0.001	•	
8	50	3	sus sus	0.001 0.000	•	
2	100	3	sus	0.000	•	
5	100	3	SUS	0.001	•	
9	100	3	sus	0.002	•	
1	50	6	Sus	0.005	•	
4	50	6	sus	0.005	•	
8	50	6	sus	0.001	•	
2	100	6	sus	0.001	•	
5	100	6	sus	0.001		
9	100	6	sus	0.000		•
1.	50	6	bot	0.171		2 . 3
4	50	6	bot	0.187		Page 2 of 3
8	50	6	bot	0.207		
2	100	6	bot	0.430		

5	100	6	bot	0.398		
9	100	6	bot	0.345		AEH-12-PSEUDO-04
1	50	9	sus	0.004	,	ALIF 12-1 OLUDO-04
4	50	9	sus	0.001		
8	50	9	sus	0.003		
2	100	9	sus	0.006		
5	100	9	sus	0.001		
9	100	9	sus	0.003		
1	50	9	bot	0.159		
4	50	9	bot	0.154		
8	50	9	bot	0.131		
2	100	9	bot	0.395		
5	100	9	bot	0.357		
9	100	9	bot	0.322		
1	50	12	sus	0.011		
4	50	12	sus	0.012		
8	50	12	sus	0.013		
2	100	12	5US	0.004		
5	100	12	sus	0.005		
9	100	12	sus	0.012		
1	50	12	bot	0.108		
4	50	12	bot	0.113		
8	50	12	bot	0.114		
2	100	12	bot	0.324		
5	100	12	bot	0.285		
9	10 0	12	bot	0.257		

File Folder: 12c Item Number: 1 Page 3 of 3

```
ods html close; /* close previous */;
ods html; /* open new */;
ods graphics on;
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
                                                      AEH-12-PSEUDO-04
FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options 1s=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
title1 h=1 'Standard Curve Linear Regression and sample concentrations';
title2 h=1 'Study # AEH-12-PSUEDO-04';
title3 h=1 'Lake Carlos-injection treatment';
title4 h=1 'SAS v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL';
* SAS ver 9.3 Analysis prepared by: JAL Page ___ of ___
* Analysis completion date: 30Jan2014 5/~
data Zeq; set carlos.carlosinjection;
run;
proc sort;
by tank time loc; run;
run;
proc gplot data= zeq;
plot abs * conc;
run:
proc reg data = zeq;
model conc = abs /edf;
output out=output out p=predicted ppm;
run;
proc sort:
by time tank loc;
proc print data=output_out;
run;
data zeq2; set output_out;
if tank = "." then delete;
if loc ="." then delete;
if time = "0" then delete;
run;
proc sort:
by tank loc;
* This procedure produces the mean concentrations for each treatment replicate over all sampling time
* by the the sampling location
* i.e. It gives the mean concentration of each treatment tank over the entire exposure by the sampl:
* location [i.e. bottom vs suspended sampling (bottom sampling initiated at 6h)]
title 'Mean treatment concentration by treatment tank and sampling location (bottom/suspended) for al.
proc means data = zeq2 mean std lclm uclm fw=8;
by tank loc;
                                                                Page ____ of _ 2
var_predicted_ppm;
run;
                 File Folder: 120
                                         Item Number: 2
proc sort;
```

```
by thero time loc;
\star This procedure produces the mean concentrations for each treatment group over all sampling times
 * by the sampling location
 * i.e. It gives the mean concentration of the 3 50ppm & 100ppm treatment tanks by sampling location
 \star (bottom/suspended) over the entire exposure
 title "Mean treatment concentration by treatment group and sampling location for all sampling times";
proc sort:
by thero loc;
                                                    AEH-12-PSEUDO-04
proc means data = zeg2 mean std lclm uclm fw=8;
by thero loc;
var predicted_ppm;
* This procedure produces the mean concentrations for each treatment group by sampling time
* i.e. It gives the mean conc. of the 3 50ppm & 100ppm treatment tanks at time 1, 3, 6, 9 and 12h
title "Mean treatment concentration for each treatment group for each sampling time";
proc sort;
by thero time loc;
proc means data = zec2 mean std lolm uclm fw=8;
by thero time loc;
var predicted_ppm;
run;
data zeq3; set output_out;
if conc > 1 then delete;
if tank > 0.5 then delete;
if thero = "." then delete;
run:
proc sort;
by thero;
* This procedure produces the mean concentrations for the standard checks for all time periods
^{\star} i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 9 and 12h
title "Mean concentration for standard checks for all sampling times";
proc means data = zeq3 mean std lclm uclm fw=8;
by there:
var predicted_ppm;
              1/30/14
run:
quit;
                              Item Number: 2 Page 2 of 2
run;
          File Folder: 120
```

```
109 DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT:
110
111 FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or unquoted text.
112
113 options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
                                                                      AEH-12-PSEUDO-04
114
115 title1 h=1 'Standard Curve Linear Regression and sample concentrations';
116 title2 h=1 'Study # AEH-12-PSUEDO-04';
117 title3 h=1 'Lake Carlos-injection treatment';
118 title4 h=1 'SAS v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL';
119
   120
121 * SAS ver 9.3 Analysis prepared by: JAL
                                                 Page ___ of ___
124
125 data Zeq; set carlos.carlosinjection;
126 run;
NOTE: There were 73 observations read from the data set CARLOS.CARLOSINJECTION.
NOTE: The data set WORK, ZEQ has 73 observations and 6 variables.
NOTE: DATA statement used (Total process time);
     real time
                     0.01 seconds
     opu time
                      0.01 seconds
127 proc sort;
128 by tank time loc; run;
NOTE: There were 73 observations read from the data set WORK.ZEQ.
NOTE: The data set WORK.ZEQ has 73 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time 0.00 seconds
     opu time
                     0.01 seconds
129
130 run;
131 proc gplot data= zeq;
132 plot abs * conc;
NOTE: 61 observation(s) contained a MISSING value for the abs * conc request.
NOTE: 4 records written to C:\Users\JLUOMA\gplot1.png.
NOTE: There were 73 observations read from the data set WORK.ZEQ.
NOTE: PROCEDURE GPLOT used (Total process time):
                      0.26 seconds
     real time
     cpu time
                      0.25 seconds
                                              Item Number: 3 Page 1 of 5
134 proc reg data = zeq; File Folder: 12 C
135 model conc = abs /edf;
136    output out=output_out p=predicted_ppm;
137 run;
```

```
NOTE: The data set WORK.OUTPUT_OUT has 73 observations and 7 variables.
NOTE: PROCEDURE REG used (Total process time):
     real time
                      1.04 seconds
     opu time
                       0.42 seconds
                                                            AEH-12-PSEUDO-04
138 proc sort;
139 by time tank loc;
NOTE: There were 73 observations road from the data set WORK.OUTPUT_CUT.
NOTE: The data set WORK.OUTPUT_OUT has 73 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                       0.00 seconds
     cpu tíme
                       0.01 seconds
140 proc print data=output_out;
141 run;
NOTE: There were 73 observations read from the data set WORK.OUTPUT OUT.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                    0.04 seconds
     cpu time
                       0.04 seconds
142 data zeq2; set output_out;
143 if tank = "." then delete;
144 if loc ="." then delete;
145 if time = "0" then delete;
146 run;
NOTE: Character values have been converted to numeric values at the places given by:
     (Line):(Column).
     145:11
NOTE: There were 73 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WCRK.ZEQ2 has 49 observations and 7 variables.
NOTE: DATA statement used (Total process time):
                      0.00 seconds
     real time
     cpu time
                       0.01 seconds
147 proc sort;
148 by tank loo;
149 run;
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 49 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                      0.00 seconds
                                                             Page 2 of 5
     cpu time
                       0.01 seconds
150! **********
```

```
151 * This procedure produces the mean concentrations for each treatment replicate over all
151! sampling times *
152
    * by the the sampling location
                                                             AEH-12-PSEUDO-04
152!
153 * i.e. It gives the mean concentration of each treatment tank over the entire exposure by
153! the sampling *
154 * location [i.e. bottom vs suspended sampling (bottom sampling initiated at 6h)]
154!
155! ***********/
156 title "Mean treatment concentration by treatment tank and sampling location
156! (bottom/suspended) for all sampling times";
157 proc means data = zeq2 mean std lclm uclm fw=8;
158 by tank loc;
159 var predicted ppm;
160 run;
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                     0.04 seconds
     cpu time
                      0.03 seconds
161 proc sort;
162 by thero time loc;
163! **********
164 * This procedure produces the mean concentrations for each treatment group over all
164! sampling times
165 * by the sampling location
165!
    ^\star i.e. It gives the mean concentration of the 3 50ppm \& 100ppm treatment tanks by sampling
166
166! location *
167
     * (bottom/suspended) over the entire exposure
1671
    168
168! ***********/
169 title "Mean treatment concentration by treatment group and sampling location for all
169! sampling times";
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 49 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
                   0.01 seconds
     opu time
                    0.01 seconds
170 proc sort;
171 by thero loc;
172
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 49 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
    real time
                0.00 seconds
     cpu time
                     0.00 seconds
```

```
173 proc means data = zeq2 mean std lcim uclm fw=8;
174 by thero loc;
                                                            AEH-12-PSEUDO-04
175 var predicted_ppm;
176 run;
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                      0.04 seconds
     opu time
                      0.00 seconds
177! *********
    \star This procedure produces the mean concentrations for each treatment group by sampling time
178
178!
179 \star i.e. It gives the mean conc. of the 3 50ppm \& 100ppm \, treatment tanks at time 1, 3, 6, 9
179! and 12h
    1801 ***********/
181 title 'Wean treatment concentration for each treatment group for each sampling time";
182
183 proc sort;
184 by thero time loc;
185
186
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 49 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                     0.01 seconds
     cpu time
                      0.00 seconds
187 proc means data = zeq2 mean std lclm uclm fw=8;
188 by thero time loc;
189 var predicted_ppm;
190 run;
NOTE: There were 49 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                   0.07 seconds
     cpu time
                     0.04 seconds
191
192 data zeq3; set output_out;
193 if conc > 1 then delete;
                                                              Page ___ 4 of _ 5
194 if tank > 0.5 then delete;
195 if thero = "." then delete;
196 run;
NOTE: Character values have been converted to numeric values at the places given by:
     (Line):(Column).
     194:4 195:12
```

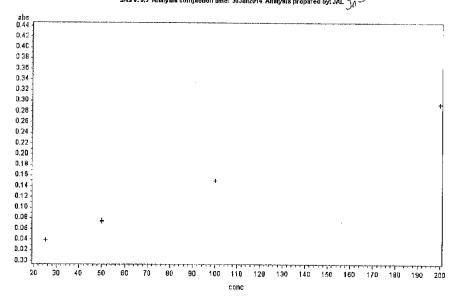
```
NOTE: There were 73 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time
                   0.01 seconds
     opu time
                      0.01 seconds
                                                             AEH-12-PSEUDO-04
197
198 proc sort;
199 by thero;
2001 *********
201 * This procedure produces the mean concentrations for the standard checks for all time
202 * i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 9 and 12h
2021
203! **********/
204 title "Mean concentration for standard checks for all sampling times";
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                      0.01 seconds
     cpu time
                       0.01 seconds
205 proc means data = zeq3 mean std lclm uclm fw=8;
206 by thero;
207 var predicted_ppm;
208 run;
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                 0.04 seconds
     cpu time
                      0.04 seconds
209 quit;
210 run;
                      12c
          File Folder:
                                    Item Number:
                                                            Page 5 of 5
```

SAS Output

Page 1 of 13

Standard Curve Linear Regression and sample concentrations
Study # ARH-12-PSUEDO-04
Loke Carlos-injection freatment
SAS v. 9.3 Analysis completion date: 30 Jan2014 Analysis propared by: JAL JA

AEH-12-PSEUDO-04



Performed by J. Luoma SAS version 9.3 08,07 30JAN14

File Folder: 12c

Item Number: ___

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Standard Curve Linear Regression and sample concentrations
Study # AEH-12-PSUEDC-94
Labe Carlos-injection treatment
SA5 v. 0.3 Analysis completion date: 30Jan/2014 Analysis prepared by: JAL

The REG Procedure Model: MODEL1 Dependent Variable: conc conc

Number of Observations Read	73
Number of Observations Used	12
Number of Observations with Missing Values	81

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	53901	53901	95117.5	<.0001
Error	10	5,66674	0.56667		·
Corrected Total	11	53906		ļ	

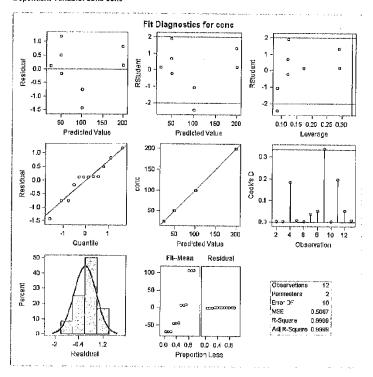
Root MSE	0.75278	R-Square	0.9999
Dependent Mean	93.75000	Adj R-Sq	0.9999
Coeff Var	0,80296		

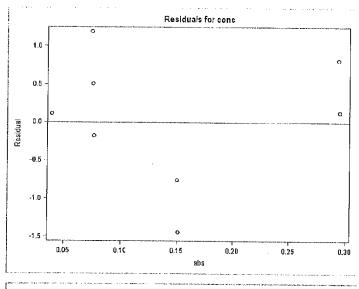
Parameter Estimates						
Variable Label DF Estimate Standard Error t Value Pr > t						Pr > t
Intercept	Intercept	1	-1.77327	0.37836	-4.69	0.0009
abs	abs	1	683.52963	2.21629	308.41	<.0001

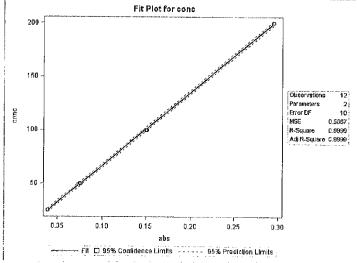
Performed by J. Luoma SAS version 9.3 08:07 30JAN14

Standard Curve Linear Regression and sample concentrations
Study # AEH-12-PSUEDO-04
Lake Carlos-Injection trealment
SAS v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL

The REG Procedure Model: MODEL1 Dependent Variable: conc conc







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Standard Curve Lineur Regression and sample concentrations
Study # AEH-12-93UEDO-04
Lake Carlos-Injection treatment
SAG v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL

Obs	tank	thero	time	loc	abs	conc	predicted_ppm
1				[! .		
2		25	0		0.039	25	24,884
3		50	0		0.076	50	50.175
4		100	0		0.151	100	101,440
5		200	0		0.295	200	199.868
6	,	25	0		0.039	25	24.884
7		50	0		0.075	50	49.491
8		100	0		0.150	100	100.756
9		200	0		C.294	200	199.184
10		25	0		0.039	25	24.884
11	- 1	50	0		0.074	50	48.808
12	,	100	0		0.150	100	100.756
13		200	0	,	0.295	200	199.868
14	1	50	1	SIIS	0.000		-1.773
15	2	100	1	sus	0.009		4.379
16	4	50	1	SUS	0.002		-0.406
17	5	100	1	sus	0.003		0.277
18	8	50	1	sus	0.001		-1.090
19	9	100	1	sus	0,036		22.834
20	1	50	3	sus	0.001		-1.090
21	2	100	3	sus	0.001		-1.090
22	4	50	3	sus	0.001		-1.090
23	5	100	3	sus	0.002		-0.406
24	8	50	3	sus	0.000		-1.773
25	9	100	3	sus	0.000		-1.773
26		25	6	.	0.036		22.834
27		50 ¦	в	. !	0,065		42.656
28		100	6		0.135		90.503
29		200	6		0.270		182,780
30	1	50 :	6	bot	0.171	.	115.110
31	1	50.	6	sus	0.005		1.644
32	2 :	1 C O	6	bot	0.430		292,144
33	2	100	6	sus	0.006		2.328
34	4	5C	6	bat	0.187		126.047
35	4	50	6	sus	0.005		1.644
36	5	100	6	bot :	0.398		270.272
37	5	100	6	SUS :	0.001		-1.090
38	8	50	6	bot	0.207		139.717
		-:-	[ì	

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	,						
39	8	50	6	sus	0,001		-1.090
40	9	100	6	bot	0.345		234.044
41	9	100	6	sus	0,000		-1.773
42	·	25	9		0.C33		20.783
43		50	9		0.069		45.390
44		100	9		0.135		90.503
45].	200	9		0.265		179.362
46	1	50	9	bot	0.159		106.908
47	1	50	9	sus	0.004		0.961
48	2	100	9	bot	0.395		268.221
49	2	100	9	sus	0,006		2.328
50	4	50	9	bot	0.154		103,490
51	4	50	9	SUS	0.301		-1.090
52	5	100	9	bot	0.357		242.247
53	5	100	9	sus	0.001		-1.090
54	8	50	9	bot	0.131		87.769
55	8	50	9	sus	0.003		0.277
56	9	100	9	bot	0.322		218.323
57	9	100	9	5us	C.003		0.277
58		25	12		0.034		21.467
59		50	12		0.068		44.707
60		100	12		0.135		90.503
61		200	12	.	0.265	•	179,362
62	1	50	12	bot	0.108	,	72.048
63	1	50	12	sus	0.011		5.746
64	2	100	12	bot	0.324		219.690
65	2	100	12	sus	0.004		0.961
66	4	50	12	bot	0.113		75.466
67	4	50	12	sus	0.012		6.429
68	5	100	12	bot	0.285		193,033
69	5	100	12	sus	0.005	.	1.644
70	8	50	12	bot	0.114		76.149
71	8	50	12	sus	0.013		7.113
72	9	100	12	bot	0.257		173.894
73	9	100	12	sus	0 012		6.429
,			,				

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Mean treatment concentration by treatment tank and sampling location (bottom/suspended) for all sampling times

The MEANS Procedure

tank=' 'loc='

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Day	Lower 95% CL for Mean	Upper 95% CL for Mean		
,	,	,			

tank=1 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
98.0221	22.8651	41.2221	154.8	

tank=1 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
1.0976	2.9558	-2.5726	4.7677	

tank=2 loc=bot

Analys	Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
260,0	36.9169	168.3	351.7			

tank=2 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Меал	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
1.7811	2.0161	-0.7223	4.2844	

tank=4 loc=bot

Analys	Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
101.7	25,3398	38.7200	164.6			

tank=4 loc=sus

Analysis Variable : predicted_ppm Predicted

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Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
1.0976	3.1841	-2.8560	5.0511	

tank=5 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc						
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
235.2	39.1008	138.1	332.3			

tank=5 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
-0.1328	1.1438	-1,5530	1.2874		

tank=8 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
101.2	33.8491	17.1260	185.3		

tank=8 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
: 0.6874	3.6682	-3.8672	5.2421	

tank=9 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
208,8	31.1962	131.3	286.2		

tank=9 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc						
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
5.1987	10,4157	-7.7341	18.1315			

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Mean treatment concentration by treatment group and sampling location for all sampling times

The MEANS Procedure

thero=. loc=' '

Analysis Variable : predicted_ppm Predicted Value of conc						
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			

thero=50 loc=bot

	Analysis Variable : predicted_ppm Predicted Value of conc						
i	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
į	100.3	24.0962	81,7785	118.8			

thero=50 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean		
0.9609	3.0459	-0.7259	2,6476	

thero=100 loc=bot

:	Analysis Variable : predicted_ppm Predicted Value of conc					
	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
Ĭ	234.7	38.1989	205.3	264.0		

thero=100 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
2.2823	6.1434	-1.1198	5.6845	

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Mean treatment concentration for each treatment group for each sampling time

The MEANS Procedure

thero=. time=. loc=' '

Analys	Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			

thero=50 time=1 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-1.0897	0.6835	-2.7877	0.6082

thera=50 time=3 loc=sus

Analysis Variable : prodicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-1.3176	0.3946	-2.2979	-0.3372	

thero=50 time=6 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
127.0	12.3288	96.3317	157.6	

thero=50 time=6 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Moan	Upper 95% CL for Mean
0.7330	1.5785	-3.1883	4.6543

thero=50 time=9 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
99.3891	10.2073	74.0328	124.7	

thero=50 time=9 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
0.0495	1.0441	-2,5442	2.6432

thero=50 time=12 loc=bot

Analysis	Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
74.5542	2.1972	69.0960	80.0125		

thero=50 time=12 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean		
6.4291	0,6835	4.7311	8.1271	

thero=100 time=1 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Moan	Upper 95% CL for Moan
9.1632	12.0154	-20.6846	39,0110

thero=100 time=3 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-1.0897	0.6835	-2.7877	0.6082	

thero=100 time=6 loc=bot

Analysis Varlable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
265.5	29.3440	192.6	338.4	

thero=100 time=6 loc=sus

Analysis Variable : predicted_ppm Predict Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-0.1784	2.1972	-5.6366	5.2799

thero=100 time=9 loc=bot

Analysis	Variable	: predict	ted ppm	Predicted		
Value of conc						
				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
242,9	24.9559	180.9	304.9

#### thero=100 time=9 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
0.5052	1.7202	-3.7680	4.7783

#### thero=100 time=12 loc=bot

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean		
195.5	23.0009	138.4	252.7	

#### there=100 time=12 lec=euc

Analysis Variable ; predicted_ppm Pre Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
3.0114	2.9794	-4.3899	10.4128

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			AEH-12-PSEUDO-04
Mean c	oncentration for sta	ndard checks for all sampling	g times
The MEA	NS Procedure		
thero=25			
Analysis	s Variable : predicted_p Value of conc	om Predicted	
Mean	Lower 95% Std Dev   CL for Mean	Upper 95% CL for Mean	
21.6946	1.0441 19.1009	24.2883	

thero=50
----------

Analysis		: predicted_p	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
44.2511	1.4229	40.7164	47.7857

#### thero=100

Analysis Variable : predicted_ppm Pred Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
90.5032	0		

#### thero≃200

	Analys	sis Variable V	: predicted_p alue of conc	pm Predicted
	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
Ì	180.5	1.9732	175,6	185.4

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File Folder:	12c	Item Number:	4	
i ile troidet: "	120	ngili MRWDGL:	7	

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Study Number: AFH-12-PSFUDO-04 Action initials Electronic Lab Notebook (pages 25 - 27) 6-Feb-14 TJS 13/3 12-Feb-14 TJS 13/5 12-FeB14 13/5 Data Source: File Folder: 14c Revised .... Forms: "Sample Absorbance Readings" Data Sheet Certified..... 1/19/19 34~ File Name: See filenames as stated below

Spectrophotometric Data

Test Article: Zequanox * (MBJ-401 SDP) Test Art cle Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 8, 2012 Test Location: Lake Shawano, Shawano, Wi Treatment Type: Bottom Injection

#### Data Explanation:

- 1) The absorbance of triplicate samples of 25, 50, 10C, and 200 mg/L dilutions of a 2,000 mg/L active ingredient (A.1.) stock prepared from Analytical Stock #2 were measured to prepare a standard curve.
- 2) Standard checks were performed at 6, 9, and 12 hours by comparing the 25, 50, 100, and 200 mg/L (A.I.) dilutions to the linear curve.

  3) Data codes used within SAS
- - tank = Tank ID (1 through 9)
  - there = Theoretical or target concentration (mg/L)
  - time = Sample Time (0, 1, 3, 6, 9, and 12 h after treatment)
  - loc = Sample Location
    - sus = Suspended Sample (sampled ~15 cm from bottom of tank)
    - sur = Surface Sample
  - abs = measured absorbance of sample
  - conc = concentration ([mg/L], only used for standards used for regression)
- 4) Information that is not relevant to a sample (i.e., tank II) for standards) or that will be calculated by SAS (i.e., predicted concentration for standard checks and samples) is denoted by a "." in the SAS input and output files.

- Data Analysis:
  1) A linear regression was completed in SAS using the absorbance values obtained from the spectrophotometer of 3 replicate cliutions of 25, 50, 100 and 200 mg/L
- 2) Standard checks and treatment sample concentrations were predicted in SAS by comparing the observed absorbances with the linear regression.

  3) The following mean treatment concentrations were determined in SAS:
  - - 3a) Mean (standard deviation) concentration by tank and location for all sampling times 3b) Mean (standard deviation) concentration by treatment group and location for all sampling times

    - 3c) Mean (standard deviation) concentration by treatment group and sampling times for botal ocations 3d) Mean (standard deviation) concentrations for 25, 50, 100, and 200 mg/L (A.I.) dilutions for all sampling times

## File Names:

Spectrophotometric Data for SAS input

It\AEH-12-PSEUDO-04\Data Summaries\spec\fLake Shawano Bottom Injection Spec Summary.xisxjSpec Data for SAS

#### SAS Program/Code

I:\AEH-12-PSEUDG-04\SAS-Spec\shawano injection program file

SAS Log

I:\AEH-12-PSE JDO-04\SA5-Spec\shawano injection log file

SAS Output

I:\AEH-12-PSEUDO-04\SAS-Spec\Shawano injection results file

#### Data Anomalies and Deviations:

- 1) One exposure tank of a different concentration was sampled in triplicate to evaluate variability of spectrophotometer during each sampling time. The triplicate sample was only taken from suspended (sus) sampling locations. The mean absorbance of the triplicate samples was imported into SAS for use in the analysis.
- 2) Surface samples (sur) were collected by submerging a collection beaker below the surface of each exposure tank; suspended samples (sus) were collected ~15 cm from the exposure tank bottom for all sampling times.

all exposes and absorbances for triplicate samples may be recorded incorrectly on "Sample Absorbance Readings" data forms as proper significant figure rules may not have been observed. Additionally, concentrations recorded on "Sample Absorbance Readings" data forms were not used in the analysis as the initial linear regression equation that was used for these calculations was derived using rounded absorbance values in Excel. All absorbances and concentrations used in SAS calculations and reported within Spectrophotometric Data Summary have been corrected.

