Naval Research Laboratory
Washington, DC 20375-5320

NRL/MR/6180--00-8474

Evaluation of the Effects of AFFF Inputs on the VIP Biological Nutrient Removal Process and Pass-Through Toxicity

M. Erten-Unal
G.C. Schafran

Old Dominion University
Norfolk, VA

F.W. Williams

Navy Technology Center for Safety and Survivability
Chemistry Division

August 11, 2000

20000919 133

Approved for public release; distribution is unlimited.

US00000956

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (*Leave Blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 11, 2000	Final Report

4. TITLE AND SUBTITLE

Evaluation of the Effects of AFFF Inputs on the VIP Biological Nutrient Removal Process and Pass-Through Toxicity

5. FUNDING NUMBERS

6. AUTHOR(S)

M. Erten-Unal,* G.C. Schafran,* and F.W. Williams

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Research Laboratory
Washington, DC 20375-5320

8. PERFORMING ORGANIZATION REPORT NUMBER

NRL/MR/6180--00-8474

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Naval Facilities Engineering Command
Washington Navy Yard
Washington, DC 20374-5065

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

*Old Dominion University, Norfolk, VA

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

This report discusses the results of a bench scale study conducted to evaluate the potential inhibitory effects of pretreated Aqueous Film Forming Foam (AFFF) wastewater to the Virginia Initiative Plant (VIP) biological nutrient removal process. The pretreatment scenarios included use of defoamers and use of Fenton's reagent as a strong oxidant. Under this testing, bench-scale reactors simulating the nitrification process were loaded with three AFFF concentrations that were pretreated by defoamers and three AFFF concentrations treated with Fenton's reagent. The pretreatment results with defoamers demonstrated that the effluent ammonia nitrogen concentrations for Defoamer #8710 were higher than the effluent ammonia levels for the Defoamer AF 9020, indicating better pretreatment and less nitrification inhibition for the latter defoamer. Fenton's reagent was used to pretreat AFFF at concentrations of 60 ppm, 120 ppm and 480 ppm. There was no nitrification inhibition at 60 ppm and 120 ppm for AFFF wastewater pretreated with Fenton's reagent as compared to the controls. Oxidation with Fenton's reagent was more effective than the defoamers used in pretreating AFFF. The nitrification inhibition potential decreased at concentrations greater than 60 ppm; however, nitrification inhibition occurred at 480 ppm AFFF pretreated with Fenton's reagent. In all of the pretreatment alternatives used, the inhibition reactor effluents exhibited pass-through toxicity to mysid shrimp at AFFF concentrations of 60 ppm or greater, whereas the effluent was not toxic to the sheepshead minnows.

14. SUBJECT TERMS

Environmentally friendly
Aqueous film forming foam
Toxicity

15. NUMBER OF PAGES

672

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std 239-18
298-102

US00000957

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Overview 1
1.2 Study Objectives 3

2.0 METHODS AND MATERIALS 4
2.1 Reference Reactor Operation 4
2.2 Analytical Methods 6
Butyl Carbitol Analysis 7
2.3 BNR Inhibition Batch Assays 10
2.4 Toxicity Pass-Through Testing 11

3.0 RESULTS 12
3.1 Reference Reactor Performance 12
3.2 Butyl Carbitol Analysis 14
3.3 BNR Inhibition Batch Assays Pretreated with Defoamers 14
3.3.1 Pretreatment with Defoamer 8710 15
3.3.2 Pretreatment with Defoamer AF9020 18
3.3.3 Pretreatment with Best Performing Defoamer 21
3.4 BNR Inhibition Batch Assays Pretreated with Fenton's Reagent 24
3.4.1 Pretreatment with Fenton's Reagent at 60 ppm AFFF 24
3.4.2 Pretreatment with Fenton's Reagent at 120 ppm AFFF 27
3.4.3 Pretreatment with Fenton's Reagent at 480 ppm AFFF 27
3.5 Toxicity Pass-Through Testing 32

4.0 SUMMARY and CONCLUSIONS 34

REFERENCES 41

Appendix A AFFF Butyl Carbitol Analyses

Appendix B BNR Inhibition Batch Assays Pretreated with Defoamers

Appendix C BNR Inhibition Batch Assays Pretreated with Fenton's Reagent

Appendix D Pass-Through Acute Toxicity Tests

US00000958

1.0 INTRODUCTION

1.1 Overview

A surfactant, commonly referred to as AFFF (aqueous film-forming foam)[1], is widely used by the U.S. Navy in fire fighting water to improve the ability to control petroleum-based fires. The US Navy is exploring a number of options that include disposal of the fire fighting water to wastewater collections systems where the components of AFFF wastewater would be removed biologically. Disposal of the fire fighting foam to sanitary sewers has been considered as an option, however, concern for the potential toxic or inhibitory effects associated with AFFF wastewater have generally led to a ban from introduction of AFFF to wastewater collection systems. Present concerns over inhibitory effects of AFFF wastewater have resulted in the prohibition of its disposal to the Hampton Roads Sanitation District (HRSD) collection system where it would eventually enter one of the treatment plants that has nitrifying organisms.

Several studies have been performed on the disposal and treatment of AFFF surrogate wastewater. Bench-scale anaerobic and aerobic reactors were used to investigate the potential inhibition of the untreated and pretreated AFFF surrogates (AFFF-S) to nitrification, denitrification, and phosphorus release and uptake in a biological nutrient removal (BNR) process (2,3). The results showed that untreated AFFF-S wastewater at concentrations similar to that expected from the firefighting events exhibited measurable inhibitory effects on biological nitrification. The use of coagulants such as alum, ferric chloride, calcium chloride and cationic polymers have also been observed to be capable of reducing the organic content of AFFF. Upon chemical pretreatment and using aerobic and anaerobic sequencing batch reactions, on acceptable effluent ameuable to an aquatic stream was processed [6, 7 and 8]. Treatability studies have also been conducted with a high-purity oxygen activated sludge system [9]. The results showed 73 to 96% biological oxygen demand (BOD) removal and 69 to 76% chemical oxygen demand (COD) removal. The use of dissolved air flotation treatment on the firefighting wastewater further reduced the dilution ratio needed for acceptable effluent quality from the biological process [10].

Additional studies that were performed by the Air Force to determine the biodegradability of AFFF wastewater (11, 12, 13, 14 and 15) demonstrated that nitrification was evident and no

Manuscript approved July 14, 2000.

US00000959

toxicity to fathead minnows was obtained at 250 ppm AFFF concentration in the wastewater.

Application of physical-chemical treatability studies that were performed with two different types of AFFF (FC-206 and AOW-6 waste) included chemical coagulation and flocculation (precipitation), clarification, carbon adsorption, chemical oxidation and air stripping ([16]. In these studies, chemical oxidation by chlorine removed only 8% COD and oxidation by potassium permanganate removed 14% of the COD. Air stripping, using both air and nitrogen sparging demonstrated only 10% COD reduction after 24-hours of aeration for both techniques.

Fenton's reagent is used for generating strong oxidants in aqueous solutions has been well documented. Studies using solutions of pure compounds and industrial wastewaters indicated very efficient destruction of the original compounds during oxidation [17]. Fenton's reagent has been applied to treatment of several wastewaters containing organic contaminants including oxidation of di- and tri- chlorophenols in aqueous solution [18].

Recurrent study was performed in two phases which will be referred to as Phase IA and Phase IB. The primary intent of Phase IA was to determine the potential inhibitory effect of untreated AFFF solution on biological treatment and whether toxicity passes through to the effluent in biological treatment processes. This report contains the results of Phase 1B in which the primary intent was to determine the potential inhibitory effect of pretreated AFFF solution on the biological nutrient removal process under six different operational conditions. The two types of pretreatment included chemical oxidation with Fenton's reagent and adding different types of defoamers to AFFF wastewater. It also was investigated whether toxicity passes through to the effluent in the biological treatment process. Phase IA results have already been documented previously [19].

US00000960

1.2 Objectives

The overall objective of this study was to study the impact of pretreated AFFF wastewater to a biological nutrient removal process and determine whether pass-through toxicity occurs in the effluent of a biological process receiving wastewater containing AFFF. Specific objectives of this study include:

- Determine the nitrification inhibition potential of AFFF wastewater that is pretreated with two different types of defoamers and the degree of COD removal under operating conditions similar to those of the VIP plant;

- Determine the nitrification inhibition potential of AFFF wastewater that is pretreated with Fenton's reagent and the degree of COD removal under operating conditions similar to those of the VIP plant;

- Measure the acute toxicity of the pretreated AFFF wastewater effluent to *Mysidopsis bahia* (mysid shrimp) and *Cyprinodon variegatus* (sheepshead minnow) to assess the possibility of toxicity pass through in a process similar to the VIP process.

- Examine the chemical composition of the AFFF surfactant and determine the butyl carbitol concentration in the reactors dosed with AFFF by ion chromatography and pulsed amperometric detection methods.

US00000961

2.0 METHODS AND MATERIALS

2.1 Reference Reactor Operation

A 100-liter capacity fill-and-draw type batch reactor was used in order to maintain a continuous supply of uniform nitrifying microorganisms at the Environmental Engineering laboratory of Old Dominion University. The reactor operation was under cyclical anaerobic and aerobic conditions to establish and maintain a nitrifying, phosphorus-accumulating biomass that would show similar nutrient removal performance as in the VIP plant. The reference reactor consisted of a 30-gallon polyethylene tank containing a hexagonal-shaped poly vinyl chloride (PVC) air diffuser and a rapid mixer. The reactor was seeded with a target mixed liquor suspended solids concentration using sludge from the VIP plant to obtain simultaneous nitrogen and phosphorus removal. The solids were allowed to settle and the supernatant was decanted. The reactor was then fed over the duration of the study with a synthetic feed solution comprised of organic and inorganic compounds necessary to support a healthy population of nitrifying, denitrifying and phosphorus removing bacteria. This feed had the same composition used in the first Phase. Table 2-1 shows the organic and inorganic constituents used for preparing the feed solution. The feed was delivered to the reactor over the periods specified each day from a feed tank with a peristaltic pump. The feed tank consisted of a 30 gallon polyethylene tank which was placed in a refrigerator at 4^0C to limit bacterial growth.

An appropriate period of time was allowed to stabilize the reference reactor bacterial population. Reactor operation was sequenced with a programmable timer to activate mechanical mixing, aeration, solution feed, and mixed liquor and supernatant withdrawal. In Phase IA, the reactor was operated on a 4-hour cycle of aerated feed anoxic react, aerated react, settle and decant. In Phase IB, the aeration during the feed stage was terminated because non-aerated feed was a more

US00000962

Table 2-1. Synthetic Feed Stock Constituents

Constituents	grams/gallon	Constituents	grams/gallon
Beef Extract	0.5392	$MgSO_4$	0.2242
Bactopeptone	0.7842	$CaCl_2.2H_2O$	0.0590
Urea	0.1470	NaCl	0.9836
KH_2PO_4	0.2818	K_2HPO_4	0.1103
$(NH_4)_2CO_3$	0.5563	$NaHCO_3$	0.8161
Na_2CO_3	2.2864	CH_3COOH	0.5688
$FeSO_4$	0.0246	$MnSO_4.H_2O$	0.0002
$CuSO_4$	0.00001	$Na_2MoO_4.2H_2O$	0.00001
$ZnSO_4.7H_2O$	0.0002		

US00000963

representative operation mode of the VIP BNR process. React aeration, mixing and decant were all controlled by a programmable controller. Aeration was provided through in-house air supply source and a dissolved oxygen concentration of approximately 4 mg/L was targeted during the react cycle in the reactor in Phase II. Additional mixing was supplied by a mechanical mixer. Operation of each cycle comprised of 4-hour feed with aeration, 4-hour anaerobic, 4-hour aerobic, 4-hour settle and a two-minute decant period. During each cycle, 7.5 gallons of feed was supplied and the same amount was decanted as supernatant. The total volume in the reactor was 24 gallons. The feed and supernatant were collected and analyzed for COD and ammonia nitrogen (NH_3-N) twice per week.

The reactor was also monitored for mixed liquor suspended solids (MLSS) and sludge volume index (SVI) twice per week. The COD analyses was favored over BOD as it gave very fast and repeatable results. However the BOD:COD ratio was periodically checked for both the feed and the supernatant in order to evaluate the stability of the ratio.

2.2 Analytical Methods

The analytical methods employed in this study for evaluating the effects of pretreated AFFF wastewater inputs on biological treatment performance consisted of procedures as prescribed by the United States Environmental Protection Agency [20] or in Standard Methods [21]. All chemicals used were reagent grade or better and all quality assurance/quality control procedures were followed as closely as possible.

Measurements of organic strength were determined through carbonaceous five day BOD ($CBOD_5$) and COD measurements. $CBOD_5$ (determined with a nitrification inhibitor added to BOD bottles) were measured to eliminate potential interferences that nitrification could have on the

US00000964

evaluation of organics removal with the BOD test. CBOD and COD analyses were determined using filtered samples on reactor effluent and filtered and unfiltered samples in the influent. Samples were filtered through a glass fiber filter to eliminate microorganisms and other particulate materials that are not related to the organic components of the AFFF or the dissolved organic compounds that are in the wastewater before AFFF introduction. Since the AFFF components are water soluble and will be dissolved in solution, filtration should not directly interfere with their accurate detection. Measurements of total suspended and volatile suspended solids (TSS and VSS, respectively) were used to determine organic solids loading, reactor MLSS and mixed liquor volatile suspended solids (MLVSS) concentrations and non-settleable TSS concentrations in reactor effluent. In order to reduce variability of TSS and VSS data, the tests were performed on the same days that solids concentrations were fed into the reactor. The nitrogen series were determined by three different analytical techniques. Persulfate digestion followed by ammonia analysis by ion selective electrode was utilized to determine total Kjeldahl nitrogen (TKN) concentrations, ammonia concentrations were measured by ion selective electrode without sample digestion, and nitrate and nitrite concentrations were determined on filtered samples using ion chromatography. Orthophosphate was similarly determined using ion chromatography.

Butyl Carbitol Analysis

As part of this study, butyl carbitol, a major component of AFFF, was also analyzed by ion chromatography utilizing electrochemical detection. Although AFFF from 3M Corporation was used in this study, there are three other Navy-approved manufacturers of AFFF and they have different amounts of butyl carbitol in their product. The AFFF from 3M Corporation was the most readily

US00000965

available product during this study. The Material Safety Data Sheet for AFFF, obtained from its manufacturer 3M Corporation, indicates that butyl carbitol (CAS # 112-34-5) is present as diethylene glycol monobutyl ether at 30 percent by volume. The method used was the one developed by the Dionex Corporation which measured alcohols by Pulsed Amperometric Detection (PAD).

In this method, a potential is applied to an electrode (a gold electrode in this case) in which the amperometric cell current is integrated and electrons are actually transferred between the analyte molecules and the electrode. The detector output is then reported for the integration period. Repetitive series of potentials or a user programmed waveform provided by Dionex is applied to the cell. A waveform includes a series of oxidation reduction potentials which sets the beginning and end of the integration period as shown in Figure 2-1. In amperometric detection method, the potential difference between the electrode and the solution is high enough to cause electron transfer reactions to occur which oxidizes or reduces the species in solution. During an oxidation reaction, electrons are transferred from the analyte to the electrode whereas during reduction, the reverse occurs. During a sample run, two eluants, 90/10 Acetonitrile/water and 100% water were used. A 0.3 M NaOH solution was used as a post column reagent and OmniPac PAX-500 columns were used as analyte columns. The eluant solutions were applied by using linear gradient method. A graphical representation of the linear gradient method is shown in Figure 2-2. A copy of the method used in butyl carbitol determination is in Appendix A.

The procedure used in method development consisted of initially determining the time at which the peak for a known concentration of pure butyl carbitol would elute and then determining the concentration of any peak that would elute at the same retention time for the samples containing AFFF. To rule out any interferences that may be caused from any constituent that would elute at the

US00000966

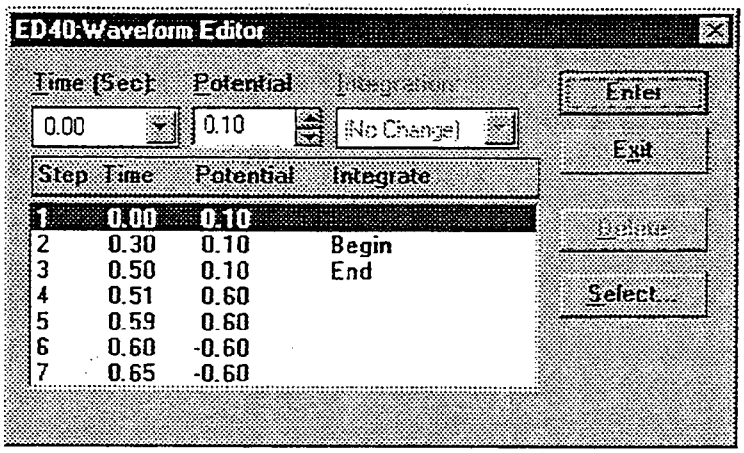


Figure 2-1. Waveform Editor

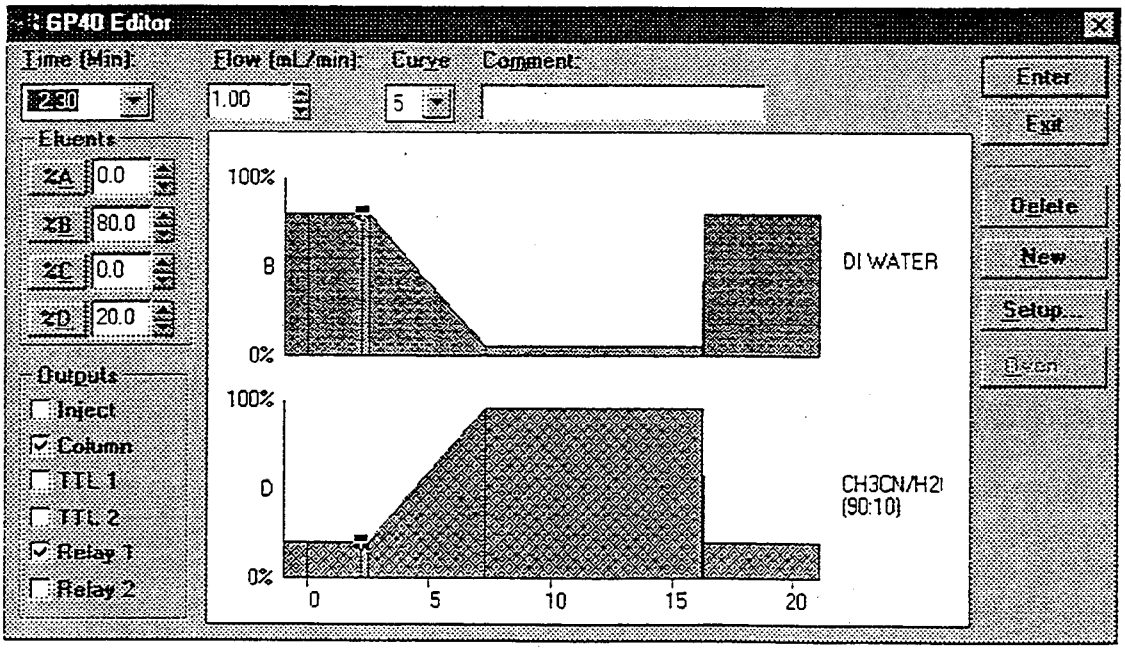


Figure 2-2. Graphical Representation of Linear Gradient Method

same retention time, the synthetic feed solution sample, and the samples from the control reactors which contained no AFFF were also tested with the same method. Results of the test method are also in Appendix A. The results attached were obtained from inhibition test samples with 60 ppm AFFF and Defoamer AF9020. Pure butyl carbitol was tested at concentrations of 1 ppm, 10 ppm and 50 ppm. This range was used since the AFFF concentration tested was only 60 ppm and the butyl carbitol concentration in AFFF was only 30% by volume.

2.3 BNR Inhibition Batch Assays

In Phase II, six nitrification inhibition tests were performed. Of the six, three inhibition tests investigated the effect of defoamers on the treatability of AFFF, and the other three investigated the use of Fenton's reagent on removal of AFFF organic strength and nitrification inhibition. The two defoamers tested were Defoamer DF8710, which is currently used by the Navy, and Defoamer AF9020 which was recommended by the manufacturer of AFFF used in this study. The inhibition tests started with 60 ppm AFFF concentration since this level was identified as the threshold concentration for nitrification inhibition in Phase IA. Specific doses of each defoamer were added in proportion to eliminate any foaming caused by AFFF during the aerated operational stage of the inhibition test.

Fenton's reagent, a strong oxidizing agent, was also investigated as another pretreatment option to determine its effects on COD removal by mixing AFFF laden wastewater with appropriate dose of Fe^{2+} and H_2O_2 (Fenton's reagent) for 24-hours period. Fenton's reagent is formed as a result of the reaction of hydrogen peroxide and iron (II) to generate hydroxyl radical [22]. Residual H_2O_2 was neutralized with sodium bisulfite. The pH of this pretreated wastewater was then adjusted to 7.0

US00000968

by adding sodium hydroxide and this was then blended with synthetic feed solution before it was fed to the reactors. As in Phase IA, three control reactors with no AFFF, no defoamers or Fenton's reagent were used to compare with the inhibition reactors. Three AFFF concentrations of 60ppm, 120 ppm and 480 ppm were pretreated with Fenton's reagent. The sixth inhibition test was conducted to investigate the effects of the defoamer alone on the nitrification process. In this test, two control reactors i.e., no AFFF, no defoamer; two reactors with defoamer alone, and two reactors with 120 ppm AFFF concentration and appropriate dose of defoamers were used.

The first two inhibition tests that were conducted to evaluate the effect of defoamers at 60ppm concentrations were conducted for a period of 8 hours with 2 hour cycles of each anaerobic feed, anaerobic, aerobic and settle period. However the remaining four tests were conducted with one of the three control and one of the three inhibitions reactors being run for an extended 2 hour aerobic cycle

2.4 Toxicity Pass-Through Testing

Toxicity pass-through testing was performed on the inhibition reactors in Phase IB to estimate the maximum loading of the pretreated AFFF wastewater to the VIP plant without increasing effluent toxicity at the VIP plant. The acute toxicity pass-through tests were conducted using the procedures outlined by the EPA (USEPA, 1989). At the end of the BNR inhibition batch aeration period, the mixed liquor was allowed to settle and clarified supernatant was decanted from each reactor and filtered through a coarse glass fiber filter. Toxicity samples were submitted to a qualified bioassay laboratory for acute toxicity testing using *M. bahia* and *C. variegatus* following the current EPA procedures.

US00000969

3.0 RESULTS

3.1 Reference Reactor Performance

The reference reactor was operated for 16 weeks and monitored for MLSS, SVI, COD, ammonia nitrogen and TKN on a semi-weekly basis (Table 3-1). Collection of influent and effluent (supernatant) samples and the mixed-liquor allowed calculation of COD and ammonia removal as well as the food-to-microorganisms (F/M) ratio.

The average COD removal was approximately 95% while removal for ammonia-nitrogen averaged 96%. Throughout Phase IB, the reference reactor exhibited very good nitrification. Even at times when there was a sharp increase in the feed ammonia concentrations, there was no inhibition to nitrification. In Phase IB, the reference reactor operation did not include aeration during the feed cycle. This was determined to be more representative of the VIP BNR process. There were no major operational problems during this phase and the reactor operated continuously for sixteen weeks without any disruption. The SVI values of the reactor were steady, averaging 132 mL/gram and the sludge had good settling characteristics.

The reactor was also monitored for pH during the different stages of operation. The pH of the feed solution was maintained at approximately 6.7 with a bicarbonate alkalinity of approximately 300-400 mg/l as calcium carbonate. The pH during the various cycles ranged from 7.5 to 7.8. The alkalinity of the supernatant was about 100-150 mg/l as calcium carbonate. Alkalinity of the feed was sufficient to provide good nitrification throughout this phase of the study. The dissolved oxygen (DO) concentration was also continuously monitored during the different stages of the reactor operation. The average DO values ranged between 0.5 to 1.0 mg/L during the feed stage; 0.15 to 0.10 mg/L during the anaerobic stage; and 5.5 to 6.0 mg/L during the aeration stage of the reactor

US00000970

TABLE 3.1 : Weekly Performance of the Reference Reactor during the Phase IB Study

Week	MLSS	MLVSS	COD mg/l		% COD	Ammonia Nitrogen, mg/l		TKN, mg/l		SVI
	mg/l	mg/l	Feed	Super.	removal	Feed	Supern.	Feed	Supern.	mL/gram
1	3020	2820	871	38	95.7	43.00	0.86	170.0	10.70	68
	2560	2128	932	27	97.1	28.20	~	241.0	~	88
2	2704	2348	820	40	95.1	28.20	0.46	147.0	6.50	102
	3616	3136	871	43	95.1	20.90	0.48	202.0	7.90	76
3	4512	3292	748	40	94.6	23.10	0.36	380.0	16.20	78
	4584	3460	1025	45	95.6	20.60	0.31	338.0	14.40	98
4	4844	3684	1025	63	93.8	86.20	1.92	210.7	28.20	114
	4716	3636	1025	40	96.1	113.40	2.52	380.6	33.00	127
5	4884	3716	1035	43	95.9	38.30	0.96	636.9	49.70	133
	5096	4044	968	30	96.9	86.60	1.53	688.9	26.60	137
6	4324	3380	997	43	95.7	30.50	1.58	149.3	1.56	162
	4808	3872	1020	50	95.1	~	~	~	~	146
7	4904	3832	1002	12	98.8	32.90	1.27	132.4	0.84	153
	3976	3148	1040	20	98.1	75.70	23.02	110.1	1.61	163
8	4276	3556	1012	53	94.8	32.20	0.10	80.7	11.90	152
	5852	4788	984	32	96.7	~	~	~	~	120
9	5068	4024	1009	81	92.0	53.70	0.92	106.8	3.09	138
	5628	4804	1063	102	90.4	49.60	0.43	126.6	3.26	124
10	5488	4748	1061	63	94.0	~	~	~	~	146
	4984	3716	1104	43	96.1	~	~	~	~	150
11	5152	4312	1127	48	95.8	12.15	0.82	61.0	0.95	146
	5040	4680	1025	61	94.1	11.69	0.89	61.0	1.00	149
12	4908	4104	991	53	94.7	26.70	0.10	25.7	1.00	143
	5028	4156	1050	66	93.7	~	~	~	~	139
13	4976	4080	1020	68	93.3	~	~	~	~	131
	4408	3544	1056	81	92.3	~	~	~	~	159
14	4364	3496	1009	61	94.0	20.70	0.40	102.9	2.20	160
	3788	3012	~	~	~	~	~	~	~	172
15	4172	3328	~	~	~	23.30	0.20	39.2	1.50	156
	4756	3920	1053	81	92.3	~	~	~	~	126
16	3360	2764	~	~	~	34.60	0.10	140.7	1.80	149
	3760	2972	991	38	96.2	~	~	~	~	133
Average	**4486**	**3641**	**998**	**51**	**95**	**41**	**1**	**206**	**11**	**132**

~ : Data not available

US00000971

operation. The DO was adjusted by changing the flow of air which was measured with the help of a flow meter, attached to the air supply line.

3.2 Butyl Carbitol Analysis

The chromatogram obtained for the butyl carbitol concentrations tested did not show any prominent peaks with the exception for the chromatograph for 50 ppm AFFF concentration. Two prominent peaks were seen at retention times of 1.68 minutes and 2.17 minutes. This indicated that the concentrations tested were low enough to be detected however, the butyl carbitol was not 100% pure. A similar prominent peak was seen at 1.68 retention time in chromatograms obtained for the synthetic feed solution. Samples from the control reactors were also measured under the respective peaks which had lower areas under each peak as shown Appendix A. On the other hand, prominent peaks with comparatively larger areas were seen in samples from the inhibition reactors at around the same retention time. However, the data was not sufficient enough to determine that these peaks belonged to butyl carbitol or there was any type of interference because similar type of peaks were also observed at the same retention time at samples obtained from the control reactors and from the feed solution which did not contain any AFFF.

3.3 BNR Inhibition Batch Assays Pretreated with Defoamers

A study that was conducted previously as an independent study in the laboratory tested six to eight defoamers that were recommended by 3M as possible candidates for curtailing the foaming caused by AFFF. The study consisted of a batch reactor with 4 hours of aeration. A screening analysis was performed and showed that 7.5 milliliters/liter of concentrated defoamer was needed to

US00000972

curtail the foaming attributable to 80 mg/L of AFFF. In addition, the dosage of defoamer required to curtail the foaming attributable to 80 mg/L of AFFF exerted a COD of approximately 4,700 mg/L. It was also observed that even with 7.5 mls/liter of defoamer added to the mixed liquor in the inhibition reactors, foaming increased over the course of 4 hours of biological treatment.

The results of this study showed that some defoamers worked better than others. Based on these results, a defoamer that exhibited the most successful results as well as the defoamer that the Navy is currently using were incorporated in the nitrification inhibition batch assay experiments. Since the Phase 1A results showed excessive foaming at 50 and 60 ppm AFFF, the two defoamers were tested for 60 ppm AFFF concentration where foaming was the most excessive. The data for the inhibition testing with the defoamers are shown in Appendix B.

3.3.1 Pretreatment with Defoamer 8710

Triplicate reactors were setup for controls and triplicate reactors were setup for 60 ppm AFFF pretreated with Defoamer 8710 which is currently used by the Navy at Oceana Naval Air Station to suppress the foaming caused by AFFF. The conditions of this inhibition test are shown in Table 3-2. The results did not show any significant solids washout in both control and inhibition reactors. The ammonia nitrogen removal rates were around 72 percent for the control reactors. However, there was significant nitrification inhibition with 60 ppm AFFF pretreated with Defoamer 8070 as compared to the control reactors as shown in Table 3-3. There was no ammonia removal in all of the inhibition reactors. Nitrate levels in the effluent were also less than 5 mg/L indicating that not much ammonia was converted to nitrate and lack of nitrification for the inhibition reactors. However, the operation of the inhibition reactors were changed from aerated feed cycle to non-aerated feed cycle in Phase

US00000973

TABLE 3-2—BNR Inhibition Reactor 60 ppm AFFF Components Pretreated with Defoamer 8710

PARAMETER	CONTROL REACTORS			INHIBITION REACTORS		
	A_1	A_2	A_3	B_1	B_2	B_3
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	3,320	3,347	3,260	3,900	3,900	3,713
Batch MLVSS (mg/L)	3,047	3,027	2,940	3,393	3,400	3,233
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	60	60	60
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	4.0	4.0	4.0
Volume of defoamer 8710 added (mL)	0	0	0	75	75	75
Volume of Synthetic Feed Solution for the simulated wastewater (mL)	2,000	2,000	2,000	1,921	1,921	1,921

US00000974

TABLE 3-3 — Nitrification Inhibition at 60 ppm AFFF Pretreated with Defoamer 8070

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	30.50			0.70.		1,190		
Reference Reactor Decant	0	1.58			30.1		5.9		
Control (A1)	0	21.25	5.85	72.4	0.7	23.3	401	32.2	92.0
Control (A2)	0	21.25	6.32	70.3	0.7	25.1	401	58.5	85.4
Control (A3)	0	19.62	5.20	73.5	0.7	25.1	401	32.2	92.0
AFFF (B1)	60	17.41	22.99	-32.0	2.6	3.0	596**	118	80.2
AFFF (B2)	60	16.73	22.11	-32.0	1.2	4.1	596**	116	80.6
AFFF (B3)	60	16.73	22.11	-32.0	0.7	3.2	596**	123	79.3

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 5.9 mg/L, Feedstock COD = 1190 mg/L, AFFF COD = 1,737 mg/L, and Defoamer 8070 COD = 4930 mg/L.

US00000975

IB. The inhibition test results for Phase IA, showed that there was significant ammonia removal during the initial aerated feed stage. Therefore, the reduction in nitrification may be attributed to the change in the operation mode of the reactors. The COD removal rates were higher for the control reactors ranging between 85 to 92 percent. For the inhibition reactors, the COD removal rates were significantly lower than the control reactors ranging between 45 to 49 percent. The air supply to each reactor was monitored during the react phase with submergible dissolved oxygen probe to ensure that appropriate amount of dissolved oxygen was provided.

3.3.2 Pretreatment with Defoamer AF9020

Defoamer AF9020 was recommended by the manufacturer during the initial screening period. The results of the initial screening study showed that Defoamer AF9020 had more successful results, therefore it was used in the inhibition tests. The conditions of the inhibition test are summarized in Table 3-4. During the testing, there was no significant loss in the solids in both control and inhibition reactors. The ammonia nitrogen removal rates were much lower for the inhibition reactors than the controls ranging between 28 to 49 percent indicating nitrification inhibition as shown in Table 3-5. The COD removal rates were also significantly lower for the inhibition reactors (47 to 56 %) when compared to the control reactors (88 to 98%). This inhibition test was also performed under non-aerated feed conditions, however, the nitrification potential was better than Defoamer 8710. The oxygen uptake rates were lower for the inhibition reactors when compared to the control reactors as shown in Appendix B.

US00000976

TABLE 3-4—BNR Inhibition Reactor 60 ppm AFFF Components Pretreated with Defoamer AF9020

PARAMETER	CONTROL REACTORS			INHIBITION REACTORS		
	A_1	A_2	A_3	B_1	B_2	B_3
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	2,993	2,993	2,813	3,413	3,333	3,620
Batch MLVSS (mg/L)	2,667	2,620	2,520	3,033	2,960	3,213
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	60	60	60
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	4.0	4.0	4.0
Volume of defoamer AF9020 added (mL)	0	0	0	15	15	15
Volume of Synthetic Feed Solution for the simulated wastewater (mL)	2,000	2,000	2,000	1,981	1,981	1,981

US00000977

TABLE 3-5 — Nitrification Inhibition at 60 ppm AFFF Pretreated with Defoamer AF9020

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	26.70			0.9		1,125		
Reference Reactor Decant	0	0.10			24.3		104.3		
Control (A1)	0	24.6	2.8	88.6	0.8	19.0	444.5	10.3	97.7
Control (A2)	0	24.0	3.2	86.7	0.8	22.1	444.5	23.7	94.7
Control (A3)	0	25.7	2.8	89.1	0.8	17.0	444.5	50.6	88.6
AFFF (B1)	60	22.3	11.3	49.3	0.8	13.5	1,907**	1004	47.3
AFFF (B2)	60	23.5	13.2	44.4	0.8	9.0	1,907**	830	56.5
AFFF (B3)	60	21.4	15.4	28.0	0.8	13.8	1,907**	964	49.5

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 104.3 mg/L, Feedstock COD = 1125 mg/L, AFFF COD = 1,737 mg/L, and Defoamer AF9020 COD = 5,300 mg/L.

US00000978

3.3.3 Pretreatment with Best Performing Defoamer

Another inhibition test was also performed with the best performing defoamer (Defoamer AF9020) at 120 ppm AFFF concentration. The sequence of the regular inhibition test was changed with this set. In the previous tests, significant nitrification inhibition was noted in reactors containing AFFF and defoamers. Nitrification was achieved successfully in the control reactors. The nitrification inhibition in the reactors containing AFFF wastewater and defoamer could be attributed both due to the presence of defoamers as well as AFFF. Therefore, this test was conducted using duplicate reactors instead of triplicates. There was duplicate set of control with no defoamers or AFFF, one duplicate set with defoamers only, and one duplicate set with both defoamers and 120 ppm AFFF. One of the main reasons for conducting the test in this fashion was to evaluate whether it was AFFF or the defoamer that would contribute to toxicity pass-through during the toxicity testing. The aeration stages of one of each set were also extended for additional two hours in order to verify the effects of additional aeration on improvements in nitrification potential.

The test conditions are shown in Table 3-7. The inhibition results are also shown in Table 3-8 with significant improvement in nitrification potential in all of the reactors that had extended aeration during the react stage. For example, ammonia removal rates were greater than 99 percent for the control, 99.5 percent for the reactor with defoamer only, and 99.6 percent for the reactor containing both defoamer and 120 ppm AFFF.

The nitrate values were also the highest for all of the extended aeration reactors indicating good nitrification potential. However, COD reduction did not follow the trend and exhibited no reduction in the reactors containing 120 ppm AFFF. The COD of the 120 ppm AFFF itself also increased significantly which might have contributed to the low removal rates.

US00000979

TABLE 3-6—BNR Inhibition Reactor 120 ppm AFFF Components Pretreated with Best Performing Defoamer *Extended Aeration* of React Phase with Defoamer AF9020

PARAMETER	CONTROL REACTORS		DEFOAMER ONLY		120 ppm AFFF and DEFOAMER	
	A_1	A_2	B_1	B_2	C_1	C_2
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	3,167	3,193	5,073	4,710	4,800	4,960
Batch MLVSS (mg/L)	2,767	2,647	4,480	4,020	4,140	4,220
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	0	120	120
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	0.0	8.0	8.0
Volume of defoamer AF9020 added (mL)	0	0	30	30	30	30
Volume of Synthetic Feed Solution for the simulated wastewater (mL)	2,000	2,000	1,970	1,970	1,962	1,962

US000000980

TABLE 3-7 — Nitrification Inhibition at 120 ppm AFFF Pretreated with Best Performing Defoamer *Extended Aeration* of React Phase with Defoamer AF9020

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	32.2			1.1		1,102		
Reference Reactor Decant	0	0.10			17.7		38.4		
Control (A1) *Extended Aeration Reactor*	0	26.3	0.01	99.9	0.9	31.1	393	38.4	90.2
Control (A2)	0	23.3	2.2	90.6	0.9	15.7	393	115.3	70.7
Defoamer Only (B1)	0	20.7	2.9	86.0	0.9	21.3	1276	615	51.8
Defoamer Only (B2) *Extended Aeration Reactor*	0	19.9	0.1	99.5	1.0	27.7	1,276	692	45.8
AFFF (C1)	120	20.7	6.6	68.1	0.9	18.5	2,408**	2,486	-3.2
AFFF (C2) *Extended Aeration Reactor*	120	19.9	0.07	99.6	0.9	28.2	2,408**	2,588	-7.5

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 38.4 mg/L, Feedstock COD = 1,102 mg/L, AFFF COD = 3,396 mg/L, and Defoamer AF9020 COD = 5,300 mg/L.

US00000981

3.4 BNR Inhibition Batch Assays Pretreated with Fenton's Reagent

In this part of the phase 1B study, the nitrification inhibition potential of AFFF pretreated with Fenton's Reagent were evaluated. The AFFF:H_2O_2:Fe^{2+} ratios that were required to achieve appreciable reductions in foaming and AFFF concentrations were determined. Since the direct measurement of AFFF was difficult and was not a possible dosing parameter at that point, the study assessed the required COD:H_2O_2:Fe^{2+} ratio needed to achieve appreciable reductions in foaming and the COD of the wastewater containing AFFF. Three different concentrations of wastewater containing 60 ppm, 120 ppm and 480 ppm AFFF were pretreated with Fenton's reagent and the data are attached in Appendix C.

3.4.1 Pretreatment with Fenton's Reagent at 60 ppm AFFF

The wastewater containing 60 ppm AFFF was pretreated with Fenton's reagent 24 hours prior to the inhibition test. The test conditions with the concentrations of iron and hydrogen peroxide are shown in Table 3-8. There was no significant loss of mixed liquor solids from the reactor. The inhibition test results are tabulated in Table 3-9. At 60 ppm AFFF, the ammonia removal rates for the extended aeration inhibition reactors (99.4%) were as high as the control reactors (99.5%). The ammonia nitrogen removal rates for the inhibition reactors operating in non-extended aeration mode were only 10 percent lower than the control reactors. Nitrate concentration in the extended aeration inhibition reactor was higher than the control reactor operating under similar conditions which indicated good nitrification potential. The COD removal rates were greater than 89 percent in all of the reactors indicating the strong oxidation potential of Fenton's reagent.

US00000982

TABLE 3-8—BNR Inhibition Reactor 60 ppm AFFF Components Pretreated with Fenton's Reagent

PARAMETER	CONTROL REACTORS			INHIBITION REACTORS		
	A_1	A_2	A_3	B_1	B_2	B_3
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	2,793	2,893	2,807	2,880	2,760	2,740
Batch MLVSS (mg/L)	2,480	2,460	2,433	2,880	2,367	2,460
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	120	120	120
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	8.0	8.0	8.0
Fe^{2+} Concentration (mg/L) *Fenton's Reagent*	0	0	0	300	300	300
H_2O_2 Concentration (mg/L) *Fenton's Reagent*	0	0	0	3,000	3,000	3,000

US00000983

TABLE 3-9 — Nitrification Inhibition at 60 ppm AFFF Pretreated with Fenton's Reagent

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	20.7			0.8		973.5		
Reference Reactor Decant	0	0.4			14.8		53.0		
Control (A1) *Extended Aeration*	0	20.7	0.1	99.5	0.8	33.8	360	26.3	92.6
Control (A2)	0	20.7	5.3	74.4	0.8	17.1	360	26.5	92.6
Control (A3)	0	19.9	4.9	75.4	0.8	16.9	360	13.3	96.3
AFFF (B1) *Extended Aeration*	60	16.3	0.1	99.4	0.8	37.4	846**	92.9	89.0
AFFF (B2)	60	16.3	6.0	63.2	0.8	N/A	846 **	79.6	90.6
AFFF (B3)	60	16.3	6.5	60.1	0.8	N/A	846**	79.6	90.6

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 53 mg/L, Feedstock COD = 973.5 mg/L, Fenton's Treated AFFF COD = 1,459 mg/L.

US00000984

3.4.2 Pretreatment with Fenton's Reagent at 120 ppm AFFF

The reactor components for this inhibition test are shown in Table 3-10. There was little or no solids loss in inhibition reactors when compared to the control reactors. The results showed no nitrification inhibition for the reactors operating in extended aeration mode for both controls and inhibition sets. The ammonia removal rates were 99.6 percent for both sets and nitrate production rates were high in both inhibition and control reactors indicating good nitrification as shown in Table 3-11. The COD removal rates were not as high for the inhibition reactors as compared to the control reactors in both non-extended and extended aeration operation modes possibly due to the higher COD of the pretreated AFFF.

3.4.3 Pretreatment with Fenton's Reagent at 480 ppm AFFF

The concentration of AFFF was increased to 480 ppm to determine if there was significant inhibition in nitrification after Fenton's oxidation as pretreatment. The test conditions are shown in Table 3-12. There was no significant loss in the solid concentrations between the control reactors and inhibition reactors. The inhibition test results showed that nitrification potential decreased by 50 percent even in the inhibition reactor operating in extended aeration mode when compared to the control reactor with similar operational mode. Even though in the remaining control reactors the ammonia removal rates were not as high (ranging from 64 to 67%), the ammonia removal in the inhibition reactors were still 50 percent less than that of control reactors which indicated nitrification inhibition (Table 3-13). The COD removal rates for the inhibition reactors decreased significantly at all operational modes when compared to the control reactors. The COD of 480 ppm AFFF wastewater pretreated with Fenton's reagent was 9,000 mg/L which contributed greatly to the

US00000985

TABLE 3-10—BNR Inhibition Reactor 120 ppm AFFF Components Pretreated with Fenton's Reagent

PARAMETER	CONTROL REACTORS			INHIBITION REACTORS		
	A_1	A_2	A_3	B_1	B_2	B_3
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	2,973	3,040	2,927	2,900	2,940	2,800
Batch MLVSS (mg/L)	2,627	2,727	2,640	2,647	2,653	2,473
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	60	60	60
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	4.0	4.0	4.0
Fe^{2+} Concentration (mg/L) *Fenton's Reagent*	0	0	0	300	300	300
H_2O_2 Concentration (mg/L) *Fenton's Reagent*	0	0	0	3,000	3,000	3,000

US00009986

TABLE 3-11 — Nitrification Inhibition at 120 ppm AFFF Pretreated with Fenton's Reagent

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	34.6			0.9		1,082		
Reference Reactor Decant	0	0.1			17.4		54.1		
Control (A1) *Extended Aeration*	0	25.2	0.1	99.6	1.0	30.4	397	13.5	96.6
Control (A2)	0	26.3	0.5	98.1	1.0	19.0	397	13.5	96.6
Control (A3)	0	27.3	0.5	98.2	0.9	15.9	397	13.5	96.6
AFFF (B1) *Extended Aeration*	120	27.3	0.1	99.6	0.9	31.0	1,276**	338	73.5
AFFF (B2)	120	42.6	12.3	71.1	0.9	28.6	1,276**	325	74.6
AFFF (B3)	120	56.6	9.8	82.7	1.0	28.4	1,276**	284	77.7

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 54.1 mg/L, Feedstock COD = 1,082 m/L, Fenton's Treated AFFF COD = 2,638 mg/L.

US00000987

TABLE 3-12—BNR Inhibition Reactor 480 ppm AFFF Components Pretreated with Fenton's Reagent

PARAMETER	CONTROL REACTORS			INHIBITION REACTORS		
	A_1	A_2	A_3	B_1	B_2	B_3
Total Reaction Volume (mL)	6,000	6,000	6,000	6,000	6,000	6,000
Batch MLSS (mg/L)	2,667	2,593	2,587	2,153	2,347	2,493
Batch MLVSS (mg/L)	2,440	2,413	2,380	1,927	2,073	2,253
Seed Biomass Volume (ml)	4,000	4,000	4,000	4,000	4,000	4,000
Effective wastewater (feed & AFFF) Volume, ml	2,000	2,000	2,000	2,000	2,000	2,000
AFFF Concentration (ppm)	0	0	0	480	480	480
AFFF Volume for the simulated wastewater (mL)	0.0	0.0	0.0	32	32	32
Fe^{2+} Concentration (mg/L) *Fenton's Reagent*	0	0	0	300	300	300
H_2O_2 Concentration (mg/L) *Fenton's Reagent*	0	0	0	3,000	3,000	3,000

US00000988

TABLE 3-13 — Nitrification Inhibition at 480 ppm AFFF Pretreated with Fenton's Reagent

Reactor	AFFF ppm	*Initial NH_3 - N mg/L	Final NH_3 - N mg/L	% Removal NH_3 - N	*Initial NO_3 - N mg/L	Final NO_3 - N mg/L	Initial COD mg/L	Final COD mg/L	COD Removal %
Feedstock	0	23.3			0.9		1,038		
Reference Reactor Decant	0	0.2			3.4		13.1		
Control (A1) *Extended Aeration*	0	18.3	0.1	99.5	1.1	30.7	346	26.3	92.4
Control (A2)	0	17.6	5.8	67.0	0.9	13.9	346	39.4	88.6
Control (A3)	0	17.6	6.2	64.8	0.9	15.0	346	13.1	96.2
AFFF (B1) *Extended Aeration*	480	15.0	6.8	54.7	0.8	17.0	3,352**	2,575	23.2
AFFF (B2)	480	15.0	9.3	38.0	0.8	11.2	3,352**	2,680	20.0
AFFF (B3)	480	14.4	9.7	32.6	0.9	14.0	3,352**	2,706	19.3

* Initial values correspond to the measurements taken at the end of feeding stage. (end of 2 hours)

** Corresponds to the total COD which includes Reference Reactor Decant = 13.1 mg/L, Feedstock COD = 1,038 m/L, Fenton's Treated AFFF COD = 9,012 mg/L.

US000000989

organic strength of the wastewater. The COD removal rates for the inhibition reactors ranged between 19 to 23 percent indicating biological degradation inhibition as well.

3.5 Toxicity Pass-Through Testing

The results of effluent toxicity pass-through tests conducted with the mysid shrimp and sheepshead minnow are shown in Table 3-14. In the samples in which AFFF was treated with the defoamers, the minnows were less sensitive to the effluent and exhibited toxicity only in one sample with 120 ppm AFFF pretreated with the best performing defoamer. However, the mysids were much more sensitive and the effluent exhibited toxicity in all of the inhibition reactors pretreated with the two types of defoamers. The results showed that Defoamer 8710 LC_{50} values (65 to 72%) were higher than the defoamer AF9020 (LC_{50}'s between 45-50%) indicating the organisms' less sensitivity to the defoamer that is currently used by NAS Oceana. The tests conducted in duplicates showed that there was no pass-through toxicity in the reactors that had defoamer only, however, pass-through toxicity was observed to both minnows and mysid shrimp in the reactors containing AFFF + Defoamer AF9020. This indicated the possibility that the toxic component of the effluent was AFFF rather than the defoamers.

For the inhibition reactors containing AFFF pretreated with the Fenton's reagent, there was no pass-through toxicity to minnows in all of the pretreatment scenarios tested. However, toxicity to mysid shrimp was evident in all of the inhibition reactors pretreated with Fenton's reagent. As the AFFF concentrations increased, the LC_{50} levels decreased indicating increased levels of toxicity. In all of the test conditions, the feedstock was toxic to both minnows and mysid shrimp most possibly due to the presence of high ammonia concentrations.

US00000990

TABLE 3-14. Summary of Toxicity Test Data for Inhibition Tests

Pretreatment Operation	Toxicity Bioassay Test Date	Sample Type	LC_{50}	
			Sheepshead Minnows	Mysid Shrimp
60 ppm AFFF + Defoamer 8710	Sept/30/97	Feedstock	3.5	8.1
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control A3	>100	>100
		Inhibition B1	>100	72
		Inhibition B2	>100	66
		Inhibition B3	>100	65
60 ppm AFFF + Defoamer AF9020	Nov/3/97	Feedstock	19.7	12.5
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control A3	>100	>100
		Inhibition B1	>100	50.5
		Inhibition B2	>100	50
		Inhibition B3	>100	45
120 ppm AFFF + Best Performing Defoamer (AF9020)	Dec/11/97	Feedstock	42	33
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control B1 Defoamer Only	>100	>100
		Control B2 Defoamer Only	>100	>100
		Inhibition C1 (AFFF+Def.)	>100	43.2
		Inhibition C2 (AFFF+Def.)	22.5	40.6
60 ppm AFFF + Fenton's Reagent	Nov/18/97	Feedstock	36.6	23.3
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control A3	>100	>100
		Inhibition B1	>100	>100
		Inhibition B2	>100	93.9
		Inhibition B3	>100	75.2
120 ppm AFFF + Fenton's Reagent	Dec/2/97	Feedstock	30.6	39.2
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control A3	>100	>100
		Inhibition B1	>100	40.2
		Inhibition B2	>100	63.9
		Inhibition B3	>100	66.0
480 ppm AFFF + Fenton's Reagent	Nov/25/97	Feedstock	13.8	9.7
		R.R. Mixed Liquor	>100	>100
		Control A1	>100	>100
		Control A2	>100	>100
		Control A3	>100	>100
		Inhibition B1	>100	>100
		Inhibition B2	>100	42.1
		Inhibition B3	>100	69.1

US00000991

4.0 SUMMARY and CONCLUSIONS

The pretreatment results with defoamers demonstrated that effluent ammonia nitrogen concentrations for Defoamer # 8710 were higher (22-23 mg/L) than the effluent ammonia levels for the Defoamer AF 9020 (11.3 to 15.4 mg/L) indicating a better pretreatment and less nitrification inhibition for the latter defoamer (Figure 4-1). The nitrate production rates were in accordance with the ammonia removal rates, and were also demonstrated with excellent mass balances on the nitrogen species. In Phase I, at 60 ppm AFFF, the effluent ammonia levels were less than 1 mg/L indicating no nitrification inhibition. It should be noted that the aeration during the feed stage in Phase II was terminated to better simulate the VIP BNR operational conditions. The higher effluent ammonia levels in Phase II was most probably due to termination of aeration during the feed cycle of the inhibition reactors. In order to verify the effect of the additional aeration to nitrification, another inhibition test was conducted with 120 mg/L AFFF and the best performing defoamer (AF 9020). In this test the aeration stage of one of the triplicate inhibition and control reactors were extended for additional two hours. The effluent ammonia nitrogen levels were less than 0.1 mg/L for both controls and the inhibition reactors as exhibited in Figure 4-2. In all of the inhibition tests performed with the defoamers as pretreatment compounds, the COD removal rates decreased significantly in the inhibition reactors when compared to the control reactors with no defoamer or AFFF added. Even though the test conducted with the best performing defoamer under extended aeration operational mode showed some improvement in the COD removal rate, the reduction was only 50 percent when compared to the 90 percent reduction observed in the control reactor.

Fenton's reagent was used to pretreat AFFF at concentrations 60 ppm, 120 ppm and 480 ppm. There were no nitrification inhibition at 60 ppm and 120 ppm AFFF wastewater pretreated with

US00000992

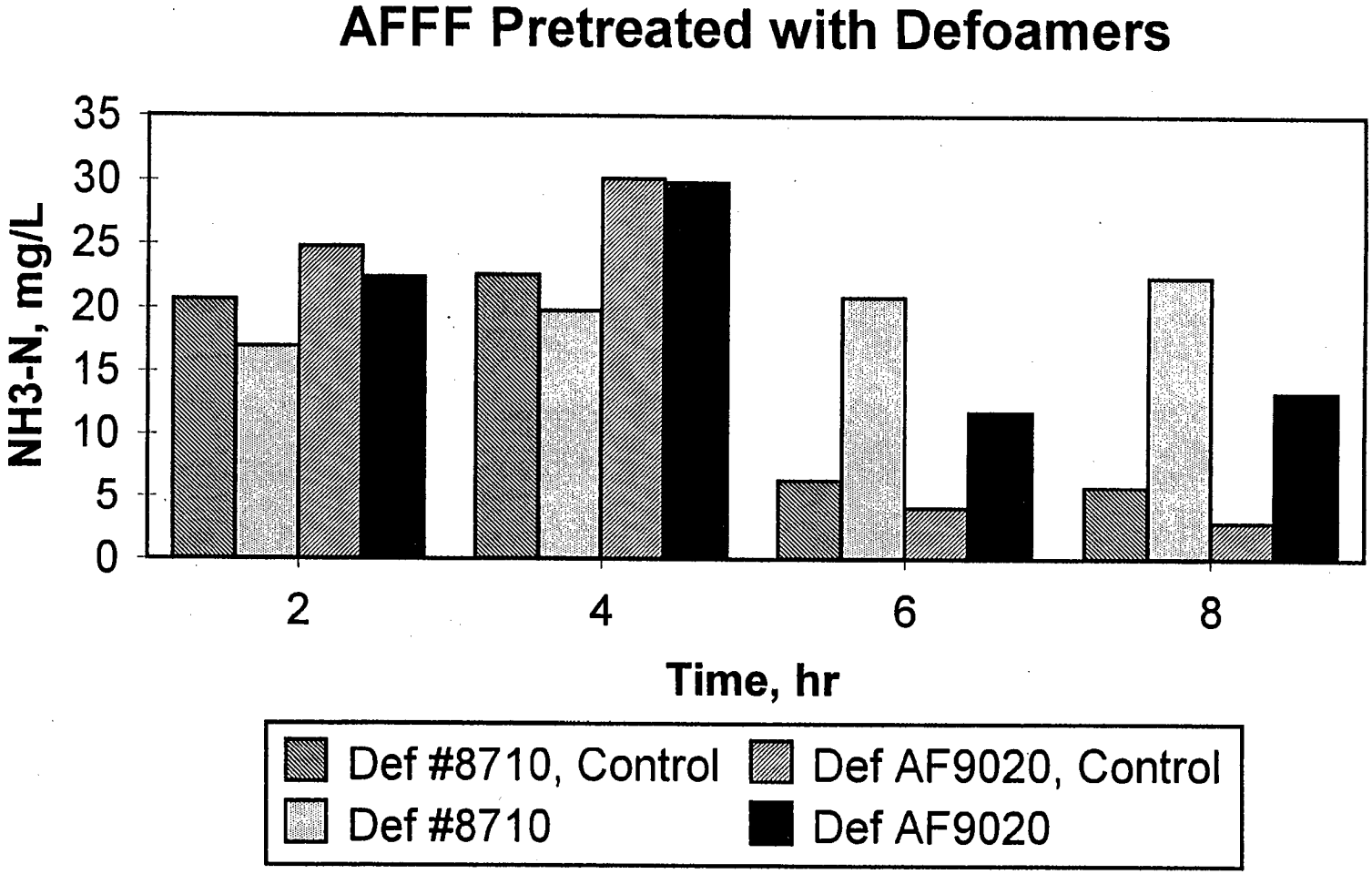


Figure 4-1. AFFF Pretreated with Defoamers (60 ppm AFFF)

US00000993

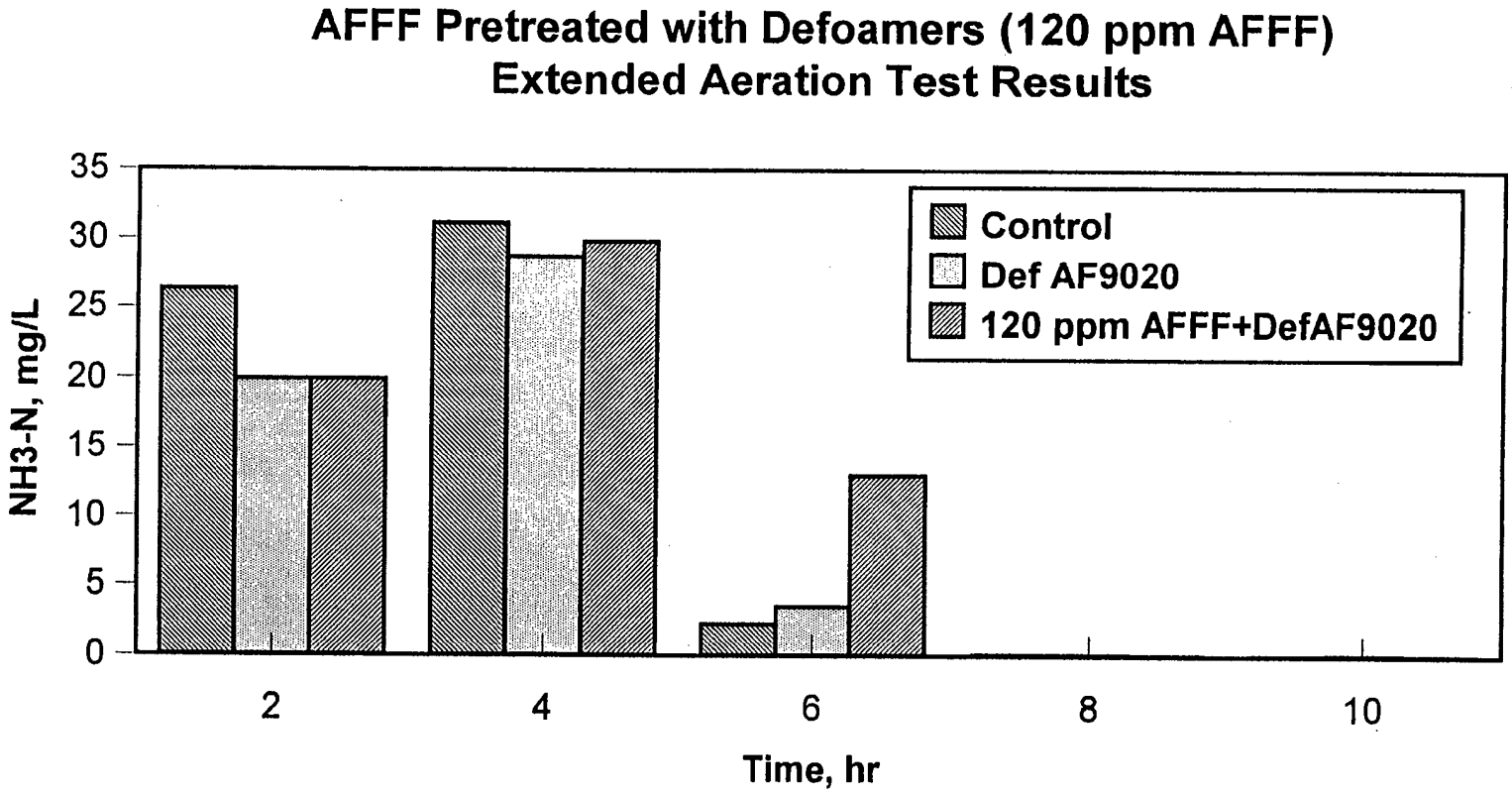


Figure 4-2. AFFF Pretreated with Defoamers under Extended Aeration Mode of Operation (120 ppm AFFF)

US00000994

the Fenton's reagent as compared to the controls. Oxidation with Fenton's reagent was more effective than the defoamers used in pretreating AFFF. The nitrification inhibition potential decreased at concentrations greater than 60 ppm however, nitrification inhibition occurred at 480 ppm AFFF pretreated with Fenton's reagent. Figure 4-3 shows that the ammonia concentrations in the effluent were higher for 120 and 480 ppm AFFF without the extended aeration phase. However, the nitrification inhibition was significantly evident with extended aeration period at 480 ppm AFFF as shown in Figure 4-4.

The toxicity test results showed that, with the exception of one case, there was no pass-through toxicity to the sheepshead minnows in all both of the pretreatment options used in the inhibition tests. However, the effluent from the inhibition reactors were consistently toxic to mysid shrimp in all of the pretreatment options that included defoamers and Fenton's reagent. Toxicity was observed at 60 ppm AFFF concentration as well as 480 ppm AFFF concentration. The LC_{50} results did not exhibit any particular trends with increasing AFFF concentrations as well. In addition, the feedstock exhibited toxicity to both test organisms in all of the inhibition tests conducted due to the presence of high ammonia concentrations.

The analytical measurements for determination of butyl carbitol component of AFFF did not distinguish major prominent peaks in the chromatograms obtained from the ion chromatograph. The data was not sufficient enough to show a distinction between the control reactors and reactors containing AFFF.

The AFFF-laden wastewater pretreated with defoamers and Fenton's reagent did not show any nitrification inhibition at concentrations as high as 120 ppm AFFF. However, nitrification inhibition was evident at 480 ppm AFFF wastewater pretreated with Fenton's reagent.

US00000995

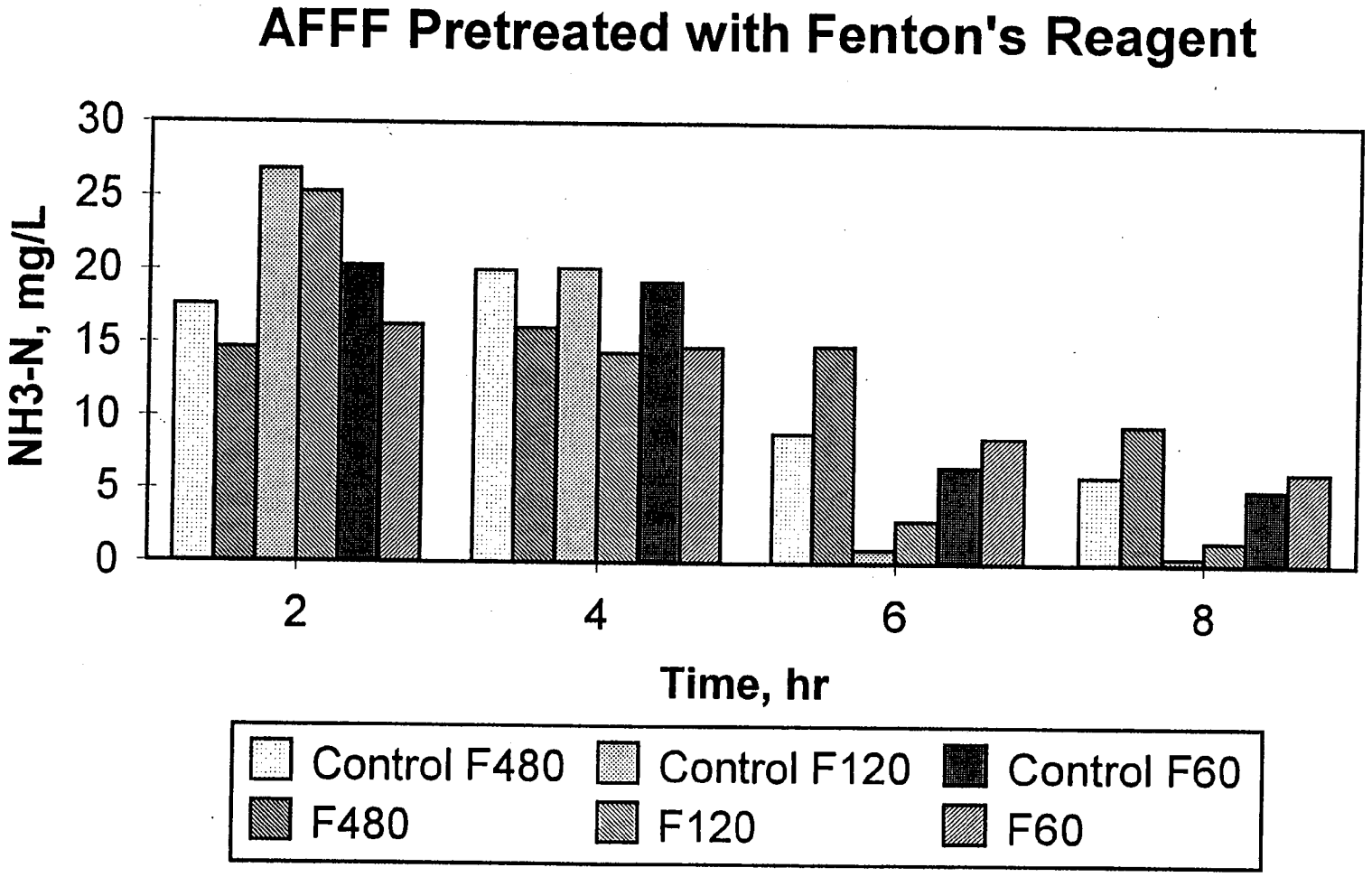


Figure 4-3. AFFF Pretreated with Fenton's Reagent

US00000996

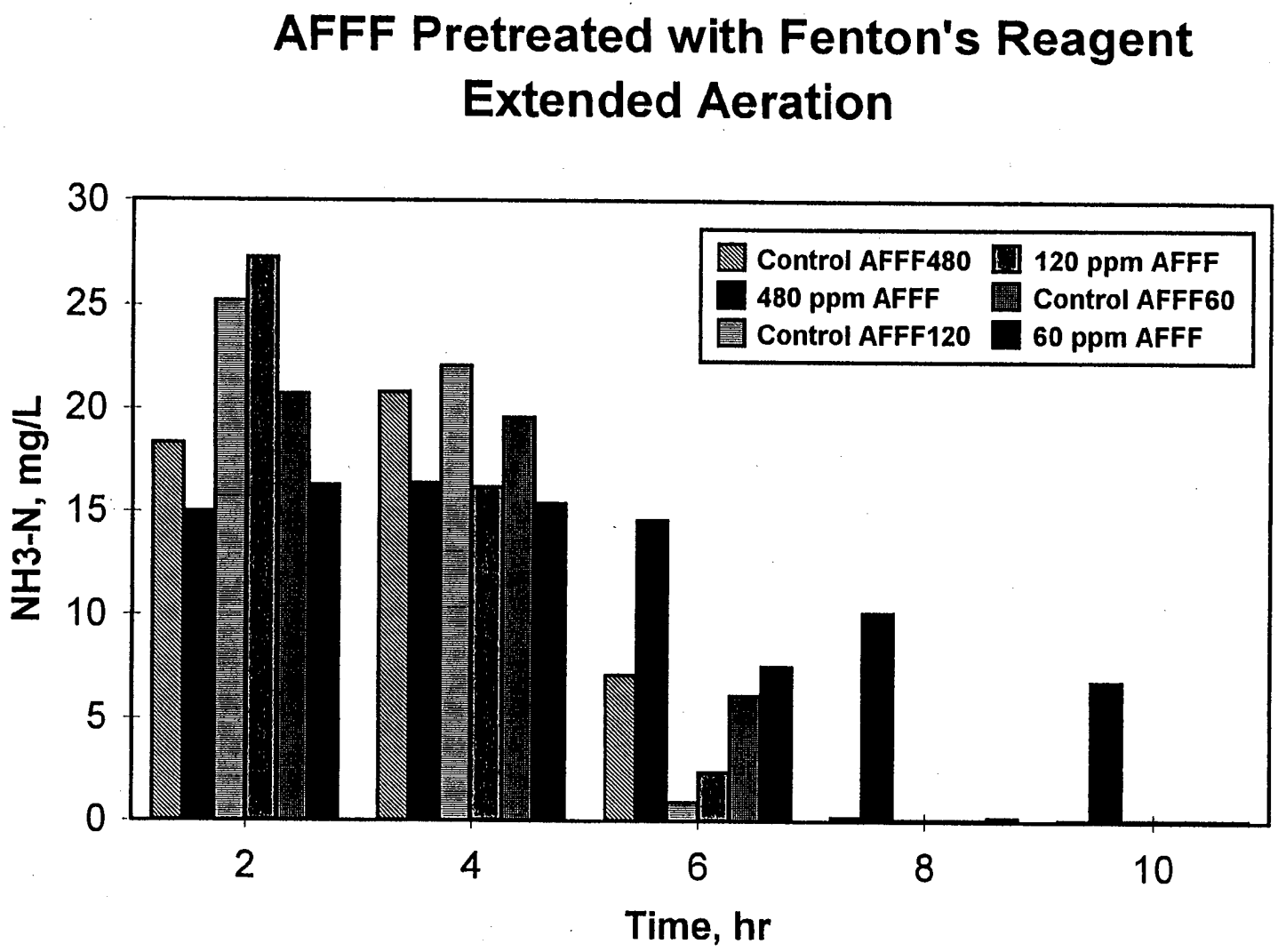


Figure 4-4. AFFF Pretreated with Fenton's Reagent (Extended Aeratiom Test Results)

US00000997

In all of the pretreatment alternatives used, the inhibition reactor effluents exhibited pass-through toxicity to mysid shrimp at AFFF concentrations 60 ppm or greater, whereas the effluent was not toxic to the sheepshead minnows.

In summary, there is not an advantage to pretreating AFFF wastewater prior to discharge to a nitrifying plant because although pretreatment with defoamers or Fenton's reagent increases the inhibition concentration, it causes pass-through toxicity. The only time it may be used is if the nitrifying plant has mixing zone (i.e., acute toxicity limit of <1.0 Toxic Units). This would allow AFFF to be discharged at higher concentrations without causing pass-through toxicity.

US00000998

References

1. Military Specification Mil-F-24385F

2. CH_2M Hill (1992). "Wastewater Effluent Pilot Study for the Advanced Fire Fighting Training Facility." Naval Facilities Engineering Command, Atlantic Division, Naval Contract N62470-91- R-6650.

3. CH_2M Hill (1995). "Wastewater Treatability Final Report for the Advanced Fire Fighting Training Facility." Naval Facilities Engineering Command, Atlantic Division, Navy Contract N62470-91- C-6650.

4. Chan, D. B., (1978). " Disposal of Wastewater Containing Aqueous Film Forming Foam." Technical Memorandum No. M-54-78-06, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California.

5. Chan, D.B., and Bingham, P., (1988). 'AFFF-laden Wastewater Treatment Technology Initiation Decision Report (IDR)." Technical Memorandum No. TM-71-88-11, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California.

6. Thomas, J.F., and LeFebvre, E.E., (1973). "Biodegradability and Toxicity of FC-200 Aqueous Film Forming Foam." Report No. EHL(K) 74-3, USAF Environmental Health Laboratory, Kelly AFB, Texas.

US00000999

7. Saam, R., and Rakowski, P. (1979). "Firefighting School Wastewater Study." Technical Memorandum No. 54-79-14, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California.

8. Saam, R., Rakowski, P, and Aydlett, G., (1979). "Treatability of Firefighting School Wastewaters: U.S. Navy Compliance with POTW Pretreatment Requirements." Proceedings of the 34th Purdue Industrial Waste Conference, West Lafayette, Indiana.

9. Union Carbide (1978). "Unox System Treatability Study Report, U.S. Navy Firefighting School." Naval Facilities Engineering Command, Atlantic Division, Norfolk, Virginia.

10. "Toxicity of Selected Effluents from the U.S. Navy Firefighting School, Norfolk, VA to Embryos of Eastern Oysters." Technical Report by, Atlantic Division, Naval Facilities Engineering Command, Norfolk, Virginia.

11. LeFebvre, E.E. (1971). "Biodegradability and Toxicity of Light Water." Report No. EHL (K) 71-36, USAF Environmental Health Laboratory.

12. LeFebvre, E.E., and Thomas, J.F. (1973). "Biodegradability and Toxicity of AER-O-Water 3% and 6% Aqueous Film Forming Foam." Report No. EHL(K) 73-22, USAF Environmental Health Laboratory, Kelly AFB, Texas.

US00001000

13. LeFebvre, E.E., and Inmand, R.C. (1974). "Biodegradability and Toxicity of Light water FC-206,, Aqueous Film Forming Foam." Report No. EHL(K) 74-26, USAF Environmental Health Laboratory, Kelly AFB, Texas.

14. LeFebvre, E.E., and Inmand, R.C. (1975). "Biodegradability and Toxicity of ANSUL K74-100, Aqueous Film Forming Foam." Report No. EHL(K) 75-3, USAF Environmental Health Laboratory, Kelly AFB, Texas.

15. Grace and Associates Inc., (1986). "Engineering Investigation of Impact of AFFF on Wastewater Treatment Performance at Naval Air Station, Memphis, Millington, Tennessee." U.S. Navy Contract N62467-86-C-0351, Naval Facilities Engineering Command, Atlantic Division, Norfolk, Virginia.

16. Engineering-Science Incorporated (1986). "Physical-Chemical Treatment from Navy Firefighting Schools." Naval Facilities Engineering Command, Atlantic Division, Contract No. N00025-74-C-0004, Norfolk, Virginia.

17. Bowers, A.R., Eckenfelder, W.W. Jr., Gaddipati, P., and Monsen, R.M., (1989). "Treatment of Toxic or Refractory Wastewater with Hydrogen Peroxide." *Water Science Technol,*. 21, p.477.

18. Barbeni, M., Minero, C., Pelizzetti, E., Borgarello, E., and Serpone, N., (1987). "Chemical Degradation of Chlorophenols with Fenton's Reagent." *Chemosphere*, 16:2225-2237.

19. Erten-Unal, M., Paranjape, S., Schafran, G.C., and Williams, F.W., "Evaluation of the Effects of AFFF Inputs to VIP Biological Nutrient Removal Process and Pass-Through Toxicity-Phase IA",technical report, Naval Research Laboratory, NRL/MR/6180--98-8141, February 1998, 46pp.

20. United States Environmental Protection Agency (1979). "Methods of Chemical Analysis of Water and Wastes." Environmental Monitoring and Support Laboratory, EPA 600/4-79-020, Cincinnati, Ohio.

21. American Public Health Association (1995). "Standard Methods for the Examination of Water and Wastewater." 19th Edition, Washington, DC.

22. Walt, R. J., Udell, M. D. and Leung, S. W. "Treatment of Contaminated Soils Using Catalyzed Hydrogen Peroxide", Proceedings of the First International Symposium, Chemical Oxidation: Technology for the Nineties, Vanderbilt University, Nashville, Tn, 1992.

23. United States Environmental Protection Agency (1989). "Toxicity Reduction Evaluation Protocol for Municipal Wastewater Treatment Plants."

US00001002

APPENDIX A

AFFF Butyl Carbitol Analysis

US00001003

Dionex Chromatography DataBase

Sample	Alcohol standards	Record	100

Analytes and Concentrations	1. Ethanol, 2. 1-Propanol, 3. 2-methyl-2-propene-1-ol, 4. Cyclopentanol, 5. Phenylmethanol, 6. 1-Phenylethanol, 7. 3-Phenyl-1-propanol, 8. 2-Ethyl-1-hexanol, 9. 1-Decanol, 10. 1-Undecanol, 11. Dodecanol, 12. 1-Tridecanol, 13. 1-Tetradecanol

Columns	OmniPac PCX-500	Sample Vol	25 µL

No.	Mobile Phases & Postcolumn Reagents
1	90/10 Acetonitrile/Water
2	Water
PCR	0.3 M NaOH

Gradient Program

Time	%1	%2	%3	%4
.00	20	80		
.20	20	80		
5.00	95	5		
14.00	95	5		

Sample Dilution & Prep, Comments

Injection @ 0.1 minutes. Column equilibrated to initial conditions for at least 7 minutes before injection.

Flow Rates:	Mobile Phase	1 mL/min	Regen	mL/min	Reagent	1 mL/min

Detector and Settings

PAD (Au), E1 = 0.10V (720ms), E2 = 1.00V (120ms), E3=-0.80V (300ms)

Notes

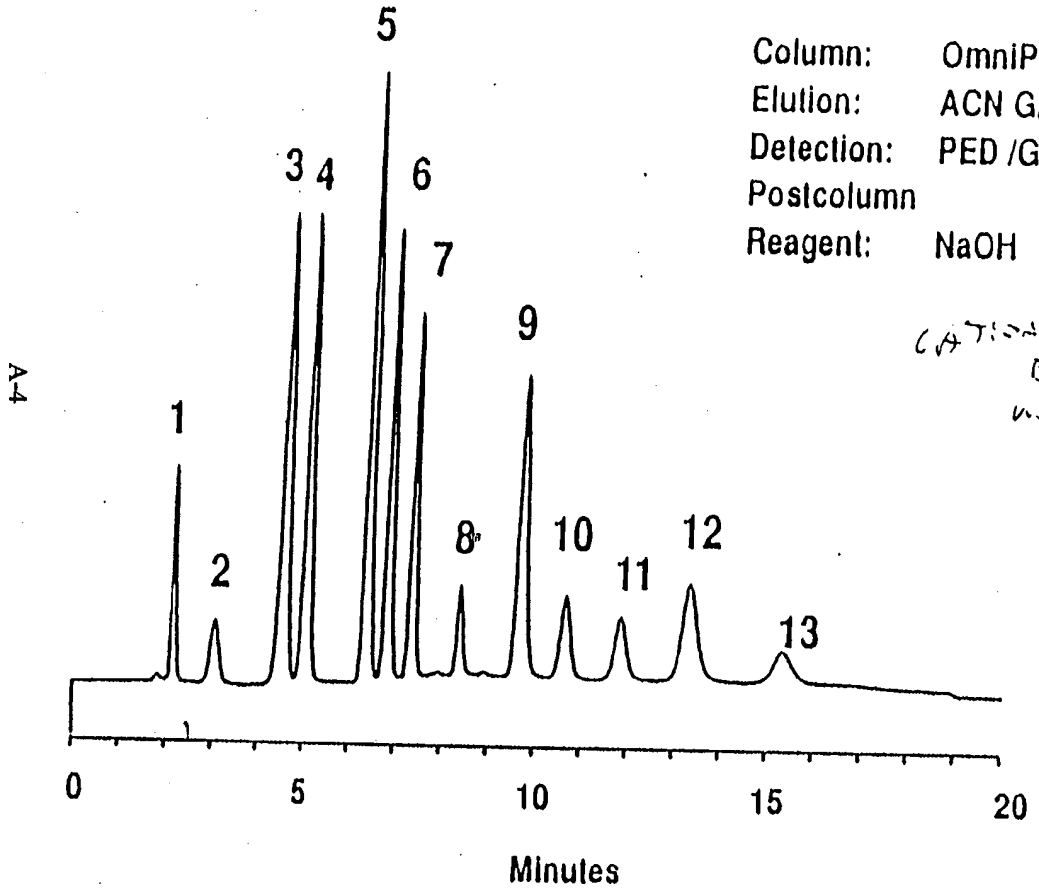
Optional columns for this application are OmniPac PAX-500 and IonPac NS1 10 µm.

Alcohols = PAX500
not = NS1

Reference	Slide 5084-01

These results are intended as a starting point for methods development and are provided to show feasibility.

Monoalcohols with Pulsed Electrochemical Detection



Column: OmniPac PCX-500
Elution: ACN Gradient
Detection: PED /Gold Electrode
Postcolumn
Reagent: NaOH

CATIONS & Butyl/carbinol use PCX

Peaks:

1. Ethanol
2. 1-Propanol
3. Methallyl alcohol
4. Cyclopentanol
5. Phenylmethanol
6. 1-Phenylethanol
7. 3-Phenyl-1-propanol
8. 2-Ethyl-1-hexanol
9. 1-Decanol
10. 1-Undecanol
11. 1-Dodecanol
12. 1-Tridecanol
13. 1-Tetradecanol

5084-01

US0001006

APPENDIX B

BNR Inhibition Batch Assays Pretreated with Defoamers

US00001007

********** AUTOMATIC CALIBRATION UPDATE **********

Data File : c:\peaknet\data\afff0008.DXD	Report Date: 11/2/97 9:07:01 PM
Sample Name: Autocal 2-1ppm	Collected : 11/2/97 8:38:40 PM
Inject # : 8	Vial # :
Method File: c:\peaknet\method\afff.met	Last Update: 11/2/97 8:38:32 PM
System Name: DX-500	Detector : ED40
Cal. Level : 2	Analyst :

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD RESPONSE	MEASURED RESPONSE	NEW RESPONSE

Data File : c:\peaknet\data\afff0008.DXD	Report Date: 11/2/97 9:07:01 PM
Sample Name: Autocal 2-1ppm	Collected : 11/2/97 8:38:40 PM
Inject # : 8	Vial # :
Method File: c:\peaknet\method\afff.met	Calibrated : 11/2/97 9:07:01 PM
System Name: DX-500	Detector : ED40
Column Type:	Operator :
Data Points: 1200	Rate : 1.00 Hz
Module Name: ID:24 0a 85	Moduleware : 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

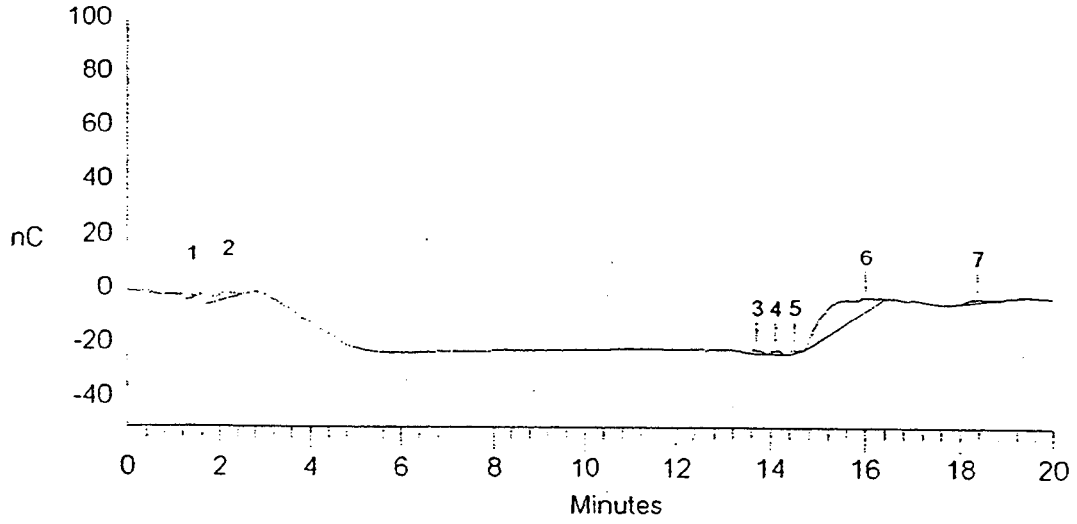
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.37		0.000	11804	56265	1	
2	2.18		0.000	33188	782834	1	
3	13.70		0.000	13711	185872	1	
4	14.08		0.000	14174	185381	1	
5	14.48		0.000	13376	127915	1	
6	16.00		0.000	47029	6262576	1	
7	18.35		0.000	9733	351092	1	
		Totals	0.000	143015	7951935		

Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30

11/2/97 9:07:02 PM

US00001009

File: afff0008.DXD Sample Autocal 2-1ppm



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 9:07:02 PM

********** AUTOMATIC CALIBRATION UPDATE **********

Data File : c:\peaknet\data\afff0009.DXD	Report Date: 11/2/97 9:35:30 PM
Sample Name: Autocal 3-10ppm	Collected : 11/2/97 9:07:09 PM
Inject # : 9	Vial # :
Method File: c:\peaknet\method\afff.met	Last Update: 11/2/97 9:07:01 PM
System Name: DX-500	Detector : ED40
Cal. Level : 3	Analyst :

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD RESPONSE	MEASURED RESPONSE	NEW RESPONSE

Data File : c:\peaknet\data\afff0009.DXD	Report Date: 11/2/97 9:35:30 PM
Sample Name: Autocal 3-10ppm	Collected : 11/2/97 9:07:09 PM
Inject # : 9	Vial # :
Method File: c:\peaknet\method\afff.met	Calibrated : 11/2/97 9:35:30 PM
System Name: DX-500	Detector : ED40
Column Type:	Operator :
Data Points: 1200	Rate : 1.00 Hz
Module Name: ID:24 0a 85	Moduleware : 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

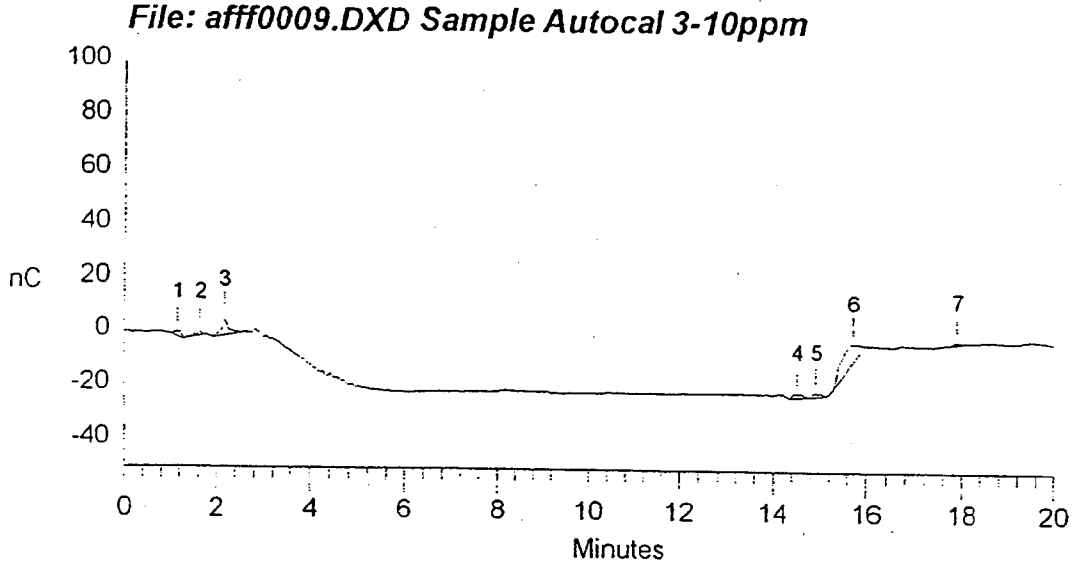
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.15		0.000	16763	174443	1	
2	1.63		0.000	12772	109527	1	
3	2.17		0.000	57222	608242	1	
4	14.50		0.000	17590	241420	1	
5	14.90		0.000	15712	186309	1	
6	15.70		0.000	66779	2046738	1	
7	17.87		0.000	8401	146694	1	
		Totals	0.000	195240	3513373		

Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30

11/2/97 9:35:30 PM

US00001011



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 9:35:31 PM

********** AUTOMATIC CALIBRATION UPDATE **********

Data File : c:\peaknet\data\afff0010.DXD	Report Date: 11/2/97 10:04:00 PM
Sample Name: Autocal 4-50ppm	Collected : 11/2/97 9:35:38 PM
Inject # : 10	Vial # :
Method File: c:\peaknet\method\afff.met	Last Update: 11/2/97 9:35:30 PM
System Name: DX-500	Detector : ED40
Cal. Level : 4	Analyst :

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD RESPONSE	MEASURED RESPONSE	NEW RESPONSE

Data File : c:\peaknet\data\afff0010.DXD	Report Date: 11/2/97 10:04:00 PM
Sample Name: Autocal 4-50ppm	Collected : 11/2/97 9:35:38 PM
Inject # : 10	Vial # :
Method File: c:\peaknet\method\afff.met	Calibrated : 11/2/97 10:04:00 PM
System Name: DX-500	Detector : ED40
Column Type:	Operator :
Data Points: 1200	Rate : 1.00 Hz
Module Name: ID:24 0a 85	Moduleware : 1.17

Calibration	Volume	Dilution	Start	Stop	Area	Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21	

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

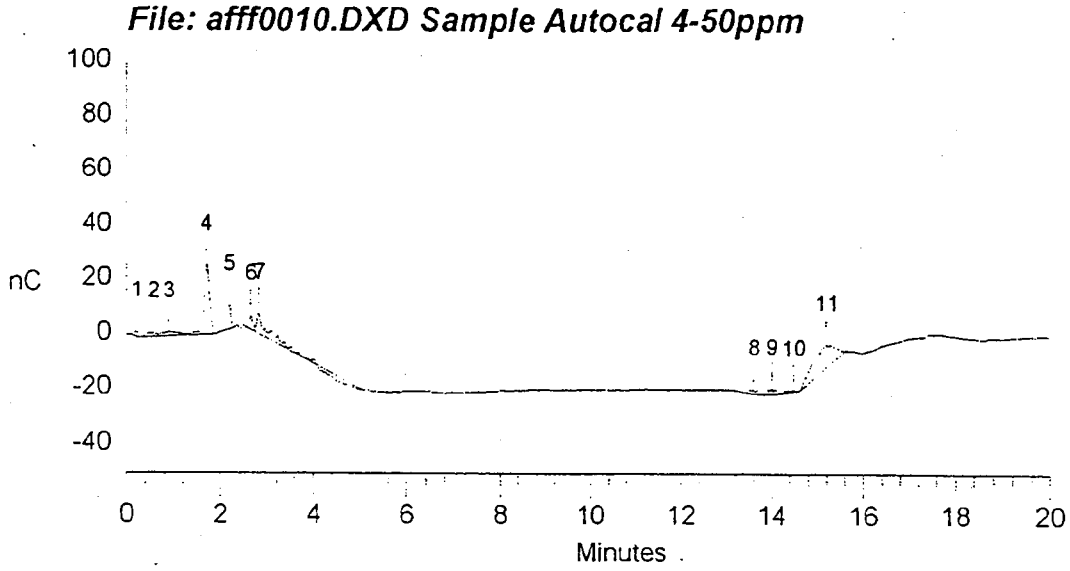
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	0.20		0.000	17700	101128	1	
2	0.55		0.000	15933	209209	2	
3	0.88		0.000	13966	318774	2	
4	1.68		0.000	253910	2050260	2	
5	2.17		0.000	86432	639595	1	
6	2.63		0.000	52031	252956	2	
7	2.80		0.000	70379	560109	2	
8	13.58		0.000	13995	192785	1	
9	13.98		0.000	19065	245079	1	
10	14.47		0.000	7367	100201	1	
11	15.18		0.000	82451	2829753	1	

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/2/97 10:04:00 PM

US00001013

Totals	0.000	633229	7499848



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 10:04:00 PM

Data File	: c:\peaknet\data\afff0011.DXD	Report Date	: 11/2/97 10:32:28 PM
Sample Name	: Feedstock	Collected	: 11/2/97 10:04:08 PM
Inject #	: 11	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

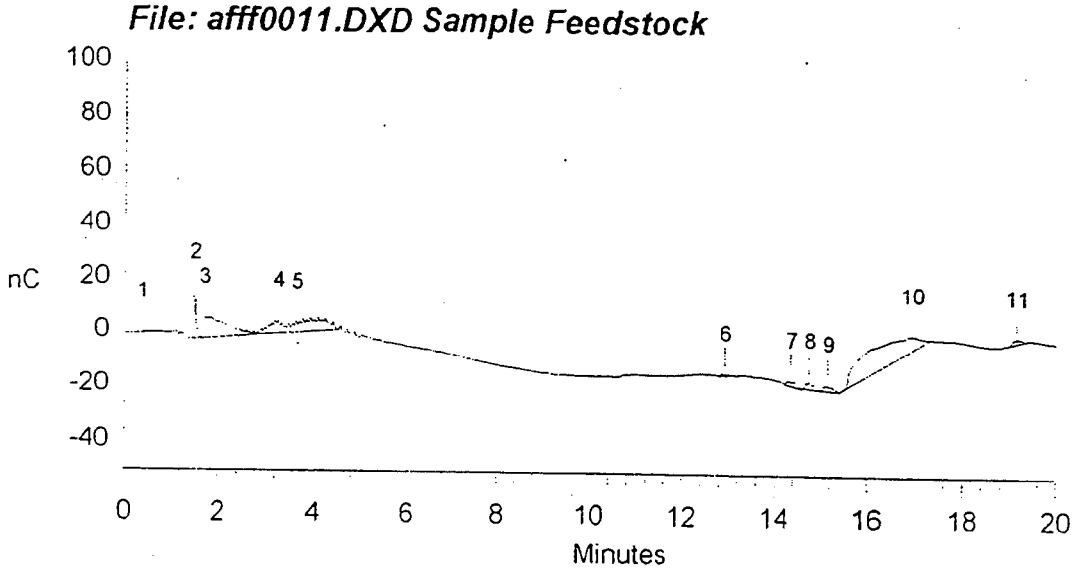
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	0.37		0.000	6079	73315	1	
2	1.50		0.000	174280	503133	2	
3	1.70		0.000	78894	2767642	2	
4	3.28		0.000	47648	977080	2	
5	3.67		0.000	38382	1749473	2	
6	12.92		0.000	5671	71319	1	
7	14.35		0.000	16647	234728	1	
8	14.75		0.000	25643	309572	1	
9	15.15		0.000	20530	257484	1	
10	16.90		0.000	54468	6735289	1	
11	19.12		0.000	17625	226412	1	
		Totals	0.000	485866	13905446		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/2/97 10:32:28 PM

US00001015



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 10:32:28 PM

US00001016

Data File	: c:\peaknet\data\afff0012.DXD	Report Date	: 11/2/97 11:00:54 PM
Sample Name	: R.R.Supernatant	Collected	: 11/2/97 10:32:36 PM
Inject #	: 12	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

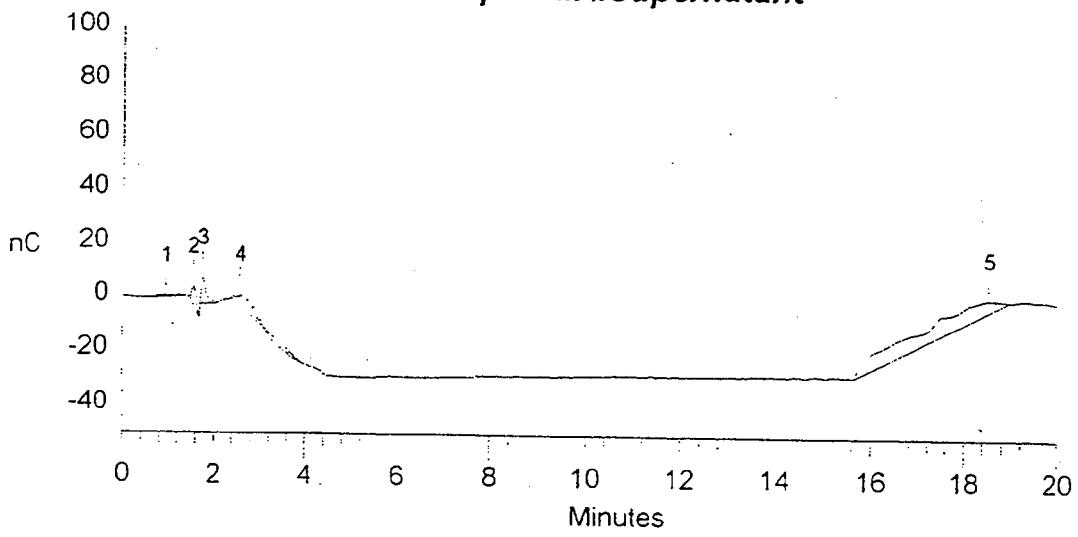
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	0.93		0.000	5135	110929	1	
2	1.53		0.000	65168	497555	1	
3	1.75		0.000	97372	701056	1	
4	2.57		0.000	42968	447030	1	
5	18.52		0.000	42378	9958336	1	
		Totals	0.000	253021	11714906		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 11:00:54 PM

US00001017



Schedule: \peaknet\schedule\afff11_2.scn
Release 4.30

11/2/97 11:00:54 PM

Data File	: c:\peaknet\data\afff0013.DXD	Report Date	: 11/2/97 11:29:19 PM
Sample Name	: A1 end of feed--control	Collected	: 11/2/97 11:01:02 PM
Inject #	: 13	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

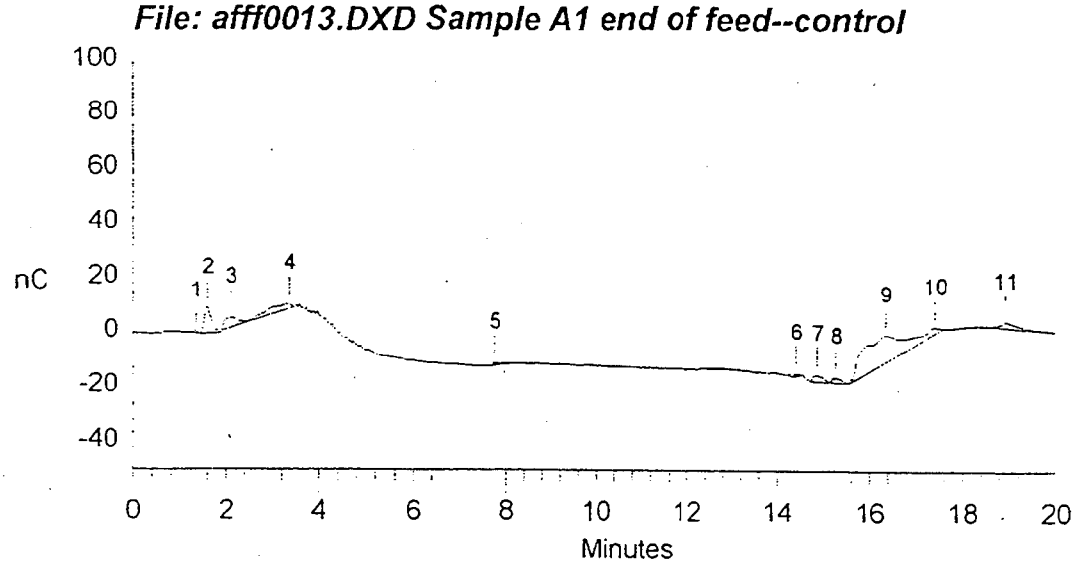
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.35		0.000	8247	60027	1	
2	1.60		0.000	93738	972378	1	
3	2.10		0.000	36379	737607	2	
4	3.37		0.000	17276	868206	2	
5	7.77		0.000	9051	101992	1	
6	14.40		0.000	10905	68482	1	
7	14.87		0.000	26453	356033	2	
8	15.27		0.000	20568	258871	2	
9	16.35		0.000	95874	5219791	2	
10	17.40		0.000	22380	1386225	2	
11	18.92		0.000	19295	519742	1	
		Totals	0.000	360166	10549353		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/2/97 11:29:19 PM

US00001019



Schedule: \peaknet\schedule\afff11_2.scn
Release 4.30

11/2/97 11:29:20 PM

```
Data File  : c:\peaknet\data\afff0014.DXD   Report Date: 11/2/97 11:57:47 PM
Sample Name: A2 end of feed--control        Collected  : 11/2/97 11:29:28 PM
Inject #   : 14                            Vial #     :
Method File: c:\peaknet\method\afff.met     Calibrated : 11/2/97 10:04:00 PM
System Name: DX-500                         Detector   : ED40
Column Type:                                Operator   :
Data Points: 1200                           Rate       : 1.00  Hz
Module Name:                  ID:24 0a 85   Moduleware : 1.17
```

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

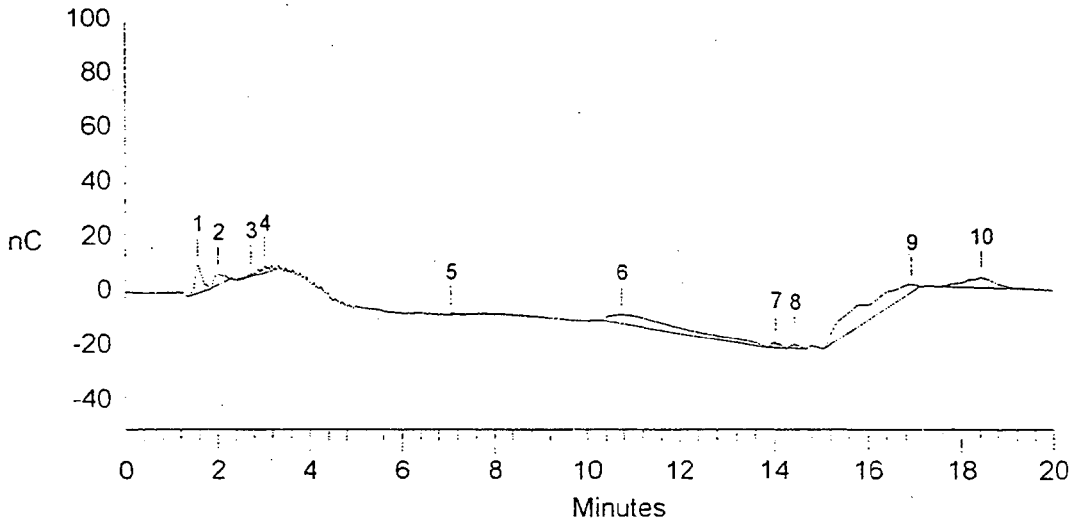
********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.57		0.000	103565	1078567	1	
2	2.00		0.000	43305	605094	1	
3	2.73		0.000	17326	140831	2	
4	3.03		0.000	28232	338452	2	
5	7.05		0.000	4724	54002	1	
6	10.75		0.000	33995	4383015	1	
7	14.03		0.000	19348	236017	1	
8	14.43		0.000	15740	189493	1	
9	16.92		0.000	30076	6191445	1	
10	18.42		0.000	34818	1652544	1	
		Totals	0.000	331131	14869459		

File: afff0014.DXD Sample A2 end of feed--control



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/2/97 11:57:48 PM

Data File	: c:\peaknet\data\afff0015.DXD	Report Date	: 11/3/97 12:26:15 AM
Sample Name	: A3 end of feed--control	Collected	: 11/2/97 11:57:56 PM
Inject #	: 15	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

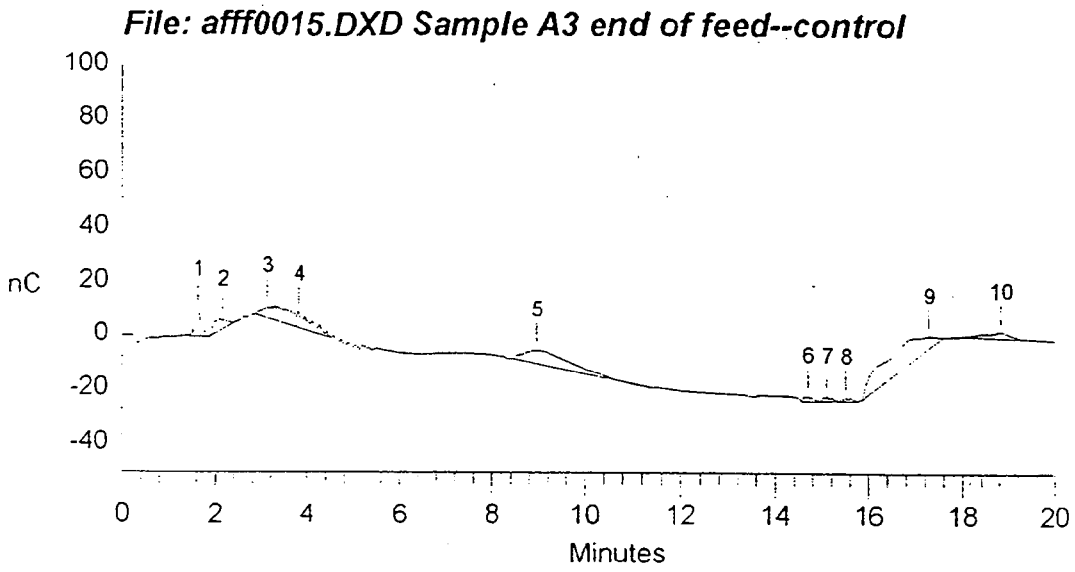
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.62		0.000	97035	1022349	1	
2	2.15		0.000	34952	779163	1	
3	3.12		0.000	42930	2157887	2	
4	3.82		0.000	48690	1283012	2	
5	8.93		0.000	48685	3596865	1	
6	14.68		0.000	17855	246147	2	
7	15.08		0.000	15788	193096	2	
8	15.48		0.000	11909	157173	1	
9	17.25		0.000	44837	6514876	1	
10	18.78		0.000	23020	900380	1	
		Totals	0.000	385700	16850947		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 12:26:15 AM

US00001023



Schedule: \peaknet\schedule\afff11_2.scn
Release 4.30

11/3/97 12:26:15 AM

US00001024

Data File	: c:\peaknet\data\afff0016.DXD	Report Date	: 11/3/97 12:54:44 AM
Sample Name	: B1 end of feed--60ppm	Collected	: 11/3/97 12:26:24 AM
Inject #	: 16	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

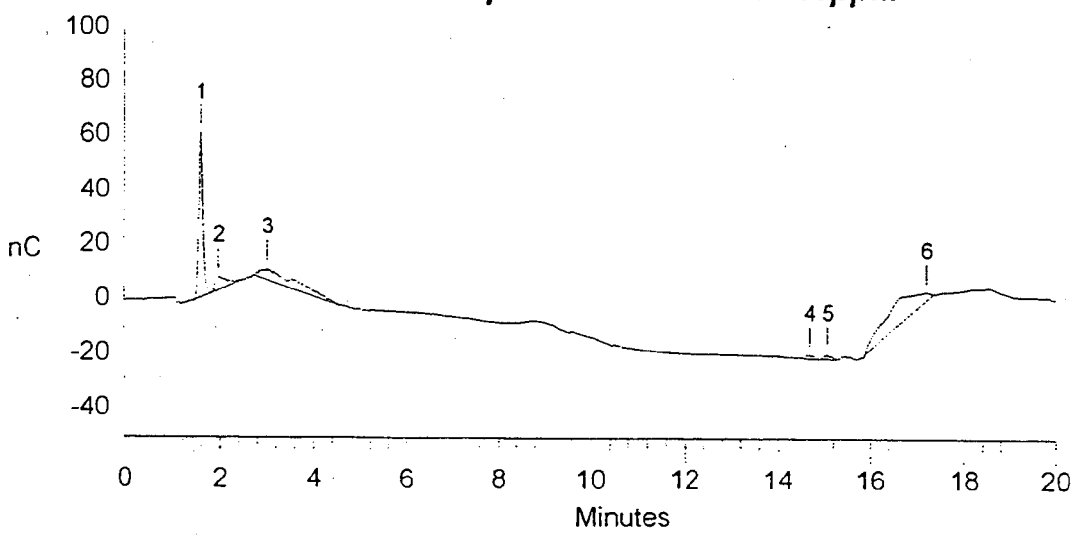
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.58		0.000	599958	3884904	1	
2	1.97		0.000	47856	726511	1	
3	3.02		0.000	41021	2497687	1	
4	14.67		0.000	14640	189454	1	
5	15.07		0.000	16736	196379	1	
6	17.18		0.000	27874	4714611	1	
		Totals	0.000	748084	12209545		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 12:54:44 AM

US00001025



Schedule: \peaknet\schedule\afff11_2.scn
Release 4.30

11/3/97 12:54:44 AM

Data File : c:\peaknet\data\afff0017.DXD	Report Date: 11/3/97 1:23:12 AM
Sample Name: B2 end of feed--60ppm	Collected : 11/3/97 12:54:52 AM
Inject # : 17	Vial # :
Method File: c:\peaknet\method\afff.met	Calibrated : 11/2/97 10:04:00 PM
System Name: DX-500	Detector : ED40
Column Type:	Operator :
Data Points: 1200	Rate : 1.00 Hz
Module Name: ID:24 0a 85	Moduleware : 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

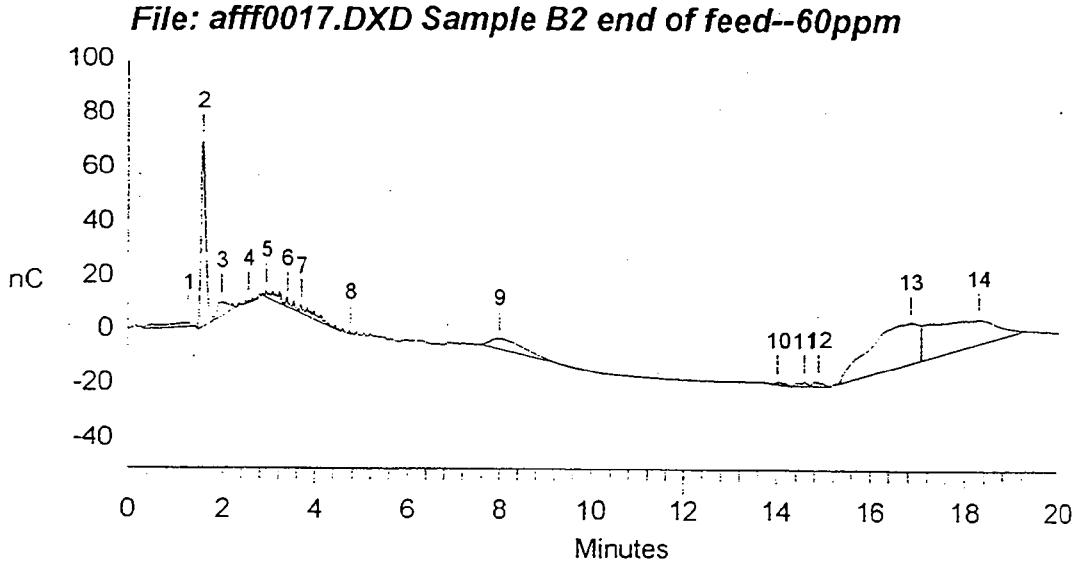
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
8	4.75	butylcarb	0.254	5765	40702	1	4.78
		Totals	0.254	5765	40702		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.27		0.000	14662	681472	1	
2	1.58		0.000	680245	4335773	2	
3	1.97		0.000	54000	868450	2	
4	2.55		0.000	12032	109646	1	
5	2.93		0.000	22046	491915	2	
6	3.38		0.000	25104	268361	2	
7	3.68		0.000	22462	704569	2	
9	8.00		0.000	37231	1925693	1	
10	14.02		0.000	9589	142353	1	
11	14.57		0.000	16345	226292	2	
12	14.88		0.000	20145	242418	2	
13	16.85		0.000	149913	11721359	2	
14	18.27		0.000	89369	10323213	2	
		Totals	0.000	1153146	32041513		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 1:23:12 AM

US00001027



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 1:23:13 AM

US00001028

Data File	: c:\peaknet\data\afff0018.DXD	Report Date	: 11/3/97 1:51:41 AM
Sample Name	: B3 end of feed--60ppm	Collected	: 11/3/97 1:23:21 AM
Inject #	: 18	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

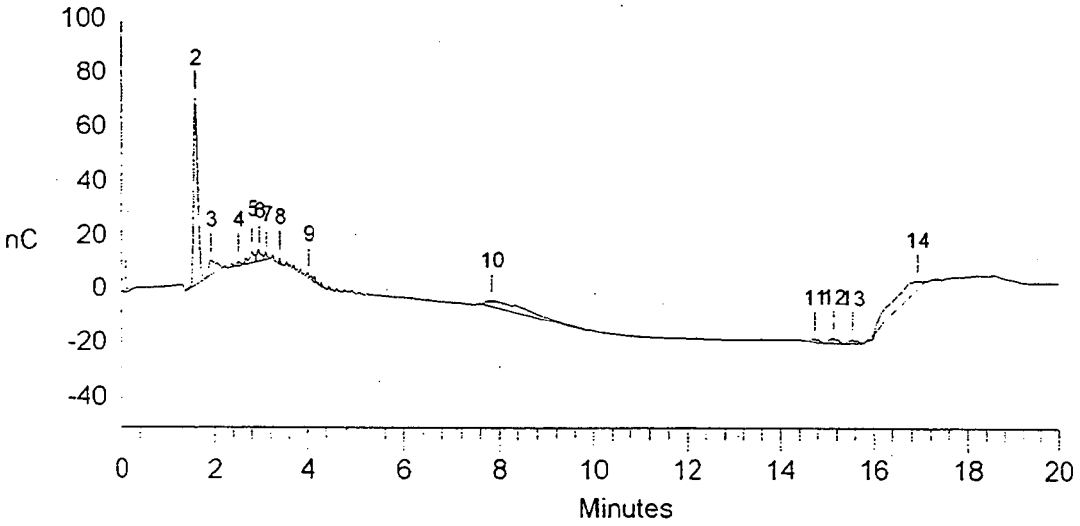
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	0.10		0.000	15252	85527	1	
2	1.58		0.000	688472	4204967	1	
3	1.92		0.000	55558	593758	1	
4	2.50		0.000	20793	124110	2	
5	2.80		0.000	46017	372540	2	
6	2.97		0.000	33714	272112	2	
7	3.12		0.000	15128	117603	2	
8	3.40		0.000	24785	73735	1	
9	4.02		0.000	10703	213414	1	
10	7.83		0.000	20808	1779034	1	
11	14.73		0.000	13638	180974	1	
12	15.13		0.000	18990	227420	1	
13	15.53		0.000	14156	159182	1	
14	16.92		0.000	30482	2522942	1	
		Totals	0.000	1008497	10927318		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 1:51:41 AM

US00001029

File: afff0018.DXD Sample B3 end of feed--60ppm



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 1:51:42 AM

Data File	: c:\peaknet\data\afff0020.DXD	Report Date	: 11/3/97 2:48:39 AM
Sample Name	: A1 end of anaerobic--control	Collected	: 11/3/97 2:20:19 AM
Inject #	: 20	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

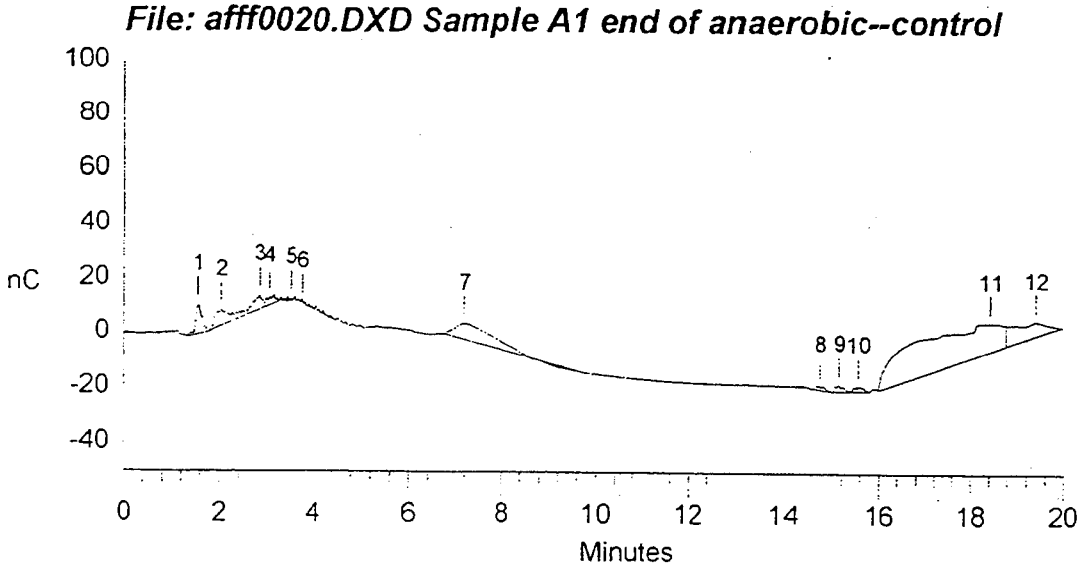
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.57		0.000	107804	1018325	1	
2	2.05		0.000	56142	1379145	2	
3	2.87		0.000	53976	658026	2	
4	3.08		0.000	31952	362311	2	
5	3.53		0.000	14130	67279	1	
6	3.78		0.000	9442	244421	1	
7	7.20		0.000	58407	3385224	1	
8	14.75		0.000	15246	211561	1	
9	15.15		0.000	23603	301924	2	
10	15.55		0.000	19094	262880	2	
11	18.42		0.000	102176	18070125	2	
12	19.40		0.000	50038	1473832	2	
		Totals	0.000	542011	27435053		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 2:48:39 AM

US00001031



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 2:48:39 AM

Data File : c:\peaknet\data\afff0022.DXD	Report Date: 11/3/97 3:45:37 AM
Sample Name: A3 end of anaerobic--control	Collected : 11/3/97 3:17:15 AM
Inject # : 22	Vial # :
Method File: c:\peaknet\method\afff.met	Calibrated : 11/2/97 10:04:00 PM
System Name: DX-500	Detector : ED40
Column Type:	Operator :
Data Points: 1200	Rate : 1.00 Hz
Module Name: ID:24 0a 85	Moduleware : 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

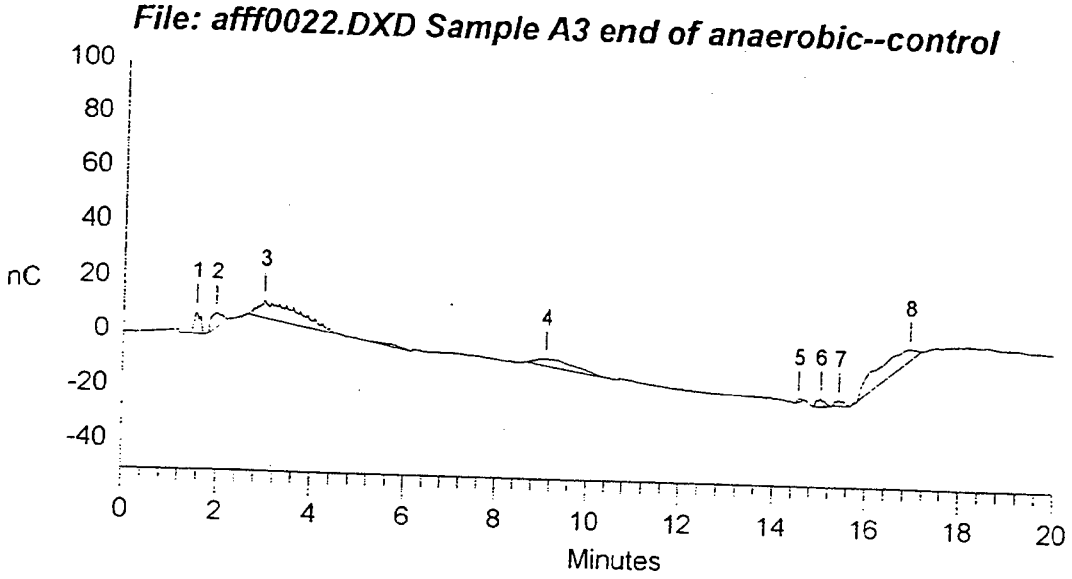
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.55		0.000	78653	724030	1	
2	1.95		0.000	54075	847460	1	
3	2.98		0.000	64556	4327621	1	
4	9.08		0.000	25865	1740498	1	
5	14.53		0.000	12794	77652	1	
6	15.02		0.000	27662	347964	1	
7	15.42		0.000	20097	259181	1	
8	16.90		0.000	40144	3951285	1	
		Totals	0.000	323848	12275691		

Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30

11/3/97 3:45:37 AM

US00001033



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 3:45:37 AM

Data File	: c:\peaknet\data\afff0023.DXD	Report Date	: 11/3/97 4:14:07 AM
Sample Name	: B1 end of anaerobic--60ppm	Collected	: 11/3/97 3:45:45 AM
Inject #	: 23	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
6	4.60	butylcarb	16.877	148491	2703590	2	1.47
		Totals	16.877	148491	2703590		

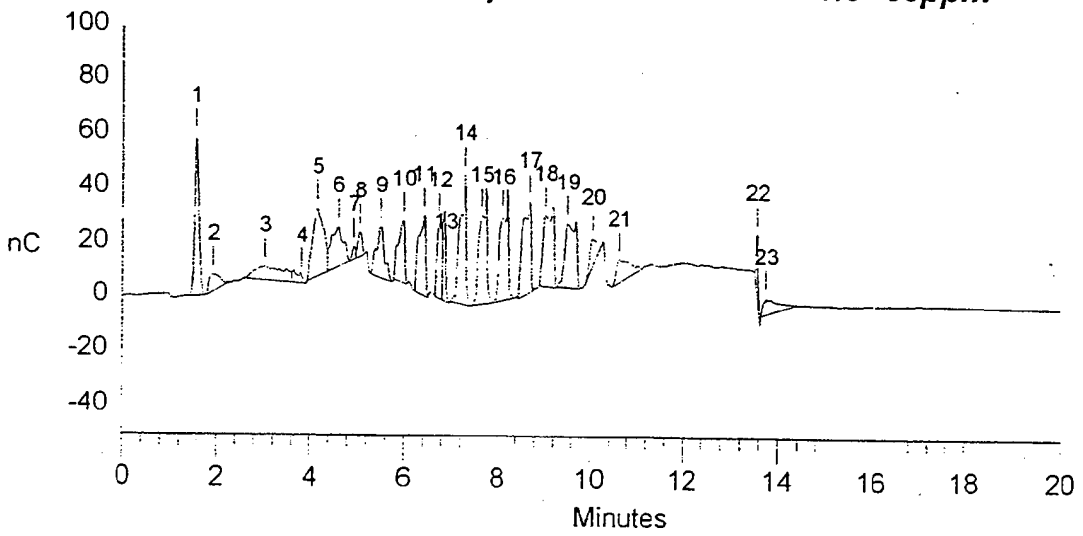
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.57		0.000	581871	3677722	1	
2	1.92		0.000	63479	967984	1	
3	3.02		0.000	52869	2184917	2	
4	3.80		0.000	28595	232682	2	
5	4.15		0.000	253137	4146095	2	
7	4.92		0.000	52122	243409	2	
8	5.05		0.000	93788	574691	2	
9	5.50		0.000	189897	2199456	1	
10	5.97		0.000	231093	2152332	1	
11	6.40		0.000	297997	2892131	1	
12	6.73		0.000	287624	2022509	2	
13	6.87		0.000	143608	1183580	2	
14	7.28		0.000	480202	4308352	1	
15	7.63		0.000	329003	4413465	1	
16	8.10		0.000	306287	4268348	1	
17	8.67		0.000	336787	4146135	1	
18	9.02		0.000	265706	4013997	1	
19	9.50		0.000	237106	3936456	1	
20	10.03		0.000	102103	1050331	1	
21	10.60		0.000	86651	1726012	1	
22	13.55		0.000	225350	644911	1	
23	13.75		0.000	62931	1222559	1	
		Totals	0.000	4708205	52208071		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 4:14:07 AM

US00001035

File: afff0023.DXD Sample B1 end of anaerobic--60ppm



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 4:14:07 AM

US00001036

Data File	: c:\peaknet\data\afff0024.DXD	Report Date	: 11/3/97 4:42:37 AM
Sample Name	: B2 end of anaerobic--60ppm	Collected	: 11/3/97 4:14:15 AM
Inject #	: 24	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

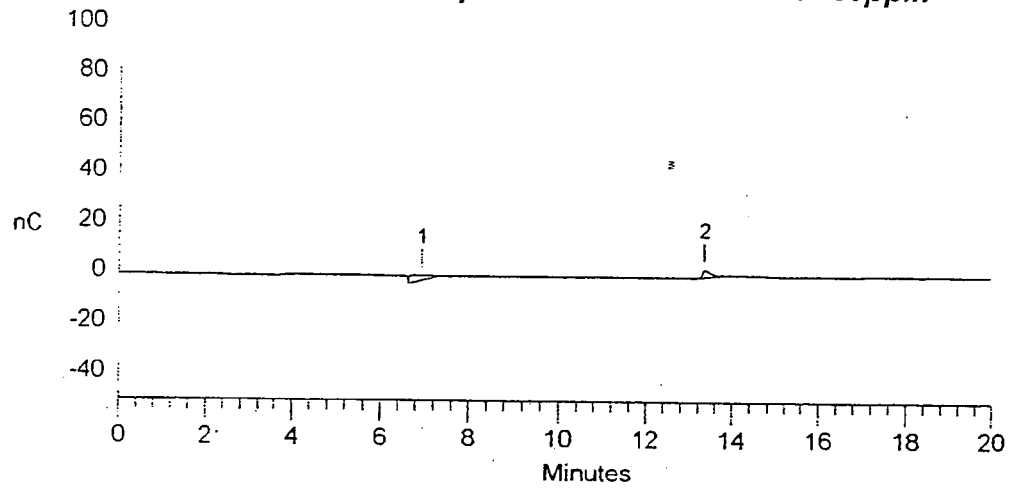
********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

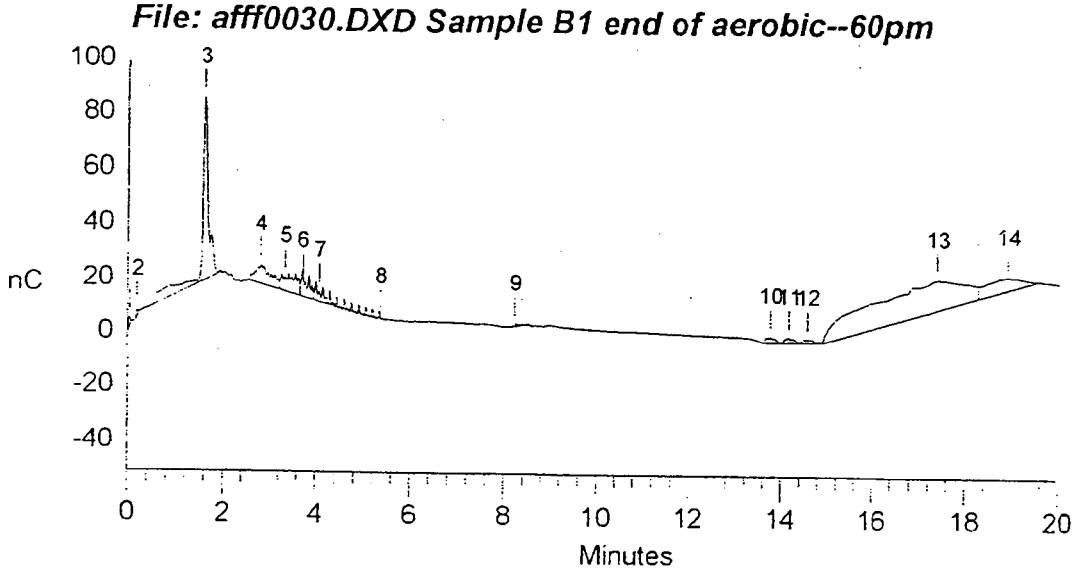
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	6.93		0.000	18791	664023	1	
2	13.33		0.000	30180	416574	1	
		Totals	0.000	48971	1080597		

File: afff0024.DXD Sample B2 end of anaerobic--60ppm



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 4:42:37 AM



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 10:58:50 AM

Data File	: c:\peaknet\data\afff0031.DXD	Report Date	: 11/3/97 11:27:16 AM
Sample Name	: B2 end of aerobic--60ppm	Collected	: 11/3/97 10:58:58 AM
Inject #	: 31	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

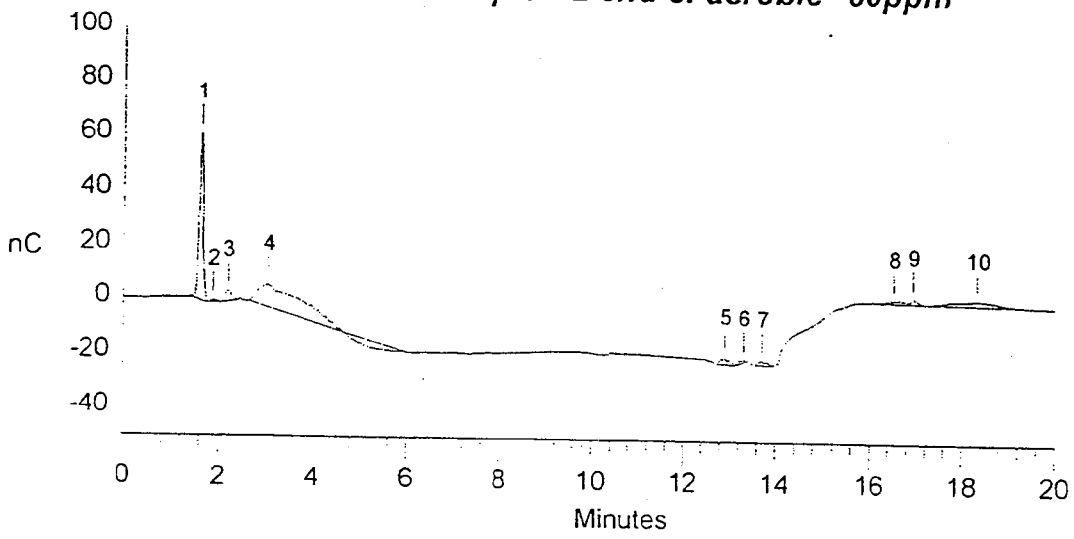
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.62		0.000	608805	3635766	1	
2	1.88		0.000	9111	69686	1	
3	2.20		0.000	38757	352877	1	
4	3.07		0.000	82525	4680119	1	
5	12.90		0.000	22774	301826	1	
6	13.30		0.000	11214	87067	1	
7	13.70		0.000	17321	209009	1	
8	16.50		0.000	9773	230808	2	
9	16.92		0.000	19228	196443	2	
10	18.30		0.000	17322	1125172	1	
		Totals	0.000	836829	10888773		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 11:27:17 AM

US00001039



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 11:27:17 AM

Data File	: c:\peaknet\data\afff0032.DXD	Report Date	: 11/3/97 11:55:45 AM
Sample Name	: B3 end of aerobic--60ppm	Collected	: 11/3/97 11:27:26 AM
Inject #	: 32	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

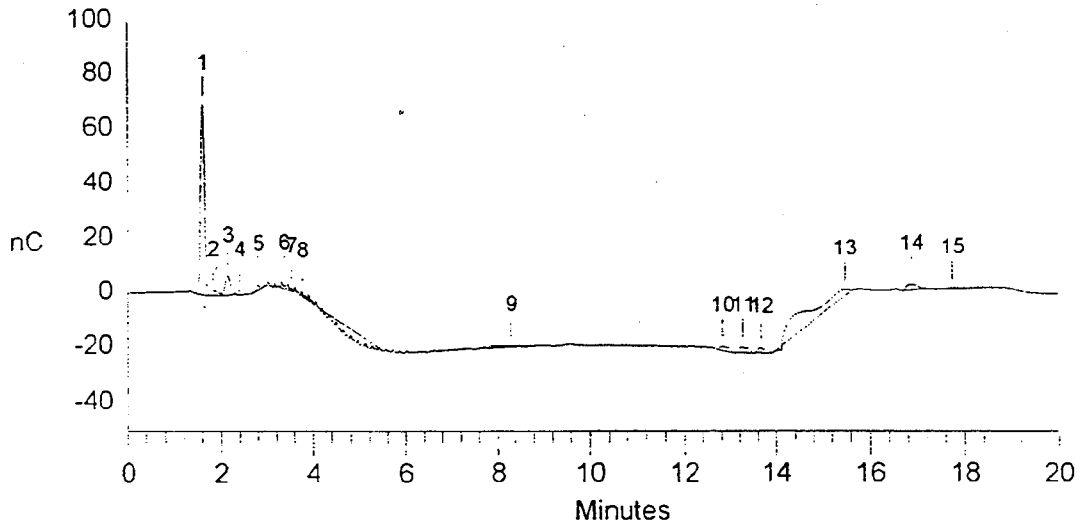
********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.62		0.000	696627	4009245	1	
2	1.83		0.000	18940	171438	2	
3	2.15		0.000	71116	552582	2	
4	2.40		0.000	16053	112345	2	
5	2.80		0.000	19373	159557	1	
6	3.38		0.000	18555	103199	2	
7	3.53		0.000	15620	93018	2	
8	3.77		0.000	20749	1301455	1	
9	8.30		0.000	4765	231369	1	
10	12.82		0.000	15549	228173	1	
11	13.27		0.000	22219	287466	1	
12	13.67		0.000	19694	248433	1	
13	15.47		0.000	25359	3572524	1	
14	16.87		0.000	22190	351848	1	
15	17.73		0.000	4021	48742	1	
		Totals	0.000	990830	11471394		

Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30 11/3/97 11:55:45 AM

US00001041

File: afff0032.DXD Sample B3 end of aerobic--60ppm



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 11:55:46 AM

Data File	: c:\peaknet\data\afff0033.DXD	Report Date	: 11/3/97 12:24:12 PM
Sample Name	: STANDARD 3-10ppm	Collected	: 11/3/97 11:55:53 AM
Inject #	: 33	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

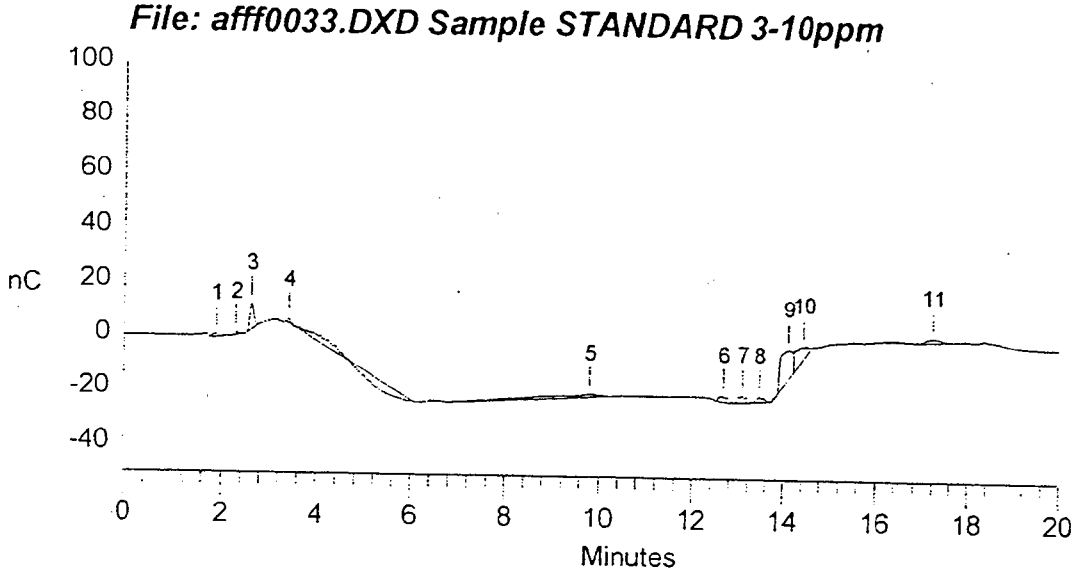
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.88		0.000	10969	85747	1	
2	2.28		0.000	11441	74416	1	
3	2.62		0.000	95822	538273	1	
4	3.42		0.000	15775	657240	1	
5	9.80		0.000	9689	1170617	1	
6	12.68		0.000	19614	289698	1	
7	13.08		0.000	24681	331846	1	
8	13.47		0.000	18537	222960	1	
9	14.10		0.000	107278	1969890	2	
10	14.43		0.000	44220	983595	2	
11	17.22		0.000	13815	307906	1	
		Totals	0.000	371840	6632187		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 12:24:12 PM

US00001043



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 12:24:12 PM

Data File	: c:\peaknet\data\afff0034.DXD	Report Date	: 11/3/97 12:52:40 PM
Sample Name	: A1 end of settle--control	Collected	: 11/3/97 12:24:20 PM
Inject #	: 34	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

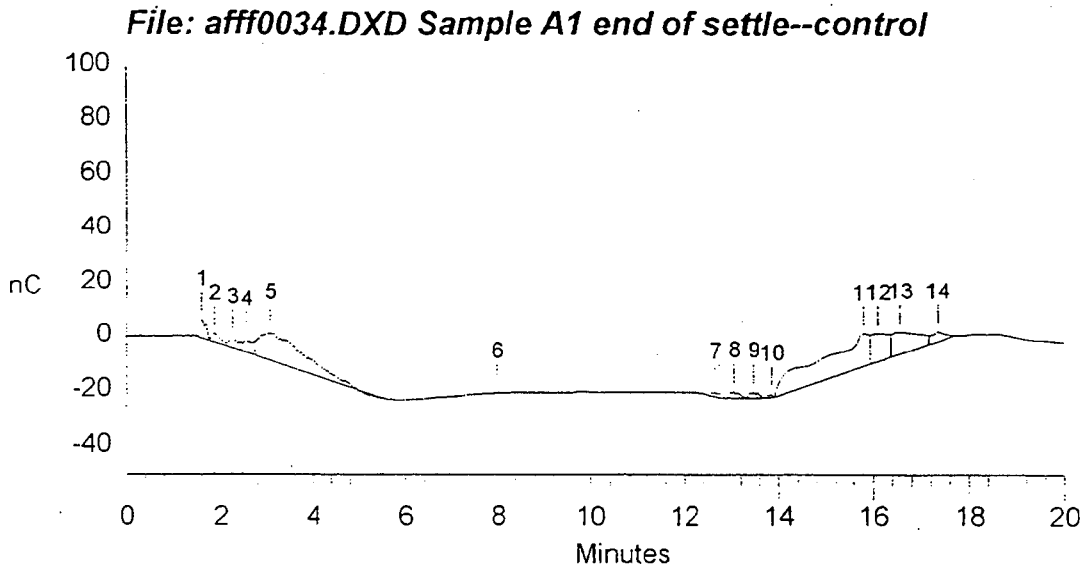
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.60		0.000	70406	669638	2	
2	1.87		0.000	33000	434800	2	
3	2.25		0.000	39588	574462	2	
4	2.55		0.000	47346	677110	2	
5	3.07		0.000	102020	7075674	2	
6	7.98		0.000	3715	37783	1	
7	12.63		0.000	13830	200863	1	
8	13.03		0.000	25097	339764	2	
9	13.43		0.000	23100	311820	2	
10	13.83		0.000	11414	84491	1	
11	15.78		0.000	120144	9602106	2	
12	16.08		0.000	102650	2542203	2	
13	16.55		0.000	81308	3056759	2	
14	17.32		0.000	36177	651916	2	
		Totals	0.000	709796	26259389		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 12:52:41 PM

US00001045



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 12:52:41 PM

Data File	: c:\peaknet\data\afff0035.DXD	Report Date	: 11/3/97 1:21:11 PM
Sample Name	: A2 end of settle--control	Collected	: 11/3/97 12:52:48 PM
Inject #	: 35	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

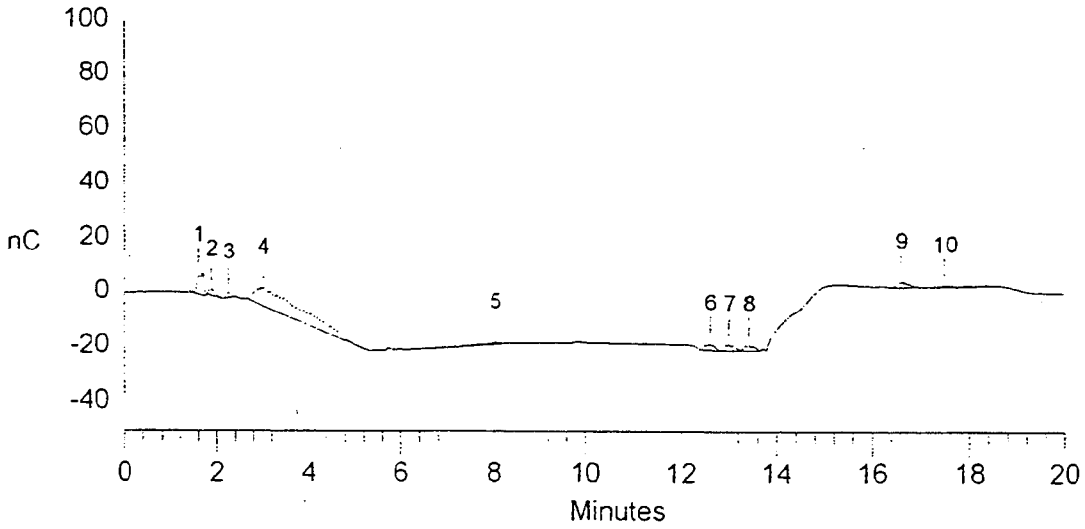
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.60		0.000	69488	750126	1	
2	1.88		0.000	21340	203220	1	
3	2.25		0.000	16588	109247	1	
4	3.02		0.000	67032	5254413	1	
5	8.03		0.000	5580	252489	1	
6	12.62		0.000	21924	309643	1	
7	13.00		0.000	20808	281658	2	
8	13.40		0.000	19219	252303	2	
9	16.60		0.000	18582	320398	1	
10	17.48		0.000	4081	48810	1	
		Totals	0.000	264643	7782307		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 1:21:11 PM

US00001047



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 1:21:12 PM

Data File	: c:\peaknet\data\afff0036.DXD	Report Date	: 11/3/97 1:49:41 PM
Sample Name	: A3 end of settle--control	Collected	: 11/3/97 1:21:19 PM
Inject #	: 36	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

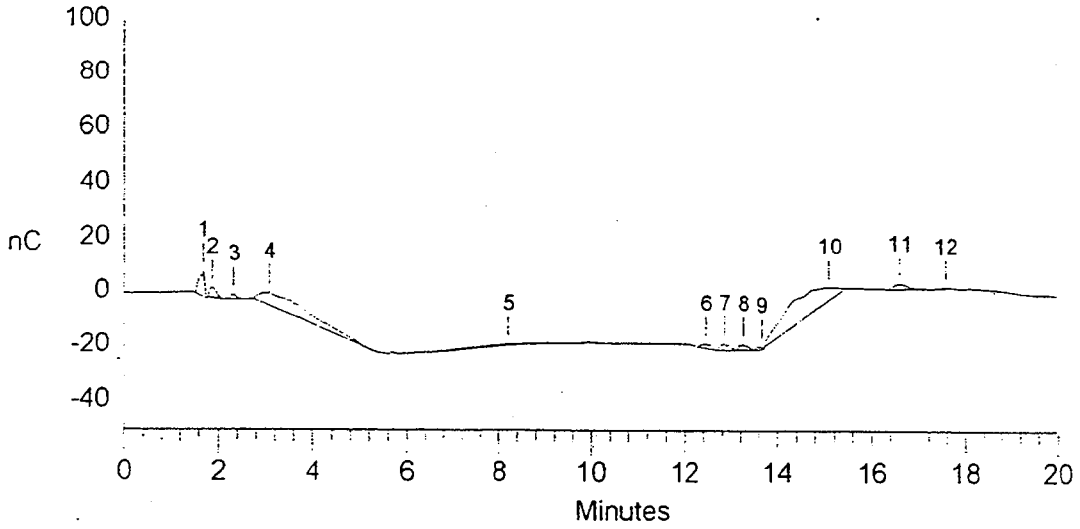
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.68		0.000	96669	762671	1	
2	1.87		0.000	37743	347577	1	
3	2.32		0.000	18237	164863	1	
4	3.08		0.000	48865	3864357	1	
5	8.20		0.000	5214	306663	1	
6	12.45		0.000	15489	215466	1	
7	12.85		0.000	24772	331377	2	
8	13.25		0.000	20861	273990	2	
9	13.65		0.000	11321	78122	1	
10	15.08		0.000	49341	6169717	1	
11	16.57		0.000	19091	367986	1	
12	17.55		0.000	4535	61938	1	
		Totals	0.000	352139	12944726		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 1:49:41 PM

US00001049

File: afff0036.DXD Sample A3 end of settle--control



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 1:49:41 PM

```
Data File  : c:\peaknet\data\afff0037.DXD   Report Date: 11/3/97 2:18:09 PM
Sample Name: B1 end of settle--60ppm        Collected  : 11/3/97 1:49:48 PM
Inject #   : 37                           Vial #     :
Method File: c:\peaknet\method\afff.met     Calibrated : 11/2/97 10:04:00 PM
System Name: DX-500                         Detector   : ED40
Column Type:                                Operator   :
Data Points: 1200                           Rate       : 1.00  Hz
Module Name:                  ID:24 0a 85   Moduleware : 1.17
```

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

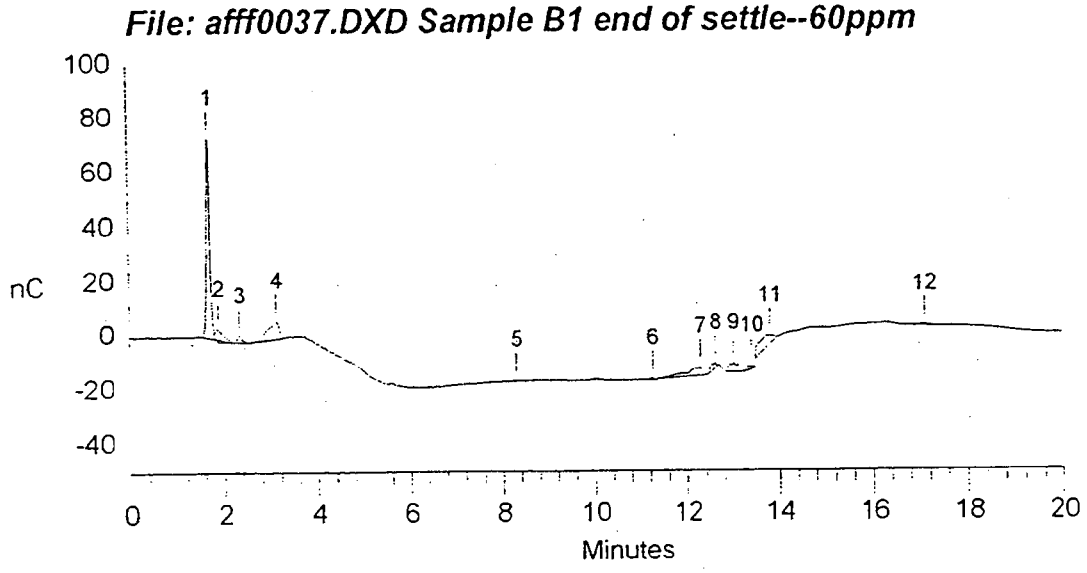
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.67		0.000	731756	3594938	3	
2	1.87		0.000	45162	549883	4	
3	2.33		0.000	24952	190974	1	
4	3.12		0.000	64692	1132008	1	
5	8.28		0.000	4061	43338	1	
6	11.25		0.000	5036	30743	1	
7	12.28		0.000	29980	742390	1	
8	12.60		0.000	16870	169948	1	
9	12.98		0.000	31510	439257	1	
10	13.38		0.000	11383	86009	1	
11	13.80		0.000	30956	910981	1	
12	17.10		0.000	6116	91389	1	
		Totals	0.000	1002473	7981857		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 2:18:09 PM

US00001051



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 2:18:09 PM

Data File	: c:\peaknet\data\afff0038.DXD	Report Date	: 11/3/97 2:46:37 PM
Sample Name	: B2 end of settle--60ppm	Collected	: 11/3/97 2:18:17 PM
Inject #	: 38	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