> File Folder: 14 Number____

tank	thero	time	łoc	abs	conc	
	25	0		0.038	25	AEH-12-PSEUDO-04
	50	0		0.067	50	AGR-12-1-0EU10U-04
	100	0		0.129	100	
	200	0		0.250	200	
	25	0	,	0.036	25	
•	50	0	-	0.065	50	
	100	0	•	0.128	100	
	200	0		0.253	200	
	25	0	•	0.037	25	
•	50	0	•	0.066	50	
	100	0	•	0.130	100	
•	200	0	•	0,251	200	
•	25	6	,	0.037		
	50	6		0.056		
	100	6		0.127		
	200	6		0.247		
•	25	9		0.037		
•	50	9		0.066		
	100	9		0.115		
	200	9	•	0.243	,	
	25	12		0.038		
	50	12		0.065		
•	100	12	•	0.127		
	200	12	•	0.243		
1	0	1	sur	0.002		
8 -	0	1	sur	0.002		
9	0	1	sur	0.003		
2	. 50	1	sur	0.004		
3	50	1	sur	0.001		
7	50	1	sur	0.002		
4	100	1	sur	0.003		
5	100	1	sur	0.004		
6	100	1	sur	0.004		
1	0	1	sus	0.002		
8	0	1	sus	0.001	4	
9	0	1	sus	0.002		
2	50	1	sus	0.075		
3	50	1	sus	0.068		
7	50	1	sus	0.067	•	
4	100	1	sus	0.144	•	
5	100	1	รมร	0.133		•
6	100	1	sus	0.119		_ 2 _ B
1	0	3	sur	0.002	•	Page of
8	0	3	sur	0.002		
9	0	3	sur	0.002		
2	50	3	sur	0.004		

3	50	3	sur	0.002		
7	50	3	sur	0.004		
4	100	3	sur	0.002		AEH-12-PSEUDO-04
5	100	3	sur	0.000		
6	100	3	sur	0.003		
1	0	3	sus	0.002		
8	0	3	sus	0.003		
9	0	3	SUS	0.003		
2	50	3	sus	0.055		
3	50	3	sus	0.055		
7	50	3	sus	0.054	•	
4	100	3	sus	0.124		
5	100	3	sus	0.126		
6	100	3	sus	0.114		
1.	0	6	sur	0.000		
8	0	6	sur	0.000		
9	0	6	sur	0.000		
2	5 <b>0</b>	6	sur	0.009		
3	50	6	sur	0.006		
7	50	6	sur	0.007		
4	100	6	sur	0.003		
5	100	6	sur	0.003		
6	100	6	sur	0.003		
1	0	6	sus	0.000		
8	0	6	sus	0.000		
9	0	6	sus	0.001		
2	50	6	sus	0.051		
3	50	6	sus	0.048	,	
7	50	6	sus	0.047	•	
4	100	6	sus	0.119		
5	100	6	sus	0.115		
6	100	6	sus	0.106	,	
1	0	9	sur	0.004		
8	0	9	sur	0.003		
9	0	9	sur	0.003	•	
2	50	9	sur	0.013		
3	50	9	sur	0.010	,	
7	50	9	sur	0.018		
4	100	9	sur	0.009		
5	100	9	sur	0.010		
6	100	9	sur	0.007		
1	. 0	9	sus	0.003		
8	0	9	sus	0.004		•
9	0	9	sus	0.002		Page 3 of 4
2	50	9	sus	0.053	٠	raysUU
3	50	9	sus	0.054		
7	50	9	sus	0.048		

4	100	9	5US	0.127	
5	100	9	sus	0.119	AEH-12-PSEUDO-04
6	100	9	sus	0.114	AEG-12-F3E0D0-04
1	0	12	sur	0.004	
8	0	12	sur	0.004	
9	0	12	sur	0.004	
2	50	12	sur	0.016	
3	50	12	sur	0.015	
7	50	1.2	sur	0.028	
4	100	12	sur	0.010	
5	<b>10</b> 0	12	sur	0.011	
6	100	12	sur	0.009	
1	0	12	sus	0.003	
8	0	12	sus	0.004	
9	0	12	sus	0.004	
2	50	12	sus	0.053	
3	50	12	sus	0.046	
7	50	12	sus	0.025	
4	100	12	sus	0.115	
5	100	12	sus	0.113	
6	100	1.2	sus	0.109	

File Folder: 140 tem Number: 1 Page 4 of 4

```
ods html close; /* close previous */;
ods html; /* open new */;
                                                          AEH-12-PSEUDO-04
ods graphics on;
DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
title1 h=1 'Standard Curve Linear Regression and sample concentrations';
title2 h=1 'Study # AEH-12-PSUEDO-04';
title3 h=1 'Shawano Lake-injection treatment';
title4 h=1 'SAS v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL';
* SAS ver 9.3 Analysis prepared by: JAL Page ___ of ___
* Analysis completion date: 30Jan2014 5
data Zeq; set shawano.shawanoinjection;
run;
proc sort;
by tank time loc; run;
run:
proc gplot data= zeq;
plot abs * conc;
run:
proc reg data = zeq;
model conc = abs /edf;
output out=output_out p=predicted ppm;
run;
proc sort;
by time tank loc;
proc print data=output_out;
run;
data zeq2; set output_out;
if tank = "." then delete;
if loc ="." then delete;
if time = "0" then delete;
ruл;
proc sort:
by tank loc;
run;
* This procedure produces the mean concentrations for each treatment replicate over all sampling tim
* by the the sampling location
* i.e. It gives the mean concentration of each treatment tank over the entire exposure by the sampl
* location [i.e. surface vs suspended sampling
title "Nean treatment concentration by treatment tank and sampling location (surface/suspended) for a
proc means data = zeq2 mean std lclm uclm fw=8;
by tank loc;
                                      Item Number: 2 Page 1 of 2
var predicted ppm;
run;
                File Folder: 1년
proc sort;
```

```
AEH-12-PSEUDO-04
by there time loc:
* This procedure produces the mean concentrations for each treatment group over all sampling times
 * by the sampling location
 st i.e. It gives the mean concentration of the 3 control, 50ppm & 100ppm treatment tanks by
 * sampling location (surface/suspended) over the entire exposure
 title "Mean treatment concentration by treatment group and sampling location for all sampling times";
proc sort;
by thero loc;
proc means data = zeq2 mean std lclm uclm fw=8;
by there loc:
var predicted_ppm;
run;
^\star This procedure produces the mean concentrations for each treatment group by sampling time
^{\star} i.e. It gives the mean conc. of the 3 control,50ppm & 100ppm treatment tanks at time 1, 3, 6, 9 _{
m al}
title "Mean treatment concentration for each treatment group for each sampling time";
proc sort;
by thero time loc;
proc means data = zeq2 mean std lclm uclm fw=8;
by thero time loc;
var predicted_ppm;
run;
data zeq3; set output_out;
if conc > 1 then delete;
if tank > 0.5 then delete;
if thero = "." then delete;
proc sort;
* This procedure produces the mean concentrations for the standard checks for all time periods
^{\star} i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 6, 9 and 12h
        title "Mean concentration for standard checks for all sampling times";
proc means data = zeq3 mean std lclm uclm fw=8;
by thero;
var predicted_ppm;
run;
quit;
              1/3-/14
run;
              570
         File Folder: 140
```

Item Number: __

```
426 DM 'LOG; CLEAR; OUTPUT; CLEAR;'; * CLEAR LOG AND OUTPUT;
                                                                     AEH-12-PSEUDO-04
428 FOOTNOTE1 'Performed by J. Luoma SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or inquoted text.
429
430 options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
432 title1 h=1 'Standard Curve Linear Regression and sample concentrations';
433 title2 h=1 'Study # AEH-12-PSUEDO-04';
434 title3 h=1 'Shawano Lake-injection treatment';
435 title4 h=1 'SAS v. 9.3 Analysis completion date: 30Jan2014 Analysis prepared by: JAL';
438 * SAS ver 9.3 Analysis prepared by: JA. Page ___ of ___
441
442 data Zeq; set shawano.shawanoinjection;
NOTE: There were 115 observations read from the data set SHAWANO.SHAWANOINJECTION.
NOTE: The data set WORK.ZEQ has 115 observations and 6 variables.
NOTE: DATA statement used (Total process time):
     real time
               0.00 seconds
                     0.00 seconds
     cpu time
444 proc sort;
445 by tank time loc; run;
NOTE: There were 115 observations read from the data set WORK.ZEQ.
NOTE: The data set WORK.ZEQ has 115 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                      0.00 seconds
     cpu time
                      0.00 seconds
446
447 run;
448 proc gplot data= zeq;
449 plot abs * conc;
450 run;
NOTE: 103 observation(s) contained a MISSING value for the abs * conc request.
NOTE: 4 records written to C:\Users\JLUOMA\gplot4.png.
NOTE: There were 115 observations read from the data set WORK.ZEQ.
NOTE: PROCEDURE GPLOT used (Total process time):
     real time
                   0.26 seconds
     cpu time
                      0.26 seconds
                                               Item Number: 3 Page 1 of 5
                         File Folder: 14c
451 proc reg data = zeq;
452 model conc = abs /edf;
453 output out=output_out p=predicted_ppm;
454 run;
```

```
AEH-12-PSEUDO-04
```

```
NOTE: The data set WORK.OUTPUT_OUT has 115 observations and 7 variables.
NOTE: PROCEDURE REG used (Total process time):
     real time
                       1.06 seconds
     cpu time
                       0.40 seconds
455 proc sort;
456 by time tank loc;
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.OUTPUT_OUT has 115 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time);
     real time
                     0.00 seconds
     cpu time
                       0.01 seconds
457 proc print data=output_out;
458 run;
NOTE: There were 115 observations read from the data set WORK.OUTPUT OUT.
NOTE: PROCEDURE PRINT used (Total process time):
     real time
                   0.06 seconds
     cpu time
                      0.06 seconds
459 data zeq2; set output_out;
460 if tank = "." then delete;
461 if loc ="." then delete;
462 if time = "0" then delete;
463 run;
NOTE: Character values have been converted to numeric values at the places given by:
     (Line):(Column).
     462:11
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ2 has 91 observations and 7 variables.
NOTE: DATA statement used (Total process time):
     real time
                      0.01 seconds
     opu time
                       0.01 seconds
464 proc sort;
465 by tank loc;
466 run;
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 9' observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                    0.00 seconds
     cpu time
                       0.00 seconds
                                                                    Page _____ of __ 5
467! **********
```

```
468 * This procedure produces the mean concentrations for each treatment replicate over all
468! sampling times .*
469 * by the the sampling location
                                                               AEH-12-PSEUDO-04
470 \, \, \, i.e. It gives the mean concentration of each treatment tank over the entire exposure by
470! the sampling *
     * location [i.e. surface vs suspended sampling
4711
472! ***********/
473 title "Mean treatment concentration by treatment tank and sampling location
473! (surface/suspended) for all sampling times";
474 proc means data = zeq2 mean std lclm uclm fw=8;
475 by tank loc;
476 var predicted_ppm;
477 run;
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time
                     0.05 seconds
     cpu time
                     0.06 seconds
478 proc sort;
479 by thero time loc;
480! **********
481 * This procedure produces the mean concentrations for each treatment group over all
481! sampling times
482 * by the sampling location
4821
483
     * i.e. It gives the mean concentration of the 3 control, 50ppm & 100ppm treatment tanks by
4831
484
     * sampling location (surface/suspended) over the entire exposure
4841
485! ***********
486 title "Mean treatment concentration by treatment group and sampling location for all
486! sampling times";
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 91 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                   0.01 seconds
     opu time
                     0.0' seconds
487 proc sort;
488 by thero loc;
489
                                                              Page __3__of__5
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 91 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                     0.00 seconds
    cpu time
                     0.01 seconds
```

```
AEH-12-PSEUDO-04
490 proc means data = zeq2 mean std lclm uclm fw=8;
491 by thero loc;
492 var predicted_ppm;
493 run;
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
               0.04 seconds
     roal time
     cpu time
                      0.01 seconds
495 * This procedure produces the mean concentrations for each treatment group by sampling time
4951
496 * i.e. It gives the mean conc. of the 3 control,50ppm & 100ppm treatment tanks at time 1,
496! 3, 6, 9 and 12h
    497! ******************************
498 title "Mean treatment concentration for each treatment group for each sampling time";
499
500 proc sort;
501 by there time loc;
502
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: The data set WORK.ZEQ2 has 91 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
     real time
                  0.01 seconds
     cpu time
                      0.01 seconds
504 proc means data = zeq2 mean std lclm uclm fw=8;
505 by thero time loc;
506 var predicted_ppm;
507 run;
NOTE: There were 91 observations read from the data set WORK.ZEQ2.
NOTE: PROCEDURE MEANS used (Total process time):
     real time 0.07 seconds
     cpu time
                      0.06 seconds
508
509 data zeg3; set output out;
510 if conc > 1 then dolete;
511 if tank > 0.5 then delete;
                                                                Page \frac{4}{5} of 5
512 if thero = "." then delete;
513 run;
NOTE: Character values have been converted to numeric values at the places given by:
     (Line):(Column).
```

511:4 512:12

```
NOTE: There were 115 observations read from the data set WORK.OUTPUT_OUT.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: DATA statement used (Total process time):
    real time
               0.01 seconds
    cpu time
                   0.01 seconds
514
515 proc sort;
516 by thero;
519 * i.e. It gives the mean conc. of the 50ppm & 100ppm standard checks at 6, 9 and 12h
5191
520! ***********/
521 title "Mean concentration for standard checks for all sampling times";
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: The data set WORK.ZEQ3 has 12 observations and 7 variables.
NOTE: PROCEDURE SORT used (Total process time):
    real time
                  0.01 seconds
    cpu time
                   0.01 seconds
522 proc means data = zeq3 mean std lclm uclm fw=8;
523 by thero;
524 var predicted_ppm;
525 run;
NOTE: There were 12 observations read from the data set WORK.ZEQ3.
NOTE: PROCEDURE MEANS used (Total process time):
             0.04 seconds
    real time
    cpu time
                  0.03 seconds
526 quit;
527 run;
```

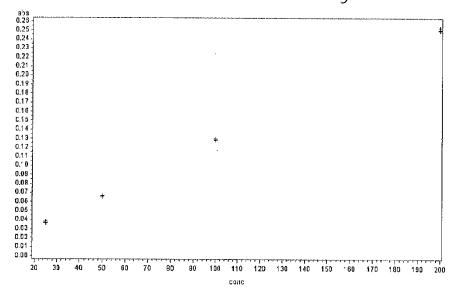
File Folder: 4c Item Number: 3 Page 5 of 5

SAS Output

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AEH-12-PSEUDO-04

# Standard Curve Linear Regression and eample concentrations Study #ARH-12-PSUEDD-0-4 Shawane Late-Injection treatment SAS v. 9.3 Analysis completion date: 30.lan2014 Analysis prepared by: JALTY



Performed by J. Luoma SAS version 9.3 08:07 30JAN14

Mc Item Number: 4 File Folder: ___

file://C:\Users\JLUOMA\sashtml4.htm

Standard Curve Linear Regression and sample concentrations
Study # AEH-12-PSUEDO-04
Shawano Lake-Injection treatment
SAS v. 9.3 Analysis completion date: 30Jan2814 Analysis prepared by: JAL

The REG Procedure Model: MODEL1 Dependent Variable: conc conc

Number of Observations Read	115
Number of Observations Used	12
Number of Observations with Missing Values	103

Analysis of Variance										
Source	Sum of Mean DF Squares Square			F Value	Pr > F					
Model	1	53896	53896	50557.1	<.0001					
Error	10	10.66035	1.06603							
Corrected Total	11	53906								

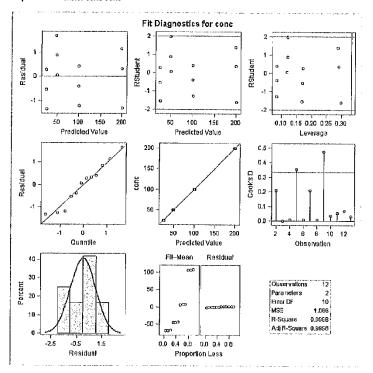
Root MSE	1.03249	R-Square	0.9998
Dependent Mean	93.75000	Adj R-Sq	0.9998
Coeff Var	1.10132		

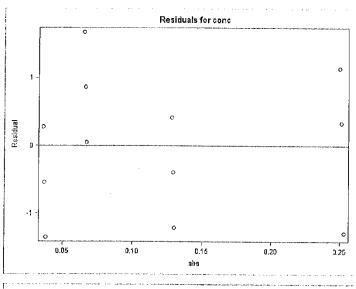
Parameter Estimates											
Variable Label DF Parameter Standard Error t Value Pr											
Intercept	Intercept	.1	-4,56868	0.52919	-8,63	<.0001					
abs	abs	1	813.67186	3.61875	224.85	<.0001					

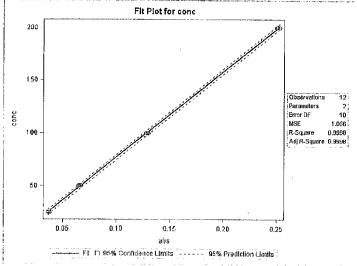
Performed by J. Luoma SAS version 9.3 08:07 30JAN14

Standard Curve Linear Regression and sample concentrations
Study # ARH-12-PSUEDC-04
Staware Lake-algetion frealment
SAS v. 3-3 Analysis completion date; 30Jan2014 Analysis prepared by; JAL

The REG Procedure Model: MODEL1 Dependent Variable: conc conc







Performed by J. Luoma SAS version 9.3 08:07 30JAN14

file://C:\Users\JLUOMA\sashtml4.htm

Standard Curve Linear Regression and sample concentrations Study # AEH-12-PSUEDD-04
Shawano Lake-Injection treatment

SAS V. 9,3 An	alysis completion	date: 30Jan2014	Analysis prepared b	y: JAL

Obs	tank	thero	time	loc	abs	conc	predicted_ppm
1		: .	i ,				,
2		25	0	-	0.03800	25	26.351
3		50	0	ŀ	0.06700	50	49.947
4		100	. 0	Ŀ	0.12900	100	100.395
5		200	0		0.25000	200	198.849
6		25	0		0.03600	25	24.724
7		50	0		0.06500	50	48.320
8		100	0		0.12800	100	99.581
9		200	0		0.25300	200	201.290
10		25	0		0.03700	25	25.537
11		50	0		0.06600	50	49.134
12		100	0		0.13000	100	101.209
13		200	0		0.25100	200	199.663
14	1	0	1	sur	0.00200		-2.941
15	1	0	1	sus	0.00200		-2.941
16	2	50	1	sur	0.00400		-1.314
17	2	50	1	sus	0.07500	٠.	56.457
18	3	50	1	sur	0.00100		-3.755
19	3	50	1	sus	0.06800		50.761
20	1	100	1	sur	0.00300		-2.128
21	4	100	1	sus	0.14400		112.600
22	5	100	1	aur	0.00400		-1.314
23	5	100	1	នបុន	0.13300		103,650
24	6	100	1	sur	0.00400	· .	-1.314
25	6	100	1	sus	0.11900		92.258
26	7	50	1	sur	0.00200		-2.941
27	7	50	1	sus	0.06700		49.947
28	8	0	1	sur	0.00200		-2.941
29	8	0	1	sus	0.00100		-3.755
30	9	0	1	sur	0.00300		-2.128
31	9 ;	0	1	sus	0.00200		-2.941
32	1 ;	0	3	sur	0.00200		-2.941
33	1	0	3	sus	0.00200		-2.941
34	2	50	3	sur	0.00400	1	-1.314
35	2	50	3	sus	0.05500	!	40.183
36	3	50	3	sur	0.00200		-2.941
37	3	50	3	sus	0.05467	•	39.912
38	4	100	3	sur	0.00200		-2.941
						. 1	

file://C:\Users\JLUOMA\sashtml4.htm

39	4	100	3	sus	0.12400		96.327
40	5	100	3	sur	0.00000		-4,569
41	5	100	3	sus	0.12600		97.954
42	6	100	3	sur	0.00300		-2.128
43	6	^00	3	sus	0.11400	·	88.190
44	7	50	3	sur	0.00400	Ι.	-1.314
45	7	50	3	sus	0.05400	T .	39.370
46	8	0	3	sur	0.00200	į .	-2.941
47	8	0	3	ลนร	0.00300		-2.128
48	9	0	3	sur	0.00200	] .	-2.941
49	9	0	3	sus	0.00300		-2.128
50	ļ	25	6		0.03700	<u> </u>	25.537
51		50	6	·	0.06600		49.134
52		100	6	ļ	0.12700	J .	98.768
53	,	200	6	<u>.                                    </u>	0.24700	<u>_</u> .	196,408
54	1	0	6	sur	0.00000		-4.569
55	1	0	6	sus	0.00000		-4,569
56	2	50	6	sur	0.00900		2.754
57	2	50	6	sus	0.05100		36.929
58	3	50	6	sur	C.00600		0.313
59	3	50	6	SUS	0.04800		34.488
60	4	100	6	sur	0.00300	:	-2.128
61	4	100	6	sus	0.11900	<u></u>	92,258
62	5	100	- 6	sur	0.00300		-2,128
63	5	100	6	SUS	0.11500	· ·	89.004
64	6	100	6	sur	0.00300		-2.128
65	6	100	- 6	sus	0.10600		81,681
66	7	50	6	SUI	0.00700		1.127
67	7	50	6	sus	0.04733		33.945
68	8	0	6	sur	0.00000		-4.569
69	8	0	6	sus			-4.569
70	9	0	6	sur	0.00000		-4.569
71	9	0	6	sus	0.00100		-3,755
72	·	25	9		0.03700		25.537
73		50	9	·:	0.06600		49.134
74	·	.00	9		0.11500		89.004
75	•	200	9		0.24300		193.154
76	1	0	9	sur	0.00400	'j	-1.314
77	1	0	9	sus	0.00300		-2.128
78 79	2	50	9	SUF ;	0.01300		6.009
	we 14000 1	50	9	SUS	0.08300		38,556
80 81	3 i	50		sur	0.01000	- :	3.568
91				:		I	i