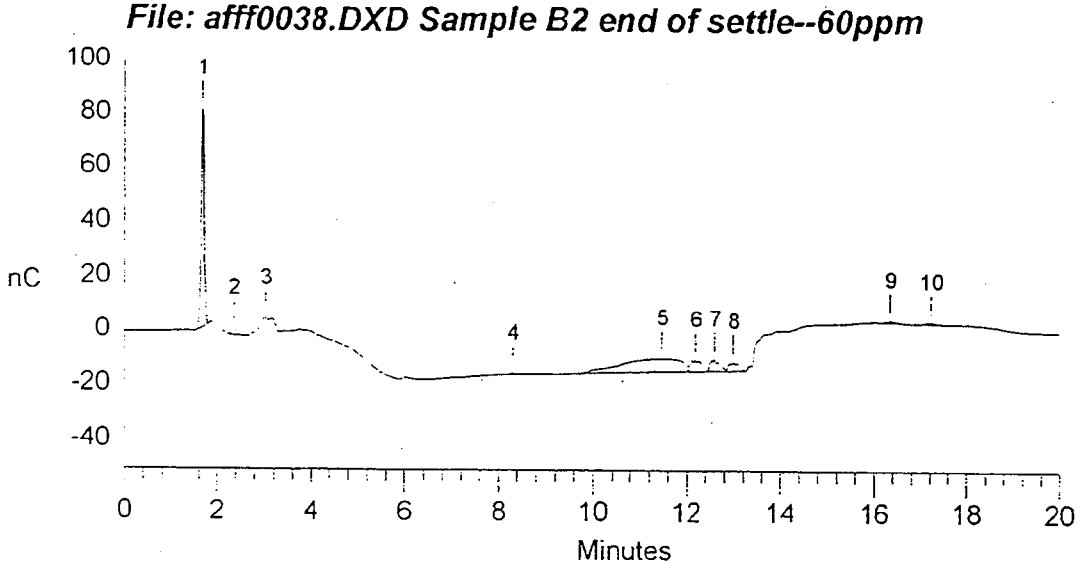
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.67		0.000	807134	3788001	1	
2	2.35		0.000	25120	170123	1	
3	3.02		0.000	18797	279215	1	
4	8.30		0.000	5800	306504	1	
5	11.47		0.000	46886	4236383	2	
6	12.18		0.000	42077	695237	2	
7	12.58		0.000	42530	597959	2	
8	12.98		0.000	32363	472836	2	
9	16.33		0.000	6258	98575	1	
10	17.20		0.000	5398	81695	1	
		Totals	0.000	1032364	10726528		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 2:46:37 PM

US00001053



Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30

11/3/97 2:46:37 PM

Data File	: c:\peaknet\data\afff0039.DXD	Report Date	: 11/3/97 3:15:06 PM
Sample Name	: B3 end of settle--60ppm	Collected	: 11/3/97 2:46:45 PM
Inject #	: 39	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

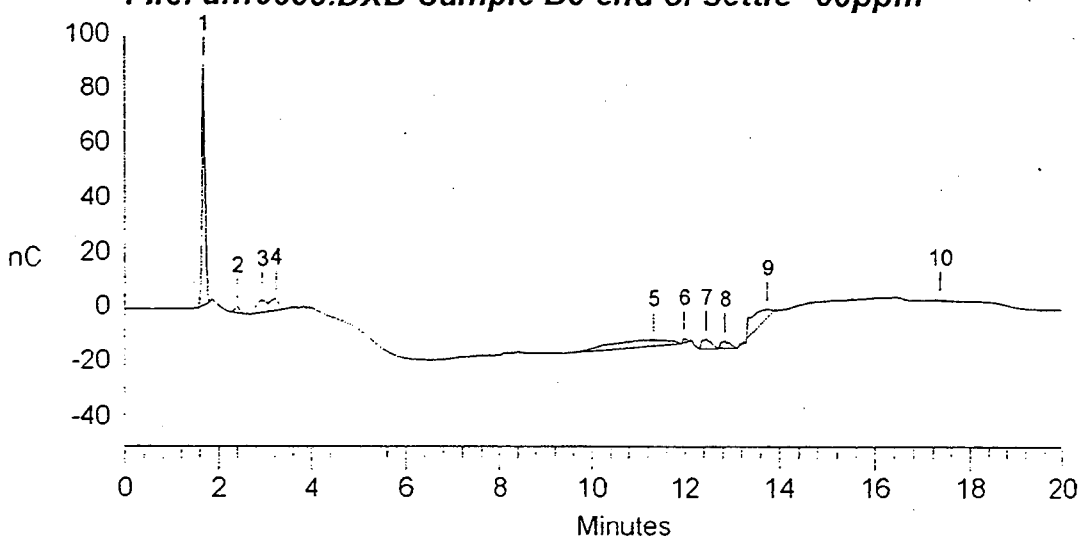
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.68		0.000	878640	4085513	1	
2	2.40		0.000	22488	144821	1	
3	2.93		0.000	44389	642685	2	
4	3.23		0.000	44063	579254	2	
5	11.32		0.000	21378	2181840	1	
6	11.98		0.000	14029	95452	1	
7	12.45		0.000	34516	473184	2	
8	12.85		0.000	27980	369718	2	
9	13.73		0.000	30548	1457236	1	
10	17.35		0.000	4947	80618	1	
		Totals	0.000	1122978	10110321		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 3:15:06 PM

US00001055



Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30

11/3/97 3:15:06 PM

Data File	: c:\peaknet\data\afff0040.DXD	Report Date	: 11/3/97 3:43:34 PM
Sample Name	: STANDARD 4-50ppm	Collected	: 11/3/97 3:15:14 PM
Inject #	: 40	Vial #	:
Method File	: c:\peaknet\method\afff.met	Calibrated	: 11/2/97 10:04:00 PM
System Name	: DX-500	Detector	: ED40
Column Type	:	Operator	:
Data Points	: 1200	Rate	: 1.00 Hz
Module Name	: ID:24 0a 85	Moduleware	: 1.17

Calibration	Volume	Dilution	Start	Stop	Area Reject	Pk. Width	Threshold
External	1	1	0.00	19.98	1000	10.00	19.21

********** Component Report: All Components **********

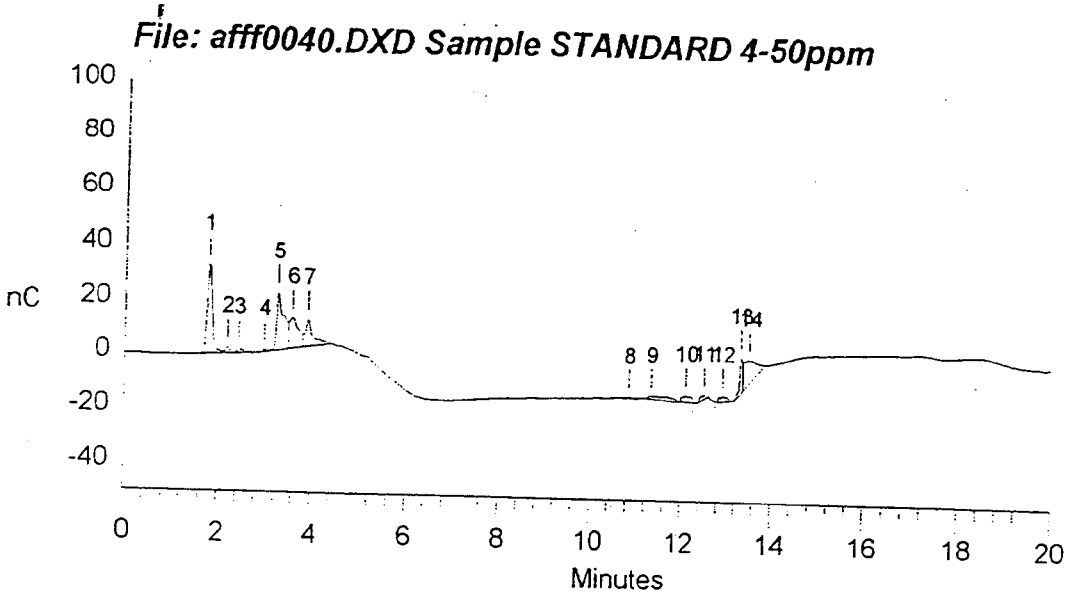
Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	butylcarb	0.000	0	0	0	0.00
		Totals	0.000	0	0		

********** Peak Report: Unknown Peaks **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.78		0.000	325296	2429357	2	
2	2.20		0.000	24002	170707	2	
3	2.45		0.000	18971	148875	2	
4	2.98		0.000	7210	50711	2	
5	3.27		0.000	209860	2375017	2	
6	3.60		0.000	111458	1482906	2	
7	3.92		0.000	101553	1071935	2	
8	10.85		0.000	5067	65565	1	
9	11.33		0.000	10457	466714	1	
10	12.12		0.000	24539	337970	1	
11	12.52		0.000	14869	125229	1	
12	12.92		0.000	22302	278019	1	
13	13.32		0.000	133338	609577	2	
14	13.52		0.000	84206	1622195	2	
		Totals	0.000	1093126	11234776		

Schedule: \peaknet\schedule\afff11_2.sch
Release 4.30 11/3/97 3:43:34 PM

US00001057



Schedule: \peaknet\schedule\afff11 2.sch
Release 4.30

11/3/97 3:43:34 PM

BNR Inhibition Batch Assay Pretreated with Defoamer 8710

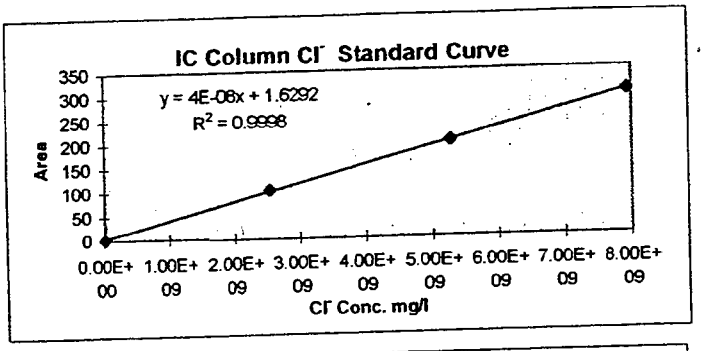
(AFFF 60 ppm)

US00001059

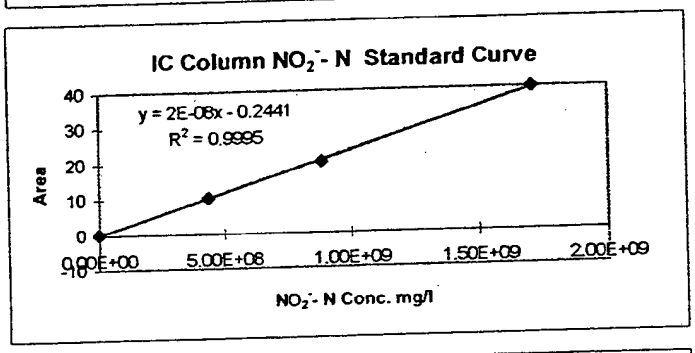
Reactor	AFFF (ppm)	Defoamer 8710 ml/liter	Stage	Time	NH3-N (mg/L)	TKN (mg/L)
			Feedstock		30.50	149.29
			RR Decant		1.58	1.56
A1	0	0	End of Feeding	2 hr	21.25	26.55
			End of Anaerobic	4 hr	23.46	31.09
			End of Aerobic	6 hr	6.59	15.24
			End of Settling	8 hr	5.85	6.34
A2	0	0	End of Feeding	2 hr	21.25	24.28
			End of Anaerobic	4 hr	22.56	29.65
			End of Aerobic	6 hr	6.34	13.90
			End of Settling	8 hr	6.32	6.34
A3	0	0	End of Feeding	2 hr	19.62	33.22
			End of Anaerobic	4 hr	21.68	26.96
			End of Aerobic	6 hr	6.10	11.45
			End of Settling	8 hr	5.20	7.31
B1	60	75	End of Feeding	2 hr	17.41	47.54
			End of Anaerobic	4 hr	20.03	32.60
			End of Aerobic	6 hr	21.40	26.96
			End of Settling	8 hr	22.99	29.10
B2	60	75	End of Feeding	2 hr	16.73	39.74
			End of Anaerobic	4 hr	20.03	35.86
			End of Aerobic	6 hr	20.58	26.96
			End of Settling	8 hr	22.11	26.45
B3	60	75	End of Feeding	2 hr	16.73	43.46
			End of Anaerobic	4 hr	19.26	37.60
			End of Aerobic	6 hr	20.58	22.29
			End of Settling	8 hr	22.11	30.51

File: AFFF Inhib (28-9-97).xls
Sheet: Standards & Data

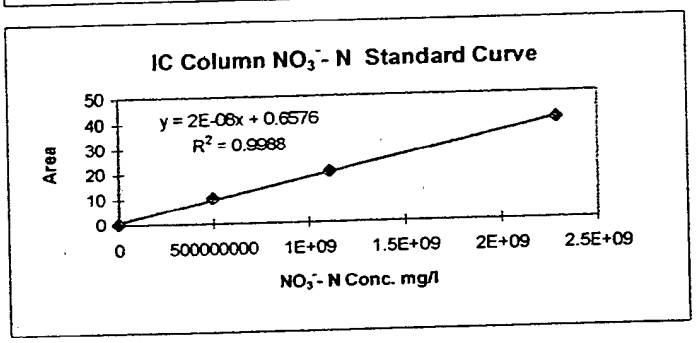
US00001060



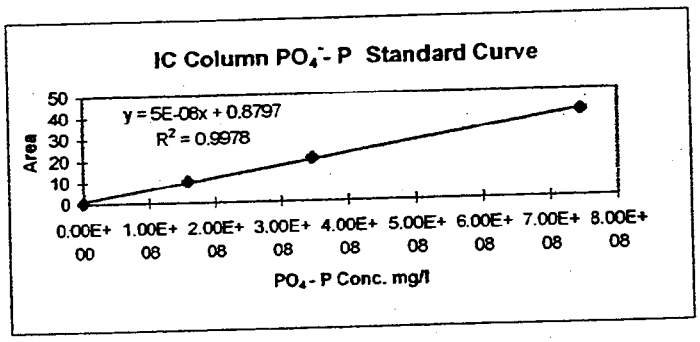
m = 4.00E-08
i = 1.62920588



m = 2.00E-08
i = -2.44E-01



m = 2.00E-08
i = 6.58E-01



m = 5.00E-08
i = 8.80E-01

File: AFFF Inhib (28-9-97).xls
Sheet: Standards & Data

US00001061

Reactor	AFFF (ppm)	Defoamer 8710 ml/liter	Stage	Time	Cl- Area	Cl- (mg/L)	NO_2^--N Area	NO_2^--N (mg/L)	NO_3^--N Area	NO_3^--N (mg/L)	PO_4^--P Area	PO_4^--P (mg/L)
			Feedstock		7457747666	282.4	0	0.0	3524379	0.7	507017629	27.8
			RR Decant		5623726490	213.4	0	0.0	1706044005	30.1	10153030	1.4
A1	0	0	End of Feeding	2 hr	5041945872	191.5	0	0.0	2758118	0.7	**	**
			End of Anaerobic	4 hr	5027455061	190.9	0	0.0	2964817	0.7	944779425	51.0
			End of Aerobic	6 hr	5053058153	191.9	85235354	1.8	1291777953	22.9	562010370	30.7
			End of Settling	8 hr	5088956393	193.2	78609565	1.6	1341478644	23.8	552997441	30.2
A2	0	0	End of Feeding	2 hr	5127400412	194.7	0	0.0	1329484	0.7	**	**
			End of Anaerobic	4 hr	4946719672	187.9	0	0.0	817360	0.7	958696272	51.8
			End of Aerobic	6 hr	5003826950	190.0	75976408	1.5	1278850617	22.7	493873713	27.1
			End of Settling	8 hr	5117089552	194.3	73973601	1.5	1315150459	23.3	495640650	27.2
A3	0	0	End of Feeding	2 hr	5091896779	193.3	0	0.0	226258	0.7	913093284	49.3
			End of Anaerobic	4 hr	4940329563	187.6	0	0.0	1800473	0.7	1002070135	54.1
			End of Aerobic	6 hr	4975297553	188.9	91086799	1.9	1255680352	22.3	545344963	29.8
			End of Settling	8 hr	5056091891	192.0	81130861	1.7	1416148773	25.1	547369867	29.9
B1	60	75	End of Feeding	2 hr	4977058840	189.0	0	0.0	111277732	2.6	907954312	49.1
			End of Anaerobic	4 hr	4737157675	180.0	0	0.0	4703645	0.7	1033593354	55.7
			End of Aerobic	6 hr	4857095710	184.5	72317154	1.4	102657989	2.4	760675975	41.3
			End of Settling	8 hr	5096308355	193.5	83028403	1.7	134183815	3.0	767856471	41.6
B2	60	75	End of Feeding	2 hr	4783930883	181.7	0	0.0	30003358	1.2	922896041	49.9
			End of Anaerobic	4 hr	4825396022	183.3	0	0.0	2363790	0.7	1051995712	56.7
			End of Aerobic	6 hr	4927322604	187.1	50259487	0.9	185767797	3.9	752829263	40.8
			End of Settling	8 hr	5028328616	190.9	52302672	1.0	202345313	4.1	754358389	40.9
B3	60	75	End of Feeding	2 hr	5079180104	192.9	0	0.0	870556	0.7	964491265	52.1
			End of Anaerobic	4 hr	4989264230	189.5	0	0.0	2805377	0.7	1119659940	60.3
			End of Aerobic	6 hr	5180772536	196.7	63924582	1.3	122078432	2.8	853373379	46.2
			End of Settling	8 hr	5414707806	205	58302078	1.12	147594599	3.2	832463719	45.1
			Stand 2		2537327961	97.2	436373497	10.0	498937800	9.3	157251445	9.2
			Stand 3		5201369190	197.5	877244997	20.3	1107112362	19.8	337460091	18.8
			Stand 4		8233404885	311.6	1.772E+09	41.2	2506862853	43.9	827751035	44.8
			Standards used									
			STD 1		112034	0	0	0	0	0	0	0
			STD 2		2546706893	100	437097596	10	499196654	10	159790402	10
			STD 3		5273486188	200	886725171	20	1111316466	20	346916597	20
			STD 4		7943185575	300	1.707E+09	40	2294176939	40	745786620	40

Phosphorus results derived from IC.
**Values not known

File: AFFF Inhib (28-9-97).xls
Sheet: Standards & Data

US00001062

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.999812763
Observations	4

	Coefficients	*Standard Error*
Intercept	1.629205877	1.797642711
X Variable 1	3.76492E-08	3.64315E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.99953939
Observations	4

	Coefficients	*Standard Error*
Intercept	-0.244116398	0.35060654
X Variable 1	2.34176E-08	3.55463E-10

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.998799273
Observations	4

	Coefficients	*Standard Error*
Intercept	0.657555531	0.549397937
X Variable 1	1.72536E-08	4.23006E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.997831646
Observations	4

	Coefficients	*Standard Error*
Intercept	0.879667485	0.733009284
X Variable 1	5.30792E-08	1.74963E-09

File: AFFF Inhib (28-9-97).xls
Sheet: Standards & Data

US00001063

Reactor	AFFF (ppm)	Defoamer 8710 ml/liter	Stage	Time	COD		
					ABS	(mg/L)	% COD Removal
			Feedstock		0.091	1189.7	
			RR Decant		0.001	5.9	
A1	0	0	End of Feeding	2 hr	0.012	150.6	62.4
			End of Anaerobic	4 hr	0.015	190.0	52.6
			End of Aerobic	6 hr	0.001	5.9	98.5
			End of Settling	8 hr	0.003	32.2	92.0
A2	0	0	End of Feeding	2 hr	0.012	150.6	62.4
			End of Anaerobic	4 hr	0.015	190.0	52.6
			End of Aerobic	6 hr	0.006	71.6	82.1
			End of Settling	8 hr	0.005	58.5	85.4
A3	0	0	End of Feeding	2 hr	0.010	124.3	69.0
			End of Anaerobic	4 hr	0.012	150.6	62.4
			End of Aerobic	6 hr	0.001	5.9	98.5
			End of Settling	8 hr	0.003	32.2	92.0
B1	60	75	End of Feeding	2 hr	0.053	689.9	61.7
			End of Anaerobic	4 hr	0.052	676.7	62.4
			End of Aerobic	6 hr	0.070	913.5	49.3
			End of Settling	8 hr	0.071	926.7	48.6
B2	60	75	End of Feeding	2 hr	0.058	755.7	58.0
			End of Anaerobic	4 hr	0.053	689.9	61.7
			End of Aerobic	6 hr	0.072	939.8	47.8
			End of Settling	8 hr	0.070	913.5	49.3
B3	60	75	End of Feeding	2 hr	0.055	716.2	60.2
			End of Anaerobic	4 hr	0.056	729.3	59.5
			End of Aerobic	6 hr	0.077	1005.6	44.2
			End of Settling	8 hr	0.075	979.3	45.6
			STD 1		0.000	0	
			STD 2		0.077	1000	
			STD 3		0.149	2000	
			STD 4		0.236	3000	
			STD 5		0.339	4500	
			FS (Filtered)		0.091	1189.7	
			FS Average		0.091	1189.7	
			RRSU(Filtered)		0.001	5.9	
			RRSU Average		0.001	5.9	

* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.

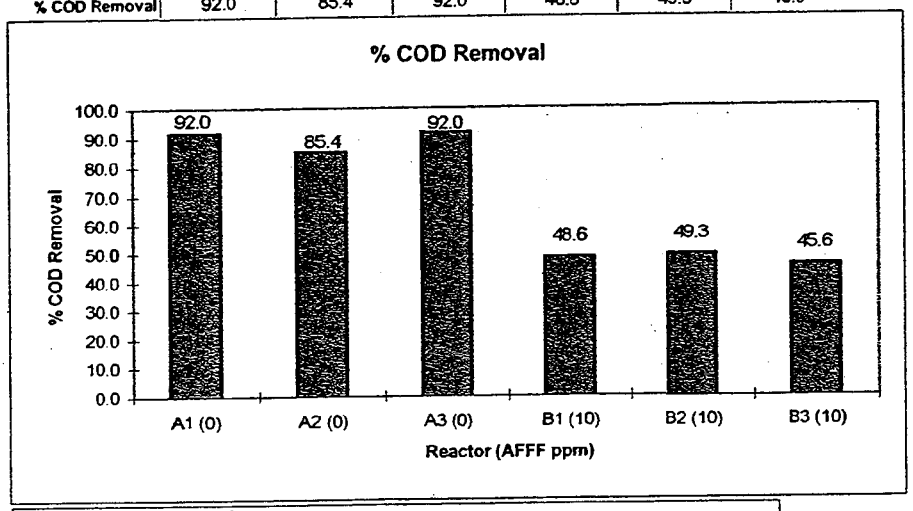
File: AFFF Inhib (28-9-97).xls
Sheet: COD

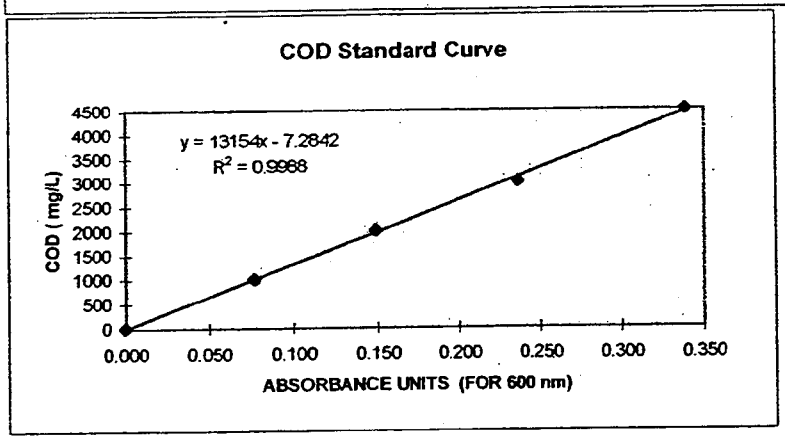
US00001064

Initial COD at Time 0 hr.

Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	5.9	23.4796981
(A1,A2&A3)	Feedstock	2	1189.7	2379.47486
	Defoamer	2	0	0
	AFFF	0	0	0
	Total	6		**400.5**
Inhibition	RR Decant	4	5.9	23.6
(B1,B2&B3)	Feedstock	2	1189.7	2379.4
	Defoamer	1	4930	4930
	AFFF	2	1737	3474
	Total	6		**1801.2**

Reactor (AFFF ppm)	A1 (0)	A2 (0)	A3 (0)	B1 (10)	B2 (10)	B3 (10)
% COD Removal	92.0	85.4	92.0	48.6	49.3	45.6





m = 13154
i = -7.2842

File: AFFF Inhib (28-9-97).xls
Sheet: COD

SUMMARY OUTPUT

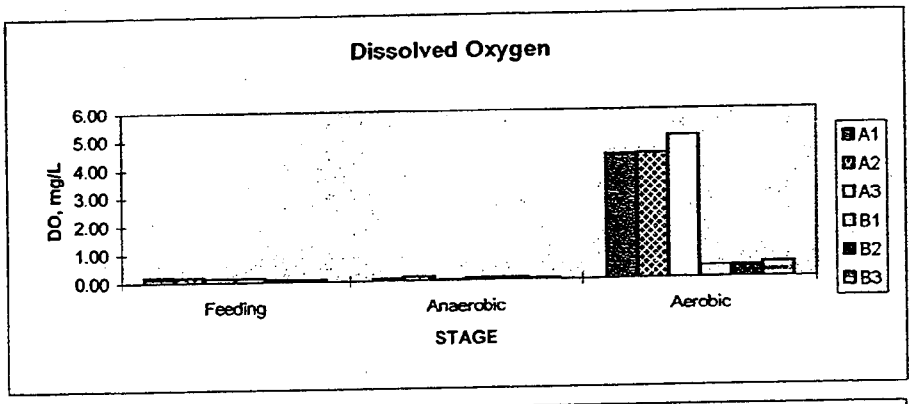
COD

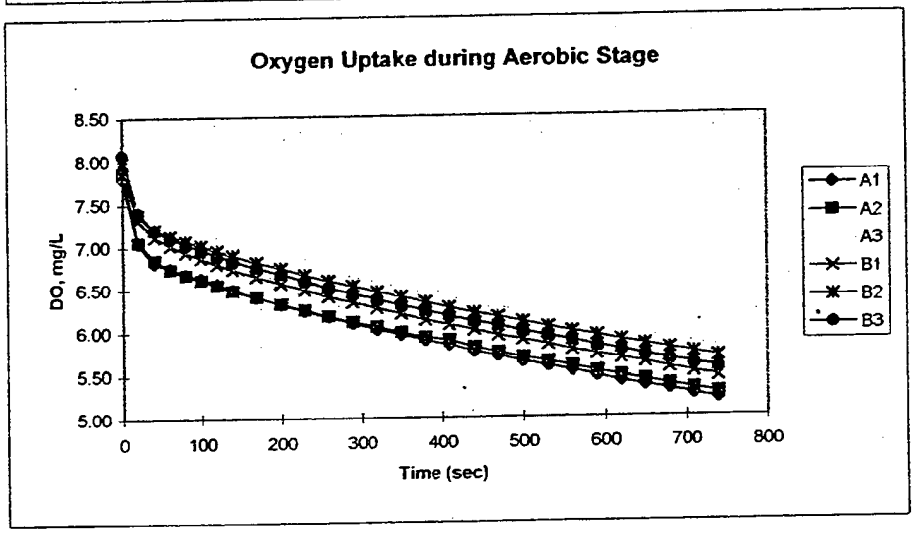
Regression Statistics	
R Square	0.998847775
Observations	5

	Coefficients	*Standard Error*
Intercept	-7.284158871	51.42618443
X Variable 1	13154.08339	257.9401893

File: AFFF Inhib (28-9-97).xls
Sheet: COD

US00001066





File: AFFF Inhib (28-9-97).xls
Sheet: Oxygen Uptake

US00001067

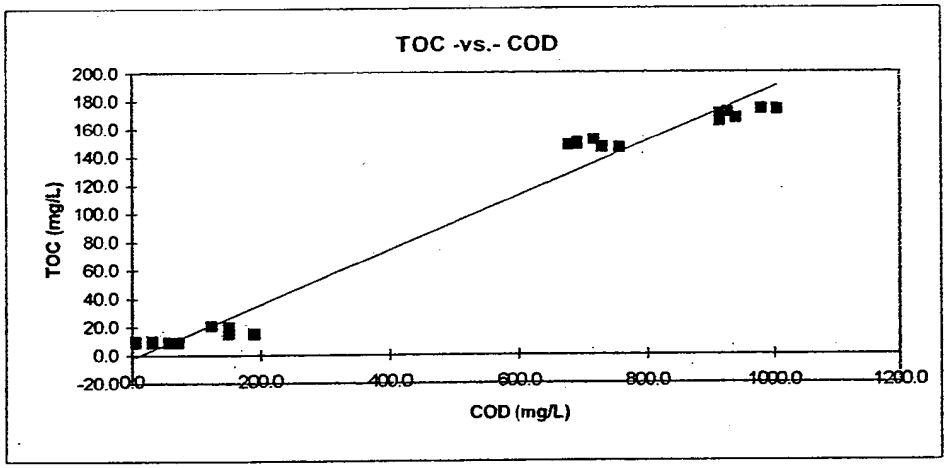
	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	A3	B1	B2	B3
Feeding	0.20	0.17	0.13	0.13	0.09	0.07
Anaerobic	0.07	0.13	0.02	0.07	0.08	0.03
Aerobic	4.38	4.40	5.02	0.41	0.43	0.53

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	A3	B1	B2	B3
Aerobic	0	7.80	7.85	7.84	7.98	7.85	8.06
	20	7.04	7.05	7.46	7.31	7.37	7.40
	40	6.81	6.84	7.30	7.11	7.20	7.19
	60	6.74	6.73	7.23	7.01	7.12	7.10
	80	6.67	6.66	7.16	6.93	7.06	7.03
	100	6.62	6.60	7.11	6.86	7.01	6.96
	120	6.56	6.54	7.04	6.79	6.95	6.90
	140	6.49	6.48	6.98	6.73	6.89	6.83
	170	6.40	6.40	6.91	6.64	6.81	6.75
	200	6.32	6.32	6.83	6.56	6.74	6.67
	230	6.24	6.25	6.75	6.49	6.66	6.59
	260	6.17	6.18	6.69	6.41	6.59	6.51
	290	6.09	6.11	6.62	6.34	6.53	6.44
	320	6.02	6.05	6.56	6.27	6.46	6.37
	350	5.96	5.98	6.49	6.20	6.40	6.30
	380	5.89	5.92	6.43	6.13	6.34	6.24
	410	5.83	5.89	6.37	6.07	6.27	6.17
	440	5.76	5.80	6.32	6.01	6.21	6.11
	470	5.70	5.74	6.26	5.94	6.16	6.05
	500	5.64	5.68	6.20	5.89	6.10	5.99
	530	5.58	5.63	6.14	5.83	6.04	5.93
	560	5.53	5.58	6.09	5.77	5.99	5.88
	590	5.47	5.52	6.04	5.72	5.94	5.82
	620	5.41	5.47	5.99	5.67	5.88	5.77
	650	5.36	5.42	5.93	5.62	5.83	5.71
	680	5.31	5.37	5.88	5.56	5.78	5.66
	710	5.25	5.32	5.83	5.51	5.73	5.61
	740	5.20	5.27	5.78	5.46	5.68	5.56

File: AFFF Inhib (28-9-97).xls
Sheet: Dissolved Oxygen

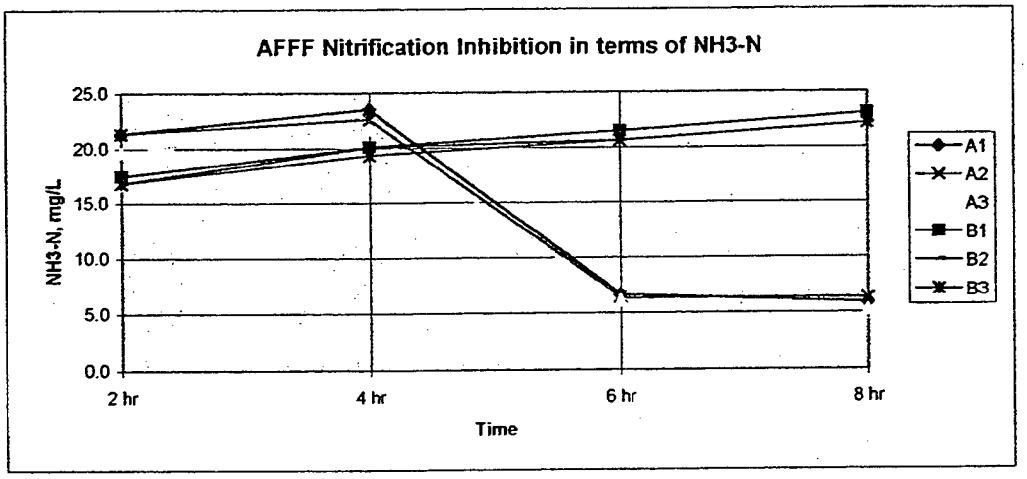
US00001068

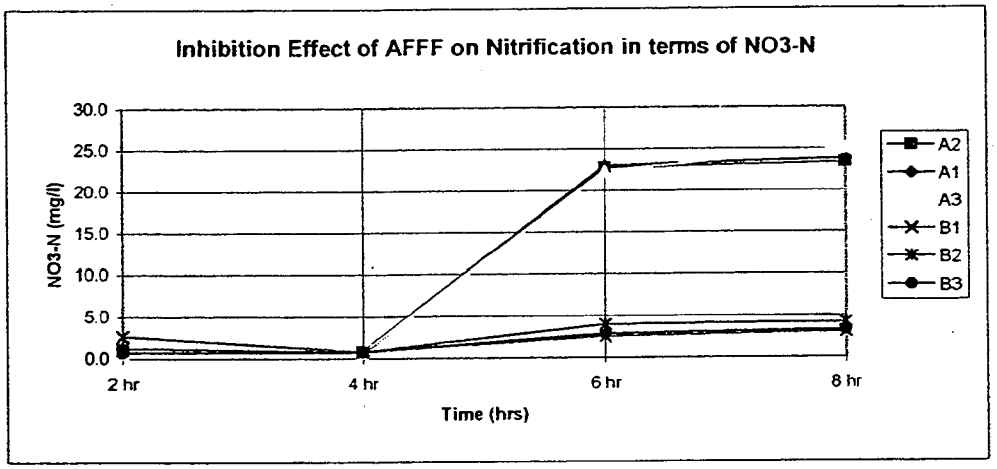
Reactor	AFFF (ppm)	Defoamer 8710 ml/liter	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
			Feedstock			1189.7	420.0	771.0
			RR Decant			5.9	10.8	333.0
A1	0	0	End of Feeding	2 hr		150.6	19.9	370.0
			End of Anaerobic	4 hr		190.0	15.1	384.0
			End of Aerobic	6 hr		5.9	9.7	207.0
			End of Settling	8 hr		32.2	9.5	216.0
A2	0	0	End of Feeding	2 hr		150.6	20.0	368.0
			End of Anaerobic	4 hr		190.0	14.7	363.0
			End of Aerobic	6 hr		71.6	8.9	227.0
			End of Settling	8 hr		58.5	9.0	214.0
A3	0	0	End of Feeding	2 hr		124.3	20.6	368.0
			End of Anaerobic	4 hr		150.6	14.9	386.0
			End of Aerobic	6 hr		5.9	8.8	219.0
			End of Settling	8 hr		32.2	9.0	213.0
B1	60	75	End of Feeding	2 hr		689.9	149.8	365.0
			End of Anaerobic	4 hr		676.7	147.7	351.0
			End of Aerobic	6 hr		913.5	164.7	350.0
			End of Settling	8 hr		926.7	171.1	294.0
B2	60	75	End of Feeding	2 hr		755.7	145.8	367.0
			End of Anaerobic	4 hr		689.9	148.0	333.0
			End of Aerobic	6 hr		939.8	167.1	344.0
			End of Settling	8 hr		913.5	170.1	327.0
B3	60	75	End of Feeding	2 hr		716.2	151.7	364.0
			End of Anaerobic	4 hr		729.3	146.3	340.0
			End of Aerobic	6 hr		1005.6	173.0	346.0
			End of Settling	8 hr		979.3	173.3	330.0

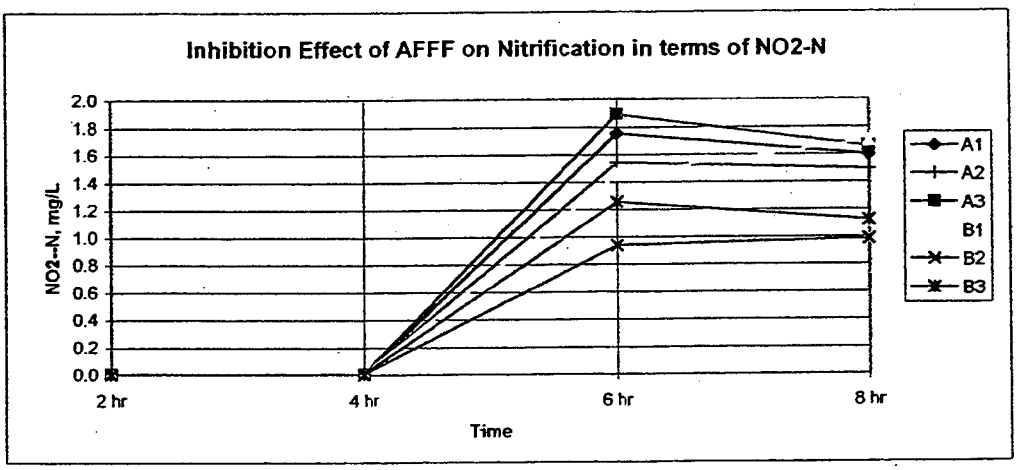


File: AFFF Inhib (28-9-97).xls
Sheet: Concentrations Table

Date of Test: 3-11-97 NH3-N & TKN Charts





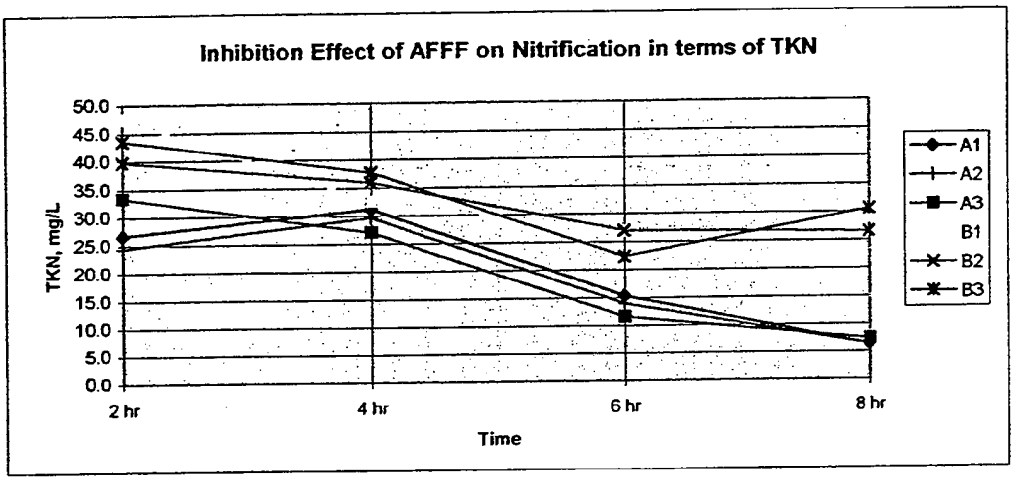


A1,A2,A3—Control Reactors B1,B2,B3—Inhibition reactors—>60ppm AFFF with Defoamer 8710

File: AFFF Inhib (28-9-97).xls
Sheet: NH3-N & TKN Charts

US00001070

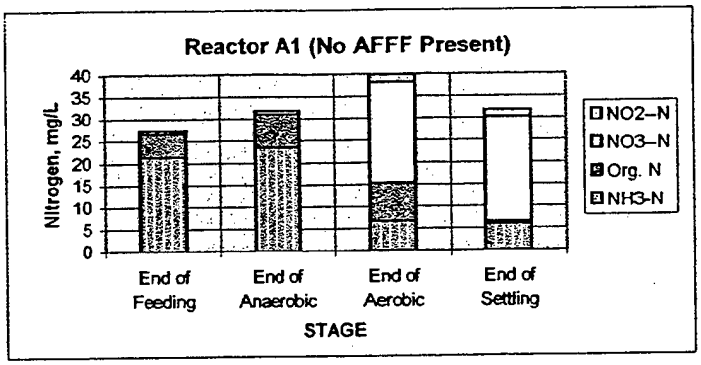
Date of Test: 3-11-97 NH3-N & TKN Charts

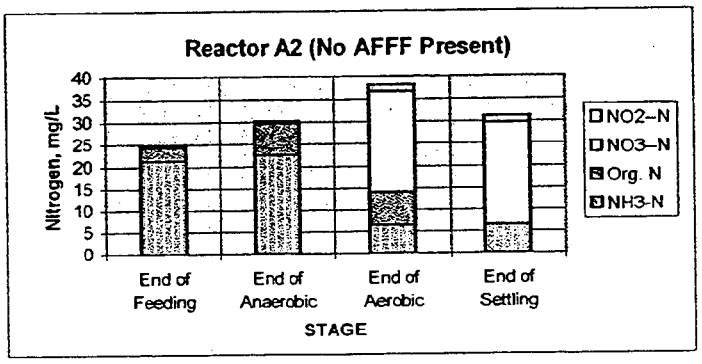


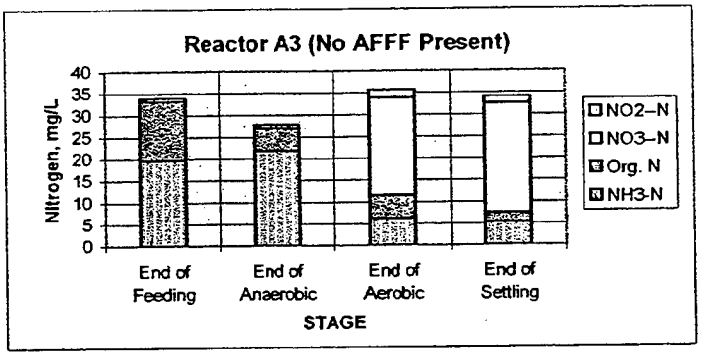
A1,A2,A3—Control Reactors B1,B2,B3—Inhibition reactors—>60ppm AFFF with Defoamer 8710

File: AFFF Inhib (28-9-97).xls
Sheet: NH3-N & TKN Charts

Date of Test: 3-11-97 Inhibition Reactors / Nitrogen Mass Balance





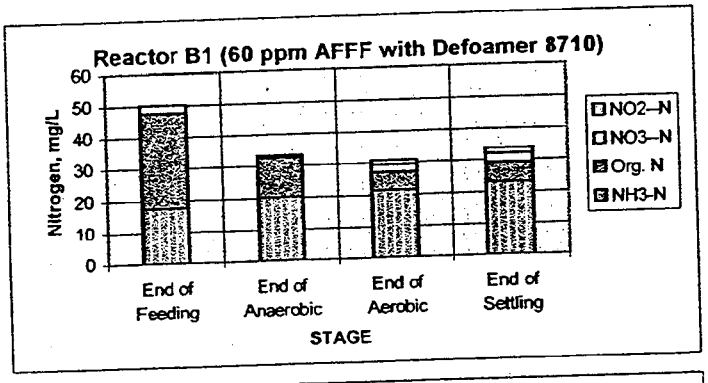


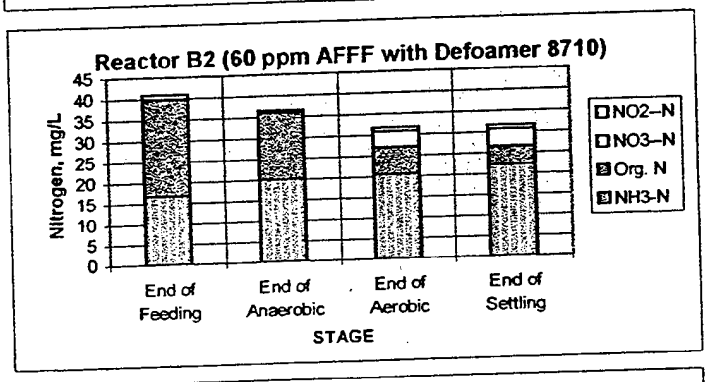
File: AFFF Inhib (28-9-97).xls
Sheet: Nitrogen Mass Balance

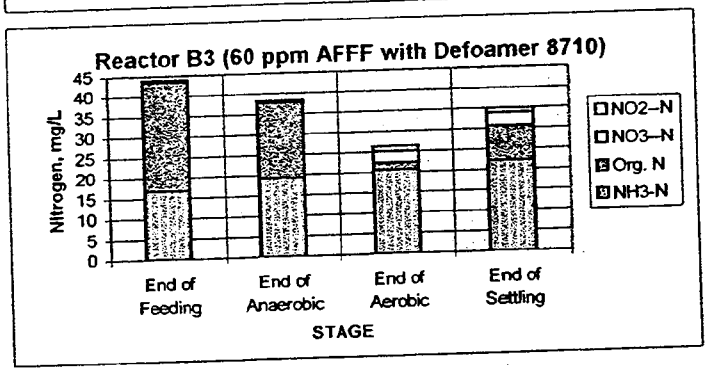
US00001072

Date of Test: 3-11-97

Inhibition Reactors / Nitrogen Mass Balance

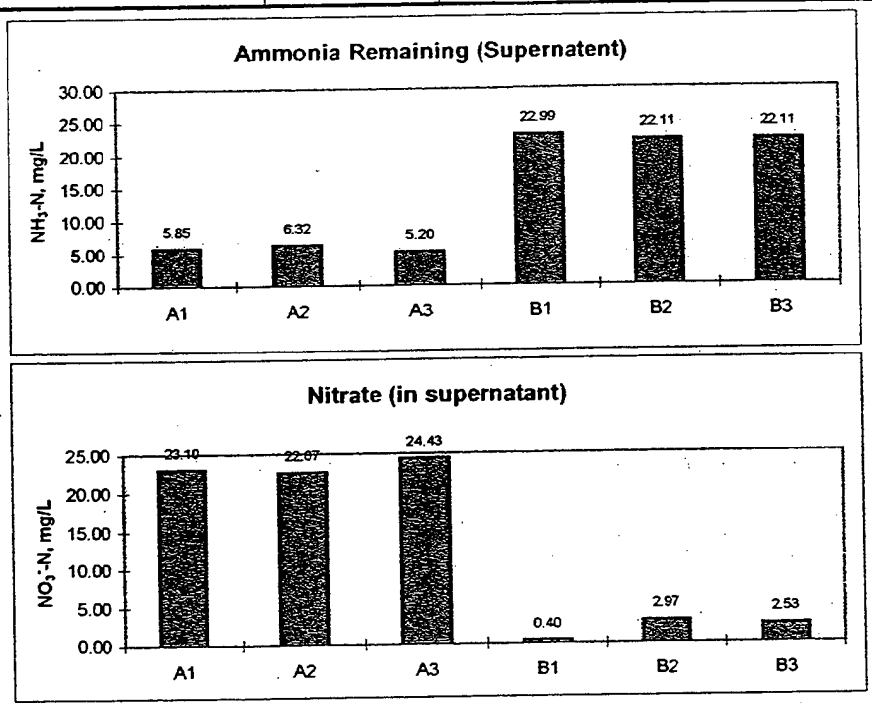






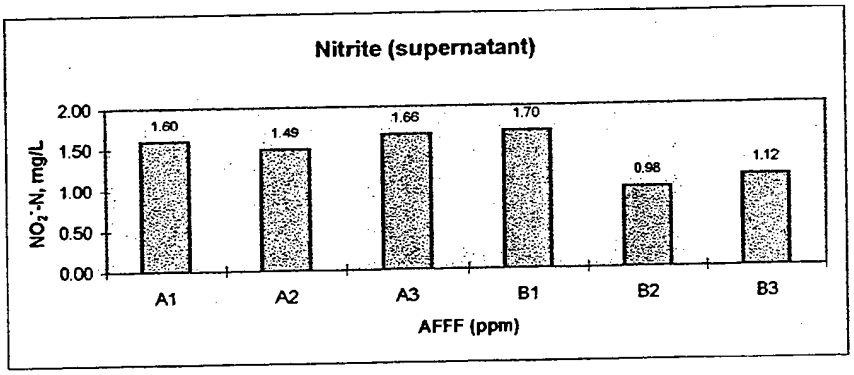
File: AFFF Inhib (28-9-97).xls
Sheet: Nitrogen Mass Balance

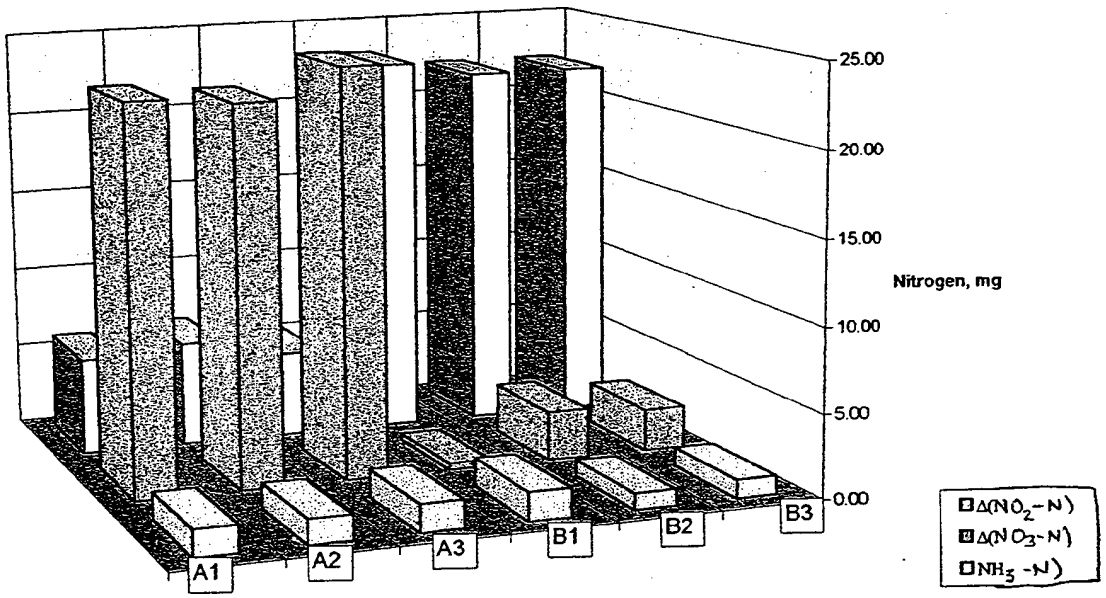
Reactor	AFFF ppm	Defoamer 8710 ml/liter	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3--N	NO2--N	Δ(NO_3^--N)	Δ(NO_2^--N)
A1 (Control)	0	0	End of Feeding	2 hr	21.25	0.7	0.0		
			End of Anaerobic	4 hr	23.46	0.7	0.0		
			End of Aerobic	6 hr	6.59	22.9	1.8		
			End of Settling	8 hr	5.85	23.8	1.6	23.10	1.60
A2 (Control)	0	0	End of Feeding	2 hr	21.25	0.7	0.0		
			End of Anaerobic	4 hr	22.56	0.7	0.0		
			End of Aerobic	6 hr	6.34	22.7	1.5		
			End of Settling	8 hr	6.32	23.3	1.5	22.67	1.49
A3 (Control)	0	0	End of Feeding	2 hr	19.62	0.7	0.0		
			End of Anaerobic	4 hr	21.68	0.7	0.0		
			End of Aerobic	6 hr	6.10	22.3	1.9		
			End of Settling	8 hr	5.20	25.1	1.7	24.43	1.66
B1	60	75	End of Feeding	2 hr	17.41	2.6	0.0		
			End of Anaerobic	4 hr	20.03	0.7	0.0		
			End of Aerobic	6 hr	21.40	2.4	1.4		
			End of Settling	8 hr	22.99	3.0	1.7	0.40	1.70
B2	60	75	End of Feeding	2 hr	16.73	1.2	0.0		
			End of Anaerobic	4 hr	20.03	0.7	0.0		
			End of Aerobic	6 hr	20.58	3.9	0.9		
			End of Settling	8 hr	22.11	4.1	1.0	2.97	0.98
B3	60	75	End of Feeding	2 hr	16.73	0.7	0.0		
			End of Anaerobic	4 hr	19.26	0.7	0.0		
			End of Aerobic	6 hr	20.58	2.8	1.3		
			End of Settling	8 hr	22.11	3.2	1.1	2.53	1.12



File: AFFF Inhib (28-9-97).xls
Sheet: NO3- & NO2 Produced

US00001074





File: AFFF Inhib (28-9-97).xls
Sheet: NO3- & NO2 Produced

BNR Inhibition Tests - 60 ppm AFFF Pretreated with Defoamer 8710 (Sept/28/97)

TSS						
Reactor	Initial wt	Final wt	Volume	MLSS	WT @ 55	MLVSS
A1	1.0961	1.1459	15	3320	1.1002	3047
A2	1.1036	1.1538	15	3347	1.1084	3027
A3	1.1044	1.1533	15	3260	1.1092	2940
B1	1.1089	1.1674	15	3900	1.1165	3393
B2	1.1127	1.1712	15	3900	1.1202	3400
B3	1.1113	1.167	15	3713	1.1185	3233

TDS				
Reactor	Initial wt	Final wt	Volume	TDS
A1	1.025	1.0399	15	993
A2	1.0187	1.0328	15	940
A3	1.0177	~	15	~
B1	1.0219	1.038	15	1073
B2	1.0168	1.0348	15	1200
B3	1.0177	1.0359	15	1213

TS					
Reactor	Initial wt	Final wt	Volume	TS	ΣTSS,TDS
A1	1.0258	1.0913	15	4367	4313
A2	1.0094	1.0732	15	4253	4287
A3	1.0229	1.0825	15	3973	~
B1	1.0231	1.099	15	5060	4973
B2	1.0271	1.1051	15	5200	5100
B3	1.0198	1.1007	15	5393	4927

File: AFFF Soilds Data

US00001076

BNR Inhibition Batch Assay Pretreated with Defoamer AF9020

(AFFF 60 ppm)

Reactor	AFFF (ppm)	Defoamer AF9020 ml/liter	Stage	Time	NH3-N (mg/L)	TKN (mg/L)	Alkalinity
			Feedstock		26.7	25.7	433.0
			RR Decant		0.1	1.6	326.0
A1	0	0	End of Feeding	2 hr	24.6	17.8	534.0
			End of Anaerobic	4 hr	30.0	41.1	527.0
			End of Aerobic	6 hr	4.7	14.4	357.0
			End of Settling	8 hr	2.8	14.4	350.0
A2	0	0	End of Feeding	2 hr	24.0	14.4	540.0
			End of Anaerobic	4 hr	29.4	43.3	528.0
			End of Aerobic	6 hr	4.5	18.7	355.0
			End of Settling	8 hr	3.2	11.1	340.0
A3	0	0	End of Feeding	2 hr	25.7	15.2	511.0
			End of Anaerobic	4 hr	31.0	45.6	524.0
			End of Aerobic	6 hr	3.2	16.0	354.0
			End of Settling	8 hr	2.8	10.5	350.0
B1	60	15	End of Feeding	2 hr	22.3	20.8	507.0
			End of Anaerobic	4 hr	28.9	59.3	511.0
			End of Aerobic	6 hr	10.7	25.7	381.0
			End of Settling	8 hr	11.3	19.7	400.0
B2	60	15	End of Feeding	2 hr	23.5	28.5	493.0
			End of Anaerobic	4 hr	30.3	53.4	516.0
			End of Aerobic	6 hr	11.9	27.0	407.0
			End of Settling	8 hr	13.2	27.0	400.0
B3	60	15	End of Feeding	2 hr	21.4	27.0	510.0
			End of Anaerobic	4 hr	30.3	56.2	531.0
			End of Aerobic	6 hr	12.6	27.0	447.0
			End of Settling	8 hr	15.4	28.5	417.0

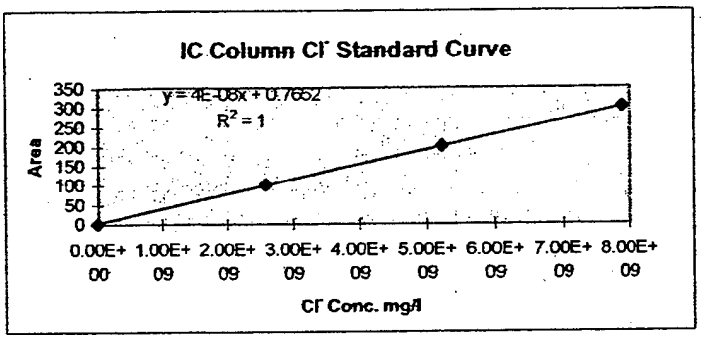
File: AFFF Inhib (2-11-97).xls
Sheet: Standards & Data

US00001078

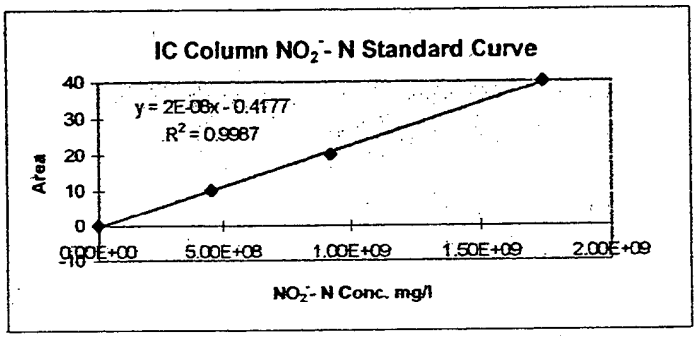
		Defoamer										
	AFFF	AF 9020			Cl-		NO_2-N		NO_3-N		PO4-P	
Reactor	(ppm)	ml/liter	Stage	Time	Area	(mg/L)	Area	(mg/L)	Area	(mg/L)	Absorb.	mg/l
			Feedstock		7458784718	283.8	0	0.0	6230008	0.9	1.612	47.89
			RR Decant		6215776781	236.7	0	0.0	1461239493	24.3	0.019	-1.24
A1	0	0	End of Feeding	2 hr	6521436722	248.3	0	0.0	225112	0.8	0.56	15.45
			End of Anaerobic	4 hr	6541737522	249.0	0	0.0	206220	0.8	0.607	16.90
			End of Aerobic	6 hr	6526328166	248.4	142391549	2.9	1158812851	19.4	0.149	2.77
			End of Settling	8 hr	6628917720	252.3	153197095	3.1	1131344921	19.0	0.17	3.42
A2	0	0	End of Feeding	2 hr	6496185022	247.3	0	0.0	3020068	0.8	0.48	12.98
			End of Anaerobic	4 hr	6493904107	247.2	0	0.0	0	0.8	0.49	13.29
			End of Aerobic	6 hr	6607957850	251.5	157637708	3.2	1116272031	18.7	0.039	-0.62
			End of Settling	8 hr	6559750264	249.7	147310900	3.0	1329426657	22.1	0.151	2.83
A3	0	0	End of Feeding	2 hr	6462688484	246.0	0	0.0	0	0.8	0.639	17.88
			End of Anaerobic	4 hr	6541325694	249.0	0	0.0	15585084	1.0	0.693	19.55
			End of Aerobic	6 hr	6537345571	248.9	166524849	3.4	1194876061	20.0	0.184	3.85
			End of Settling	8 hr	6696567822	254.9	148840324	3.0	1007475791	17.0	0.252	5.95
B1	60	15	End of Feeding	2 hr	6379079984	242.9	0	0.0	156248	0.8	0.725	20.54
			End of Anaerobic	4 hr	6384157598	243.0	0	0.0	105106	0.8	0.905	26.09
			End of Aerobic	6 hr	6408351115	244.0	145107540	2.9	635447762	11.0	0.257	6.10
			End of Settling	8 hr	6738146973	256.5	126417813	2.5	793675421	13.5	0.467	12.58
B2	60	15	End of Feeding	2 hr	6373314182	242.6	0	0.0	0	0.8	0.889	25.60
			End of Anaerobic	4 hr	6446545211	245.4	0	0.0	96884	0.8	1.236	36.30
			End of Aerobic	6 hr	6207893047	236.4	121298643	2.4	280948060	5.3	0.128	2.12
			End of Settling	8 hr	6626744880	252.3	134009389	2.7	514120835	9.0	0.616	17.18
B3	60	15	End of Feeding	2 hr	6391628940	243.3	0	0.0	145740	0.8	0.903	26.03
			End of Anaerobic	4 hr	6401156329	243.7	0	0.0	0	0.8	1.495	44.29
			End of Aerobic	6 hr	6568896471	250.1	109336485	2.1	293674209	5.5	0.514	14.03
			End of Settling	8 hr	6532740605	248.7	131553129	2.6	809881753	13.8	0.301	7.46
			Stand 3		5219091409	198.8	917655285	20.7	1148516754	19.2		
			Standards used									
			STD 1		472916	0	0	0	1293424	0	0.185	5
			STD 2		2592013444	100	454327901	10	537513653	10	0.756	20
			STD 3		5234110314	200	925169445	20	1154945353	20	1.217	35
			STD 4		7902689639	300	1738139936	40	2467096565	40	1.645	50

File: AFFF Inhib (2-11-97).xls
Sheet: Standards & Data

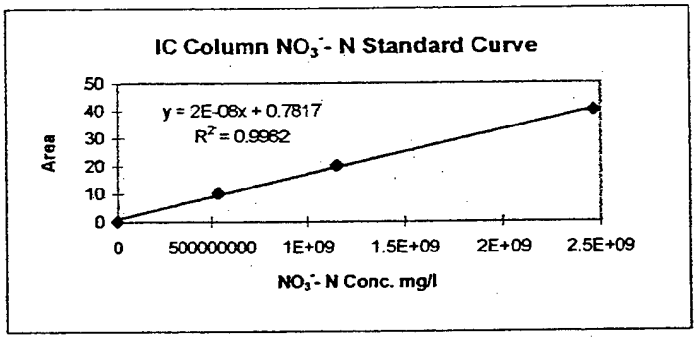
US00001079



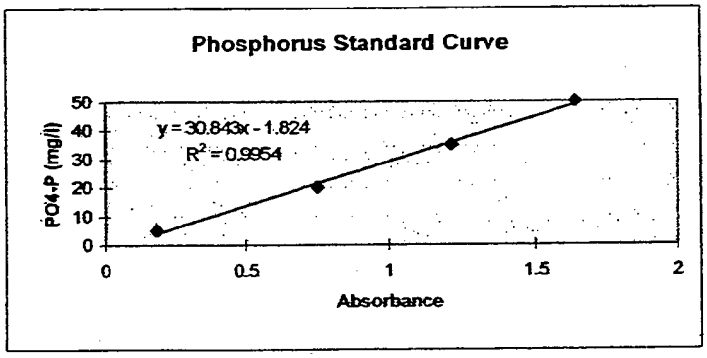
m = 4.00E-08
i = 7.65E-01



m = 2.00E-08
i = -4.18E-01



m = 2.00E-08
i = 7.82E-01



File: AFFF Inhib (2-11-97).xls
Sheet: Standards & Data

US00001080

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.99995642
Observations	4

	Coefficients	*Standard Error*
Intercept	0.76519136	0.870412079
X Variable 1	3.7951E-08	1.7715E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.99873067
Observations	4

	Coefficients	*Standard Error*
Intercept	-0.41772585	0.585531826
X Variable 1	2.2989E-08	5.79516E-10

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.99817439
Observations	4

	Coefficients	*Standard Error*
Intercept	0.7816875	0.674739918
X Variable 1	1.6072E-08	4.86023E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.99540535
Observations	4

	Coefficients	*Standard Error*
Intercept	-1.82395065	1.621942917
X Variable 1	30.8429668	1.481724664

File: AFFF Inhib (2-11-97).xls
Sheet: Standards & Data

US00001081

Reactor	AFFF (ppm)	Defoamer AF9020 ml/liter	Stage	Time	COD		
					ABS	(mg/L)	% COD Removal*
			Feedstock		0.087	1125.0	
			RR Decant		0.011	104.3	
A1	0	0	End of Feeding	2 hr	0.014	144.6	67.5
			End of Anaerobic	4 hr	0.013	131.2	70.5
			End of Aerobic	6 hr	0.006	37.1	91.6
			End of Settling	8 hr	0.004	10.3	97.7
A2	0	0	End of Feeding	2 hr	0.014	144.6	67.5
			End of Anaerobic	4 hr	0.014	144.6	67.5
			End of Aerobic	6 hr	0.004	10.3	97.7
			End of Settling	8 hr	0.005	23.7	94.7
A3	0	0	End of Feeding	2 hr	0.012	117.7	73.5
			End of Anaerobic	4 hr	0.010	90.9	79.6
			End of Aerobic	6 hr	0.008	64.0	85.6
			End of Settling	8 hr	0.007	50.6	88.6
B1	60	15	End of Feeding	2 hr	0.061	775.8	59.3
			End of Anaerobic	4 hr	0.057	722.1	62.1
			End of Aerobic	6 hr	0.065	829.5	56.5
			End of Settling	8 hr	0.078	1004.1	47.3
B2	60	15	End of Feeding	2 hr	0.067	856.4	55.1
			End of Anaerobic	4 hr	0.058	735.5	61.4
			End of Aerobic	6 hr	0.059	748.9	60.7
			End of Settling	8 hr	0.065	829.5	56.5
B3	60	15	End of Feeding	2 hr	0.061	775.8	59.3
			End of Anaerobic	4 hr	0.059	748.9	60.7
			End of Aerobic	6 hr	0.064	816.1	57.2
			End of Settling	8 hr	0.075	963.8	49.5
			STD 1		0.000	0	
			STD 2		0.083	1000	
			STD 3		0.153	2000	
			STD 4		0.223	3000	
			STD 5		0.339	4500	
			FS (Filtered)		0.087	1096.0	
			FS Average		0.087	1096.0	
			RRSU(Filtered)		0.011	59.3	
			RRSU Average		0.011	59.3	

* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.

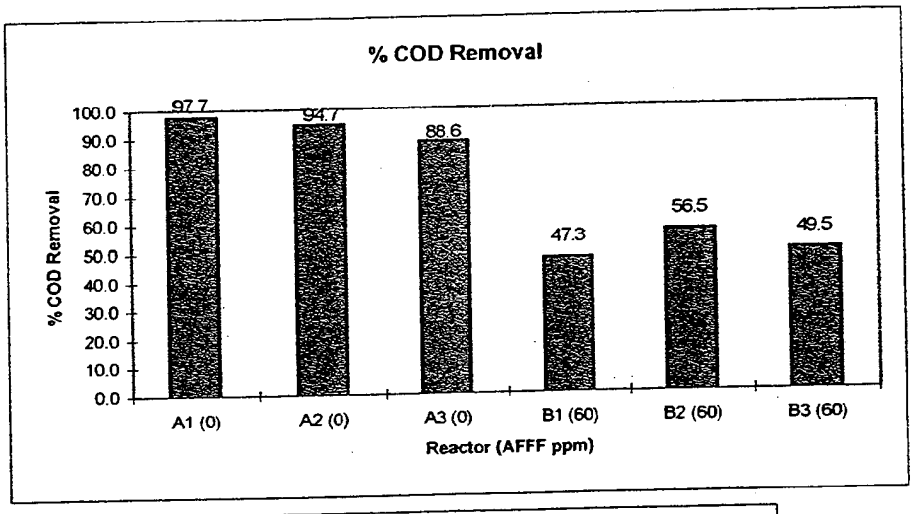
File: AFFF Inhib (2-11-97).xls
Sheet: COD

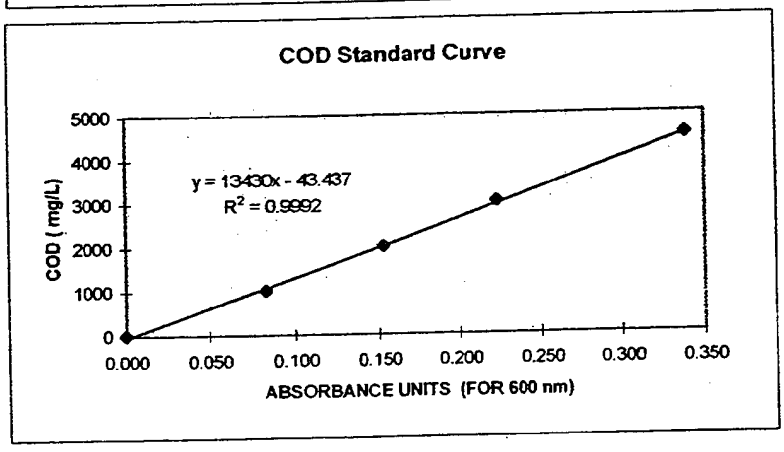
US00001082

Initial COD at Time 0 hr.

Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	104.3	417.172
(A1,A2&A3)	Feedstock	2	1125.0	2249.946
	Defoamer	2	0	0
	AFFF	0	0	0
	Total	6		**444.5**
Inhibition	RR Decant	4	104.3	417.172
(B1,B2&B3)	Feedstock	2	1125.0	2249.946
	Defoamer	1	5300	5300
	AFFF	2	1737	3474
	Total	6		**1906.9**

Reactor (AFFF ppm)	A1 (0)	A2 (0)	A3 (0)	B1 (60)	B2 (60)	B3 (60)
% COD Removal	97.7	94.7	88.6	47.3	56.5	49.5

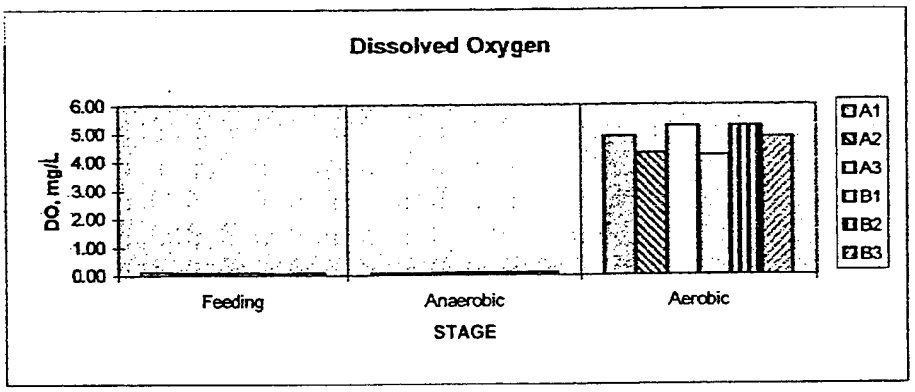


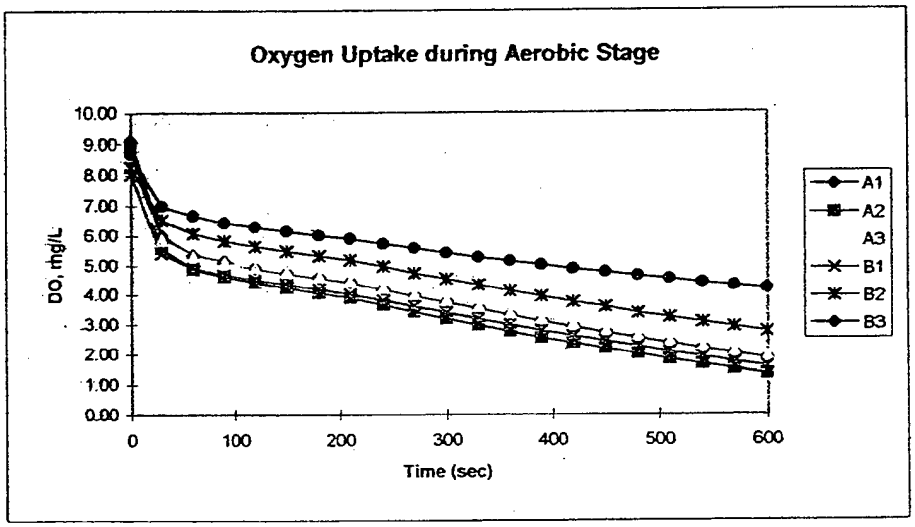


m = 13430
i = -43.437

File: AFFF Inhib (2-11-97).xls
Sheet: COD

US00001083





File: AFFF Inhib (2-11-97).xls
Sheet: Oxygen Uptake

US00001084

Stage	Dissolved Oxygen (mg/L) at various stages					
	A1	A2	A3	B1	B2	B3
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	4.88	4.30	5.27	4.21	5.27	4.85

Stage	Time (sec)	Dissolved Oxygen in mg/L					
		A1	A2	A3	B1	B2	B3
Aerobic	0	9.12	8.92	8.28	8.00	8.24	8.69
	30	5.98	5.54	5.83	5.38	6.49	6.96
	60	5.32	4.85	5.28	4.88	6.04	6.64
	90	5.09	4.59	5.08	4.66	5.80	6.40
	120	4.91	4.40	4.92	4.49	5.61	6.26
	150	4.73	4.23	4.76	4.33	5.45	6.11
	180	4.57	4.05	4.60	4.16	5.29	5.98
	210	4.41	3.88	4.46	4.01	5.15	5.86
	240	4.17	3.63	4.23	3.80	4.93	5.69
	270	3.95	3.40	4.01	3.59	4.71	5.54
	300	3.73	3.17	3.79	3.38	4.51	5.39
	330	3.52	2.95	3.59	3.17	4.31	5.25
	360	3.31	2.74	3.37	2.97	4.12	5.12
	390	3.10	2.53	3.17	2.77	3.93	4.99
	420	2.89	2.34	2.97	2.59	3.74	4.85
	450	2.71	2.16	2.78	2.41	3.58	4.74
	480	2.52	1.98	2.59	2.23	3.36	4.62
	510	2.34	1.81	2.41	2.06	3.22	4.50
	540	2.18	1.65	2.24	1.89	3.06	4.39
	570	2.01	1.49	2.08	1.72	2.90	4.28
	600	1.85	1.33	1.92	1.57	2.74	4.18

File: AFFF Inhib (2-11-97).xls
Sheet: Dissolved Oxygen

Date of Test: 3-25-97 Concentrations Table AFFF Conc. = 60 ppm

Reactor	AFFF (ppm)	Defoamer AF9020 ml/liter	Stage	Time	Concentration, mg/L TKN	NH3-N	Org. N	NO2-N	NO3-N	Total N	Cl-	PO4-P
			Feedstock		25.7	26.7	-1.0	0.0	0.9	26.5	283.8	47.9
			RR Decant		1.6	0.1	1.5	0.0	24.3	25.8	236.7	-1.2
A1	0	0	End of Feeding	2 hr	17.8	24.6	-6.8	0.0	0.8	18.6	248.3	15.4
			End of Anaerobic	4 hr	41.1	30.0	11.1	0.0	0.8	41.9	249.0	16.9
			End of Aerobic	6 hr	14.4	4.7	9.8	2.9	19.4	36.7	248.4	2.8
			End of Settling	8 hr	14.4	2.8	11.6	3.1	19.0	36.5	252.3	3.4
A2	0	0	End of Feeding	2 hr	14.4	24.0	-9.6	0.0	0.8	15.3	247.3	13.0
			End of Anaerobic	4 hr	43.3	29.4	13.9	0.0	0.8	44.1	247.2	13.3
			End of Aerobic	6 hr	18.7	4.5	14.3	3.2	18.7	40.7	251.5	-0.6
			End of Settling	8 hr	11.1	3.2	8.0	3.0	22.1	36.2	249.7	2.8
A3	0	0	End of Feeding	2 hr	15.2	25.7	-10.5	0.0	0.8	16.0	246.0	17.9
			End of Anaerobic	4 hr	45.6	31.0	14.6	0.0	1.0	46.6	249.0	19.6
			End of Aerobic	6 hr	16.0	3.2	12.8	3.4	20.0	39.4	248.9	3.9
			End of Settling	8 hr	10.5	2.8	7.8	3.0	17.0	30.5	254.9	5.9
B1	60	15	End of Feeding	2 hr	20.8	22.3	-1.5	0.0	0.8	21.6	242.9	20.5
			End of Anaerobic	4 hr	59.3	28.9	30.4	0.0	0.8	60.0	243.0	26.1
			End of Aerobic	6 hr	25.7	10.7	14.9	2.9	11.0	39.6	244.0	6.1
			End of Settling	8 hr	19.7	11.3	8.5	2.5	13.5	35.8	256.5	12.6
B2	60	15	End of Feeding	2 hr	28.5	23.5	5.0	0.0	0.8	29.3	242.6	25.6
			End of Anaerobic	4 hr	53.4	30.3	23.1	0.0	0.8	54.2	245.4	36.3
			End of Aerobic	6 hr	27.0	11.9	15.2	2.4	5.3	34.7	236.4	2.1
			End of Settling	8 hr	27.0	13.2	13.8	2.7	9.0	38.7	252.3	17.2
B3	60	15	End of Feeding	2 hr	27.0	21.4	5.7	0.0	0.8	27.8	243.3	26.0
			End of Anaerobic	4 hr	56.2	30.3	26.0	0.0	0.8	57.0	243.7	44.3
			End of Aerobic	6 hr	27.0	12.6	14.5	2.1	5.5	34.6	250.1	14.0
			End of Settling	8 hr	28.5	15.4	13.1	2.6	13.8	44.9	248.7	7.5

File: AFFF Inhib (2-11-97).xls
Sheet: Concentrations Table

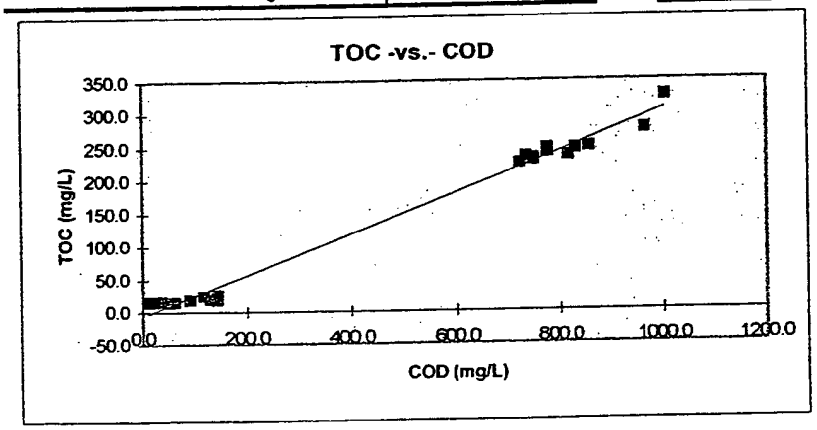
US00001086

Date of Test: 3-25-97

Concentrations Table

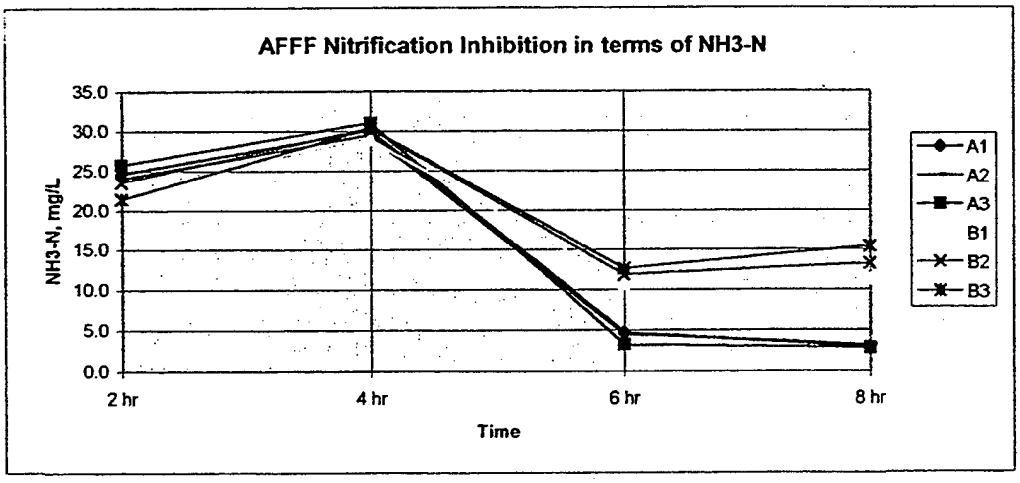
AFFF Conc. = 60 ppm

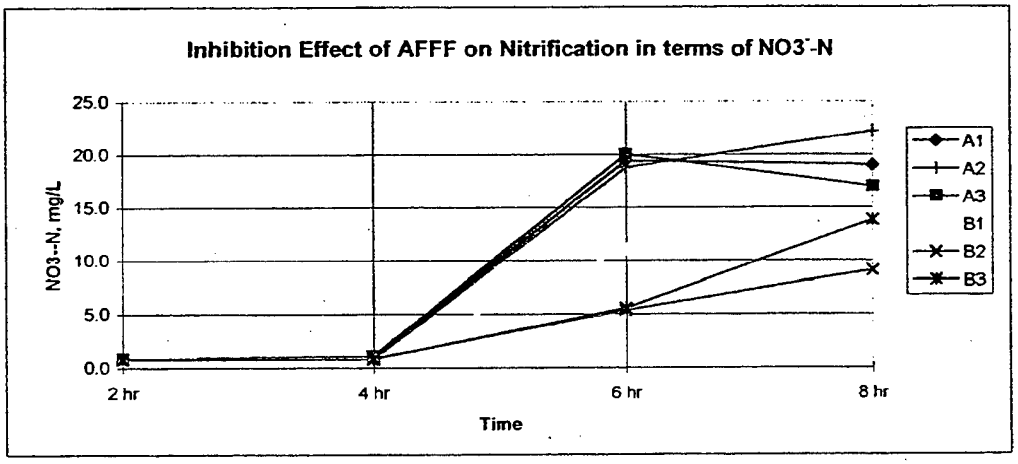
Reactor	AFFF (ppm)	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
		Feedstock			1125.0	443.1	433.0
		RR Decant			104.3	13.9	326.0
A1	0	End of Feeding	2 hr		144.6	25.4	534.0
		End of Anaerobic	4 hr		131.2	19.1	527.0
		End of Aerobic	6 hr		37.1	15.2	357.0
		End of Settling	8 hr		10.3	15.3	350.0
A2	0	End of Feeding	2 hr		144.6	25.4	540.0
		End of Anaerobic	4 hr		144.6	18.3	528.0
		End of Aerobic	6 hr		10.3	14.4	355.0
		End of Settling	8 hr		23.7	14.4	340.0
A3	0	End of Feeding	2 hr		117.7	24.0	511.0
		End of Anaerobic	4 hr		90.9	17.7	524.0
		End of Aerobic	6 hr		64.0	14.4	354.0
		End of Settling	8 hr		50.6	14.2	350.0
B1	60	End of Feeding	2 hr		775.8	241.1	507.0
		End of Anaerobic	4 hr		722.1	225.9	511.0
		End of Aerobic	6 hr		829.5	247.5	381.0
		End of Settling	8 hr		1004.1	326.0	400.0
B2	60	End of Feeding	2 hr		856.4	249.6	493.0
		End of Anaerobic	4 hr		735.5	235.8	516.0
		End of Aerobic	6 hr		748.9	232.6	407.0
		End of Settling	8 hr		829.5	246.2	400.0
B3	60	End of Feeding	2 hr		775.8	247.4	510.0
		End of Anaerobic	4 hr		748.9	229.4	531.0
		End of Aerobic	6 hr		816.1	236.2	447.0
		End of Settling	8 hr		963.8	276.4	417.0
		FS1				444.1	
		FS2				443.6	
		FS3				441.5	
		FS Avarage				443.1	
		RRSU1				14.7	
		RRSU2				13.5	
		RRSU3				13.3	
		RRSU Avarage				13.87	

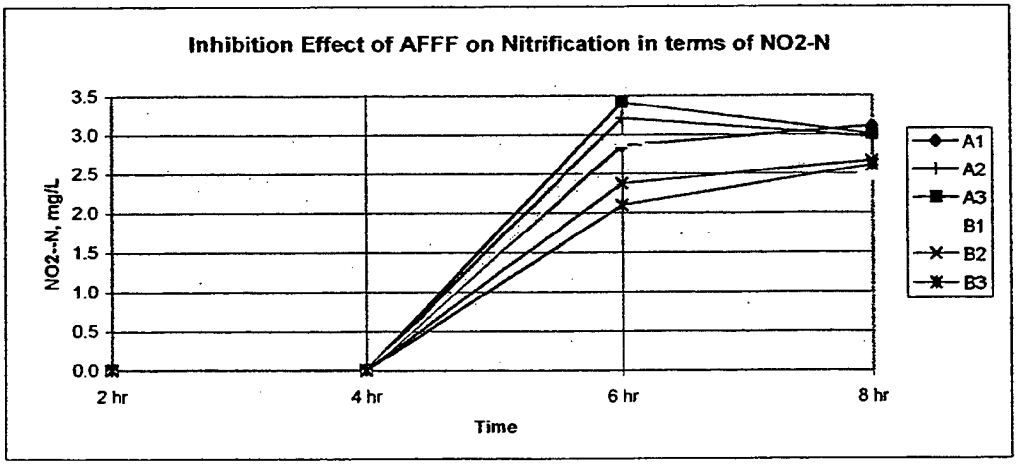


File: AFFF Inhib (2-11-97).xls
Sheet: Concentrations Table

US00001087

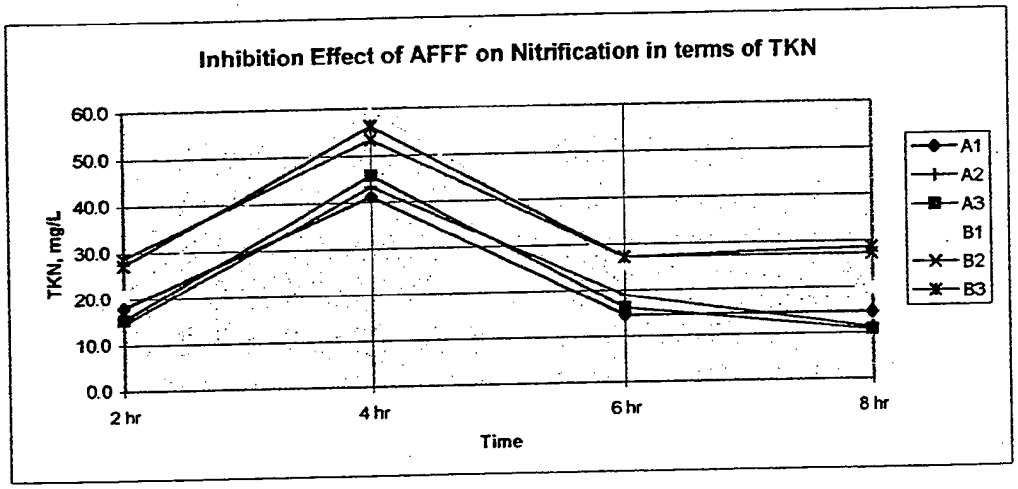


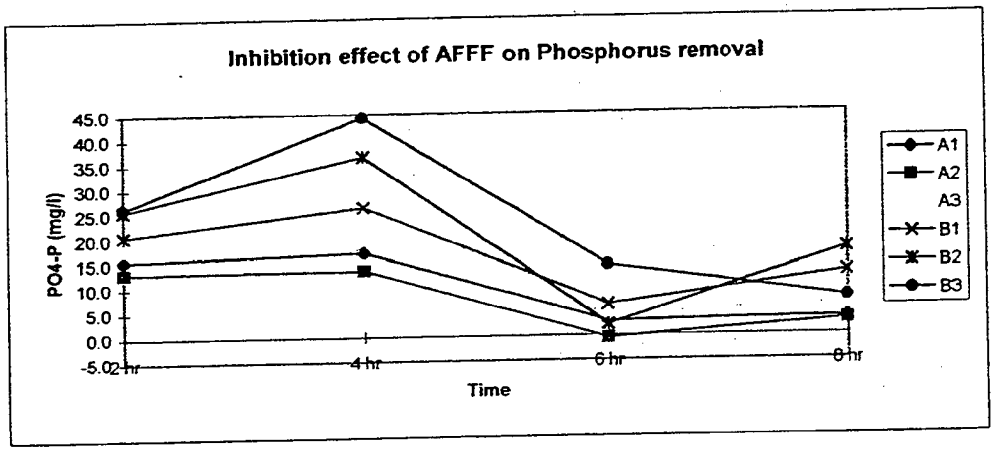




File: AFFF Inhib (2-11-97).xls
Sheet: NH3-N & TKN Charts

US00001088

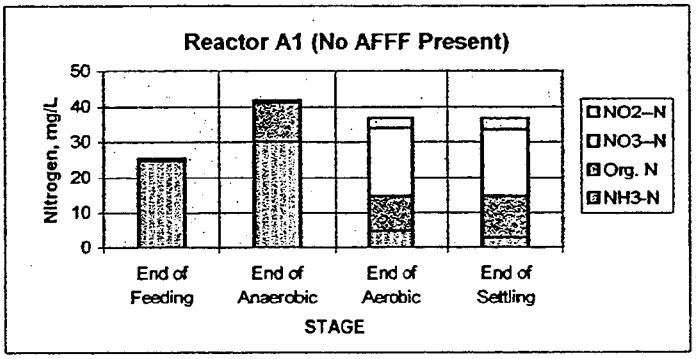


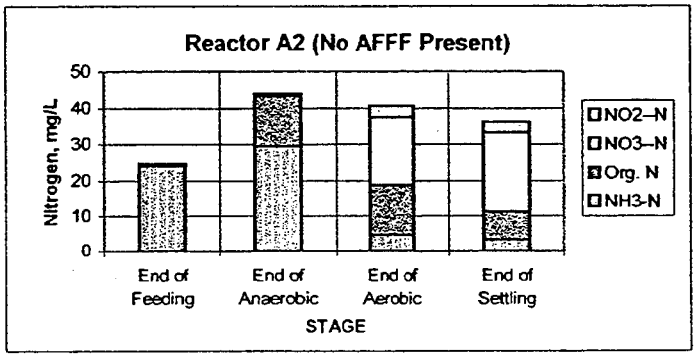


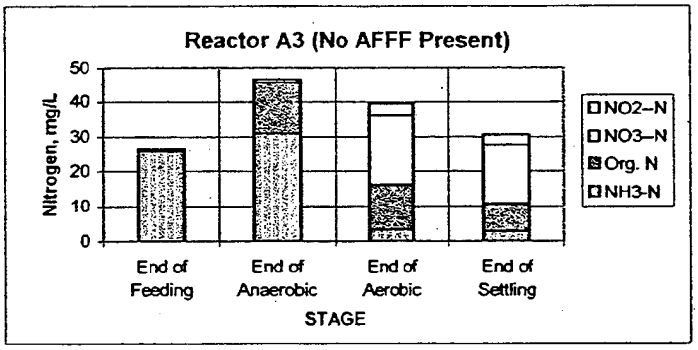
File: AFFF Inhib (2-11-97).xls
Sheet: NH3-N & TKN Charts

US00001089

Date of Test: 3-25-97 Inhibition Reactors / Nitrogen Mass Balance AFFF Conc. = 60 ppm



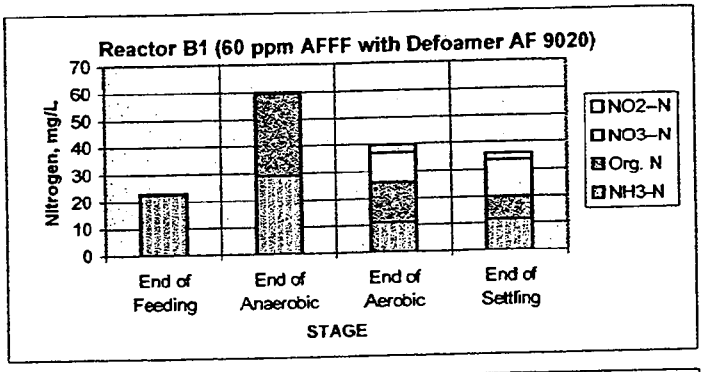


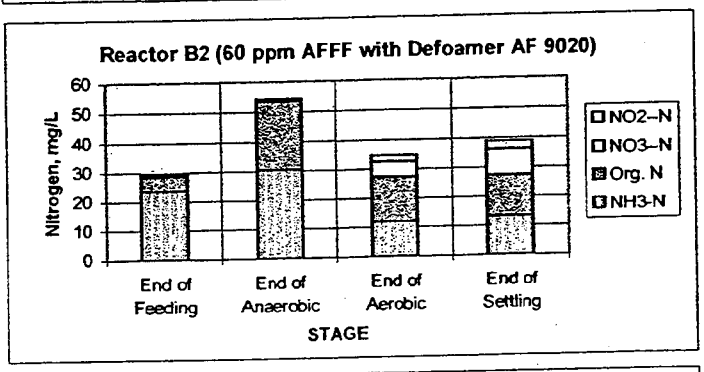


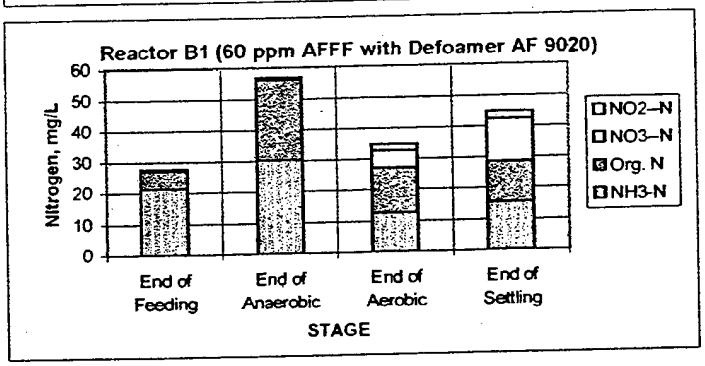
File: AFFF Inhib (2-11-97).xls
Sheet: Nitrogen Mass Balance

US00001090

Date of Test: 3-25-97 Inhibition Reactors / Nitrogen Mass Balance AFFF Conc. = 60 ppm



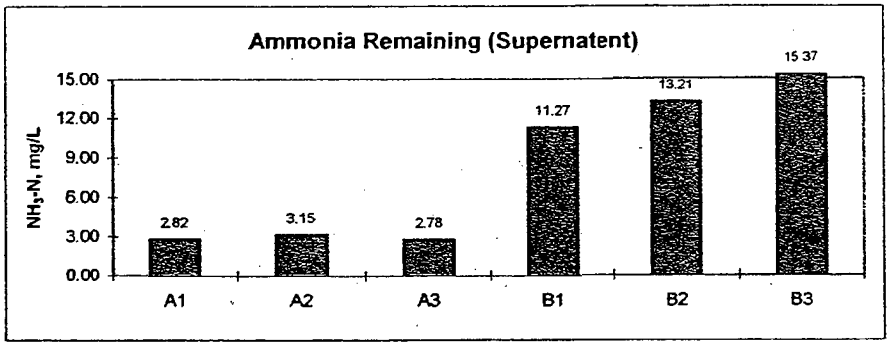


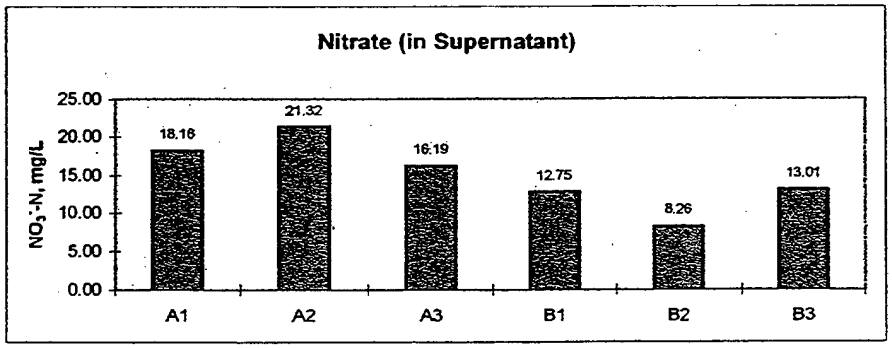


File: AFFF Inhib (2-11-97).xls
Sheet: Nitrogen Mass Balance

US00001091

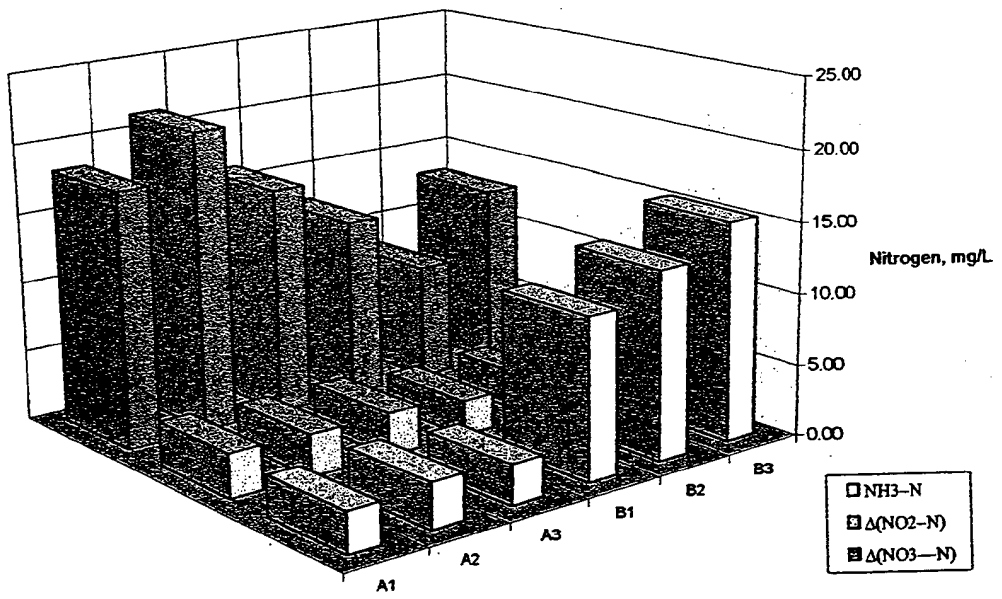
Reactor	AFFF ppm	Defoamer AF 9020	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3–N	NO2–N	Δ(NO_3^--N)	Δ(NO_2-N)
A1	0	0	End of Feeding	2 hr	24.55	0.8	0.0		
(Control)			End of Anaerobic	4 hr	30.02	0.8	0.0		
			End of Aerobic	6 hr	4.67	19.4	2.9		
			End of Settling	8 hr	2.82	19.0	3.1	18.16	3.10
A2	0	0	End of Feeding	2 hr	23.97	0.8	0.0		
(Control)			End of Anaerobic	4 hr	29.44	0.8	0.0		
			End of Aerobic	6 hr	4.45	18.7	3.2		
			End of Settling	8 hr	3.15	22.1	3.0	21.32	2.97
A3	0	0	End of Feeding	2 hr	25.65	0.8	0.0		
(Control)			End of Anaerobic	4 hr	30.97	1.0	0.0		
			End of Aerobic	6 hr	3.20	20.0	3.4		
			End of Settling	8 hr	2.78	17.0	3.0	16.19	3.00
B1	60	15	End of Feeding	2 hr	22.31	0.8	0.0		
			End of Anaerobic	4 hr	28.88	0.8	0.0		
			End of Aerobic	6 hr	10.74	11.0	2.9		
			End of Settling	8 hr	11.27	13.5	2.5	12.75	2.49
B2	60	15	End of Feeding	2 hr	23.50	0.8	0.0		
			End of Anaerobic	4 hr	30.26	0.8	0.0		
			End of Aerobic	6 hr	11.85	5.3	2.4		
			End of Settling	8 hr	13.21	9.0	2.7	8.26	2.66
B3	60	15	End of Feeding	2 hr	21.35	0.8	0.0		
			End of Anaerobic	4 hr	30.26	0.8	0.0		
			End of Aerobic	6 hr	12.57	5.5	2.1		
			End of Settling	8 hr	15.37	13.8	2.6	13.01	2.61





File: AFFF Inhib (2-11-97).xls
Sheet: NO3- & NO2 Produced

US00001092



File: AFFF Inhib (2-11-97).xls
Sheet: NO3- & NO2 Produced

BNR Inhibition Tests - 60 ppm AFFF Pretreated with Defoamer AF9020 (Nov/2/97)

TSS Reactor	Initial wt	Final wt	Volume	MLSS	T @ 550	MLVSS
A1	1.1121	1.157	15	2993	1.117	2667
A2	1.1126	1.1566	15	2933	1.1173	2620
A3	1.1123	1.1545	15	2813	1.1167	2520
B1	1.1207	1.1719	15	3413	1.1264	3033
B2	1.1225	1.1725	15	3333	1.1281	2960
B3	1.1309	1.1852	15	3620	1.137	3213

TDS Reactor	Initial wt	Final wt	Volume	TDS
A1	1.0169	1.0338	15	1127
A2	1.0237	1.0388	15	1007
A3	1.024	1.038	15	933
B1	1.0363	1.0561	15	1320
B2	1.0255	1.0415	15	1067
B3	1.0377	1.0587	15	1400

TS Reactor	Initial wt	Final wt	Volume	TS	TSS,TDS
A1	1.0146	1.0759	15	4087	4120
A2	1.0167	1.0775	15	4053	3940
A3	1.0179	1.0799	15	4133	3747
B1	1.0241	1.1017	15	5173	4733
B2	1.0263	1.104	15	5180	4400
B3	1.0280	1.1042	15	5080	5020

File: AFFF Soilds Data

US00001094

BNR Inhibition Batch Assay Pretreated with Best Performing Defoamer

(AFFF 120 ppm)

Reactor	AFFF (ppm)	Defoamer AF9020 ml/liter	Stage	Time	NH3-N (mg/L)	TKN (mg/L)	Alkalinity
			Feedstock		32.2	80.7	493.0
			RR Decant		0.1	11.9	295.0
A1	0	0	End of Feeding	2 hr	26.3	67.9	483.0
			End of Anaerobic	4 hr	31.1	55.1	462.0
			End of Aerobic	6 hr	2.3	15.6	322.0
			Extended Aeration	(4hr)	0.1	7.7	290.0
			End of Settling	8 hr	0.0	5.7	299.0
A2	0	0	End of Feeding	2 hr	23.3	64.1	468.0
			End of Anaerobic	4 hr	28.7	52.1	513.0
			End of Aerobic	6 hr	2.9	13.8	299.0
			End of Settling	8 hr	2.2	17.5	305.0
B1	0	30	End of Feeding	2 hr	20.7	57.1	483.0
			End of Anaerobic	4 hr	28.7	49.3	462.0
			End of Aerobic	6 hr	3.9	19.7	362.0
			End of Settling	8 hr	2.9	14.1	355.0
B2	0	30	End of Feeding	2 hr	19.9	101.8	477.0
			End of Anaerobic	4 hr	28.7	55.1	501.0
			End of Aerobic	6 hr	3.5	18.6	335.0
			Extended Aeration	(4hr)	0.1	8.0	310.0
			End of Settling	8 hr	0.1	6.4	316.0
C1	120	30	End of Feeding	2 hr	20.7	171.3	444.0
			End of Anaerobic	4 hr	31.0	81.4	490.0
			End of Aerobic	6 hr	11.5	29.8	396.0
			End of Settling	8 hr	6.6	16.7	387.0
C2	120	30	End of Feeding	2 hr	19.9	85.5	472.0
			End of Anaerobic	4 hr	29.8	96.2	437.0
			End of Aerobic	6 hr	13.0	15.6	400.0
			Extended Aeration	(4hr)	0.05	13.34	294
			End of Settling	8 hr	0.07	17.7	311.0

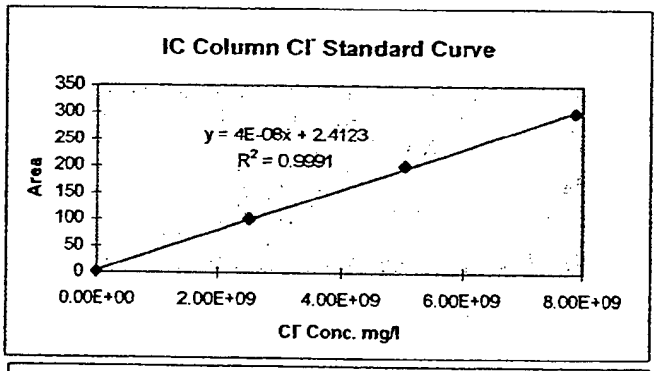
File: AFFF Inhib (10-12-97).xls
Sheet: Standards & Data

US00001096

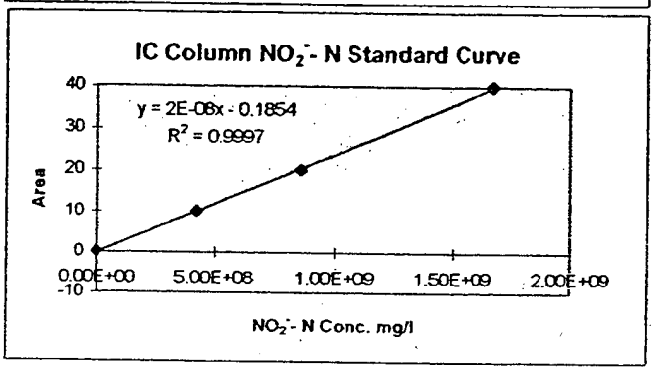
Reactor	AFFF (ppm)	Defoamer AF9020 ml/liter	Stage	Time	Cl-		NO_2^--N		NO_3^--N		PO4-P	
					Area	(mg/L)	Area	(mg/L)	Area	(mg/L)	Absorb.	mg/l
			Feedstock		7054379476	271.7	0	0.0	9902431	1.1	0.366	11.71
			RR Decant		5734515761	221.3	16370108	0.4	996533663	17.7	0.052	1.93
A1	0	0	End of Feeding	2 hr	6348421565	244.8	0	0.0	3849770	0.9	1.351	42.40
			End of Anaerobic	4 hr	5994018561	231.3	0	0.0	4797019	1.0	1.313	41.21
			End of Aerobic	6 hr	6169545264	238.0	271036986	6.4	1126185695	19.9	0.529	16.79
			Extended Aeration	(4hr)	6267692633	241.7	0	0.0	1787334663	31.1	0.258	8.35
			End of Settling	8 hr	6311578450	243.4	0	0.0	1785261984	31.1	0.241	7.82
A2	0	0	End of Feeding	2 hr	6202705931	239.2	0	0.0	2350208	0.9	1.418	44.48
			End of Anaerobic	4 hr	6191501229	238.8	0	0.0	184122	0.9	1.513	47.44
			End of Aerobic	6 hr	6255671833	241.2	266251370	6.3	1079785510	19.2	0.368	11.78
			End of Settling	8 hr	6208634134	239.4	241528645	5.7	874891000	15.7	0.446	14.21
B1	0	30	End of Feeding	2 hr	430780220	226.3	0	0.0	1660856	0.9	1.807	56.60
			End of Anaerobic	4 hr	420167237	221.4	0	0.0	2433724	0.9	1.628	51.03
			End of Aerobic	6 hr	424214043	223.3	15462091	4.4	50983819	20.9	0.448	14.27
			End of Settling	8 hr	440646369	230.8	17074983	4.9	52814085	21.3	0.375	12.00
B2	0	30	End of Feeding	2 hr	412011695	217.7	1158193	0.1	4824306	1.0	1.085	34.11
			End of Anaerobic	4 hr	413015053	218.2	2150122	0.1	3879584	0.9	1.708	53.52
			End of Aerobic	6 hr	442187880	231.5	16477617	4.7	56288014	22.0	0.688	21.75
			Extended Aeration	(4hr)	489608591	244.1	2709918	0.8	90396623	29.0	0.588	18.63
			End of Settling	8 hr	446746147	233.6	2538866	0.7	84010344	27.7	0.603	19.10
C1	120	30	End of Feeding	2 hr	429190296	225.6	0	0.0	1619044	0.9	1.595	50.00
			End of Anaerobic	4 hr	423750052	223.1	0	0.0	3811496	0.9	1.642	51.46
			End of Aerobic	6 hr	439228579	230.2	8380591	2.4	40313185	18.8	0.966	30.40
			End of Settling	8 hr	425798596	224.0	9741585	2.8	39107556	18.5	0.934	29.41
C2	120	30	End of Feeding	2 hr	407279466	215.5	729742	0.1	1841106	0.9	1.658	51.96
			End of Anaerobic	4 hr	414717322	218.9	0	0.0	17034729	1.2	1.747	54.73
			End of Aerobic	6.hr	421088553	221.9	8343067	2.4	29085719	16.5	0.881	27.76
			Extended Aeration	(4hr)	429931641	225.9	4392062	1.3	75586351	25.9	0.369	11.8
			End of Settling	8 hr	441428568	231.2	2962652	0.8	86642505	28.2	0.616	19.50
			stand 2		2472225244	96.80	427056958	10.15	498963689	9.33		
			Stand 3		5095839709	197.0	871460063	20.7	1087463930	19.3		
			stand 4		7600127427	292.5	1.644E+09	39.1	2320505088	40.2		
			Standards used									
			STD 1		3257406	0	0	0	1034310	0	0.156	5
			STD 2		2528446248	100	425265034	10	497596898	10	0.624	20
			STD 3		5043256928	200	861191951	20	1090488678	20	1.113	35
			STD 4		7887900239	300	1.672E+09	40	2338151857	40	1.598	50

File: AFFF Inhib (10-12-97).xls
Sheet: Standards & Data

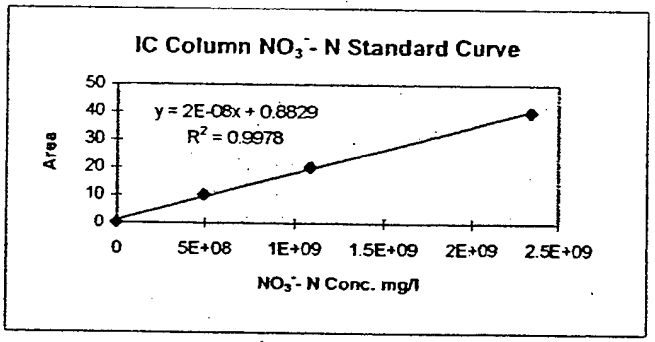
US00001097



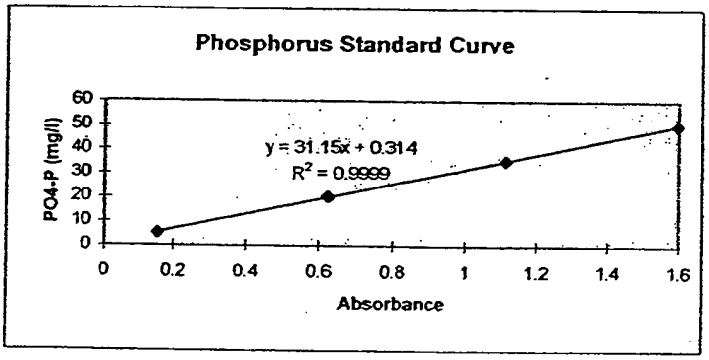
m = 4.00E-08
i = 2.41E+00



m = 2.00E-08
i = -1.85E-01



m = 2.00E-08
i = 8.83E-01



File: AFFF Inhib (10-12-97).xls
Sheet: Standards & Data

US00001098

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.999086704
Observations	4

	Coefficients	*Standard Error*
Intercept	2.412275642	3.957771334
X Variable 1	3.81786E-08	8.16224E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.999722165
Observations	4

	Coefficients	*Standard Error*
Intercept	0	0.271753644
X Variable 1	2.37647E-08	2.81876E-10

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.997784521
Observations	4

	Coefficients	*Standard Error*
Intercept	0.882869329	0.740861883
X Variable 1	1.69249E-08	5.6393E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.999910723
Observations	4

	Coefficients	*Standard Error*
Intercept	0.313953782	0.21342196
X Variable 1	31.14986676	0.208127792

File: AFFF Inhib (10-12-97).xls
Sheet: Standards & Data

US00001099

Reactor	AFFF (ppm)	Defoamer AF9020	Stage	Time	COD		
					ABS	(mg/L)	% COD Removal
			Feedstock		0.086	1102.0	
			RR Decant		0.003	38.4	
A1	0	0	End of Feeding	2 hr	0.007	89.7	77.2
			End of Anaerobic	4 hr	0.012	153.8	60.9
			End of Aerobic	6 hr	0.003	38.4	90.2
			Extended Aeration	(4hr)	0.005	64.1	83.7
			End of Settling	8 hr	0.003	38.4	90.2
A2	0	0	End of Feeding	2 hr	0.005	64.1	83.7
			End of Anaerobic	4 hr	0.007	89.7	77.2
			End of Aerobic	6 hr	0.012	153.8	60.9
			End of Settling	8 hr	0.009	115.3	70.7
B1	0	30	End of Feeding	2 hr	0.067	858.5	32.7
			End of AnaerobiC	4 hr	0.060	768.8	39.8
			End of Aerobic	6 hr	0.052	666.3	47.8
			End of Settling	8 hr	0.048	615.1	51.8
B2	0	30	End of Feeding	2 hr	0.073	935.4	26.7
			End of Anaerobic	4 hr	0.083	1063.6	16.7
			End of Aerobic	6 hr	0.056	717.6	43.8
			Extended Aeration	(4hr)	0.06	768.8	39.8
			End of Settling	8 hr	0.054	692.0	45.8
C1	120	30	End of Feeding	2 hr	0.171	2191.2	9.0
			End of Anaerobic	4 hr	0.160	2050.2	14.9
			End of Aerobic	6 hr	0.157	2011.8	16.5
			End of Settling	8 hr	0.194	2485.9	-3.2
C2	120	30	End of Feeding	2 hr	0.186	2383.4	1.0
			End of Anaerobic	4 hr	0.154	1973.4	18.1
			End of Aerobic	6 hr	0.161	2063.1	14.3
			End of Anaerobic	4 hr	0.191	2447.5	-1.6
			End of Settling	8 hr	0.202	2588.4	-7.5
			STD 1		0.000	0	
			STD 2		0.079	1000	
			STD 3		0.167	2000	
			STD 4		0.242	3000	
			STD 5		0.340	4500	
			FS (Filtered)		0.095	1217.3	
			FS (Filtered)		0.076	973.9	
			FS Average		**0.086**	**1095.6**	
			RRSU(Filtered)		0.001	12.8	
			RRSU(Filtered)		0.005	64.1	
			RRSU Average		**0.003**	**38.4**	

* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.

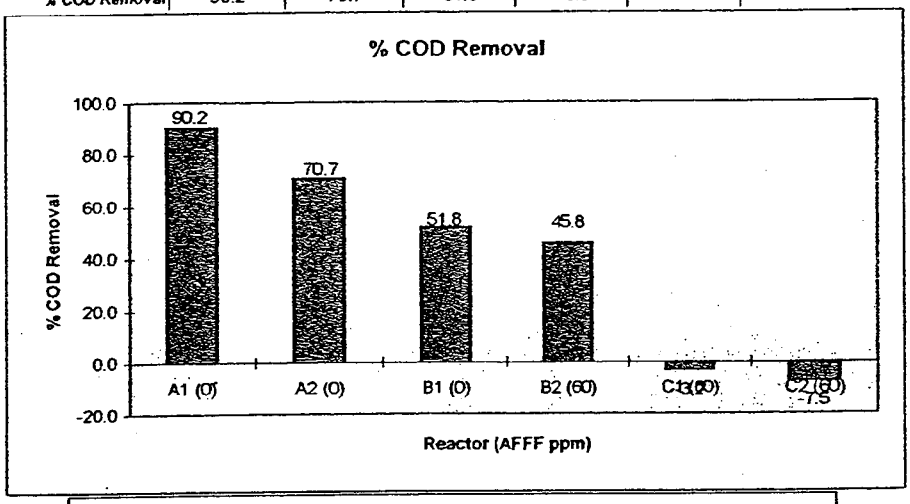
File: AFFF Inhib (10-12-97).xls
Sheet: COD

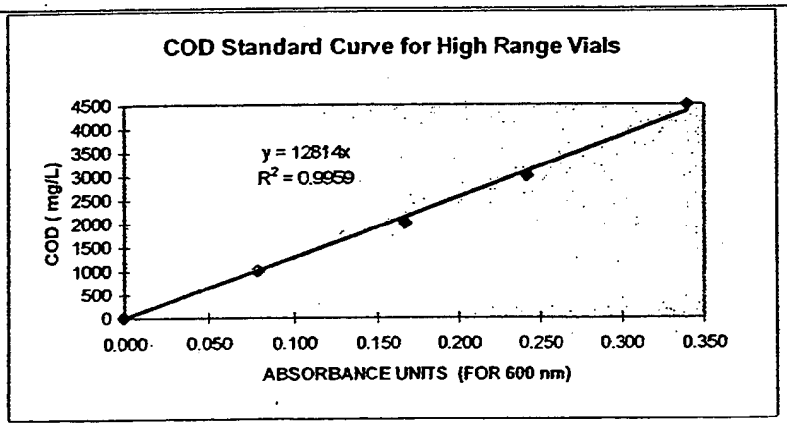
US00001100

Initial COD at Time 0 hr.

Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	38.4	153.768
(A1,A2)	Feedstock	2	1102.0	2204.008
	AFFF	0	0	0
	Total	6		393.0
Inhibition	RR Decant	4	38.4	153.768
(B1,B2)	Feedstock	2	1102.0	2204.008
	Defoamer		5300	5300
	Total	6		1276.3
	RR Decant	4	38.4	153.768
(C1,C2)	Feedstock	2	1102.0	2204.008
	AFFF	2	3396	6792
	Defoamer	1	5300	5300
	Total	6		2408.3

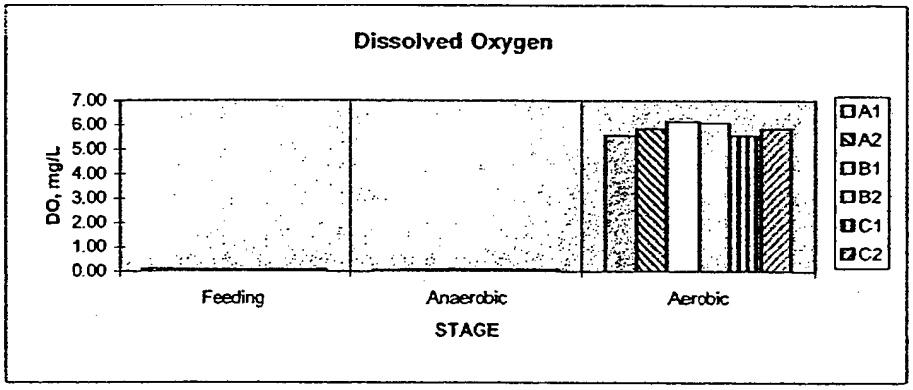
Reactor (AFFF ppm)	A1 (0)	A2 (0)	B1 (0)	B2 (60)	C1 (60)	C2 (60)
% COD Removal	90.2	70.7	51.8	45.8	-3.2	-7.5

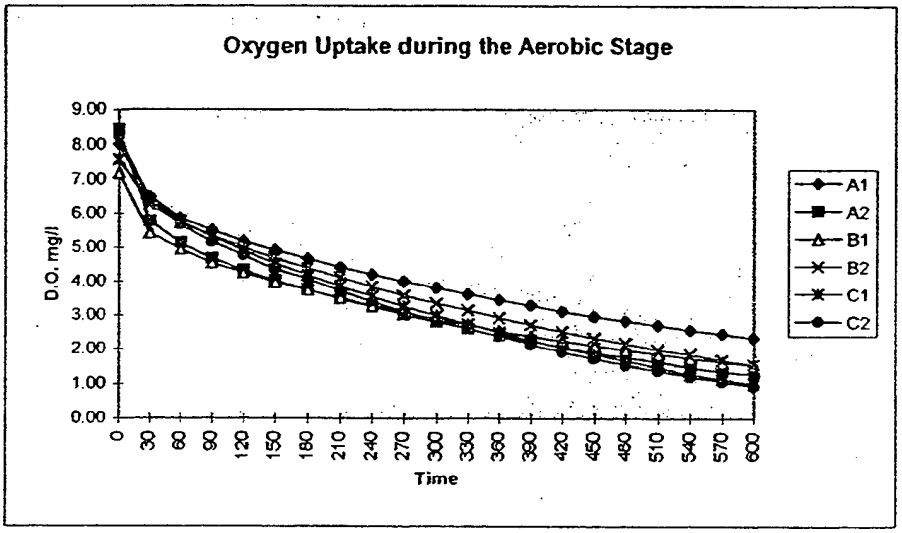




File: AFFF Inhib (10-12-97).xls
Sheet: COD

US00001101





File: AFFF Inhib (10-12-97).xls
Sheet: Oxygen Uptake

US00001102

	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	B1	B2	C1	C2
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	5.58	5.84	6.17	6.10	5.57	5.85

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	B1	B2	C1	C2
Aerobic	0	8.02	8.43	7.20	7.61	7.56	8.25
	30	6.49	5.77	5.42	6.26	6.37	6.38
	60	5.86	5.12	4.96	5.72	5.77	5.66
	90	5.50	4.68	4.54	5.35	5.31	5.16
	120	5.18	4.32	4.25	4.98	4.90	4.76
	150	4.90	4.02	3.97	4.67	4.52	4.35
	180	4.66	3.74	3.73	4.37	4.17	4.06
	210	4.40	3.47	3.51	4.11	3.84	3.71
	240	4.18	3.23	3.27	3.83	3.54	3.39
	270	3.98	2.99	3.07	3.58	3.25	3.11
	300	3.79	2.77	2.88	3.34	2.98	2.83
	330	3.60	2.58	2.71	3.13	2.73	2.59
	360	3.43	2.38	2.54	2.91	2.48	2.36
	390	3.27	2.22	2.39	2.72	2.26	2.13
	420	3.10	2.05	2.24	2.51	2.04	1.92
	450	2.95	1.89	2.10	2.32	1.84	1.72
	480	2.83	1.75	1.97	2.16	1.66	1.54
	510	2.69	1.63	1.86	1.98	1.48	1.38
	540	2.56	1.48	1.74	1.85	1.29	1.21
	570	2.44	1.37	1.63	1.68	1.15	1.06
	600	2.32	1.27	1.54	1.55	1.01	0.92

File: AFFF Inhib (10-12-97).xls
Sheet: Dissolved Oxygen

US00001103

Reactor	AFFF (ppm)	Defoamer AF9020	Stage	Time	Concentration, mg/L							
					TKN	NH3-N	Org. N	NO2-N	NO3-N	Total N	Cl-	PO4-P
			Feedstock		80.7	32.19	48.5	0.0	1.1	81.8	271.7	11.7
			RR Decant		11.9	0.11	11.8	0.4	17.7	30.0	221.3	1.9
A1	0	0	End of Feeding	2 hr	67.9	26.33	41.5	0.0	0.9	68.8	244.8	42.4
			End of Anaerobic	4 hr	55.1	31.05	24.0	0.0	1.0	56.0	231.3	41.2
			End of Aerobic	6 hr	15.6	2.34	13.2	6.4	19.9	42.0	238.0	16.8
			Extended Aeration	(4hr)	7.7	0.05	7.6	0.0	31.1	38.8	241.7	8.4
			End of Settling	8 hr	5.7	0.01	5.7	0.0	31.1	36.8	243.4	7.8
A2	0	0	End of Feeding	2 hr	64.1	23.34	40.7	0.0	0.9	65.0	239.2	44.5
			End of Anaerobic	4 hr	52.1	28.67	23.4	0.0	0.9	53.0	238.8	47.4
			End of Aerobic	6 hr	13.8	2.86	11.0	6.3	19.2	39.3	241.2	11.8
			End of Settling	8 hr	17.5	2.19	15.3	5.7	15.7	39.0	239.4	14.2
B1	0	30	End of Feeding	2 hr	57.1	20.69	36.4	0.0	0.9	58.0	226.3	56.6
			End of Anaerobic	4 hr	49.3	28.67	20.6	0.0	0.9	50.2	221.4	51.0
			End of Aerobic	6 hr	19.7	3.93	15.8	4.4	20.9	45.1	223.3	14.3
			End of Settling	8 hr	14.1	2.89	11.2	4.9	21.3	40.3	230.8	12.0
B2	0	30	End of Feeding	2 hr	101.8	19.88	81.9	0.1	1.0	102.8	217.7	34.1
			End of Anaerobic	4 hr	55.1	28.67	26.4	0.1	0.9	56.1	218.2	53.5
			End of Aerobic	6 hr	18.6	3.49	15.1	4.7	22.0	45.3	231.5	21.7
			Extended Aeration	(4hr)	8.0	0.05	8.0	0.8	29.0	37.7	244.1	18.6
			End of Settling	8 hr	6.4	0.09	6.3	0.7	27.7	34.8	233.6	19.1
C1	120	30	End of Feeding	2 hr	171.3	20.69	150.6	0.0	0.9	172.2	225.6	50.0
			End of Anaerobic	4 hr	81.4	31.00	50.4	0.0	0.9	82.3	223.1	51.5
			End of Aerobic	6 hr	29.8	11.54	18.3	2.4	18.8	51.0	230.2	30.4
			End of Settling	8 hr	16.7	6.64	10.1	2.8	18.5	38.0	224.0	29.4
C2	120	30	End of Feeding	2 hr	85.5	19.88	65.7	0.1	0.9	86.5	215.5	52.0
			End of Anaerobic	4 hr	96.2	29.84	66.3	0.0	1.2	97.3	218.9	54.7
			End of Aerobic	6 hr	15.6	13.00	15.6	2.4	16.5	47.4	221.9	27.757
			Extended Aeration	(4hr)	13.3	0.05	13.3	1.3	25.9	40.5	225.9	11.808
			End of Settling	8 hr	17.7	0.07	17.6	0.8	28.2	46.7	231.2	19.502

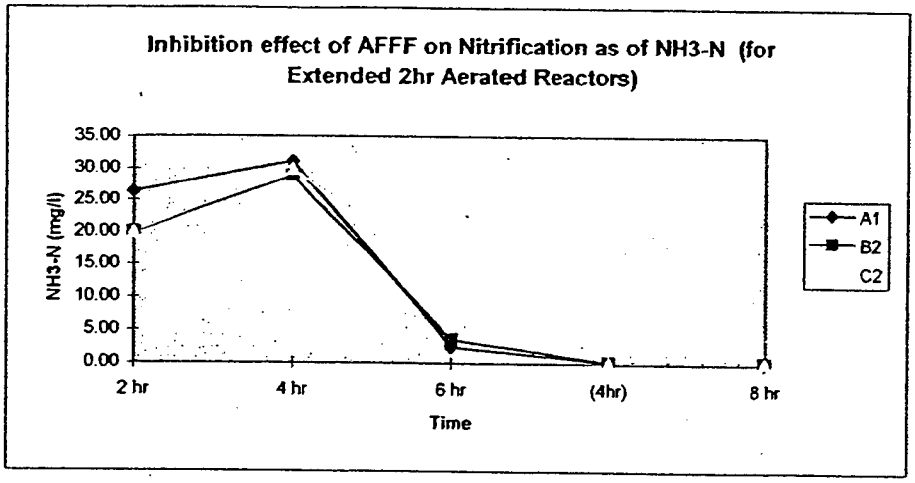
File: AFFF Inhib (10-12-97).xls
Sheet: Concentrations Table

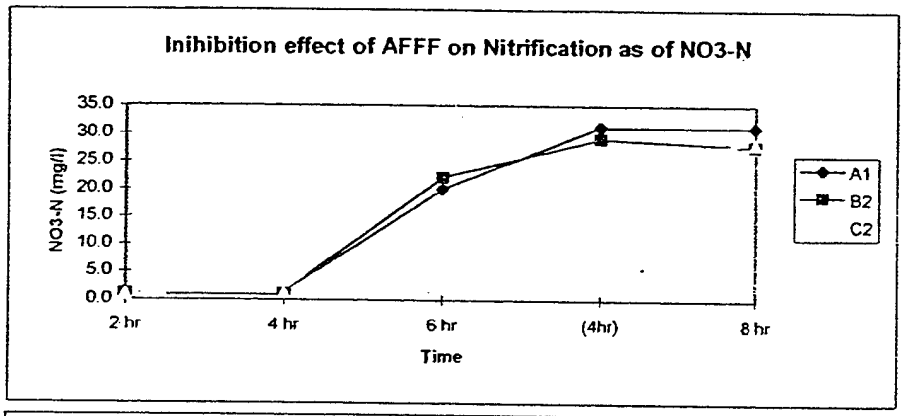
US00001104

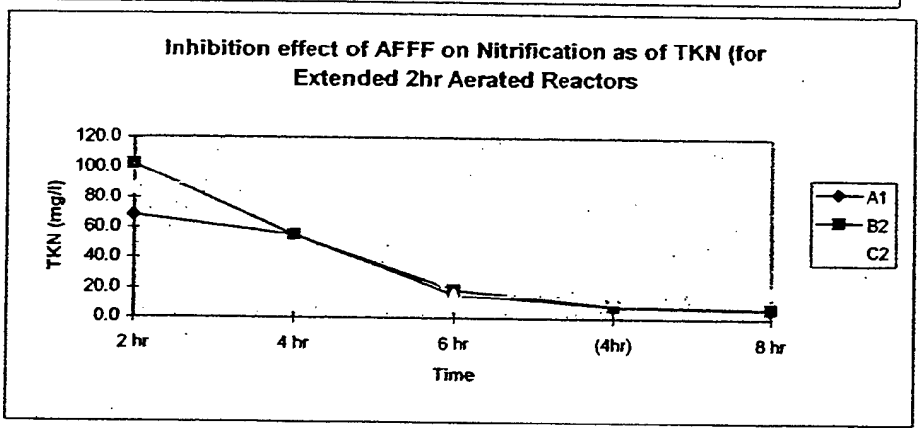
Reactor	AFFF (ppm)	Defoamer AF9020	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
			Feedstock			1102.0	381.7	430.0
			RR Decant			38.4	12.8	319.0
A1	0	0	End of Feeding	2 hr		89.7	25.4	501.0
			End of Anaerobic	4 hr		153.8	18.04	473.0
			End of Aerobic	6 hr		38.4	13.4	287.0
			Extended Aeration	(4hr)		64.1	14.42	297.0
			End of Settling	8 hr		38.4	13.9	271.0
A2	0	0	End of Feeding	2 hr		64.1	24.8	506.0
			End of Anaerobic	4 hr		89.7	17.57	484.0
			End of Aerobic	6 hr		153.8	13.3	273.0
			End of Settling	8 hr		115.3	11.5	291.0
B1	0	30	End of Feeding	2 hr		858.5	241.3	473.0
			End of Anaerobic	4 hr		768.8	208.2	487.0
			End of Aerobic	6 hr		666.3	118.8	294.0
			End of Settling	8 hr		615.1	197.8	300.0
B2	0	30	End of Feeding	2 hr		935.4	271.3	592.0
			End of Anaerobic	4 hr		1063.6	233.4	554.0
			End of Aerobic	6 hr		717.6	139.9	475.0
			Extended Aeration	(4hr)		768.8	131.9	457.0
			End of Settling	8 hr		692.0	202.0	433.0
C1	120	30	End of Feeding	2 hr		2191.2	568.1	584.0
			End of Anaerobic	4 hr		2050.2	525.2	560.0
			End of Aerobic	6 hr		2011.8	534.4	487.0
			End of Settling	8 hr		2485.9	634.3	503.0
C2	120	30	End of Feeding	2 hr		2383.4	635.8	578.0
			End of Anaerobic	4 hr		1973.4	514.4	564.0
			End of Aerobic	6 hr		2063.1	548.0	485
			Extended Aeration	(4hr)		2447.5	651.4	
			End of Settling	8 hr		2588.4	655.1	477
			FS1				380.7	
			FS2				384.0	
			FS3				380.4	
			FS Avarage				381.7	
			RRSU1				13.8	
			RRSU2				12.2	
			RRSU3				12.3	
			RRSU Avarage				12.80	

File: AFFF Inhib (10-12-97).xls
Sheet: Concentrations Table

US00001105

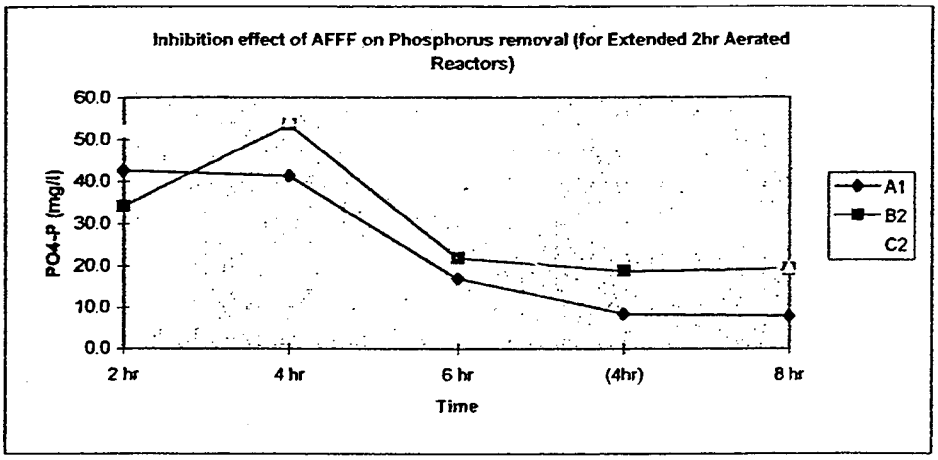




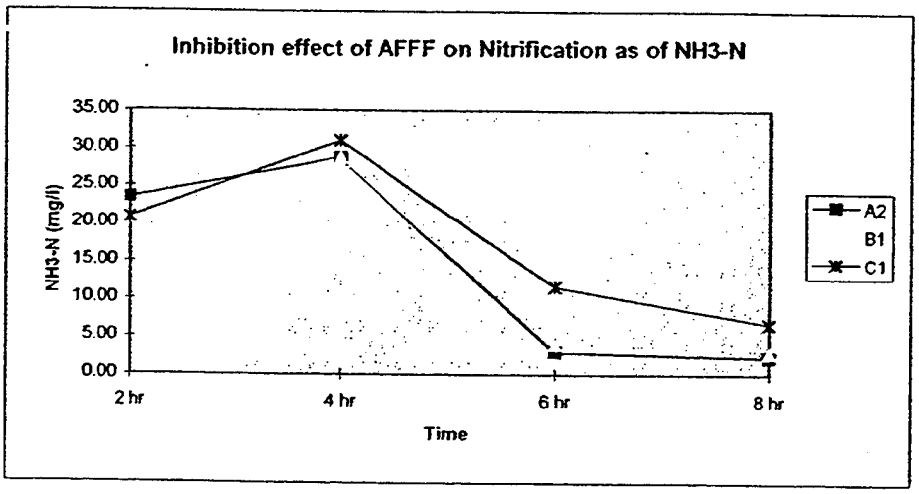


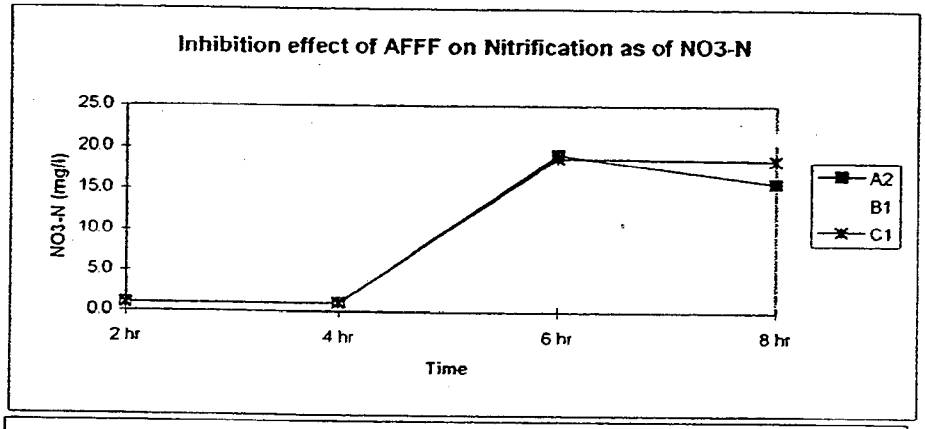
File: AFFF Inhib (10-12-97).xls
Sheet: NH3-N & TKN Charts

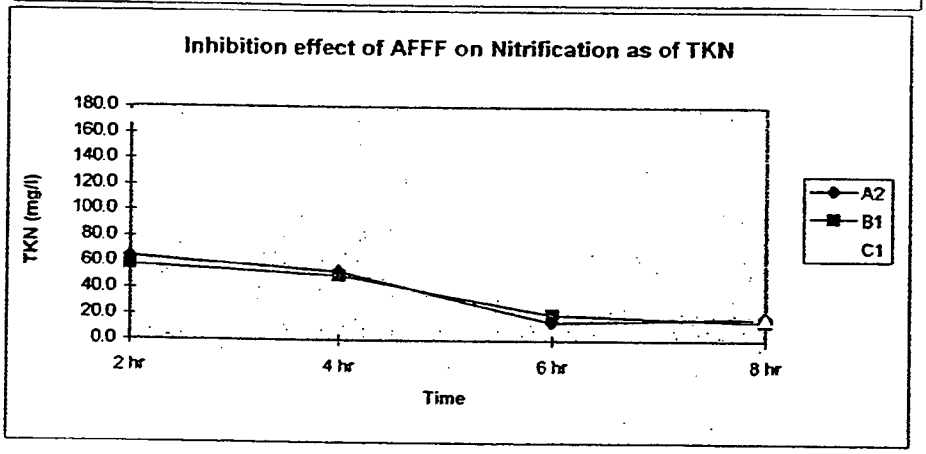
US00001106



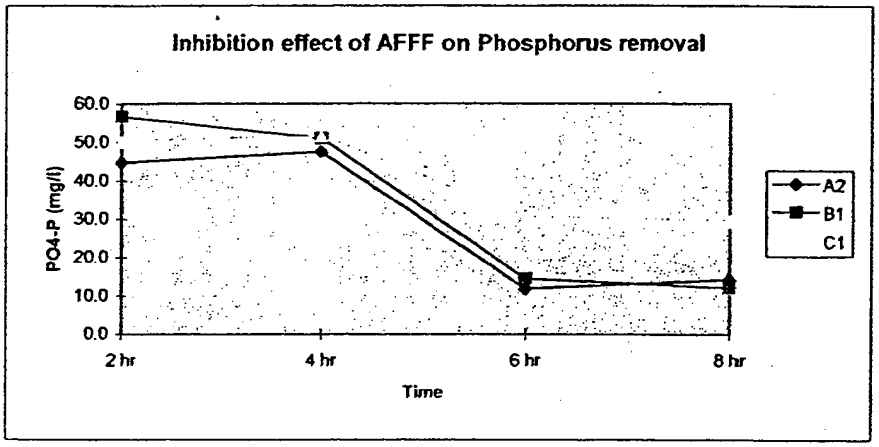
File: AFFF Inhib (10-12-97).xls
Sheet: NH3-N & TKN Charts



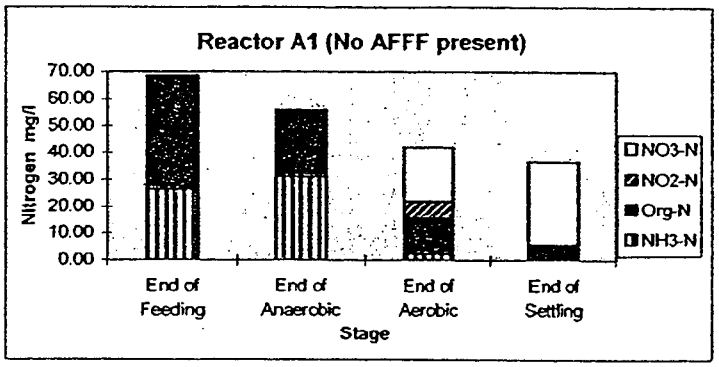


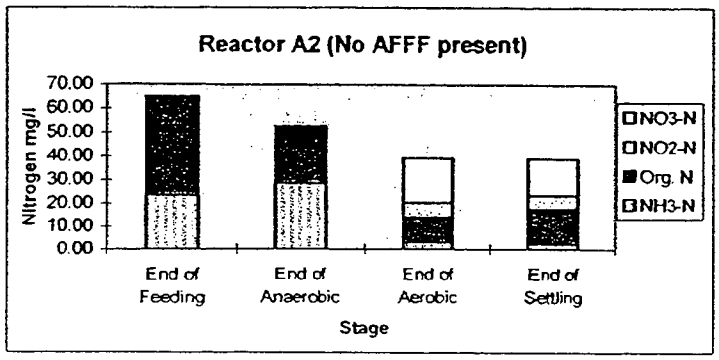


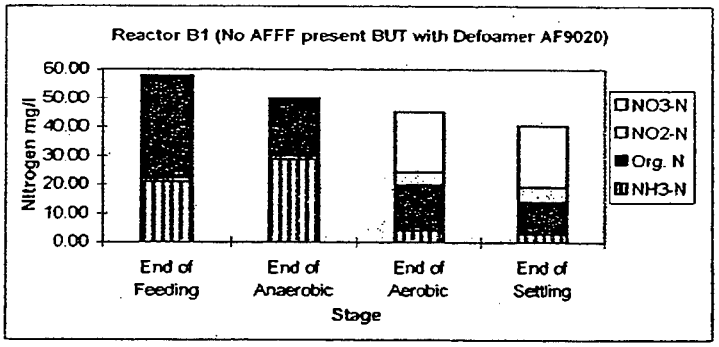
File: AFFF Inhib (10-12-97).xls
Sheet: NH3-N & TKN Charts



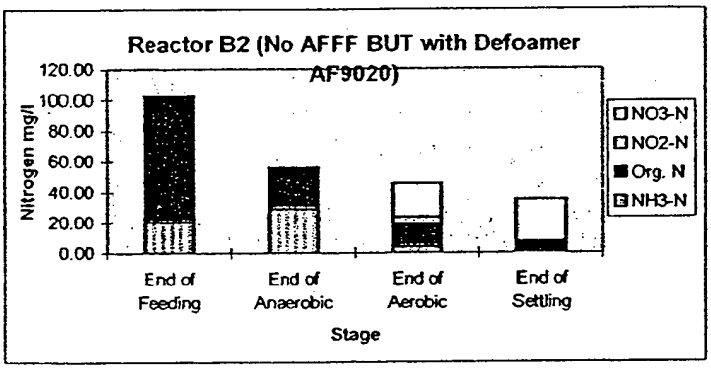
File: AFFF Inhib (10-12-97).xls
Sheet: NH3-N & TKN Charts

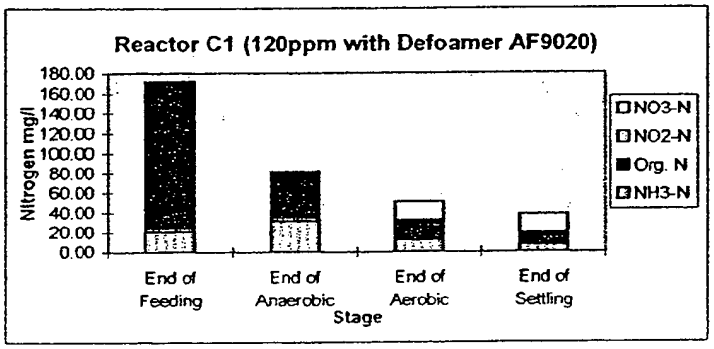


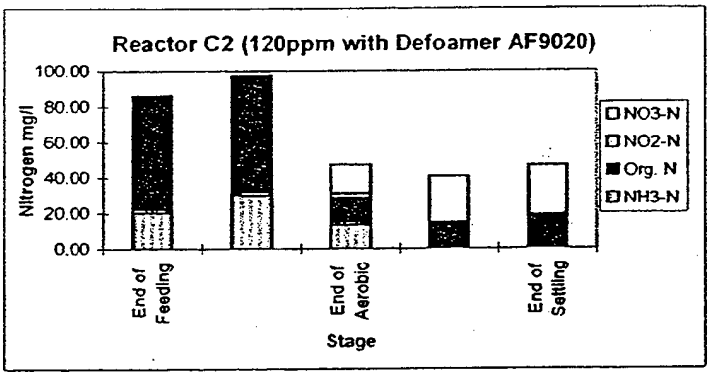




File: AFFF Inhib (10-12-97).xls
Sheet: Nitrogen Mass Balance

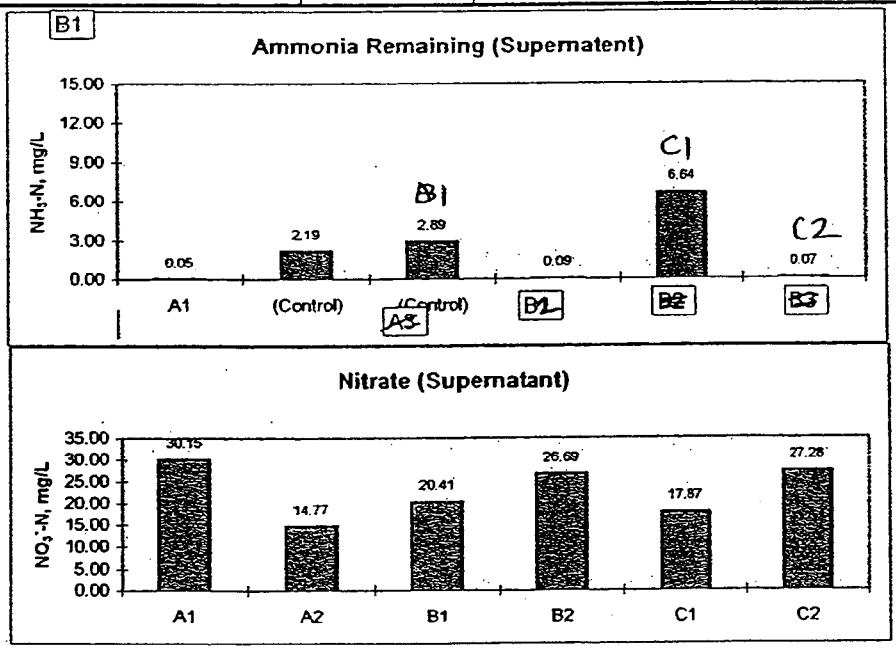






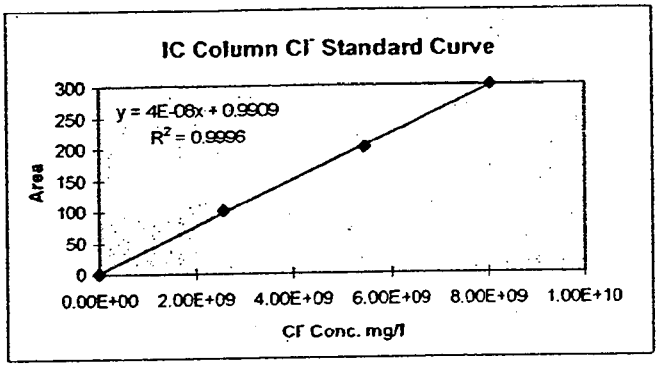
File: AFFF Inhib (10-12-97).xls
Sheet: Nitrogen Mass Balance

Reactor	AFFF ppm	Defoamer AF 9020 ml/liter	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3--N	NO2--N	Δ(NO_3^--N)
A1	0	0	End of Feeding	2 hr	26.33	0.9	0.0	
(Control)			End of Anaerobic	4 hr	31.05	1.0	0.0	
			End of Aerobic	6 hr	2.34	19.9	6.4	
			Extended Aeration	(4hr)	0.05	31.1	0.0	
			End of Settling	8 hr	0.01	31.1	0.0	30.15
A2	0	0	End of Feeding	2 hr	23.34	0.9	0.0	
(Control)			End of Anaerobic	4 hr	28.67	0.9	0.0	
			End of Aerobic	6 hr	2.86	19.2	6.3	
			End of Settling	8 hr	2.19	15.7	5.7	14.77
B1	0	30	End of Feeding	2 hr	20.69	0.9	0.0	
(Control)			End of Anaerobic	4 hr	28.67	0.9	0.0	
			End of Aerobic	6 hr	3.93	20.9	4.4	
			End of Settling	8 hr	2.89	21.3	4.9	20.41
B2	0	30	End of Feeding	2 hr	19.88	1.0	0.1	
			End of Anaerobic	4 hr	28.67	0.9	0.1	
			End of Aerobic	6 hr	3.49	22.0	4.7	
			Extended Aeration	(4hr)	0.05	29.0	0.8	
			End of Settling	8 hr	0.09	27.7	0.7	26.69
C1	120	30	End of Feeding	2 hr	20.69	0.9	0.0	
			End of Anaerobic	4 hr	31.00	0.9	0.0	
			End of Aerobic	6 hr	11.54	18.8	2.4	
			End of Settling	8 hr	6.64	18.5	2.8	17.87
C2	120	30	End of Feeding	2 hr	19.88	0.9	0.1	
			End of Anaerobic	4 hr	29.84	1.2	0.0	
			End of Aerobic	6 hr	13	16.5	2.4	
			Extended Aeration	(4hr)	0.05	25.9	1.3	
			End of Settling	8 hr	0.07	28.2	0.8	27.28

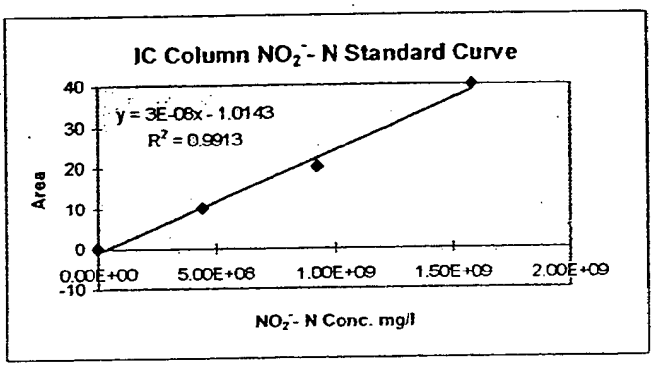


File: AFFF Inhib (10-12-97).xls
Sheet: NO3- & NO2 Produced

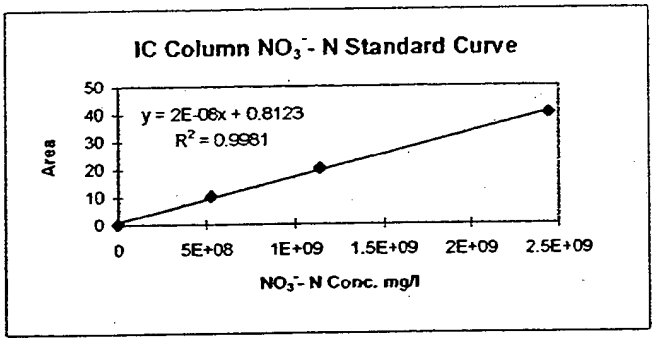
US00001112



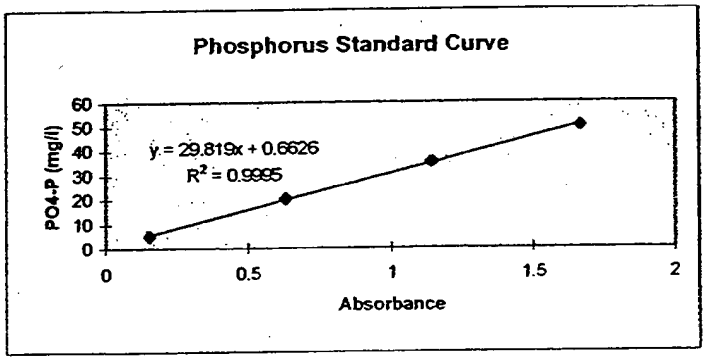
m = 4.00E-08
i = 9.91E-01



m = 3.00E-08
i = -1.01E+00



m = 2.00E-08
i = 8.12E-01



File: AFFF Inhib (17-11-97).xls
Sheet: Standards & Data

US00001113

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	COD		
						ABS	(mg/L)	% COD Removal
				Feedstock		0.380	973.5	
				RR Decant		0.021	53.0	
A1	0	0	0	End of Feeding **	2 hr	0.030	76.1	78.9
				End of Anaerobic**	4 hr	0.018	45.3	87.4
				End of Aerobic	6 hr	0.001	13.3	96.3
				Extended Aeration	(4hr)	0.001	13.3	96.3
				End of Settling	8 hr	0.002	26.5	92.6
A2	0	0	0	End of Feeding**	2 hr	0.029	73.5	79.6
				End of Anaerobic **	4 hr	0.021	53.0	85.3
				End of Aerobic	6 hr	0.003	39.8	88.9
				End of Settling	8 hr	0.002	26.5	92.6
A3	0	0	0	End of Feeding**	2 hr	0.026	65.8	81.7
				End of Anaerobic**	4 hr	0.023	58.1	83.8
				End of Aerobic	6 hr	0.002	26.5	92.6
				End of Settling	8 hr	0.001	13.3	96.3
B1	60	3000	300	End of Feeding**	2 hr	0.107	273.5	67.7
				End of Anaerobic**	4 hr	0.095	242.7	71.3
				End of Aerobic	6 hr	0.010	132.7	84.3
				Extended Aeration	(4hr)	0.008	106.1	87.5
				End of Settling	8 hr	0.007	92.9	89.0
B2	60	3000	300	End of Feeding**	2 hr	0.113	288.9	65.9
				End of Anaerobic**	4 hr	0.106	270.9	68.0
				End of Aerobic	6 hr	0.010	132.7	84.3
				End of Settling	8 hr	0.006	79.6	90.6
B3	60	3000	300	End of Feeding**	2 hr	0.123	314.5	62.8
				End of Anaerobic	4 hr	0.016	212.3	74.9
				End of Aerobic	6 hr	0.012	159.2	81.2
				End of Settling	8 hr	0.006	79.6	90.6
				STD 1		0.000	0	} Vials used range
				STD 2		0.089	1000	}from 100mg/l COD
				STD 3		0.159	2000	} TO 4500 mg/l COD
				STD 4		0.218	3000	}
				STD 5		0.337	4500	}
				STD 1**		0.000	0	} Vials used range
				STD 6 **		0.196	500	}from 20mg/l COD
				STD 7 **		0.390	1000	} TO 900 mg/l COD
				FS (Filtered)**		0.380	973.5	
				FS Average**		0.380	973.5	
				RRSU(Filtered)**		0.021	53.0	
				RRSU Average**		0.021	53.0	

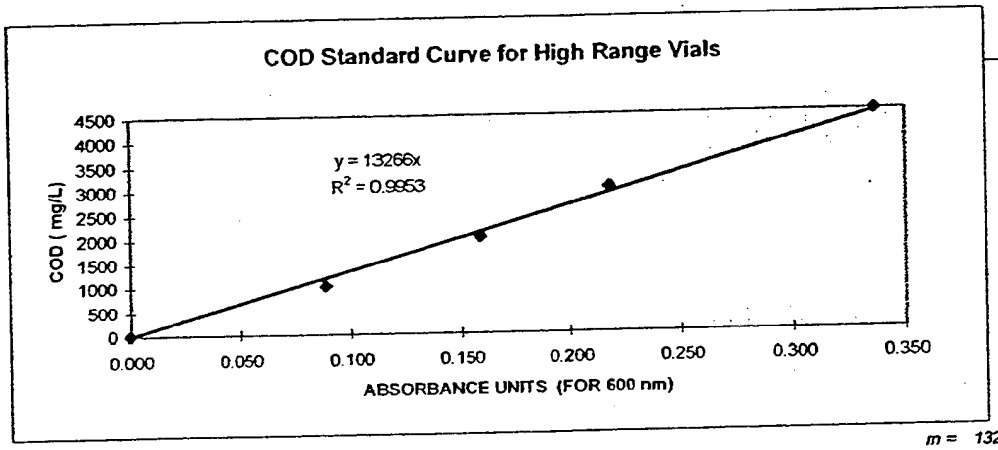
* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.
** COD measured with standard range vials (Range 20-900 mg/l)

File: AFFF Inhib (17-11-97).xls
Sheet: COD

US00001114

Initial COD at Time 0 hr.