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82         4         100         9         sur         0.00900         2.754           83         4         100         9         sus         0.12733         99.039           84         5         100         9         sus         0.01000         3.568           85         5         100         9         sus         0.11900         92.258           86         6         100         9         sus         0.00700         1.127           87         6         100         9         sus         0.01400         86.190           88         7         50         9         sus         0.01400         10.077           89         7         50         9         sus         0.04800         34.488           90         8         0         9         sus         0.04800         -2.128           91         8         0         9         sus         0.00300         -2.128           91         8         0         9         sus         0.00200         -2.941           92         9         0         9         sus         0.00200         -2.128           93	1	1						
83 4 100 9 sus 0.12733 99.039  84 5 100 9 sur 0.01000 3.568  85 5 130 9 sus 0.11900 92.258  86 6 100 9 sur 0.00700 1.127  87 6 100 9 sus 0.11400 88.190  88 7 50 9 sus 0.11400 10.077  89 7 50 9 sus 0.01800 34.488  90 8 0 9 sur 0.00300 -2.128  91 8 0 9 sur 0.00300 -2.128  91 8 0 9 sur 0.00300 -2.128  93 9 0 9 sur 0.00300 -2.128  94 . 25 12 0.03800 26.351  95 . 50 12 0.03800 26.351  96 . 100 12 0.02500 48.320  97 . 200 12 0.24300 193.154  98 1 0 12 sur 0.00400 -1.314  99 1 0 12 sur 0.00400 .13.568  100 2 50 12 sur 0.01600 8.450  101 2 50 12 sur 0.01600 .38.566  102 3 50 12 sur 0.01600 .38.566  103 3 50 12 sur 0.01500 .76.36  104 4 100 12 sur 0.01500 .76.36  105 4 100 12 sur 0.01500 .38.686  106 5 100 12 sur 0.01500 .38.686  107 5 100 12 sur 0.01500 .38.686  108 6 100 12 sur 0.01500 .38.686  109 6 100 12 sur 0.01500 .38.686  100 12 sur 0.01500 .38.686  101 101 12 sur 0.01500 .38.686  102 3 50 12 sur 0.01500 .38.686  103 3 50 12 sur 0.01500 .38.686  104 4 100 12 sur 0.01500 .38.686  105 4 100 12 sur 0.01500 .38.686  106 5 100 12 sur 0.01500 .38.686  107 5 100 12 sur 0.01500 .38.686  108 6 100 12 sur 0.01500 .38.686  109 6 100 12 sur 0.01000 .38.686  100 12 sur 0.01000 .38.686  100 12 sur 0.01000 .38.686  101 10 12 sur 0.01000 .38.686  102 3 50 12 sur 0.01000 .38.686  103 3 50 12 sur 0.01000 .38.686  104 4 105 12 sur 0.01000 .38.686  105 4 106 12 sur 0.01000 .38.686  107 5 100 12 sur 0.01000 .38.686  108 6 100 12 sur 0.01000 .38.686  109 6 100 12 sur 0.01000 .38.686	ļ	3	50	9	sus	0.05400	ļ·	39.370
84         5         100         9         sur         0.01000         3.588           85         5         130         9         sus         0.11900         92.258           86         6         100         9         sur         0.00700         1.127           87         6         100         9         sus         0.11400         88.190           88         7         50         9         sur         0.00800         10.077           89         7         50         9         sur         0.00300         -2.128           90         8         0         9         sur         0.00300         -2.128           91         8         0         9         sur         0.00300         -2.128           91         8         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00200         -2.941           94         .         25         12         .         0.06500         48.320           95         . </td <td>82</td> <td>4</td> <td>100</td> <td> 9</td> <td>sur</td> <td>0.00900</td> <td>l</td> <td>2.754</td>	82	4	100	9	sur	0.00900	l	2.754
86         5         120         9         sus         0.11900         92.258           86         6         100         9         sur         0.00700         1.127           87         6         100         9         sus         0.11400         88.190           88         7         50         9         sus         0.04800         34.488           90         8         0         9         sur         0.00300         -2.128           91         8         0         9         sur         0.00300         -2.128           91         8         0         9         sur         0.00300         -2.128           91         8         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00200         -2.412           94         .         25         12         .         0.02500         48.320           95         .         50         12         .         0.02400         98.768           97         . <td>83</td> <td>4</td> <td>100</td> <td>9</td> <td>sus</td> <td>0.12733</td> <td>ί.</td> <td>99.039</td>	83	4	100	9	sus	0.12733	ί.	99.039
86         6         100         9         sur         0.00700         1.127           87         6         100         9         sus         0.11400         .88.190           88         7         50         9         sur         0.01800         .10.077           89         7         50         9         sur         0.0300         .2128           91         8         0         9         sur         0.00300         .2128           91         8         0         9         sur         0.00300         .2128           93         9         0         9         sur         0.00300         .2128           93         9         0         9         sur         0.00200         .2941           94         .         25         12         .03800         .26.351           95         .         50         12         .005500         .48.320           96         .         100         12         .024300         .98.768           97         .         200         12         .024300         .93.154           98         1         0         12         sur         0.	84	5	100	9	sur	0.01000	<u> </u>	3.568
87         6         100         9         sus         0.11400         .         88.190           88         7         50         9         sur         0.01800         .         10.077           89         7         50         9         sur         0.01800         .         34.488           90         8         0         9         sur         0.00300         .         -2.128           91         8         0         9         sur         0.00300         .         -2.128           93         9         0         9         sur         0.00300         .         -2.128           93         9         0         9         sur         0.00300         .         -2.128           94         .         25         12         .         0.06500         .         48.320           95         .         50         12         .         0.24300         .         193.154           97         .         200         12         sur         0.04600         .         -1.314           99         1         0         12         sur         0.00400         .         -2.128	85	5	100	9	sus	0.11900	<u> </u>	92.258
88         7         50         9         sur         0.01800         10.077           89         7         50         9         sus         2.04800         34.488           90         8         0         9         sur         2.00300         -2.128           91         8         0         9         sur         0.00400         -1.314           92         9         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00200         -2.941           94         .         25         12         .         0.0800         26.351           95         .         50         12         .         0.06500         48.320           96         .         100         12         .         0.24300         193.154           98         1         0         12         sur         0.00400         -1.314           99         1         0         12         sur         0.00400         -1.314           99         1         0         12         sur         0.00400         36.450           101         2 <td>86</td> <td>6</td> <td>100</td> <td>9</td> <td>sur</td> <td>0.00700</td> <td>Ĺ:</td> <td>1,127</td>	86	6	100	9	sur	0.00700	Ĺ:	1,127
89         7         50         9         sus         2.04800         34.488           90         8         0         9         sur         2.00300         -2.128           91         8         0         9         sur         0.00400         -1.314           92         9         0         9         sur         0.00300         -2.128           93         9         0         9         sur         0.00200         -2.941           94         .         25         12         .         0.0890         26.361           95         .         50         12         .         0.05500         .         48.320           96         .         100         12         .         0.05500         .         48.320           97         .         200         12         .         0.24300         .         193.154           98         1         0         12         sur         0.00400         .         -1.314           99         1         0         12         sur         0.00400         .         -2.128           100         2         50         12         sur	87	6	100	9	sus	0.11400		88.190
90 8 0 9 sur 0.00300	88	7	50 :	9	sur	0.01800		10.077
91         8         0         9         sus         0.00400        1.314           92         8         0         9         sur         0.00300        2.128           93         9         0         9         sus         0.00200        2.128           94         . 25         12         . 0.03800         . 26.351           95         . 50         12         . 0.65500         . 48.320           96         . 100         12         . 0.12700         . 98.768           97         . 200         12         . 0.24300         . 193.154           98         1         0         12         sur         0.00400        1.314           99         1         0         12         sur         0.00400        1.314           99         1         0         12         sur         0.00400        2.128           100         2         50         12         sur         0.01600        2.128           101         2         50         12         sur         0.01600        2.128           102         3         50         12         sur         0.01500        7.	89	7	50	9	sus	0.04800		34.488
92 8 0 9 sur 0.003002.128 93 9 0 9 sur 0.002002.941 94 . 25 12 . 0.03800 . 26.351 95 . 50 12 . 0.05500 . 48.320 96 . 100 12 . 0.12700 . 98.768 97 . 200 12 . 0.24300 . 193.154 98 1 0 12 sur 0.004001.314 99 1 0 12 sur 0.00600 . 8.450 100 2 50 12 sur 0.01600 . 8.450 101 2 50 12 sur 0.01500 . 7.636 102 3 50 12 sur 0.01500 . 7.636 103 3 50 12 sur 0.01500 . 32.860 104 4 100 12 sur 0.01500 . 32.860 105 4 100 12 sur 0.01500 . 33.656 106 5 100 12 sur 0.01500 . 33.668 107 5 100 12 sur 0.01100 . 4.382 107 5 100 12 sur 0.01100 . 4.382 107 5 100 12 sur 0.01100 . 87.376 108 6 100 12 sur 0.00900 . 2.754 109 6 100 12 sur 0.02800 . 18.214 110 7 50 12 sur 0.02800 . 15.773 112 8 0 12 sur 0.004001.314 113 8 0 12 sur 0.004001.314	90	8	0	9	sur	0.00300		-2.128
93 9 0 9 aus 0.002002.941 94 . 25 12 . 0.03800 . 26.351 95 . 50 12 . 0.6500 . 48.320 96 . 100 12 . 0.12700 . 98.768 97 . 200 12 . 0.24300 . 193.154 98 1 0 12 sur 0.004001.314 99 1 0 12 sur 0.004002.128 100 2 50 12 sur 0.01600 . 8.450 101 2 50 12 sur 0.01500 . 7.636 102 3 50 12 sur 0.01500 . 7.636 103 3 60 12 sur 0.01500 . 32.860 104 4 100 12 sur 0.01500 . 32.860 105 4 100 12 sur 0.01500 . 35.688 105 4 100 12 sur 0.01500 . 33.8568 106 5 100 12 sur 0.01500 . 35.868 107 5 100 12 sur 0.01100 . 4.382 107 5 100 12 sur 0.01100 . 4.382 107 5 100 12 sur 0.01100 . 87.376 108 6 100 12 sur 0.00900 . 2.754 109 6 100 12 sur 0.02800 . 18.214 111 7 50 12 sur 0.02800 . 15.773 112 8 0 12 sur 0.004001.314 113 8 0 12 sur 0.004001.314	91	8	0	9	sus	0.00400		-1.314
94 . 25 12 . 0.03800 . 26.351  95 . 50 12 . 0.06500 . 48.320  96 . 100 12 . 0.12700 . 98.768  97 . 200 12 . 0.24300 . 193.154  98 1 0 12 sur 0.004001.314  99 1 0 12 sur 0.004002.128  100 2 50 12 sur 0.01600 . 8.450  101 2 50 12 sur 0.01600 . 38.556  102 3 50 12 sur 0.01500 . 7.636  103 3 50 12 sur 0.01500 . 32.860  104 4 100 12 sur 0.01900 . 3.568  105 4 100 12 sur 0.01900 . 89.004  106 5 100 12 sur 0.01100 . 89.004  107 5 100 12 sur 0.01100 . 4.382  108 6 100 12 sur 0.0990 . 2.754  109 6 100 12 sur 0.0990 . 84.122  110 7 50 12 sur 0.02800 . 18.214  111 7 50 12 sur 0.02600 . 15.773  112 8 0 12 sur 0.004001.314  113 8 0 12 sur 0.004001.314	92	9	0	9	sur	0.00300		-2.128
95         .         50         12         .         0.06500         .         48,320           96         .         100         12         .         0.12700         .         98,768           97         .         200         12         .         0.24300         .         193,154           98         1         0         12         sur         0.00400         .         -1.314           99         1         0         12         sur         0.00300         .         -2.128           100         2         50         12         sur         0.01600         .         8.450           101         2         50         12         sur         0.01600         .         36.566           102         3         50         12         sur         0.01500         ,         7.636           103         3         60         12         sur         0.04600         ,         32.860           104         4         100         12         sur         0.01900         ,         3.568           105         4         100         12         sur         0.01900         ,         89.004 <td>93</td> <td>9</td> <td>0</td> <td>9</td> <td>ธนธ</td> <td>0.00200</td> <td>,</td> <td>-2.941</td>	93	9	0	9	ธนธ	0.00200	,	-2.941
96 . 100 12 . 0.12700 . 98.768  97 . 200 12 . 0.24300 . 193.154  98 1 0 12 sur 0.004001.314  99 1 0 12 sus 0.003002.128  100 2 50 12 sur 0.01600 . 8.450  101 2 50 12 sus 0.05300 . 38.556  102 3 50 12 sus 0.05300 . 38.556  103 3 50 12 sus 0.0500 . 32.860  104 4 100 12 sur 0.01500 . 32.860  105 4 100 12 sus 0.01600 . 89.004  106 5 100 12 sus 0.11500 . 89.004  107 5 100 12 sus 0.11500 . 87.376  108 6 100 12 sus 0.11300 . 87.376  109 6 100 12 sus 0.10900 . 2.754  109 6 100 12 sus 0.00900 . 2.754  111 7 50 12 sus 0.02600 . 18.214  111 7 50 12 sus 0.02600 . 15.773  112 8 0 12 sus 0.026001.314  113 8 0 12 sus 0.004001.314	94	<u> </u>	25	12		D.03800	,	26.351
97 . 200 12 . 0.24300 . 193.154  98 1 0 12 sur 0.004001.314  99 1 0 12 sur 0.006002.128  100 2 50 12 sur 0.01600 . 3.6566  101 2 50 12 sur 0.01500 . 7.636  102 3 50 12 sur 0.01500 . 32.860  103 3 50 12 sur 0.01500 . 32.860  104 4 100 12 sur 0.01900 . 3.568  105 4 100 12 sur 0.01900 . 3.668  106 5 100 12 sur 0.01100 . 89.004  107 5 100 12 sur 0.01100 . 4.382  107 5 100 12 sur 0.0100 . 87.376  108 6 100 12 sur 0.00900 . 2.754  109 6 100 12 sur 0.00900 . 84.122  110 7 50 12 sur 0.02800 . 18.214  111 7 50 12 sur 0.02600 . 15.773  112 8 0 12 sur 0.004001.314  113 8 0 12 sur 0.004001.314	95	ļ.	50	12	·	0.06500		48,320
98 1 0 12 sur 0.004001.314  99 1 0 12 sur 0.004002.128  100 2 50 12 sur 0.01600 . 8.450  101 2 50 12 sur 0.01500 . 7.636  102 3 50 12 sur 0.01500 . 32.860  103 3 50 12 sur 0.01500 . 32.860  104 4 100 12 sur 0.01900 . 3.568  105 4 100 12 sur 0.01900 . 89.004  106 5 100 12 sur 0.01100 . 89.004  107 5 100 12 sur 0.01100 . 4.382  107 5 100 12 sur 0.0100 . 87.376  108 6 100 12 sur 0.00900 . 2.754  109 6 100 12 sur 0.00900 . 84.122  110 7 50 12 sur 0.02800 . 18.214  111 7 50 12 sur 0.02600 . 15.773  112 8 0 12 sur 0.004001.314  113 8 0 12 sur 0.004001.314	96	·	100	12		0.12700		98.768
99 1 0 12 sus 0.003002.128 100 2 50 12 sur 0.01600 . 8.450 101 2 50 12 sus 0.05300 . 38.556 102 3 50 12 sus 0.05300 . 32.860 103 3 50 12 sus 0.04600 . 32.860 104 4 100 12 sus 0.04600 . 35.868 105 4 100 12 sus 0.11600 . 89.004 106 5 100 12 sus 0.11600 . 89.004 107 5 100 12 sus 0.11600 . 87.376 108 6 100 12 sus 0.11330 . 87.376 108 6 100 12 sus 0.10900 . 2.754 109 6 100 12 sus 0.10900 . 84.122 110 7 50 12 sus 0.02800 . 18.214 111 7 50 12 sus 0.02600 . 15.773 112 8 0 12 sus 0.004001.314	97		200	12		0.24300		193.154
100   2   50   12   sur   0.01600   8.4800   101   2   50   12   sus   0.05300     38.556   102   3   50   12   sur   0.01500     7.636   103   3   50   12   sur   0.01500     32.860     32.860     32.860     32.860     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.68     35.6	98	1	0	12	sur	0.00400		-1.314
101   2   50   12   Sus   0.05300   38.556   102   3   50   12   Sur   0.01500   .   7.636   103   3   50   12   Sur   0.01500   .   32.860   104   4   100   12   Sur   0.01000   .   3.568   105   4   100   12   Sur   0.01000   .   89.004   106   5   100   12   Sur   0.01100   .   89.004   4.382   107   5   100   12   Sur   0.01100   .   87.376   108   6   100   12   Sur   0.0900   .   2.754   109   6   100   12   Sur   0.0900   .   84.122   110   7   50   12   Sur   0.02800   .   18.214   111   7   50   12   Sur   0.02600   .   15.773   112   8   0   12   Sur   0.00400   .   -1.314   113   8   0   12   Sur   0.00400   .   -1.314   114   9   0   12   Sur   0.00400   .   -1.314   114   9   0   12   Sur   0.00400   .   -1.314   114   114   9   0   12   Sur   0.00400   .   -1.314   114   114   115   115   Sur   0.00400   .   -1.314   114   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   1	99	1	0	12	sus	0.00300		-2.128
102         3         50         12         sur         0.01500         .         7.636           103         3         50         12         sus         0.04600         .         32.860           104         4         100         12         sur         0.01000         .         3.568           105         4         100         12         sur         0.11500         .         89.004           106         5         100         12         sur         0.01100         .         4.382           107         5         100         12         sur         0.00900         .         2.754           108         6         100         12         sur         0.00900         .         84.122           110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sur         0.00400         .         -1.314           113         8         0         12         sur         0.00400         .         -1.314           114         9         0         12         sur         0.00400         . <td< td=""><td>100</td><td>2</td><td>50</td><td>12</td><td>sur</td><td>0.01600</td><td></td><td>8.450</td></td<>	100	2	50	12	sur	0.01600		8.450
103         3         60         12         sus         0.04600         .         32.860           104         4         100         12         sur         0.01000         .         35.868           105         4         100         12         sur         0.01000         .         89.004           106         5         100         12         sur         0.01100         .         4.382           107         5         100         12         sur         0.01390         .         87.376           108         6         100         12         sur         0.00900         .         2.754           109         6         100         12         sur         0.00900         .         84.122           110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sur         0.00400         .         -1.314           113         8         0         12         sur         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .	101	2	50	12	sus	0.05300		38.556
104         4         100         12         sur         0.01000         .         3.568           105         4         100         12         sus         0.11500         .         89.004           106         5         100         12         sur         0.01100         .         4.382           107         5         100         12         sus         0.11300         .         87.376           108         6         100         12         sus         0.0990         .         2.754           109         6         100         12         sus         0.10900         .         84.122           110         7         50         12         sus         0.02800         .         18.214           111         7         50         12         sus         0.02500         .         15.773           112         8         0         12         sus         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314	102	3	50	12	.sur	0.01500	,	7.636
105 4 10C 12 sus 0.11500 . 89.004 106 5 100 12 sur 0.01100 . 4.382 107 5 100 12 sus 0.11300 . 87.376 108 6 100 12 sur 0.00900 . 2.754 109 6 100 12 sus 0.10900 . 84.122 110 7 50 12 sur 0.02800 . 18.214 111 7 50 12 sus 0.02600 . 15.773 112 8 0 12 sur 0.004001.314 113 8 0 12 sur 0.004001.314	103	3	50	12	sus	0.04600	-	32.860
106         5         100         12         sur         0.01100         .         4.362           107         5         100         12         sus         0.11300         .         87.376           108         6         100         12         sur         0.00900         .         2.754           100         6         100         12         sus         0.10900         .         84.122           110         7         50         12         sus         0.02800         .         18.214           111         7         50         12         sus         0.02500         .         15.773           112         8         0         12         sus         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	104	4	100	12	SUIT	0.01000		3,568
107         5         100         12         sus         0.11300         .         87.376           108         6         100         12         sur         0.00900         .         2.754           100         6         100         12         sus         0.10900         .         84.122           110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sus         0.02500         .         15.773           112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	105	4	100	12	sus	0.11500		89.004
108         6         100         12         sur         0.00900         .         2.754           109         6         100         12         sus         0.10900         .         84.122           110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sus         0.02600         .         15.773           112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	106	5	100	12	sur	0.01100		4.382
109         6         100         12         sus         0.10900         .         84.122           110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sus         0.02600         .         15.773           112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	107	5	100	12	sus	0.11300		87.376
110         7         50         12         sur         0.02800         .         18.214           111         7         50         12         sus         0.02600         .         15.773           112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	108	6	100	12	sur	0.00900		2.754
111         7         50         12         sus         0.02500         .         15.773           112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	109	6	100	12	sus	0.10900		84.122
112         8         0         12         sur         0.00400         .         -1.314           113         8         0         12         sus         0.00400         .         -1.314           114         9         0         12         sur         0.00400         .         -1.314	110	7	50	12	sur	0.02800	•	18.214
113 8 0 12 sus 0.004001.314 114 9 0 12 sur 0.004001.314	111	7	50	12	sus	0.02500		15,773
114 9 : 0 12 sur 0.004001.314	112	8	0	12	sur	0.00400		-1.314
	113	8	0	12	SUS	0.00400		-1.314
115 9 0 12 sus 0.00400 -1.314	114	9 :	D.	12	sur	0.00400	اً ,	-1.314
	115	9	0	12	sus	0.00400		-1.314

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Mean treatment concentration by treatment tank and sampling location (surface/suspended) for all sampling times

The MEANS Procedure

tank=' 'loc=' '

Analysis Variable : prodicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean			
			,		

#### tank=1 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
-2.6159	1.3615	-4.3064	-0.9253		

#### tank≃1 loc≔sus

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
-2.9413	0.9965	-4.1787	-1.7040		

#### tank=2 loc≔sur

Analysis Variable : prodicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
2.9171	4.3590	-2.4954	8.3296		

#### tank=2 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
42.1361	8.0878	32,0938	52.1784		

#### tank=3 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
0.9643	4.7235	-4.9007	6.8293		

#### tank=3 loc≔sus

Analysis Variable : predicted_ppm Predicted

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	Value of conc				
Mean	Std Dev	. Lower 95% CL for Mean	Upper 95% CL for Mean		
39.478	7.0037	30.7819	48,1743		

#### tank=4 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
 -0.1749	3.0769	-3.9954	3,6457		

#### tank=4 loc=sus

Analysis	Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dav	Lower 95% CL for Mean	Upper 95% CL for Mean			
97.8455	9.0943	86.5534	109.1			

#### tank≃5 loc≃sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-0.0121	3.8424	-4.7831	4.7588	

#### tank=5 loc≃sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
94.0483	6.7196	85.7049	102.4	

#### tank=6 loc≔sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-0.3376	2.1833	-3.0485	2.3733	

#### tank≃6 loc=sus

Analysis Variable : predicted_ppm Predicted Value of cone				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
86.8880	4.0927	81.8063	91.9698	

#### tank=7 loc≃sur

Analysis Variable : predicted_ppm Predicted

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L	Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
5.0326	8.9208	-6.0439	16.1092		

#### tank=7 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Uppor 95% CL for Mean	
34.7045	12.3807	19.3319	50.0772	

#### tank=8 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.7786	1.2069	-4.2771	-1,2801	

#### tank≔8 loc≔sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
2.6159	1.4781	-4.4512	-0.7806	

#### tank=9 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dov	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.6159	1.2340	-4.1481	-1.0837	

#### tank=9 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.6159	0.9277	-3,7678	-1.4639	

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#### Mean treatment concentration by treatment group and sampling location for all sampling times

The MEANS Procedure

thero=. loc=' '

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Uppor 95% CL for Mean		

#### thero=0 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.6701	1.1778	-3.3224	-2.0179	

#### therc=0 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dav	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.7244	1.0859	-3.3257	-2,1230	

#### thero=50 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
2.9713	6,1236	-0.4198	6.3625	

#### thero≈50 loc≈sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Sid Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
38,7729	9,3074	33.6187	43.9272	

#### thero=100 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-0.1749	2,8817	-1.7707	1.4210	

#### thero=100 loc=sus

-				
	Analysis Variable : predicted_	ppm	Predicte	ed
	Value of conc			

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SAS Output

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
92.9273	7.9843	88.5168	97.3378

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## Mean treatment concentration for each treatment group for each sampling time

The MEANS Procedure

thero=. time=. loc=' '

Analysis Varlable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		

#### thero=0 time=1 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
-2.6701	0.4698	-3,8371	-1.5031		

#### thero=0 time=1 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-3.2126	0.4698	-4.3795	-2.0456	

#### thero=0 time=3 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.9413	0			

#### thero=0 time=3 loc=sus

Analysis	Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean			
-2.3989	0.4698	-3.5659	-1.2319			

#### thero=0 time=6 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-4.5687	0		,	

#### thero=0 time=6 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-4.2975	0.4698	-5.4644	-3,1305

#### thero=0 time=9 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-1.8564	0,4698	-3.0234	-0.6895	

#### thero=0 time=9 foc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.1277	0.8137	-4.1489	-0.1064	

#### thero=0 time=12 loc=sur

Analysis	Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
-1.3140	0	,			

#### thero=0 time=12 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-1.5852	0.4698	-2,7522	-0.4182	

## thero=50 time=1 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
-2.6701	1.2429	-5.7577	0.4174	

#### thero=50 time=1 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
52.3883	3.5467	43.5778	61.1989	

#### thero=50 time=3 loc=sur

Analysis	Variable : pre	dicted	ppm P	redicted	
Value of conc					

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	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
ĺ	-1.8564	0,9395	-1.1904	0.4775

#### thero=50 time=3 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
39.8216	0.4143	38.7925	40.8508		

#### thero=50 time=6 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
1.3982	1.2429	-1.6893	4.4858		

#### thero=50 time=6 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
35.1204	1.5892	31,1726	39.0683	

#### thero=50 time=9 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
6.5515	3.2884	-1.6174	14.7204	

#### thero=50 time=9 loc=sus

Analysis Variable : prodicted_ppm Predicted Value of conc				
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
37.4710	2.6156	30.9735	43.9685	

#### thero=50 time=12 loc=sur

Analysis Variable : predicted_ppm Predicted Value of conc					
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean		
11.4335	5.8862	-3.1887	26.0558		

#### thero=50 time=12 loc=sus

Analysis Variable ; predicted_ppm Predicted Value of conc						
		1			r	

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
29.0631	11.8566	-0.3902	58.5164

#### thero≃100 time=1 loc=sur

Analysi	pm Predicted		
Mean	Std Dav	Lower 95% CL for Mean	Uppor 95% CL for Moan
-1.5852	0.4698	-2.7522	-0.4182

#### thero=100 time=1 loc=sus

Analys	pm Predicted		
Меап	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
102.8	10.1953	77.5095	128.2

#### thero=100 time=3 loc=sur

Analysi	s Variable Va	: predicted_p alue of conc	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-3.2126	1,2429	-6.3001	-0.1250

#### thero=100 time=3 loc≃sus

Analysis	Variable : predicted_ppm Predicted Value of conc			
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean	
94,1568	5.2312	B1.1619	107.2	

#### thero=100 time=6 loc=sur

Analysi		: predicted_p	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
-2.1277	0		

#### thero=100 time=6 loc=sus

Analysi	pm Predicted		
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
87.6475	5.4177	74.1892	101.1

#### thero=100 time=9 loc=sur

: Value of conc	

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Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
2.4831	1,2429	-0.6044	5.5707

#### thero=100 time=9 loc=sus

Analysis		: predicted_p	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
93.1623	5.4807	79.5476	106.8

#### thero=100 time=12 loc=sur

Analys	is Variable V	: predicted_p alue of conc	pm Predicted
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
3.5680	0.8137	1.5468	5.5893

#### thero=100 time=12 loc=sus

Analysis Variable : predicted_ppm Predicted Value of conc							
Mean	SId Dev	Lower 95% CL for Mean	Upper 95% CL for Mean				
86.8338	2.4858	80.6587	93.0089				

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#### Mean concentration for standard checks for all sampling times

The MEANS Procedure

#### thero=25

Analysis Variable : predicted_ppm Predicted Value of conc								
Moan	Std Dev	Lower 95% CL for Mean						
25.8084	0.4698	24.6414	26.9754					

#### thero≃50

Analysis Varlable : predicted_ppm Predicted Value of conc								
Mean	Std Dev	Lower 95% CL for Mean						
48.8624	0.4698	47.6955	50.0294					

#### thero=100

Analysis Variable : predicted_ppm Predicted Value of conc								
Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean					
95.5130	5.6373	81.5092	109.5					

#### thero=200

Analysis Variable : predicted_ppm Predicted Value of conc								
Mean	Std Dov	Lower 95% CL for Mean	Upper 95% CL for Mean					
194.2	1.8791	189.6	198.9					

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# Appendix 8. Survival Assessment Summary

Item Number	Item Description	Number of Pages	Report Page Number
1	Zebra Mussel Survival on Artificial Substrate – Lake Carlos – Whole Tank – Data Summary	2	437
2	Zebra Mussel Survival on Artificial Substrate – Lake Shawano – Whole Tank – Data Summary	2	439
3	Zebra Mussel Survival on Artificial Substrate – Lake Carlos – Bottom Injection –Data Summary	2	441
4	Zebra Mussel Survival on Artificial Substrate – Lake Shawano – Bottom Injection – Data Summary	2	443
5	Zebra Mussel Survival on Artificial Substrate – All Exposures – Data Summary	6	445

Study Number: AEH-12-PSEUOO-04	Action	Date	Initials
Electronic Lab Notebook (pages 29)	Created	28-Oct-13	KLW 17
Data Source: File Folder: 9d	Revised	4-Mar-14	TJS ·TD·S
Forms: "Zebra Mussel Survival"	Reviewed Certified	YMARIY	115
	(	-1-11-1	<u></u>
Flie Name: See filonomes as stated below			

#### Zebra Mussel Survival on Artificial Substrate

Test Article: MBI 401 SDP {Pseudomonas fluorescens Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 15, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Whole Tank

Data Explanation;
Each tank replicate contained 9 perforated aluminum trays (*15.2 cm x 15.2 cm with 2.5 cm sides) with attached zebra mussels enclosed in a mesh containment as (*20.3 x 25.4 x 5.1 cm; 0.31 x 0.31 cm openings). Each substrate contained a minimum of 50 adhering zebra mussels prior to treatment. Aluminum trays were coded with tags according to treatment type (W = winde water body, B = bottom injection; tank number 1-9, row letter A, B, C; position number 1-3). Example code of W 1A3 = whole water body (tank) treatment, Tank 1, Row A, position 3. The tanks are numbered 1-9; the rows are in order from the front of the tank (siel) to the rear of the tank (wall) (A = sie; B = middle, C = wall); the position is from left to right in order (1 = left; 2 = center; B = right). The relative terms consolidated that with mesh boycles cases with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg case with 1.5 amplifyed they period neg cases with 1.5 amplifyed they period neg case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 amplifyed they are set of the case with 1.5 were removed after 6, 9 and 12 h of exposure. The substrates were consolidated into wire mesh holding cages with 1 sampling time period per cage and the treatment levels indiscriminately distributed. The wire mesh holding cages were held in the lake until survival assessments were completed at 28 days postdasing termination.

Survival Data Filename:

I:\AEH-12-PSEUDO-04\Data Summarles\(Lake Carlos Survival (Whole Tank).xlsx)Survival Data

Data anomalies and deviations; NONE

File Folder: 9d

Item Number__

Study Number; AEI+12-PSEUDO-04 Electronic Lab Note 200k (pages 29) Data Source: File Folder: 9d Forms: "Zebra Mussel Surviva!" Test Article: M81 401 SDP [P/-CL 145A (SDP)]
Article Lot 8: 403P12163C and 4C1P12164C MIx
Exposure Date: August 15, 2012
Test Location: Lake Carlos, Alexandria, MN
Treatment type: Whole Tank

#### Zebra Mussel Survival on Artificial Substrate

Treatment		6 hour S	ample Time		1	9 hour S	ample Time		1	12 hour S	ample Time	
Level	Sample	Total Number	Number	Number	5ample	Total Number	Number	Number	Sample	Total Number	Number	Number
(mg/L)	JD.	of Animals	Alive	Dead	ID	of Animals	Alive	Dead	ΙĎ	of Animals	Alive	Dead
	W2A1	339	337	2	W2A3	326	320	6	W2A2	390	374	16
	W2B2	237	227	10	W285	236	230	6	W2B1	185	181	4
1	WZC1	168	165	3	W2C3	226	220	6	W2C2	198	190	8
i .	W3A1	328	<b>30</b> S	23	W3A5	178	171	7	W3A2	185	180	5
0	W3B1	255	252	3	W3B3	213	211	2	W3B2	312	304	8
	W303	310	304	6	W3C2	214	203	11	W3C1	259	254	S
	W5A1	269	264	5	W5A3	177	175	2	W5A2	240	238	2
	W582	173	171	2	W583	192	185	7	W5B1	196	190	6
	W5C1	175	175	0	W5C3	173	152	11	W5C2	212	206	6
	W1A2	280	6	274	WIA1	164	3	161	W1C2	175	0	175
	W1A3	149	0	149	W181	128	5	123	W183	160	1	159
1	W182	232	4	228	W1C1	267	0	267	W1C3	266	C	266
	W4B2	214	4	210	W4A1	221	0	221	W4A2	158	3	155
50	W4C1	191	э	191	W4A3	375	0	375	W4B1	280	3	27/
	W4C2	175	4	171	W483	765	4	261	W4C3	455	2	453
	W881	208	5	203	EV8M	131	4	127	W8A1	151	1	150
	W682	178	1	177	WBC1	169	0	169	W8A2	119	0	119
	W8B3	248	1	247	WBC3	180	0	180	M8C5	290	3	287
	W6A2	257	7	250	W6B2	188	1	187	W6A1	239	3	236
	EA9W	235	8	227	W6B3	183	2	181	W681	249	1	246
	W6C3	267	3	264	W6C1	176	0	176	W6C2	155	2	153
	W/7A1	212	2	210	W7A3	258	3	255	W7A2	237	1	236
100	W782	266	10	256	W7B3	193	O	193	W7B1	286	0	286
	W7C1	269	2	267	W/C3	158	3	155	W7C2	203	0	203
1 :	W9A1	283	8	275	W9A3	393	1	392	W9A2	315	0	316
l i	W9B2	190	2 .	188	W9B3	128	0	128	W9B1	273	S	26B
	W9C1	324	7	317	W9C3	260	0	260	W9C2	156	. 1	155

File Folder: 9d

hem Number | Page 2 of 2

Study Number: AEH-12-PSEUDO-04 Created...... 28-Oct-13 KLW TS
Revised..... 4-Mar-14 TJS TS
Reviewed... 4Mar-14 TJS TS Electronic Lab Notebook (pages 29) Data Source: File Folder: 11d Revised.... Forms: "Zebra Mussel Survival" Reviewed... 400 ARI4 File Name: See filenames as stated below

#### Zebra Mussel Survival on Artificial Substrate

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, WI Treatment Type: Whole Tank

Data Explanation:
Each tank replicate contained 9 perforated aluminum trays (~15.2 cm x 15.2 cm with 2.5 cm sides) with attached zebra mussels enclosed in a mesh containment bag (*20.3 x 25.4 x 5.1 cm; 0.31 x 0.31 cm openings). Each substrate contained a minimum of 50 adhering zebra mussels prior to treatment. Aluminum trays were coded with tags according to treatment type (W = whole water body, B = bottom injection; tank number 1-9, row letter A, B, C; position number 1-3). Example code of W 1A3 = whole water body (tank) treatment, Tank 1, Row A, position 3. The tanks are numbered 1-9; the rows are in order from the front of the tank (Isle) to the rear of the tank (wall) (A = isle; B = middle; C = wall); the position is from left to right in order (1 = left; 2 = center; 3 = right). Three trays were removed after 6, 9 and 12 h of exposure. The substrates were consolidated into wire mesh holding cages with 1 sampling time period per cage and the treatment levels indiscriminately distributed. The wire mesh holding cages were held in the lake until survival assessments were completed at

Survival Data Filename:

I:\AEH-12-PSEUDO-04\Data Summarles\[Lake Shawano Survival (Whole Tank).xlsx|Survival Data

Data anomalies and deviations:

File Folder: __ \d

Item Number_

Study Number: AEII-12-PSEUDO-04 Electronic Lab Notebook (peges 29) Deta Source: File Folder: 11d Forms: "Zebro Mussel Survival" Tesl Article: MBI 401 SDP [P/-CL 145A (SDP)] Article Lot #: 401P12363C and 401P12].54C Mic Exposure Date: September 6, 2012 Test Location: Lake Shawano, Shawano, Wi Treatment Type: Whole Tank

#### Zebra Mussel Survival on Artificial Substrate

Treatment		6 hour S	anıple Time			9 hour S	ample Time			12 hour 5	iample Time	
Level	Sample	Tota Number	Number	Number	Sample	Total Number	Number	Number	Sample	Total Number	Nunsber	Number
(mg/L)	ID.	of Animals	Alive	Dead	ID	of Animais	Alive	Dead	10	of Animals	Alive	Ocad
	W1A1	109	165	4	W1A3	159	150	9	W1A2	101	96	5
	W181	118	111	7	W183	84	B2	2	W1C2	108	102	6
	W182	87	85	2	Wici	144	135	6	W1C3	131	106	5
	W4A1	64	61	3	W4A3	110	103	7	W4B3	79	76	3
0	W4A2	74	67	7	W4B2	75	72	3	W4C2	81	77	4
	W481	78	74	4	W4C1	71	69	2.	W4C3	141	137	4
	W7A1	124	122	2	W7A3	54	52	2	W7A2	92	90	2
	W7B1	80	78	2	W7B2	108	102	6	W7B3	104	LD2	2
	W7C1	108	103	5	W7C3	111	105	6	W7C2	90	87	3
	W2A1	108	17	91	W2A3	114	26	88	W2A2	98	1	97
	W2B1	116	10	106	W2B2	103	9	94	W2B3	85	5	80
	W2C1	61	4	57	W2C3	117	5	112	W2C2	86	0	86
	WSA1	95	8	87	W5A3	61	2	59	W5A2	60	0	6D
50	W581	67	8	59	W582	105	22	83	W583	63	5	58
	W5C1	85	14	71	W5C3	80	19	61	WSC2	114	2	112
	W8A3	96	5	91	WBA1	148	2	146	W8A2	76	3	73
	W8B3	149	57	92	W881	85	5	80	W8B2	88	3	85
	WBC1	136	3	133	W8C2	61	1	60	WBC3	129	1	128
	W3A1	138	27	111	W3B1	51	2	49	W3A2	95	1	94
	W362	122	8	114	W3C2	73	4	69	EVEM.	131	6	125
	W3B3	104	9	95	W3C3	88	0	88	W3C1	104	1	103
400	W6A1	69	0	69	W6B1	59	0	59	W6B3	77	0	77,
100	WEAZ	124	3	121	W6B2	94	13	81	W6C1	62	3	59
	W6A3	57	3	54	Mecs	94	0	94	W6C3	102	1	101
	W9A1	77	2	75	W9A3	107	14	93	W9A2	104	D	104
!	W9B1	119	4	115	W932	59	6	69	W9B3	102	2	100
	W9C1	118	19	99	W9C3	123	7	115	W9C2	60	2	58

File Folder: \\d

#### Zebra Mussel Survival on Artificial Substrate

Test Article: MBI 401 SDP [Pseudomonas fluorescens 8] - CL 145A (SDPI) Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: August 17, 2012 Test Location: Lake Carlos, Alexandria, MN Treatment Type: Bottom Injection

#### Data Explanation:

Each tank replicate contained 3 perforated aluminum trays (*15.2 cm x 15.2 cm with 2.5 cm sides) with attached zebra mussels enclosed in a mesh containment beg (*20.3 x 25.4 x 5.1 cm; 0.31 x 0.31 cm openings). Each substrate contained a minimum of 50 adhering zebra mussels prior to treatment. Aluminum trays were coded with tags according to treatment type (W = whole water body, B = bottom injection; tank number 1-9, row letter A, B, C; position number 1-3). Example code of W 1A3 = whole water body (tank) treatment, Tank 1, Row A, osition 3. The tanks are numbered 1-9; the rows are in order from the front of the tank (Isle) to the rear of the tank (wall) (A = isle; B = middle; C = wall); the position is from left to right in order (1 = left; 2 = center; 3 = right). All substrates were removed after 12 h of exposure. The substrates were consolidated into a wire mesh holding cage with the treatment levels indiscriminately distributed. The wire mesh holding cages were held in the lake until survival assessments were completed at 27 days post-dosing termination.

Survival Data Filename:

!:\AEH-12-P5EUDO-04\Data Summarles\(Lake Carlos Survival [Bottom Injection).xlsx)Survival Data

Data anomalies and deviations: NONE

File Folder: 12

Item Number | | Page | of 2

Study Mumber: ABH-12-PSEUDO-04 Electronic Lab Notebook (pages 29) Data Source: Fije Folder: 12d Forms "Zebra Mussel Suvyival"

Test Article: MBI 401 SDP (9'-CL 145A (SDP))
Article Lot #: 401P12163C and 401P12164C Mix
Exposure Date: August 17, 2012
Test location: Lake Carlos, Alexandria, MV
Treatment Type: Bottom Injection

## Zebra Mussel Survival on Artificial Substrate

Treatment Level		Total Number	Number	Number
(mg/L)	1D	of Antmals	Altva	Dead
	BBAB	196	192	4
	B3B1	242	237	5
	B3C3	253	246	7
	B6A2	186	182	4
0	6681	21/	206	11
	86C1	179	175	4
	87A1	225	221	4
	8783	176	167	9
	B7CL	276	273	3
	BIAL	210	52	158
	B1B2	510	R6	424
	B1B3	279	62	217
i	B4B1	188	10	178
50	B4B2	256	65	191
	B4B3	188	14	174
	B8A3	282	50	232
	6883	291	69	227
	BBC2	200	99	161
	B2A1	279	18	261
	8233	153	21	132
	B2C1	193	39	154
	05A1	329	112	217
100	95B3	393	121	272
	BSC1	264	55	209
	B9A',	269	13	256
	B983	179	40	139
[	B9C1	283	25	263

Study Number: AEH-12-PSEUDO-04 Electronic Lab Notebook (pages 29 - 30) Data Source: File Folder: 14d Forms: "Zebra Mussel Survival"

Action	Date	Initials
Created	28-Oct-13	KLW TIS
Revised	4-Mar-14	TJS TK
Reviewed	4MARIY	"7 <b>3</b> 5
Certified	3/4/14	JAL
	,,	

File Name: See filenames as stated below

#### Zebra Mussel Survival on Artificial Substrate

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf-CL 145A (SDP)] Article Lot #: 401P12163C and 401P12164C Mix Exposure Date: September 8, 2012 Test Location; Lake Shawano, Shawano, Wi Treatment Type: Bottom Injection

#### Data Explanation:

Each tank replicate contained 4 perforatec aluminum trays (*15.2 cm x 15.2 cm with 2.5 cm sides) with attacked zebra mussels enclosed in a mesh containment bag (~20.3 x 25.4 x 5.1 cm; 0.31 x 0.31 cm openings). Each substrate contained a minimum of 50 adhering zebra mussels prior to treatment. Aluminum trays were coded with tags according to treatment type (W = whole water body, 8 = bottom injection; tank number 1-9, now letter A, B, C; position number 1-3).

Example code of W 1A3 = whole water body (tank) treatment, Tank 1, Row A, position 3. The tanks are numbered 1-9; the rows are in order from the front of the tank (isle) to the rear of the tank (wall) (A = isle; B = middle; C = wall); the position is from left to right in order (1 = left; 2 = center; 3 = right). All substrates were removed after 12 h of exposure. The substrates were consolidated into a wire mesh holding cage with the treatment levels indiscriminately distributed. The wire mesh holding cages were held in the lake until survival assessments were completed at 32 days post-exposure termination.

Survival Data Filename:

I:\AEH-12-PSEUDO-04\Data Surrmarles\(Lake Shawano Survival (Bottom Injection).xlsx)Survival Data

Data anomalie<u>s and deviations:</u> NONE

File Folder: _ 14

Item Number______

Study Number: AEH-12-PSEUDO-04 Electronic Lab Motebook (pages 29 – 30) Date Source: File Folder; 14c Forms: "Zebra Mussel Sun/Na"

Test Article: M6I 401 SDP [P/-CL 145A (SDP)]
Article Let 1: 401P12363C and 401P12364C Mic
Exposure Date: September 8, 2012
Test Location: Lake Shawaro, Shawano, WI
Treatment Type: Bottom finjection

#### Zebra Mussel Survival on Artificial Substrate

Treatment Level		Total Number	Number	Number
(mg/L)	ID	of Animais	Alive	Dead
	B1A3	107	100	7
	B1C1	137	127	10
	B1C2	111	108	3
	B1C3	147	139	В
	BBA3	140	133	7
٥	8381	81	76	5
	B8B2	134	128	6
	B8B5	163	159	4
	B9A2	115	115	0
	09B1	84	80	4
	8982	87	85	2
	B9B3	137	127	10
	B2A2	119	4	115
	B2B1	105	3	102
	B282	116	2	114
	B283	145	S	140
	BBAZ	117	4	113
50	8381	144	В	136
	B382	103	D	103
	B3C2	109	2	107
	B7A2	115	2	113
	B781	128	4	124
	B7B2	116	3	113
	B7B3	109	6	103
	34A2	117	1	116
	0402	123	1	122
	94B3	126	2	124
	94C3	104	3	104
	B5A2	106	2	104
100	35B1	105	9	105
	35B2	97	0	97
	3583	108	0	108
	3682	121	2	119
	3683	113	0	113
į	36C2	127	1	126
	36C3	98	3	99

File Folder: 14d

Study Number: AEH-12-PSEJDO-04 Electronic Lab Notebook (pages 29-30) Created...... 14-Feb-13 TJS 775 Revised...... 4-Mar-14 TJS 775 Data Source: File Folder: 18 Forms: "Zebra Mussel Survival" Certified... 3/4/14 File Name: See filenames as stated below

#### Zebra Mussel Survival on Artificial Substrate

Test Article: MBI 401 SDP [Pseudomonas fluorescens Pf -CL 145A (SDP)] Article Lot #: 401P12163C and 401P121G4C Mix Exposure Date: August 15 and 17, and September 6 and 8, 2012
Test Locations: Lake Carlos, Alexandria, MN and Lake Shawano, Shawano, WI Treatment Type: Whole Tank and Bottom Injection

<u>Qata Explanation:</u>
Each tank replicate contained 3, 4, or 9 perforated aluminum trays (~15.2 cm x 15.2 cm with 2.5 cm sides), depending on lake and treatment type, with attached zebra mussels enclosed in a mesh containment bag (*20.3 x 25.4 x 5.1 cm; 0.31 x 0.31 cm openings). Each substrate contained a minimum of 50 adhering zebra mussels prior to treatment. Aluminum trays were coded with tags according to treatment type (W = whole water body, B = bottom injection; tank number 1-9, row letter A, B, C; position number 1-3). Example code of W 1A3 = whole water body (tank) treatment, Tank 1, Row A, position 3. The tanks are numbered 1-9; the rows are in order from the front of the tank (isle) to the rear of the tank (wall) (A = isle; B = midcle; C = wall); the position is from left to right in order (1 = left; 2 = center; 3 = right). For whole water body treatments, three trays were removed after 6, 9 and 12 h of exposure. The substrates were consolidated into wire mesh holding cages with 1 sampling time period per cage and the treatment levels indiscriminately distributed. The wire mesh holding cages were held in the lake until survival assessments were completed at 28 days post dosing termination.

#### Survival Data for SAS Filename:

I:\AEH-12-PSEUDO-04\Data Summaries\[All Exposures Survival Assessment.xlsx]Survival Data for SAS loc = Location LC = Lake Carlos

SL = Shawano take trt_typ = Treatment Group W f = Whole Tank

BI = Bottom Injection conc = Concentration

0 = contral 50 = 50 mg/L (A.I.) treatment: 100 = 100 mg/L (A.I.) treatment

time = Exposure Duration tak = Exposure Tank ID tray = Substrate IO tot = Total Number of Zebra Mussels dead = Number of Zebra Mussel Mortalities

<u>Data anomalies and deviations:</u> NONE

File Folder: 18 Item Number_

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					b.		
loc	trt_typ	conc	time	tnk	tray	tot	dead
LC	WT	100	6	7	B2	266	256
l.C	WT	100	6	9	B2	190	188
LC	WT	50	6	1.	A3	149	149
LC	WT	0	6	5	C <b>1</b>	175	0
LC	WT	0	6	2	C1	168	3
I.C	WT	100	6	6	C3	267	264
l.C	WT	0	6	2	B2	237	10
LC	WT	100	6	7	A1	212	210
LC	WT	0	6	3	A1	328	23
LC	WT	100	6	6	A3	235	227
LC	WT	50	6	4	C2	<b>17</b> 5	171
LC	WT	0	6	5	B2	173	2
LC	WT	0	6	3	<b>B1</b>	255	3
LC	WT	50	6	8	81	208	203
LC	WT	50	6	1	A2	280	274
I.C	WT	100	6	6	A2	257	250
LC	WT	0	6	2	A1	339	2
LC	WT	50	6	8	B2	178	177
LC	WT	100	6	9	C1	324	317
LC	WΤ	100	6	7	C1	269	267
LC	WT	50	6	4	B2	214	210
LC	WT	50	6	1	B2	232	228
LC	WT	0	. 6	5	A1	259	5
LC	WT	0	6	3	C3	310	.6
LC	WT	50	5	4	C1	191	191
LC	WT	100	6	9	A1	283	275
LC	WT	50	6	8	В3	248	247
LC	WT	0	9	5	83	192	7
l.C	WT	0	9	3	А3	178	7
LC	WT	0	9	5	C3	173	11
LC	WT	50	9	4	В3	265	261
LC	WT	50	9	4	A3	375	375
LC	WT	100	9	6	B2	188	187
LC	WT	0	9	2	C3	226	6
LC	WΤ	100	9	7	В3	193	193
LC	WT	0	9	3	В3	213	2
LC	WT	50	9	8	C1	169	169
LC	WŢ	50	9	1.	A1	164	161
LC	WT	100	9	7	C3	158	155
LC	WΤ	50	9	4	A1	221	221
LC	WT	0	9	3	C2	214	11
LC	WŢ	50	9	8	C3	180	180
l.C	WΤ	100	9	6	C <b>1</b>	176	<b>1</b> 76
LC	WΤ	50	9	8	A3	131	127
LC	WT	100	9	9	A3	393	392
LC	$\mathbf{w}_{\perp}$	100	9	9	33	128	128
Ł <b>C</b>	WT	100	9	6	83	183	181
I.C	WT	50	9	1	31	128	123

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					AEH-12-PSEUDO-0		
LC	WT	100	9	9	C3	260	260
LC	WT	0	9	2	В3	236	6
LC	WT	0	9	5	A3	177	2
LC	WT	100	9	7	A3	258	255
LC	WT	0	9	2	A3	326	6
LC	WT	50	9	1	C1	267	267
LC	WT	0	12	3	B2	312	8
LC	WT	0	12	3	A2	185	5
LC	WT	100	12	6	B1	249	248
LC	WT	50	12	1	C3	266	266
LC	WT	100	12	6	A1	239	236
LC	WT	0	12.	2	A2	390	16
LC	WT	50	12	1	C2	175	175
LC	WT	50	12	1	В3	160	159
LC	WT	0	12	3	C1	259	5
LC	WT	0	12	2	B1	185	4
LC	WT	50	12	8	C2	290	287
LC	· WT	100	12	9	A2	316	316
LC	WT	0	12	2	C2	198	8
LC	WT	100	12	7	A2	237	236
LC	WT	50	12	8	A2	119	119
LC	WT	100	12	9	В1	273	268
LC	WT	50	12	8	A1	151	150
LC	WT	0	12	5	A2	240	2
LC	WT	0	12	5	C2	212	6
LC	WT	· 100	12	7	B1	286	286
LC	WT	0	12	5	B1	196	6
LC	WT	50	12	4	A2	158	155
LC	WT	100	12	7	C2	203	203
LC	WT	100	12	9	C2	156	155
LC	WT	50	12	4	C3	455	453
LC	WT	50	12	4	B1	280	277
LC	WT	100	12	6	C2	155	153
LC	BI	100	12	9	A1	269	256
LC	ВІ	50	12	4	B2	256	191
L.C	ВІ	100	12	9	B3	179	139
I.C	ы	100	12	2	В3	1.53	132
LC	ВІ	50	12	1	В3	279	217
LC	ВІ	0	12	6	C1	1.79	4
LC	BJ	50	12	8	C2	200	161
IC	BI	0	12	7	A1	2.25	4
LC	ВІ	50	12	1	B2	510	424
LC	ВІ	50	12	4	B1	188	178
LC	BI	100	12	2	C1	193	154
I.C	BI	100	12	9	C1	2.88	263
LC	BI	0	12	3	C3	253	7
LC	ВІ	50	12	4	В3	188	174
LC	BI	50	12	8	В3	291	222
I.C	BI	100	12	5	A1	329	217

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					ÄEH	ÃEH-12-PSEUDO-04		
LC	ВІ	0	12	7	В3	176	9	
LC	ВІ	0	12	3	B1	242	5	
LC	BI	0	12	6	B1	217	11	
LC	BI	100	12	5	В3	393	272	
LC	BI	0	12	6	A2	186	4	
LC	Bſ	50	12	8	A3	282	<b>2</b> 32	
LC	ВІ	0	12	3	A3	196	4	
LC	ВІ	50	12	1	A1	210	158	
LC	BI	0	1.2	7	C1	276	3	
LC	ы	100	12	2	A1.	279	261	
LC	Bl	100	12	5	C1	264	209	
SL	WT	50	6	8	C1	136	1.33	
SL	WT	0	6	7	B1	80	2	
SL	WT	100	6	9	A1	77	75	
SL	WT	0	6	1	A1	109	4	
SL	WT	0	6	1	B2	87	2	
SL	WT	0	6	7	C1	108	5	
SL	WT	100	6	6	A3	57	54	
SL	WT	100	6	9	C1	118	99	
SL	WT	1.00	6	3	В3	104	95	
SL	WT	50	6	8	A3	96	91	
SL	WT	100	6	3	B2	122	114	
SL	WT	100	6	6	A2	124	121	
SL	WT	50	6	2	A1	108	91	
SL	WT	0	6	1	B1	118	7	
Sī.	WT WT	50 100	6 6	5 <b>3</b>	B1	67	59	
SL SL	WT	100	6	3 9	A1 B1	138	111	
SL	WT	0	6	4	A1	119 64	115 3	
SL	WT	50	6	2	B1	116	3 106	
SL	WT	0	6	7	A1	124	2	
SL	WT	100	6	6	A1	69	69	
SI.	WT	50	6	5	C1	85	71	
SL.	WT	50	6	2	C1	61	57	
SI.	WT	0	6	4	B1	78	4	
SI.	WT	0	6	4	A2	74	7	
SL	WT	50	6	5	A1	95	87	
SL	WT	50	6	8	В3	149	92	
SL	WT	100	9	3	B1	51	49	
SL	WT	50	9	8	C2	61	60	
SL	WT	100	9	3	C2	73	69	
SL	WT	0	9	4	C1	71	2	
SL	WT	0	9	1	B3	84	2	
SL	TW	0	9	1	A3	159	9	
SL	WT	50	9	8	A1	148	146	
SL	WT	D	9	7	B2	108	6	
SL	WT	50	9	2	C3	117	112	
SL	TW	100	9	9	C3	123	116	
SL	WT	0	9	7	A3	54	2	

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					4	EH-12-PSE	UDO-04
\$L	WT	0	9	7	C3	1 <b>1</b> 1	6
SL.	WT	50	9	8	B1	85	80
SL	WT	50	9	5	A3	61	59
SL	WT	100	9	3	C3	88	88
SL	WT	50	9	2	B2	103	94
SL	WT	100	9	9	A3	107	93
SI.	WT	100	9	6	B1	59	59
SL	WT	50	9	5	C3	80	61
SŁ	WT	100	9	9	B2	69	69
SL	WT	50	9	2	A3	114	88
SL	WT	100	9	6	C2	94	94
SL	WT	. 0	9	4	B2	75	3
SŁ	WT	100	9	6	В2	94	81
SL	WT	50	9	5	B2	105	83
\$L	WT	0	9	4	A3	110	7
51.	WT	0	9	1	C1	144	6
SL	WT	100	12	6	C1	62	59
SL	WT	100	12	3	A3	131	125
SL	WT	50	12	5	C2	114	112
SL	WT	50	12	2	A2	98	97
SL	WT	0	12	1	A2	101	5
SL	WT	0	12	1	C2	108	6
SL	WT	100	12	3	A2	95	94
SL	WT	50	12	8	В2	88	85
SL.	W⊤	100	12	9	C2	60	58
SL.	WT	100	12	6	В3	77	77
SL	WT	0	12	7	A2	92	2
SL	WT	50	<b>1</b> 2	2	C2	86	86
SL	W⊺	100	12	6	C3	102	101
SL	WT	50	12	8	C3	129	128
SL	W⊤	100	12	3	C1	104	103
SL	W⊤	50	12	2	В3	85	80
SL	W⊺	50	12	5	В3	63	58
SL	WT	0	12	4	C3	141	4
SL	WT	0	12	7	C2	90	3
SL	WT	0	12	7	В3	104	2
SL	WT	50	12	8	A2	76	73
SL	WT	0	1.2	4	В3	79	3
SL	WT	10 <b>0</b>	12	9	В3	102	100
SL	WT	0	12	4	C2	81	4
SL	WT	100	12	9	A2	104	104
SL	WΤ	50	12	5	A2	60	60
SL.	WT	0	12	1	C3	111	5
SI.	BI	0	12	1	C3	147	8
SL	BI	50	<b>1</b> 2	3	C2	109	107
SL	ВІ	Э	12	8	B2	134	6
SL	BI	50	12	3	B2	103	103
SL	BI	100	12	4	В3	126	124
SL	ы	0	12	1	C2	111	3

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					AE	H-12-PSEU	D <b>O</b> -04
SL	ВІ	100	12	5	B1	105	105
SI.	BI	50	12	7	B1	128	124
SL	В	0	12	8	В3	163	4
SL	Bl	100	12	4	В2	123	122
SL	BI	100	12	4 .	C3	104	104
SL	ВІ	50	12	7	В3	109	103
SL.	ВІ	50	12	7	B2	116	113
SL	ВІ	0	12	8	В1	81	5
SL	ВІ	100	12	5	B2	97	97
SL	ВІ	50	12	7	A2	115	113
SL	BI	100	12	6	В3	113	113
SL	В1	0	12	8	A3	140	7
SL	ВІ	0	12	9	В2	87	2
SL	BI	50	12	2	A2	119	115
SL	BI	50	12	2	B1	105	102
SL	BI	100	12	6	B2	121	119
SL	B!	100	12	6	C2	127	126
SL	BI	100	12	4	. A2	117	116
SL	ВІ	50	12	3	B1	144	136
SL	Bi	100	12	5	В3	108	108
SL	BI	100	12	6	C3	98	95
SL	BI	0	12	1	<b>A</b> 3	107	7
SL	BI	100	12	5	A2	106	1.04
SL	BI	0	12	9	В3	137	10
SL	ВІ	50	12	2	B2	116	114
SL	B1	0	12	9	B1	84	4
SL	81	0	12	9	A2	115	0
SL	BI	50	12	3	Λ2	117	113
SL	BI	0	12	1	C1	137	10
SL	BI	50	12	2	A3	145	140

File Folder: 18	Item Number:	Page 6 of 6
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# Appendix 9. Statistical Analysis including SAS Programs, Outputs and Logs for Survival Data

Item Number	Item Description	Number of Pages	Report Page Number
1	SAS program for zebra mussel survival data	7	452
2	SAS log for zebra mussel survival data	13	459
3	SAS output for zebra mussel survival data	39	472

```
DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
FOOTNOTE1 'Performed by K. Weber SAS version ' &SYSVER &SYSTIME &SYSDATE;
options 1s=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
title1 h=1 'Statistical analysis of zebra mussel mortality after';
title2 h=1 'exposure to various concentrations of Pf-CL145A';
title3 h=1 'SAS v. 9.3 Analysis completion date: 01MAY2014 Analysis prepare
title4 h=1 ' ';
/***************
* SAS ver 9.3 Analysis prepared by: KLW [w] *
* Analysis completion date: 01MAY2014
*****************************
* Variable Names:
* loc = test location LC=Lake Carlos; SL = Shawano Lake
* trt_typ = exposure method WT = whole water application; BI = bottom injectic
* conc = concentration (in mg/L)
            50 = 50 mg/L active ingredient
            100 = 100 mg/L active ingredient
* tnk = test tank ID (1 to 9)
* time = time post exposure assessment occurred
* tray = zebra mussel tray within tank - there were three mussel trays at each
* tot = total number of zebra mussels at risk
* dead = number of zebra mussels dead after treatment
data mussel; set PseudoO4.survivaldata;
pctsurv = (tot-dead)/tot*100;
pctmort = dead/tot*100;
if conc = 0 then conca = 'C':
if conc = 50 then conca = 'A';
if conc = 100 then conca = {}^{1}B^{1};
run;
proc sort data=mussel; by loc trt_typ conc time; run;
proc print data=mussel; title4 h=1 'all data'; run;
Title1 h=2 'The mean percent survival and mortality by location and treatment
title2 h=2 ' classified by concentration and exposure duration';
proc means data = mussel mean std lclm uclm fw=8;
by loc trt_typ;
class conc time;
var petsurv petmort;
run;
                                                     Item No.
```

```
data Carlos_6; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'SL' then delete;
if time ne 6 then delete;
run:
data Carlos_9; set mussel;
if trt_typ = '81' then delete;
if loc = 'SL' then delete;
if time ne 9 then delete;
data Carlos_12; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'SL' then delete;
if time ne 12 then delete;
data Shawanc_6; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'LC' then delete;
if time ne 6 then delete;
run;
data Shawano_9; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'LC' then delete;
if time ne 9 then delete;
data Shawano_12; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'LC' then delete;
if time ne 12 then delete;
run;
data time_Carlos; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'SL' then delete;
run;
data time_Shawano; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'LC' then delete;
run;
data BI_Carlos; set mussel;
if trt_typ = 'WT' then delete;
if loc = 'SL' then delete;
data BI_Shawano; set mussel;
```

Page  $\frac{2}{}$  of  $\frac{1}{}$ 

```
AEH-12-PSEUDO-04
```

```
if trt_typ = 'WT' then delete;
if loc = 'LC' then delete;
data BI_vs_WT Carlos; set mussel;
if time < 12 then delete;
if loc = 'SL' then delete;
run;
data BI_vs_WT_Shawano; set mussel;
if time < 12 then delete;
if loc = 'LC' then delete;
* This analysis compares the effect of exposure concentration on zebra mussel
* survival for 6 h WT (whole water treatment)at Lake Carlos only.
title: h=2 'This analysis looks at the effect of exposure concentration on zet
survival for 6 h WT at Lake Carlos';
proc glimmix data = Carlos_6;
title4 Zebra mussel mortality - 6 h at Lake Carlos only';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
 Ismeans conca /pdiff ol ilink or;
 random _residual_;
\ensuremath{^\star} This analysis compares the effect of exposure concentration on zebra mussel
* survival for 9 h WT (whole water treatment)at Lake Carlos only.
title1 h=2 'This analysis looks at the effect of exposure concentration on zet
survival for 9 h WT at Lake Carlos';
proc glimmix data = Carlos_9;
title4 'Zebra mussel mortality - 9 h at Lake Carlos only';
class conca:
model dead/tot = conca / d = bin link = logit noint s or;
 lsmeans conca /pdiff ol ilink or;
 random _residual_;
^{\star} This analysis compares the effect of exposure concentration on zebra mussel
* survival for 12 h WT (whole water treatment)at Lake Carlos only.
title1 h=2 This analysis looks at the effect of exposure concentration on zek
survival for 12 h WT at Lake Carlos';
```

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```
proc glimmix data = Carlos 12;
title4 'Zebra mussel mortality - 12 h at Lake Carlos only';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
  Ismeans conca /pdiff cl ilink or;
  random _residual_;
  run;
* This analysis compares the effect of exposure concentration on zebra mussel
* survival for 6 h WT (whole water treatment)at Shawano Lake only.
*********************
title1 h=2 'This analysis looks at the effect of exposure concentration on zet
survival for 6 h WT at Shawaro Lake';
proc glimmix data = Shawano_6;
title4 'Zebra mussel mortality - 6 h at Shawano Lake only';
class conca;
model dead/tot = conca / d = bir link = logit roint s or;
 Ismeans conca /pdiff ol ilink or;
 random _residual_;
* This analysis compares the effect of exposure concentration on zebra mussel
* survival for 9 h WT (whole water treatment)at Shawano Lake only.
          *****************
title1 h	imes 2 'This analysis looks at the effect of exposure concentration on zet
survival for 9 h WT at Shawano Lake';
proc glimmix data = Shawano_9;
title4 'Zebra mussel mortality - 9 h at Shawano Lake only';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
 1smeans conca /pdiff ol ilink or;
 random _residual_;
 run;
* This analysis compares the effect of exposure concentration on zebra mussel
* survival for 12 h WT (whole water treatment)at Shawano Lake only.
*****************
title1 h=2 'This analysis looks at the effect of exposure concentration on zet
survival for 12 h WT at Shawano Lake';
proc glimmix data = Shawano_12;
title4 'Zebra mussel mortality - 12 h at Shawano Lake only';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
```

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```
1smeans conca /pdiff cl ilink or;
  random _residual_;
* This analysis compares the effect of exposure duration on zebra mussel
* survival for the WT (whole water treatment)at Lake Carlos only. Note: BI onl
* 12-h exposure period and was therefore excluded from the analysis set. The
* full data set was reduced to contain all observations for WT at LC.
title1 h=2 'This analysis looks at the effect of exposure duration at Lake Car
title2 h=2 'Therefore BI data were excluded from this analysis';
title3 h=2 'Includes 6, 9 and 12 h WWC Lake Carlos data';
proc glimmix data = time_Carlos;
title4 'Zebra mussel mortality - time at Lake Carlos only';
class time conca;
model dead/tot = time|conca / a = bin link = logit noint s or;
 Ismeans conca /pdiff cl ilink or;
 Ismeans time /pdiff ol ilink or;
 1smeans conca*time /pdiff ol ilink or;
 random _residual_;
 run;
^{\star} This analysis compares the effect of exposure duration on zebra mussel
* survival for the WT (whole water treatment)at Shawano Lake only. Note: 8I or
* 12-h exposure period and was therefore excluded from the analysis set. The
* full data set was reduced to contain all observations for WT at SL.
**********************
title1 h=2 'This analysis locks at the effect of exposure duration at Shawano
title2 h=2 'Therefore BI data were excluded from this analysis';
title3 h=2 'Includes 6, 9 and 12 h WWC Shawano Lake data';
proc glimmix data = time_Shawano;
title4 'Zebra mussel mortality - time at Shawaro Lake only';
class time conca;
model dead/tot = time|conca / d = bin link = logit noint s or;
 Ismeans conca /pdiff cl ilink or;
 Ismeans time /pdiff of ilink or;
 lsmeans conca*time /pdiff cl ilink or;
 random _residual_;
 run:
* This analysis compares the effect of treatment method BI (bottom injection)
* on zebra mussel survival at Lake Carlos. Note: BI only used a 12-h exposure
st period - thus the full data set was reduced to contain only those observation
```