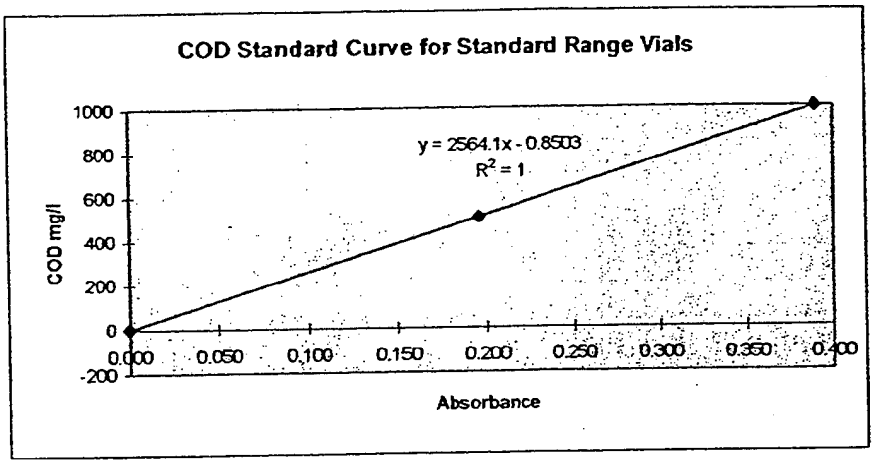
Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	53.0	211.9832
(A1,A2&A3)	Feedstock	2	973.5	1947.0154
	AFFF	0	0	0
	Total	6		359.8
Inhibition	RR Decant	4	53.0	211.9832
(B1,B2&B3)	Feedstock	2	973.5	1947.0154
	Fentons Treated AFFF	2	1459	2918
	Total	6		846.2



m = 13266
i = 0

File: AFFF Inhib (17-11-97).xls
Sheet: COD

US00001115



Fentons Pretreatment

For AFFF ppm	60 Reactor 1	60 Reactor 2	60 Reactor 3
Tap water	1250 ml	1250 ml	1250 ml
Actual AFFF ppm	150	150	150
	5 ml	5 ml	5 ml
H202, 3000*2.5 mg/l	7500 mg/l	7500 mg/l	7500mg/l
Fe3+ 300*2.5	750 mg/l	750 mg/l	750 mg/l
FeSO4 (3times)	3723.28 mg/l	3723.28 mg/l	3723.28 mg/l

Initial COD

	Absorbance	COD mg/l	Actual COD
AFFF - 60 ppm	0.131	1737.8	1737.8

COD after 24 hr reaction period between fentons reagent and AFFF

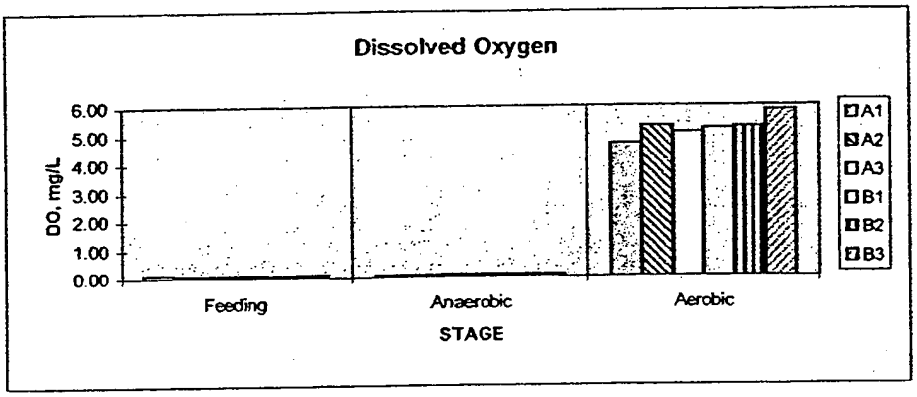
	Absorbance	COD mg/l	Actual COD
	0.11	1459.3	1459.3

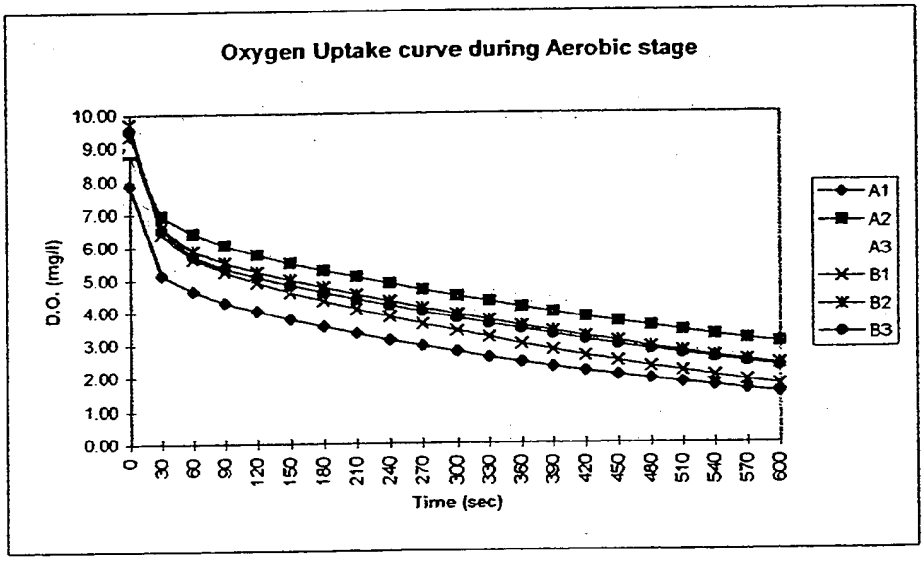
% COD Removal 16.03

File: AFFF Inhib (17-11-97).xls
Sheet: COD

US00001116

Date of Test: 3-25-97 Oxygen Uptake AFFF Conc. = 60 ppm





File: AFFF Inhib (17-11-97).xls
Sheet: Oxygen Uptake

	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	A3	B1	B2	B3
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	4.68	5.30	5.07	5.21	5.27	5.85

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	A3	B1	B2	B3
Aerobic	0	7.84	8.83	8.99	9.71	9.34	9.47
	30	5.12	6.94	6.45	6.39	6.58	6.49
	60	4.63	6.39	5.80	5.61	5.88	5.69
	90	4.28	6.03	5.43	5.22	5.52	5.33
	120	4.01	5.74	5.12	4.89	5.22	5.06
	150	3.77	5.48	4.87	4.59	4.97	4.81
	180	3.54	5.26	4.65	4.33	4.74	4.59
	210	3.33	5.05	4.44	4.07	4.52	4.37
	240	3.12	4.84	4.25	3.83	4.30	4.17
	270	2.94	4.65	4.06	3.61	4.09	3.98
	300	2.76	4.46	3.89	3.40	3.90	3.79
	330	2.58	4.29	3.72	3.19	3.72	3.61
	360	2.43	4.11	3.55	2.99	3.54	3.44
	390	2.29	3.95	3.39	2.81	3.37	3.28
	420	2.15	3.80	3.24	2.63	3.21	3.12
	450	2.02	3.66	3.11	2.46	3.06	2.96
	480	1.91	3.52	2.99	2.29	2.89	2.81
	510	1.79	3.38	2.86	2.15	2.75	2.67
	540	1.69	3.25	2.74	2.00	2.61	2.54
	570	1.58	3.12	2.63	1.86	2.48	2.41
	600	1.49	3.01	2.52	1.73	2.36	2.28

File: AFFF Inhib (17-11-97).xls
Sheet: Dissolved Oxygen

US00001118

Date of Test: 3-25-97 Concentrations Table AFFF Conc. = 60 ppm

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Concentration, mg/L TKN	NH3-N	Org. N	NO2--N	NO3--N	Total N	Cl-	PO4-P
				Feedstock		102.9	20.7	82.2	0.0	0.8	103.7	215.9	11.9
				RR Decant		2.2	0.4	1.8	-0.5	14.8	16.5	189.3	2.1
A1	0	0	0	End of Feeding	2 hr	28.8	20.7	8.1	0.0	0.8	29.6	201.4	30.3
				End of Anaerobic	4 hr	30.5	19.6	10.9	0.0	0.8	31.4	198.8	32.2
				End of Aerobic	6 hr	6.4	6.1	0.2	3.0	18.4	27.8	194.7	5.2
				Extended Aeration	(4hr)	1.5	0.1	1.4	-0.8	28.9	29.6	193.8	6.9
				End of Settling	8 hr	0.5	0.1	0.4	7.2	33.8	41.5	202.0	6.1
A2	0	0	0	End of Feeding	2 hr	29.5	20.7	8.9	0.0	0.8	30.4	201.4	22.8
				End of Anaerobic	4 hr	27.8	18.8	9.0	0.0	0.8	28.7	197.4	22.5
				End of Aerobic	6 hr	9.6	6.6	2.9	3.1	16.0	28.6	190.8	10.5
				End of Settling	8 hr	7.1	5.3	1.8	0.9	17.1	25.2	203.7	11.7
A3	0	0	0	End of Feeding	2 hr	27.8	19.9	8.0	0.0	0.8	28.7	197.9	15.1
				End of Anaerobic	4 hr	27.8	19.6	8.2	0.0	0.8	28.7	203.0	16.2
				End of Aerobic	6 hr	10.2	6.6	3.6	3.1	15.6	28.9	188.0	8.4
				End of Settling	8 hr	7.1	4.9	2.2	0.8	16.9	24.9	200.3	9.6
B1	60	3000	300	End of Feeding	2 hr	19.7	16.3	3.4	0.0	0.8	20.5	195.4	16.9
				End of Anaerobic	4 hr	31.8	15.4	16.4	0.0	0.8	32.6	200.0	19.4
				End of Aerobic	6 hr	13.7	7.5	6.3	3.3	10.9	28.0	186.4	12.1
				Extended Aeration	(4hr)	3.1	0.2	2.8	-0.2	23.2	26.0	189.7	11.2
				End of Settling	8 hr	0.6	0.1	0.5	0.0	37.4	38.0	198.9	12.2
B2	60	3000	300	End of Feeding	2 hr	27.4	16.3	11.1	0.0	0.8	28.2	196.3	12.7
				End of Anaerobic	4 hr	45.6	14.2	31.4	0.0	0.8	46.4	201.2	17.4
				End of Aerobic	6 hr	10.8	8.4	2.4	3.8	9.2	23.9	187.4	24.8
				End of Settling	8 hr	8.5	6.0	2.5	1.7	*	10.2	202.2	24.4
B3	60	3000	300	End of Feeding	2 hr	25.9	16.3	9.6	0.0	0.8	26.7	194.8	12.7
				End of Anaerobic	4 hr	23.0	15.4	7.6	-0.4	0.8	23.4	201.0	26.5
				End of Aerobic	6 hr	9.2	8.8	0.4	3.7	8.7	21.6	184.9	19.747
				End of Settling	8 hr	9.2	6.5	2.7	1.4	*	10.5	198.5	10.682

* Values not known

File: AFFF Inhib (17-11-97).xls
Sheet: Concentrations Table

US00001119

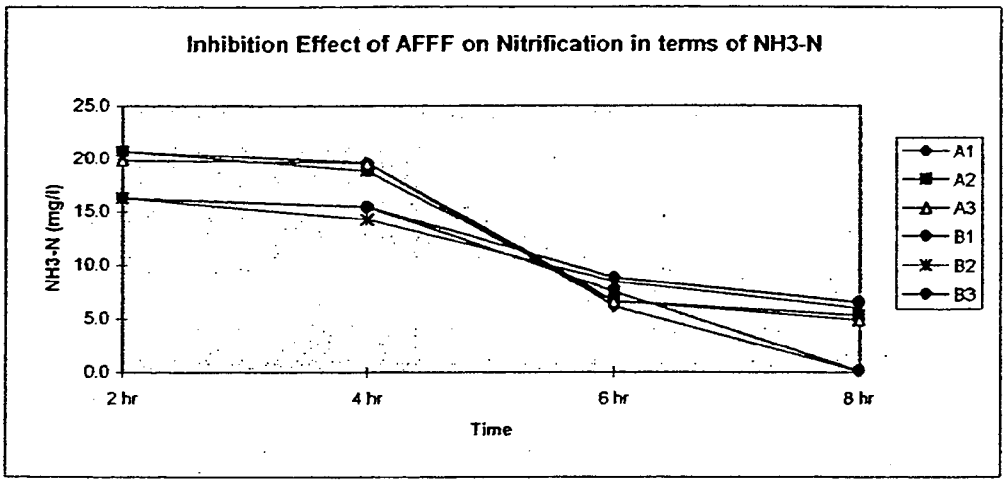
Date of Test: 3-25-97 Concentrations Table AFFF Conc. = 60 ppm

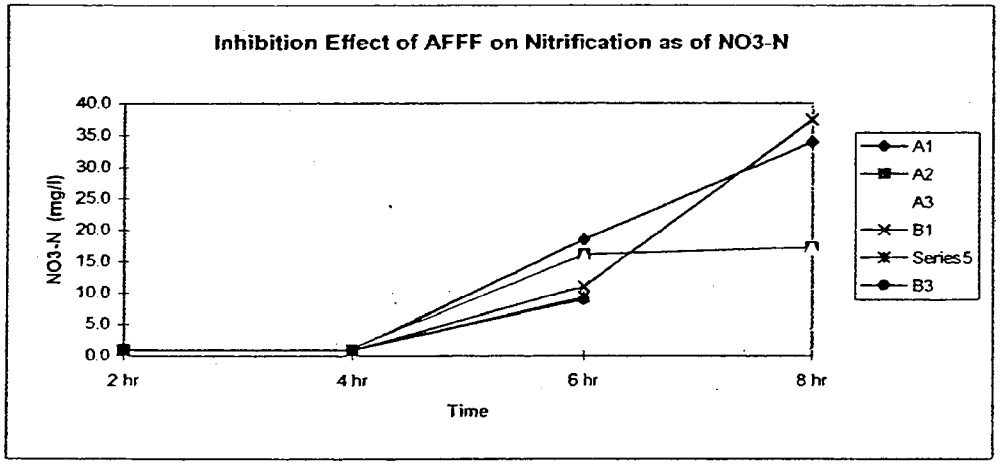
Reactor	AFFF (ppm)	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
		Feedstock			973.5	406.6	447.0
		RR Decant			53.0	12.1	309.0
A1	0	End of Feeding	2 hr		76.1	30.7	498.0
		End of Anaerobic	4 hr		45.3	19.5	523.0
		End of Aerobic	6 hr		13.3	14.8	331.0
		Extended Aeration	(4hr)		13.3	14.0	263.0
		End of Settling	8 hr		26.5	13.4	262.0
A2	0	End of Feeding	2 hr		73.5	28.6	514.0
		End of Anaerobic	4 hr		53.0	17.5	480.0
		End of Aerobic	6 hr		39.8	12.4	337.0
		End of Settling	8 hr		26.5	13.7	327.0
A3	0	End of Feeding	2 hr		65.8	28.4	480.0
		End of Anaerobic	4 hr		58.1	18.2	500.0
		End of Aerobic	6 hr		26.5	12.7	328.0
		End of Settling	8 hr		13.3	12.6	331.0
B1	60	End of Feeding	2 hr		273.5	85.2	563.0
		End of Anaerobic	4 hr		242.7	76.1	534.0
		End of Aerobic	6 hr		132.7	58.9	411.0
		Extended Aeration	(4hr)		106.1	58.0	274.0
		End of Settling	8 hr		92.9	60.0	328.0
B2	60	End of Feeding	2 hr		288.9	83.1	590.0
		End of Anaerobic	4 hr		270.9	76.1	546.0
		End of Aerobic	6 hr		132.7	59.4	414.0
		End of Settling	8 hr		79.6	59.8	428.0
B3	60	End of Feeding	2 hr		314.5	85.8	553.0
		End of Anaerobic	4 hr		212.3	77.7	523.0
		End of Aerobic	6 hr		73	61.84	412
		End of Settling	8 hr		<5	62.23	437
		FS1				404.6	
		FS2				407.5	
		FS3				407.7	
		FS Avarage				406.6	
		RRSU1				12.9	
		RRSU2				11.3	
		RRSU3				12.0	
		RRSU Avarage				12.08	

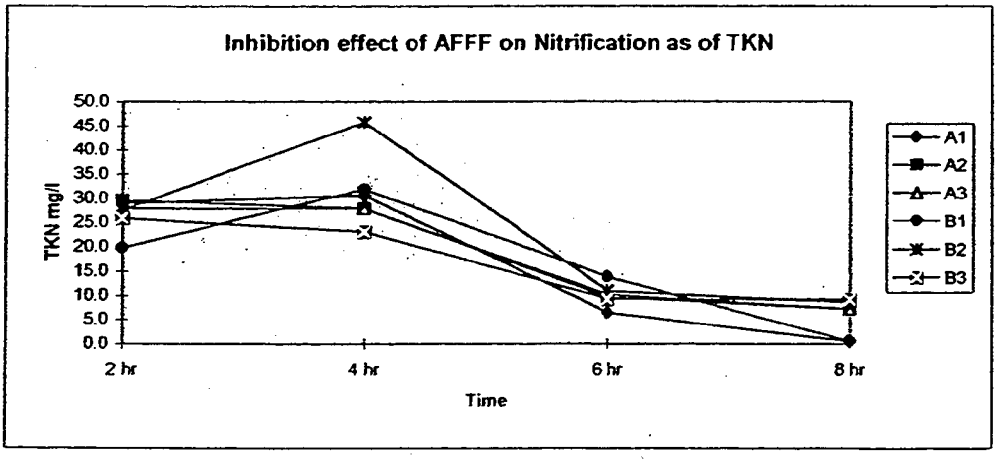
File: AFFF Inhib (17-11-97).xls
Sheet: Concentrations Table

US00001120

Date of Test: 3-25-97 NH3-N & TKN Charts AFFF Conc. = 60 ppm

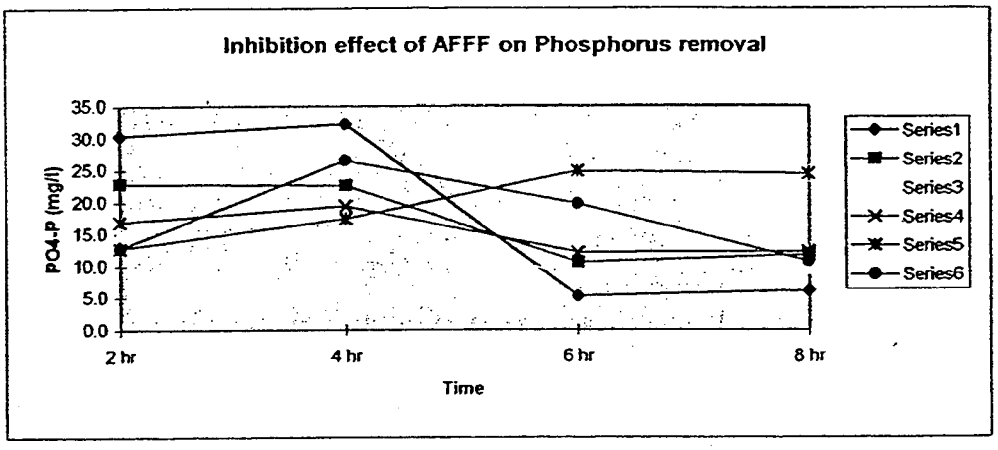






File: AFFF Inhib (17-11-97).xls
Sheet: NH3-N & TKN Charts

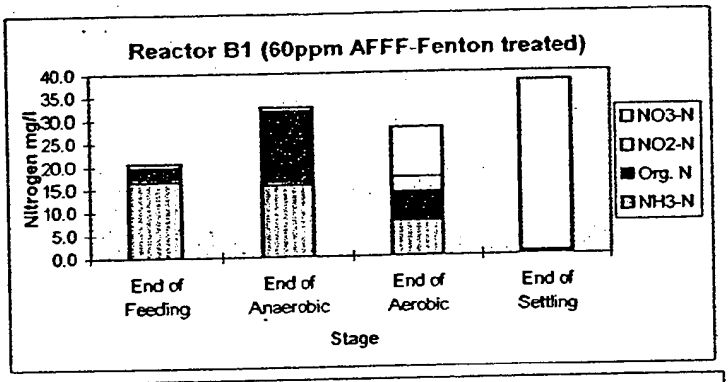
Date of Test: 3-25-97 NH3-N & TKN Charts AFFF Conc. = 60 ppm

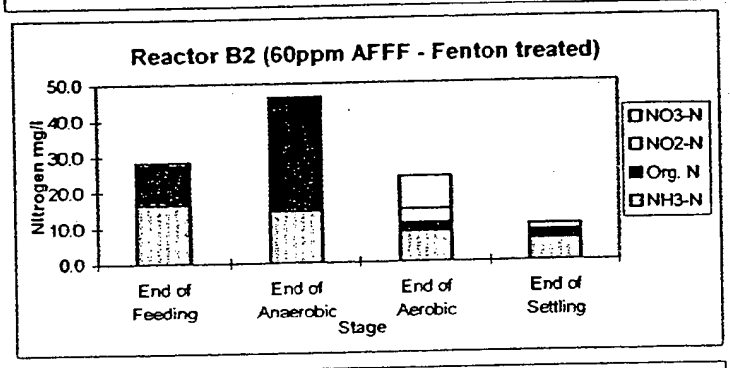


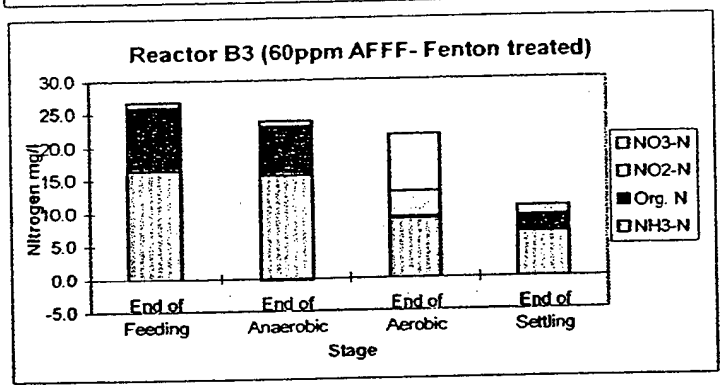
File: AFFF Inhib (17-11-97).xls
Sheet: NH3-N & TKN Charts

US00001122

Date of Test: 3-25-97 Inhibition Reactors / Nitrogen Mass Balance AFFF Conc. = 60 ppm



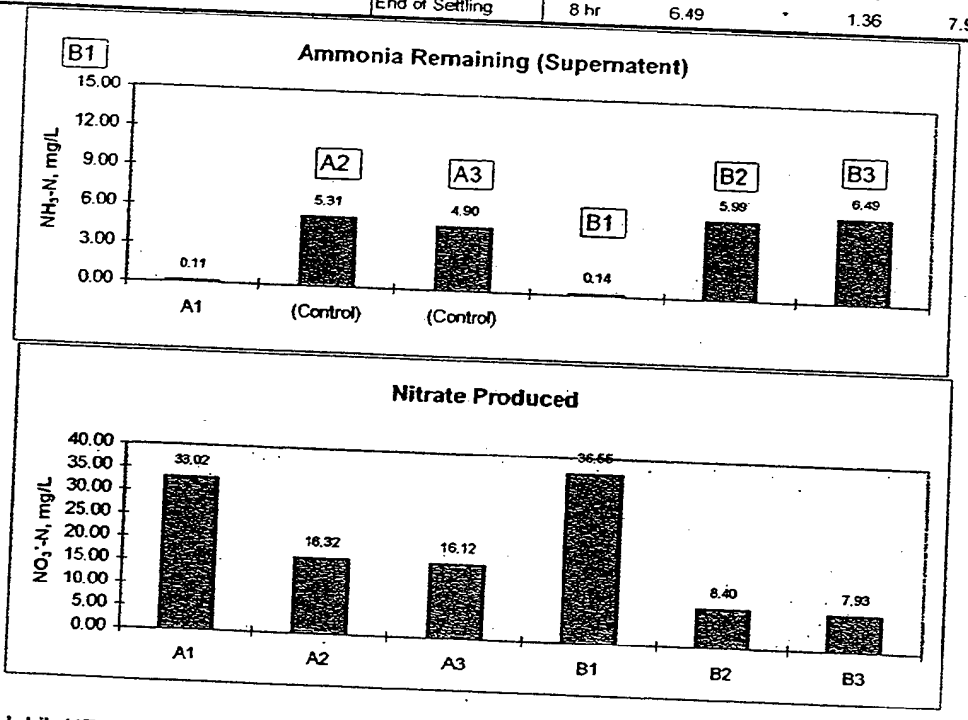




File: AFFF Inhib (17-11-97).xls
Sheet: Nitrogen Mass Balance

Date of Test: 3-25-97 Inhibition Reactors / NO3- & NO2 Produced AFFF Conc. = 60 ppm

Reactor	AFFF ppm	H2O2 mg/l	Fe3+ mg/l	Stage	Time	NH3-N	NO3-N	NO2-N	Δ(NO_3^--N)
A1 (Control)	0	0	0	End of Feeding	2 hr	20.69	0.8	0.0	
				End of Anaerobic	4 hr	19.61	0.8	0.0	
				End of Aerobic	6 hr	6.11	18.4	3.0	
				Extended Aeration	(4hr)	0.11	28.9	-0.8	
				End of Settling	8 hr	0.11	33.8	7.2	33.02
A2 (Control)	0	0	0	End of Feeding	2 hr	20.69	0.8	0.0	
				End of Anaerobic	4 hr	18.84	0.8	0.0	
				End of Aerobic	6 hr	6.62	16.0	3.1	
				End of Settling	8 hr	5.31	17.1	0.9	16.32
A3 (Control)	0	0	0	End of Feeding	2 hr	19.88	0.8	0.0	
				End of Anaerobic	4 hr	19.61	0.8	0.0	
				End of Aerobic	6 hr	6.62	15.6	3.1	
				End of Settling	8 hr	4.90	16.9	0.8	16.12
B1	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	15.42	0.8	0.0	
				End of Aerobic	6 hr	7.46	10.9	3.3	
				Extended Aeration	(4hr)	0.23	23.2	-0.2	
				End of Settling	8 hr	0.14	37.4	0.0	36.55
B2	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	14.23	0.8	0.0	
				End of Aerobic	6 hr	8.42	9.2	3.8	
				End of Settling	8 hr	5.99	-	1.7	8.40
B3	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	15.42	0.8	-0.4	
				End of Aerobic	6 hr	8.76	8.74	3.73	
				End of Settling	8 hr	6.49	-	1.36	7.93



File: AFFF Inhib (17-11-97).xls
Sheet: NO3- & NO2 Produced

US00001124

BNR Inhibition Tests - 60 ppm AFFF Pretreated with Fenton's Reagent (Nov/17/97)

TSS Reactor	Initial wt	Final wt	Volume	MLSS	WT @ 550 C	MLVSS
A1	1.114	1.1559	15	2793	1.1187	2480
A2	1.1126	1.156	15	2893	1.1191	2460
A3	1.1199	1.162	15	2807	1.1255	2433
B1	1.1154	1.1586	15	2880	1.1154	2880
B2	1.1113	1.1527	15	2760	1.1172	2367
B3	1.0983	1.1394	15	2740	1.1025	2460

TDS Reactor	Initial wt	Final wt	Volume	TDS
A1	1.0134	1.0261	15	847
A2	1.0147	1.0293	15	973
A3	1.0153	1.0303	15	1000
B1	1.0436	1.0945	15	3393
B2	1.0465	1.0952	15	3247
B3	1.0307	1.0745	15	2920

TS Reactor	Initial wt	Final wt	Volume	TS	ΣTSS,TDS
A1	1.0312	1.13	25	3952	3640
A2	1.0166	1.0746	15	3867	3867
A3	1.0122	1.0704	15	3880	3807
B1	1.0083	1.1003	15	6133	6273
B2	1.0141	1.1064	15	6153	6007
B3	1.0109	1.1044	15	6233	5660

File: AFFF Soilds Data

US00001125

APPENDIX C

BNR Inhibition Batch Assays Pretreated with Fenton's Reagent

US00001126

BNR Inhibition Batch Assay Pretreated with Fenton's Reagent

(AFFF 60 ppm)

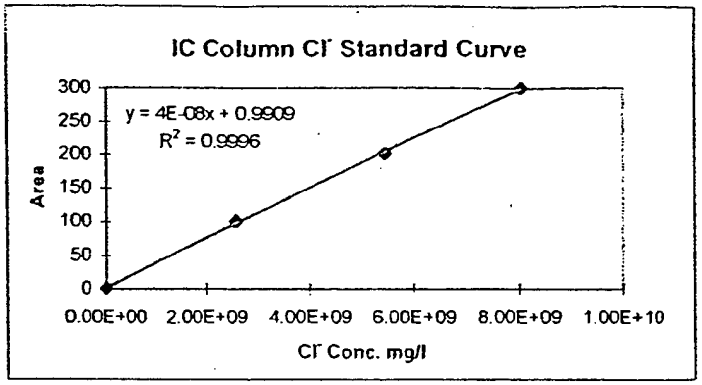
Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	NH3-N (mg/L)	TKN (mg/L)	Alkalinity
				Feedstock		20.7	102.9	447.0
				RR Decant		0.4	2.2	309.0
A1	0	0	0	End of Feeding	2 hr	20.7	28.8	498.0
				End of Anaerobic	4 hr	19.6	30.5	523.0
				End of Aerobic	6 hr	6.1	6.4	331.0
				Extended Aeration	(4hr)	0.1	1.5	263.0
				End of Settling	8 hr	0.1	0.5	262.0
A2	0	0	0	End of Feeding	2 hr	20.7	29.5	514.0
				End of Anaerobic	4 hr	18.8	27.8	480.0
				End of Aerobic	6 hr	6.6	9.6	337.0
				End of Settling	8 hr	5.3	7.1	327.0
A3	0	0	0	End of Feeding	2 hr	19.9	27.8	480.0
				End of Anaerobic	4 hr	19.6	27.8	500.0
				End of Aerobic	6 hr	6.6	10.2	328.0
				End of Settling	8 hr	4.9	7.1	331.0
B1	60	3000	300	End of Feeding	2 hr	16.3	19.7	563.0
				End of Anaerobic	4 hr	15.4	31.8	534.0
				End of Aerobic	6 hr	7.5	13.7	411.0
				Extended Aeration	(4hr)	0.2	3.1	274.0
				End of Settling	8 hr	0.1	0.6	328.0
B2	60	3000	300	End of Feeding	2 hr	16.3	27.4	590.0
				End of Anaerobic	4 hr	14.2	45.6	546.0
				End of Aerobic	6 hr	8.4	10.8	414.0
				End of Settling	8 hr	6.0	8.5	428.0
B3	60	3000	300	End of Feeding	2 hr	16.3	25.9	553.0
				End of Anaerobic	4 hr	15.4	23.0	523.0
				End of Aerobic	6 hr	8.8	9.2	412.0
				End of Settling	8 hr	6.5	9.2	437.0

File: AFFF Inhib (17-11-97).xls
Sheet: Standards & Data

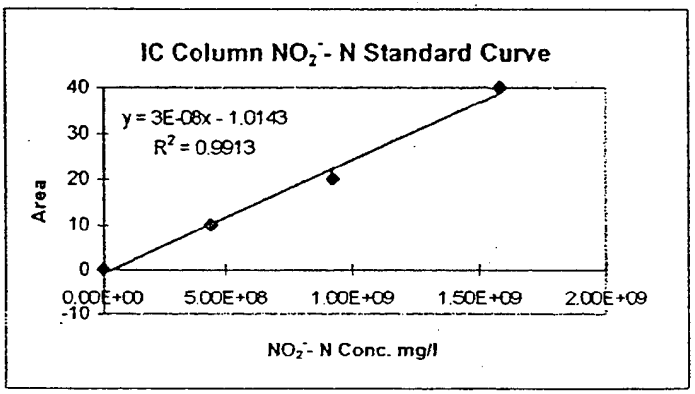
Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	Cl-		NO_2^--N		NO_3^--N		PO4-P	
						Area	(mg/L)	Area	(mg/L)	Area	(mg/L)	Absorb.	mg/l
				Feedstock		5807734868	215.9	0	0.0	0	0.8	0.378	11.93
				RR Decant		5088030059	189.3	18533649	-0.5	865888608	14.8	0.049	2.12
A1	0	0	0	End of Feeding	2 hr	5414368836	201.4	0	0.0	84908	0.8	0.995	30.33
				End of Anaerobic	4 hr	5345974928	198.8	0	0.0	212574	0.8	1.059	32.24
				End of Aerobic	6 hr	5235496411	194.7	160999406	3.0	1084880949	18.4	0.153	5.22
				Extended Aeration	(4hr)	5210918794	193.8	10376403	-0.8	1734473723	28.9	0.208	6.87
				End of Settling	8 hr	5432080598	202.0	327233852	7.2	2039121450	33.8	0.183	6.12
A2	0	0	0	End of Feeding	2 hr	5416022378	201.4	0	0.0	89976	0.8	0.744	22.85
				End of Anaerobic	4 hr	5307025713	197.4	0	0.0	52180	0.8	0.734	22.55
				End of Aerobic	6 hr	5130364031	190.8	162417541	3.1	935491198	16.0	0.33	10.50
				End of Settling	8 hr	5476773682	203.7	76258681	0.9	1007957588	17.1	0.371	11.73
A3	0	0	0	End of Feeding	2 hr	5321776591	197.9	0	0.0	217920	0.8	0.483	15.07
				End of Anaerobic	4 hr	5457976525	203.0	40710490	0.0	1763367	0.8	0.522	16.23
				End of Aerobic	6 hr	5053601257	188.0	165207674	3.1	913754761	15.6	0.258	8.36
				End of Settling	8 hr	5387232572	200.3	71938053	0.8	995657727	16.9	0.301	9.64
B1	60	3000	300	End of Feeding	2 hr	5254503710	195.4	0	0.0	0	0.8	0.544	16.88
				End of Anaerobic	4 hr	5377809775	200.0	0	0.0	100640	0.8	0.627	19.36
				End of Aerobic	6 hr	5009530875	186.4	172102121	3.3	623890414	10.9	0.383	12.08
				Extended Aeration	(4hr)	5098979374	189.7	31000471	-0.2	1380576510	23.2	0.353	11.19
				End of Settling	8 hr	5347972570	198.9	0	0.0	2257465140	37.4	0.387	12.20
B2	60	3000	300	End of Feeding	2 hr	5276618823	196.3	0	0.0	0	0.8	0.404	12.71
				End of Anaerobic	4 hr	5410720650	201.2	0	0.0	0	0.8	0.56	17.36
				End of Aerobic	6 hr	5037470503	187.4	192838355	3.8	519045648	9.2	0.811	24.85
				End of Settling	8 hr	5438217127	202.2	108285687	1.7	*	*	0.797	24.43
B3	60	3000	300	End of Feeding	2 hr	5237933600	194.8	0	0.0	0	0.8	0.404	12.71
				End of Anaerobic	4 hr	5406092060	201.0	22624100	-0.4	0	0.8	0.867	26.52
				End of Aerobic	6 hr	4969066373	184.9	188964308	3.7	489642483	8.7	0.64	19.75
				End of Settling	8 hr	5337021830	198.5	94581465	1.4	*	*	0.336	10.68
				stand 2		2587238260	96.73	444494781	10.14	529102517	9.38		
				Stand 3		5219091409	194.1	917655285	22.0	1148516754	19.4		
				Standards used									
				STD 1		0	0	0	0	0	0	0.158	5
				STD 2		2594976044	100	444761304	10	531020858	10	0.636	20
				STD 3		5464371291	200	925169445	20	1144250131	20	1.14	35
				STD 4		8047270041	300	1.582E+09	40	2447042210	40	1.666	50

* — Value not known

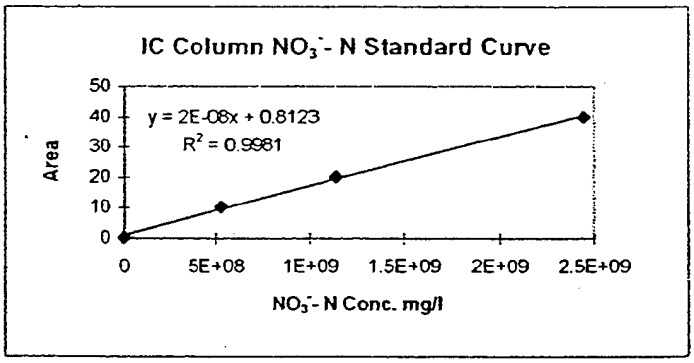
File: AFFF Inhib (17-11-97).xls
Sheet: Standards & Data



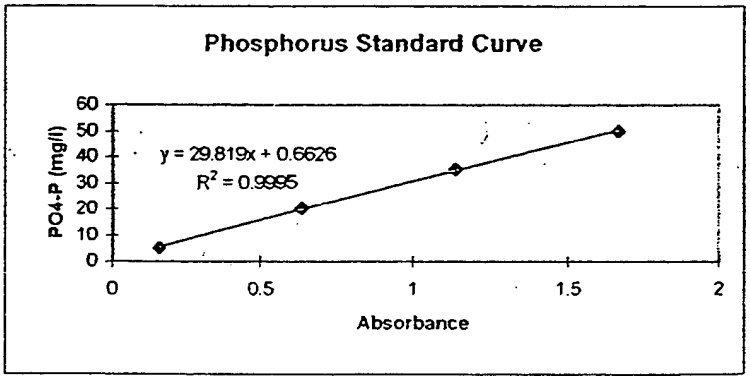
m = 4.00E-08
i = 9.91E-01



m = 3.00E-08
i = -1.01E+00



m = 2.00E-08
i = 8.12E-01



File: AFFF Inhib (17-11-97).xls
Sheet: Standards & Data

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.99956796
Observations	4

	Coefficients	*Standard Error*
Intercept	0.99092734	2.73839137
X Variable 1	3.7006E-08	5.4401E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.99129268
Observations	4

	Coefficients	*Standard Error*
Intercept	-1.01431796	1.56774331
X Variable 1	2.5086E-08	1.6625E-09

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.99813498
Observations	4

	Coefficients	*Standard Error*
Intercept	0.81231028	0.68129031
X Variable 1	1.6193E-08	4.9493E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.99954389
Observations	4

	Coefficients	*Standard Error*
Intercept	0.6626043	0.47798482
X Variable 1	29.8193286	0.45041746

File: AFFF Inhib (17-11-97).xls
Sheet: Standards & Data

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	COD		
						ABS	(mg/L)	% COD Removal
				Feedstock		0.380	973.5	
				RR Decant		0.021	53.0	
A1	0	0	0	End of Feeding **	2 hr	0.030	76.1	78.9
				End of Anaerobic**	4 hr	0.018	45.3	87.4
				End of Aerobic	6 hr	0.001	13.3	96.3
				Extended Aeration	(4hr)	0.001	13.3	96.3
				End of Settling	8 hr	0.002	26.5	92.6
A2	0	0	0	End of Feeding**	2 hr	0.029	73.5	79.6
				End of Anaerobic **	4 hr	0.021	53.0	85.3
				End of Aerobic	6 hr	0.003	39.8	88.9
				End of Settling	8 hr	0.002	26.5	92.6
A3	0	0	0	End of Feeding**	2 hr	0.026	65.8	81.7
				End of Anaerobic**	4 hr	0.023	58.1	83.8
				End of Aerobic	6 hr	0.002	26.5	92.6
				End of Settling	8 hr	0.001	13.3	96.3
B1	60	3000	300	End of Feeding**	2 hr	0.107	273.5	67.7
				End of Anaerobic**	4 hr	0.095	242.7	71.3
				End of Aerobic	6 hr	0.010	132.7	84.3
				Extended Aeration	(4hr)	0.008	106.1	87.5
				End of Settling	8 hr	0.007	92.9	89.0
B2	60	3000	300	End of Feeding**	2 hr	0.113	288.9	65.9
				End of Anaerobic**	4 hr	0.106	270.9	68.0
				End of Aerobic	6 hr	0.010	132.7	84.3
				End of Settling	8 hr	0.006	79.6	90.6
B3	60	3000	300	End of Feeding**	2 hr	0.123	314.5	62.8
				End of Anaerobic	4 hr	0.016	212.3	74.9
				End of Aerobic	6 hr	0.012	159.2	81.2
				End of Settling	8 hr	0.006	79.6	90.6
				STD 1		0.000	0	} Vials used range
				STD 2		0.089	1000	}from 100mg/l COD
				STD 3		0.159	2000	} TO 4500 mg/l COD
				STD 4		0.218	3000	}
				STD 5		0.337	4500	}
				STD 1**		0.000	0	} Vials used range
				STD 6 **		0.196	500	}from 20mg/l COD
				STD 7 **		0.390	1000	} TO 900 mg/l COD
				FS (Filtered)**		0.380	973.5	
				FS Average**		**0.380**	**973.5**	
				RRSU(Filtered)**		0.021	53.0	
				RRSU Average**		**0.021**	**53.0**	

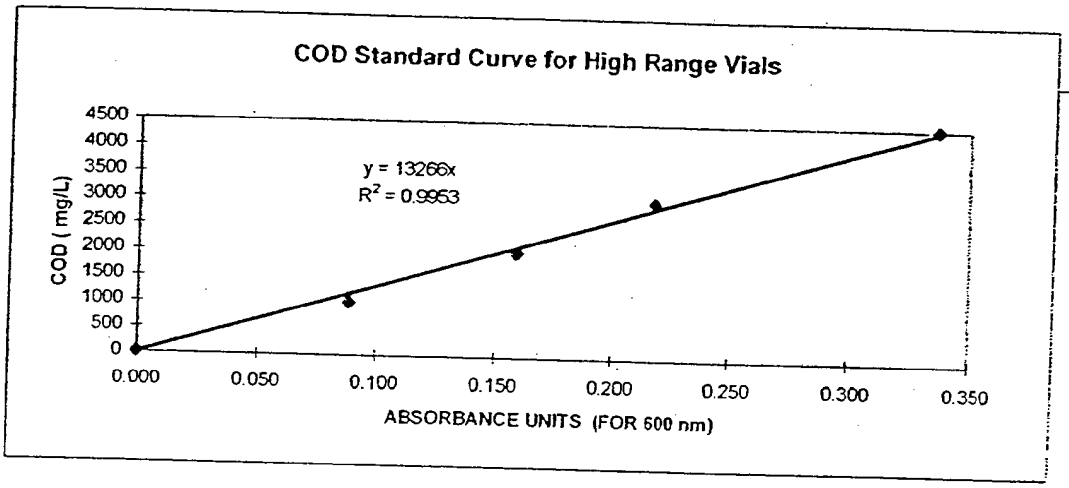
* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.
** COD measured with standard range vials (Range 20-900 mg/l)

File: AFFF Inhib (17-11-97).xls
Sheet: COD

US00001133

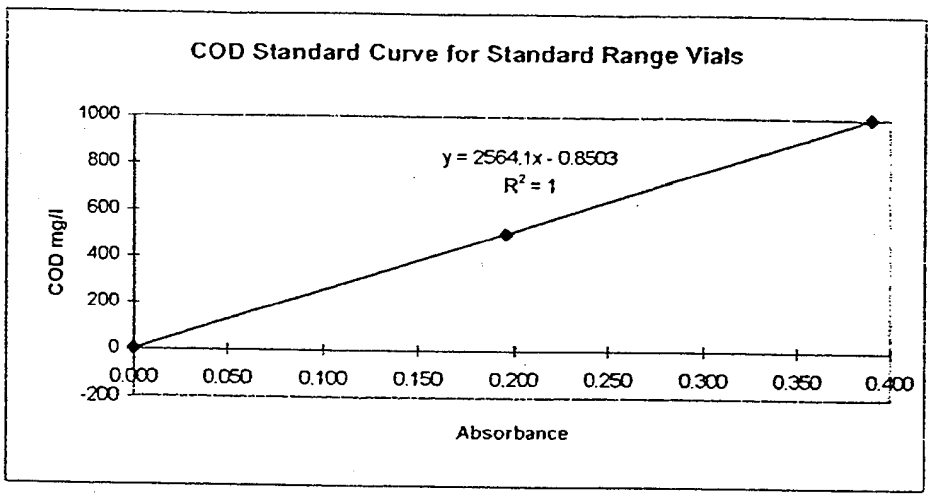
Initial COD at Time 0 hr.

Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	53.0	211.9832
(A1,A2&A3)	Feedstock	2	973.5	1947.0154
	AFFF	0	0	0
	Total	6		359.8
Inhibition	RR Decant	4	53.0	211.9832
(B1,B2&B3)	Feedstock	2	973.5	1947.0154
	Fentons Treated AFFF	2	1459	2918
	Total	6		846.2



m = 13266
i = 0

File: AFFF Inhib (17-11-97).xls
Sheet: COD



Fentons Pretreatment

For AFFF ppm	60 Reactor 1	60 Reactor 2	60 Reactor 3
Tap water	1250 ml	1250 ml	1250 ml
Actual AFFF ppm	150	150	150
	5 ml	5 ml	5 ml
H202, 3000*2.5 mg/l	7500 mg/l	7500 mg/l	7500mg/l
Fe3+ 300*2.5	750 mg/l	750 mg/l	750 mg/l
FeSO4 (3times)	3723.28 mg/l	3723.28 mg/l	3723.28 mg/l

Initial COD

	Absorbance	COD mg/l	Actual COD
AFFF - 60 ppm	0.131	1737.8	1737.8

COD after 24 hr reaction period between fentons reagent and AFFF

	Absorbance	COD mg/l	Actual COD
	0.11	1459.3	1459.3

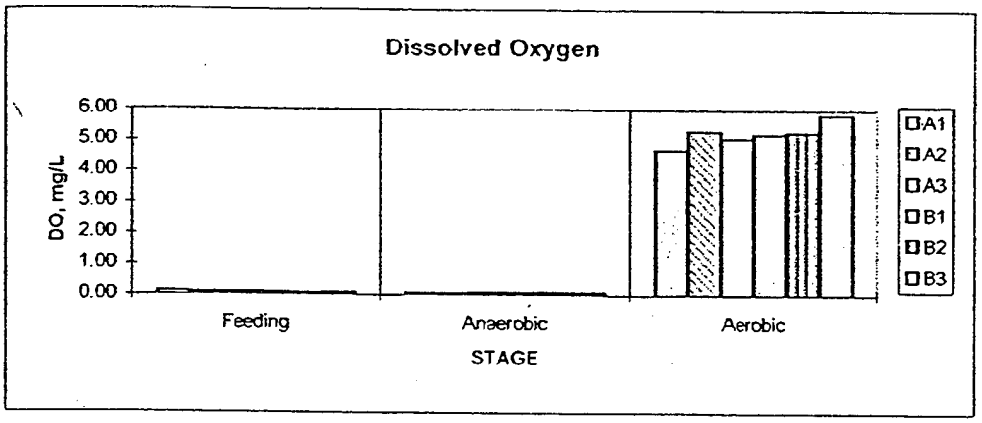
% COD Removal 16.03

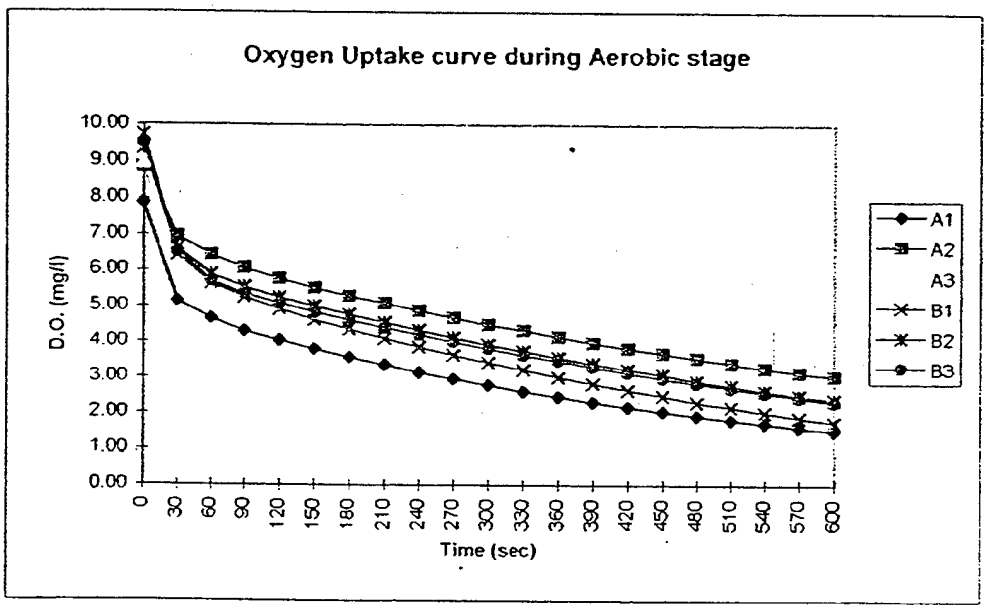
File: AFFF Inhib (17-11-97).xls
Sheet: COD

	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	A3	B1	B2	B3
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	4.68	5.30	5.07	5.21	5.27	5.85

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	A3	B1	B2	B3
Aerobic	0	7.84	8.83	8.99	9.71	9.34	9.47
	30	5.12	6.94	6.45	6.39	6.58	6.49
	60	4.63	6.39	5.80	5.61	5.88	5.69
	90	4.28	6.03	5.43	5.22	5.52	5.33
	120	4.01	5.74	5.12	4.89	5.22	5.06
	150	3.77	5.48	4.87	4.59	4.97	4.81
	180	3.54	5.26	4.65	4.33	4.74	4.59
	210	3.33	5.05	4.44	4.07	4.52	4.37
	240	3.12	4.84	4.25	3.83	4.30	4.17
	270	2.94	4.65	4.06	3.61	4.09	3.98
	300	2.76	4.46	3.89	3.40	3.90	3.79
	330	2.58	4.29	3.72	3.19	3.72	3.61
	360	2.43	4.11	3.55	2.99	3.54	3.44
	390	2.29	3.95	3.39	2.81	3.37	3.28
	420	2.15	3.80	3.24	2.63	3.21	3.12
	450	2.02	3.66	3.11	2.46	3.06	2.96
	480	1.91	3.52	2.99	2.29	2.89	2.81
	510	1.79	3.38	2.86	2.15	2.75	2.67
	540	1.69	3.25	2.74	2.00	2.61	2.54
	570	1.58	3.12	2.63	1.86	2.48	2.41
	600	1.49	3.01	2.52	1.73	2.36	2.28

File: AFFF Inhib (17-11-97).xls
Sheet: Dissolved Oxygen





File: AFFF Inhib (17-11-97).xls
Sheet: Oxygen Uptake

Date of Test: 3-25-97 Concentrations Table AFFF Conc. = 60 ppm

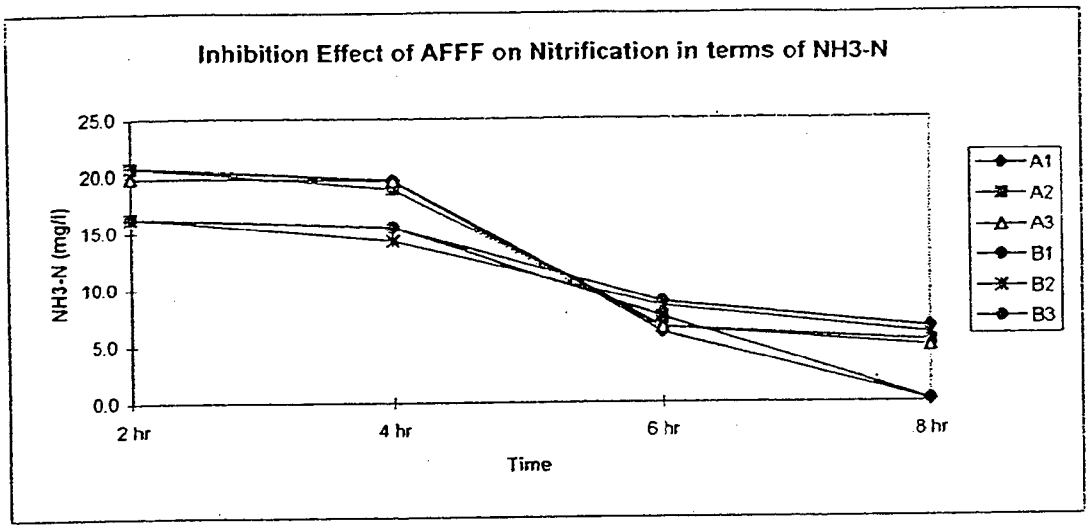
Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Concentration, mg/L TKN	NH3-N	Org. N	NO2--N	NO3--N	Total N	Cl-	PO4-P
				Feedstock		102.9	20.7	82.2	0.0	0.8	103.7	215.9	11.9
				RR Decant		2.2	0.4	1.8	-0.5	14.8	16.5	189.3	2.1
A1	0	0	0	End of Feeding	2 hr	28.8	20.7	8.1	0.0	0.8	29.6	201.4	30.3
				End of Anaerobic	4 hr	30.5	19.6	10.9	0.0	0.8	31.4	198.8	32.2
				End of Aerobic	6 hr	6.4	6.1	0.2	3.0	18.4	27.8	194.7	5.2
				Extended Aeration	(4hr)	1.5	0.1	1.4	-0.8	28.9	29.6	193.8	6.9
				End of Settling	8 hr	0.5	0.1	0.4	7.2	33.8	41.5	202.0	6.1
A2	0	0	0	End of Feeding	2 hr	29.5	20.7	8.9	0.0	0.8	30.4	201.4	22.8
				End of Anaerobic	4 hr	27.8	18.8	9.0	0.0	0.8	28.7	197.4	22.5
				End of Aerobic	6 hr	9.6	6.6	2.9	3.1	16.0	28.6	190.8	10.5
				End of Settling	8 hr	7.1	5.3	1.8	0.9	17.1	25.2	203.7	11.7
A3	0	0	0	End of Feeding	2 hr	27.8	19.9	8.0	0.0	0.8	28.7	197.9	15.1
				End of Anaerobic	4 hr	27.8	19.6	8.2	0.0	0.8	28.7	203.0	16.2
				End of Aerobic	6 hr	10.2	6.6	3.6	3.1	15.6	28.9	188.0	8.4
				End of Settling	8 hr	7.1	4.9	2.2	0.8	16.9	24.9	200.3	9.6
B1	60	3000	300	End of Feeding	2 hr	19.7	16.3	3.4	0.0	0.8	20.5	195.4	16.9
				End of Anaerobic	4 hr	31.8	15.4	16.4	0.0	0.8	32.6	200.0	19.4
				End of Aerobic	6 hr	13.7	7.5	6.3	3.3	10.9	28.0	186.4	12.1
				Extended Aeration	(4hr)	3.1	0.2	2.8	-0.2	23.2	26.0	189.7	11.2
				End of Settling	8 hr	0.6	0.1	0.5	0.0	37.4	38.0	198.9	12.2
B2	60	3000	300	End of Feeding	2 hr	27.4	16.3	11.1	0.0	0.8	28.2	196.3	12.7
				End of Anaerobic	4 hr	45.6	14.2	31.4	0.0	0.8	46.4	201.2	17.4
				End of Aerobic	6 hr	10.8	8.4	2.4	3.8	9.2	23.9	187.4	24.8
				End of Settling	8 hr	8.5	6.0	2.5	1.7	*	10.2	202.2	24.4
B3	60	3000	300	End of Feeding	2 hr	25.9	16.3	9.6	0.0	0.8	26.7	194.8	12.7
				End of Anaerobic	4 hr	23.0	15.4	7.6	-0.4	0.8	23.4	201.0	26.5
				End of Aerobic	6 hr	9.2	8.8	0.4	3.7	8.7	21.6	184.9	19.747
				End of Settling	8 hr	9.2	6.5	2.7	1.4	*	10.5	198.5	10.682

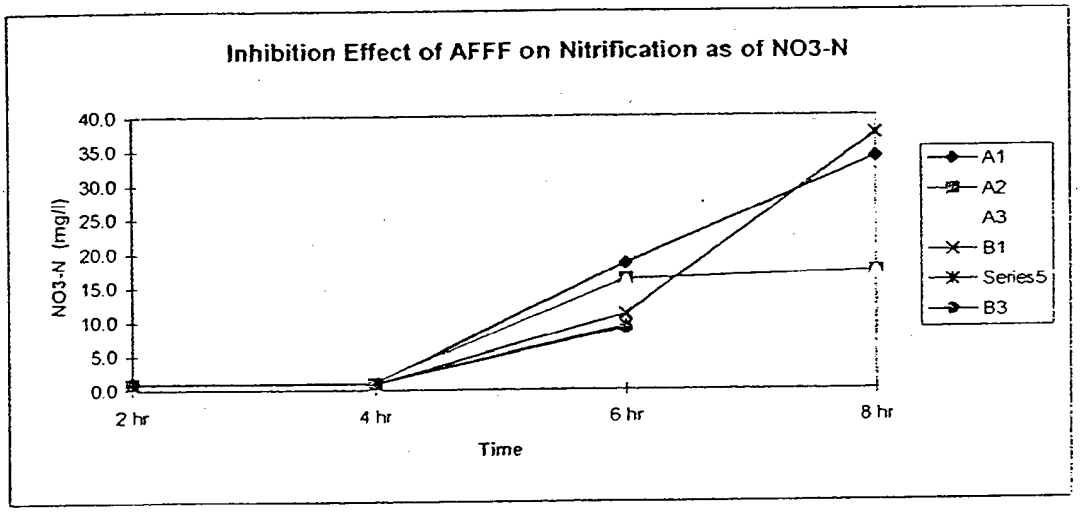
* Values not known

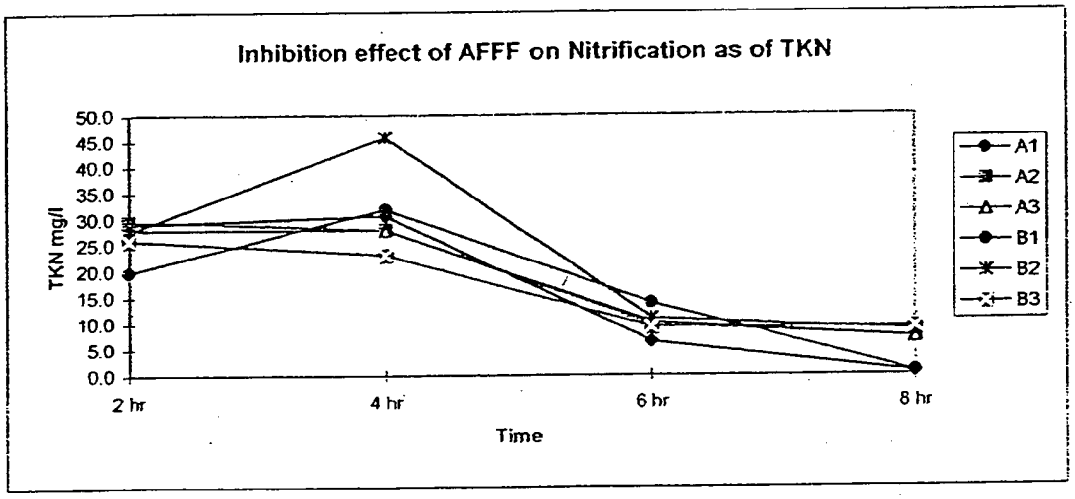
File: AFFF Inhib (17-11-97).xls
Sheet: Concentrations Table

Reactor	AFFF (ppm)	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
		Feedstock			973.5	406.6	447.0
		RR Decant			53.0	12.1	309.0
A1	0	End of Feeding	2 hr		76.1	30.7	498.0
		End of Anaerobic	4 hr		45.3	19.5	523.0
		End of Aerobic	6 hr		13.3	14.8	331.0
		Extended Aeration	(4hr)		13.3	14.0	263.0
		End of Settling	8 hr		26.5	13.4	262.0
A2	0	End of Feeding	2 hr		73.5	28.6	514.0
		End of Anaerobic	4 hr		53.0	17.5	480.0
		End of Aerobic	6 hr		39.8	12.4	337.0
		End of Settling	8 hr		26.5	13.7	327.0
A3	0	End of Feeding	2 hr		65.8	28.4	480.0
		End of Anaerobic	4 hr		58.1	18.2	500.0
		End of Aerobic	6 hr		26.5	12.7	328.0
		End of Settling	8 hr		13.3	12.6	331.0
B1	60	End of Feeding	2 hr		273.5	85.2	563.0
		End of Anaerobic	4 hr		242.7	76.1	534.0
		End of Aerobic	6 hr		132.7	58.9	411.0
		Extended Aeration	(4hr)		106.1	58.0	274.0
		End of Settling	8 hr		92.9	60.0	328.0
B2	60	End of Feeding	2 hr		288.9	83.1	590.0
		End of Anaerobic	4 hr		270.9	76.1	546.0
		End of Aerobic	6 hr		132.7	59.4	414.0
		End of Settling	8 hr		79.6	59.8	428.0
B3	60	End of Feeding	2 hr		314.5	85.8	553.0
		End of Anaerobic	4 hr		212.3	77.7	523.0
		End of Aerobic	6 hr		73	61.84	412
		End of Settling	8 hr		<5	62.23	437
		FS1				404.6	
		FS2				407.5	
		FS3				407.7	
		FS Avarage				406.6	
		RRSU1				12.9	
		RRSU2				11.3	
		RRSU3				12.0	
		RRSU Avarage				12.08	

File: AFFF Inhib (17-11-97).xls
Sheet: Concentrations Table

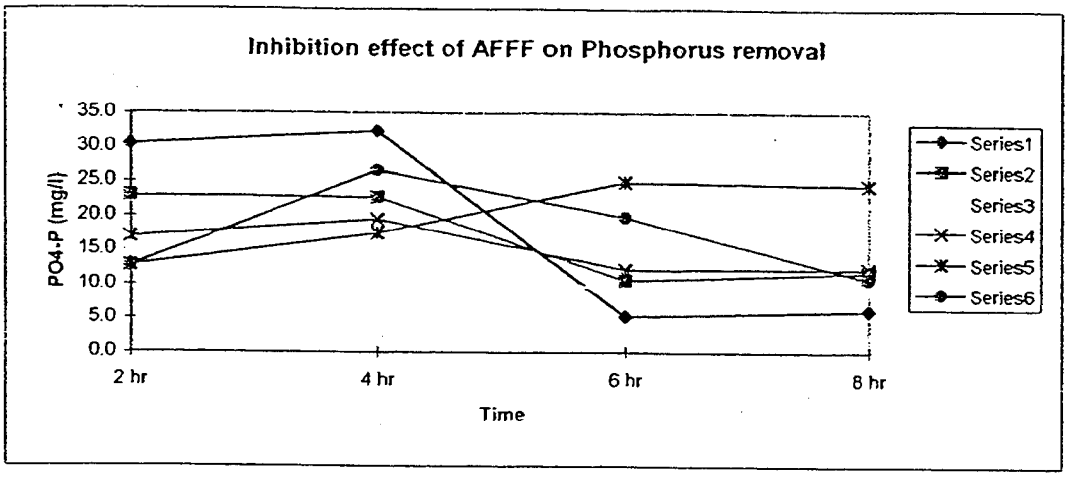




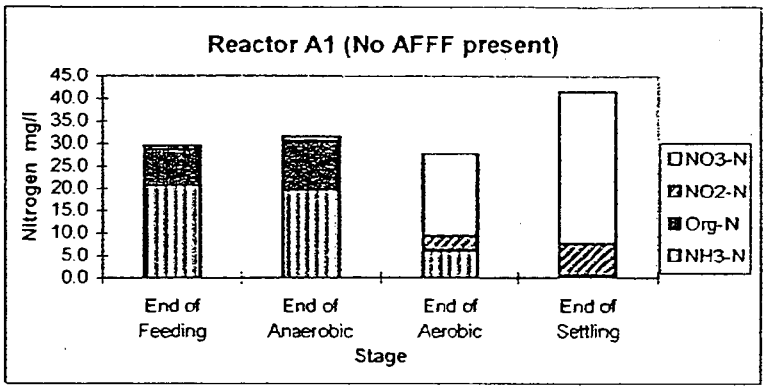


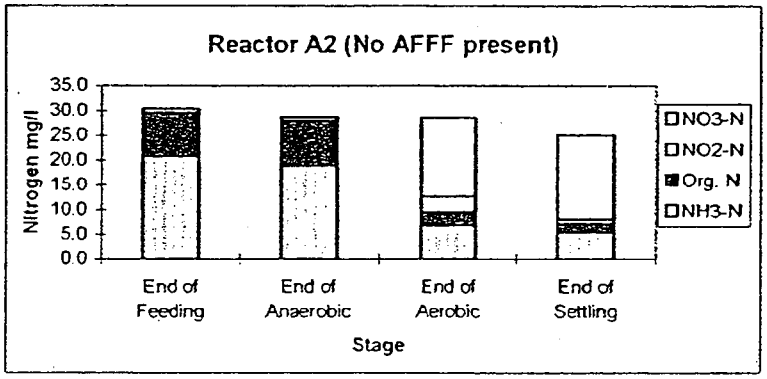
File: AFFF Inhib (17-11-97).xls
Sheet: NH3-N & TKN Charts

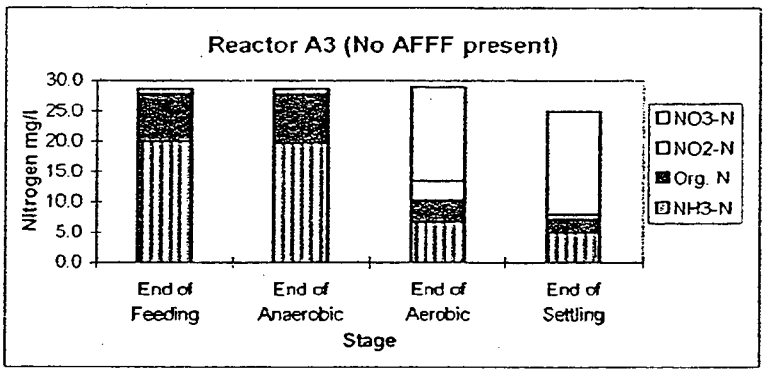
Date of Test: 3-25-97 NH3-N & TKN Charts AFFF Conc. = 60 ppm



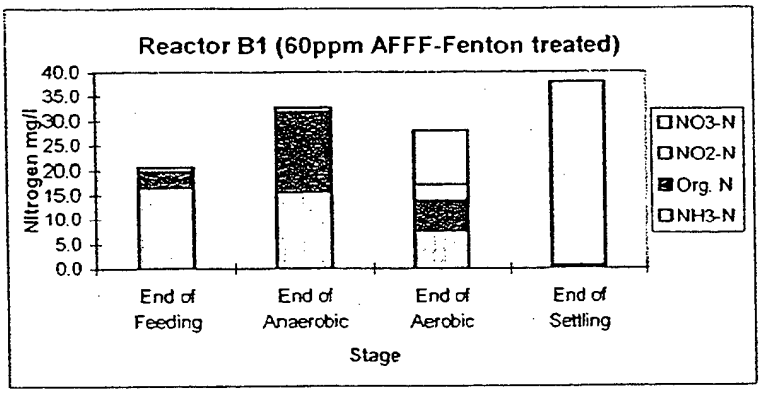
File: AFFF Inhib (17-11-97).xls
Sheet: NH3-N & TKN Charts

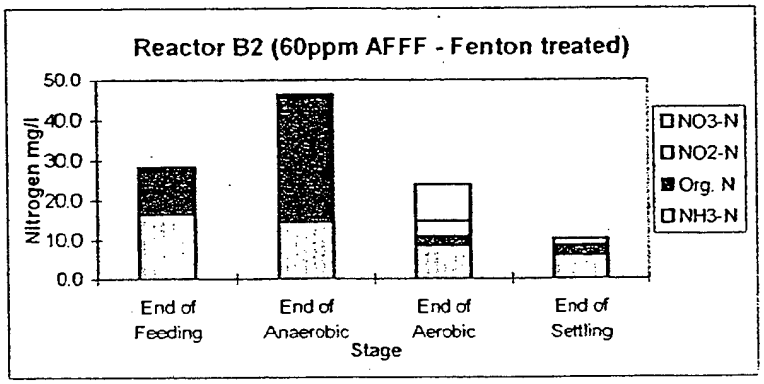


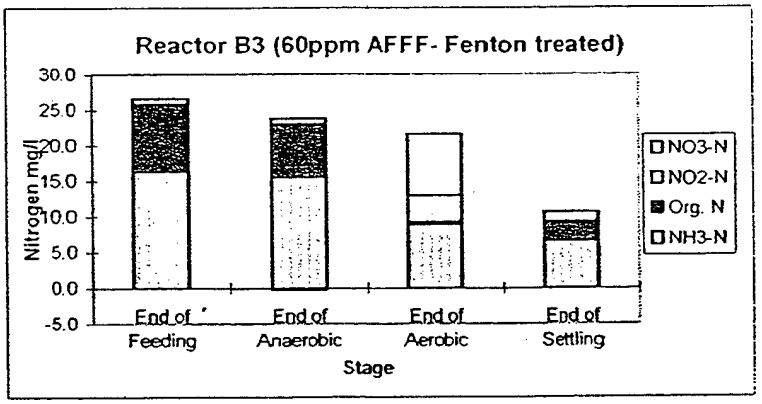




File: AFFF Inhib (17-11-97).xls
Sheet: Nitrogen Mass Balance



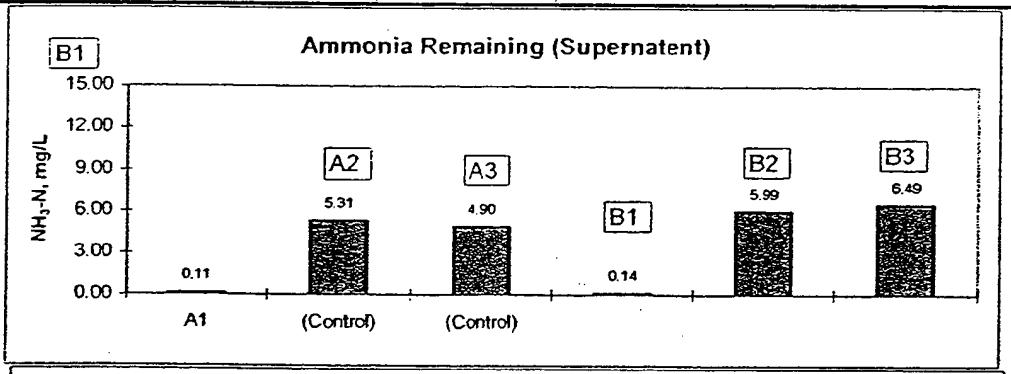


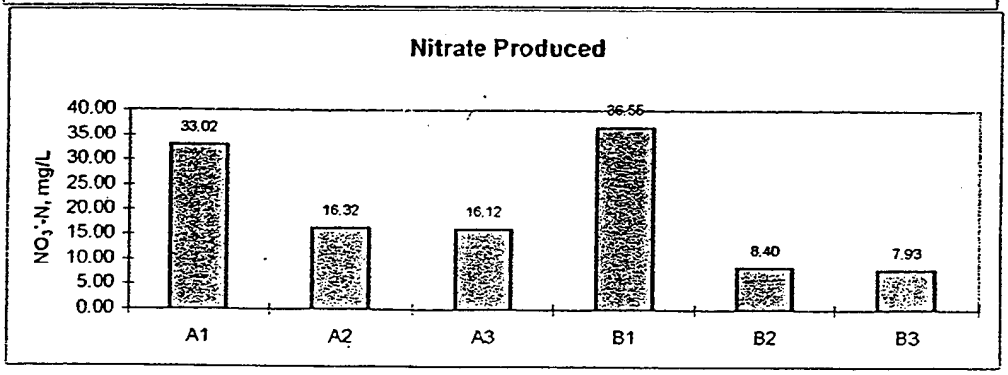


File: AFFF Inhib (17-11-97).xls
Sheet: Nitrogen Mass Balance

Date of Test: 3-25-97 Inhibition Reactors / NO3- & NO2 Produced AFFF Conc. = 60 ppm

Reactor	AFFF ppm	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3--N	NO2--N	Δ(NO_3^--N)
A1	0	0	0	End of Feeding	2 hr	20.69	0.8	0.0	
(Control)				End of Anaerobic	4 hr	19.61	0.8	0.0	
				End of Aerobic	6 hr	6.11	18.4	3.0	
				Extended Aeration	(4hr)	0.11	28.9	-0.8	
				End of Settling	8 hr	0.11	33.8	7.2	33.02
A2	0	0	0	End of Feeding	2 hr	20.69	0.8	0.0	
(Control)				End of Anaerobic	4 hr	18.84	0.8	0.0	
				End of Aerobic	6 hr	6.62	16.0	3.1	
				End of Settling	8 hr	5.31	17.1	0.9	16.32
A3	0	0	0	End of Feeding	2 hr	19.88	0.8	0.0	
(Control)				End of Anaerobic	4 hr	19.61	0.8	0.0	
				End of Aerobic	6 hr	6.62	15.6	3.1	
				End of Settling	8 hr	4.90	16.9	0.8	16.12
B1	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	15.42	0.8	0.0	
				End of Aerobic	6 hr	7.46	10.9	3.3	
				Extended Aeration	(4hr)	0.23	23.2	-0.2	
				End of Settling	8 hr	0.14	37.4	0.0	36.55
B2	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	14.23	0.8	0.0	
				End of Aerobic	6 hr	8.42	9.2	3.8	
				End of Settling	8 hr	5.99	*	1.7	8.40
B3	60	3000	300	End of Feeding	2 hr	16.26	0.8	0.0	
				End of Anaerobic	4 hr	15.42	0.8	-0.4	
				End of Aerobic	6 hr	8.76	8.74	3.73	
				End of Settling	8 hr	6.49	*	1.36	7.93





File: AFFF Inhib (17-11-97).xls
Sheet: NO3- & NO2 Produced

BNR Inhibition Tests - 60 ppm AFFF Pretreated with Fenton's Reagent (Nov/17/97)

TSS Reactor	Initial wt	Final wt	Volume	MLSS	WT @ 550 C	MLVSS
A1	1.114	1.1559	15	2793	1.1187	2480
A2	1.1126	1.156	15	2893	1.1191	2460
A3	1.1199	1.162	15	2807	1.1255	2433
B1	1.1154	1.1586	15	2880	1.1154	2880
B2	1.1113	1.1527	15	2760	1.1172	2367
B3	1.0983	1.1394	15	2740	1.1025	2460

TDS Reactor	Initial wt	Final wt	Volume	TDS
A1	1.0134	1.0261	15	847
A2	1.0147	1.0293	15	973
A3	1.0153	1.0303	15	1000
B1	1.0436	1.0945	15	3393
B2	1.0465	1.0952	15	3247
B3	1.0307	1.0745	15	2920

TS Reactor	Initial wt	Final wt	Volume	TS	ΣTSS,TDS
A1	1.0312	1.13	25	3952	3640
A2	1.0166	1.0746	15	3867	3867
A3	1.0122	1.0704	15	3880	3807
B1	1.0083	1.1003	15	6133	6273
B2	1.0141	1.1064	15	6153	6007
B3	1.0109	1.1044	15	6233	5660

File: AFFF Soilds Data

BNR Inhibition Batch Assay Pretreated with Fenton's Reagent

(AFFF 120 ppm)

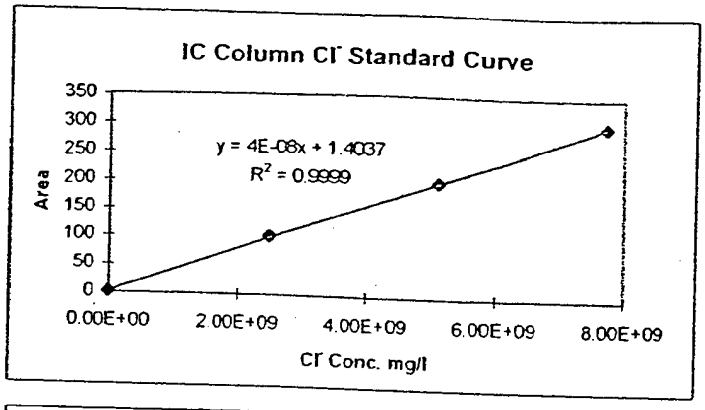
Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	NH3-N (mg/L)	TKN (mg/L)	Alkalinity
				Feedstock		34.6	140.7	430.0
				RR Decant		0.1	1.8	319.0
A1	0	0	0	End of Feeding	2 hr	25.2	16.2	501.0
				End of Anaerobic	4 hr	22.1	16.5	473.0
				End of Aerobic	6 hr	0.9	2.7	287.0
				Extended Aeration	(4hr)	0.1	2.6	297.0
				End of Settling	8 hr	0.1	2.0	271.0
A2	0	0	0	End of Feeding	2 hr	26.3	22.8	506.0
				End of Anaerobic	4 hr	21.3	23.3	484.0
				End of Aerobic	6 hr	1.0	2.9	273.0
				End of Settling	8 hr	0.5	2.8	291.0
A3	0	0	0	End of Feeding	2 hr	27.3	38.0	473.0
				End of Anaerobic	4 hr	18.9	27.6	487.0
				End of Aerobic	6 hr	1.0	2.9	294.0
				End of Settling	8 hr	0.5	5.6	300.0
B1	120	3000	300	End of Feeding	2 hr	27.3	50.6	592.0
				End of Anaerobic	4 hr	16.2	29.2	554.0
				End of Aerobic	6 hr	2.4	13.4	475.0
				Extended Aeration	(4hr)	0.1	5.9	457.0
				End of Settling	8 hr	0.1	8.7	433.0
B2	120	3000	300	End of Feeding	2 hr	24.3	42.6	584.0
				End of Anaerobic	4 hr	14.4	34.6	560.0
				End of Aerobic	6 hr	3.0	13.4	487.0
				End of Settling	8 hr	1.6	12.3	503.0
B3	120	3000	300	End of Feeding	2 hr	26.3	56.6	578.0
				End of Anaerobic	4 hr	14.4	41.1	564.0
				End of Aerobic	6 hr	2.9	12.0	485.0
				End of Settling	8 hr	1.6	9.8	477.0

File: AFFF Inhib (1-12-97).xls
Sheet: Standards & Data

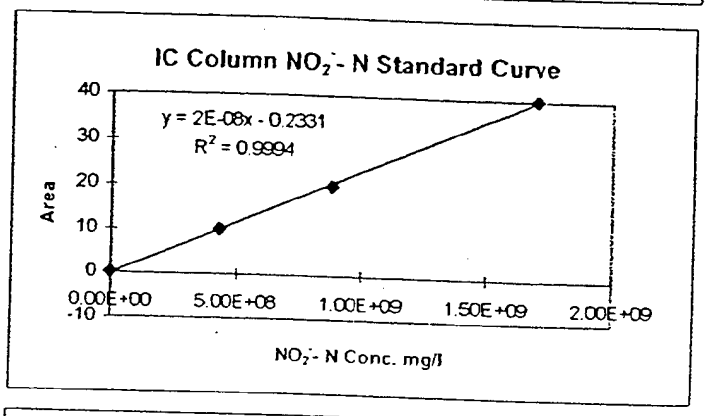
Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	Cl- Area	Cl- (mg/L)	NO_2^--N Area	NO_2^--N (mg/L)	NO_3^--N Area	NO_3^--N (mg/L)	PO4-P Absorb.	PO4-P mg/l
				Feedstock		6415840997	249.5	0	0.0	2999602	0.9	0.359	11.37
				RR Decant		5165171073	201.1	15252495	0.4	980449999	17.4	0.11	3.94
A1	0	0	0	End of Feeding	2 hr	5636490017	219.3	0	0.0	8285053	1.0	0.556	17.24
				End of Anaerobic	4 hr	5565778827	216.6	22014912	0.5	8248297	1.0	1.527	46.20
				End of Aerobic	6 hr	5587767124	217.5	237912104	5.6	1309005030	22.9	0.196	6.51
				Extended Aeration	(4hr)	6360877548	247.3	28977091	0.7	1665166248	28.9	0.165	5.58
				End of Settling	8 hr	5742700331	223.4	14439043	0.3	1756232544	30.4	0.107	3.85
A2	0	0	0	End of Feeding	2 hr	5453642899	212.3	0	0.0	5348368	1.0	0.409	12.86
				End of Anaerobic	4 hr	5549230457	216.0	22476337	0.5	12719689	1.1	1.131	34.39
				End of Aerobic	6 hr	5545313287	215.8	243723873	5.7	1218372767	21.4	0.224	7.34
				End of Settling	8 hr	5663477238	220.4	253297426	5.9	1078852244	19.0	0.112	4.00
A3	0	0	0	End of Feeding	2 hr	5496024620	213.9	0	0.0	102182	0.9	1.03	31.38
				End of Anaerobic	4 hr	5576772514	217.0	21352132	0.5	9222295	1.0	1.194	36.27
				End of Aerobic	6 hr	5556863735	216.3	251352393	5.9	1228966969	21.6	0.099	3.61
				End of Settling	8 hr	5951069962	231.5	324595775	7.6	892540865	15.9	0.26	8.42
B1	120	3000	300	End of Feeding	2 hr	457079520	228.9	0	0.2	0	0.9	1.417	42.92
				End of Anaerobic	4 hr	436465012	219.4	0	0.2	2413048	0.9	1.52	45.99
				End of Aerobic	6 hr	424172102	213.7	25833324	7.3	56300488	21.9	1.172	35.61
				Extended Aeration	(4hr)	462727593	231.5	6404243	1.8	36280666	17.8	0.94	28.69
				End of Settling	8 hr	448160769	224.8	3939501	1.1	101580036	31.0	1.064	32.39
B2	120	3000	300	End of Feeding	2 hr	400203689	202.5	0	0.2	3064266	0.9	1.166	35.43
				End of Anaerobic	4 hr	395127891	200.2	0	0.2	3821042	0.9	1.669	50.43
				End of Aerobic	6 hr	408789981	206.5	28250426	7.9	46467575	19.9	1.102	33.52
				End of Settling	8 hr	459889036	230.2	5272664	1.5	89906486	28.6	1.074	32.69
B3	120	3000	300	End of Feeding	2 hr	412801655	208.4	0	0.2	5131448	1.0	1.105	33.61
				End of Anaerobic	4 hr	400870390	202.8	1322995	0.2	2745177	0.9	1.385	41.96
				End of Aerobic	6 hr	434292751	218.3	24585375	6.9	51478437	20.9	1.183	35.94
				End of Settling	8 hr	424292751	213.7	11525301	3.2	88687303	28.4	1.213	36.83
				stand 2		2501404503	98.12	434651899	10.18	506201128	9.39		
				Stand 3		5127125765	199.6	883978295	20.7	1094957038	19.3		
				stand 4		7886570017	306.3	1700383445	39.8	2399022283	41.2		
				Standards used									
				STD 1		1726964	0	0	0	2116836	0	0.158	5
				STD 2		2497916940	100	430009432	10	505155875	10	0.636	20
				STD 3		5128148989	200	883500936	20	1090488678	20	1.14	35
				STD 4		7744736801	300	1691875383	40	2354417370	40	1.666	50

File: AFFF Inhib (1-12-97).xls
Sheet: Standards & Data

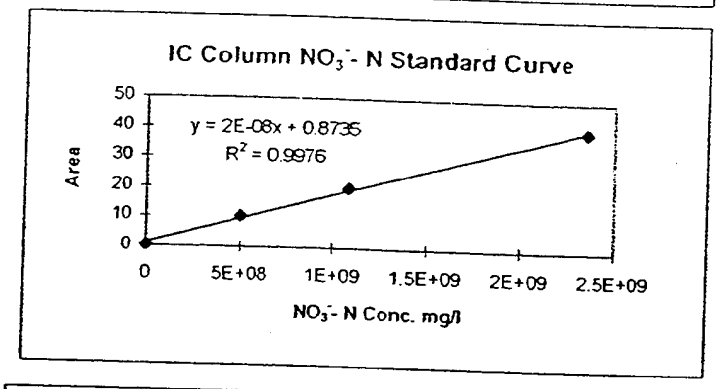
US00001148



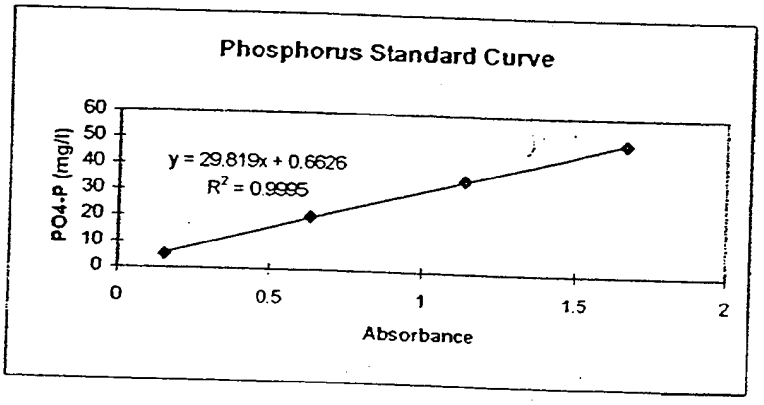
m = 4.00E-08
i = 1.40E+00



m = 2.00E-08
i = -2.33E-01



m = 2.00E-08
i = 8.74E-01



File: AFFF Inhib (1-12-97).xls
Sheet: Standards & Data

US00001149

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.999859016
Observations	4

	Coefficients	*Standard Error*
Intercept	1.403699417	1.56137508
X Variable 1	3.86654E-08	3.2466E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.999387669
Observations	4

	Coefficients	*Standard Error*
Intercept	0	0.40411631
X Variable 1	2.34187E-08	4.131E-10

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.997641688
Observations	4

	Coefficients	*Standard Error*
Intercept	0.873456724	0.76464318
X Variable 1	1.68277E-08	-5.7853E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.999543893
Observations	4

	Coefficients	*Standard Error*
Intercept	0.6626043	0.47798482
X Variable 1	29.81932856	0.45041746

File: AFFF Inhib (1-12-97).xls
Sheet: Standards & Data

US00001150

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	COD		
						ABS	(mg/L)	% COD Removal
				Feedstock		0.080	1082.4	
				RR Decant		0.004	54.1	
A1	0	0	0	End of Feeding **	2 hr	0.002	27.1	93.2
				End of Anaerobic**	4 hr	0.001	13.5	96.6
				End of Aerobic	6 hr	0.005	67.7	83.0
				Extended Aeration	(4hr)	0.002	27.1	93.2
				End of Settling	8 hr	0.001	13.5	96.6
A2	0	0	0	End of Feeding**	2 hr	0.002	27.1	93.2
				End of Anaerobic **	4 hr	0.001	13.5	96.6
				End of Aerobic	6 hr	0.001	13.5	96.6
				End of Settling	8 hr	0.001	13.5	96.6
A3	0	0	0	End of Feeding**	2 hr	0.001	13.5	96.6
				End of Anaerobic**	4 hr	0.001	13.5	96.6
				End of Aerobic	6 hr	0.001	13.5	96.6
				End of Settling	8 hr	0.001	13.5	96.6
B1	120	3000	300	End of Feeding**	2 hr	0.029	392.4	69.3
				End of Anaerobic**	4 hr	0.029	392.4	69.3
				End of Aerobic	6 hr	0.027	365.3	71.4
				Extended Aeration	(4hr)	0.024	324.7	74.6
				End of Settling	8 hr	0.025	338.3	73.5
B2	120	3000	300	End of Feeding**	2 hr	0.028	378.8	70.3
				End of Anaerobic**	4 hr	0.040	541.2	57.6
				End of Aerobic	6 hr	0.024	324.7	74.6
				End of Settling	8 hr	0.024	324.7	74.6
B3	120	3000	300	End of Feeding**	2 hr	0.026	351.8	72.4
				End of Anaerobic	4 hr	0.023	311.2	75.6
				End of Aerobic	6 hr	0.021	284.1	77.7
				End of Settling	8 hr	0.021	284.1	77.7
				STD 1		0.000	0	
				STD 2		0.077	1000	
				STD 3		0.147	2000	
				STD 4		0.225	3000	
				STD 5		0.330	4500	
				FS (Filtered)**		0.080	1082.4	
				FS Average		**0.080**	**1082.4**	
				RRSU(Filtered)**		0.004	54.1	
				RRSU Average		**0.004**	54.1	

* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.

File: AFFF Inhib (1-12-97).xls
Sheet: COD

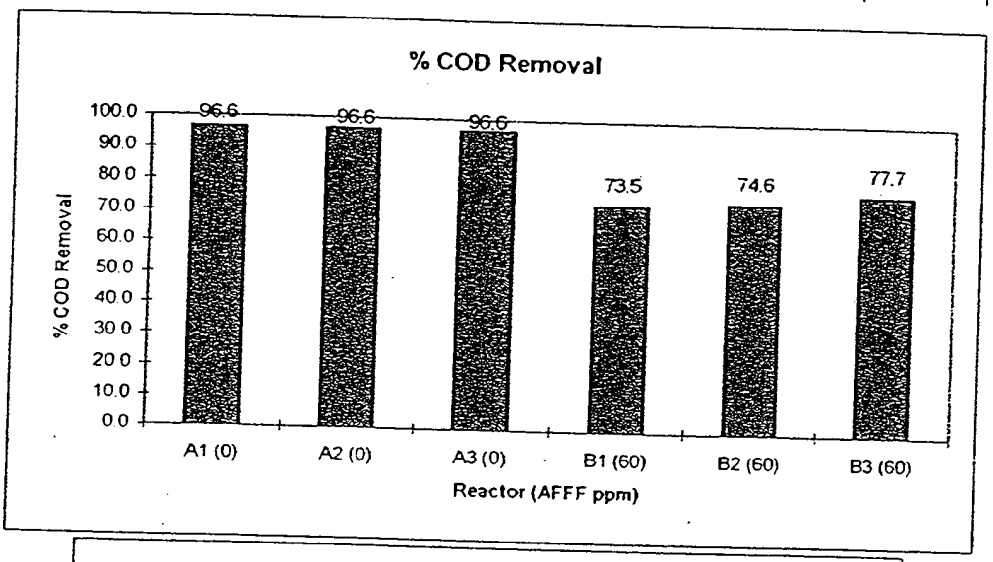
Initial COD at Time 0 hr.

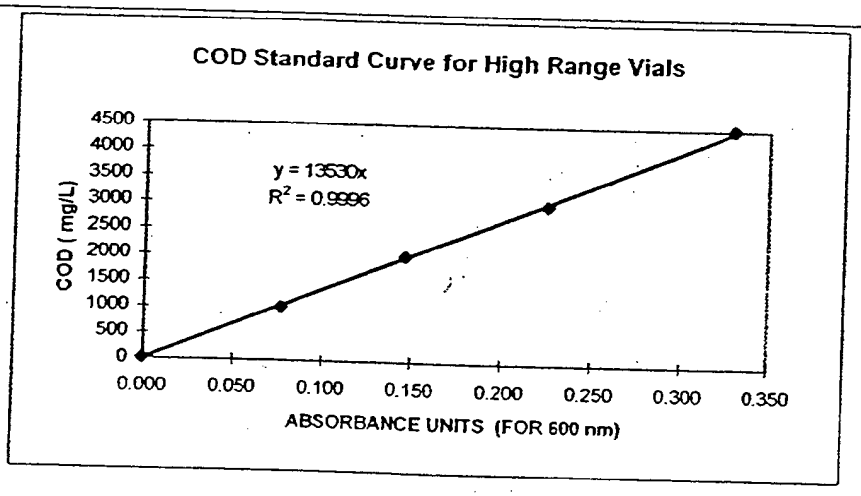
Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	54.1	216.48
(A1,A2&A3)	Feedstock	2	1082.4	2164.8
	AFFF	0	0	0
	Total	6		396.9
Inhibition	RR Decant	4	54.1	216.48
(B1,B2&B3)	Feedstock	2	1082.4	2164.8
	AFFF	2	2638.35	5276.7
	Total	6		1276.3

Raw AFFF COD Reduced by Fentons Reagent

Total

Reactor (AFFF ppm)	A1 (0)	A2 (0)	A3 (0)	B1 (60)	B2 (60)	B3 (60)
% COD Removal	96.6	96.6	96.6	73.5	74.6	77.7





m = 13530

File: AFFF Inhib (1-12-97).xls
Sheet: COD

Fentons Pretreatment			
For AFFF ppm	120	120	120
	Reactor 1	Reactor 2	Reactor 3
Tap water	1250 ml	1250 ml	1250 ml
Actual AFFF ppm	300	300	300
	10 ml	10 ml	10 ml
H202, 3000*2.5 mg/l	7500 mg/l	7500 mg/l	7500mg/l
Fe3+ 300*2.5	750 mg/l	750 mg/l	750 mg/l
FeSO4 (3times)	3723.28 mg/l	3723.28 mg/l	3723.28 mg/l

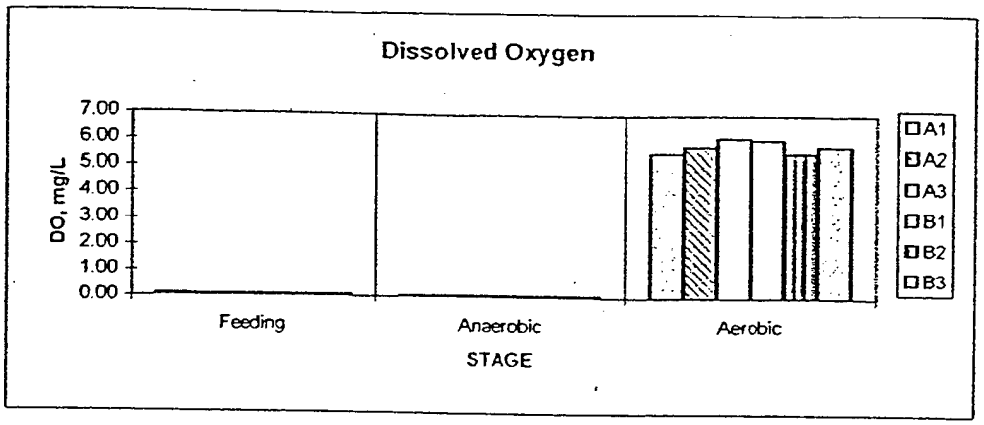
Initial COD			
	Absorbance	COD mg/l	Actual COD
AFFF - 120 ppm	0.251	3396.03	3396.03

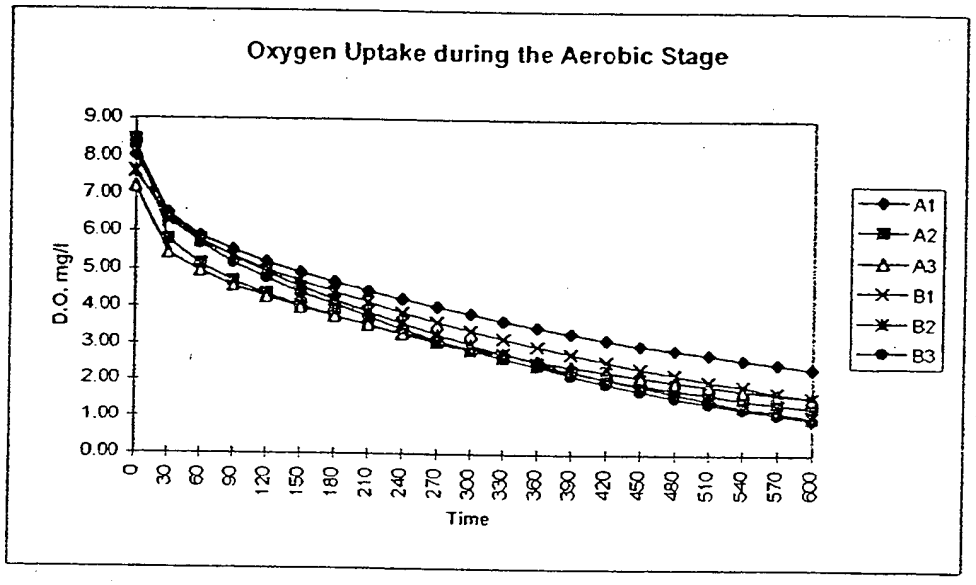
COD after 24 hr reaction period between fentons reagent and AFFF

	Absorbance	COD mg/l	Actual COD
	0.195	2638.35	2638.35
% COD Removal	22.31		

File: AFFF Inhib (1-12-97).xls
Sheet: COD

US00001153





File: AFFF Inhib (1-12-97).xls
Sheet: Oxygen Uptake

	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	A3	B1	B2	B3
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	5.58	5.84	6.17	6.10	5.57	5.85

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	A3	B1	B2	B3
Aerobic	0	8.02	8.43	7.20	7.61	7.56	8.25
	30	6.49	5.77	5.42	6.26	6.37	6.38
	60	5.86	5.12	4.96	5.72	5.77	5.66
	90	5.50	4.68	4.54	5.35	5.31	5.16
	120	5.18	4.32	4.25	4.98	4.90	4.76
	150	4.90	4.02	3.97	4.67	4.52	4.35
	180	4.66	3.74	3.73	4.37	4.17	4.06
	210	4.40	3.47	3.51	4.11	3.84	3.71
	240	4.18	3.23	3.27	3.83	3.54	3.39
	270	3.98	2.99	3.07	3.58	3.25	3.11
	300	3.79	2.77	2.88	3.34	2.98	2.83
	330	3.60	2.58	2.71	3.13	2.73	2.59
	360	3.43	2.38	2.54	2.91	2.48	2.36
	390	3.27	2.22	2.39	2.72	2.26	2.13
	420	3.10	2.05	2.24	2.51	2.04	1.92
	450	2.95	1.89	2.10	2.32	1.84	1.72
	480	2.83	1.75	1.97	2.16	1.66	1.54
	510	2.69	1.63	1.86	1.98	1.48	1.38
	540	2.56	1.48	1.74	1.85	1.29	1.21
	570	2.44	1.37	1.63	1.68	1.15	1.06
	600	2.32	1.27	1.54	1.55	1.01	0.92

File: AFFF Inhib (1-12-97).xls
Sheet: Dissolved Oxygen

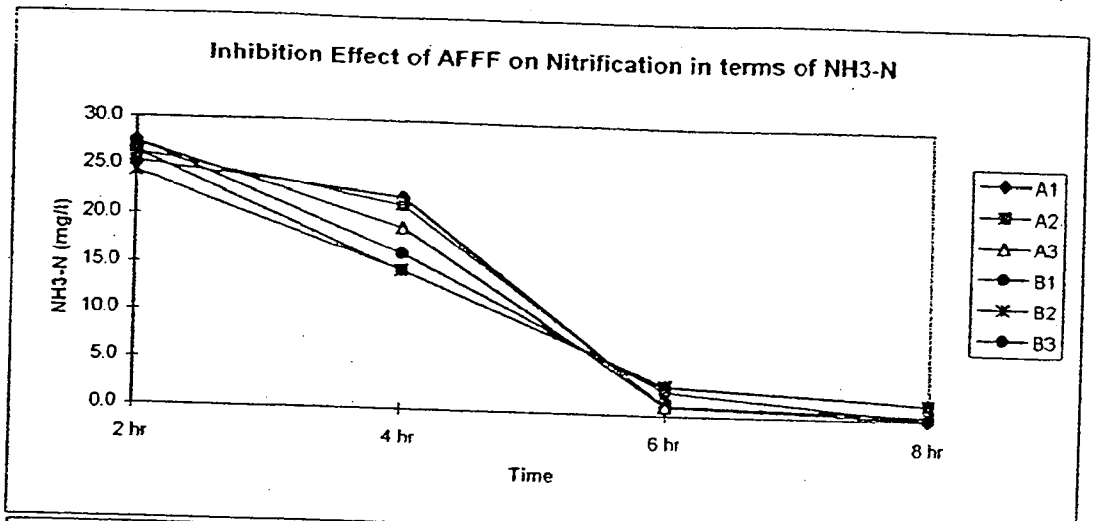
Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Concentration, mg/L							
						TKN	NH3-N	Org. N	NO2-N	NO3-N	Total N	Cl-	PO4-P
				Feedstock		140.7	34.6	106.0	0.0	0.9	141.6	249.5	11.4
				RR Decant		1.8	0.1	1.7	0.4	17.4	19.5	201.1	3.9
A1	0	0	0	End of Feeding	2 hr	16.2	25.2	-9.0	0.0	1.0	17.2	219.3	17.2
				End of Anaerobic	4 hr	16.5	22.1	-5.6	0.5	1.0	18.0	216.6	46.2
				End of Aerobic	6 hr	2.7	0.9	1.9	5.6	22.9	31.2	217.5	6.5
				Extended Aeration	(4hr)	2.6	0.1	2.5	0.7	28.9	32.2	247.3	5.6
				End of Settling	8 hr	2.0	0.1	1.9	0.3	30.4	32.8	223.4	3.9
A2	0	0	0	End of Feeding	2 hr	22.8	26.3	-3.5	0.0	1.0	23.8	212.3	12.9
				End of Anaerobic	4 hr	23.3	21.3	2.0	0.5	1.1	24.9	216.0	34.4
				End of Aerobic	6 hr	2.9	1.0	1.9	5.7	21.4	30.0	215.8	7.3
				End of Settling	8 hr	2.8	0.5	2.3	5.9	19.0	27.8	220.4	4.0
A3	0	0	0	End of Feeding	2 hr	38.0	27.3	10.7	0.0	0.9	38.9	213.9	31.4
				End of Anaerobic	4 hr	27.6	18.9	8.7	0.5	1.0	29.1	217.0	36.3
				End of Aerobic	6 hr	2.9	1.0	1.9	5.9	21.6	30.3	216.3	3.6
				End of Settling	8 hr	5.6	0.5	5.1	7.6	15.9	29.1	231.5	8.4
B1	120	3000	300	End of Feeding	2 hr	50.6	27.3	23.3	0.2	0.9	51.6	228.9	42.9
				End of Anaerobic	4 hr	29.2	16.2	13.0	0.2	0.9	30.3	219.4	46.0
				End of Aerobic	6 hr	13.4	2.4	11.0	7.3	21.9	42.5	213.7	35.6
				Extended Aeration	(4hr)	5.9	0.1	5.8	1.8	17.8	25.5	231.5	28.7
				End of Settling	8 hr	8.7	0.1	8.6	1.1	31.0	40.8	224.8	32.4
B2	120	3000	300	End of Feeding	2 hr	42.6	24.3	18.4	0.2	0.9	43.6	202.5	35.4
				End of Anaerobic	4 hr	34.6	14.4	20.2	0.2	0.9	35.8	200.2	50.4
				End of Aerobic	6 hr	13.4	3.0	10.4	7.9	19.9	41.2	206.5	33.5
				End of Settling	8 hr	12.3	1.6	10.6	1.5	28.6	42.4	230.2	32.7
B3	120	3000	300	End of Feeding	2 hr	56.6	26.3	30.4	0.2	1.0	57.8	208.4	33.6
				End of Anaerobic	4 hr	41.1	14.4	26.7	0.2	0.9	42.2	202.8	42.0
				End of Aerobic	6 hr	12.0	2.9	9.1	6.9	20.9	39.8	218.3	35.939
				End of Settling	8 hr	9.8	1.6	8.2	3.2	28.4	41.4	213.7	36.833

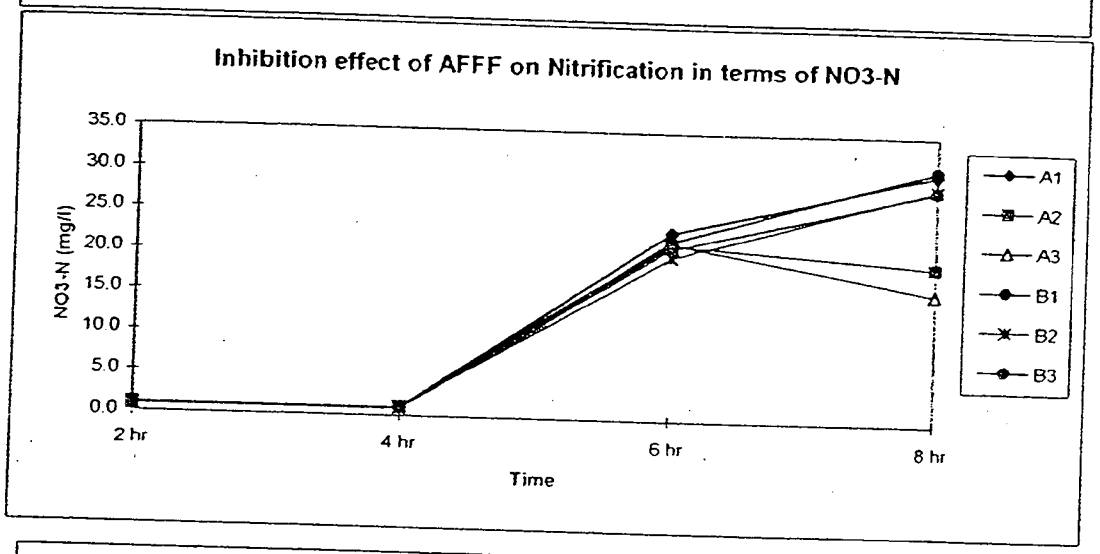
File: AFFF Inhib (1-12-97).xls
Sheet: Concentrations Table

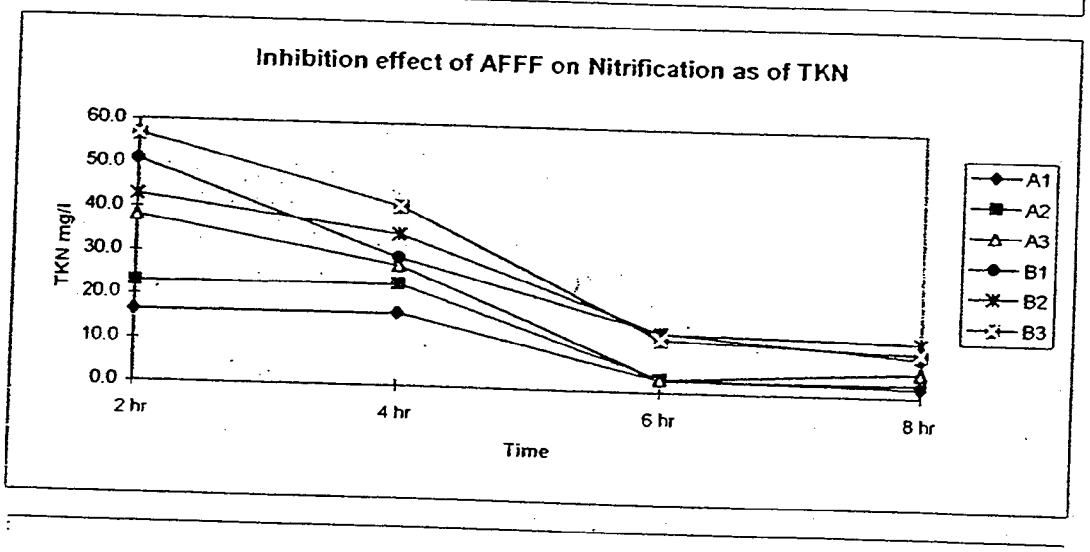
Reactor	AFFF (ppm)	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
		Feedstock			1082.4	287.7	430.0
		RR Decant			54.1	11.5	319.0
A1	0	End of Feeding	2 hr		27.1	12.6	501.0
		End of Anaerobic	4 hr		13.5	13.29	473.0
		End of Aerobic	6 hr		67.7	11.48	287.0
		Extended Aeration	(4hr)		27.1	11.34	297.0
		End of Settling	8 hr		13.5	11.5	271.0
A2	0	End of Feeding	2 hr		27.1	12.8	506.0
		End of Anaerobic	4 hr		13.5	13.26	484.0
		End of Aerobic	6 hr		13.5	11.6	273.0
		End of Settling	8 hr		13.5	11.5	291.0
A3	0	End of Feeding	2 hr		13.5	10.6	473.0
		End of Anaerobic	4 hr		13.5	11.7	487.0
		End of Aerobic	6 hr		13.5	11.1	294.0
		End of Settling	8 hr		13.5	11.4	300.0
B1	120	End of Feeding	2 hr		392.4	140.5	592.0
		End of Anaerobic	4 hr		392.4	125.8	554.0
		End of Aerobic	6 hr		365.3	135.7	475.0
		Extended Aeration	(4hr)		324.7	131.9	457.0
		End of Settling	8 hr		338.3	133.2	433.0
B2	120	End of Feeding	2 hr		378.8	155.9	584.0
		End of Anaerobic	4 hr		541.2	131.5	560.0
		End of Aerobic	6 hr		324.7	122.5	487.0
		End of Settling	8 hr		324.7	122.4	503.0
B3	120	End of Feeding	2 hr		351.8	161.2	578.0
		End of Anaerobic	4 hr		311.2	138.5	564 0
		End of Aerobic	6 hr		263.3	139 2	485
		End of Settling	8 hr		263.3	132.0	477
		FS1				287.1	
		FS2				288.9	
		FS3				287.1	
		FS Avarage				287.7	
		RRSU1				12.0	
		RRSU2				11.2	
		RRSU3				11.3	
		RRSU Avarage				11.48	

File: AFFF Inhib (1-12-97).xls
Sheet: Concentrations Table

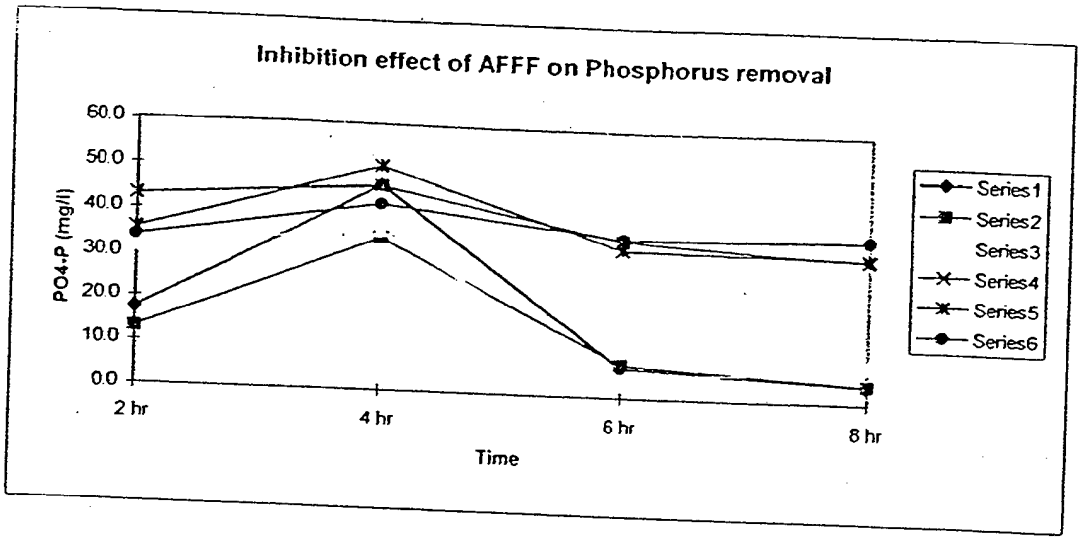
US00001157



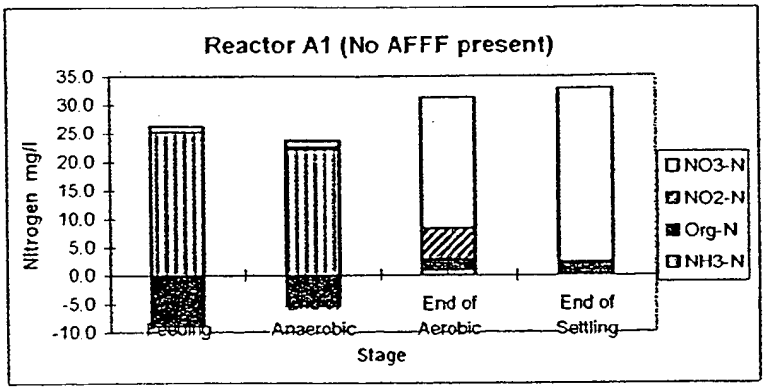


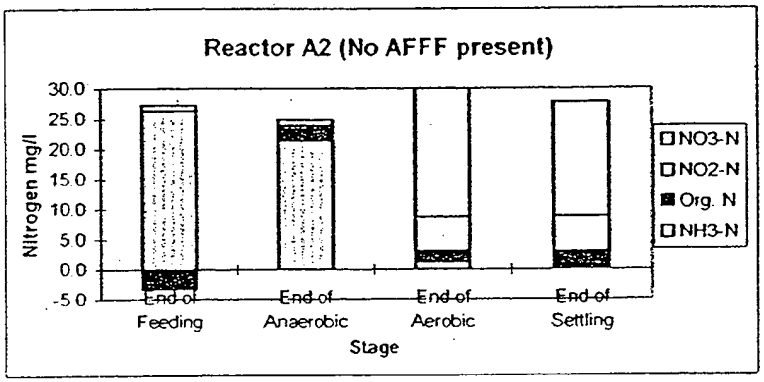


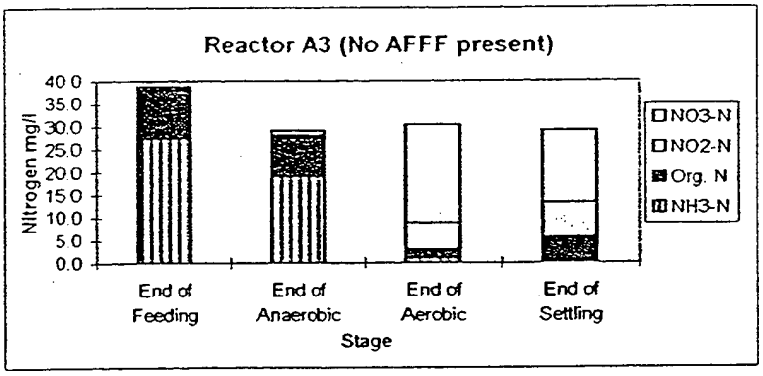
File: AFFF Inhib (1-12-97).xls
Sheet: NH3-N & TKN Charts



File: AFFF Inhib (1-12-97).xls
Sheet: NH3-N & TKN Charts

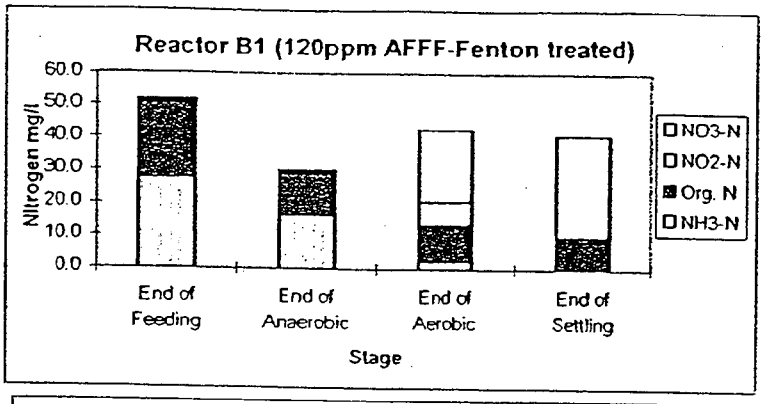


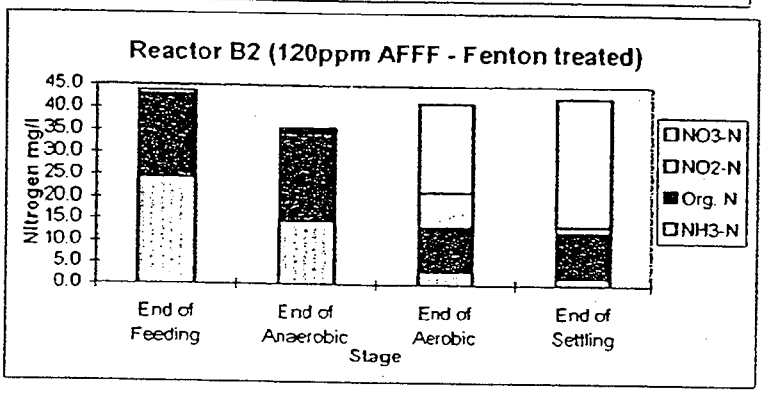


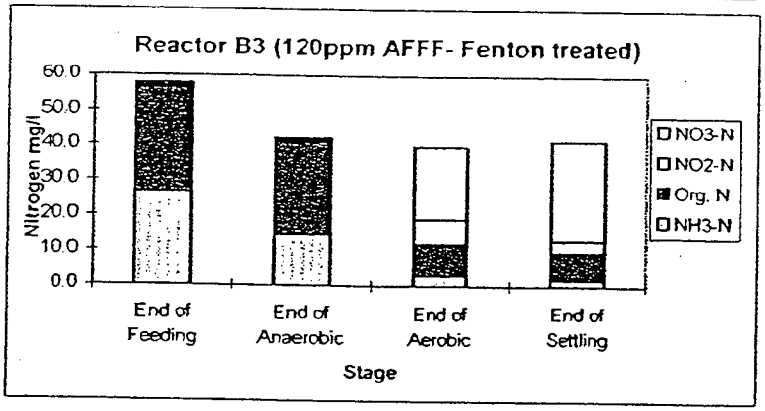


File: AFFF Inhib (1-12-97).xls
Sheet: Nitrogen Mass Balance

US00001160



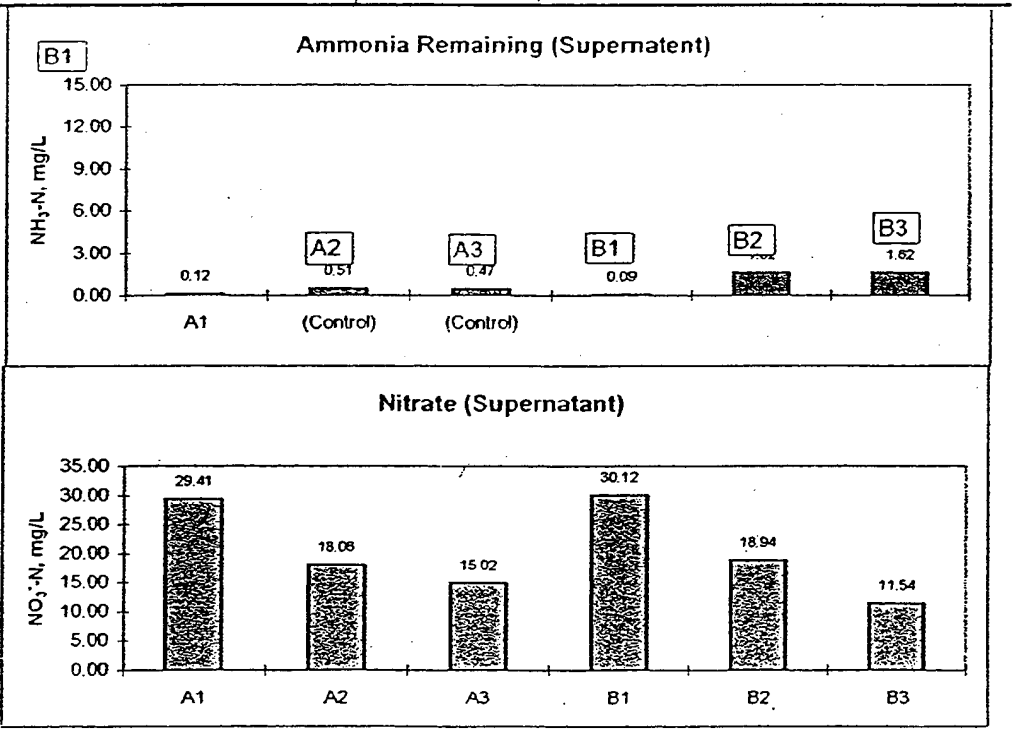




File: AFFF Inhib (1-12-97).xls
Sheet: Nitrogen Mass Balance

US00001161

Reactor	AFFF ppm	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3-N	NO2-N	Δ(NO_3^--N)
A1 (Control)	0	0	0	End of Feeding	2 hr	25.23	1.0	0.0	
				End of Anaerobic	4 hr	22.10	1.0	0.5	
				End of Aerobic	6 hr	0.85	22.9	5.6	
				Extended Aeration	(4hr)	0.12	28.9	0.7	
				End of Settling	8 hr	0.07	30.4	0.3	29.41
A2 (Control)	0	0	0	End of Feeding	2 hr	26.25	1.0	0.0	
				End of Anaerobic	4 hr	21.26	1.1	0.5	
				End of Aerobic	6 hr	1.03	21.4	5.7	
				End of Settling	8 hr	0.51	19.0	5.9	18.06
A3 (Control)	0	0	0	End of Feeding	2 hr	27.31	0.9	0.0	
				End of Anaerobic	4 hr	18.93	1.0	0.5	
				End of Aerobic	6 hr	0.99	21.6	5.9	
				End of Settling	8 hr	0.47	15.9	7.6	15.02
B1	120	3000	300	End of Feeding	2 hr	27.30	0.9	0.2	
				End of Anaerobic	4 hr	16.22	0.9	0.2	
				End of Aerobic	6 hr	2.41	21.9	7.3	
				Extended Aeration	(4hr)	0.10	17.8	1.8	
				End of Settling	8 hr	0.09	31.0	1.1	30.12
B2	120	3000	300	End of Feeding	2 hr	24.25	0.9	0.2	
				End of Anaerobic	4 hr	14.44	0.9	0.2	
				End of Aerobic	6 hr	3.04	19.9	7.9	
				End of Settling	8 hr	1.62	28.6	1.5	18.94
B3	120	3000	300	End of Feeding	2 hr	26.25	1.0	0.2	
				End of Anaerobic	4 hr	14.44	0.9	0.2	
				End of Aerobic	6 hr	2.92	12.50	4.17	
				End of Settling	8 hr	1.62	14.01	0.47	11.54



File: AFFF Inhib (1-12-97).xls
Sheet: NO3- & NO2 Produced

BNR Inhibition Tests - 120 ppm AFFF with Fenton's Treatment (Dec/1/97)

TSS Reactor	Initial wt	Final wt	Volume	MLSS	WT @ 550 C	MLVSS
A1	1.0941	1.1387	15	2973	1.0993	2627
A2	1.0988	1.1444	15	3040	1.1035	2727
A3	1.0985	1.1424	15	2927	1.1028	2640
B1	1.0895	1.133	15	2900	1.0933	2647
B2	1.0905	1.1346	15	2940	1.0948	2653
B3	1.0951	1.1371	15	2800	1.1	2473

TDS Reactor	Initial wt	Final wt	Volume	TDS
A1	1.0026	1.0181	15	1033
A2	1.0032	1.0186	15	1027
A3	0.9989	1.0134	15	967
B1	1.0095	1.073	15	4233
B2	1.0013	1.0626	15	4087
B3	0.9993	1.05	15	3380

TS Reactor	Initial wt	Final wt	Volume	TS	ΣTSS,TDS
A1	1.0128	1.0728	15	4000	4007
A2	1.0051	1.0646	15	3967	4067
A3	0.9958	1.0556	15	3987	3893
B1	1.0042	1.1127	15	7233	7133
B2	0.9972	1.1077	15	7367	7027
B3	0.9995	1.1048	15	7020	6180

File: AFFF Soilds Data

US00001163

BNR Inhibition Batch Assay Pretreated with Fenton's Reagent

(AFFF 480 ppm)

Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	Cl- Area	Cl- (mg/L)	NO_2^--N Area	NO_2^--N (mg/L)	NO_3^--N Area	NO_3^--N (mg/L)	PO4-P Absorb.	PO4-P mg/l
				Feedstock		6994915305	267.2	0	0.0	6898590	0.9	0.366	11.46
				RR Decant		6143498102	234.7	0	0.0	152448200	3.4	0.057	2.06
A1	0	0	0	End of Feeding	2 hr	6342217404	242.3	0	0.0	16135853	1.1	0.889	27.39
				End of Anaerobic	4 hr	6314295331	241.3	16684479	0.4	340286209	6.5	1.067	32.80
				End of Aerobic	6 hr	6564722520	250.8	207690276	4.8	1029993807	18.1	0.195	6.26
				Extended Aeration	(4hr)	6360877548	243.0	28977091	0.7	1665166248	28.8	0.107	3.58
				End of Settling	8 hr	6442995920	246.2	0	0.0	1774355893	30.7	0.026	1.11
A2	0	0	0	End of Feeding	2 hr	6295388362	240.5	0	0.0	7701686	0.9	1.129	34.69
				End of Anaerobic	4 hr	6281276851	240.0	0	0.0	5558668	0.9	1.265	38.83
				End of Aerobic	6 hr	6463991289	247.0	224767195	5.2	756122193	13.5	0.324	10.19
				End of Settling	8 hr	6324538637	241.6	200313133	4.6	776512216	13.9	0.145	4.74
A3	0	0	0	End of Feeding	2 hr	6404002120	244.7	0	0.0	4154920	0.9	1.041	32.01
				End of Anaerobic	4 hr	6377294440	243.7	0	0.0	17260157	1.1	1.164	35.76
				End of Aerobic	6 hr	6441725036	246.1	188674712	4.3	725441683	13.0	0.071	2.48
				End of Settling	8 hr	6553391763	250.4	185443858	4.3	844270868	15.0	0.095	3.21
B1	480	3000	300	End of Feeding	2 hr	463427330	215.8	0	0.0	3630164	0.8	1.533	46.99
				End of Anaerobic	4 hr	438079340	204.2	0	0.0	2413048	0.8	1.726	52.87
				End of Aerobic	6 hr	513179469	238.6	6113100	0.1	17456452	13.0	1.098	33.75
				Extended Aeration	(4hr)	462727593	215.5	6404243	0.1	36280666	16.8	0.914	28.15
				End of Settling	8 hr	450324509	209.8	5303037	0.1	37543352	17.0	0.951	29.27
B2	480	3000	300	End of Feeding	2 hr	452867340	211.0	0	0.0	3064266	0.8	1.121	34.45
				End of Anaerobic	4 hr	449852557	209.6	0	0.0	3821042	0.8	0.781	24.10
				End of Aerobic	6 hr	459282056	213.9	9635275	0.2	10084217	11.5	0.754	23.28
				End of Settling	8 hr	459889036	214.2	5272664	0.1	8990648	11.2	0.797	24.59
B3	480	3000	300	End of Feeding	2 hr	456854052	212.8	0	0.0	5131448	0.9	1.247	38.28
				End of Anaerobic	4 hr	438048021	204.2	1322995	0.0	2745177	0.8	1.195	36.70
				End of Aerobic	6 hr	453387705	211.2	6628273	0.2	15231488	12.5	0.635	19.65
				End of Settling	8 hr	475054249	221.1	11525301	0.3	22687303	14.0	1.317	40.42
				stand 2		2509698171	96.07	434368072	9.96	503394837	9.26		
				Stand 3		5262303226	201.1	908908419	20.8	1109913718	19.5		
				stand 4		7839759641	299.5	1.693E+09	38.8	2358731472	40.5		
				Standards used									
				STD 1		2484184	0	0	0	71633	0	0.163	5
				STD 2		2578366836	100	442549719	10	510852474	10	0.628	20
				STD 3		5272237045	200	913151766	20	1106408486	20	1.149	35
				STD 4		7838874180	300	1.722E+09	40	2352579746	40	1.631	50

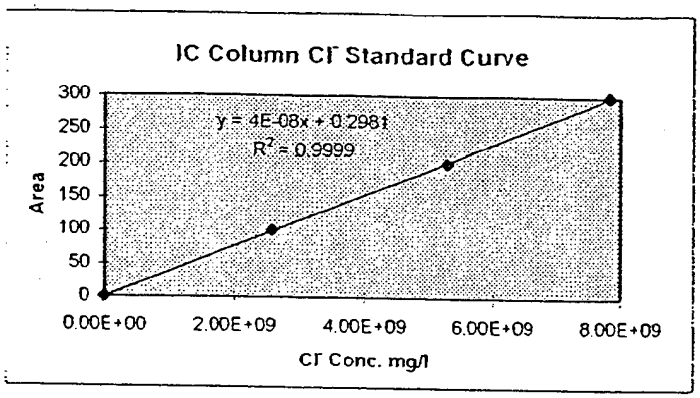
File: AFFF Inhib (24-11-97).xls
Sheet: Standards & Data

US00001165

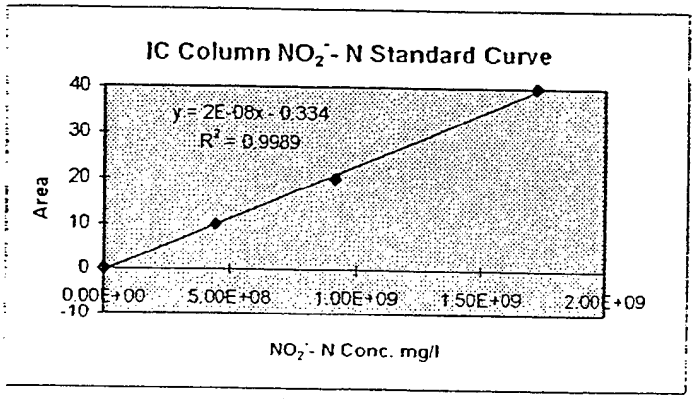
Reactor	AFFF (ppm)	H_2O_2 mg/l	Fe^{3+} mg/l	Stage	Time	Cl- Area	Cl- (mg/L)	NO_2^--N Area	NO_2^--N (mg/L)	NO_3^--N Area	NO_3^--N (mg/L)	PO4-P Absorb.	PO4-P mg/l
				Feedstock		6994915305	267.2	0	0.0	6898590	0.9	0.366	11.46
				RR Decant		6143498102	234.7	0	0.0	152448200	3.4	0.057	2.06
A1	0	0	0	End of Feeding	2 hr	6342217404	242.3	0	0.0	16135853	1.1	0.889	27.39
				End of Anaerobic	4 hr	6314295331	241.3	16684479	0.4	340286209	6.5	1.067	32.80
				End of Aerobic	6 hr	6564722520	250.8	207690276	4.8	1029993807	18.1	0.195	6.26
				Extended Aeration	(4hr)	6360877548	243.0	28977091	0.7	1665166248	28.8	0.107	3.58
				End of Settling	8 hr	6442995920	246.2	0	0.0	1774355893	30.7	0.026	1.11
A2	0	0	0	End of Feeding	2 hr	6295388362	240.5	0	0.0	7701686	0.9	1.129	34.69
				End of Anaerobic	4 hr	6281276851	240.0	0	0.0	5558668	0.9	1.265	38.83
				End of Aerobic	6 hr	6463991289	247.0	224767195	5.2	756122193	13.5	0.324	10.19
				End of Settling	8 hr	6324538637	241.6	200313133	4.6	776512216	13.9	0.145	4.74
A3	0	0	0	End of Feeding	2 hr	6404002120	244.7	0	0.0	4154920	0.9	1.041	32.01
				End of Anaerobic	4 hr	6377294440	243.7	0	0.0	17260157	1.1	1.164	35.76
				End of Aerobic	6 hr	6441725036	246.1	188674712	4.3	725441683	13.0	0.071	2.48
				End of Settling	8 hr	6553391763	250.4	185443858	4.3	844270868	15.0	0.095	3.21
B1	480	3000	300	End of Feeding	2 hr	463427330	215.8	0	0.0	3630164	0.8	1.533	46.99
				End of Anaerobic	4 hr	438079340	204.2	0	0.0	2413048	0.8	1.726	52.87
				End of Aerobic	6 hr	513179469	238.6	6113100	0.1	17456452	13.0	1.098	33.75
				Extended Aeration	(4hr)	462727593	215.5	6404243	0.1	36280666	16.8	0.914	28.15
				End of Settling	8 hr	450324509	209.8	5303037	0.1	37543352	17.0	0.951	29.27
B2	480	3000	300	End of Feeding	2 hr	452867340	211.0	0	0.0	3064266	0.8	1.121	34.45
				End of Anaerobic	4 hr	449852557	209.6	0	0.0	3821042	0.8	0.781	24.10
				End of Aerobic	6 hr	459282056	213.9	9635275	0.2	10084217	11.5	0.754	23.28
				End of Settling	8 hr	459889036	214.2	5272664	0.1	8990648	11.2	0.797	24.59
B3	480	3000	300	End of Feeding	2 hr	456854052	212.8	0	0.0	5131448	0.9	1.247	38.28
				End of Anaerobic	4 hr	438048021	204.2	1322995	0.0	2745177	0.8	1.195	36.70
				End of Aerobic	6 hr	453387705	211.2	6628273	0.2	15231488	12.5	0.635	19.65
				End of Settling	8 hr	475054249	221.1	11525301	0.3	22687303	14.0	1.317	40.42
				stand 2		2509698171	96.07	434368072	9.96	503394837	9.26		
				Stand 3		5262303226	201.1	908908419	20.8	1109913718	19.5		
				stand 4		7839759641	299.5	1.693E+09	38.8	2358731472	40.5		
				Standards used									
				STD 1		2484184	0	0	0	71633	0	0.163	5
				STD 2		2578366836	100	442549719	10	510852474	10	0.628	20
				STD 3		5272237045	200	913151766	20	1106408486	20	1.149	35
				STD 4		7838874180	300	1.722E+09	40	2352579746	40	1.631	50

File: AFFF Inhib (24-11-97).xls
Sheet: Standards & Data

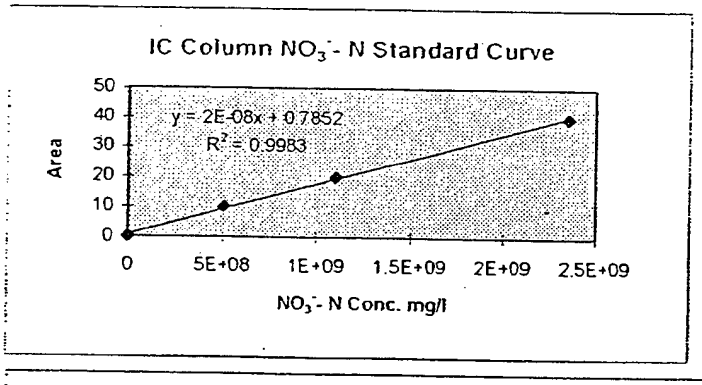
US00001166



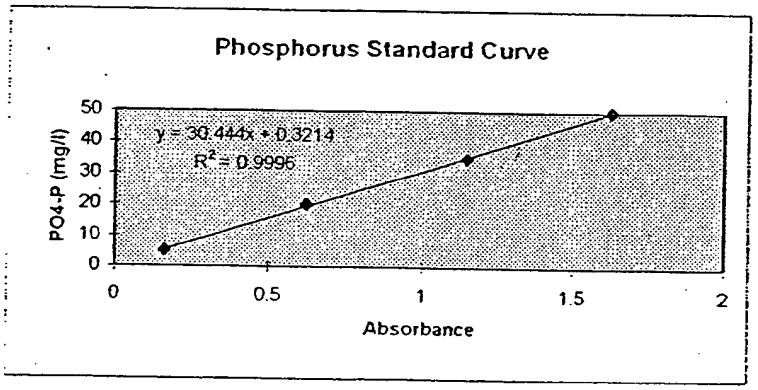
m = 4.00E-08
i = 2.98E-01



m = 2.00E-08
i = -3.34E-01



m = 2.00E-08
i = 7.85E-01



File: AFFF Inhib (24-11-97).xls
Sheet: Standards & Data

US00001167

SUMMARY OUTPUT

CL

Regression Statistics	
R Square	0.999911804
Observations	4

	Coefficients	*tandard Error*
Intercept	0.298112729	1.24079601
X Variable 1	3.81601E-08	2.5342E-10

SUMMARY OUTPUT

NO2-N

Regression Statistics	
R Square	0.996872207
Observations	4

	Coefficients	*tandard Error*
Intercept	0	0.55036653
X Variable 1	2.29215E-08	5.5073E-10

SUMMARY OUTPUT

NO3-N

Regression Statistics	
R Square	0.998291554
Observations	4

	Coefficients	*tandard Error*
Intercept	0.785241086	0.65262939
X Variable 1	1.68414E-08	4.9265E-10

SUMMARY OUTPUT

PO4-P

Regression Statistics	
R Square	0.999568534
Observations	4

	Coefficients	*tandard Error*
Intercept	0.32137639	0.46914916
X Variable 1	30.44371169	0.44724934

File: AFFF Inhib (24-11-97).xls
Sheet: Standards & Data

US00001168

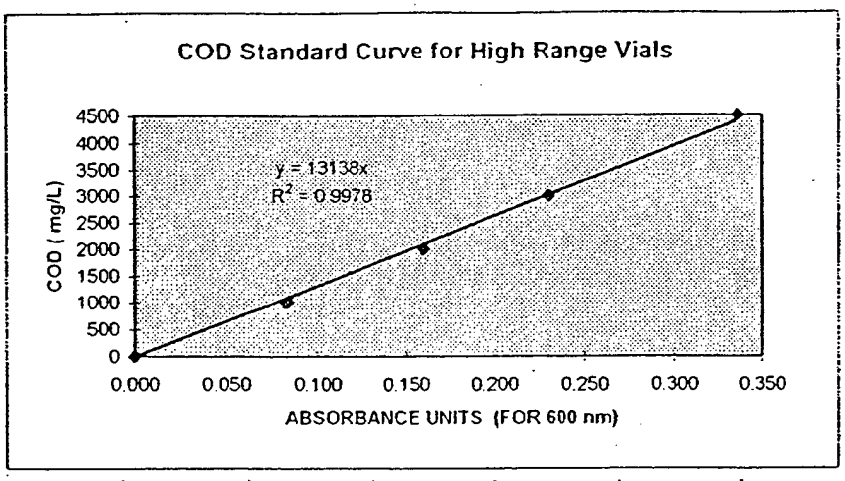
Date of Test: 3-25-97 COD Concentration and % Removal AFFF Conc. = 60 ppm

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	COD ABS	COD (mg/L)	COD % COD Removal
				Feedstock		0.079	1037.9	
				RR Decant		0.001	13.1	
A1	0	0	0	End of Feeding	2 hr	0.006	78.8	77.2
				End of Anaerobic	4 hr	0.006	78.8	77.2
				End of Aerobic	6 hr	0.004	52.6	84.8
				Extended Aeration	(4hr)	0.001	13.1	96.2
				End of Settling	8 hr	0.002	26.3	92.4
A2	0	0	0	End of Feeding	2 hr	0.017	223.3	35.4
				End of Anaerobic	4 hr	0.004	52.6	84.8
				End of Aerobic	6 hr	0.004	52.6	84.8
				End of Settling	8 hr	0.003	39.4	88.6
A3	0	0	0	End of Feeding	2 hr	0.008	105.1	69.6
				End of Anaerobic	4 hr	0.004	52.6	84.8
				End of Aerobic	6 hr	0.001	13.1	96.2
				End of Settling	8 hr	0.001	13.1	96.2
B1	480	3000	300	End of Feeding	2 hr	0.232	3048.0	9.1
				End of Anaerobic	4 hr	0.217	2850.9	15.0
				End of Aerobic	6 hr	0.202	2653.9	20.8
				Extended Aeration	(4hr)	0.195	2561.9	23.6
				End of Settling	8 hr	0.196	2575.0	23.2
B2	480	3000	300	End of Feeding	2 hr	0.240	3153.1	5.9
				End of Anaerobic	4 hr	0.219	2877.2	14.2
				End of Aerobic	6 hr	0.210	2759.0	17.7
				End of Settling	8 hr	0.204	2680.2	20.0
B3	480	3000	300	End of Feeding	2 hr	0.220	2890.4	13.8
				End of Anaerobic	4 hr	0.220	2890.4	13.8
				End of Aerobic	6 hr	0.221	2903.5	13.4
				End of Settling	8 hr	0.206	2706.4	19.3
				STD 1		0.000	0	
				STD 2		0.083	1000	
				STD 3		0.160	2000	
				STD 4		0.230	3000	
				STD 5		0.336	4500	
				FS (Filtered)**		0.079	1037.9	
				FS Average**		0.079	1037.9	
				RRSU(Filtered)**		0.001	13.1	
				RRSU Average**		0.001	13.1	

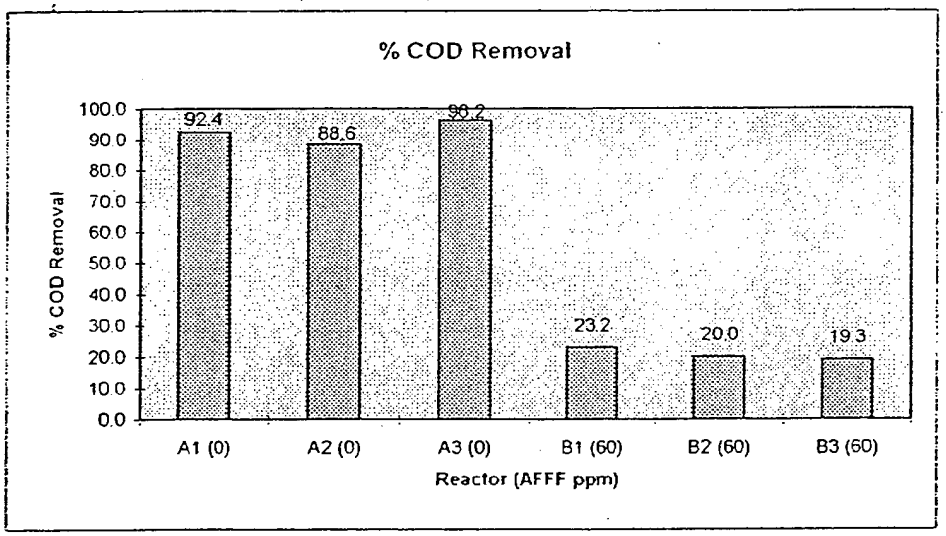
* The values of "COD % Removal" shown in table and chart above are accumulative figures based on the initial COD concentration at time 0 hr.