Page <u>5</u> of <u>7</u>

```
* for 12-h BI at LC.
*******************************
proc glimmix data = BI_Carlos;
title1 h=3 'Zebra mussel mortality - BI application';
title2 h=2 'This analysis only looks at 12h BI at Lake Carlos';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
 Ismeans conca /pdiff cl ilink or;
 random _residual_;
* This analysis compares the effect of treatment method BI (bottom injection)
* on zebra mussel survival at Shawano Lake, Note: BI only used a 12-h exposure
* period - thus the full data set was reduced to contain only those observation
* for 12-h BI at SL.
proc glimmix data = BI_Shawano;
title1 h=3 'Zebra mussel mortality - BI application';
title2 h=2 'This analysis only looks at 12h BI at Shawano Lake';
class conca;
model dead/tot = conca / d = bin link = logit noint s or;
 Ismeans conea /pdiff cl ilink or;
 random _residual_;
 run;
* This analysis compares the effect of treatment method BI (bottom injection)
* vs WT (whole water treatment) on zebra mussel survival at Lake Carlos.
* Note: BI only used a 12-h exposure period - thus the full data set was
^{\star} reduced to contain only those observations for 12-h for both BI and WT at LC
proc glimmix data = BI_vs_WT_Carlos;
title1 h=3 'Zebra mussel mortality - application method';
title2 h=2 'This analysis only looks at 12h WT vs 12h BI at Lake Carlos';
title3 h=2 'BI only had 12h exposure so can only compare to 12h WT treatment';
class conca loc trt_typ tnk tray;
model dead/tot = conca|trt_typ / d = bin link = logit noint s or;
 1smeans conca /pdiff cl ilink or;
 lsmeans trt_typ /pdiff cl ilink or;
 lsmeans conca*trt_typ /pdiff cl ilink or;
 random _residual_;
 random tnk tray(tnk);
```

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```
* This analysis compares the effect of treatment method BI (bottom injection)
\star vs WT (whole water treatment) on zebra mussel survival at Shawano Lake.
* Note: BI only used a 12-h exposure period - thus the full data set was
* reduced to contain only those observations for 12-h for both BI and WT at SL
proc glimmix data = BI_vs_WT_Shawano;
title1 h=3 Zebra mussel mortality - application method';
title2 h=2 'This analysis only looks at 12h WT vs 12h 8I at Shawano Lake';
title3 h=2 'BI only had 12h exposure so can only compare to 12h WT treatment';
class conca loc trt_typ tnk tray;
model dead/tot = conca|trt_typ / d = bin link = logit noint s or;
 Ismeans conca /pdiff cl ilink or;
 lsmeans trt_typ /pdiff cl ilink or;
 lsmeans conca*trt_typ /pdiff cl ilink or;
 random _residual_;
 random tnk tray(tnk);
                              MMs
                         I WALL JOH
 run;
```

FF# \6 Item No. \alpha Pg \(\frac{1}{2}\) of \(\frac{7}{2}\)

```
1
    DM 'LOG; CLEAR; OUTPUT; CLEAR; '; * CLEAR LOG AND OUTPUT;
2
3
    FOOTNOTE: 'Performed by K. Weber SAS version ' &SYSVER &SYSTIME &SYSDATE;
WARNING: The FOOTNOTE statement is ambiguous due to invalid options or
        unquoted text.
    options ls=97 ps=54 formdlim='-' pageno = 1 nocenter nodate nosource2;
5
6
7
    title1 h=1 'Statistical analysis of zebra mussel mortality after';
    title2 h=1 'exposure to various concentrations of Pf-CL145A';
9
    title3 h=1 'SAS v. 9.3 Analysis completion date: 01MAY2014 Analysis pr
    title4 h=1 ' ';
10
    11
12 * SAS ver 9.3 Analysis prepared by: KLW W
   * Analysis completion date: 01MAY2014
14
15
16 /*******************************
16 | *********
* * Variable Names:
17 |
   * loc = test location LC=Lake Carlos; SL = Shawano Lake
18 I
  * trt_typ = exposure method WT = whole water application; BI = bottom inj
19 |
20 * conc = concentration (in mg/L)
20 1
21 *
                50 = 50 mg/L active ingredient
21 |
22 *
               100 = 100 mg/L active ingredient
22 1
23 * tnk = test tank ID (1 to 9)
24 * time = time post exposure assessment occurred
24 1
25 * tray = zebra mussel tray within tank - there were three mussel trays at
25 I each tank *
26 * tot = total number of zebra mussels at risk
26 1
   * dead = number of zebra mussels dead after treatment
27 1
28 ********************************
28 ! **********/
29
30 data mussel; set Pseudo04.survivaldata;
31 pctsurv = (tot-dead)/tot*100;
```

```
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32 pctmort = dead/tot*100;
33 if conc = 0 then conca = C';
34 if conc = 50 then conca = 'A;
35 if conc = 100 then conca = 'B';
NOTE: There were 225 observations read from the data set PSEUD004.SURVIVALDATA
NOTE: The data set WORK.NUSSEL has 225 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.10 seconds
      cpu time
                         0.00 seconds
37
    proc sort data=mussel; by loc trt_typ conc time; run;
38
NOTE: There were 225 observations read from the data set WORK, MUSSEL.
NOTE: The data set WORK.MUSSEL has 225 observations and 11 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time
                         0.01 seconds
      cpu time
                         0.01 seconds
39 proc print data=mussel; title4 h=1 'all data'; run;
NOTE: Writing HTML Body file: sashtml.htm
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: PROCEDURE PRINT used (Total process time):
      real time
                         0.67 seconds
      opu time
                         0.49 seconds
40 Title1 h=2 'The mean percent survival and mortality by location and treat
    title2 h=2 ' classified by concentration and exposure duration';
    proc means data = mussel mean std lclm uclm fw=8;
43 by loc trt_typ;
    class conc time;
45
    var potsurv potmort;
46
    run;
NOTE: There were 225 observations read from the data set WORK, MUSSEL.
NOTE: PROCEDURE MEANS used (Total process time):
      real time
                   0.20 seconds
      opu time
                         0.07 seconds
47 data Carlos_6; set mussel;
                                                          Page _ 2 _ of _ [3__
```

```
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48 if trt_typ = 'BI' then delete;
49 if loc = 'SL' then delete;
50 if time ne 6 then delete;
51 run;
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.CARLOS_6 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
                         0.01 seconds
      real time
      cpu time
                         0.01 seconds
52 data Carlos_9; set mussel;
if trt_typ = 'BI' then delete;
if loc = 'SL' then delete;
55 if time ne 9 then delete;
56 run;
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.CARLOS_9 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.01 seconds
                         0.01 seconds
      cpu time
   data Carlos 12; set mussel;
58  if trt_typ = 'BI' then delete;
59
     if loc = 'SL' then delete;
   if time ne 12 then delete;
60
    run:
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.CARLOS 12 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.00 seconds
                         0.00 seconds
      cpu time
62
63 data Shawano 6; set mussel;
64 if trt_typ = 'BI' then delete;
    if loc = 'LC' then delete;
   if time ne 6 then delete;
66
67
    run;
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
```

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```
NOTE: The data set WORK.SHAWANO_6 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
      cpu time
                         0.01 seconds
68 data Shawano_9; set mussel;
69  if trt_typ = 'BI' then delete;
70 if loc = 'LC' then delete;
71
    if time ne 9 then delete;
    run;
72
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.SHAWANO_9 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                       0.01 seconds
      cpu time
                         0.01 seconds
73 data Shawano_12; set mussel;
74  if trt_typ = 'BI' then delete;
75 if loc = 'LC' then delete;
76
    if time ne 12 then delete;
77
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.SHAWANO_12 has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                        0.01 seconds
      cpu time
                         0.01 seconds
78
79
    data time_Carlos; set mussel;
   if trt_typ = 'BI' then delete;
    if loc = 'SL' then delete;
81
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.TIME_CARLOS has 81 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
                         0.00 seconds
      cpu time
83
```

```
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```

```
84 data time_Shawano; set mussel;
85  if trt_typ = 'BI' then delete;
86 if loc = 'LC' then delete;
87
   run:
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.TIME_SHAWANO has 81 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0.00 seconds
88
89
    data BI_Carlos; set mussel;
    if trt_typ = 'WT' then delete;
90
    if loc = 'SL' then delete;
NOTE: There were 225 observations read from the data set WORK, MUSSEL.
NOTE: The data set WORK.BI CARLOS has 27 observations and 11 variables.
NOTE: DATA statement used (Total process time):
     real time
                        0.00 seconds
      cpu time
                         0.00 seconds
   data BI_Shawano; set mussel;
   if trt_typ = 'WT' then delete;
    if loc = 'LC' then delete;
94
NOTE: There were 225 observations read from the data set WORK, MUSSEL.
NOTE: The data set WORK.BI_SHAWANO has 36 observations and 11 variables.
NOTE: DATA statement used (Total process time):
      real time
                         0.00 seconds
      cpu time
                         0.00 seconds
96 data BI_vs_WT_Carlos; set mussel;
97 if time < 12 then delete;
   if loc = 'SL' then delete;
99
   run;
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.BI VS WT CARLOS has 54 observations and 11 variables.
NOTE: DATA statement used (Total process time):
     real time
                         0.03 seconds
      opu time
                         0.00 seconds
```

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```
100 data BI_vs_WT_Shawano; set mussel;
101 if time < 12 then delete;
102 if loc = 'LC' then delete;
NOTE: There were 225 observations read from the data set WORK.MUSSEL.
NOTE: The data set WORK.BI_VS_WT_SHAWANO has 63 observations and 11 variables.
NOTE: DATA statement used (Total process time):
     real time
                     0.01 seconds
     cpu time
                     0.01 seconds
   105
* 06
   * This analysis compares the effect of exposure concentration on zebra mu
107 * survival for 6 h WT (whole water treatment) at Lake Carlos only.
109 title1 h=2 'This analysis looks at the effect of exposure concentration c
110 survival for 6 h WT at Lake Carlos';
111
    proc glimmix data = Carlos 6;
112 title4 'Zebra mussel mortality - 6 h at Lake Carlos only';
113 class conca:
114 model dead/tot = conca / d = bin link = logit noint s or;
     1smeans conca /pdiff cl ilink or;
115
116
     random _residual_;
117
     run:
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (ABSGCONV=0.00001) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                    0.26 seconds
     cpu time
                    0.10 seconds
118
120 * This analysis compares the effect of exposure concentration on zebra mu
121 * survival for 9 h WT (whole water treatment) at Lake Carlos only.
123 title1 h=2 'This analysis looks at the effect of exposure concentration c
124 survival for 9 h WT at Lake Carlos';
                                               Page 6 of 3
```

```
125 proc glimmix data = Carlos_9;
126 title4 'Zebra mussel mortality - 9 h at Lake Carlos only';
127 class conca;
128 model dead/tot = conca / d = bin link = logit noint s or;
     lsmeans conca /pdiff cl ilink or;
130
      random _residual_;
131
     run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
                     0.21 seconds
                     0.15 seconds
     cpu time
134 \, * This analysis compares the effect of exposure concentration on zebra mu
135 * survival for 12 h WT (whole water treatment)at Lake Carlos only.
137 title: h=2 'This analysis looks at the effect of exposure concentration c
138 survival for 12 h WT at Lake Carlos';
139 proc glimmix data = Carlos 12;
140 title4 Zebra mussel mortality - 12 h at Lake Carlos only';
141 class conca;
142 model dead/tot = conca / d = bin link = logit noint s or;
143
     Ismeans conca /pdiff cl ilink or;
144
      random [residual_;
145
      run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (ABSGCONV=0.00001) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                     0.23 seconds
                     0.14 seconds
     opu time
146
148 * This analysis compares the effect of exposure concentration on zebra mu
```

```
149 * survival for 6 h WT (whole water treatment)at Shawano Lake only.
    ***************
150
151 title1 h=2 'This analysis looks at the effect of exposure concentration \epsilon
152 survival for 6 h WT at Shawano Lake';
153 proc glimmix data = Shawano_6;
154 title4 'Zebra mussel mortality - 6 h at Shawano Lake only';
155 class conca;
156 model dead/tot = conca / d = bin link = logit noint s or;
157
    Ismeans conca /pdiff cl ilink or;
158
      random _residual_;
159
     run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (ABSGCONV=0.00001) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                     0.29 seconds
     cpu time
                      0.17 seconds
162
   * This analysis compares the effect of exposure concentration on zebra mu
163 * survival for 9 h WT (whole water treatment)at Shawano Lake only.
165 title1 h=2 'This analysis looks at the effect of exposure concentration c
166 survival for 9 h WT at Shawano Lake';
167 proc glimmix data = Shawano 9;
168 title4 'Zebra mussel mortality - 9 h at Shawano Lake only';
169 class conca;
170 model dead/tot = conca / d = bin link = logit noint s or;
171
     Ismeans conca /pdiff cl ilink or;
172
      random _residual_;
173
     run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                      0.37 seconds
                      0.15 seconds
     opu time
```

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```
174
176 * This analysis compares the effect of exposure concentration on zebra mu
177 \,^* survival for 12 h WT (whole water treatment)at Shawano Lake only.
179 title1 h=2 'This analysis looks at the effect of exposure concentration c
180 survival for 12 h WT at Shawano Lake';
181 proc glimmix data = Shawano 12;
182 title4 'Zebra mussel mortality - 12 h at Shawano Lake only';
183 class conca;
184
    model dead/tot = conca / d = bin link = logit noint s or;
185
     Ismeans conca /pdiff cl ilink or;
186
      random _residual_;
187
      run:
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (ABSGCONV=0.00001) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                     0.49 seconds
                     0.10 seconds
     cpu time
190 * This analysis compares the effect of exposure duration on zebra mussel
191 * survival for the WT (whole water treatment)at Lake Carlos only. Note: E
192 * 12-h exposure period and was therefore excluded from the analysis set.
193 * full data set was reduced to contain all observations for WT at LC.
194 ********************************
195 title1 h=2 'This analysis looks at the effect of exposure duration at Lak
196 title2 h=2 'Therefore BI data were excluded from this analysis';
197 title3 h=2 'Includes 6, 9 and 12 h WWC Lake Carlos data';
198 proc glimmix data = time_Carlos;
199 title4 'Zebra mussel mortality - time at Lake Carlos only';
200 class time conca;
201 model dead/tot = time|conca / d = bin link = logit noint s or;
      1smeans conca /pdiff cl ilink or;
      Ismeans time /pdiff cl ilink or;
203
      1smeans conca*time /pdiff cl ilink or;
204
205
      random _residual_;
206
      run:
```

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```
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time 0.35 seconds
     cpu time
                      0.20 seconds
207
209 * This analysis compares the effect of exposure duration on zebra mussel
210 * survival for the WT (whole water treatment) at Shawano Lake only. Note:
211 * 12-h exposure period and was therefore excluded from the analysis set.
212 * full data set was reduced to contain all observations for WT at SL.
213 ********************************
214 title1 h=2 'This analysis looks at the effect of exposure duration at Sha
215 title2 h=2 'Therefore BI data were excluded from this analysis';
216 title3 h=2 'Includes 6, 9 and 12 h WWC Shawano Lake data';
217 proc glimmix data = time_Shawano;
218 title4 'Zebra mussel mortality - time at Shawano Lake only';
219 class time conca;
220 model dead/tot = time|conca / d = bin link = logit noint s or;
221
      1smeans conca /pdiff cl ilink or;
      Ismeans time /odiff cl ilink or:
222
223
      lsmeans conca*time /pdiff cl ilink or;
224
      random _residual_;
225
      run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                      0.35 seconds
                      0.18 seconds
     cou time
226
228 * This analysis compares the effect of treatment method BI (bottom inject
229 * on zebra mussel survival at Lake Carlos. Note: BI only used a 12-h expc
230 * period - thus the full data set was reduced to contain only those obser
231 * for 12-h BI at LC.
                                                       Page <u>10</u> of <u>13</u>
```

```
233 proc glimmix data = BI_Carlos;
234 title1 h=3 'Zebra mussel mortality - BI application';
235 title2 h=2 'This analysis only looks at 12h BI at Lake Carlos';
236 class conca;
237 model dead/tot = conca / d = bin link = logit noint s or;
238
     Ismeans conca /pdiff cl ilink or;
239
     random _residual_;
240
     run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                     0.24 seconds
     cpu time
                     0.14 seconds
241
243 * This analysis compares the effect of treatment method BI (bottom inject
^{244} * or zebra mussel survival at Shawano Lake. Note: BI only used a 12-h exp
245 * period - thus the full data set was reduced to contain only those obser
246 * for 12-h BI at SL.
248 proc glimmix data = BI_Shawano;
249 title1 h=3 'Zebra mussel mortality - BI application';
250 title2 h=2 'This analysis only looks at 12h BI at Shawano Lake';
251 class conca;
252 model dead/tot = conca / d = bin link = logit noint s or;
253
     Ismeans conca /pdiff cl ilink or;
254
     random _residual_;
255
     run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (ABSGCONV=0.00001) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                     0.23 seconds
     cpu time
                     0.09 seconds
```