File: AFFF Inhib (24-11-97).xls
Sheet: COD

US00001169



Reactor (AFFF ppm)	A1 (0)	A2 (0)	A3 (0)	B1 (60)	B2 (60)	B3 (60)
% COD Removal	92.4	88.6	96.2	23.2	20.0	19.3



File: AFFF Inhib (24-11-97).xls
Sheet: COD

m = 13138
i = 0

Fentons Pretreatment

For - AFFF ppm	480 Reactor 1	480 Reactor 2	480 Reactor 3
Tap water	1250 ml	1250 ml	1250 ml
Actual AFFF ppm	1200	1200	1200
	40 ml	40 ml	40 ml
H202, 3000*2.5 mg/l	7500 mg/l	7500 mg/l	7500mg/l
Fe3+ 300*2.5	750 mg/l	750 mg/l	750 mg/l
FeSO4 (3times)	3723.28 mg/l	3723.28 mg/l	3723.28 mg/l

Initial COD

	Dilution Factor	Absorbance	COD mg/l	Actual COD
AFFF - 480 ppm	33%	0.334	4388.1	13164.276

COD after 24 hr reaction period between fentons reagent and AFFF

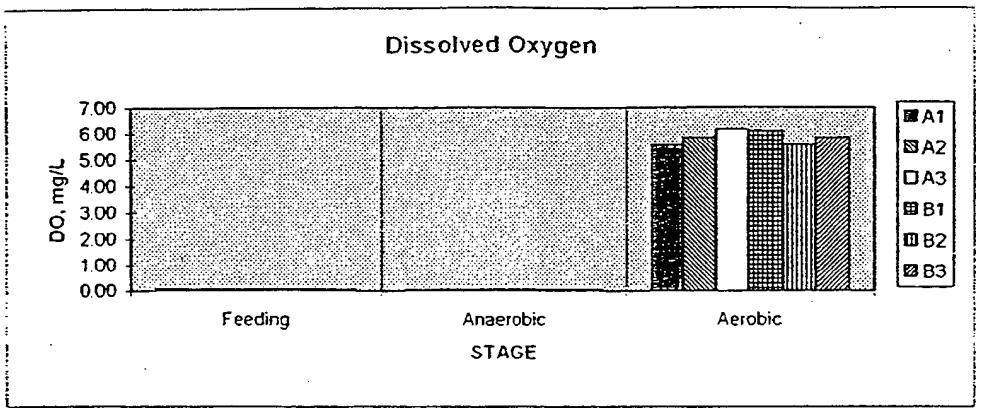
	Dilution Factor	Absorbance	COD mg/l	Actual COD
	50%	0.343	4506.3	9012.668

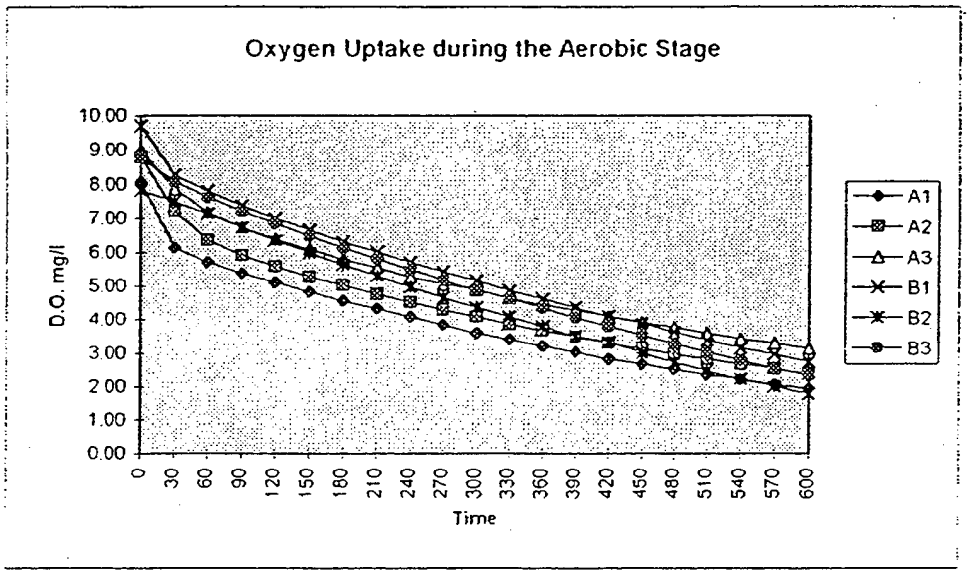
% COD Removal 31.54

Initial COD at Time 0 hr.

Sample	Constituent	Vol (L)	COD mg/L	
Controls	RR Decant	4	13.1	
(A1,A2&A3)	Feedstock	2	1037.9	2075.804
	AFFF	0	0	0
	Total	6		346.0
Inhibition	RR Decant	4	13.1	13.1
(B1,B2&B3)	Feedstock	2	1037.9	2075.804
Fentons treated AFFF		2	9012	18024
	Total	6		3352.2

File: AFFF Inhib (24-11-97).xls
Sheet: COD





File: AFFF Inhib (24-11-97).xls
Sheet: Oxygen Uptake

	Dissolved Oxygen (mg/L) at various stages					
Stage	A1	A2	A3	B1	B2	B3
Feeding	0.11	0.09	0.09	0.09	0.08	0.10
Anaerobic	0.07	0.08	0.09	0.09	0.10	0.09
Aerobic	5.58	5.84	6.17	6.10	5.57	5.85

		Dissolved Oxygen in mg/L					
Stage	Time (sec)	A1	A2	A3	B1	B2	B3
Aerobic	0	8.06	8.80	8.99	9.71	7.82	8.78
	30	6.14	7.21	7.88	8.27	7.50	8.08
	60	5.70	6.36	7.17	7.80	7.12	7.63
	90	5.36	5.91	6.72	7.37	6.73	7.22
	120	5.11	5.58	6.39	7.01	6.34	6.84
	150	4.82	5.27	6.09	6.65	5.98	6.48
	180	4.55	5.01	5.79	6.31	5.63	6.13
	210	4.32	4.76	5.54	6.01	5.30	5.80
	240	4.07	4.51	5.27	5.69	4.97	5.49
	270	3.83	4.28	5.06	5.42	4.66	5.18
	300	3.59	4.07	4.88	5.15	4.36	4.88
	330	3.40	3.85	4.64	4.86	4.08	4.61
	360	3.20	3.66	4.45	4.61	3.80	4.33
	390	3.03	3.47	4.27	4.36	3.51	4.05
	420	2.83	3.30	4.09	4.09	3.32	3.79
	450	2.66	3.13	3.92	3.86	2.99	3.52
	480	2.51	2.97	3.77	3.62	2.72	3.27
	510	2.36	2.82	3.59	3.38	2.47	3.03
	540	2.21	2.66	3.42	3.16	2.23	2.78
	570	2.08	2.52	3.29	2.96	2.00	2.55
	600	1.94	2.37	3.14	2.74	1.77	2.33

File: AFFF Inhib (24-11-97).xls
Sheet: Dissolved Oxygen

Reactor	AFFF (ppm)	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Concentration, mg/L TKN	NH3-N	Org. N	NO2-N	NO3-N	Total N	Cl-	PO4-P
				Feedstock		39.2	23.3	15.9	0.0	0.9	40.1	267.2	11.5
				RR Decant		1.5	0.2	1.3	0.0	3.4	4.8	234.7	2.1
A1	0	0	0	End of Feeding	2 hr	15.3	18.3	-3.1	0.0	1.1	16.3	242.3	27.4
				End of Anaerobic	4 hr	18.1	20.8	-2.7	0.4	6.5	25.0	241.3	32.8
				End of Aerobic	6 hr	3.7	7.1	-3.4	4.8	18.1	26.6	250.8	6.3
				Extended Aeration	(4hr)	0.7	0.2	0.5	0.7	28.8	30.2	243.0	3.6
				End of Settling	8 hr	2.1	0.1	2.1	0.0	30.7	32.8	246.2	1.1
A2	0	0	0	End of Feeding	2 hr	14.4	17.6	-3.2	0.0	0.9	15.3	240.5	34.7
				End of Anaerobic	4 hr	15.2	20.0	-4.8	0.0	0.9	16.1	240.0	38.8
				End of Aerobic	6 hr	2.4	8.3	-5.9	5.2	13.5	21.1	247.0	10.2
				End of Settling	8 hr	5.3	5.8	-0.4	4.6	13.9	23.8	241.6	4.7
A3	0	0	0	End of Feeding	2 hr	14.4	17.6	-3.2	0.0	0.9	15.3	244.7	32.0
				End of Anaerobic	4 hr	15.2	20.0	-4.8	0.0	1.1	16.3	243.7	35.8
				End of Aerobic	6 hr	3.9	9.4	-5.5	4.3	13.0	21.2	246.1	2.5
				End of Settling	8 hr	5.7	6.2	-0.6	4.3	15.0	24.9	250.4	3.2
B1	480	3000	300	End of Feeding	2 hr	13.6	15.0	-1.4	0.0	0.8	14.4	215.8	47.0
				End of Anaerobic	4 hr	13.5	16.4	-2.9	0.0	0.8	14.4	204.2	52.9
				End of Aerobic	6 hr	11.8	14.6	-2.8	0.1	13.0	24.9	238.6	33.7
				Extended Aeration	(4hr)	12.5	10.1	2.4	0.1	16.8	29.4	215.5	28.1
				End of Settling	8 hr	9.0	6.8	2.3	0.1	17.0	26.1	209.8	29.3
B2	480	3000	300	End of Feeding	2 hr	12.8	15.0	-2.2	0.0	0.8	13.6	211.0	34.4
				End of Anaerobic	4 hr	13.5	16.4	-2.9	0.0	0.8	14.4	209.6	24.1
				End of Aerobic	6 hr	12.5	14.6	-2.1	0.2	11.5	24.2	213.9	23.3
				End of Settling	8 hr	16.1	9.3	6.8	0.1	11.2	27.5	214.2	24.6
B3	480	3000	300	End of Feeding	2 hr	13.6	14.4	-0.8	0.0	0.9	14.5	212.8	38.3
				End of Anaerobic	4 hr	15.2	15.8	-0.6	0.0	0.8	16.1	204.2	36.7
				End of Aerobic	6 hr	11.1	15.1	-4.0	0.2	12.5	23.8	211.2	19.7
				End of Settling	8 hr	12.8	9.7	3.1	0.3	14.0	27.1	221.1	40.4

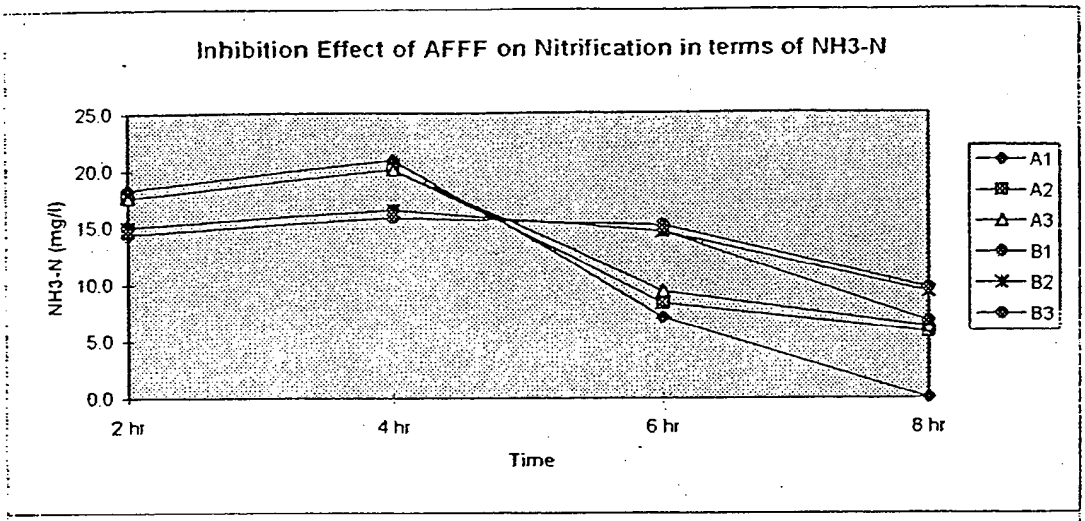
File: AFFF Inhib (24-11-97).xls
Sheet: Concentrations Table

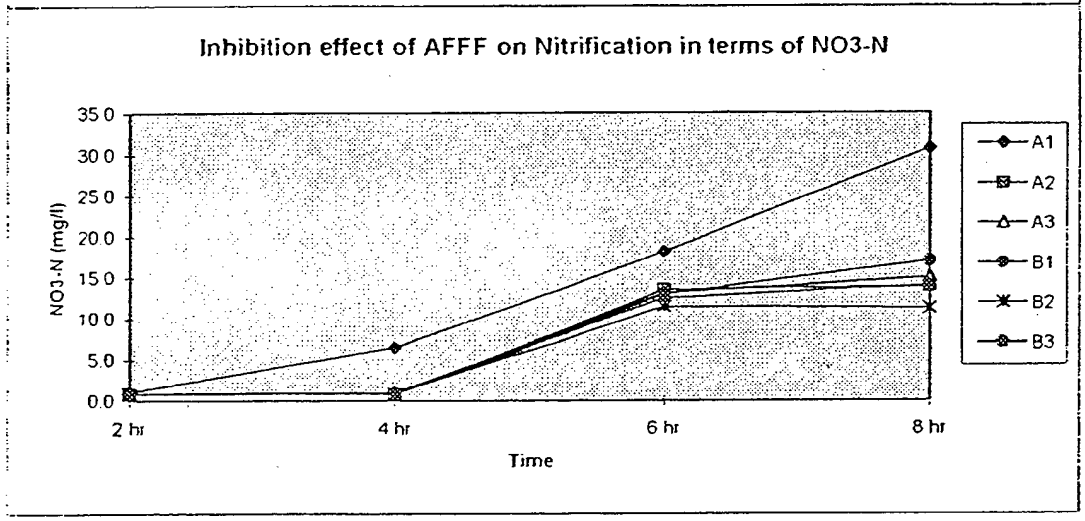
US00001174

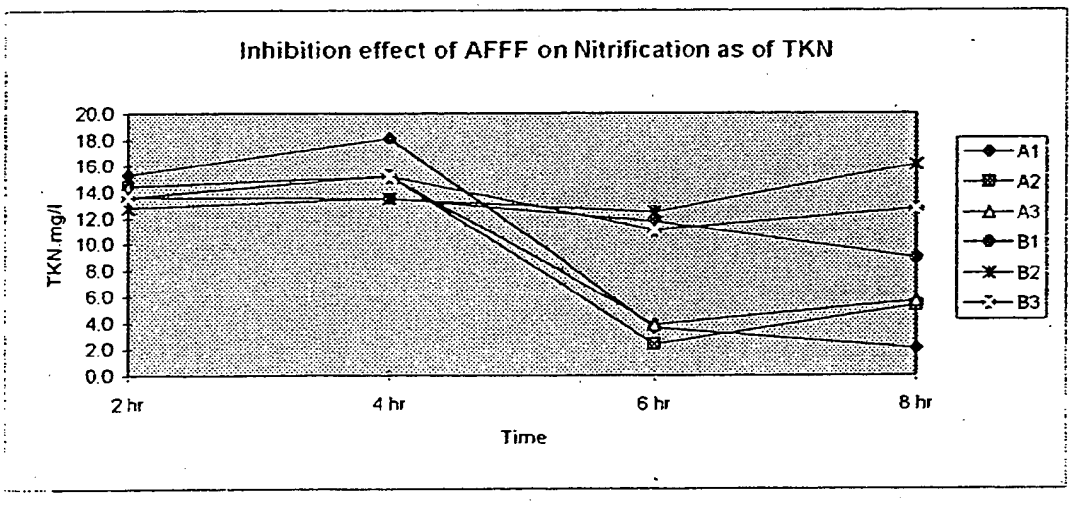
Reactor	H2O2 mg/l	Fe3+ mg/l	AFFF (ppm)	Stage	Time	Concentration, mg/L BOD	COD	TOC	Alkalinity HCO3 (mg/l)
				Feedstock			1037.9	403.3	510.0
				RR Decant			13.1	12.7	300.0
A1	0	0	0	End of Feeding	2 hr		78.8	15.9	533.0
				End of Anaerobic	4 hr		78.8	16.3	557.0
				End of Aerobic	6 hr		52.6	14.5	371.0
				Extended Aeration	(4hr)		13.1	13.7	273.0
				End of Settling	8 hr		26.3	14.6	267.0
A2	0	0	0	End of Feeding	2 hr		223.3	15.5	520.0
				End of Anaerobic	4 hr		52.6	16.3	547.0
				End of Aerobic	6 hr		52.6	14.1	407.0
				End of Settling	8 hr		39.4	14.1	367.0
A3	0	0	0	End of Feeding	2 hr		105.1	16.0	527.0
				End of Anaerobic	4 hr		52.6	15.7	521.0
				End of Aerobic	6 hr		13.1	13.9	397.0
				End of Settling	8 hr		13.1	13.9	373.0
B1	3000	300	480	End of Feeding	2 hr		3048.0	854.6	577.0
				End of Anaerobic	4 hr		2850.9	793.3	548.0
				End of Aerobic	6 hr		2653.9	807.1	567.0
				Extended Aeration	(4hr)		2561.9	830.8	504.0
				End of Settling	8 hr		2575.0	828.2	477.0
B2	3000	300	480	End of Feeding	2 hr		3153.1	786.8	593.0
				End of Anaerobic	4 hr		2877.2	823.7	564.0
				End of Aerobic	6 hr		2759.0	797.4	550.0
				End of Settling	8 hr		2680.2	834.5	534.0
B3	3000	300	480	End of Feeding	2 hr		2890.4	802.0	577.0
				End of Anaerobic	4 hr		2890.4	805.4	542.0
				End of Aerobic	6 hr		2896.0	787.0	555
				End of Settling	8 hr		2694.3	832.8	620
				FS1				395.1	
				FS2				411.0	
				FS3				403.8	
				FS Avarage				403.3	
				RRSU1				13.5	
				RRSU2				12.6	
				RRSU3				12.1	
				RRSU Avarage				12.71	

File: AFFF Inhib (24-11-97).xls
Sheet: Concentrations Table

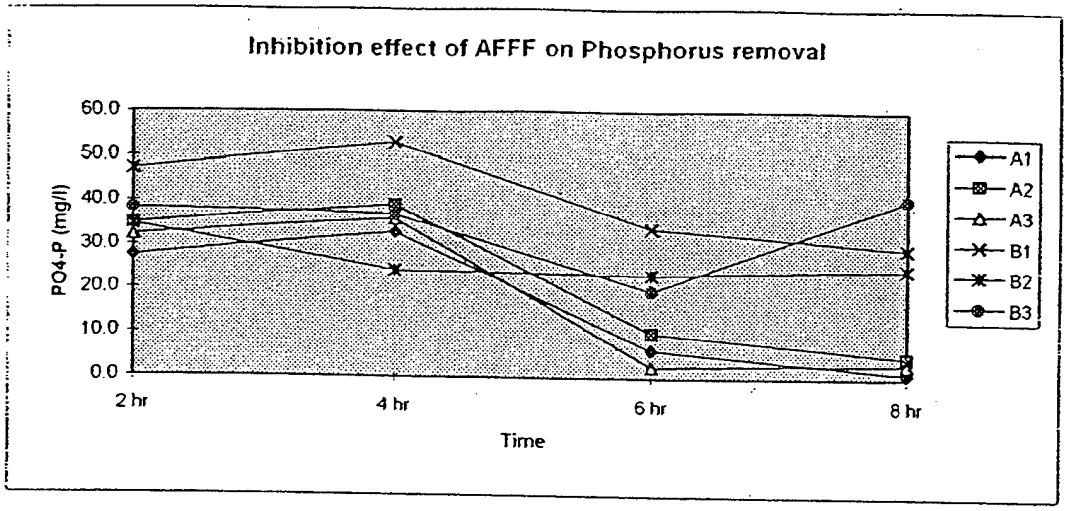
US00001175



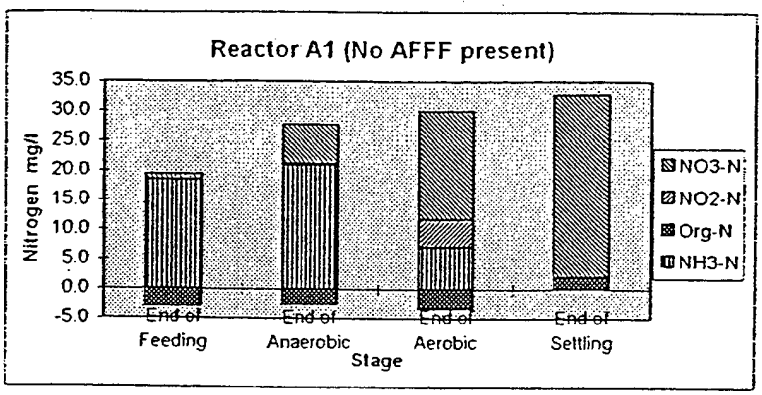


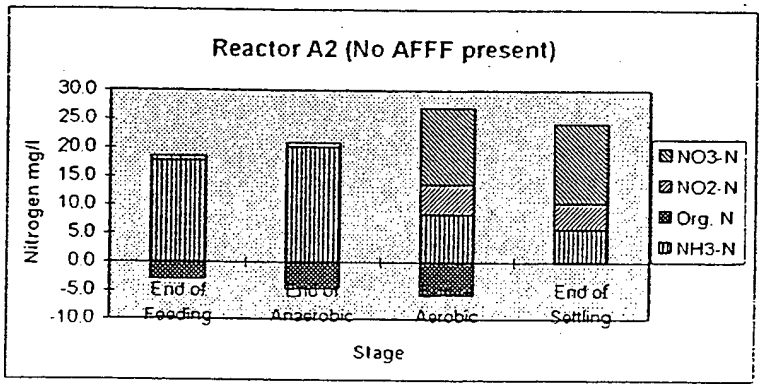


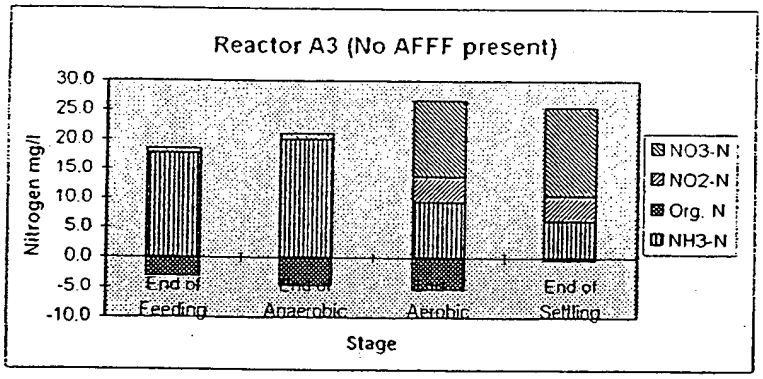
File: AFFF Inhib (24-11-97).xls
Sheet: NH3-N & TKN Charts



File: AFFF Inhib (24-11-97).xls
Sheet: NH3-N & TKN Charts

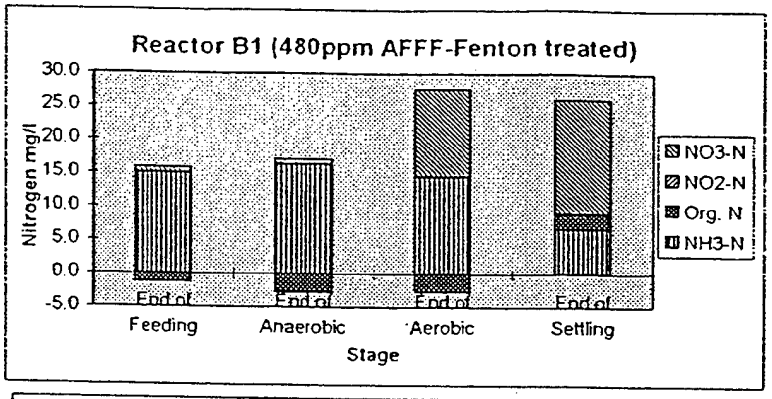


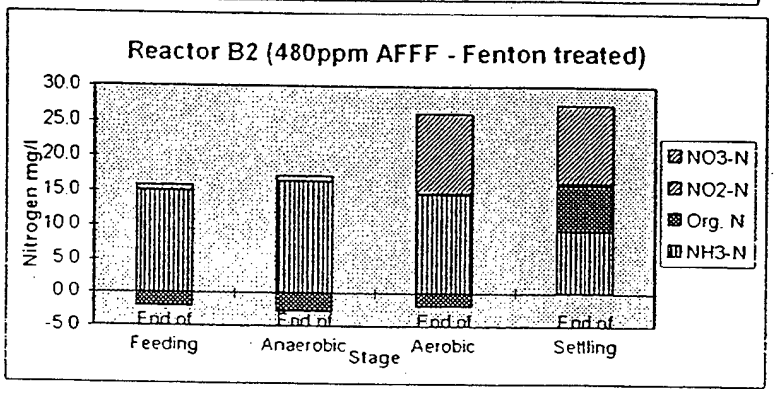


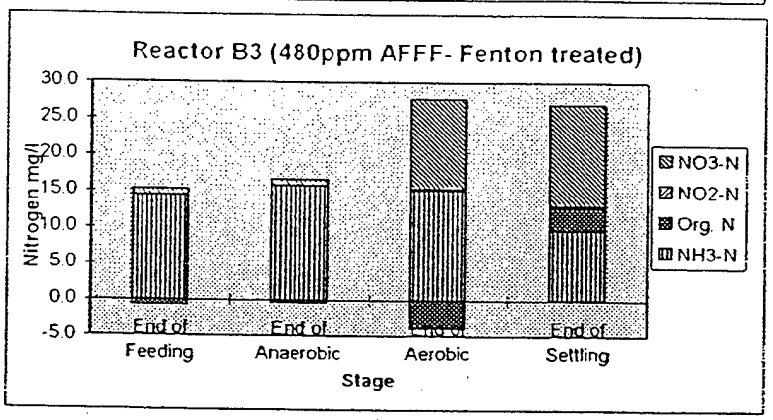


File: AFFF Inhib (24-11-97).xls
Sheet: Nitrogen Mass Balance

US00001178

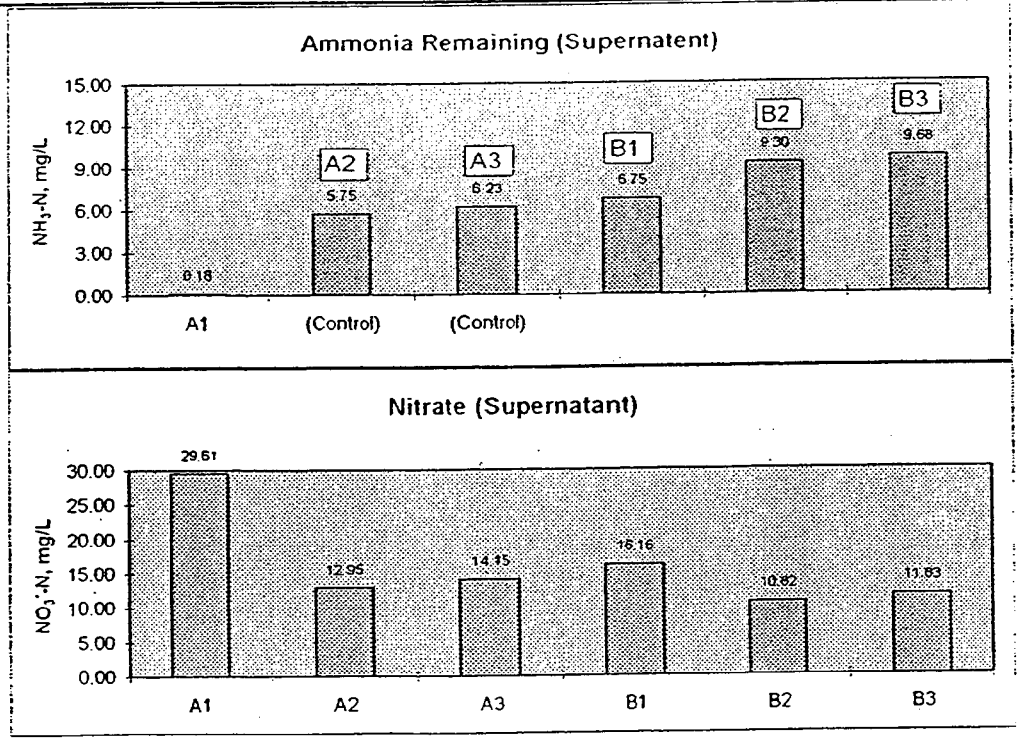






File: AFFF Inhib (24-11-97).xls
Sheet: Nitrogen Mass Balance

Reactor	AFFF ppm	H2O2 mg/l	Fe3+ mg/l	Stage	Time	Nitrogen Concentration, mg/L NH3-N	NO3--N	NO2--N	Δ(NO_3^--N)
A1 (Control)	0	0	0	End of Feeding	2 hr	18.34	1.1	0.0	
				End of Anaerobic	4 hr	20.83	6.5	0.4	
				End of Aerobic	6 hr	7.09	18.1	4.8	
				Extended Aeration	(4hr)	0.18	28.8	0.7	
				End of Settling	8 hr	0.05	30.7	0.0	29.61
A2 (Control)	0	0	0	End of Feeding	2 hr	17.62	0.9	0.0	
				End of Anaerobic	4 hr	20.02	0.9	0.0	
				End of Aerobic	6 hr	8.32	13.5	5.2	
				End of Settling	8 hr	5.75	13.9	4.6	12.95
A3 (Control)	0	0	0	End of Feeding	2 hr	17.62	0.9	0.0	
				End of Anaerobic	4 hr	20.02	1.1	0.0	
				End of Aerobic	6 hr	9.38	13.0	4.3	
				End of Settling	8 hr	6.23	15.0	4.3	14.15
B1	480	3000	300	End of Feeding	2 hr	15.00	0.8	0.0	
				End of Anaerobic	4 hr	16.40	0.8	0.0	
				End of Aerobic	6 hr	14.55	13.0	0.1	
				Extended Aeration	(4hr)	10.08	16.8	0.1	
				End of Settling	8 hr	6.75	17.0	0.1	16.16
B2	480	3000	300	End of Feeding	2 hr	15.00	0.8	0.0	
				End of Anaerobic	4 hr	16.40	0.8	0.0	
				End of Aerobic	6 hr	14.55	11.5	0.2	
				End of Settling	8 hr	9.30	11.2	0.1	10.62
B3	480	3000	300	End of Feeding	2 hr	14.41	0.9	0.0	
				End of Anaerobic	4 hr	15.76	0.8	0.0	
				End of Aerobic	6 hr	15.14	12.50	0.20	
				End of Settling	8 hr	9.68	14.01	0.30	11.63



File: AFFF Inhib (24-11-97).xls
Sheet: NO3- & NO2 Produced

BNR Inhibition Tests - 480 ppm AFFF Pretreated with Fenton's Reagent (Nov/24/97)

TSS Reactor	Initial wt	Final wt	Volume	MLSS	WT @ 550 C	MLVSS
A1	1.0988	1.1388	15	2667	1.1022	2440
A2	1.0995	1.1384	15	2593	1.1022	2413
A3	1.0993	1.1381	15	2587	1.1024	2380
B1	1.1159	1.1482	15	2153	1.1193	1927
B2	1.1194	1.1546	15	2347	1.1235	2073
B3	1.1116	1.149	15	2493	1.1152	2253

TDS Reactor	Initial wt	Final wt	Volume	TDS
A1	0.9889	1.005	15	1073
A2	1.0009	1.017	15	1073
A3	0.9991	1.0157	15	1107
B1	1.0209	1.0734	15	3500
B2	1.0178	1.0777	15	3993
B3	1.0233	1.066	15	2847

TS Reactor	Initial wt	Final wt	Volume	TS	ΣTSS,TDS
A1	1.0086	1.0599	15	3420	3740
A2	1.0147	1.0656	15	3393	3667
A3	1.0096	1.0618	15	3480	3693
B1	1.0182	1.1181	15	6660	5653
B2	1.0234	1.1296	15	7080	6340
B3	1.0263	1.1265	15	6680	5340

File: AFFF Soilds Data

US00001181

APPENDIX D-1

BNR Inhibition Pass-Through Acute Toxicity Test Results

60 ppm AFFF Pretreated with Defoamer 8710

US00001182

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1351
9/28/97 2300 Sample No. JRA97-10760

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001184

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	85	80	55	30
12.5	20	0	5	5
25.0	0	0	20	5
50.0	0	0	5	0
100	0	0	0	0
48-h LC50:	8.1%		3.5%	
95% Confidence Limits:	N/A		0.19-6.04	
Calculation Method:	Trimmed Spearman-Karber		Probit	
Toxic Units (T.U.):	12.35		28.57	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	9/30/97 1045	9/30/97 1050
Test End:	10/2/97 1115	10/2/97 1100
Organism Source:	CBI stock cultures	CBI stock cultures
Hatch/harvest Date:	9/30/97	9/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.5-20.7°C	19.5-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Although D.O. concentration decreased to less than 4.0 mg/l in higher effluent concentrations, the drop was unanticipated and probably caused by a bacterial bloom (solutions turned milky color overnight). Low D.O. was not primary cause of toxicity as indicated by low survival in concentrations with adequate D.O. concentration.

US00001185

ODU/OCEANA Sample I.D. Feed
9/28/97 Sample 97-10760 Test ID: JRA97109

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
9/28/97 2300	9/30/97 1045/1050[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	4.2 (—)	20.9 (—)	20.8 (—)
Salinity (g/kg)	N/A	20 (—)	20 (—)
Conductivity (uMHOS/cm)	2080 (—)	N/A	N/A
pH	7.01 (—)	7.09 (—)	7.90 (—)
Dissolved Oxygen (mg/l)	11.2 (—)	7.9 (—)	8.0 (—)
Total Hardness (mg/l as $CaCO_3$)	129 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	399 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	36 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001186

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.6 (0.3)	20.6 (0.3)	20.6 (0.2)	20.9 (0.1)	20.9 (0.1)	20.9 (0.1)
D.O. (mg/l)	7.8 (0.3)	6.4 (1.6)	6.2 (1.6)	5.4 (3.6)	5.0 (4.1)	4.6 (4.7)
pH	7.71 (0.17)	7.61 (0.15)	7.66 (0.16)	7.73 (0.39)	7.64 (0.55)	7.58 (0.69)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.6)	20.4 (0.6)	20.4 (0.5)	20.4 (0.5)	20.5 (0.5)	20.8 (0.1)
D.O. (mg/l)	7.8 (0.2)	6.3 (1.8)	6.3 (1.7)	5.3 (3.1)	4.5 (3.2)	5.2 (3.9)
pH	7.84 (0.09)	7.55 (0.20)	7.57 (0.16)	7.53 (0.15)	7.60 (0.34)	7.45 (0.50)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

Coastal Bioanalysts Inc.

III. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	9/16/97-9/18/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	651.8 mg/l (605.9-701.2)
Control Chart LC50 (95% C.L.):	611.0 mg/l (483.0-739.0)

***C. variegatus* - Acute**	CBI Stock Cultures
Reference Test Dates:	9/16/97-9/18/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1174.3 mg/l (1048.0-1315.9)
Control Chart LC50 (95% C.L.):	1063.1 mg/l (901.6-1224.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		

US00001189

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	16	100
	C-2	10	16	
6.25	1-1	9	9	80
	1-2	8	7	
12.5	2-1	9	0	0
	2-2	6	6	
25	3-1	0	0	0
	3-2	0	0	
50	4-1	6	0	0
	4-2	6	6	
100	5-1	0	0	0
	5-2	0	0	
Observer:		C.H	C.H	
Time:		1215	1115	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.1	20.2
	1	20.8	20.6	20.5
	2	20.7	20.7	20.5
	3	20.8	20.9	—
	4	20.9	20.9	—
	5	20.9	20.8	—
pH	C	7.90	7.68	7.54
	1	7.78	7.49	7.57
	2	7.68	7.81	7.49
	3	7.45	8.00	—
	4	7.25	8.03	—
	5	8.09	8.06	—
D.O. (mg/l)	C	8.0	7.8	7.5
	1	8.0	6.3	4.9
	2	7.9	6.0	4.7
	3	7.9	2.8	—
	4	7.9	2.1	—
	5	7.9	1.2	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	—
	4	20	20	—
	5	20	20	—
Replicate # above meas.		2	1	1
Initials:		PB	PB	C.H

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 9/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 1-23

SET UP: Date 9/30/97 Time Water Added 1030

Time Animals Added 1045 Set Up By PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaspH2 Meter (852360)
- ☐ YSI SCT 33 Meter (HB016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Small treated milky colony by Day 1. C.H.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ↓ D.O. not cause of mortality (i.e. 20% 30‰ v-1 @ 12.5% 6.0 mg/L D.O.)

Signature: _____ Date: 10/8/97

TEST I.D.: JRH 971C9

US00001190

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 9/30/97 TEST NUMBER: JRA97109 DURATION: 48 H
TOXICANT : FEED #13
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	4
12.50	20	20
25.00	20	20
50.00	20	20
100.00	20	20

SPEARMAN-KARBER TRIM: 20.00%

SPEARMAN-KARBER ESTIMATES: LC50: 8.11
95% CONFIDENCE LIMITS
ARE NOT RELIABLE.

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	1	1	30
	1-2	10	5	
12.5	2-1	1	1	5
	2-2	0	0	
25	3-1	2	0	5
	3-2	2	1	
50	4-1	1	0	0
	4-2	0	0	
100	5-1	0	0	0
	5-2	0	0 *	
Observer:		GH	GH	
Time:		1245	1100	

		Day 0	Day 1	Day 2	
TEMP	C	20.8	20.6	19.7	
	1	20.7	20.7	19.8	
	2	20.7	20.7	19.8	
	3	20.8	20.6	19.9	
	4	20.5	20.6	20.0	
	5	20.9	20.7	—	
pH	C	7.90	7.87	7.74	
	1	7.78	7.39	7.98[D]	7.48 Dup.
	2	7.69	7.38	7.63	7.63 Rest.
	3	7.46	7.43	7.70	
	4	7.27	7.61	7.94	
	5	7.09	7.30	—	
D.O. (mg/l)	C	8.0	7.7	7.6	
	1	8.0	6.3	4.5	
	2	7.9	6.4	4.6	
	3	7.9	6.2	1.4	
	4	7.9	3.9[T]	1.6	
	5	7.9	2.4	—	
SALIN (g/kg)	C	20	20	20	
	1	20	20	20	
	2	20	20	20	
	3	20	20	20	
	4	20	20	20	
	5	20	20	—	
Replicate # above meas.		2	1/5	2	
Initials:		PB	PB	GH	

NOTES: Sample turned a dk gray color by Day 1 GH

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 9/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 2-1,2

SET UP: Date 9/30/97 Time Water Added 1035

Time Animals Added 1050 Set Up By PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments ↓ D.O. not conc. of mg/L (eg 5% of WWI @ 50% conc. = 9 mg/L DO) ∴ test valid

Signature 10/8/97 Date

TEST I.D.: JKA 97 109

US00001192

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97109 ACV FEED #13

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	14	0.7000	0.7000
12.5000	20	19	0.9500	0.9500
25.0000	20	19	0.9500	0.9500
50.0000	20	20	1.0000	1.0000
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 1.296
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

JRA97109 ACV FEED #13

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	0.346	0.000	1.472
LC/EC 50.00	3.467	0.192	6.041

US00001193

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDI.0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	9/28/97						
Temp (°C)	4.2						
Conduct. (uMHOS)	2080						
Salinity (g/kg)	21						
pH	7.01						
Diss. Oxygen (mg/l)	11.2						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	36						
Hard (mg/l CaCO3)	129						
Alkln (mg/l CaCO3)	399						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	9/30/97						
Temp. (°C)	20.9						
Salinity (g/kg)	20						
D.O. (mg/l)	7.9						
Aeration Rate	NA						
Aeration Time (min)	NA						
Adjust. D.O. (mg/l)	-						
pH	7.09						
Tot Chlorine (mg/l)	ND						
Initials	DB						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	9/30/97						
Temp. (°C)	20.8						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.90						
Diss. Oxygen (mg/l)	8.0						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	FB						

EFFLUENT ID: Eff 13 #13 47-10765 TEST ID: JRK 47109

US00001194

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: ODU / Ocean CODE:
CONTACT: Doug Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
(SEQ#11 2BJ)	1351	Feed 97-10763	START 9/28 STOP 11PM		G	JJ	L	8	1	Toxicity	6.71	21.9°C		DJK CSR
	1352	Mixed Lg. 97-10764	START 9/28 STOP 12PM		G	JJ	L	8	1	Toxicity (rep)	8.46	21.6°C		
	1353 A1 REV	A1 97-10765	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.99	21.8		
	1354 A2 REV	A2 97-10763	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.86	21.9		
	1355 A3 REV	A3 97-10764	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.94	22.0		
	1356 B1 REV	B1 97-10765	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	8.22	21.9		
	1357 B2 REV	B2 97-10766	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.95	21.9		

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: Sig samples were just taken out of 4°C refrigerator & brought to table lab. (10 min) then in a cooler. ops

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )		
SDWA ( )	TSCA ( )		
CWA ( )	PHOTO ( )		
CAA ( )	OTHER ( )		

samples not received <4°C analysis per Betty rec 9/29/97

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS: Arrival Temp. 5.6°C

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).*
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL: DATE:

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

US00001195

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: ODU/Ocean CODE:
CONTACT: D. Kirk
PHONE: 683/5159-6[illegible] EXT: FAX:
J.O. #: 191290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM # / SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TIMES	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED (*)
13 [illegible]	B3 -97-(0167	START	9/28	6PM	G	JJ	L	8	1	Toxicity	8.56	21.9°C		
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START								Arrival Temp. 5.4c mlc				
		STOP												
		START												
		STOP												

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	"	GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (D/H): (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

samples not rec'd 4°C
analysis as requested Betty mlc 9/29/97

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

P.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S). ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.*

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. - THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM - 3:30 PM).*

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY: Nicole Cutler-Hurst	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 9/29/97 1410
RELINQUISHED BY: [illegible]	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: [illegible]
RELINQUISHED BY: [illegible]	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: [illegible]
RELINQUISHED BY: [illegible]	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: [illegible]
RELINQUISHED BY: JM Stanlee	RECD BY: Georgi Hyde	COMPANY/COMMAND: CTL	DATE/TIME: 9/29/97 1600

Relinquished by: JM Stanlee Rec'd by: Georgi Hyde CTL 9/29/97 1600

D-15

US00001196

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Mixed Lq
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1352
9/28/97 2400 Sample No. JRA97-10761

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001198

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	95	95	100	100
25.0	100	100	100	100
50.0	100	95	100	100
100	100	95	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.0		<1.0	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	9/30/97 1050	9/30/97 1055
Test End:	10/2/97 1125	10/2/97 1135
Organism Source:	CBI stock cultures	CBI stock cultures
Hatch/harvest Date:	9/30/97	9/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.5-20.7°C	19.5-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentration ≤ 4.0 mg/l.

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
9/28/97 2400	9/30/97 1050/1055[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	5.1 (—)	20.9 (—)	20.8 (—)
Salinity (g/kg)	N/A	21 (—)	20 (—)
Conductivity (uMHOS/cm)	1517 (—)	N/A	N/A
pH	8.03 (—)	7.97 (—)	7.90 (—)
Dissolved Oxygen (mg/l)	11.6 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	114 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	266 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	2.1 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.6 (0.2)	20.7 (0.2)	20.6 (0.3)	20.6 (0.2)	20.5 (0.2)	20.6 (0.3)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)	7.7 (0.4)	7.7 (0.3)	7.7 (0.5)
pH	7.78 (0.11)	7.87 (0.14)	7.89 (0.12)	8.00 (0.09)	8.08 (0.08)	8.18 (0.19)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.6)	20.4 (0.6)	20.5 (0.5)	20.4 (0.5)	20.4 (0.4)	20.5 (0.5)
D.O. (mg/l)	7.7 (0.2)	7.7 (0.3)	7.6 (0.4)	7.6 (0.4)	7.6 (0.5)	7.6 (0.7)
pH	7.78 (0.19)	7.85 (0.25)	7.88 (0.21),	7.96 (0.13)	8.06 (0.07)	8.14 (0.15)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

Coastal Bioanalysts Inc.

III. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	9/16/97-9/18/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	651.8 mg/l (605.9-701.2)
Control Chart LC50 (95% C.L.):	611.0 mg/l (483.0-739.0)

***C. variegatus* - Acute**	CBI Stock Cultures
Reference Test Dates:	9/16/97-9/18/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1174.3 mg/l (1048.0-1315.9)
Control Chart LC50 (95% C.L.):	1063.1 mg/l (901.6-1224.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Mix L. R.R.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		

US00001203

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	16	10	100
	C-2	16	10	
6.25	1-1	16	10	100
	1-2	16	16	
12.5	2-1	9	9	95
	2-2	16	16	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	95
	4-2	10	9	
100	5-1	10	9	95
	5-2	10	10	
Observer:		GH	GH	
Time:		1130	1125	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.6	20.4
	1	20.8	20.7	20.5
	2	20.1	20.6	20.3
	3	20.8	20.5	20.4
	4	20.8	20.4	20.4
	5	20.4	20.6	20.3
pH	C	7.90	7.76	7.69
	1	8.03	7.84	7.75
	2	8.02	7.85	7.80
	3	8.01	8.03	7.91
	4	8.00	8.15	8.09
	5	7.97	8.35	8.22
D.O. (mg/l)	C	7.6	7.8	7.7
	1	7.9	7.8	7.5
	2	7.9	7.8	7.4
	3	7.9	7.9	7.2
	4	7.9	7.5	7.3
	5	8.0	7.9	7.1
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 4/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2-1,2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 2-1,2

SET UP: Date 4/30/97 Time Water Added 1040

Time Animals Added 1050 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartonus R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature _____ Date 4/8/97

TEST I.D.: JR497110

US00001204

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1115	1135	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.7	19.7
	1	20.5	20.7	19.8
	2	20.4	20.6	19.9
	3	20.8	20.5	19.9
	4	20.8	20.5	20.0
	5	20.9	20.6	19.9
pH	C	7.90	7.88	7.56
	1	8.03	7.95	7.56
	2	8.02	7.98	7.64
	3	8.01	8.05	7.81
	4	8.00	8.13	8.05
	5	7.97	8.25	8.20
D.O. (mg/l)	C	7.9	7.8	7.5
	1	7.9	7.8	7.4
	2	7.9	7.7	7.2
	3	7.9	7.8	7.1
	4	7.9	7.9	7.6
	5	8.0	7.9	6.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		1	2	3
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 9/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 4-13

SET UP: Date 9/30/97 Time Water Added 1040

Time Animals Added 1055 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Orgsense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartonus R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 10/8/97 Date

TEST I.D.: JAN97116

US00001205

COASTAL BIOANALYSTS INC EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	9/28/97						
Temp. (°C)	15.1						
Conduct. (uMHOS)	1517						
Salinity (g/kg)	25						
pH	8.03						
Diss. Oxygen (mg/l)	11.6						
Tot. Chlorine (mg/l)	<0.1						
NH3-N (mg/l)	3.1						
Hard (mg/l CaCO3)	114						
Alkln (mg/l CaCO3)	266						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	9/30/97						
Temp (°C)	20.4						
Salinity (g/kg)	21						
D O (mg/l)	8.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.97						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	9/30/97						
Temp. (°C)	20.8						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.90						
Diss. Oxygen (mg/l)	7.4						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: Mixed Layer TEST ID: JRA 97 110

1352 97-10761

US00001206

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

CLIENT INFORMATION

COMPANY/COMMAND: ODU / Oceana CODE:
CONTACT: Doug Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
(0 2811 2813	1351	Feed 97-10764	START	7/9/28		G	JJ	L	6	1	Toxicity	6.71	21.9°C	1	SJH CBL
	1352	Mixed Lg. 97-10765	START	7/9/28		G	JJ	L	8	1	Toxicity (mod)	7.61	21.6°C		
	1353	A1 97-10763	START	7/9/28		G	JJ	L	8	1	Toxicity	7.99	21.8		
	1354	A2 97-10763	START	7/9/28		G	JJ	L	8	1	Toxicity	7.86	21.9°		
	1355	A3 97-10764	START	7/9/28		G	JJ	L	8	1	Toxicity	7.94	22.0		
	1356	B1 97-10765	START	7/9/28		G	JJ	L	8	1	Toxicity	8.22	21.9		
	1357	B2 97-10766	START	7/9/28		G	JJ	L	8	1	Toxicity	7.95	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: Sig samples were just taken out of 4°C refrigerator & brought to lab (40 min) in a cooler. ups

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

samples not received <4°C analysis per Betty MLL 9/29/97

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS: Arrival Temp. 5.6°C

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY	REC'D BY	COMPANY/COMMAND	DATE/TIME
RELINQUISHED BY	REC'D BY	COMPANY/COMMAND	DATE/TIME
		COMPANY/COMMAND	DATE/TIME
RELINQUISHED BY	REC'D BY	COMPANY/COMMAND	DATE/TIME

US00001207

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: ODU/Ocean CODE:
CONTACT: D. Kirk
PHONE: 683/559-4HEXT: FAX:
J.O. #: 1915290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	TEMPERATURE	OTHER	PRESERVATIVE VERIFIED
13	~~B3~~	B3 (37.7/76.7)	START	9/28	5PM	G	JJ	L	8	1	Toxicity	8.56	21.9°C		
COOLANT, 2nd			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START								Arrival Temp. 5.4c ms				
			STOP												
			START												
			STOP												

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CP - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (D.T.): (FOR RUSH TURNAROUND STATE REASON BELOW)
COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:
RCRA ( ) HRSD ( )
SDWA ( ) TSCA ( )
CWA ( ) PHOTO ( )
CAA ( ) OTHER ( )

samples rec'd 4°C
analyze anyway per Betty
mc 9/29/97

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

P.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).*
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

**FOR LAB USE ONLY!!
SAMPLES VERIFICATION
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )
INITIAL
DATE

RELINQUISHED BY: Wayne Cutler-USN	REC'D BY: [illegible]	COMPANY/COMMAND: PWC Norf	DATE/TIME: 9/29/97 11:
RELINQUISHED BY: [illegible]	REC'D BY: Boyd Hyatt	COMPANY/COMMAND: B.E.S. Inc	DATE/TIME: 9/29/97 14
RELINQUISHED BY: Sandra Hyatt	REC'D BY: Edna Crudup	COMPANY/COMMAND: JLR	DATE/TIME: 9/29/97 16

Relinquished by: JM Trainiee Rec'd by: Dwight Hyatt CTI 7/27/97 1600

D-27

US00001208

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1353
9/28/97 1700 Sample No. JRA97-10762

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001210

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	95	95	100	100
6.3	100	95	100	100
12.5	95	95	100	100
25.0	95	95	100	100
50.0	100	100	100	100
100	95	90	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.0		<1.0	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	9/30/97 1145	9/30/97 1200
Test End:	10/2/97 1145	10/2/97 1200
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	9/30/97	9/26/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.5-20.7°C	19.5-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentration ≤ 4.0 mg/l.

US00001211

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
9/28/97 1700	9/30/97 1145/1200[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (—)	20.7 (—)	20.8 (—)
Salinity (g/kg)	N/A	21 (—)	20 (—)
Conductivity (uMHOS/cm)	1479 (—)	N/A	N/A
pH	7.89 (—)	7.75 (—)	7.90 (—)
Dissolved Oxygen (mg/l)	11.5 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	118 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	248 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	6.9 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001212

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.6 (0.3)	20.6 (0.2)	20.5 (0.2)	20.5 (0.2)	20.6 (0.2)	20.6 (0.1)
D.O. (mg/l)	7.8 (0.2)	7.7 (0.2)	7.7 (0.3)	7.6 (0.4)	7.6 (0.3)	7.5 (0.5)
pH	7.74 (0.17)	7.73 (0.18)	7.77 (0.18)	7.87 (0.08)	7.90 (0.14)	7.96 (0.19)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.5)	20.4 (0.6)	20.4 (0.5)	20.4 (0.3)	20.5 (0.4)	20.4 (0.5)
D.O. (mg/l)	7.8 (0.2)	7.8 (0.2)	7.7 (0.3)	7.7 (0.2)	7.7 (0.2)	7.6 (0.4)
pH	7.79 (0.12)	7.79 (0.13)	7.80 (0.13)	7.86 (0.09)	7.94 (0.12)	7.95 (0.17)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

US00001213

Coastal Bioanalysts Inc.

III. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	9/16/97-9/18/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	651.8 mg/l (605.9-701.2)
Control Chart LC50 (95% C.L.):	611.0 mg/l (483.0-739.0)

***C. variegatus* - Acute**	Aquatic Bio Systems (same batch as test)
Reference Test Dates:	9/30/97-10/2/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1067.9 mg/l (903.6-1232.2)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		

US00001215

% Effluent	I.D	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	9	9	95
	C-2	10	10	
6.25	1-1	10	9	95
	1-2	10	10	
12.5	2-1	9	9	95
	2-2	10	10	
25	3-1	10	10	95
	3-2	9	9	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	9	90
	5-2	9	9	
Observer:		GH	GH	
Time:		1340	1145	

		Day 0	Day 1	Day 2
TEMP	C	20.5	21.6	20.3
	1	20.5	20.6	20.4
	2	20.7	20.5	20.3
	3	20.7	20.6	20.3
	4	20.7	20.7	20.3
	5	20.7	20.7	20.5
pH	C	7.84	7.77	7.55
	1	7.87	7.79	7.50
	2	7.57	7.88	7.56
	3	7.85	7.96	7.80
	4	7.80	8.01	7.85
	5	7.75	8.12	8.01
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.7	7.8	7.5
	2	7.9	7.7	7.4
	3	7.9	7.6	7.2
	4	7.9	7.7	7.3
	5	8.0	7.5	7.1
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		1	2	2
Initials:		PB	PB	PB

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 9/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 4-1,2

SET UP: Date 9/30/97 Time Water Added 1130

Time Animals Added 1145 Set Up By PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartonius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: Sample 7366 - no - explained

inst per L. Clubbs, JRA

Signature 10/8/97 Date

TEST I.D.: JRA 97 111

US00001216

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	GH	
Time:		1345	1200	

		Day 0	Day 1	Day 2
TEMP	C	20.2	20.4	19.5
	1	20.3	20.7	19.8
	2	20.5	20.5	19.8
	3	20.6	20.6	20.5
	4	20.7	20.7	20.6
	5	20.6	20.8	19.9
pH	C	7.57	7.52	7.66
	1	7.58	7.54	7.64
	2	7.57	7.55	7.65
	3	7.56	7.95	7.78
	4	7.51	8.05	7.96
	5	7.75	8.06	8.03
D.O. (mg/l)	C	7.4	7.5	7.6
	1	7.9	7.8	7.6
	2	7.9	7.7	7.4
	3	7.9	7.6	7.5
	4	7.9	7.6	7.5
	5	8.0	7.6	7.3
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		1	2	2
Initials:		PB	PB	GH

Species: Cyprinodon variegatus Source: CBI AMS

Hatch Date/Time: 9/26/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.5 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3,-1,2

SET UP: Date 9/30/97 Time Water Added 1135

Time Animals Added 1200 Set Up By PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments Sample pH adjusted to 8 with 1N NaOH

Signature _____ Date 10/8/97

TEST I.D.: JR4 97 111

US00001217

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDW-1)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:						
Sample Date	9/28/97					
Temp. (°C)	13.4					
Conduct. (uMHOS)	1479					
Salinity (g/kg)	21					
pH	7.89					
Diss. Oxygen (mg/l)	11.5					
Tot. Chlorine (mg/l)	<0.1					
NH3-N (mg/l)	0.9					
Hard (mg/l CaCO3)	118					
Alkln (mg/l CaCO3)	248					
Color/Appearance[1]	CY					
Initials	GH					

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	9/30/97						
Temp. (°C)	20.7						
Salinity (g/kg)	21						
D.O. (mg/l)	8.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.75						
Tot Chlorine (mg/l)	0.1						
Initials	RB						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	9/30/97						
Temp. (°C)	20.8						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.90						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	RB						

EFFLUENT ID: A1 TEST ID: JICA 97111

41353 97-10702

US00001218

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

CLIENT INFORMATION

COMPANY/COMMAND: ODU / Oceans CODE:
CONTACT: Doug Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	TEMPERATURE	OTHER	PRESERVATION VERIFIED BY
(SEABIL 203)	1351	Feed 97-10764	START 9/28 STOP 11PM		G	JJ	L	8	1	Toxicity	6.71	21.9°C		D/H asn
	1352	Mixed Lg. 97-10764	START 9/28 STOP 12PM		G	JJ	L	8	1	Toxicity (mc)	7.61	21.6°C		
	1353	A1 97-10763	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.99	21.8		
	1354	A2 97-10763	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.86	21.9		
	1355	A3 97-10764	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.94	22.0		
	1356	B1 97-10765	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	8.22	21.9		
	1357	B2 97-10766	START 9/28 STOP 6PM		G	JJ	L	8	1	Toxicity	7.95	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: Samples were just taken out of 4°C refrigerator & brought to the lab. (10 mph) in a cooler. mc

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

samples not iced <4°C analysis per Betty mc 9/29/97

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS: Arrival Temp. 5.6°C mc

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

SAMPLES VERIFICATION INITIAL: DATE:

**FOR LAB USE ONLY!!
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 9/29/97 1440
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 9/29/97 1445
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND: SPB	DATE/TIME: 9/29/97 1705
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND: CBL	DATE/TIME: 9/29/97 1v.

US00001219

D-38

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

CLIENT INFORMATION

COMPANY/COMMAND: ODU/OCEANO CODE:
CONTACT: D. Kirk
PHONE: 683/5159-64 EXT: FAX:
J.O. #: 915290
SIGNATURE: On File
PERMIT NO.:

LAB USE ONLY LINE ITEM # / SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	TEMPERATURE	OTHER	PRESERVATIVE VERIFIED BY
1358 COOLED, 2CS	B3 (97-10167)	START	9/28	6PM	G	JJ	L	8	1	Toxicity	8.56	21.9°C		
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START								Arrival Temp. 5.4c mc				
		STOP												
		START												
		STOP												

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (days): (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

Samples rec'd 4°C and analyzed according to Betty mcc 9/29/97

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. - THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM - 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) INITIAL: DATE:

RELINQUISHED BY: Angie Lukes-Hurd	RECD BY: Cathie Jarell	COMPANY/COMMAND: PWC Lab	DATE/TIME: 9/29/97 1110
RELINQUISHED BY: Cathie Jarell	RECD BY: Angie Lukes-Hurd	COMPANY/COMMAND: P.W.C. VAC	DATE/TIME: 9/29/97 1145
RELINQUISHED BY: Angie Lukes-Hurd	RECD BY: Elaine Cheatham	COMPANY/COMMAND: ESR	DATE/TIME: 9/30/97 1015
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:

Relinquished by: JM Franklin Rec'd by: Georgia Hyde CTL 9/29/97 1600

US00001220

US00001221

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1354
9/28/97 1700 Sample No. JRA97-10763

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001222

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	95	100	100
50.0	100	95	100	100
100	100	90	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.0		<1.0	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	9/30/97 1245	9/30/97 1255
Test End:	10/2/97 1300	10/2/97 1315
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	9/30/97	9/26/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.5-20.7°C	19.5-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentration ≤ 4.0 mg/l.

US00001223

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: ODU/OCean CODE:
CONTACT: D. Kirk
PHONE: 683/5159-4 EXT: FAX:
J.O. #: 1915290
SIGNATURE: on file
PERMIT NO:

LAB USE ONLY LINE ITEM # / SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TIMES	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
1358	B3 .77-(0167	START	9/28	6PM	G	JJ	L	8	1	Toxicity	8.56	21.9°C	1	
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START												
		STOP												
		START								Arrival Temp. 5.4c mc				
		STOP												
		START												
		STOP												

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

samples not rec'd 4°C
analyze anyway per Betty
mcc 9/29/97

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S). ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY: Wanda Cutchin-Udal	RECD BY: Cathie Applin	COMPANY/COMMAND: PWC Lab	DATE/TIME: 9/29/97 1010
RELINQUISHED BY:	RECD BY: Randy Hyde	COMPANY/COMMAND: B.E.S.	DATE/TIME: 9/29/97 1145
RELINQUISHED BY: Randy Hyde	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:

Relinquished by: Jim Fairrie Rec'd by: Randy Hyde CTL 9/29/97 1600

D-43

US00001224

US00001225

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1358
9/28/97 1700 Sample No. JRA97-10767

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001226

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	95	100	100
50.0	100	85	100	100
100	85	10	100	100
48-h LC50:	65.0%		>100%	
95% Confidence Limits:	53.7-79.9		N/A	
Calculation Method:	Probit		N/A	
Toxic Units (T.U.):	1.54		<1.0	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	9/30/97 1325	9/30/97 1315
Test End:	10/2/97 1400	10/2/97 1320
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	9/30/97	9/26/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.5-20.7°C	19.5-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentration ≤ 4.0 mg/l.

US00001227

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
9/28/97 1700	9/30/97 1325/1315[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.1 (—)	20.9 (—)	20.7 (—)
Salinity (g/kg)	1 (—)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	1639 (—)	N/A	N/A
pH	7.16 (—)	7.24 (—)	7.84 (—)
Dissolved Oxygen (mg/l)	11.1 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	147 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	281 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	25 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001228

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.7 (0.2)	20.7 (0.2)	20.8 (0.2)	20.7 (0.1)	20.7 (0.1)	20.8 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)	7.6 (0.3)	7.5 (0.4)
pH	7.78 (0.07)	7.60 (0.17)	7.62 (0.11)	7.67 (0.15)	7.71 (0.33)	7.69 (0.41)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.7 (0.1)	20.8 (0.1)	20.9 (0.1)	20.8 (0.1)	20.8 (0.1)	20.7 (0.1)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)	7.7 (0.3)
pH	7.71 (0.16)	7.60 (0.15)	7.58 (0.11)	7.66 (0.14)	7.69 (0.34)	7.64 (0.37)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001229

Coastal Bioanalysts Inc.

III. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures (same batch as test)
Reference Test Dates:	9/30/97-10/2/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	596.7 mg/l (548.4-648.6)
Control Chart LC50 (95% C.L.):	612.8 mg/l (486.5-739.1)

***C. variegatus* - Acute**	Aquatic Bio Systems (same batch as test)
Reference Test Dates:	9/30/97-10/2/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1067.9 mg/l (903.6-1232.2)

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDI.0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	9/28/97						
Temp. (°C)	3.1						
Conduct. (uMHOS)	1639						
Salinity (g/kg)	1						
pH	7.16						
Diss. Oxygen (mg/l)	11.1						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	25						
Hard (mg/l CaCO3)	147						
Alkln (mg/l CaCO3)	281						
Color/Appearance[1]	OY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	9/30/97						
Temp. (°C)	20.9						
Salinity (g/kg)	20						
D.O. (mg/l)	8.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.24						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	9/30/97						
Temp. (°C)	20.7						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.84						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: B3 TEST ID: JKA 97 116

(+ BSB 97-10767)

US00001231

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION	
COMPANY/COMMAND:	ODU / Oceans CODE:
CONTACT:	Doug Kirk
PHONE:	683-5159 EXT: FAX:
J.O. #:	1912290
SIGNATURE:	on file
PERMIT NO:	

LAB USE ONLY LINE ITEM #	SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	TEMPERATURE	OTHER	PRESERVATION VERIFIED BY
(SDG 28H 203)	1351	Feed 97-10764	START 9/28 STOP 11PM		G	JJ	L	8	1	Toxicity	6.71	21.9°C		DJK CSR
	1352	Mixed Lg. 97-10764	START 9/28 STOP 12PM		G	JJ	L	8	1	Toxicity (rad)	7.66	21.6°C		
	1353 ~~A1 MEL~~	A1 97-10763	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	7.99	21.8		
	1354 ~~A2 MEL~~	A2 97-10763	START 9/28 STOP 6PM		G	JJ	L	8	1	Toxicity	7.86	21.9		
	1355 ~~A3 MEL~~	A3 97-10764	START 9/28 STOP 6PM		G	JJ	L	8	1	Toxicity	7.94	22.0		
	1356 ~~B1 MEL~~	B1 97-10765	START 9/28 STOP 5PM		G	JJ	L	8	1	Toxicity	8.22	21.9		
↓	1357 ~~B2 MEL~~	B2 97-10766	START 9/28 STOP 6PM		G	JJ	L	8	1	Toxicity	7.95	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	"	GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: Samples were just taken out of 4°C refrigerator & brought to the lab. (10 min) in ice cooler. apb

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

samples not rec'd <4°C analysis per Betty mcc 9/29/97

REGULATION APPLIED:	
RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS: Arrival Temp. 5.6°C

D.O. NUMBER: INIT.:

CONTRACT LAB: DATE:

CONTRACT NO.(S):

OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!! SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL: _____ DATE: _____

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 9/29/97 1400
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 9/29/97 1405
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 9/29/97

US00001232

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: ODU/Ocean CODE:
CONTACT: D. Kirk
PHONE: 683/5159-4 EXT: FAX:
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED BY
1358	B3	B3 97-10167	START	9/28	1PM	G	JJ	L	8	1	Toxicity	8.54	21.9°C		
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START								Arrival Temp. 5.4c mlc				
			STOP												
			START												
			STOP												

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (DAYS): (FOR RUSH TURNAROUND STATE REASON BELOW)
COMMENTS:

REGULATION APPLIED:
RCRA ( ) HRSD ( )
SDWA ( ) TSCA ( )
CWA ( ) PHOTO ( )
CAA ( ) OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

samples rec'd 4.4c
analyze anyway per Betty
mlc 9/29/97

P.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!
SAMPLES VERIFICATION
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )
INITIAL:
DATE:

RELINQUISHED BY: Angie Cutchen-Neal	RECD BY: Cathie Jarrell	COMPANY/COMMAND: PWC Lab	DATE/TIME: 9/29/97 1410	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND: O.E.S.	DATE/TIME:	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE:	

Relinquished by: JM Franklin Rec'd by: Dwayne Hyde CTO 7/29/97 1600

US00001233

APPENDIX D-2

BNR Inhibition Pass-Through Acute Toxicity Test Results

60 ppm AFFF Pretreated with Defoamer AF9020

US00001234

US00001235

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1367
11/2/97 1110 Sample No. JRA97-12376

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001236

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
% Effluent Concentration	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	85	85
12.5	55	50	70	65
25.0	15	0	65	40
50.0	0	0	75	30
100	0	0	50	0
48-h LC50:	12.5%		19.7%	
95% Confidence Limits:	10.7-14.6		14.0-26.8	
Calculation Method:	Spearman-Karber		Probit	
Toxic Units (T.U.):	8.00		5.08	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1605	11/3/97 1620
Test End:	11/5/97 1540	11/5/97 1535
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	10/31/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]D.O. concentration decreased to slightly less than 4.0 mg/l in 100% concentrations on day 2 of the sheepshead test, the drop was unanticipated and probably caused by a bacterial bloom (solutions turned milky color overnight). Low D.O. was not the primary cause of toxicity as indicated by low survival in concentrations with adequate D.O. concentration.

US00001237

ODU/OCEANA Sample I.D. Feed
11.2.97 Sample 97-12376 Test ID: JRA97129

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1110	11/3/97 1605/1620[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (---)	20.6 (---)	20.5 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1960 (---)	N/A	N/A
pH	7.10 (---)	7.32 (---)	7.96 (---)
Dissolved Oxygen (mg/l)	10.7 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	143 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	372 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	32.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001238

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.5 (0.2)	20.6 (0.1)	20.5 (0.1)	20.5 (0.1)	20.5 (0.1)
D.O. (mg/l)	7.8 (0.2)	7.5 (0.4)	7.1 (0.7)	6.3 (1.5)	7.0 (1.4)	6.8 (1.7)
pH	7.78 (0.16)	7.56 (0.26)	7.56 (0.25)	7.57 (0.20)	7.51 (0.01)	7.58 (0.37)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.1)	20.6 (0.1)	20.6 (0.1)	20.5 (0.1)	20.5 (0.1)	20.5 (0.1)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.3)	7.5 (0.5)	7.0 (0.8)	6.6 (1.2)	5.7 (2.1)
pH	7.81 (0.17)	7.44 (0.35)	7.43 (0.30)	7.50 (0.22)	7.49 (0.21)	7.61 (0.34)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001239

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	8.1%	12.35	N/A	N/A	3.5%	28.57	N/A	N/A
11/3/97*	12.5%	8.00	N/A	N/A	19.7%	5.08	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:.	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

US00001240

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate LC50 %	Vertebrate EC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		
11/3/97	12.5	19.7		

US00001241

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	6	5	50
	2-2	5	5	
25	3-1	3	0	0
	3-2	0	0	
50	4-1	0	0	0
	4-2	0	0	
100	5-1	0	0	0
	5-2	0	0	
Observer:		GH	GH	
Time:		1555	1540	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.4	20.4
	1	20.6	20.3	20.5
	2	20.6	20.5	20.6
	3	20.5	20.5	20.6
	4	20.6	20.4	—
	5	20.6	20.4	—
pH	C	7.96	7.75	7.64
	1	7.85	7.33	7.51
	2	7.77	7.28	7.42
	3	7.65	7.34	7.71
	4	7.52	7.56	—
	5	7.72	7.84	—
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.4	7.1
	2	7.9	6.6	6.8
	3	7.9	6.0	5.6
	4	8.0	6.6	—
	5	8.0	5.6	—
SALIN (g/kg)	C	26	26	26
	1	26	26	26
	2	26	26	26
	3	26	26	26
	4	26	26	—
	5	26	26	—
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 10/31/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 26

Acclimation Temp (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 16-4-2

SET UP: Date 11/3/97 Time Water Added 1550

Time Animals Added 1605 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Sample was cloudy on Day 1 (Conc 12.5% & 6.25% to some effect). GH

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBL.