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```
258 * This analysis compares the effect of treatment method BI (bottom inject
^{259} * vs WT (whole water treatment) on zebra mussel survival at Lake Carlos.
260 * Note: BI only used a 12-h exposure period - thus the full data set was
261 * reduced to contain only those observations for 12-h for both BI and WT
262
263 proc glimmix data = BI_vs_WT_Carlos;
264 titlei h=3 'Zebra mussel mortality - application method';
    title2 h=2 'This analysis only looks at 12h WT vs 12h BI at Lake Carlos';
    title3 h=2 'BI only had 12h exposure so can only compare to 12h WT treatm
    class conca loc trt typ tnk tray;
268
    model dead/tot = conca|trt_typ / d = bin link = logit noint s or;
269
      1smeans conca /pdiff cl ilink or;
270
      Ismeans trt_typ /pdiff cl ilink or;
271
      lsmeans conca*trt_typ /pdiff cl ilink or;
      random _residual_;
272
273
      random tnk tray(tnk);
274
      run;
NOTE: The model does not contain an intercept. Columns of X are scaled only ar
NOTE: Convergence criterion (PCONV=1.11022E-8) satisfied.
NOTE: PROCEDURE GLIMMIX used (Total process time):
     real time
                       D.45 seconds
     cou time
                       0.23 seconds
275
277 * This analysis compares the effect of treatment method BI (bottom inject
278 * vs WT (whole water treatment) on zebra mussel survival at Shawano Lake.
279 * Note: BI only used a 12-h exposure period - thus the full data set was
280 * reduced to contain only those observations for 12-h for both BI and WT
281 *******************************
282 proc glimmix data = BI_vs_WT_Shawano;
283 title1 h=3 'Zebra mussel mortality - application method';
284 title2 h=2 'This analysis only looks at 12h WT vs 12h BI at Shawano Lake'
285 title3 h=2 'BI only had 12h exposure so can only compare to 12h WT treatm
286 class conca loc trt_typ tnk tray;
287 model dead/tot = conca]trt_typ / d = bin link = logit noint s or;
288
      Ismeans conca /pdiff cl ilink or;
289
      lsmeans trt_typ /pdiff cl ilink or;
290
      lsmeans conca*trt_typ /pdiff cl ilink or;
291
      random _residual_;
                                                      Page ______ of <u>\ \ }</u>
```

256

292 random thk tray(thk);

293 run;

AEH-12-PSEUDO-CD

NOTE: The model does not contain an intercept. Columns of X are scaled only ar

NOTE: Convergence criterion (PCONV=1.11022E-8) satisfied.

NOTE: Estimated G matrix is not positive definite. NOTE: PROCEDURE GLIMMIX used (Total process time):

real time

0.37 seconds

cpu time

0.18 seconds

FF # 18 Item No. 3 SAS Output Page 1 of 39

ata										1	puff 7014	
)S	loc	te	typ	conc	tlme	tnk	tray	tot	dead	pctsurv	palmort conce	
1	LC	В		, 0	12	6	C1	179	4	97.765	2.235 C	
2	rc	В		, (	12	7	A1	225	4	98.222	1.778 G	
3	LC	В		C	12	3	C3	253	7	97.233	2,767 C	
4	LC	В		[ 0	12	7	63	176	9	94.886	5.114 C	
5	LC	В		C	12	3	<b>B</b> 1	242	5	97.934	2,066 C	
6	LC	В		, 0	12	6	В1	217	11	94.931	5,069 C	
7	LC	В		, 0	12	6	A2	186	4	97.849	2.151 C	
е	LC	В			12	3	А3	196	4	97.959	2.041 C	
9	LC	В		C	12	7	C1	276	3	98.913	1.087 C	
10	LC	В	~ .	50	12	4	B2	256	191	25.391	74.609 A	
11	LC	В		; 50	, 12	1	<b>B</b> 3	279	217	22.222	77,778 A	
12	LC	В		50		8	C2	200	161	19.500	80,500 A	
13	LC	В		50	;	1	B2	510	424	16.863	83.137 A	
14	LC	В		50		4	B1	188	178	5.319	94,681 A	
15	LC	В		50	12	4	<b>B</b> 3	188	174	7.447	82.553 A	
16	LC	В		50	12	8	H3	291	222	23,711	76.289 A	
17	LC	B		50	12	8	A3	282	232	17,730	82.270 A	
18		В		50	12	÷	A1	210	158	24.762	75,238 A	
19	LC	_ B!		100	. proces	ļ	A1	269	256	4.833	95.167 B	
20	LC			100	4		В3	179	139	22.346	77.654 B	
21	LC	В		100	12		В3	153	132	13.725	86,275 B	
22		В		100	12		01	193	154	20.207	79.793 B	
23	LC	ВІ		100		ļ	C1	288	263	8.681	91.319 B	
24	LC	BI		100	ŧ	} - · · '	A1	329	217	34.043	65.957 B	
25	LC	В		100	5	1	B3	393	272	30,789	69,211 B	
26	LC		-	100	i		Αí	279	261	6.452	93.549 B	
 27	LC	В		100	2	5		264	209	20.833	79,167 B	
28	LC	w				5	C1	175	0	100,000	0,000 C	
29	LC	W		;	·-			168	3	98,214	1.786 C	
30		W			4	<u>.</u>	B2	237	10	95.781	4.219 C	
31		W				1 1	A1	328	23	92,988	7.012 C	
32	LC	w		: `` : 0	,	t i	H2	173	2	98.844	1.156 C	
33		W			4		B1	255	3	98.624	1.176 C	
34		W				i	A1	339	2	99.410	0.590 C	
35	LC						A1	269	. 5	98.141	1.859 C	
36	1	w			1	3	СЗ	310	6	98,065	1.935 C	
37	LC	W				5	⊞3	192	7	96.354	3.646 C	
38	LC						 A3	178	7	98.067	3,933 C	
39	LC	W				+ '	C3	173	11	93.642	6.358 C	
40		W	•		1 -		C3	226	6	97.345	til man et en le it	_
41		w				1 .		213	2	99.061	0,939 C	FF # <u>18</u>
12	LC	w			1111	3	C2	214	11	94,860	5.140 C	Item No. 4
13		w				4		236	' . 6	97,458	2,542 C	Pg   of 39

 $file: ///C: /Uscrs/klwebcr/AppData/Local/Temp/2/SAS\%20 Temporary\%20 Files/_1D3488_L... \\ 5/1/2014$ 

SAS Output

44	Le	WT	0	. 9	- 5	, A3	177	2	98,870	1 130	С
45	LC	WT	0	. š.	2	, A3	326			1.840	C
46	LC	WT	. 0	12		B2	312	8	97.436	2.564	C
47	LC	WT	0	12	3	5000	185	5	97.297	ç	C
48	LC	WT	. 0	12	2	4	390	16	96.897	4.103	С
49	LC	WT	0	12	3	C1	259	5	99.069	1.931	С
50	LC	WT	. 0	12	2	B1	: 185	4	97.838	2.162	С
51	LC	WT	0	12	2	C2	198	8	95.960	4.040	C
52	LC	WT	0	12	5	, A2	240	2	99.167	0.833	c
53	LC	WT	, 0	12	5	C2	212	6	97.170	2.830	C
54	LC	WT	О	, 12	5	81	196	6	96,939	3.061	C ·
55	rc	WT	50	6	1	EA.	149	149	0.000	100.000	Α
56	LC	WT	50	6	4	C2	175	171	2.286	97.714	Α
57	LC	WT	50	6	8	В:	208	203	2.404	97.596	Α
58	LC	WT	5C	6	1	A2	280	274	2.443	97.857	A
59	LC	WT	50	6	В	<b>B</b> 2	178	177	0.562	99,438	Α
. 60	LC	WT	50	6	4	B2	214	210	1.869	98.131	Α
61	LC	WT	50	6	1	B2	232	228	1.724	98.276	Α
62	LC	WT	; 50	6	4	C1	191	191	0.000	100,000	Α
63	LC	wr	, 50	6	В	В3	248	217	0.403	99.597	Α
64	LO	WT	50	9	. 4	ВЗ	265	261	1,509	98,491	Α
65	LC	WT	50	9	4	<b>A</b> 3	375	375	0.000	100.000	Α :
66	LC	WT	50	9	8	C1	169	169	0.000	100.000	Α
. 67	rc	WT	50	9	1	A1	164	161	1.829	98.171	A
68	LC	WT	50	9	4	Α1	221	221	0.000	100,000	A
69	LC	WT	50	9		C3	180	180	0.000	100.000	Α:
70	LC	WT	50	9	8	A3	131	127	3.053	96.947	A
71	LC	WT	50	9	. 1	B1	128	123	3.906	96.094	Λ
72	LC	WT	50	9	1	C1	267	267	0.000	100.000	Α
73	LC	WT	50	12	. 1	C3	266	266	0.000	100.000	Α
74	r.c	WT	50	12	1		175	175	0.000	100.000	A
75	LC	WT	50	12	1	<b>B</b> 3	160	159	0.625	99,375	<u>^</u>
76	LC	WT	50	12	8	C2	290	207	1.034	98,966	Α
77	LC	WT	50	12	. 8	A2	119	119	0.000	100.000	A
78 79	LC LC	WT	50	12	8	A1 A2	151	150	0.662	99.338	A :
80	LC	WT	: 60	12 12	4	C3	158 455	155 453	0.440	96.101 99.560	A :
81	LC.	WT	50	12	4	Bí	280	277	1.071	98.929	Α
82	LC	WT	. 100	6	7	B2	266	256	3.759	96.241	В
83	LC	WT	100	6	9	B2	190	188	1.053	98,947	8
84	LC	WT	100	6		C3	267	264	1.124	98,876	8
85	LC	WT	100	6	7	A1	212	210	0.943	99.057	В
86	LC	WΓ	100	6	6	A3	235	227	3,404	96.596	в :
87	LC	WT	100	6.	6	Λ2	257	250	2.724	97.276	В
88	LC.	WT	100	6		C1	324	317	2,160	97.840	В :
89	LC	WT	100		7 .	C1	269	267	0.743	99,257	В.
90					Ċ.						

AEH-12-PSEUDO-1

 $file: ///C: /Users/klweber/AppData/Local/Temp/2/SAS\% 20 Temporary\% 20 Files/_TD 3488_I... \\ 5/1/2014$ 

	LC	WT	100	6	9	<b>A</b> 1	283	275	2,827	97.173	В
91	LC	WT	100	9	6	В2	188	187	0.532	99.468	В
92	LC	. WT	100	9	7	83	193	193	0.000	100.000	В
93	LC	.WT	100	. 9	7	C3	158	155	1.899	96.101	В
94	LC	WT	100	9	6	C1	176	176	0.000	100,000	В
95	LC	wT .	100	9	ε	A3	393	392	0.254	99.746	В
96	LC	WT	100	9	9	вз	128	128	0.000	100.000	В
97	LC	WT	100	9	6	В3	183	181	1.093	98 907	В
98	LC	WΤ	100	9	9	C3	260	260	0.000	100.000	В
99	LC	WT	100	. 9	7	АЭ	258	255	1.163	98.837	В
100	LC	WT	100	12	6	81	249	248	0.402	99.598	В
101	LC	WT	100	12	6	A1	239	236	1,265	98,745	В :
102	LC	WT	100	12	9	A2	316	316	0.000	100.000	В
103	LC	WT	100	12	7	A2	237	236	0.422	99.578	В
104	LC.	WJ	100	12	9	В1	273	268	1.832	98.16B	В
105	LC	WT	100	12	7	В1	286	286	0.000	100.000	В
106	LC	WT	100	12	7	C2	203	203	C.000	100.000	В
107	LC	WT	100	12	9	C2	156	155	0.641	99,359	В
108	LC	WΤ	100	12	6	C2	155	153	1.290	98.710	в
109	SL	В	0	12	1	C3	147	8	94,558	5,442	C
110	SL.	BI	0	12	8		134	6	95,522	4.478	C
111	SL	ВІ	0	12	1		111	3	97,297	2.703	G
112	SL.	BI	0	12	8	В3	163	4	97.546	2.454	c
113	SL.	В	0	12	8	B1	. 81	5	93.827	6.173	C
114	SL	В	C	12	8	А3	140	7	95,000	5.000	C
115	SL	В	. C	12	9	B2	87	2	97.701	2.299	c
116	SL	BI .	C.	12	1	<b>A</b> 3	107	7	93,458	6.542	c
117	SL	BI	0	12	9	B3	137	10	92,701	7.299	С
118	SL	BI	0	12	9	в1	84	4	95.238	4,762	c
119	SL	ВІ	0	12	9	A2	115	0	100.000	0.000	C
120	SL	ВІ	o	12	1	C1	137	10	92,701	7.299	c
121	SL	BI	50	12	3	C2	109	107	1,835	98,165	Α
122	SL .	BI	50	12	3	52	103	103	0.000	100.000	Α .
123	SL	BI	50	12	7	B1	128	124	3.125	96.875	Α .
124	SL	В	60	12	7	B3	109	103	5.505	94.495	Α
125	SL,	BI	50	12	7	B2	116	113	2.586	97.414	Α :
126	SL	BI	50	12	7	A2	115	113	1.739	98,231	A
127	SL.	ВІ	50	12	2	A2	119	115	3.361	96,639	Α
128	SL	BI	50	12	2	81	105	102	2.857	97,143	Α.
129	SL.	ы	50 1	12	3	В1	144	136	5.556	94,444	Α,
130	SL,	BI	50	12	2	B2	116	114	1.724	98,276	Α
131	SL	BI	50	12	3	A2	117	113	3.419	96,581	Α :
132	SL	BI	60:	12	2	А3	145	140	3,448	· · · · · · · · · · · · · · · · · · ·	Α
133	SL.	Bi	100	12	- 1	B3	126	124	1.587		В :
134	SL.	В	100	12		81	105	105	0.000	· - · · · · · · · · · ·	В
135	SL .	ВІ	100	12	4	B2	123	122	0.813	99.187	
136		٥.			٠,				0.010	uu.101	-
.50											

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	SL	ы	100	12	4	C3	104	104	0.000	100.000	В
137	SL	81	100	12	5	В2	97	97	0.000	100,000	В
138	SL	ВІ	100	12	6	В3	113	113	0,000	100,000	8
139	SL	. BI	100	12	6	82	121	119	1,653	98.347	В
140	SL	. Bl	100	12	6	C2	127	126	0.787	99.213	В
141	SI.	В	100	12	4	A2	117	116	0.955	99.145	В
142	SL	BI	100	12	5	В3	108	108	0,000	100.000	В
143	SL	ВІ	100	12	6	C3	98	95	3.061	96.939	В
144	SL	ы	100	12	5	A2	106	104	1.887	98.113	В
145	SL	WT	0	6	7	B1	80	2	97.500	2.500	С
146	SL	WT	0	6	1	Α1	109	4	96.330	3.670	С
. 147	SL	WT	0	6	1	B2	87	2	97.701	2.299	С
148	SL	WT	0	6	7	C1	108	5	95.370	4.630	C
149	SL	WT	. 0	6	1	В1	118	7	94,068	5 932	С
150	SL	WT	0	6	4	<b>A</b> 1	64	3	95,313	4.688	C :
151	SL	WT	0	6	7	A1	124	2	98.387	1.613	С
152	SL	WT	0	6	4	В1	78	4	94.872	5.128	C .
153	SL	WT	0	6	4	A2	74	7	90,541	9.459	С
154	SL	WT	0	9	4	C1	71	2	97,183	2.817	C
155	SL	WT	0	9	1	В3	84	2	97.619	2.381	С
156	SL	wr	0	9	1	А3	159	9	94.340	5.660	С
157	SL	WT	0	9	7	B2	108	6	94.444	5.556	С
158	SL	WT	0	9	7	A3	54	2	96.296	3.704	С
159	SL	WT	0	9	7	C3	111	6	94,595	5.405	С
160	SL	WT	0	g	4	В2	75	3	96.000	4.000	С
161	SL.	WT	0	9	4	A3	110	7	93.636	6.364	C
162	SL	WT	0	9	1	C1	144	6	95.833	4.167	С
163	SL	WT	0	12	1	A2	101	5	95.050	4.950	С
164	SL	WT	0	12	1	C2	108	8	94.444	5.556	С
165	SL	WT	0	12	. 7	A2	92	2.	97.826	2.174	C :
166	SL	₩ſ	0	12	4	C3	141	4	97,163	2,837	C
167	SL	WT	0	12	7	C2	90	3	96.667	3.333	С
168	SL	WT	0	12	7	В3	104	2	98.077	1.923	C .
168	SL	WT	0	12	. 4	В3	79	3	96,203	3,797	C
170	8L	WT	. 0.	12	4	C2	81	4	95.062	4.938	C
171	SL.	WT	0	12	17	C3	111	5	95,495	4,505	C
172	SL	WT	50	6	8	C1	136	133	2.206	97.794	A
173	SL	WT	50	6	8	А3	96	91	5.208	94,792	٨
174	SL	WT	50	6	2	A1	108	91	15.741	84.259	Α
175	SL	WT	50	6	5	B.	67	59	11.940	88.060	A
176	SL	WT	50	. 6	2	8	116	106	8,621	91.379	Α
177	SL	<b>W</b> T	50	6	. 5	C1	85	71	16.471	83.529	Λ
178	SL	W⊺	50	6.	2	C1	61	57	6.557	93.443	Α
179	SL	WT.	50	6	5	A1	95	87	8.421	91.579	A _.
180	SL	WT	60	. 6	8	В3	149	92	38,255	61.745	
181	SL	WT .	50	9	8	C2	61	60	1,639	98,361	Λ
182											

AEH-12-PSEUDO-03

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SAS Output

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	SL	WT	50	9	8	· A1	: 148	146	1.351	98,649	Α .
183	SL	WT	50	9		co	117	112	4,274	95.726	Α
184	SL	WT	50	9	 8	B1	85	80	5.882	94.118	A
185	SL.	WT	50	9	5	A3	61	59	3.279	96.721	Ä
186	SL	wī	50	9	2	82	103	94	8.738	91,262	A
187	SL	WT	50	9:	5	C3	80	61	23.750	76.250	Λ
188	SL.	WT	50	9	2	A3	114	88	22.807	77.193	Α
189	SL	WT	- 50	9	5	Б2	105	83	20.952	79.048	Α
190	SL	WT	50	12	5	C2	114	112	1.754	98.246	Α
191	SL	WT	50	12	2	A2	98	97	1,020	98,980	À
192	SL	WT	50	12	8	82	88	85	3.409	96.591	A
193	SL	WT	50	12	2	C2	86	86	0.000	100,000	Α
194	SL	WT	5C	12	8	СЗ	129	128	0.775	99.225	Α .
195	SL.	WT	5C	12	2	В3	85	80	5,882	94.118	Α
196	SL	WT	50	12	5	В3	63	58	7.937	92.063	Α
197	SL	WT	50	12	8	A2	76	73	3.947	96.053	Α
198	SL.	WT	50	12	5	A2	60	60	0.000	100.000	Α
199	SL	WT	100	6	9	Αí	77	75	2.597	97,403	В
200	SL	WT	100	6	6	АЗ	57	54	5.263	94.737	В
201	SL	WΤ	100	6	9	C1	118	99	16,102	83,898	В
202	SL	WT	100	6	3	В3	104	95	8.654	91,346	В
203	SL	WT	100	6	3	B2	122	114	6,557	93,443	В
204	SL	WT	100	6	6	A2	124	121	2.419	97.581	В
205	SI.	.wT	100	6	3	A1	138	111	19,565	80,435	В
206	SL	WT	100	ß	9	81	119	115	3.361	96.639	В
207	SL	WT	100	6	6	A1	69	69	0.000	100.000	В
208	SL	WT	100	9	3	81	51	49	3.922	96.078	В
209	SL	:WT	100	9	3	G2	73	69	5.479	94.521	В
210	SL	WT	100	9	9	C3	123	116	5.691	94,309	В
211	SL	WT	100	9	3	C3	88	88	0.000	100.000	В
212	SL	WT	100	9	9	EА	107	93	13.084	86.916	В
213	SL	WT	100	9	6	B1	59	59	0.000	100,000	В
214	SL	WT	100	9	9	82	69	69	000.0	100.000	В
215	SL	WT	100	9	0	C2	94	94	0.000	100,000	В .
216	SL.	WT	100	9	6	B2	94	81	13 830	86.170	В
217	SL	WT	100	12	6	C1	62	59	4.839	95.161	В
218	SL	WT	100	12	3	۸3	131	125	4.580	95.420	В
219	SL	WT	100	12	3.	A2	95	94	1.053	96,947	В
220	SL	· WT	100	12	9	C2	60	58	3.333	96.667	В
221	SL.	- WI	100	12	6	В3	- 77	. 77	0.000	100.000	В .
222	SI.	WT	100	12	6	C3	102	101	0.980	99.020	8 :
223	SL	WT	100	12	3	C1	104	103	0.962	99.038	8
224	SL	WT	100	12	9	В3	102	100	1.961	98.039	В
225	SL	WI	100	12	9	A2	104	104	0.000	100.000	В

ACH-12-PSEUDO-03

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The mean percent survival and mortality by location and treatment type classified by concentration and exposure duration

The MEANS Procedure

loc=LC irt_typ=Bi

AEM-12-PSEUDO-0}

conc	time	N Obs	Variable	Mean	Sto Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
0	12		potsury potment				
50	12		potsurv potmort	18.1050 81.8950		12.4927 76.2826	23.7174 87.5073
100	12	g	potsurv potmort		10.3957 10.3957		25.9807 90.0010

loc=LC trt_typ=WT

conc	time	N Obs	Varlable	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
0	6	9	polsurv polmort	97.8073 2.1927	2,1553 2.1553		99.4640 3.8494
	9	9	polsury polmort	96.8685 3.1315	1.8169 1.8169	95,4719 1,7349	98,2651 4,5281
	12	9	poleurv pelmort	97.3081 2.6919	1.0183 1.0183	96,5254 1.9092	98.0908 3,4746
50	6	9	patsurv potmort	1.2656 98.7344	1.0077 1.0077	0.4911 97,9598	2.04 <b>0</b> 2 99,5089
	9	9	potsurv potmort	1.1443 98.8557	1.5175 1.5175	-0.0222 97.6893	2,3107 100.0
	12		polsurv polmort	0.6368 99.3632	0.6320 0.6320		
100	6	9	pctsury pctmort	2.0820 97.9180	1.1511 1.1511	1.1971 97.0332	2,9668 98,8029
	9	9	pctsurv pctmort	0.5490 99.4510	0.6880 0.6880	0.0201 98,9222	1.0778 99.9799
	12		potsury potmort	0.6491 99.3509	0,6665 0.6665	0.1368 98.8386	

loc=SL trt_typ≃Bl

conc	time	N Obs	Variable	Mean	Std Dev		Upper 95% CL for Mean
0	12	12	poteury potmort	95,4624 4,5376			96,9004 5,9755
50	12	12	potsurv potmort	2,9296 97.07 <b>0</b> 4	1.5677 1.5677	1,9335 96,0744	3.9256 98.0665
100	12	12		0.8869 99.1131		0.2587 98.4848	1.5152 99.7413

loc=SL trt_typ=WT

canc	time	N Obs	Variable	Mean	Std Dev	Lower 95% CL for Mean	
0	6	9	potsurv potmort	95.5646 4.4354	2.3698 2.3698	93.7431 2.6138	97.3862 6,2569
	9	9	potaury potmort	95.5496 4.4504	1.3716 1.3716	94.4954 3.3961	96.6039 5.5046
	12	9	pctsurv	96.2207	1.2993	95.2220	97.2195

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SAS Output

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:			potmort	3.7793	1,2993	2.7805	4.7780
50	6	9	pctsurv pctmort	12 6022 87.3978	10.7002 10.7002	4.3773 79.1729	20,8271 95.6227
	9		pctsurv pctmort	10.2969 89.7031		3,0379 82,4440	17.5560 96.9621
:	12	9	polsurv polmort	2.7473 97.2527	2.7746 2.7746	0.6145 95.1200	4.0800 99.3855
100	6	9	polsurv	7.1688 92.8312	6.6051 6.6051	2.0917 87.7540	12.2460 97.9083
	9	0	ocisury pelmori	4,6673 95.3327	5,5249 5.5249	0.4205 91.0859	8,9141 99,5795
	12	9	potsurv potmort	1.9675 98.0325	1.8541 1.8541	0.5423 96.6073	3.3927 99.4577

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AEH-12-PSEUDO-94

This analysis looks at the offect of exposure concentration on zebra musselsurvival for 6 h WT at Lake Carlos AEH-12-PSEUDO-93 Zebra mussel mortality - 6 h at Lake Carlos only The GLIMMIX Procedure Model Information Response Variable (Events) | dead Response Variable (Trials) tot Response Distribution Binomial Link Function Logit Variance Function Default Variance Matrix Diagonal Estimation Technique Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class Lovels Values conca 3 ABC Number of Observations Read Number of Observations Used Number of Events Number of Trials 6432 Dimensions Covariance Parameters 1 Columns in X Columns in Z Subjects (Blocks in V) Max Obs per Subject 27 Optimization information Optimization Technique Newton-Raphson Parameters In Optimization 3 Lower Boundaries 0 0 Upper Boundaries Not Profiled Fixed Effects Iteration History Objective Function Iteration Restarts Evaluations 4 78.995175605 . 7.775484 3 75.335487809 3.65968780 0.906969

Convergence criterion (ABSGCONV=0.00001) satisfied.

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3 75.284110563 0.05137725 0.017251 3 75.284093161 0.00001740 6.577E-6 SAS Output

Fit Statistics	1
-2 Log Likelihood	150,67
AIC (smaller is better)	156.57
AICC (smaller is better)	157.61
BiC (smaller is better)	160,46
CAIC (smaller is better)	163.46
HQIC (smaller is better)	157.72
Pearson Chi-Square	70.70
Pearson Chi-Square / DF	2.95

AEH-12-PSEUDO-01

	Parameter Estimates											
Effect	conca	Estimate	Standard Error	DF	t Value	Pr >  t						
conca	A	4.3041	0.3456	24	12.45	<.0001						
conca	В	3.8286	0.2478	24	15.45	<.0001						
conca	С	-3.7072	0.2364	24	-15.88	<.0001						
Resid		2.9459										

	Type III Te	sts of Flx	ed Effect	6
Effect	Num DF	Den DF	F Value	Pr>F
conca	3	24	213.21	<.0001

:	Odds Ratio Estimates										
con	ca _conca	Estimate	DF	95% Confidence Limi							
Α	C	>999,999	24	>999.999	>999.999						
В	C	>999.999	24	924.217	>999.999						

	conca Least Squares Means											
conca	Estimate	Standard Error	DF tValue	Pr > [t]	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean	
Α	4.3041	0.3456	24 12.45	<.0001	0.05	3.5908	5.0173	0.9867	0.004546	0.9732	0.9934	
В	3.8286	0.2478	24 15,45	<,0001	0.05	3.3171	4.3402	0.9787	0.005161	0.9650	0.9871	
С	-3.7072	0.2364	24 -15.68	<.0001	0.05	-4.1952	-3.2193	0.02396	0.005528	0.01484	0.03845	

	Differences of conca Least Squares Means											
con	a _con	nca Estimate	Standard Error		t Value	Pr >  t	Alpha	Lower	Upper	Odds Railo	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
Α	В	0.4764	0.4253	24	1.12	0.2747	0.05	-0.4023	1.3531	1.609	0.669	3.870
A	c	8,0113	0.4187	24	19,13	<.0001	0,06	7.1471	8,8755	>999,999	>999,999	>999.009
8	C	7,5359	0.3425	24	22.00	<.0001	0.05	6.8289	8.2428	>999.999	924,217	>999.999

Performed by K. Weber SAS version 9.3 13:52 01MAY14

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This analysis looks at the effect of exposure concentration on zebra musselsurvival for 9 h WT at Lake Carlos AEH-12-P\$EUDO-04 Zebra mussel mortality - 9 h at Lake Carlos only The GUIMMIX Procedure Model Information WCRK.CARLOS_9 Response Variable (Events) | dead Response Variable (Trials) tol Response Distribution Link Function Variance Function Default Variance Metrix Diagonal
Estimation Yechnique Maximum Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class | Levels | Values | conca 3 ABC Number of Observations Read 27 Number of Observations Used 27 Number of Events 3859 Number of Trials Covariance Parameters 1 Columns in X Columns in Z Subjects (Blocks in V) 1 Max Obs per Subject 27 Optimization Information Optimization Technique Newton-Raphson Parameters in Optimization 3 Lower Boundaries Upper Boundaries 0 Fixed Effects Not Profiled Iteration History Iteration Restarts Evaluations Function Change Gradient

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4 68.164941544

3 62.693908903 5.47103264 1.263567

3 62.406780661 0.00174851 0.00069 3 62.406780571 0.0000009 3.608E-8

0 0

0

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Convergence criterion (GCONV=1E-8) satisfied.

AEH-12-PSEUDO-50

Fit Statistics	
-2 Log Likellhood	124.81
AIC (smaller is better)	130.81
AICC (smaller is better)	131.86
BIC (smaller is better)	134.70
CAIC (smaller is better)	137.70
HQIC (smaller is better)	131,97
Pearson Chi-Square	67.20
earson Chi-Square / DF	2.80

	Parameter Estimates											
Effect	conca	Estimate	Standard Error	DF	t Value	Pr >  t						
conca	Α	4.7686	0,4201	24	11,35	<.0001						
conca	В	5.2611	0.5305	24	<b>9</b> .92	<.0001						
conca	С	-3.4770	0.2231	24	-15.59	<.0001						
Resid		2.8001										

Type III Tests of Fixed Effects										
Effect	Num DF	Den DF	F Value	Pr > F						
conca			156.70							

	Odds Ratio Estimates										
cone	a _conca	Estimate	DF	95% Confide	nce Limits						
Α	C	>999.999	24	>999,999	>999.999						
В	c	>999.999	24	>999,999	>999,999						

:	conca Least Squares Means											
conca	Estimate	Standard Error	DF	f Value	Pr >  t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
Α	4,7686	0.4201	24	11.35	<.0001	0.05	3.9015	5.6356	0.9916	0.003508	0.9802	0.9964
В	5.2611	0.5305	24	9.92	<.0001	0.05	4.1662	6.3561	0,9948	0.002725	0.9847	0.9983
C .,	-3.4770	0.2231	24	-15.59	<.0001	0.05	-3.9374	-3.0165	0.02997	0,006487	0.01913	0.04668

conca	_conca	Estimato	Standard Error	DF	t Value			and more surface to	res Mear Upper	Odda Ralio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
Α	В	-0.4926	0.6767	24	-0.73	0.4737	0.05	-1.8893	0.9041	0.611	0,151	2.470
Α	C	8.2456	0.4757	24	17.33	<.0001	0.05	7.2638	9.2273	>999.999	>999.999	>999.999
В	c	8,7381	0.5765	24	15,18	<.0001	0.05	7.5503	9.9260	>999.999	>999.999	>999,999

Performed by K. Weber SAS version 9.3 13:52 01MAY14

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This analysis looks at the effect of exposure concentration on zebra musselsurvival for 12 h WT at Lake Carlos Zebra mussel mortality - 12 h at Lake Carlos only #251-12-PSEUDO-04 The GLIMMIX Procedure Model Information WORK.CARLOS_12 Response Variable (Events) | dead Response Variable (Trials) tot Response Distribution Binomial Link Function Logit Variance Function Default Variance Matrix Diagonal Estimation Technique Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class Levels Values conca 3 ABC Number of Observations Read Number of Observations Used Number of Events 4202 Number of Trials 6345 Dimensions Covariance Parameters 1 Columns In X Columns in Z 0
Subjects (Blocks in V) 1 Max Obs per Subject 27 Optimization Information Optimization Technique Newton-Rephson Parameters in Optimization : 3 0 Lower Boundaries Upper Boundaries 0 Not Profiled Iteration History Objective Function Iteration Restarts Evaluations Change Gradient 4 51.529434631 0 2.309641 3 50.064319619 1.46511531 0.31522 3 50.037570263 0.02674936 0.00862 3 50.037552305 0.00001796 6,941E-6 Convergence criterion (ABSGCONV=0.00001) satisfied.

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Fit Statistics	
-2 Log Likelihood	100.08
AIC (smaller is better)	106.08
AIGC (smaller is better)	<b>107</b> .12
B(C (smaller is better)	109.96
CAIC (smaller is better)	112.96
HQIC (smaller is better)	107.23
Pearson Chl-Square	32.34
Pearson Chi-Square / DF	1.35

AII 1-12-PSEUDO-13

	Parameter Estiniates											
Effect	conca	Estimate	Standard Error	DF	t Value	Pr > [t]						
conca	Α	5.0562	0.3230	24	15.66	<.0001						
conca	В	5.0852	0.3229	24	15.75	<.0001						
conca	С	-3.5634	0.1520	24	-23.45	<.0001						
Resid		1.3473		[ .								

	Type III Tests of Fixed Effects										
Effect	Num DF	Den DF	F Value	Pr > F							
conca	3	24	347.67	<.0001							

		Odds Rat	o Es	timates	
conc	a _conca	Estimate	DF	95% Confld	nce Limits
Α	G	>999.999	24	>999.999	>999.999
В		>999.999	24	>999.999	>999.999

				co	onca Lea	st Squa	res Mear	1\$				
conca	Estimate	Standard Error	DF	t Value	Pr>_t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
A	5.0562	0.3230	24	15.66	<.0001	0.05	4.3897	5.7228	0.9937	0.002031	0.9877	0.9967
В	5.0852	0.3229	24	15.75	<.0001	0.05	4.4187	5.7517	0.9939	0.001974	0.9881	0.9968
C	<b>-3</b> .5634	0.1520	24	-23.45	< 0001	0.05	-3.8770	-3.2496	0.02756	0.004073	0.02029	0.03733

	Differences of conca Least Squares Means											
conca	_conca	Estimale	Standard Error	DF	t Value	Pr > [6]	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	В	-0.02897	0.4567	24	-0.06	0.9499	0.05	-0.9716	0,9136	0.971	0,378	2.493
Α	C	8 6197	C,3569	24	24.15	<.0001	0.05	7.8830	9.3563	>999.999	>999.999	>999,999
В	C	8.6486	C.3569	24	24.23	<.0001	0.05	7.9120	9.3852	>999.999	>999.999	>999.999

Performed by K. Weber SAS version 9.3 13:52 01MAY14

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SAS Output

This analysis looks at the effect of exposure concentration on zebra musselsurvival for 6 h WT at Shawano Lake Zebra mussel mortality - 6 h at Shawano Lake only The GLIMMIX Procedure AEH-12-PSEUDO-0: Model Information WORK.SHAWANO_6 Response Variable (Events) | deac Response Variable (Trials) lot Response Distribution Binomial Link Function Variance Function Default Variance Matrix Diagonal Estimation Technique Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class Levels Values conca Number of Observations Read Number of Observations Used 27 Number of Events 1676 Number of Trials 2683 Covariance Parameters 1 Columns in X Columns in Z Subjects (Blocks in V) 1 Max Obs per Subject 27 Optimization Information Optimization Technique Newton-Raphson Parameters in Optimization 3 Lower Boundaries Upper Boundaries Fixed Effects Iteration History Iteration Restarts Evaluations Function Change Gradient 4 133.22145011 3 . 125.83770172 7.38374839 1.027229 3 125.7752597, 0.06244202 0.011145 3 125,77525235 0,00000735 1,849E-6 Convergence criterion (ABSGCONV=0.00001) satisfied.

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	Fit St	atistics												
-2 Log	Likeliho	od	251,55								المصالحي	l-12-P3	COUR	-0.1
AIC (sr	naller Is	better)	257.55										4"	, ,
AICC (	smaller l	s better)	258.59											
BIC (er	naller is	better)	261.44											
CAIC (	smaller l	s belter)	264.44											
HQIC (	smaller l	s better)	258.71											•
Pearso	n Chi-Sc	juare	168.29											
Pearso	n Chl-Sc	juare / DF	7.01											
								ı						
	γ <u>-</u>		meter Es					ļ						
		Estimate	Standar	was an owner	1.00									
conca	ļ <b>.</b>	1.8319		0 2541	;		<.0001	į						
conca	! В :	2.4313		0.3189	. 24		<.0001							
conca	C	-3.1086		0.4511	24	6.89	<.0001	,t						
Resid	İ	7.0121			1 ::	لا ا		j						
7	Type III T	ests of Fla	ed Effec	ts.										
	,	Don DF	1		F I									
conca		24	ļ	<,000	!									
	`	1		L. T.										
		Odds Ra	lio Estim	ates										
conca	conca	Estimate	DF 95	% Conf	Idenc	e Limits								
A	c	139,842	24	48,037		407.096	1							
8	C	254,636	24	61.422	١	796.341	<u>;</u>							
											· · · · · · · · · ·			
						onca Lea	er odna	res mean	15 }	1	[		r	
		!				1			İ		Standard Error	Lower	Upper	
	·	e Standa				4			!	}	Mean	ł	Mean	
Α.	1.831	Tag. 1	0.2541			<,0001		1.3075	ļ	0.8620	0,03023		0.9134	
	2.431	3	0.3189	24		<.0001			3.0895		0,02369	}	0.9565	
В						<.0001	0.05	-4.0396	-2.1776	0.04276	0.01846	0.01730	0.1018	
C B	-3.108	6	0.4511	24	-6.89	~.0001			A	h	in our resources			
**		6	0.4511	24	-6.89			onca l es	st Sayar	es Maans				
**		6	0.4511	24	-6.89			onca Lea	st Squar	es Means			Lower	Unne
С	-3.108		St	andard		Differen	ces of c				Odds		Lower nfidence for Odds	Upper Confidence Limit for Odds
Conca	-3.108	Estimate	St	andard Error	DF	Differen	ces of c	Alpha	Lower	Upper	Odds Ratio		nfidence for Odds Ratio	Confidence Limit for Odds Ratio
С	-3.108		St	andard	DF 24	Different t Value -1.47	ces of c	Alpha		Upper 0.2423	Odds		nfidence for Odds	Confidence Limit for Odds

Performed by K. Weber SAS version 9.3 13:52 01MAY14

796.341

This analysis looks at the effect of exposure concentration on zebra musselsurvival for 9 h WT at Shawano Lake Zebra mussel mortality - 9 h at Shawano Lake only ACH-12-PSEUDO-5-The GLIMMIX Procedure Model Information WORK.SHAWANO_9 Data Sel Response Variable (Events) | dead Response Variable (Trials) tot Response Distribution Binomial Link Function Logit Variance Matrix Diagonal Estimation Technique Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class Levols Values conca 3 ABC Number of Observations Read 27 Number of Observations Used 27 Number of Events 1544 Number of Trials ; 2548 Dimensions Covariance Parameters 1 Columns in X Columns in Z Subjects (Blocks in V) 1 Max Obs per Subject 27 Optimization Technique Parameters in Optimization 3 Lower Boundaries Upper Boundaries Fixed Effects Not Profiled Iteration History Iteration Restarts Evaluations Function Change Gradient 4 116.55095602 3 : 106,41799088 : 10,13296514 : 1,431037 3 103,21296528 0.20502559 0.045502 3:105.21278193 0.00018336 0.00006 3 . 105,21278193 | 0.00000000 | 1,03E-10

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Convergence criterion (GCONV=1E-8) satisfied.

AEH-12-PSEUDO-00

Fit Statistics	
-2 Log Likelihood	212.43
AIC (smaller is better)	218,43
AICC (smaller is better)	219.47
BIC (smaller is better)	222,31
CAIC (smaller is better)	225.31
HQIC (smaller is better)	219,58
Pearson Chi-Square	122.32
Pearson Chl-Square / DF	5,10

		Para	meter Estimates		· · · · · · ·	
Effect	conca	Esilmate	Standard Error	DF	t Value	Pr >  t
conca	Α	2,1523	0,2500	24	8.61	<.0001
conca	В	2,8876	0.3568	24	7.87	<.0001
conca	С	-3.0107	0.3526	24	-8.54	<.0001
Resid		5.0965	ť			

Type III Tests of Fixed Effects										
Effect	Num DF	Den DF	F Value	Pr > F						
conca	3	24	69.66	<.0001						

		Odds Rat	lo Es	timates	
con	ca _conce	Estimate	DF	95% Confide	ence Limits
Α	; C	174,689	24	71.579	426,329
В	С	364.427	24	127.514	>999.999

				ec.	nca Lea	st Squa	res Mean	19			or the transfer to	
conce	Estimate	Standard Error	DF	t Value	Pr > jt[	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
Α	2.1523	0.2500	24	8.61	<.0001	0.05	1,6362	2.6683	0.8959	0,02332	0.8370	0.9351
В	2.8876	0,3668	24	7.87	<.0001	0.05	2.1306	3.6445	0.9472	0.01833	0.8938	0.9745
С	-3.0107	0.3526	24	-8.54	<.0001	0.05	-3,7386	-2.2829	0.04694	0.01578	0.02324	0.09255

Upper Confidence Limit for Odds Ratio	Lower Confidence Limit for Odds   Ratio	Odds Ratio	Upper	Lower	Alpha	Pr> t	t Value :	Standard Error DF	Est mate	_conca	conca
1.198	0.192	0.479	0.1808	-1.6514	0,05	0.1106	-1.66	0.4439 24	0.7353	В	٨
426,329	71.579	174.689	6.0552	4,2708	0.06	<.0001	11.94	0,4323 24	5.1630	c ·	Α
>999,999	127,514	364.427	6.9484	4.8482	0.05	<.0001	11.59	0.5088 24	5,8983	C	В

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This analysis looks at the effect of exposure concentration on zebra musselsurvival for 12 h WT at Shawano Lake Zebra mussel mortality - 12 h at Shawano Lake only AJJ-12-PSSUDO-... The GLIMMIX Procedure Model Information

Set WORK.SI-AWANO_12 Response Variable (Events) | dead Response Variable (Trials) tol Response Distribution Binomial Link Function Logt Variance Function
Variance Matrix Default Diagonal Degrees of Freedom Method Residual Class Level Information Class Levels Values conca 3 ABC Number of Observations Read 27 Number of Observations Used 27 Number of Events Number of Trisis 2543 Covariance Parameters | 1 Columns In X 3 Columns in Z Subjects (Blocks In V) 1 Max Obs per Subject 27 Optimization information Optimization Technique Newton-Raphson Parameters In Optimization 3 Lower Boundaries 0
Upper Boundaries 0 Fixed Effects Not Profiled Iteration History 3 51.661802121 0.02645682 0.006667 0 0 3 51.66179312 0.00000900 2.649E-6

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Convergence criterion (ABSGCONV=0.00001) satisfied,

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#25-12-P\$EUDO-9:

Fit Statistics	
-2 Log Likelihood	103,32
AIC (smaller is better)	109.32
AICC (smaller is better)	110.37
BIC (smaller is better)	113.21
CAIC (smaller is better)	116.21
HQIC (smaller is better)	110.48
Pearson Chi-Square	36.18
Pearson Chi-Square / DF	1.51

Parameter Estimates											
Effect	conca	Estimate	Standard Error	D۴	t Value	Pr >  t					
conca	A	3.6623	0.2781	24	13.17	<.0001					
conca	В	3 9379	0.3099	24	12.71	<.0001					
conca	C	-3.2456	0.2146	24	-15.12	<.0001					
Resid		1.5076									

1	Type Ili Tests of Fixed Effects										
Effect	Num OF	Den DF	F Value	Pr≻F							
conca	3	24	187.86	<.0001							

Odds Rallo Estimates											
cen	ca _con	ca Estimate	Estimate DF 95% Confidence								
A	. C	>999.999	24	484.394	>999,999						
В	· c	>999.999	24	605.122	>999,999						

	conca Least Squares Means											
conca	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
Α	3,6623	0.2781	24	13.17	<.0001	0.05	3.0884	4.2362	0.9750	0.006786	0.9564	0.9867
8	3.9379	0.3099	24	12.71	<.0001	0.05	3.2983	4.5776	0.9809	0.005811	0.9644	0.9898
C	-3.2456	0.2146	24	-15,12	<,0001	0.05	-3,6886	-2,8026	0.03749	0.007744	0.02440	0.05718

	Differences of corca Least Squares Means											
conc	a _conca	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
Α	B	-0,2757	0,4164	24	-0,66	0,5'43	0.05	-1.1350	0.5837	0.759	0.321	1,793
Α	c	6,9079	0.3513	24	19.67	<.0001	0.05	6.1829	7.6328	>999.999	484.394	>909,999
В	C	7.1835	0.3770	24	19,05	<,0001	0.05	6.4054	7.9616	>999,999	605.122	>999,099

Performed by K. Weber SAS version 9.3 13:52 01MAY14

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ATT-12-PSEUDO-9-This analysis looks at the effect of exposure duration at Lake Carlos Therefore BI data were excluded from this analysis Includes 6, 9 and 12 h WWC Lake Carlos data Zebra mussel mortality - time at Lake Carlos only The GLIMMIX Procedure Model information WORK.TIME_CARLOS Response Variable (Events) | dead Response Variable ("riais) tot Response Distribution Binomiai Link Function LogII Variance Function Dofault Variance Matrix Diegonal
Estimation Technique Maximum Maximum Likelihood Degrees of Freedom Method Residual Class Level Information Class | Levels | Values time 3 6912 conca 3 ABC Number of Observations Read Number of Observations Used Number of Events 12229 Number of Trials 18549 Dimensions Covariance Parameters 1 Columns in X 15 Columns in Z 0 Subjects (Blocks In V) 1 Max Obs per Subject 81 Optimization Information Optimization Technique Newton-Raphson Parameters in Optimization 9 Lower Boundaries Upper Boundaries Fixed Effects Not Profiled Iteration History Objective
Iteration Restarts Evaluations Function 0 4 198.68955178 3 188,09371633 10,59583545 1,094281

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3 187.73020999 0.36350634 0.083355

3 187.72842613 0.00178367 0.000597 3 187.72842604 0.00000009 3.125E-8

0

Convergence	criterio	n (GCO	NV=1€-8) sa	tisfied.
				2.1
•				

1 200	12.000	J00-51
Detail I	2-1-0-2	الرابال بالل

Fit Statistics							
-2 Log Likelihood	375,46						
AIC (smaller is better)	393.46						
AICC (smaller is better)	395.99						
BIC (smaller is better)	415.01						
CAIC (smaller is better)	424.01						
HQIC (smaller is better)	402.10						
Pearson Chi-Square	170,24						
Pearson Chi-Square / DF	2,36						

			Parameter	Estimates			
Effect	conca	time	Estimate	Standard Error	DF	t Value	Pr >  t
time		6	-3.7072	0.2118	72	-17.50	<.0001
time		9	-3,4770	0.2050	72	-16,96	<.0001
time		12	-3.5634	0.2013	72	-17.70	<.0001
conca	A		8.6197	0.4728	72	18.23	<.0001
conca	8	:	8.6485	0.4728	72	18,29	<.0001
conca	С	:	0				
time*conca	Α	6	-0.6084	0.6036	72	-1.01	0.3168
time*conca	В	6	-1.1128	0.5636	72	-1.97	0.0522
(lme*conca	С	6	0				
time*conca	Α	9	0.3741	0.6439	72	-0.58	0,5631
time*conca	6	9	0.08949	0.7094	72	0.13	0.9000
time*conca	C	9	0				
time*conca	A	12	0				
tlme*conca	В	12	0				
time*conca	С	12	0			,	
Residual			2.3644	-			

Type III Tests of Fixed Effects										
Effect	Num DF	Den DF	F Value	Pr>F						
time	2	72	5.74	0.0048						
conca	2	72	882.11	<.0001						
time*conca	4	72	1.61	0.1802						

	Odds Ratio Estimates											
time	conca	onca time i conca Estimate DF 95% Confidence Lim										
6		12		0.488	72	0.292	0.815					
9		12		0.992	72	0,540	1,820					
	. A		C	>999.989	72	>999,999	>999,999					
	В		С	>999.989	72	>999.999	>999.999					

			C	onca Le	ast Squares Meai	15				- 1
						1		Standard		
				i					Lower	Upper
conc	a Estimate	Standard Error	DF t Value	Pr >  t	Alpha   Lower	Upper	Mean	Mean	Mean	Mean
Α	4.7096	0.2181	72 21.60	<.0001	0.05 4.2749	5.1443	0.6911	0.001929	0.9863	0.9942

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E-11/2 15/2	<b>P</b> 2 11 2022 - 204 - 204	yer ment have denot much obtains		Difference	s of con	ica Les	st Squa	res Mean	s		
conca	_conca	Estimale	Standard Error DF	t Value   P	r>      A	\lpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	В	-0.01537	0,3159 72	-0.05 0.	.9613	0.05	-0.6450	0.6143	0.985	0.525	1.848
A	C	8.2922	0.2484 72	33.38 <.	.0001	0.05	7.7970	8.7873	>999.999	>899,999	>999,929
В	С	8.3075	0.2576 72	32.25 <	0001	0.05	7.7940	8.8211	>999.999	>999.999	>999.999

71 - 178 - 178-17 - 17	v 11/2 mm and and 11/10/20	Attachment on the second of the second		tln	ie Loast	Square	s Means					
time	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Mean		Lower Moan	Upper Mean
6	1.4752	0,1453	72	10.15	<.0001	0.05	1.1855	1.7648	0.8138	0.02201	0.7659	0.8538
9	2.1842	0.2183	72	10.01	<,0001	0.05	1.7491	2.6193	0.8988	0.01985	0.8518	0,9321
12	2.1927	0.2125	72	10.32	<.0001	0.05	1.7690	2.6164	0.8996	0.01920	0.8543	0.9319

	Differences of time Least Squares Means											
time	time	Estimale	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	
6	9	-0.7091	0.2622	72	-2.70	0.0085	0.05	-1.2318	-0.1864	0.492	0.292	0.830
6	12	-0.7175	0.2575	72	-2.79	0.0068	0.05	-1.2308	-0.2043	0.488	0.292	0.815
9	12	-0.00845	0,3046	72	-0,03	0.9780	0.05	-0.6158	0.5989	0,992	0.540	1.820

					time*co	nca Lea	at Squa	res Mean	ıs				
conca	time	Eslimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower	Upper Mean
Α	6	4,3041	0,3096	72	13.90	<.0001	0.05	3.6869	4.9213	0.9867	0.004073	0.9756	0.9928
В	6	3.8286	0,2220	72	17.24	<.0001	0.05	3.3860	4.2713	0.9787	0 004624	0.9673	0.9862
С	6	-3.7072	0.2118	72	-17.50	< .0001	0.05	-4.1294	-3,2850	0.02396	0 004953	0.01584	0.03609
. A	. 9	4.7686	0.3860	72	12.35	<.0001	0.05	3.9990	5,5381	0.9916	0.003224	0.9820	0.9961
В	9	5.2611	0.4875	72	10.79	<.0001	0,05	4,2093	6.2330	0.9948	0.002504	0,9865	0.9980
C	9	-3.4770	0.2050	72	-16.96	<.0001	0.05	-3.8857	-3.0683	0.02997	0.005961	0.02012	D.04443
Α	12	5.0562	0.4278	72	11.82	<.0001	0.05	4.2034	5.9091	0.9937	0.002691	0.9853	0.9973
В	12	5.0852	0.4278	72	11.89	<.0001	0.05	4.2324	5.9380	0.9839	0.002615	0.9857	0.9974
c	12	-3.5634	0,2013	72	-17.70	<.0001	0.05	-3.9647	-3.1621	0.02756	0.005395	0.01862	0.04062

					Differ	ence	s of time	*conca	Least So	uares Mea	ıns			
conca	tlme	_сопса	tlme	Estlinate	Standard Error	DF	t Value	Pr >  4	Alpha	l.ower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	6	В	6	0.4754	0.3810	72	1 25	0.2161	0.05	-0.2841	1.2349	1.609	0.753	3.438
À	6	C	6	8.0113	0.3751	72	21.36	<.0001	0.05	7.2635	8.7591	>999,999	>999,999	>999,999
Α	6	Α	. 9	-0.4645	0.4949	72	-0.94	0.3511	0.05	-1.4510	0,5220	0.628	0.234	1.685
Α	G	8	9	-0.9571	0.5775	72	-1.66	0.1018	0.05	-2.1083	0.1942	0.384	0.121	1.214
A	6	C	9	7.7811	0.3713	72	20.95	<.0001	0.05	7.0408	8.5213	>999,999	>999.999	>999,999
A	6	A	12	-0.7522	0.5281	72.	-1,42	0.1587	0,05	-1.8049	0.3006	0.471	0.164	1.351

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AD3-12-PSEUDO-01

ひにひいい	0 14-h													
1.312 [;]	0.160	0,458	0.2715	-1.8338	0,06	0.1434	-1,48	72	0.5281	-0.7812	12	В	6	A
>999.999	>989.999	>999.999	8.6037	7.1313	0.05	<.0001	21.30	72.	0.3693	7.8675	12	C	6	A
>999,999	>999.999	>999,999	8.1476	6.9242	0,05	<.0001	24.56	72	0.3069	7.5359	6	C	6	В
0.949	0,161	0.391	-0.05214	-1.8277	0.05	0.0383	-2.11	72	0.4453	-0.9399	9	- A	6	В
0.894	0,082	0.239	-0,3646	-2.5004	0.05	0.0093	-2.67	72	0.5357	-1.4325	9	В	6	· B
>999.999	815.004	>699.999	7.9081	6.7032	0.05	<.0001	24.17	72	0.3022	7.3056	: 9	C	6	В
0.766	0.112	0.293	-0.2667	-2.1885	0.05	0.0130	-2.55	72	0,4820	-1.2276	12	. A	6	В
0.744	0.109	0.285	-0.2968	-2.2174	0.05	0.0111	-2.61	72	0.4820	-1.2566	12	В	6	В
>999.999	893.003	>999.999	7.9895	6.7946	0.05	<.0001	24.66	72	0.2997	7,3921	12	c	6	В
<0.001	<0.001	<0.001	-7.5980	-9.3536	0.05	<.0001	-19.25	72	0.4403	-8.4758	9	A	6	c
<0.001	<0.001	<0.001	-7.9088	-10.3280	0.05	<.0001	-16.87	72	0.5315	-8.9684	9	8	6	C
1.430	0.441	0.794	0.3574	-0.8178	0.05	0.4373	-0.78	72	0.2948	-0.2302	9	c	, в	C
<0.001	<0.001	<0.001	-7.8118	-9.7161	0.05	<.0001	-18.36	72	0.4774	-8,7635	12	Α	6	c
<0.001	<0.001	<0.001	-7.8409	-9.7440	0.05	<.0001	-18.42	72	0.4774	-8.7924	12	Ð	6	·c
1.551	0.484	0.866	0.4387	-0.7263	0.05	0.8241	-0.49	72	0.2922	-0.1438	12	С	6	C
2,111	0.177	0.611	0.7471	-1.7322	0.05	0.4309	-3.79	72	0.6219	-0.4926	9	В	9	Α
>999.999	>999.999	>999.999	9.1169	7,3742	0.05	<.0001	18 86	72	0.4371	8,2456	. 9	c	9	Α
2.366	0.238	0.750	0,8611	-1.4364	0.05	0.6191	-0.50	72	0.5763	0.2877	12	Α	9	Α
2.298	0.231	0.729	0.8320	-1.4653	0.05	0.5843	-0.55	72	0.5762	-0.3167	12	8	9	A
>999.999	>999.999	>999.999	9.1999	7.4641	0.05	<.0001	19.14	72	0.4354	8.3320	12	С	9	A
>999,999	>999.999	>999.999	9.7924	7.6839	0.05	<.0001	16.52	72	0,5289	8.7381	9	С	9	В
4,472 :	0,337	1,227	1.4979	-1.0881	0.05	0.7530	0,32	72	0.6486	0.2049	12	Α	9	В
4.344	0.327	1,192	1.4689	-1.1170	0.05	0,7870	0.27	72	0.6486	0.1759	-2	В	9	. 8
>999.999	>999.999	>999.999	9.8760	7.7731	0.05	<.0001	16.73	72	0.5274	8.8246	, 12	C	. 9	8
<0.001	<0.001	<0.001	-7.5875	-9,4789	0.05	<.0001	-17.99	72	0,4744	-8,5332	12	Α	9	, c
<0.001	<0.001	<0.001	7.6166	-9,5079	0,05	<.0001	-18.05	72	0.4744	-8.5622	12	8	9	C
1.933	0,615	1.090	0.6592	-0.4863	0,05	0.7644	0.30	72	0.2873	0.08642	12	C	9	C
3.245	0.291	0.971	1.1771	-1.2350	0.05	0,9619	-0.05	72	0.6050	-0.02897	12	В	12	۸
>999.989	>999,999	>999 999	9.5622	7.8771	0.05	< 0001	18,23	72	0.4728	8.6197	12	С	12	Α
>999.999	>999.999	>999 999	9.5911	7.706*	0.05	<.0001	18.29	72	0.4728	8.6486	12	С	12	В

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#III-12-PSEUDO-01

This analysis tooks at the effect of exposure duration at Shawano Lake Therefore BI data were excluded from this analysis includes 6, 9 and 12 h WWC Shawano Lake data Zebra mussel mortality - time at Shawano Lake only

## The GLIMMIX Procedure

Model Info	rmation
Data Set	WORK.TIME_SHAWANO
Response Variable (Events)	doad
Response Variable (Trials)	tot
Response Distribution	Binomial
Link Function	Logit
Variance Function	Default
Varlance Matrix	Diagonal
Estimation Technique	Maximum Likelihood
Degrees of Freedom Method	Residual

Class I.	evel Info	rmation
Class	Levels	Values
time	3	Б 9 12
conca	3	ABC

Number of Obser	vations Read	81
Number of Obser	vations Used	81
Number of Event	9	4854
Number of Trials		7774

Dimensions	
Covariance Parameters	1
Columns in X	15
Columns in Z	0
Subjects (Blocks In V)	1
Max Obs per Subject	81

Optimization Information							
Optimization Technique	Newton-Raphson						
Parameters in Optimization	9						
Lower Boundaries	0						
Upper Boundaries	0						
Fixed Effects	Not Profiled						

		Itera	flon History		
Iteration	Restarts	Evaluations	Objective Function		Max Gradient
	0	4	303.20045245		17.01214
1	0	3	283.94395153	19,25650092	1.617625
2	0	3	283.6500271	0,29392443	0.039634
3	0	3	283.5498274	0.00019971	0,000052
4	0	3	283.6498274	0.000000000	8.91E-11

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AI HIZ-PSEUDO-C)

Convergence criterion (GCONV=1E-8) satisfied.

Fit Statistics					
-2 Log Likelihood	567.30				
AIC (smaller is better)	585,30				
AICC (smaller is better)	587.83				
BIC (smaller is better)	606.85				
CAIC (smaller is better)	615.85				
HQIC (smaller is better)	593.95				
Pearson Chi-Square	326.79				
Pearson Chi-Square / DF	4.54				

Parameter Estimates									
Effect	conca	time	Estimate	Standard Error	DF	t Value	Pr >  t		
time		6	-3.1036	0.3629	72	-8.57	<.0001		
time	}	9	-3.0107	0.3328	72	-9.05	<.0001		
time		12	-3.2456	0.3724	72	-8.72	<.0001		
conca	А		6.9079	0.6095	72	11.33	<.0001		
conca	В		7.1835	0.6541	72	10.98	<.0001		
conca	С		0						
time*conca	Α	6	-1,9673	0.7382	72	-2.67	0.0095		
time*conca	В	6	-1.6437	0.7908	72	-2.08	0.0412		
time*conca	С	6	0						
time*conca	Α	9	-1.7448	0.7334	72	-2.38	0.0200		
time*conce	В	9	-1,2852	0.8114	72	-1.58	0.1176		
time*conca	C	9	0						
time*conca	Α	12	0						
time*conca	В	12	0		, ,				
time*conca	С	12	0			,			
Residual			4.5387						

Type III Tests of Fixed Effects						
Effect	Num DF	Den DF	F Value	Pr≻F		
time	2	72	5,69	0.0051		
conca	2	72	272.74	<.0001		
timo*conca	4	72	2.20	0.0779		

Odds Ratio Estimates									
time	conca	time	_conca	Estimate	DF	95% Confide	nce Limits		
6		12		0.344	72	0.183	0.646		
9 .		12		0.461	72	0,241	0.879		
	Α	:	С	290. 67	72	165.672	608,215		
	В		С	496.321	72	268.392	917,818		

	conca Least Squares Means							
			1 1	T		Standa En		
conca	Estimate Star	dard Error DF	t Value Pr >	t  Alpha L	ower Upper	Mean Me	an Mean Mean	
Λ	2.5488	0.1916 72	13.31 <.00	0.05 2	.1670 2.9307	0.9275 0.012	88 0.8972 0.9493	

В	3.0856	0.2297 72	13.43 < .0001	0.05 2.6277	3.5435	0,9563	0.009600	0.9326	0,9719
С	-3.1216	0.2058 72	-15.17 <.0001	0.05 -3,6319	-2.7114	0.04222	0.008322	0.02842	0.06230

	□ifferences of conca Least Squares Means												
conca	_conca	Estimate	Standard Error	DF	t Value	Pr > jtj	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio	
Α	В	-0.5368	0.2991	72	-1.79	0.0769	0.05	-1.1330	0.05944	0.585	0.322	1.061	
Α	C	5.6705	0.2811	72	20.17	<.0001	0,05	5.1100	6,2309	290.167	165.672	508.215	
В	C	6.2072	0.3084	72		<.0001		5.5924	6.8220	496,321	268,392	917.818	

	time Least Squares Means											
timo	Estimate	Standard Error	DF	t Value	Pr > <b>[</b> t]	Alpha	Lower	Upper	Mean	Standard Error Moan	Lower Mean	Upper
6	0.3849	0.1831	72	2.36	0.0210	0.05	0.05981	0.7100	0.5951	0.03929	0.5149	0.6704
9	0.6764	0.1783	72	3.79	0.0003	0.05	0,3209	1.0319	0.6629	0.03985	0.5795	0.7373
12	1.4515	0.2709	72	5.36	<.0001	0.05	0.9114	1.9916	0.8102	0.04166	0.7133	0.8799

	Differences of time Least Squares Means												
time	time	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio		
6	9	-0.2915	0.2416	72	-1.21	0.2317	0.05	-0.7732	0.1902	0.747	0.462	1.210	
6	12	-1.0667	0.3162	72	-3.37	0.0012	0.05	-1.6970	-0.4363	0.344	0.183	0.646	
9	12	-0.7752	0,3244	72	-2,39	0.0195	0.05	-1.4218	-0.1286	0.461	0.241	0.879	

					time*co	nce Lea	st Squa	res Mean	8				
conca	time	Estimate	Standard Error	DF	t Value	Pr > [t]	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
A	6	1.8319	0,2044	72	8.96	<.0001	0.05	1.4244	2.2395	0.8620	0.02432	0.8060	0.9037
В	6	2.4313	0.2566	72	9,48	<.0001	0.05	1,9198	2.9428	0.9192	0.01906	0.8721	0.9499
c	6	-3.1086	0.3629	72	-8.57	<.0001	0.05	3.8320	-2.3851	0.04276	0.01485	0.02121	0.08432
A	9	2.1523	0.2360	72	9.12	<.0001	0.05	1,6819	2,6226	0.8959	0.02201	0.8432	0.9323
В	9	2.8876	0.3461	72	8.34	<.0001	0.05	2.1976	3.5776	0.9472	0.01730	0.9000	0,9728
c	g	-3.0107	0.3328	72	-9.05	<.0001	0.05	-3.6741	-2.3473	0.04694	0.01489	0.02474	0.06728
Ä	12	3,6623	0,4825	72	7.59	<.0001	0.05	2.7005	4.6240	0.9750	0.01177	0.9371	0,9903
В	12	3.9379	0.5378	72	7.32	<.0001	0.05	2.8659	5.0100	D.9809	0.01008	0.9461	0.9934
С	12	-3.2456	0.3724	72	-8.72	<.0001	0.05	-3.9880	-2.5032	0.03749	0.01344	0.01820	0.07564

	Differences of time*conca Least Squares Means													
conca	time	_conca	time	Estimate	Standard Error		t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	6	B	6	-0.5993	0.3281	72	-1.83	0.0719	0.05	-1.2533	0.05466	0,549	0,286	1.056
A	6	C	6	4.9405	0.4165	72	11.86	<.0001	0.05	4.1102	5.7708	139.842	60.958	320.808
A	6	Α	9	-0.3203	0.3122	72	-1.03	0,3083	0.05	-0.9427	0.3020	0.726	0.390	1,353
Α	6	6	9	-1.0556	0.4020	72	-2.63	0.0105	0.05	-1.8570	-0.2543	0.348	0.156	0.775
À	6	C	9	4.8427	0.3906	/2	12.40	<.0001	0,05	4,0641	5.6213	126.809	58.213	276,236
Α	6	Α.	12	-1.8303	0,5240	72	-3.49	0,0008	0.05	-2.8749	-0,7858	0.160	0.056	0.456

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## AEH12-PSEUGO-00

Α	6	В	12	-2.1060	0.5753	72	-3,66	0.0005	0.05	-3,2529	-0.9591	0.122	0.039	0.383
Α	<u>;</u> 6	C	12	5.0775	0.4248	72	11.95	<.0001	0.05	4.2306	5.9244	160.376	68.761	374.054
В	6	C	. 6	5.5398	0.4445	72	12.46	<.0001	0.05	4.6538	6.4258	254.636	104 986	617.605
В	6	Α	9	0.2790	0.3486	72	0.80	0.4261	0.05	-0.4159	0.9739	1.322	0.660	2.648
В	6	В	9	-0.4563	0.4308	72	-1.06	0.2931	0.05	-1,3152	0.4026	0.834	0 268	1.496
В	6	C	9	5.4420	0.4202	72	12,95	<.0001	0.05	4.6043	6,2797	230.905	99.914	533.632
В	6	Α	12	-1.2310	0.5464	72	-2.25	0.0273	0.05	-2.3203	-0.1417	0.292	0.098	0.868
В	6	В	12	-1.5067	0.5958	72	-2.53	0.0136	0.06	2.6945	-0.3189	0.222	0.068	0.727
В	6	¢	12	5.6788	0.4522	72	12.55	<.0001	0.05	4.7753	6,5784	292.027	118.547	719.377
C	6	Α	. 9	-5.2608	0,4329	72	-12.15	<.0001	0.05	-6.1238	-4.3979	0,005	0.002	0,012
С	6	В	9	-5.9962	0.5015	72	-11.96	<.0001	0.05	-6.9959	-4.9964	0.002	<0.001	0.007
c	6	C	9	-0.09783	0.4924	72	-0.20	0.8431	0.05	-1.0794	0,8838	0.907	0.340	2,420
C	6	A	12	-6.7708	0.6037	72	-11,22	<.0001	0.05	-7.9743	-5.5674	0.001;	<0.001	0.004
C	8	В	12	-7.0465	0.6488	72	-10.86	<.0001	0,05	-8,3398	-5.7532	<0.001	<0.001	0.003
C	6	c	12	0.1370	0.5200	72	0,26	0.7929	0.05	-0.8996	1,1736	1.147 :	0.407	3.234
A	9	8	9	-0.7363	0.4189	72	-1.76	0.0834	0.05	-1.5703	0.09971	0,479	0,208	1,105
Α .	9	C	9	5.1630	0.4079	72	12.66	<.0001	0.05	4.3498	5.9762	174.689	77,461	393.957
Α	9	Α	12	-1.5100	0.5371	72	-2.81	0.0063	0.05	-2.5806	-0.4394	0.221	0.076	0.644
A	9	. B	12	1.7857	0.5873	72	-3.04	0.0033	0,06	-2.9563	-0.6150	0.168	0.052	0.541
Α	9	С	12	5,3978	0,4409	72	12.24	<.0001	0.05	4,5190	6.2767	220.931	91.744	532,030
В	9	C	9	5.8983	0.4801	72	12.28	<.0001	0.05	4,9412	6.8555	364,427	139.934	949.066
В	9	Α	12	-0.7747	0.5938	72	-1.30	0,1961	0,05	-1.9583	0.4090	0.461	0.141	1.505
В	9	В	112	-1.0503	0.6395	72	-1.64	0.1049	0.05	-2.3252	0.2245	0.350	0,098	1.252
В	9	C	12	6.1332	0.6084	72	12.06	<.0001	0.05	5.1197	7.1467	460.893	167.280	>999.999
C	. 6	!A	12	-6.6730	0.5861	72	11.39	<.0001	0.05	-7.8414	-5.5048	0.001	<0.001	0.004
C	8	В	12	-6,9487	0.6324	72	-10,99	<.0001	0.05	-8.2094	-5.6880	<0.001	<0.001	0.003
С	9	С	12	0.2348	0.4994	72	0.47	0,6396	0,06	-0.7608	1.2305	1.265	0.467	3,423
Α	12	8	12	-0.2757	0.7225	72	-0.38	0.7039	0.05	-1.7159	1,1646	0.759	0.180	3.205
Α	12	С	12	6.9079	0.6095	72	11.33	<.0001	0.05	5,6929	8,1228	>999,999	296.753	>999.999
В	12	С	12	7.1835	0.6541	72	10.98	<.0001	0.05	5.8795	8.4875	>999.999	357.638	>999.999

-2 Log Likelihood

392,24

```
Zebra mussel mortality - BI application
This analysis only looks at 12h Bi at Lake Carlos
The GLIMMIX Procedure
              Model Information
                          WORK BI_CARLOS
Data Set
Response Variable (Events) dead
Response Variable (Trials)
Response Distribution
                           Binomial
Link Function
                           Logit
Variance Function
Variance Matrix
                           Diagonal
Estimation Technique
                          Maximum Likelihood
Degrees of Freedom Method Residual
Class Level Information
Class Levels Values
           3 ABC
conca
Number of Observations Read 27
Number of Observations Used
Number of Events
                            3911
Number of Trials
                            6701
      Dimensions
Covariance Parameters
Columns in X
Columns in Z
Subjects (Blacks in V) 1
Max Obs per Subject 27
         Optimization Information
Optimization Technique
Parameters in Optimization 3
Lower Boundaries
Upper Boundaries
                  Not Profiled
Fixed Effects
                        Iteration History
                                Objective
Function
lieration Restarts Evaluations
                           4 . 202.97656102
                           3 196.1362029 6.84035812 1.281055
               0
                           3 196.12164269 0.01456021 0.003436
               0
                           3 196.12164259 0,00000010 2.497E-8
Convergence criterion (GCONV=1E-8) satisfied.
         Fit Statistics
```

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ACHIZ-PSEUDO-01

AIC (smaller is better)	398,24
AICC (smaller is better)	399.29
BIC (smaller is better)	402,13
CAIC (smaller is belter)	405.13
HQIC (smaller is better)	399.40
Pearson Chi-Square	245.35
Pearson Chi-Square / DF	10.22

Parameter Estimates												
Effect	conca	Estimate	Standard Error	DF	t Value	Pr >  t						
conca	Α	1.4766	0.1876	24	8.81	<.0001						
COIICS	В	1,4554	0.1685	24	8.64	<.0001						
conca	С	-3.6173	0.4537	24	-7.97	<.0001						
Res'd		10.2231				•:						

Type III Tests of Fixed Effects											
Effect	Num DF	Den DF	F Value	Pr>F							
conca	3	24	71.92	<.0001							

Odds Ratio Estimates											
cond	a _conca	Estimate	DF	95% Confide	nce Limits						
Α	C	163.019	24	60.077	442.349						
В	C	169,592	24	58.776	433.329						

				CC	onca Lea	st Squa	res Mean	s	•			
conce	Estimalo	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
A	1.4766	0.1676	24	8,81	<.0001	C.05	1.1307	1,8225	0.8141	0.02537	0.7560	0.8609
В	1.4554	0.1695	24	8.64	<.0001	0.05	1.1076	1.8032	0.8108	0.02585	0.7517	0,8585
c	-3.6173	0.4537	24	-7.97	<.0001	0.05	-4.5536	-2.6809	0.02615	0.01156	0.01042	0.06411

	Differences of conca Least Squares Means											
conca	_conca	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	В	0.02125	0.2377	24	0.00	0,9295	0.05	-0.4693	0.51 8	1.021	0.625	1,668
Α	С	5.0939	0.4837	24	10.53	<.0001	0.05	4.0958	6.0921	163.019	60.077	442.349
В	С	5.0726	0,4840	24	10.48	<.0001	0.05	4.0737	6.0715	159.592	58.776	433.329

Zebra mussel mortality - BI application This analysis only tooks at 12h BI at Shawano Lake

The GLIMMIX Procedure

Model Inform	nation
Data Set	WORK.BI_SHAWANO
Response Varieble (Events)	dead
Response Variable (Trials)	lot
Response Distribution	Binomial
Link Function	Logit
Variance Function	Default
Variance Matrix	Diagonal
Estimation Technique	Maximum Likelihood
Degrees of Freedom Method	Residual

Class L	evel Info	rmation
Class	Levels	Values
conca	3	ABC

Number of Observations Read	36
Number of Observations Used	36
Number of Events	2782
Number of Trials	4214

Dimensions	,
Covariance Parameters	1
Columns In X	3
Columns in Z	0
Subjects (Blocks in V)	1
Max Obs per Subject	36

Optimization Information								
Optimization Technique	Newton-Raphson							
Parameters in Optimization	3							
Lower Boundaries	o							
Upper Boundaries	0							
Fixed Effects	Not Profiled							

		terati	lon History		1
Iteration	Restarts	Evatuations	Objective Function	Change	Max Gradient
0	0	4	70.365340511		2.847558
1	0	3	69.10008839	1.25525212	0.156711
2	0	3	69.090174146	0.00991424	0.002733
3	0	3	59.09017162	0.00000253	8.719E-7

Convergence criterion (ABSGCONV=0.00001) satisfied.

Fit Statistics
-2 Log Likelihood 138.18

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ACTI-12-PSEUDO-01

AIC (smaller is better)	144.18
AICC (smaller is beiter)	144.93
BIC (smaller is better)	148.93
CAIC (smaller is better)	151.93
HQIC (smaller is better)	145.84
Pearson Chi-Square	38.98
Pearson Chi-Square / DF	1.18

Parameter Estimates									
Effect	conca	Estimate	Standard Error	OF	t Value	Pr >  t			
conca	Α	3.4708	0.1683	33	20.62	<.0001			
conca	В	4.7103	0.3151	33	14.95	<.0001			
conca	C	-3.0380	0.1369	33	-22.18	<.0001			
Resid	i	1.1811							

1	Type III Tests of Fixed Effects								
Effect	Num DF	Den DF	F Value	Pr > F					
conca	_		380.30						

	Odds Ratio Estimates									
. con	ca _con	ica Estimate	DF	95% Conflde	nce Limits					
A	С	671.033	33	431.554	>999.999					
В	С	>999.999	33	>999.989	>999,999					

	conca Lesst Squares Means											
conca	Estimate	Standard Error	DF	t Value	<b>₽</b> r> t	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
. A	3.4708	0.1683	33	20,62	<.0001	0.05	3.1284	3.8132	0.9698	0.004922	0.9580	0.9784
В	4,7103	0.3151	33	14.95	<.0001	0.05	4.0691	5.3514	0.9911	0.002787	0.9832	0.9953
C	-3.0380	0.1369	33	-22.18	<.0001	0.05	-3.3166	-2.7594	0.04574	0.005977	C.03501	0.05956

					Differen	ces of c	onca Le	ast Squa	res Mean	s		
conca	_conca	Estimate	Slandard Error D	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio
A	В	-1.2395	0.3673	33	-3.47	0.0015	0,05	-1.9663	-0.5126	0.290	0,140	0.599
A	c	6.5088	0.2170	33	30.00	<.0001	0.05	6.0674	6.9502	671.033	431.554	>999.999
В	С	7.7483	0.3436	33	22,55	<.0001	0.05	7.0492	8.4474	>999.999	>9 <b>9</b> 9,999	>999,899

Zebra mussel mortality - application method This analysis only looks at 12h WT vs 12h BI at Lake Carlos BI only had 12h exposure so can only compare to 12h WT treatment

## The GLIMMIX Procedure

Modelini	formation
Data Set	WORK BI_VS_WT_CARLOS
Response Variable (Events)	deac
Response Variable (Trials)	tot
Response Distribution	Binomial
Link Function	Logit
Variance Function	Default
Variance Matrix	Not blocked
Estimation Technique	Residual PL
Degrees of Freedom Method	Containment

	Class Level Information							
Class	Levels	Values .						
conca	3	ABC						
loc	1	LC						
trt_typ	2	BIWT						
tnk	9	123456789						
tray	9	A* A2 A3 B1 B2 B3 C1 C2 C3						

Number of Observations Read	54
Number of Observations Used	54
Number of Events	8113
Number of Trials	13046

Dimensions	1
G-side Cov. Parameters	2
R-side Cov. Parameters	1
Columns in X	11
Columns in Z	59
Subjects (Blocks in V)	1
Max Obs per Subject	54

Optimization Info	ormation
Optimization Technique	Dual Quasi-Newton
Parameters in Optimization	2
Lower Boundaries	2
Upper Boundaries	o
Fixed Effects	Profiled
Residual Variance	Profiled
Starting From	Data

	Iteratio	on Kistory Objective		Max
Iteration Restarts	Subiterations	Function	Change	Gradient

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DHIZ-PSEUDO-CT

0	0		7 114.0	7872109 0.766	67939	5.0478	-6		
1	0		- 4	8085509 0.362		4 1	i		
2	0			4352559 0.023			- /		
3	0			7685399 0.001					
4			* * *** * * * * * * * * * * * * * * *	7422183 0.000					
5	0			0743968 0.000		÷	•		
6	0	,		.0743846 O COC			:		
	"					0,000	-0		
Convergence o	criterion (	PCONV	=1.11022E-	8) salisfied.					
	it Statis		1 400 00						
2 Res Log Ps									
Generalized C			60.23						
Gener, Chi-Sq	juare / D	F	1.25						
Covariano	e Paran	eter Est	limates	1					
Cov Parm	-,		ndard Error	1					
nk	0.055		0.07644	.4					
ray(tnk)	0,24		0,1059	d .					
Residual (VC)			0,4968	i					
	j '	,		1					
		Solu	tions for F	ixed Effects					
Iffect	conca	trt_typ	Estimate	Standard Erro	r DF	t Value	Pr >  t		
onca	Α	:	4.9711	0.372	6 2	13.34	0.0056		
onca	В		4,9871	0,375	7 2	13.27	0,0056		
onca	c		-3,5461	0.259	1, 2	-13.68	0.0053		
rt_typ	1	ВІ	-C.09125	0.351	9 2	-0.26	0.8197		
rt_lyp	ļ · · · · ·	WT	0				,		
conca*trt_typ	Α	В	-3,2699	0.502	8 2	-6.50	0.0228		
conca*trt_typ	٨	WT	0						
conce*trt_typ	В	ВІ	-3,2397	0.588		-5.50	0,0315		
conca*trt_typ	В	WT	0						
conca*trt_typ	-	BI	. 0	·					
onca*trt_typ	1	wT	. 0	· · · · · · ·	,				
			Ratio Esti						
onca trt_typ	_cone	a trt_ty	/p Estimat	le DF 95% Co	nfide	nce Limit	5		
Α	C		974.74	4 2 251.8	74	>999.99	9 .		
3	; C		>999.99	9 2 316.6	39	>999.99	9		
BI		WT	0.10	4 2 0.0	143	0,25	4 ;		
e ne nemer silaha			ed Effects	0.5					
Effect	÷		DF F Value	. No. merca é					
onca	ļ .	2:	2 427.24	- same					
rt_typ	J	1	2 119.7						
	1	2	2 24.60	0.0391					
conca*trt_typ	)								
onca*trt_typ	)			conca Lea	st Sa	ares Mos	ıns		
conca [*] trt_typ				conca Lea	st Sql	ares Mea	ıns	 Standard	 

 $\label{local/Temp/2/SAS} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\colored} \mbox{\color$ 

	]	Mean	an	Me	Mear	Mean	er	Upp	Lower	Alpha	>  t  .	ue Pr	t Valu	DF	ra Error	Standa	stimate	onca
		0.9874	22	0.90	0.008593	,9641	88	4.36	2,2222	0.05	056	25 0.00	13.2	2	0.2483		3.2905	
		0.9865	30	0.91	0.007586	9652	25	4.29	2.3508	0.05	046	72 - 0.00	14.7	2	0.2256		3.3216	
		0.05947	86	0.011	0.005038	02681	10 0	-2.76	-4.4224	0.05	029	80 : 0.00	-18.6	2	0.1931		-3.5917	
						 Veans	 Iares	ast Squ	nca Le	s of ce	erence	Diffe						
Up		Lower		T		·	7	- ·i				7	7.		7			
ontide t for O		ldence r Odds	Cont	Lim	Odds		i			Pr>				anda				i
R. 4.		Ratio   0.229	,	<b>ļ</b>	0,969	per 124		-1.474	Alpha 0.05	t  9345	).09   0			0.335	4	0.03116	conca E	nca
>999.		51.874		·	974,744	354		5.528	0.05	:	1.88 C	agara.		0,314	i	6,8822	3 }	
>999.		16.839		} 	>999.999	383	· ; ·	5.758	0.05	.0015		***	1.	0.268		6.9133		
· · ·										· · · · · · · · · · · · · · · · · · ·								
			,		Standard		-Ţ-	• 	Means	quare	east	t_typ L	tri	· · · · · ·				
		per een		Lower Mean	Error Mean	ean	ar i	Սրթ	Lower	Moha	>  t  .	ue Pr	t Valu	DE	rd Error	Standa	stimate	tvp
			Ĺ		0.03433	691			-0.7169	0.05			-0.9	2	0.1379	Diana	-0,1237	
			ta .		0.01869	945			1.2852	0.05		79 0.00		2	0.1981		2.1374	; Т.
					i 	Veans	ares	ast Squ	typ Le	s of tri	rence	Differ			r			
Up onfide		Lower	Conf	c													Ì	i
t for Oa Ri	Limit f	r Odds Ratio	ilt fo	Lim	Odds Ratjo	per	· u	Lowe	Alpha	Pr>	lue ;	t Valu		andar Erro	50	stimate	rt_typ E	_typ
0.:		0.043			0.104	720	-1.	-3,1502	0.05	C082	.94 0	-10.9	6 2	0.206	L	-2,2611	٧٢	
	· · · · · · · · · · · · · · · · · · ·							~										1
4							a)115	res Me	at Squa	yp Lea	a*trt_1	conca						ç.
	Upper	Lower Mean	r	tandare Erro Mear	Mean	per	╽.	Lowe	Alpha		ilua P	E + Val	or DF	of Green	Clondar	ntion ates	: t_typ∫Es	,
	Mean 0.9283	0.6589	. i	0.03070	0.8334	613		0.658	0.05		.28 : 0		! ····	0.221	Januar	1.6099	Ciyp ; Ex	
	0.9263	0.9657	-4	0.03070		744	400	3.367	0.05	.0056				0.372		4.9711	,	
			:			1.1			0.05					0.221		1.6562		
4		0.6686	÷.	0.02986	0.8397	106		0.701 3.370			47   0	1.		0.375		4.9871		
	0,9986	0,9668		0.002530	i	. :	-1		0.05		1.27   0		-					
-	0.07555		- 2	.006580				-4.770	···i	.0052		r ja - m		0.263		3.6373		
3	0.08083	009359	D.	0.007060	0.02803	311	. í -2	-4.661	0.05	.0053	.68 0	2 -13.	71 . 2	0.259		3.5461	π	
					ans	es Me	Squa	Least	trt_typ	conca	ces of	liferenc	DI					
Up onficio	wer	Lo Confide	i								İ		į					1
Limit	t for	Limit	ij					l	_		.1						1	į
O:	dds	_	ids ! itlo i		Upper	Lowe	oha	r>    t  Al		t Val		tandare Erro		stima	t typ E	onca t	t_typ i_c	hea
0,	,007		035	ļ		4.906	.06		6 0,01		↓ 01 2	0,3591	11	-3,36			: :	!
3. 3.i	,248 .		956	d ee oo	agains was a	1.3939	ن		5 0,89	j "		0.3132		0,046		8	` <u>.</u> !` I B	
O.:	.005		034	1		5.253		1.1	5 . 0.01			0.4360	400	-3,37	VΤ			, ;
834.	.285	250		190.0		3.7678	.05		6 0.00			0.3438		5.24	. }	. : B	i c	
751.	.057			173.4	-4	3.6903	.05	2 .	4 0.00			0.3406		5.150	ντ		 I C	
,	.259		- 3	27.5		1,4490	.05		0.01	1		0.4337	- 1	3.314	- 1	. ;•	T B	
177			984			2.2930			0.01	;		0.5292		0.0160			тв	
177.	1011	υ,		. 0,0														
9.1	.101	769	199	>999	10.5716	8.6452	.05 -	28. r	67 O.OO	18.	i3 2	0.4563	84 -	C.UU				
	.053 >	769. 709.		>999 9		8.6452 6.5642	.05		7 0.00 7 0.00			0.4563		8,608 8,517	'\ : <b>∀</b> Τ	- B	nr c	

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ANTHIZ-POEUDO-OU

В	BI	В	, WT	-3,3310	0,4209	2	-7.91 0.0156	0.05	-5.1419	-1.5200	0.036	0.006	0.219
В	BI	C	ВІ	5.2935	0.3390	2	15.61 0.0041	0.05	3.8348	6.7521	199.033	46.285	855.878
В	ВІ	¢	WT	5.2022	0.3027	2	17.19 0.0034	0.05	3.8999	6.5045	181.674	49.397	668,169
В	WT	C	ВІ	8 6244	0.4245	2	20.32 0.0024	0.05	6.7980	10.4508	>999.999	896.092	>999.999
B	WT	С	WT	8.5332	0.4500	2	18.96 0.0028	0.05	6.5971	10.4693	>999.999	732.963	>999.999
C	BI	C	wr	-0.09125	0.3519	2	-0.26 0.8197	0.05	-1.6055	1.4230	0,913	0.201	4.149

Zebra mussel mortality - application method This analysis only looks at 12h WT vs 12h Bi at Shawano Lake Bi only had 12h exposure so can only compare to 12h WT treatment

## The GLIMMIX Procedure

Model Information						
Data Set	WORK.BI_VS_WT_SHAWANO					
Response Variable (Events)	dead					
Response Variable (Trials)	tot					
Response Distribution	Binomlal					
Link Function	Logit					
Variance Function	Default					
Variance Matrix	Not blocked					
Estimation Technique	Residual PL					
Degrees of Freedom Method	Containment					

Class Level Information									
Class	Levels	Values							
conca	3	ABC							
loc	1	SL							
trt_typ	2	BIWT							
tnk	9	123456789							
tray	9	B2 A2 A3 B1 B2 B3 C1 C2 C3							

Number of Observations Read	63
Number of Observations Used	63
Number of Events	4416
Number of Triels	6757

Dimensions	ļ
G-side Cov. Parameters	2
R-side Cov. Parameters	1
Columns in X	11
Columns in Z	57
Subjects (Blocks In V)	1
Max Obs per Subject	G3

Optimization information									
Optimization Technique	Dual Quasi-Newton								
Parameters in Optimization	2								
Lower Boundaries	2								
Upper Boundaries	0								
Fixed Effects	Profiled								
Residual Variance	Profiled								
Starting From	Data								

		Iteratio	n History		
teration :	Restarts	Subiterations	Objective Function	Change	Max Gradlent

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0.1	اه		0 ! 447 0							100 to name
0	0			3087772 0.30		1				ACT-12-PSEUD
2				7951899 0.00						
3				7951899 0.00 12024805 0.00		make a second				
4	0			2024808 0.00 2026165 0.00						
	. <u></u>	· ··· ,	0 139.0		000000	33.007	90.			
Convergence o	riterion (	PCONV	=1,11022E-	8) satisfied,						
			-							
Estimated G ma	atrix is r	not posil	ive definite	3.						
F	it Statis	ties	2							
-2 Res Log Pse			139.82							
Generalized C			75.16							
Gener, Chi-Sq			1.32							
			J							
Covarianc	e Param	eter Est	imates							
Cov Parm	Estima	ite Stan	dard Error	_						
tnk		0								
tray(tnk)		0		i						
Residual (VC)	1.31	86	0.2470							
		Sale	floor for E	Ixed Effects			,			
Effect	conce	r	y	Standard Err	or i DF	t Value	Pr>PI			
conca	A		3.6623		0 10	·	<.0001			
conca	В		3.9379			13.59	h			
cohoa	c.		-3.2456	0.20		- <b>1</b> 6,17	the second			
trt_typ		ВІ	0.2076	0.24		0.84	0.4212			
trt_typ		wT	0.2010							
	Á	В	-0.3990	j	6 10	-1.00	0.3427			
concatrt_typ	Α	WT	0				+			
**	В	BI .	0.5648	0.500	1 10	1.12	0.2905			
		WT	 D							
concattrt_typ		BI	3	: :						
conca*trt_typ	С	WT	0							
		1,11 								
		,	Ratio Estin				-			
conca trt_typ		a int_ty	·- <del></del>	· ·		ice Limit	-d			
<u>.</u>	C		819.20	and and a con-		>999.99				
B	. C		>999.89	i - er		>989,99	41			
BI	: /	WT	1.30	1 10 0.	835	2.02	5 :			
Type	III Test	s of Fixe	d Effects							
Effect			F F Value	Pr > F						
conca				3 < 0001						
irt_typ				5 0.2154						
conca*trt_typ				0.2494						
		-								
		d combons		conca Le	st Squ	ares Mea	ins	P		, , , , , , , , ,
	i						1	Standard	1	
			:				*	Error	Lower	Upper

SAS Output

AZTH12-PSEUDO-01

conc	a Estimate	Standard Error 1	DF t Val	ıe Pr> t	Alpha	Lower	Upper	Mean	Mean	Mean	Mean
Α	3.5665	0.1575	10 22.	1000.> 48	0.05	3,2156	3.9175	0.9725	0.004209	0.9614	0.9805
В	4.3241	0.2207	10 19.	59 <.0001	0.05	3.8323	4.8159	0.9869	0.002848	0.9788	0.9920
С	-3.1418	0.1237	10 -25	39 < .0001	0.05	-3.4175	-2.8661	0.04142	0.004912	0.03175	0.05385

***	Differences of conca Least Squares Means												
conca	_conca	Estimate	Standard Error	DF	t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio	
Α	В	-0.7576	0.2712	10	-2.79	0,0190	0.05	-1.3618	-0.1534	0.469	0.256	0.858	
A	[C	6,7083	0.2003	10	33.49	<.0001	0.05	6,2621	7.1546	819,206	524.298	>999.999	
В	C	7.4659	0.2530	10	29.51	<.0001	C.05	6.9021	8.0297	>999.999	994.356	>999.999	

	trt_typ Least Squares Means											
trt_typ	Estimate	Standard Error	DF t Value	Pr > jt]	Alpha	Lower	Upper	Mean		Lower Mean	Upper Mean	
В	1,7144	0.1348	10 12.72	<.0001	0.05	1,4141	2.0146	0.8474	0.01743	0.8044	0.8823	
WT	1.4515	0,1460	10 9,94	<.0001	0.05	1.1262	1.7769	0.8102	0.02245	0.7551	0.8553	

	Differences of int_typ Least Squares Means												
- trt_tj	/p trt_typ	Estimate	Standard Error	D₽	t Value	Pr>	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Upper Confidence Limit for Odds Ratio	
ВІ	WT	0.2628	0.1987	10		0.2154		-0.1799		1.301	0.835	2.025	-

				C	onca trt	typ Lea	et Squa	res Mean	8				
conca	trt_typ	Estimate	Standard Error	DF	t Value	Pr > [t]	Alpha	Lower	Upper	Mean	Standard Error Meen	Lower Mean	Upper Mean
Α	В	3.4708	0.1778	10	19.52	<.0001	0.05	3.0746	3.8670	0.9698	0.005200	0.9558	0.9795
A	WT	3,6623	0,2600	10	14 08	<.0001	0.05	3,0829	4.2417	0.9750	0.006346	0.9562	0.9858
В	ВІ	4.7103	0,3330	10	14.15	<.0001	0.05	3,9684	5.4522	0.9911	0.002944	0.9814	0.9957
В	WT	3,9379	0,2899	10	13,59	<.0001	0.05	3.2921	4,5838	0.9809	0.005435	0.9642	0.9899
С	ВІ	-3.0380	0.1447	10	-21.C0	<.0001	0.05	-3.3604	-2.7156	0.04574	0.006315	0.03356	0.06206
С	WT	-3,2456	0,2007	10	-16.17	<.0001	0.05	-3,6928	-2.7983	0.03749	0.007242	0.02430	0.05741

conca	Irt_typ	_conca	trt_typ	Estimate	Standard Error		t Value	Pr >  t	Alpha	Lower	Upper	Odds Ratio	Lower Confidence Limit for Odds Ratio	Confidence
A	ВІ	Α	WT	-0.1915	0.3150	10	-0.61	0,5569	0,05	-0.8934	0.5104	0,826	0.409	1,666
A	В	В	ВІ	-1.2395	0.3775	10	-3.28	0.0082	0.05	-2.0805	-0.3984	0.290	0.125	0.671
A	ВІ	В	WT	-0.4871	0.3400	10	-1.37	0.1995	0.05	-1.2248	0.2906	0.627	0.294	1.337
Α	Bi	C	BJ	6,5088	0.2292	10	28.39	<.0001	0.05	5.9980	7.0196	671.033	402.634	>999.999
Α	ВІ	С	WT	8.7164	0.2682	10	25.05	<.0001	0.05	6.1189	7,3139	825,827	454.360	>999,999
٨	WT	В	ВІ	-1.0480	0.4225	10	-2.48	0.0325	0.05	-1.9893	-0.1067	0.351	0.137	0.899
A	WŢ	В	WT	-0.2757	0.3894	10	-0.71	0.4952	0.05	-1,1433	0,5920	0.759	0.319	1.808
A	WT .	С	BI	6,7003	0.2976	10	22.52	<.0001	0.05	6.0372	7,3633	812,639	418.730	>999,999
Α	wr .	c	WT	6.9079	0,3285	10	21.03	<.0001	0.05	6.1759	7.6398	>999,999	481.020	>999.999

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AZCHI2-PSEUDO-00

В	Bl	В	WT	0.7723	0.4415 10	1.75 0.1108	0.05 -0,2113 1.7560 2.165	0.810	5.789
В	В	С	ВІ	7.7483	0.3630 10	21.34 <.0001	0.05 6.9394 8,5572 >999,999	>999.999	>999.999
В	В	C	WT	7.9559	0.3888 10	20.46 < 0001	0.05 7.0898 8.8221 >999.999	>999.999	>999.999
В	WT	C	BI	6.9759	0.3240 10	21.53 . <.0001	0.05 6.2541 7.6978 >999.999	520,145	>999,999
В	WT	C	WT	7.1835	0.3526 10	20.37 <.0001	0.05 6.3979 7.9691 >999.999	600,599	>999,999
C	·BI	С	, WT	0.2076	0.2474 10	0.84 0.4212	0.05 -0.3438 0.7589 1.231	0.709	2.136

Performed by K. Weber SAS version 9.3 13:52 01MAY14

MW 3014

FF#___|8 Item No. _4 Pg 31 of 39

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