Comments: _____

Pamela L. Bloom 11/5/97

Signature Date

TEST I.D.: JAN 97129

US00001242

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/3/97 TEST NUMBER: JRA97129 DURATION: 48 H
TOXICANT : FEED STOCK
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	10
25.00	20	20
50.00	20	20
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 12.50
95% LOWER CONFIDENCE: 10.71
95% UPPER CONFIDENCE: 14.60

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	9	9	65
	1-2	8	8	
12.5	2-1	6	6	65
	2-2	8	7	
25	3-1	6	4	40
	3-2	7	4	
50	4-1	8	5	30
	4-2	7	1	
100	5-1	7	0	0
	5-2	3	0	
Observer:		GH	GH	
Time:		1600	1535	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.6	20.4
	1	20.6	20.5	20.7
	2	20.6	20.5	20.6
	3	20.5	20.4	20.6
	4	20.6	20.5	20.5
	5	20.6	20.5	20.4
pH	C	7.96	7.81	7.63
	1	7.95	7.35	7.23
	2	7.77	7.20	7.30
	3	7.65	7.25	7.59
	4	7.52	7.27	7.68
	5	2.32	7.53	7.99
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.7	7.4
	2	7.9	7.5	7.6
	3	7.9	6.9	6.3
	4	8.0	6.1	5.2
	5	8.0	5.3	3.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

NOTES: Same for mysids

Species: Cyprinodon variegatus Source: EBI-A135

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 3-1,2

SET UP: Date 11/3/97 Time Water Added 1550

Time Animals Added 1620 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J Bloom 11/7/97

Signature Date

TEST I.D.: 110397GH

US00001244

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97129 C VARIEGATUS

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	3	0.1500	0.1500
12.5000	20	7	0.3500	0.3500
25.0000	20	12	0.6000	0.6000
50.0000	20	14	0.7000	0.7000
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 2.978
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

JRA97129 C VARIEGATUS

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	1.679	0.400	3.437
LC/EC 50.00	19.695	14.003	26.830

US00001245

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/2/97						
Temp. (°C)	13.4						
Conduct. (uMHOS)	1960						
Salinity (g/kg)	1						
pH	7.10						
Diss. Oxygen (mg/l)	10.7						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	~~2.8~~ <32.5						
Hard (mg/l CaCO3)	143						
Alkln (mg/l CaCO3)	372						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							11/3/97
Temp. (°C)							20.6
Salinity (g/kg)							20
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							7.32
Tot Chlorine (mg/l)							ND
Initials							GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							11/3/97
Temp. (°C)							20.5
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							7.96
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GH

EFFLUENT ID: Fresh Stock #135967 TEST ID: TRAG720

US00001246

1351
0002BH
2BJ

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) Jason C Fost Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 11:10 am
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number Frequency of collection Volume
*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.3°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 6.68 Field Total Residual Chlorine
Comments/Sample description 2 liters of Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
   Received by U Unal Date 11/3/97 Time 1045
2. Relinquished by U Unal Date 11/3/97 Time 1130
   Received by J. Hauser Date 11/3/97 Time 1130
   Reli: J. Hauser 11/3/97 1220

FOR REED LAB USE ONLY

JRA# 97-1237C Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

see CBI for CPOM OMS

Rev 5/13/94

US00001247

		Date	Time
Rcvd by	L Quist	11-3-97	1230
Relinq. by	L Quist	11-3-97	
Rcvd by	[signature]	11/3/97	1530

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1610	11/3/97 1625
Test End:	11/5/97 1555	11/5/97 1545
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	10/31/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Acration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001249

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1900	11/3/97 1610/1625[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.2 (---)	20.6 (---)	20.5 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1436 (---)	N/A	N/A
pH	8.45 (---)	8.12 (---)	7.96 (---)
Dissolved Oxygen (mg/l)	11.2 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	127 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	273 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	1.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.5 (0.2)	20.6 (0.3)	20.6 (0.2)	20.6 (0.3)	20.6 (0.3)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)	7.5 (0.4)
pH	7.79 (0.16)	7.86 (0.12)	7.89 (0.09)	7.98 (0.04)	8.11 (0.04)	8.24 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.6 (0.1)	20.7 (0.2)	20.7 (0.2)	20.7 (0.3)	20.5 (0.3)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)
pH	7.82 (0.17)	7.87 (0.11)	7.91 (0.08)	7.97 (0.04)	8.09 (0.03)	8.15 (0.09)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Mix L. R.R.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		

US00001253

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1610	1555	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.4	20.4
	1	20.7	20.6	20.3
	2	20.8	20.6	20.3
	3	20.8	20.5	20.4
	4	20.9	20.3	20.5
	5	20.8	20.6	20.3
pH	C	7.96	7.76	7.64
	1	7.99	7.82	7.77
	2	8.00	7.85	7.83
	3	8.02	7.92	7.95
	4	8.07	8.12	8.15
	5	8.12	8.27	8.34
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.7	7.7
	2	7.9	7.7	7.7
	3	7.9	7.6	7.5
	4	7.9	7.7	7.4
	5	7.9	7.5	7.2
SALIN (g/kg)	C	20	20	20
	1	20	21	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 10/31/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 3X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 5-12

SET UP: Date 11/3/97 Time Water Added 1540

Time Animals Added 1610 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaspH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D. Bivins 11/7/97

Signature Date

TEST I.D.: JAA47130

US00001254

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1605	1545	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.5	20.3
	1	20.2	20.7	20.5
	2	20.8	20.8	20.5
	3	20.8	20.8	20.4
	4	20.9	20.7	20.4
	5	20.8	20.6	20.2
pH	C	7.96	7.76	7.63
	1	7.99	7.84	7.77
	2	8.00	7.88	7.85
	3	8.02	7.96	7.94
	4	8.07	8.08	8.13
	5	8.12	8.20	8.30
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.7	7.6
	2	7.9	7.6	7.5
	3	7.9	7.7	7.5
	4	7.9	7.7	7.6
	5	7.9	7.6	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI AABS

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 12-23

SET UP: Date 11/3/97 Time Water Added 1546

Time Animals Added 1605 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP Portaph2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D Bloom 11/7/97

Signature Date

TEST I.D.: TRA97130

US00001255

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceanic CODE:
CONTACT: Douglas Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 191229 C
SIGNATURE:
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED BY
0002BH	1357	97-12376 Forest Stock	START												
0002BJ			STOP	11/2/97	11:10	G	JJ	L	1	1P	Toxicity	6.68	22.3		VH
	1360	97-12377 Mixed Reference Reactor	START												
			STOP		0700							8.33	21.2		
	1361	97-12378 B3 AFFF+ Defoamer	START												
			STOP		0815							7.50	21.3		
	1362	97-12379 B2 AFFF+ Defoamer	START												
			STOP		0800							7.73	21.1		
	1363	97-12380 B1 AFFF+ Defoamer	START												
			STOP		0715							7.91	20.3		
	1364	97-12381 A3 - Control	START												
			STOP		5:35							7.92	21.5		
	1365	97-12382 A2 - Control	START												
			STOP		5:32							7.57	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
"OFFICIAL" USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND: AES	DATE/TIME: 11/3/97 1130
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND: Reed	DATE/TIME: 11/3/97 1230
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

US00001256

		Date	Time
Rcvd by	Fdoty	11-3-97	1230
Relinq by	Fdoty	11-3-97	____
Rcvd by	[signature]	11/3/97	1330

US00001257

1360

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location –
NPDES# – Instream Waste Conc –
Sample collected by (print&sign) Jason C Hoss Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 7:00 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number – Frequency of collection – Volume –

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 21.2°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.33 Field Total Residual Chlorine –
Comments/Sample description Mixed Liquor from Reference Reactor (2 liters)
Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
   Received by V Hunt Date 11/3/97 Time 1045
2. Relinquished by V Hunt Date 11/3/97 Time 1130
   Received by J. Hawes Date 11/3/97 Time 1130
   Ref: J. Hawes 11/3/97 1230

FOR REED LAB USE ONLY

JRA# 97-12377 Arrival Temperature – On ice? –
Color – Odor – Solids –
pH – DO (mg/L) – Conductivity (umhos/cm) – @ – °C
Salinity (ppt) – TRC (mg/L) – Method –

see COC form EPDL0KS

Rev 5/15/94

US00001258

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDI.0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	11/2/97
Temp. (°C)	13.2
Conduct. (uMHOS)	1436
Salinity (g/kg)	1
pH	8.45
Diss. Oxygen (mg/l)	11.2
Tot. Chlorine (mg/l)	<DL
NH3-N (mg/l)	1.5
Hard (mg/l CaCO3)	127
Alkln (mg/l CaCO3)	273
Color/Appearance[1]	C Y
Initials	GH

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	11/3/97
Temp (°C)	20.6
Salinity (g/kg)	26
D.O. (mg/l)	8.0
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	8.12
Tot Chlorine (mg/l)	ND
Initials	GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	11/3/97
Temp. (°C)	20.5
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	7.96
Diss. Oxygen (mg/l)	87.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	KH

EFFLUENT ID: mother liquor from TEST ID: JNA 97130
1L 1368 ref reactor D-78

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1361
11/2/97 2015 Sample No. JRA97-12378

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001260

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	95	95
6.3	100	100	100	100
12.5	95	95	100	100
25.0	100	100	100	100
50.0	95	35	100	100
100	60	5	100	100
48-h LC50:	45.0%		>100%	
95% Confidence Limits:	37.9-53.3		N/A	
Calculation Method:	Trimmed Spearman-Karber		N/A	
Toxic Units (T.U.):	2.22		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1725	11/3/97 1735
Test End:	11/5/97 1740	11/5/97 1730
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/2/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001261

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 2015	11/3/97 1725/1735[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.1 (---)	20.7 (---)	20.7 (---)
Salinity (g/kg)	2 (---)	21 (---)	20 (---)
Conductivity (uMHOS/cm)	1749 (---)	N/A	N/A
pH	8.14 (---)	7.87 (---)	7.85 (---)
Dissolved Oxygen (mg/l)	11.8 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	132 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	325 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	13.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001262

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.6 (0.1)	20.6 (0)	20.5 (0.1)	20.5 (0.1)	20.6 (0.1)	20.6 (0.1)
D.O. (mg/l)	7.8 (0.2)	7.6 (0.3)	7.6 (0.4)	7.5 (0.5)	7.4 (0.6)	7.3 (0.9)
pH	7.78 (0.06)	7.78 (0.08)	7.82 (0.04)	7.92 (0.02)	7.99 (0.11)	8.06 (0.18)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.2)	20.5 (0.1)	20.4 (0.1)	20.5 (0.1)	20.6 (0.1)	20.6 (0.1)
D.O. (mg/l)	7.8 (0.2)	7.7 (0.2)	7.7 (0.3)	7.6 (0.5)	7.4 (0.6)	7.3 (0.8)
pH	7.71 (0.13)	7.73 (0.12)	7.80 (0.06)	7.89 (0.02)	7.95 (0.08)	8.01 (0.14)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

US00001263

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-3

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/26/97	>100	>100		
9/30/97	65	>100		
11/3/97	45.0	>100		

US00001264

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	65.0%	1.54	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	45.0%	2.22	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

US00001265

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	9	9	95
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	3	35
	4-2	9	4	
100	5-1	8	1	5
	5-2	4	0	
Observer:		GH	GH	
Time:		1710	1740	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.5	20.5
	1	20.6	20.6	20.6
	2	20.5	20.5	20.6
	3	20.6	20.5	20.4
	4	20.7	20.7	20.5
	5	20.7	20.6	20.5
pH	C	7.95	7.75	7.73
	1	7.87	7.72	7.74
	2	7.87	7.81	7.79
	3	7.90	7.93	7.94
	4	7.87	8.03	8.08
	5	7.87	8.10	8.07
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.6	7.4
	2	7.9	7.7	7.1
	3	7.9	7.7	7.0
	4	7.9	7.6	6.7
	5	8.0	7.5	6.3
SALIN (g/kg)	C	20	20	20
	1	20	20	21
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		2	2	2
Initials:		EH	EH	EH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 4-1-2

SET UP: Date 11/3/97 Time Water Added 1720

Time Animals Added 1725 Set Up By PAGA

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Dipsense pH Meter (09500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela M Slayton 11/7/97

Signature Date

TEST I.D.: JCA97136

US00001266

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/3/97 TEST NUMBER: JRA97136 DURATION: 48 H
TOXICANT : B3
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	1
25.00	20	0
50.00	20	13
100.00	20	19

SPEARMAN-KARBER TRIM: 5.00%

SPEARMAN-KARBER ESTIMATES: LC50: 44.96
95% LOWER CONFIDENCE: 37.91
95% UPPER CONFIDENCE: 53.31

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

US00001267

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	9	9	95
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1715	1730	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.5	20.4
	1	20.6	20.6	20.4
	2	20.5	20.4	20.3
	3	20.6	20.4	20.5
	4	20.7	20.5	20.6
	5	20.7	20.5	20.5
pH	C	7.85	7.60	7.68
	1	7.87	7.68	7.65
	2	7.87	7.76	7.77
	3	7.90	7.86	7.90
	4	7.87	7.95	8.03
	5	7.87	8.02	8.15
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.7	7.5
	2	7.9	7.8	7.3
	3	7.9	7.8	7.0
	4	7.9	7.6	6.7
	5	8.0	7.6	6.4
SALIN (g/kg)	C	20	20	21
	1	20	20	20
	2	20	20	20
	3	20	20	21
	4	21	21	21
	5	21	21	21
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 4-23

SET UP: Date 11/3/97 Time Water Added 1720

Time Animals Added 1735 Set Up By: DD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Orgsense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela Y. Stacy 11/7/97

Signature Date

TEST I.D.: JRA97134

US00001268

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/21/97						
Temp. (°C)	13.1						
Conduct. (uMHOS)	21794						
Salinity (g/kg)	20						
pH	8.14						
Diss. Oxygen (mg/l)	11.8						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	13.5						
Hard (mg/l CaCO3)	132						
Alkln (mg/l CaCO3)	325						
Color/Appearance[1]	CY						
Initials	GT						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							11/23/97
Temp. (°C)							20.7
Salinity (g/kg)							21
D.O. (mg/l)							8.0
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							7.87
Tot Chlorine (mg/l)							ND
Initials							GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							11/23/97
Temp. (°C)							20.7
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							7.85
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO)							NA
Alkln (mg/l CaCO)							NA
Initials							GH

EFFLUENT ID: B3 / 21361 TEST ID: TNA97136

US00001269

1361

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Foss Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 8:15 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____

Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 21.3°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.50 Field Total Residual Chlorine _____
Comments/Sample description B3 - 2 liters of Sample containing 60 ppm AFFF and defoamer #2,
Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00am
   Received by V Hunt Date 11/3/97 Time 1045
2. Relinquished by V Hunt Date 11/3/97 Time 1130
   Received by J Hamel Date 11/3/97 Time 1130
   Rel. J-Hamel 11/3/97 1220

FOR REED LAB USE ONLY

JRA# 97-12378 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

gve
cppl
brw
CPPL
0145

Rev 5/16/94

US00001270

		Date	Time
Rcvd by	Lehr	11-3-97	1230
Relinq. by	Lehr	11-3-97	—
Rcvd by	[signature]	11/3/97	1330

US00001271

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceanic CODE:
CONTACT: Douglas Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 19122.90
SIGNATURE:
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	DH DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED BY
0002 BH	1358	97-12377 Feed Stock	START												
0002 BJ			STOP	11/2/97	11:10	G	JJ	L	1	1P	"Toxicity"	6.68	22.3		VH
	1360	97-12377 Mixed Reference Reactor	START												
			STOP		0700							8.33	21.2		
	1361	97-12378 B3 AFFF+ Defoamer	START												
			STOP		0815							7.50	21.3		
	1362	97-12379 B2 AFFF+ Defoamer	START												
			STOP		0800							7.73	21.1		
	1363	97-12380 B1 AFFF+ Defoamer	START												
			STOP		0715							7.91	20.3		
	1364	97-12381 A-3 - Control	START												
			STOP		5:35							7.92	21.8		
	1365	97-12382 A2- Control	START												
			STOP		5:30							7.57	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	6 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )..	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL
DATE

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:	

US00001272

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1362
11/2/97 2000 Sample No. JRA97-12379

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001274

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	50	100	100
100	65	0	100	100
48-h LC50:	50.0%		>100%	
95% Confidence Limits:	42.8-58.4		N/A	
Calculation Method:	Spearman-Karber		N/A	
Toxic Units (T.U.):	2.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1720	11/3/97 1730
Test End:	11/5/97 1730	11/5/97 1720
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/1/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001275

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 2000	11/3/97 1720/1730[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.7 (---)	20.5 (---)	20.8 (---)
Salinity (g/kg)	2 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1775 (—)	N/A	N/A
pH	8.18 (—)	7.85 (---)	7.76 (---)
Dissolved Oxygen (mg/l)	11.8 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	140 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	375 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	14.0 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.3)	20.4 (0.2)	20.4 (0.2)	20.4 (0.2)	20.3 (0.2)	20.4 (0.2)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.2)	7.7 (0.3)	7.7 (0.3)	7.6 (0.5)	7.6 (0.5)
pH	7.75 (0.02)	7.81 (0.06)	7.86 (0.02)	7.93 (0.04)	8.00 (0.13)	8.05 (0.19)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.3)	20.4 (0.3)	20.4 (0.3)	20.4 (0.3)	20.3 (0.3)	20.3 (0.3)
D.O. (mg/l)	7.8 (0.2)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)	7.7 (0.4)	7.6 (0.5)
pH	7.72 (0.04)	7.76 (0.08)	7.84 (0.05)	7.92 (0.03)	7.97 (0.11)	7.98 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001277

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	66.0%	1.52	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	50.0%	2.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-2

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	66	>100		
11/3/97	50.0	>100		

US00001279

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	5	50
	4-2	10	5	
100	5-1	10	0	0
	5-2	7	0	
Observer:		GH	GH	
Time:		1705	1730	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.4	20.2
	1	20.7	20.5	20.3
	2	20.6	20.4	20.3
	3	20.6	20.4	20.2
	4	20.4	20.3	20.1
	5	20.5	20.5	20.2
pH	C	7.76	7.72	7.76
	1	7.97	7.79	7.76
	2	7.89	7.85	7.84
	3	7.97	7.94	7.96
	4	7.95	8.06	8.10
	5	7.85	8.08	8.23
D.O. (mg/l)	C	7.9	7.4	7.9
	1	7.4	7.4	7.6
	2	7.4	7.2	7.4
	3	7.4	7.8	7.3
	4	8.0	7.8	7.1
	5	8.0	7.6	7.1
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/1/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 7-23

SET UP: Date 11/3/97 Time Water Added 1250

Time Animals Added 1720 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J. Bliss 11/7/97

Signature Date

TEST I.D.: JMA97135

US00001280

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/3/97 TEST NUMBER: JRA97135 DURATION: 48 H
TOXICANT : B2
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	10
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 50.00
95% LOWER CONFIDENCE: 42.82
95% UPPER CONFIDENCE: 58.38

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1700	1720	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.4	20.2
	1	20.4	20.5	20.1
	2	20.6	20.5	20.0
	3	20.6	20.6	20.0
	4	20.4	20.5	19.9
	5	20.5	20.5	19.9
pH	C	7.76	7.69	7.71
	1	7.87	7.76	7.71
	2	7.88	7.84	7.79
	3	7.89	7.94	7.94
	4	7.85	7.99	8.06
	5	7.85	7.97	8.11
D.O. (mg/l)	C	7.9	7.5	7.6
	1	7.9	7.5	7.5
	2	7.9	7.7	7.5
	3	7.9	7.6	7.4
	4	8.0	7.7	7.3
	5	8.0	7.7	7.1
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above mean		1	2	2
Initials:		GH	GH	GH

NOTES: _____

Species: Cyprinodon variegatus Source: CBI-AQS
Hatch Date/Time: 10/26/97
Acclimation water: HW/M ASW ☒ Other: _____ Salinity: 20
Acclimation Temp. (range): 20.0 to 20.1
Feeding prior to test: Artemia 2X /d Other: _____
Feeding during test: Not fed ☒ Artemia _____ /d Other: _____
Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml
Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml
Initial no. organisms per replicate: 10 No. replicates: 2
Photoperiod: 16L 8D ☒ Other: _____ Randomization template no. 7-1,2
SET UP: Date 11/3/97 Time Water Added 1715
Time Animals Added 1730 Set Up By: GH/GH

INSTRUMENTATION USED:
Stem Thermometer Number: A1
☐ YSI D.O. Meter # 1 (SN#80164175)
☒ CP Digisense pH Meter (09500563)
☐ Sartorius BI60P Balance (40070093)
☐ YSI SCT 33 Meter (98016792)
☒ YSI D.O. Meter # 2 (SN#1A026379)
☐ Corning 240 pH Meter (SN5268)
☐ SP PortaCHQ Meter (852360)
☒ Spartan ATC Refractometer (A366)
Other: _____

Quality Assurance:
As Quality Assurance officer for the test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.
Comments: _____
Pamela D. Black 11/7/97
Supervisor Date

TEST I.D JRA97135

US00001281

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1363
11/2/97 1915 Sample No. JRA97-12380

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001282

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	90	100	100
50.0	100	65	100	100
100	80	0	100	100
48-h LC50:	50.5%		>100%	
95% Confidence Limits:	41.7-61.2		N/A	
Calculation Method:	Probit		N/A	
Toxic Units (T.U.):	1.98		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1715	11/3/97 1701
Test End:	11/5/97 1705	11/5/97 1715
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/2/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001283

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1915	11/3/97 1715/1701[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia:C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.7 (---)	20.9 (---)	20.8 (---)
Salinity (g/kg)	1 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1671 (---)	N/A	N/A
pH	8.17 (---)	7.85 (---)	7.76 (---)
Dissolved Oxygen (mg/l)	11.8 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	130 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	350 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	8.6 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001284

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.4)	20.4 (0.4)	20.4 (0.4)	20.4 (0.3)	20.4 (0.4)	20.4 (0.5)
D.O. (mg/l)	7.8 (0.2)	7.7 (0.2)	7.6 (0.3)	7.6 (0.5)	7.5 (0.4)	7.4 (0.7)
pH	7.73 (0.02)	7.79 (0.07)	7.83 (0.01)	7.87 (0.04)	8.00 (0.13)	8.03 (0.17)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.5)	20.3 (0.4)	20.3 (0.5)	20.2 (0.5)	20.2 (0.5)	20.2 (0.6)
D.O. (mg/l)	7.8 (0.2)	7.6 (0.3)	7.5 (0.4)	7.4 (0.6)	7.4 (0.6)	7.4 (0.8)
pH	7.73 (0.03)	7.79 (0.09)	7.82 (0.02)	7.89 (0.02)	7.94 (0.08)	8.00 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001285

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	72.0%	1.39	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	50.5%	1.98	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

US00001286

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97134

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	0	0.0000	0.0000
12.5000	20	0	0.0000	0.0000
25.0000	20	2	0.1000	0.1000
50.0000	20	7	0.3500	0.3500
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 3.927
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 7.815

JRA97134

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	18.980	9.860	25.898
LC/EC 50.00	50.460	41.719	61.212

US00001287

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		C-H	CH	
Time:		1645	1715	

		Day 0	Day 1	Day 2
TEMP	C	20.8	19.9	20.1
	1	20.8	20.0	20.1
	2	20.9	20.0	20.0
	3	20.8	20.1	14.8
	4	20.8	20.1	14.8
	5	20.9	19.8	14.9
pH	C	7.76	7.72	7.71
	1	7.87	7.85	7.09
	2	7.84	7.82	7.81
	3	7.87	7.91	7.90
	4	7.85	8.00	7.98
	5	7.85	8.06	8.08
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.6	7.4
	2	7.9	7.6	7.1
	3	7.9	7.6	6.8
	4	7.9	7.7	6.7
	5	8.0	7.6	6.5
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		CH	FH	FH

Species: Cyprinodon variegatus Source: ~~CBI~~ ABS

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 21,2

SET UP: Date 11/3/97 Time Water Added 1650

Time Animals Added 1701 Set Up By RO/CH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J. Bloom 11/7/97

Signature Date

TEST ID TRA97.134

US00001288

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/2/97						
Temp. (°C)	3.7						
Conduct. (uMHOS)	1671						
Salinity (g/kg)	1						
pH	8.17						
Diss. Oxygen (mg/l)	11.8						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	8.6						
Hard (mg/l CaCO3)	130						
Alkln (mg/l CaCO3)	350						
Color/Appearance[1]	CY						
Initials	CH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							11/3/97
Temp. (°C)							20.9
Salinity (g/kg)							32
D.O. (mg/l)							8.0
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							7.85
Tot Chlorine (mg/l)							ND
Initials							CH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							11/3/97
Temp. (°C)							20.8
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							7.76
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)						†	NA
Alkln (mg/l CaCO3)							NA
Initials							CH

EFFLUENT ID: B1 (41363) TEST ID: JRA 412 134

D-108

US00001289

Toxicity Test Sample Chain of Custody
(Please complete all information)

1363

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson JJoson Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 7:15 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 20.3°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.91 Field Total Residual Chlorine _____
Comments/Sample description B1 - 2 liters of sample containing 60 ppm AFFF and defoamer #2
Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
Received by V Dunn Date 11/3/97 Time 1045
2. Relinquished by V Dunn Date 11/3/97 Time 1130
Received by F. Dunn Date 11/3/97 Time 1130
Rel: F-Dunn 11/3/97 1230

FOR REED LAB USE ONLY

JRA# 97-12380 Arrival Temperature: _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

W B1 Sin Cyp 0.195

Rev 5/15/96

US00001290

		Date	Time
Rcvd:	Laing	11-3-97	1230
Relinq:	Laing	11-3-97	———
Rcvd:	[illegible]	11/3/97	1330

US00001291

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Ocean CODE:
CONTACT: Doug Ins Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 19229C
SIGNATURE:
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATI VERIFIED B
0002BH	67	97-12376	START												
0002BJ	1358	Feed Stock	STOP	11/2/97	11:10	G	JJ	L	1	1P	"Toxicity"	6.68	22.5		VA
	1360	97-12377 Mixed Reference Reactor	START												
			STOP		0700							8.33	21.2		
	1361	97-12378 B3 AFFF+ Defrimmer	START												
			STOP		0815							7.50	21.3		
	1362	97-12379 B2 AFFF+ Defrimmer	START												
			STOP		0800							7.73	21.1		
	1363	97-12380 B1 AFFF+ Defrimmer	START												
			STOP		0715							7.91	20.3		
	1364	97-12381 A3 - Control	START												
			STOP		5:35							7.92	21.5		
	1365	97-12382 A2 - Control	START												
			STOP		5:30							7.57	21.9		

D-111

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) INITIAL: DATE

RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:	
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:	

US00001292

CLIENT:	Navy Public Works Center	SUBMITTED BY:	James R. Reed & Associates 11864 Canon Blvd., Suite 103 Newport News, VA 23606 (757) 873-4703 phone (757) 873-1498 fax		
ATTN:	Merrill Anderson-Ashcraft				
ADDRESS:	Code 930, Bldg Z-140				
CITY:	Norfolk, VA 23511				
PHONE:	445-8850	SAMPLE RECEIPT DATE:	11/07/97	TIME:	1230
FAX:	445-8852				
		RECEIVED BY:	VAS		
		GRAB COLLECTION DATE:	11/07/97	GRAB TIME:	1135
SPECIAL NOTES: Contract #: N00187-93-D-9748 Delivery Order #: 260 J.O.#: 1252001 Item #: 0002FM, 0003AD PWC #: 80249		COMPOSITE COLLECTION:	Start Date / Start Time	End Date	End Time
		COLLECTED BY:	VH - Navy		
		PICKED UP BY:	Bayside		
		NUMBER OF CONTAINERS:	2	Condition	_X_GOOD ___OTHER
		EXPLAIN			
SAMPLE ID: Bldg 566					
SAMPLE NO: 97-12744					

Pres.	Parameter	Method Number	JRA Quantification Level*	Practical Quantitation Limit	Result	Analyst/Date/Time
None	Fecal Coliform	SM 18th 9221E	2/100 mL	20/100 mL	40/100 mL	RES-11/07/97 @ 1325

NOTES:

* JRA Quantification level is the concentration of the lowest calibaration standard above zero with a reliable signal.

RESPECTFULLY SUBMITTED BY: DATE: November 11, 1997

Elaine Claiborne

Elaine Claiborne

Laboratory Director

US00001293

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Dam Neck CODE:
CONTACT: Sidney Cornick
PHONE: 433-6182 EXT: FAX:
J.O. #: 19/3547
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
0002FM	80249	Bldg 566	START												
			STOP	11/7/97	1135	G	VH	L	4	2B	Fecal Coliform	97-12744			VH
			START									97-12744			
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
		Arrival Temp. 8.4°	STOP												
			START												
			STOP												
			START												
			STOP												

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): Rush (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
"OFFICIAL USE ONLY"

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.
2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

FOR LAB USE ONLY!! SAMPLES VERIFICATION INITIAL
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) DATE

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 11-7-97 1350
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

US00001294

US00001295

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1364
11/2/97 1755 Sample No. JRA97-12381

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001296

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1640	11/3/97 1655
Test End:	11/5/97 1650	11/5/97 1655
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/1/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001297

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1755	11/3/97 1640/1655[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (—)	20.3 (—)	20.6 (—)
Salinity (g/kg)	1 (—)	21 (—)	20 (—)
Conductivity (uMHOS/cm)	1659 (—)	N/A	N/A
pH	8.17 (—)	7.98 (—)	7.83 (—)
Dissolved Oxygen (mg/l)	11.5 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	122 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	303 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	4.7 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1635	1655	

		Day 0	Day 1	Day 2
TEMP	C	20.6	19.7	20.4
	1	20.5	19.6	20.5
	2	20.5	19.6	20.5
	3	20.4	19.7	20.3
	4	20.3	19.8	20.5
	5	20.3	19.9	20.4
pH	C	7.83	7.64	7.75
	1	7.82	7.69	7.75
	2	7.87	7.77	7.73
	3	7.92	7.86	7.93
	4	7.97	8.02	8.08
	5	7.98	8.09	8.25
D.O. (mg/l)	C	7.4	7.7	7.6
	1	7.4	7.8	7.7
	2	7.4	7.7	7.6
	3	7.4	7.6	7.6
	4	7.4	7.7	7.4
	5	8.0	7.7	7.5
SALIN (g/kg)	C	26	21	26
	1	20	21	21
	2	26	20	20
	3	20	20	20
	4	20	20	20
	5	21	21	21
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI-ABS

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 26

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 8-23

SET UP: Date 11/3/97 Time Water Added 1630

Time Animals Added 1655 Set Up By GH/RD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela G. Black 11/7/97

Signature Date

TEST I.D.: CRA97133

3

US00001299

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	11/12/97
Temp. (°C)	13.4
Conduct. (uMHOS)	1659
Salinity (g/kg)	1
pH	8.17
Diss. Oxygen (mg/l)	11.5
Tot. Chlorine (mg/l)	<DL
NH3-N (mg/l)	4.7
Hard (mg/l CaCO3)	122
Alkln (mg/l CaCO3)	343
Color/Appearance[1]	C Y
Initials	GH

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	11/13/97
Temp. (°C)	20.3
Salinity (g/kg)	21
D.O. (mg/l)	8.0
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	7.98
Tot Chlorine (mg/l)	ND
Initials	GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	11/13/97
Temp. (°C)	20.6
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	7.83
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GH

EFFLUENT ID: A3 4364 TEST ID: JNA42133 D-119

Toxicity Test Sample Chain of Custody
(Please complete all information)

1364

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson ~~JFox~~ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 5:55 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 21.8°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.92 Field Total Residual Chlorine _____
Comments/Sample description A3 - 2 liters of control

Type of test(s) to be performed Mysid Shrimp, Cryprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
   Received by V Hunt Date 11/3/97 Time 1045
2. Relinquished by V Hunt Date 11/3/97 Time 1130
   Received by J. Hunt Date 11/3/97 Time 1130
   Rel J. Hunt 11/3/97 1230

FOR REED LAB USE ONLY

JRA# 97-12381 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

SW-101 for 6700 0155

US00001301

		Date	Time
Revd:	Lelux	11-3-97	1230
Relinq:	Lelux	11-3-97	———
Rcvd:	[signature]	11/3/97	1330

US00001302

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: OCEANA CODE:
CONTACT: Douglas Kirk
PHONE: 683-5159 EXT: FAX:
J.O. #: 197229C
SIGNATURE:
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED BY
0002BH	1357	97-12376	START												
0002BJ	1358	Forest Stock	STOP	11/2/97	11:10	G	JJ	L	1	1 P	"Toxicity"	6.68	22.5		VH
	1360	97-12377	START												
		mixed Reference Rocks	STOP		0100							8.33	21.2		
	1361	97-12378	START												
		B3 AFFF+ Defoamer	STOP		0815							7.50	21.5		
	1362	97-12379	START												
		B2 AFFF+ Defoamer	STOP		0800							7.73	21.1		
	1363	97-12380	START												
		B1 AFFF+ Defoamer	STOP		0715							7.91	20.5		
	1364	97-12381	START												
		A3 - Control	STOP		5:35							7.92	21.5		
	1365	97-12382	START												
		A2 - Control	STOP		5:3?							7.57	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID.	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS: _____

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
**ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.*

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) INITIAL

DATE

RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND	DATE/TIME:

US00001303

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1365
11/2/97 1730 Sample No. JRA97-12382

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001304

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1650	11/3/97 1650
Test End:	11/5/97 1630	11/5/97 1640
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/1/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001305

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1730	11/3/97 1650/1650[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.8 (—)	20.1 (—)	20.6 (—)
Salinity (g/kg)	1 (—)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	1603 (—)	N/A	N/A
pH	8.19 (—)	7.98 (—)	7.83 (—)
Dissolved Oxygen (mg/l)	11.2 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	126 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	271 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	5.2 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001306

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.2)	20.3 (0.2)	20.2 (0.1)	20.3 (0.2)	20.2 (0.3)	20.2 (0.1)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.2)	7.8 (0.1)	7.8 (0.2)	7.7 (0.3)	7.7 (0.3)
pH	7.73 (0.10)	7.77 (0.08)	7.82 (0.05)	7.92 (0.01)	8.03 (0.07)	8.13 (0.15)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.4)	20.2 (0.4)	20.1 (0.2)	20.0 (0.3)	20.1 (0.3)	20.0 (0.2)
D.O. (mg/l)	7.8 (0.2)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.7 (0.3)	7.7 (0.3)
pH	7.76 (0.07)	7.78 (0.07)	7.82 (0.07)	7.87 (0.05)	8.00 (0.05)	8.12 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001307

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

US00001308

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-2

Date of Test	Invertebrate LC50%	Vertebrate LC50%	Invertebrate NOEC%	Vertebrate NOEC%
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		

US00001309

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1130	1630	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.4	20.2
	1	20.5	20.3	20.1
	2	20.3	20.3	20.1
	3	20.1	20.4	20.3
	4	20.2	20.5	20.0
	5	20.1	20.3	16.2
pH	C	7.83	7.72	7.64
	1	7.86	7.75	7.70
	2	7.88	7.79	7.80
	3	7.92	7.92	7.93
	4	7.96	8.03	8.09
	5	7.98	8.14	8.27
D.O. (mg/l)	C	7.9	7.7	7.7
	1	7.9	7.8	7.6
	2	7.9	7.8	7.7
	3	7.9	7.6	7.8
	4	8.0	7.5	7.6
	5	8.0	7.4	7.6
SALINITY (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/1/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 3X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 10-12

SET UP: Date 11/3/97 Time Water Added 1640

Time Animals Added 1650 Set Up By GH/PD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D. Frano 11/7/97

Signature Date

TEST I.D.: JAN92132

US00001310

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		C-H	C-H	
Time:		1625	1640	

		Day 0	Day 1	Day 2
TEMP	C	20.6	19.8	20.2
	1	20.5	19.8	20.3
	2	20.3	19.9	20.2
	3	20.1	19.7	20.2
	4	20.2	19.8	20.3
	5	20.1	19.8	20.1
pH	C	7.83	7.69	7.75
	1	7.86	7.73	7.74
	2	7.88	7.77	7.80
	3	7.92	7.87	7.83
	4	7.96	7.99	8.06
	5	7.98	8.13	8.24
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.7	7.7
	2	7.9	7.6	7.5
	3	7.9	7.6	7.5
	4	8.0	7.5	7.6
	5	8.0	7.6	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		EH	EH	EH

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-12

SET UP: Date 11/3/97 Time Water Added 1640

Time Animals Added 1650 Set Up By EH/RP

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature _____ Date 11/7/97

TEST I.D.: JM971132

US00001311

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDI.0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/2/97						
Temp. (°C)	2.8						
Conduct. (uMHOS)	1603						
Salinity (g/kg)	1						
pH	8.19						
Diss. Oxygen (mg/l)	11.2						
Tot. Chlorine (mg/l)	<0.2						
NH3-N (mg/l)	5.2						
Hard (mg/l CaCO3)	126						
Alkln (mg/l CaCO3)	271						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							11/3/97
Temp. (°C)							20.1
Salinity (g/kg)							26
D.O. (mg/l)							8.0
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							7.98
Tot Chlorine (mg/l)							ND
Initials							GH

DILUTION WATER CHARACTERISTICS: DMW: HWM:✓							ACUTE
Date							11/3/97
Temp. (°C)							20.6
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							7.83
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GH

EFFLUENT ID: A2 #1345 TEST ID: SNA97132

D-151

Toxicity Test Sample Chain of Custody
(Please complete all information)

1365

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location –
NPDES# – Instream Waste Conc –
Sample collected by (print&sign) Jason Foss Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 5:30 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number – Frequency of collection – Volume –

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 21.9°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.57 Field Total Residual Chlorine –
Comments/Sample description A2 - 2 liters of control

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
Received by V Hunt Date 11/3/97 Time 10:45
2. Relinquished by V Hunt Date 11/3/97 Time 1130
Received by J Hauer Date 11/3/97 Time 1130
Rel: J-Hauer 11/7/97 1230

FOR REED LAB USE ONLY

JRA# 97-12382 Arrival Temperature – On ice? –
Color – Odor – Solids –
pH – DO (mg/L) – Conductivity (µmhos/cm) – @ – °C
Salinity (ppt) – TRC (mg/L) – Method –

SW VOT dorm extracts

Rev 5/15/94

US00001313

	Date	Time
Rcvd by: [signature]	11-3-97	1230
Relinq by: [signature]	11-3-97	____
Rcvd by: [signature]	11/3/97	1330

US00001314

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: OCEANA CODE:
CONTACT: Douglas Kirk
PHONE: 683-3155 EXT: FAX:
J.O. #: 19229.0
SIGNATURE:
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE VERIFIED BY
0002 BH	07	97-12376	START												
0003 BJ	1358	Food Stock	STOP	11/20	1110	G	JS	L	1	1P	"Toxicity"	6.68	22.3		VH
	08	97-12377	START												
	1360	mixed Reference Powder	STOP		0700							8.33	21.2		
		97-12378	START												
	1361	B3 AFFF + Defoamer	STOP		0815							7.50	21.3		
		97-12379	START												
	1362	B2 AFFF + Defoamer	STOP		0800							7.73	21.1		
		97-12380	START												
	1363	B1 AFFF + Defoamer	STOP		0715							7.91	20.3		
		97-12381	START												
	1364	A3 - Control	STOP		5:55							7.92	21.8		
		97-12382	START												
	1365	A2 - Control	STOP		5:3							7.57	21.9		

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS:

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

SAMPLE DISPOSAL: (1)RETURN TO CLIENT ( )DISPOSAL BY LAB

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL
DATE

RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME:

US00001315

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1366
11/2/97 1830 Sample No. JRA97-12383

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001316

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:		>100%		>100%
95% Confidence Limits:		N/A		N/A
Calculation Method:		N/A		N/A
Toxic Units (T.U.):		<1.00		<1.00

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/3/97 1635	11/3/97 1630
Test End:	11/5/97 1605	11/5/97 1615
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/1/97	10/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	20.0-20.6°C	20.0-20.6°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when effluent oxygen demand results in dissolved oxygen concentrations ≤ 4.0 mg/l.

US00001317

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/2/97 1830	11/3/97 1635/1630[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.1 (---)	20.9 (---)	20.7 (---)
Salinity (g/kg)	N/A	21 (---)	20 (---)
Conductivity (uMHOS/cm)	1624 (---)	N/A	N/A
pH	8.17 (---)	7.95 (---)	8.03 (---)
Dissolved Oxygen (mg/l)	11.1 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	115 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	346 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	5.2 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.3 (0.4)	20.3 (0.4)	20.3 (0.3)	20.4 (0.4)	20.5 (0.3)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.8 (0.2)	7.8 (0.2)
pH	7.79 (0.22)	7.83 (0.17)	7.86 (0.13)	7.96 (0.04)	8.06 (0.07)	8.12 (0.16)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.3)	20.4 (0.3)	20.4 (0.3)	20.5 (0.2)	20.5 (0.3)	20.5 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.2)	7.7 (0.2)	7.8 (0.2)	7.7 (0.3)	7.7 (0.3)
pH	7.87 (0.16)	7.83 (0.18)	7.88 (0.11)	7.94 (0.05)	8.05 (0.06)	8.08 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	10/15/97-10/17/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.2 mg/l (540.9-609.5)
Control Chart LC50 (95% C.L.):	612.1 mg/l (488.3-735.9)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/3/97-11/5/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1200.0 mg/l (1070.5-1345.2)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (891.2-1258.6)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		

US00001321

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1620	1605	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.5	20.2
	1	20.7	20.3	20.0
	2	20.8	20.2	20.0
	3	20.7	20.2	20.1
	4	20.8	20.4	20.1
	5	20.9	20.4	20.3
pH	C	8.03	7.76	7.59
	1	8.02	7.80	7.68
	2	8.00	7.85	7.74
	3	8.00	7.95	7.93
	4	7.99	8.07	8.13
	5	7.95	8.17	8.25
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.7	7.8
	2	7.9	7.7	7.6
	3	7.9	7.6	7.7
	4	8.0	7.7	7.7
	5	8.0	7.7	7.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		2	2	1
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/1/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.1o to 20.1o

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 1-2.3

SET UP: Date 11/3/97 Time Water Added 1625

Time Animals Added 1635 Set Up By GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP Portaph2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela G. Bloxsom 11/7/97

Signature Date

TEST I.D.: JMA97131

US00001322

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		CH	CH	
Time:		1615	1615	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.2	20.1
	1	20.7	20.2	20.2
	2	20.8	20.3	20.2
	3	20.7	20.4	20.3
	4	20.8	20.2	20.4
	5	20.9	20.3	20.2
pH	C	8.03	7.86	7.71
	1	8.02	7.86	7.66
	2	8.00	7.84	7.79
	3	8.00	7.92	7.91
	4	7.99	8.06	8.11
	5	7.95	8.16	8.13
D.O. (mg/l)	C	7.4	7.5	7.2
	1	7.9	7.9	7.5
	2	7.9	7.7	7.6
	3	7.9	7.8	7.6
	4	8.0	7.8	7.4
	5	8.0	7.7	7.5
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	21
	3	20	20	20
	4	21	21	21
	5	21	21	21
Replicate # above meas.		2	2	2
Initials:		CH	CH	CH

Species: Cyprinodon variegatus Source: ESI ABS

Hatch Date/Time: 10/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 20.0 to 20.6

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: ____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 5-12

SET UP: Date 11/3/97 Time Water Added 1615

Time Animals Added 1630 Set Up By CH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D. Blewis 11/7/97
Signature Date

TEST I.D.: BA971311

US00001323

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	11/2/17
Temp. (°C)	13.1
Conduct. (uMHOS)	1624
Salinity (g/kg)	1
pH	8.17
Diss. Oxygen (mg/l)	11.1
Tot. Chlorine (mg/l)	<DL
NH3-N (mg/l)	5.2
Hard (mg/l CaCO3)	115
Alkln (mg/l CaCO3)	346
Color/Appearance[1]	CY
Initials	GH

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	11/3/17
Temp. (°C)	20.9
Salinity (g/kg)	21
D.O. (mg/l)	8.0
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	7.95
Tot Chlorine (mg/l)	ND
Initials	GH

DILUTION WATER CHARACTERISTICS: DMW: HWM:✓	ACUTE
Date	11/3/17
Temp. (°C)	20.7
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.03
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GH

EFFLUENT ID A1 1T 1360 TEST ID: 17A47131

US00001324

Toxicity Test Sample Chain of Custody
(Please complete all information)

1366
1366

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location –
NPDES# – Instream Waste Conc –
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/2/97 Time 6:30 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number – Frequency of collection – Volume –

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 21.8°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.88 Field Total Residual Chlorine –
Comments/Sample description A1 – 2 liters of control

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Erten-Unal Date 11/3/97 Time 10:00 am
   Received by V Hunt Date 11/3/97 Time 1045
2. Relinquished by V Hunt Date 11/3/97 Time 1130
   Received by J Hauser Date 11/3/97 Time 430
   Rel: J. Hauser 11/3/97 1230

FOR REED LAB USE ONLY

JRA# 97-12383 Arrival Temperature – On ice? –
Color – Odor – Solids –
pH – DO (mg/L) – Conductivity (µmhos/cm) – @ – °C
Salinity (ppt) – TRC (mg/L) – Method –

see GPI doc for codes

Rev 5/15/94

US00001325

		Date	Time
Rcvd by:	L Duff	11-3-97	1230
Relsd by:	L Duff	11-3-97	
Rcvd by:	[illegible]	11/3/97	1330

US00001326

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

CONTINUATION SHEET

SHEET 2 OF 2

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

P.O.C.: Douglas Kirk
COMMAND: Oceana

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERV. VERIFIED
0002B1	1366	97-12383 A-1 Control	START												
0002BT			STOP	10/6/97	0930	G	JJ	L	1	1P		7.88	21.5		√
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												

D-146

COMMENTS:

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM – 3:30 PM).*

D.O. NUMBER: | INIT.:
CONTRACT LAB: | DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

FOR LAB USE ONLY SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY: V Dunn	REC'D BY: J. Daniels	COMPANY/COMMAND: BES	DATE/TIME: 10/7/97 11:5
RELINQUISHED BY:	REC'D BY: Victor Smith	COMPANY/COMMAND: Read	DATE/TIME: 10-7-97 1
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

US00001327

APPENDIX D-3

BNR Inhibition Pass-Through Acute Toxicity Test Results

120 ppm AFFF Pretreated with Best Performing Defoamer

US00001328

US00001329

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed Stock
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1402
12/10/97 1000 Sample No. JRA97-14195

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001330

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	95	90	100	100
50.0	25	0	100	25
100	0	0	0	0
48-h LC50:	33.0%		42.0%	
95% Confidence Limits:	30.1-36.2		36.8-48.1	
Calculation Method:	Spearman-Karber		Spearman-Karber	
Toxic Units (T.U.):	3.03		2.38	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/11/97 1610	12/11/97 1600
Test End:	12/13/97 1615	12/13/97 1620
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/11/97	12/3/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.1-21.0°C	19.1-21.0°C
Test Aerated?[1]:	Yes	Yes
Aeration Initiation Date/Time:	12/11 at 1640	12/11 at 1640

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001331

ODU/OCEANA Sample I.D. Feed Stock
12/10/97 Sample 97-14195 Test ID: JRA97175

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/10/97 1000	12/11/97 1610/1600[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.7 (---)	20.9 (---)	20.8 (---)
Salinity (g/kg)	1 (---)	21 (---)	20 (---)
Conductivity (uMHOS/cm)	1280 (---)	N/A	N/A
pH	6.86 (---)	7.14 (---)	8.08 (---)
Dissolved Oxygen (mg/l)	9.5 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	157 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	373 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	29.0 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001332

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.7)	20.1 (0.7)	20.1 (0.9)	20.0 (0.7)	20.1 (0.8)	20.0 (1.1)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.1)	7.6 (0.2)	7.4 (0.2)	7.2 (0.8)	6.8 (1.3)
pH	8.03 (0.09)	8.02 (0.14)	8.02 (0.16)	7.97 (0.38)	7.99 (0.65)	7.80 (0.93)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.1 (0.8)	20.1 (0.8)	20.2 (0.8)	20.2 (0.6)	20.2 (0.7)	20.2 (0.9)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.1)	7.6 (0.2)	7.5 (0.3)	7.2 (0.8)	6.8 (1.4)
pH	8.07 (0.04)	8.08 (0.07)	7.97 (0.12)	7.95 (0.35)	8.03 (0.47)	7.59 (0.64)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	8.1%	12.35	N/A	N/A	3.5%	28.57	N/A	N/A
11/3/97	12.5%	8.00	N/A	N/A	19.7%	5.08	N/A	N/A
11/25/97	9.7%	10.31	N/A	N/A	13.8%	7.25	N/A	N/A
12/2/97	39.2%	2.55	N/A	N/A	30.6%	3.27	N/A	N/A
12/11/97*	33.0%	3.03	N/A	N/A	42.0%	2.37	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/11/97-12/13/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	596.2 mg/l (575.8-617.3)
Control Chart LC50 (95% C.L.):	608.1 mg/l (491.4-724.9)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/11/97-12/13/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1231.0 mg/l (1098.8-1379.2)
Control Chart LC50 (95% C.L.):	1077.9 mg/l (893.7-1262.1)

US00001334

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		
11/3/97	12.5	19.7		
11/18/97	23.3	36.6		
11/25/97	9.7	13.8		
12/2/97	39.2	30.6		
12/11/97	33.0	42.0		

US00001335

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form SWASTAT)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	3	25
	4-2	10	2	
100	5-1	0	0	0
	5-2	0	0	
Observer:		CB	PD	
Time:		1650	1620	

D-145

		Day 0	Day 1	Day 2
TEMP	C	20.8	14.3	20.3
	1	20.5	14.3	20.3
	2	20.4	14.4	20.4
	3	20.7	14.5	20.3
	4	20.8	14.5	20.5
	5	20.8	14.5	—
pH	C	8.08	8.11	8.03
	1	8.02	8.15	8.08
	2	7.84	8.03	8.05
	3	7.55	8.14	8.16
	4	7.50	8.24	8.36
	5	7.14	8.04	—
D.O. (mg/l)	C	87.9	7.8	7.7
	1	7.7	7.7	7.6
	2	7.4	7.7	7.7
	3	7.2	7.7	7.6
	4	6.3	7.7	7.7
	5	5.80	7.5	—
SALIN (g/kg)	C	20	21	20
	1	20	20	20
	2	20	21	20
	3	20	20	20
	4	21	21	21
	5	21	21	—
Replicate # above meas.		2	2	1
Initials:		CB	CB	CB

Species: C. variegatus Source: ABS

Hatch Date/Time: 12/3/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.1 to 21.0

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-12

SET UP: Date 12/11/97 Time Water Added 1550

Time Animals Added 1600 Set Up By CB/BD

INSTRUMENTATION USED:

Stem Thermometer Number: #1

- ☐ YSI D.O. Meter # 1 (SN:E9014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8018792)
- ☒ YSI D.O. Meter # 2 (SN:B1A028329)
- ☐ Corning 240 pH Meter (SN5259)
- ☐ SP PortaPH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for special study - only provided ~2L sample CB

ODD @ 3.2(4) 1640 - started aeration for AMMONIA V

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela M Bluntzer 12/15/97

Signature Date

TEST I.D.: SRA97175

D-155

US00001336

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson / [signature] Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 10 am
_____(Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

Temperature of sample in sample collection device 0 °C
Final temperature of effluent at sample collection point 26.2 °C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 6.78 Field Total Residual Chlorine _____
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 12/11/97 Time 9 am
   Received by Catherine Miller Date 12/11/97 Time 0910
2. Relinquished by A Miller Date 12-11-97 Time 11:00
   Received by Boyd S Hobbs Date 12-11-97 Time 1100
   Boyd S Hobbs 12-11-97 1205

1394

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

SU
CBI
NFM
GRAB/COMP

Rev 5/16/94

US00001337

Print & Sign Names

Relinquished by Dave Mahan Date 12/11/97 Time 1335

Received by [illegible] Date 12/11/97 Time 1335

Relinquished by _____ Date _____ Time _____

Received by _____ Date _____ Time _____

US00001338

Address report to: Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Bldg. Z-140
Norfolk, VA 23511

Report Due Date: 12-19-97

Sample Date: 12-10-97

Sample Location: Feed Stock

Contract No.: N00187-93-D-9748

Delivery Order: 235

J.O. #: 19122290

Item No.: 0002BJ, 0002BH

NPDES Permit #:

PWC #: 1402

Sample ID:

JRA ID: 97-14195

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Mother Liquor
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1401
12/10/97 1945 Sample No. JRA97-14194

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001340

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	95	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/11/97 1620	12/11/97 1615
Test End:	12/13/97 1630	12/13/97 1615
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/11/97	12/3/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.1-21.0°C	19.1-21.0°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001341

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/10/97 1945	12/11/97 1620/1615[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	4.0 (---)	20.7 (---)	20.7 (---)
Salinity (g/kg)	1 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1200 (---)	N/A	N/A
pH	8.47 (---)	8.26 (---)	8.19 (---)
Dissolved Oxygen (mg/l)	8.5 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	174 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	338 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	1.8 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001342

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.6)	20.2 (0.6)	20.2 (0.7)	20.3 (0.6)	20.3 (0.7)	20.2 (0.6)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)	7.7 (0.3)
pH	8.08 (0.12)	8.10 (0.12)	8.17 (0.05)	8.24 (0.03)	8.31 (0.05)	8.37 (0.10)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.1 (0.7)	20.1 (0.7)	20.2 (0.7)	20.2 (0.7)	20.3 (0.7)	20.1 (0.7)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.2)	7.8 (0.2)	7.7 (0.2)	7.7 (0.2)	7.7 (0.3)
pH	8.11 (0.10)	8.13 (0.09)	8.16 (0.07)	8.23 (0.03)	8.30 (0.04)	8.36 (0.09)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/11/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/11/97-12/13/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	596.2 mg/l (575.8-617.3)
Control Chart LC50 (95% C.L.):	608.1 mg/l (491.4-724.9)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/11/97-12/13/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1231.0 mg/l (1098.8-1379.2)
Control Chart LC50 (95% C.L.):	1077.9 mg/l (893.7-1262.1)

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form SWASTAT)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GB	BB	
Time:		1700	1615	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20/19.3	20.0
	1	20.7	19.4	20.3
	2	20.8	19.4	20.4
	3	20.8	19.5	20.4
	4	20.9	19.6	20.4
	5	20.7	19.4	20.3
pH	C	8.19	8.13	8.06
	1	8.20	8.15	8.03
	2	8.21	8.19	8.08
	3	8.35	8.25	8.19
	4	8.25	8.33	8.31
	5	8.26	8.39	8.44
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.8	7.6
	2	7.9	7.9	7.6
	3	7.9	7.7	7.5
	4	7.9	7.7	7.5
	5	8.0	7.6	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GM	GM	GM

Species: C. variegatus Source: ABS

Hatch Date/Time: 12/3/97

Acclimation water: HWM ASW ☐ Other:_____ Salinity: 20

Acclimation Temp. (range): 19.1 to 21.0

Feeding prior to test: Artemia 2X /d Other:_____

Feeding during test: Not fed ☒ Artemia_____/d Other:_____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other:_____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other:_____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other:_____ Randomization template no. 3-12

SET UP: Date 12/11/97 Time Water Added 1610

Time Animals Added 1615 Set Up By GB/SD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other_____

NOTES: Reduced volume for special study - 8.5L provided in 2L sample C-B

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments_____

Signature Date 12/15/97

TEST I.D.: SRA97176

US00001345

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	12/10/97
Temp. (°C)	4.0
Conduct (uMHOS)	1200
Salinity (g/kg)	1
pH	8.47
Diss. Oxygen (mg/l)	8.5
Tot. Chlorine (mg/l)	COC
NH3-N (mg/l)	1.8
Hard (mg/l CaCO3)	174
Alkln (mg/l CaCO3)	338
Color/Appearance[1]	CY
Initials	GB

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	12/11/97
Temp. (°C)	20.7
Salinity (g/kg)	20
D.O. (mg/l)	8.0
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	8.26
Tot Chlorine (mg/l)	ND
Initials	GB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	12/11/97
Temp. (°C)	20.2
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.14
Diss. Oxygen (mg/l)	NA 7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GB

EFFLUENT ID: Mixed Layer #1393 TEST ID: JRA 97176

US00001346

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Joson Affiliation ODU Env Eng lab
Type of sample ✓ (Grab): Date 12/10/97 Time 7:45
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____
Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____
*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 25.0°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? NO dechlorinated? NO If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 8.19 Field Total Residual Chlorine _____
Comments/Sample description Mother Liquor from Reference Reactor
Type of test(s) to be performed Mysid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
Received by [signature] Date 12/11/97 Time 0940 1393
2. Relinquished by [signature] Date 12-11-97 Time 11:00
Received by [signature] Date 12-11-97 Time 1205

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

yes
4°C blo in
cpdwigs

Rev 5/16/94

US00001347

Print & Sign Names

Relinquished by Laura Mahan Date 12/11/97 Time 1335

Received by Pam Bloom Date 12.14.97 Time 1535

Relinquished by _____ Date _____ Time _____

Received by _____ Date _____ Time _____

US00001348

US00001349

APPENDIX D-4

BNR Inhibition Pass-Through Acute Toxicity Test Results

60 ppm AFFF Pretreated with Fenton's Reagent

US00001350

US00001351

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus

Sample I.D. A1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1371
11/17/97 2040 Sample No. JRA97-13121

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001352

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	95	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	95	100	100
100	100	100	100	95
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1730	11/18/97 1730
Test End:	11/20/97 1720	11/20/97 1730
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/18/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001353

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 2040	11/18/97 1730/1730[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.8 (—)	20.4 (—)	20.6 (—)
Salinity (g/kg)	N/A	20 (—)	20 (—)
Conductivity (uMHOS/cm)	950 (—)	N/A	N/A
pH	8.42 (—)	8.17 (—)	8.05 (—)
Dissolved Oxygen (mg/l)	11.4 (—)	8.0 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	145 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	258 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	0.8 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001354

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.3)	20.4 (0.3)	20.5 (0.3)	20.3 (0.5)	20.3 (0.5)	20.3 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)
pH	7.96 (0.14)	8.09 (0.11)	8.10 (0.10)	8.14 (0.07)	8.20 (0.02)	8.24 (0.06)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.3)	20.2 (0.5)	20.3 (0.4)	20.3 (0.4)	20.2 (0.3)	20.2 (0.2)
D.O. (mg/l)	7.9 (0.1)	7.7 (0.2)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.2)
pH	7.89 (0.16)	8.12 (0.11)	8.13 (0.10)	8.14 (0.08)	8.18 (0.05)	8.19 (0.04)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001355

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		

US00001357

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	9	95
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	95
	4-2	10	9	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1710	1720	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.4	20.6
	1	21.5	20.6	20.0
	2	20.6	21.2	20.1
	3	20.4	20.2	19.8
	4	20.4	20.2	19.8
	5	20.4	20.2	19.9
pH	C	8.05	8.03	7.79
	1	8.21	8.07	8.00
	2	8.21	8.08	8.02
	3	8.21	8.14	8.08
	4	8.18	8.22	8.19
	5	8.17	8.29	8.27
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.9	7.9	7.8
	2	7.9	7.8	7.8
	3	7.9	7.7	7.7
	4	7.9	7.7	7.8
	5	8.0	7.7	7.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/18/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-2,3

SET UP: Date 11/18/97 Time Water Added 1720

Time Animals Added 1730 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☐ CP Digisense pH Meter (D9500563)
- ☒ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela J. Basco 11/21/97

Signature Date

TEST I.D.: TRA 97146

US00001358

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	95
	5-2	10	9	
Observer:		GH	GH	
Time:		1600	1730	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.4	20.0
	1	20.5	20.5	19.7
	2	20.6	20.5	19.8
	3	20.4	20.6	19.8
	4	20.4	20.4	19.9
	5	20.4	20.3	20.0
pH	C	8.05	7.89	7.23
	1	8.21	8.15	8.00
	2	8.21	8.15	8.02
	3	8.21	8.17	8.05
	4	8.18	8.23	8.13
	5	8.17	8.24	8.17
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.7	7.6
	2	7.9	7.8	7.7
	3	7.9	7.9	7.7
	4	7.9	7.8	7.8
	5	8.0	7.8	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	1	1
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____ /d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 1-1,2

SET UP: Date 11/18/97 Time Water Added 1720

Time Animals Added 1730 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaPH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for species study. Used only portion of 2L stock #3

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela Y. Blanco 11/21/97

Signature Date

TEST I.D.: JRA97146

US00001359

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/17/97						
Temp. (°C)	3.8						
Conduct. (uMHOS)	950						
Salinity (g/kg)	1						
pH	8.42						
Diss. Oxygen (mg/l)	11.4						
Tot. Chlorine (mg/l)	<0.1						
NH3-N (mg/l)	0.8						
Hard (mg/l CaCO3)	145						
Alkln (mg/l CaCO3)	258						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.4						
Salinity (g/kg)	20						
D.O. (mg/l)	8.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.12						
Tot Chlorine (mg/l)	NO						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	11/18/97						
Temp. (°C)	20.6						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	8.05						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: A1 #1371 TEST ID: JNA 97146

D-179

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County –
Pipe/Outfall/Location
NPDES#
Instream Waste Conc
Sample collected by (print&sign) JJoson Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 8:40 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device ~0 °C
Final temperature of effluent at sample collection point 23.0 °C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.88 . Field Total Residual Chlorine
Comments/Sample description A1 - control (4 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by Heather Quillen Date 11/18/97 Time 1050 # 1371
2. Relinquished by Heather Quillen Date 11/18/97 Time 1120
Received by J Bowers Date 11/18/97 Time 1120
Rel: J Bowers 11/18/97 @ 1210 Rec by D.H. Hyde 11/18/97 13:

97-13121
FOR REED LAB USE ONLY
JRA# 97-13130mc Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 9/16/96

US00001361

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
00028H 00028J	1371	A-1 Control	START	11/17/97	2040	G	JJ	L	1	1 P	Biomassay	97-13121			
	1372	A-2 Control	START		1930							97-13122			
	1373	A-3 Control	START		1955							97-13123			
	1374	B-1 ppm AFFF + Fentons Reagent	START		2030							97-13124			
	1375	B-2 ppm AFFF + Fentons Reagent	START		1910							97-13125			
	1376	B-3 ppm AFFF + Fentons Reagent	START		1930							97-13126			
	1377	Mixed Liquor from Reference Tanks	START		1045							97-13127			

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:	
RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).*

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL: DATE:

RELINQUISHED BY: Stephen Bullock	RECD BY: [illegible]	COMPANY/COMMAND: PWC Lab	DATE/TIME: 11/18/97 1000
RELINQUISHED BY: Kathleen Bullock	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 11/18/97 1120
RELINQUISHED BY: [illegible]	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 11/18/97 1320
RELINQUISHED BY:	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 11/18/97 1716

D-181

US00001362

US00001363

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1373
11/17/97 1855 Sample No. JRA97-13123

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001364

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	95	100	100
6.3	100	95	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	95	100	100
100	100	95	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1735	11/18/97 1735
Test End:	11/20/97 1700	11/20/97 1710
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/18/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001365

ODU/OCEANA Sample I.D. A3
11/17/97 Sample 97-13123 Test ID: JRA97145

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1855	11/18/97 1735/1735[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.8 (—)	20.6 (—)	20.6 (—)
Salinity (g/kg)	N/A	20 (—)	20 (—)
Conductivity (uMHOS/cm)	990 (—)	N/A	N/A
pH	8.09 (—)	8.01 (—)	8.05 (—)
Dissolved Oxygen (mg/l)	12.0 (—)	7.9 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	135 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	296 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	6.4 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001366

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.3)	20.5 (0.4)	20.5 (0.4)	20.5 (0.4)	20.4 (0.6)	20.4 (0.5)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.8 (0.1)	7.7 (0.2)
pH	7.90 (0.14)	7.93 (0.11)	7.96 (0.08)	8.01 (0.03)	8.11 (0.09)	8.16 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.5)	20.4 (0.6)	20.4 (0.6)	20.4 (0.5)	20.3 (0.6)	20.3 (0.4)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.2)	7.8 (0.1)
pH	7.89 (0.16)	7.91 (0.14)	7.95 (0.11)	7.99 (0.06)	8.06 (0.05)	8.09 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001367

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-3

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		

US00001369

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	9	95
	C-2	10	10	
6.25	1-1	10	10	95
	1-2	10	9	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	9	95
	4-2	10	10	
100	5-1	10	10	95
	5-2	10	9	
Observer:		GH	GH	
Time:		1025	1700	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.8	20.2
	1	20.8	20.7	20.1
	2	20.8	20.6	20.1
	3	20.7	20.8	20.0
	4	20.7	20.8	19.8
	5	20.6	20.8	19.8
pH	C	8.05	7.85	7.79
	1	8.05	7.90	7.84
	2	8.04	7.95	7.88
	3	8.03	8.03	7.98
	4	8.01	8.17	8.15
	5	8.01	8.24	8.24
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.9	7.7	7.7
	2	7.9	7.7	7.6
	3	7.9	7.6	7.6
	4	7.9	7.7	7.7
	5	7.9	7.6	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/18/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-23

SET UP: Date 11/18/97 Time Water Added 1715

Time Animals Added 1735 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☐ CP Digisense pH Meter (09500563)
- ☒ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela D Bloss 11/21/97

Signature Date

TEST I.D.: TRA97145

US00001370

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1615	1710	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.6	19.8
	1	20.8	20.7	19.7
	2	20.8	20.7	19.7
	3	20.7	20.6	19.8
	4	20.7	20.5	19.6
	5	20.6	20.5	19.8
pH	C	8.05	7.88	7.73
	1	8.05	7.91	7.77
	2	8.04	7.97	7.83
	3	8.03	8.03	7.92
	4	8.01	8.10	8.05
	5	8.01	8.16	8.11
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.9	7.8
	2	7.9	7.8	7.8
	3	7.9	7.7	7.7
	4	7.9	7.8	7.6
	5	7.9	7.8	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/15/92

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 6-2,3

SET UP: Date 11/18/92 Time Water Added 1715

Time Animals Added 1735 Set Up By PDIGM

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaHZ Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: Reduced volume for previous study. Last only possible ~2L stock left

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela K Blood 11/21/92
Signature Date

TEST I.D.: JRA 1215

US00001371

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:						
Sample Date	11/17/97					
Temp. (°C)	2.8					
Conduct. (uMHOS)	490					
Salinity (g/kg)	31					
pH	8.09					
Diss. Oxygen (mg/l)	12.0					
Tot. Chlorine (mg/l)	LOL					
NH3-N (mg/l)	0.4					
Hard (mg/l CaCO3)	135					
Alkln (mg/l CaCO3)	96					
Color/Appearance[1]	CY					
Initials	GH					

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.6						
Salinity (g/kg)	20						
D.O. (mg/l)	7.4						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.01						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	11/18/97						
Temp. (°C)	20.6						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	8.05						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: A3 #1373

TEST ID: JNA97145

D-191

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 6:55 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.3°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 - 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 7.98 Field Total Residual Chlorine _____
Comments/Sample description A3 - Control (2 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
   Received by Heather Miller Date 11/18/97 Time 0950 #1375
2. Relinquished by Heather Miller Date 11/18/97 Time 1130
   Received by J. Hamm Date 11/18/97 Time 1130
   Rel: J. Hamm 11/18/97 @ 1210 Rec: Dy D. Hyde 11/19/97

FOR REED LAB USE ONLY

JRA# 97-1323 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001373

CHAIN-OF-CUSTODY RECORD & ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
0012BH 0013BJ	1371	A-1 Control	START / STOP	11/12/97	2040	G	JJ	L	1	1P	Bioassay	97-13121			don
	1372	A-2 Control	START / STOP		1830							97-13122			
	1373	A-3 Control	START / STOP		1955							97-13123			
	1374	B-1 Y Fentons Reagent ppm AFFF	START / STOP		2030							97-13124			
	1375	B-2 ppm AFFF Fenton Reagent	START / STOP		1910							97-13125			
	1376	B-3 ppm AFFF Y Fenton Reagent	START / STOP		1930							97-13126			
	1377	Mixed Liquor from Reference Pond	START / STOP		1945							97-13127			

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).*
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!! SAMPLES VERIFICATION
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )
INITIAL:
DATE:

RELINQUISHED BY: C. Stephen Bullard	RECD BY: [illegible]	COMPANY/COMMAND: OAIC Lab	DATE/TIME: 11/18/97 1000
RELINQUISHED BY: C. Stephen Bullard	RECD BY: F. Hansen	COMPANY/COMMAND: ABS	DATE/TIME: 11/18/97 1140
RELINQUISHED BY: F. Hansen	RECD BY: [illegible]	COMPANY/COMMAND: FAA	DATE/TIME: 11/18/97 1200
RELINQUISHED BY:	RECD BY: JS Hayes	COMPANY/COMMAND: CH2M	DATE/TIME: 11/19/97 1314

US00001374

US00001375

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1372
11/17/97 1830 Sample No. JRA97-13122

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001376

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	95	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	95	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1800	11/18/97 1800
Test End:	11/20/97 1740	11/20/97 1750
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/18/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001377

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1830	11/18/97 1800/1800[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*:*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.2 (—)	20.6 (—)	20.8 (—)
Salinity (g/kg)	N/A	20 (—)	20 (—)
Conductivity (uMHOS/cm)	980 (—)	N/A	N/A
pH	8.17 (—)	8.01 (—)	8.21 (—)
Dissolved Oxygen (mg/l)	11.6 (—)	7.9 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	138 (—)	N/A[1]	N/A
Alkalinity (mg/l as $CaCO_3$)	300 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	6.2 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001378

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.4)	20.6 (0.3)	20.5 (0.5)	20.4 (0.4)	20.4 (0.3)	20.4 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.8 (0.1)
pH	8.07 (0.12)	8.09 (0.10)	8.11 (0.08)	8.14 (0.02)	8.15 (0.06)	8.14 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.6)	20.5 (0.5)	20.6 (0.4)	20.4 (0.4)	20.4 (0.4)	20.3 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)
pH	8.08 (0.13)	8.07 (0.11)	8.10 (0.10)	8.12 (0.04)	8.12 (0.04)	8.09 (0.07)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001379

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-2

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		

US00001381

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	95
	1-2	10	9	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	95
	5-2	10	9	
Observer:		GH	GH	
Time:		1750	1740	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.7	20.1
	1	20.8	20.7	20.2
	2	20.8	20.8	14.9
	3	20.7	20.6	19.9
	4	20.6	20.6	20.0
	5	20.6	20.7	20.0
pH	C	8.21	8.03	7.92
	1	8.20	8.06	8.01
	2	8.19	8.10	8.04
	3	8.15	8.15	8.11
	4	8.08	8.20	8.18
	5	8.01	8.20	8.21
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.7	7.8
	2	7.9	7.8	7.8
	3	7.9	7.8	7.7
	4	7.9	7.7	7.6
	5	7.9	7.8	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/18/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-1,2

SET UP: Date 11/18/97 Time Water Added 1740

Time Animals Added 1800 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☒ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela D. Bloom 11/21/97

Signature Date

TEST I.D.: JRA97142

US00001382

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1800	1750	

		Day 0	Day 1	Day 2
TEMP	C	12.8	20.7	14.8
	1	20.8	20.8	20.0
	2	20.8	20.8	20.1
	3	20.7	20.6	14.4
	4	20.6	20.6	14.5
	5	20.6	20.5	14.9
pH	C	8.21	8.06	7.96
	1	8.20	8.04	7.98
	2	8.19	8.11	8.00
	3	8.15	8.14	8.07
	4	8.08	8.16	8.12
	5	8.01	8.15	8.12
D.O. (mg/l)	C	7.9	2.8	7.8
	1	7.9	2.9	7.7
	2	7.9	2.7	7.8
	3	7.9	2.8	2.7
	4	7.9	7.8	7.8
	5	7.9	2.8	2.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: ~~CBI~~ ABS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 9-1,2

SET UP: Date 11/18/97 Time Water Added 1740

Time Animals Added 1800 Set Up By PDIGH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for special study. Used only portion of ~2L stock #3

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J Blevins 11/21/97

Signature Date

TEST I.D.: JRA 42147

US00001383

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	11/17/97
Temp. (°C)	3.2
Conduct. (uMHOS)	980
Salinity (g/kg)	01
pH	8.17
Diss. Oxygen (mg/l)	11.6
Tot. Chlorine (mg/l)	<DL
NH3-N (mg/l)	6.3
Hard (mg/l CaCO3)	138
Alkln (mg/l CaCO3)	300
Color/Appearance[1]	CY
Initials	GH

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	11/18/97
Temp. (°C)	20.6
Salinity (g/kg)	20
D.O. (mg/l)	7.9
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	8.01
Tot Chlorine (mg/l)	ND
Initials	GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	11/18/97
Temp. (°C)	20.8
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.21
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GH

EFFLUENT ID: A2 #1372 TEST ID: JRA 97197

US00001384

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County ~ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 6:30 pm
~ (Composite): From Date ~ Time ~
To Date ~ Time ~
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 23.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? ~ If yes – limit (mg/L) ~
Field pH 7.84 Field Total Residual Chlorine _____
Comments/Sample description A2 - Control (2 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by [signature] Date 11/18/97 Time 0950 #1372
2. Relinquished by [signature] Date 11/18/97 Time 1120
Received by J. Hawes Date 11/18/97 Time 1120
Rel: J. Hawes 11/18/97 1210 Rec by [signature] 11/18/97 1

FOR REED LAB USE ONLY

JRA# 97-1322 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 3/16/94

US00001385

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1374
11/17/97 2030 Sample No. JRA97-13124

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001386

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	95	100	100
25.0	100	100	100	100
50.0	100	95	100	100
100	100	90	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1810	11/18/97 1800
Test End:	11/20/97 1800	11/20/97 1810
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/18/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001387

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 2030	11/18/97 1810/1800[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (---)	20.6 (—)	20.8 (—)
Salinity (g/kg)	2 (---)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	2310 (---)	N/A	N/A
pH	8.24 (---)	8.01 (—)	8.21 (—)
Dissolved Oxygen (mg/l)	11.5 (—)	7.8 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	141 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	243 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	2.6 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001388

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.5)	20.4 (0.3)	20.5 (0.3)	20.5 (0.3)	20.4 (0.4)	20.5 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.5 (0.3)	7.5 (0.3)
pH	8.07 (0.12)	8.07 (0.11)	8.09 (0.09)	8.11 (0.04)	8.13 (0.05)	8.13 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.6)	20.4 (0.6)	20.4 (0.5)	20.4 (0.6)	20.3 (0.5)	20.4 (0.4)
D.O. (mg/l)	7.7 (0.2)	7.7 (0.2)	7.8 (0.1)	7.7 (0.2)	7.6 (0.2)	7.6 (0.2)
pH	8.08 (0.13)	8.06 (0.11)	8.09 (0.10)	8.09 (0.07)	8.09 (0.03)	8.08 (0.07)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001389

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	72.0%	1.39	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	50.5%	1.98	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	72	>100		
11/3/97	50.5	>100		
11/18/97	>100	>100		

US00001391

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	95
	2-2	10	9	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	9	95
	4-2	10	10	
100	5-1	10	10	90
	5-2	10	8	
Observer:		GH	GH	
Time:		1635	1800	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.6	19.1
	1	20.7	20.5	20.1
	2	20.7	20.6	20.1
	3	20.8	20.6	20.2
	4	20.6	20.7	19.9
	5	20.6	20.8	20.0
pH	C	8.21	8.03	7.97
	1	8.19	8.05	7.98
	2	8.19	8.06	8.01
	3	8.15	8.12	8.07
	4	8.07	8.17	8.15
	5	8.01	8.19	8.20
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.9	7.7	7.6
	2	7.9	7.6	7.5
	3	7.8	7.6	7.5
	4	7.8	7.4	7.3
	5	7.8	7.3	7.3
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/18/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 2-1,2

SET UP: Date: 11/18/97 Time Water Added: 1745

Time Animals Added: 1810 Set Up By: PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☐ CP Digisense pH Meter (D9500563)
- ☒ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D. Blasic 11/21/97

Signature Date

TEST I.D.: TRA97148

US00001392

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1640	1810	

		Day 0	Day 1	Day 2
TEMP	C	20.8	20.7	19.7
	1	20.7	20.8	14.7
	2	20.7	20.7	19.8
	3	20.8	20.6	14.2
	4	20.6	20.5	19.7
	5	20.6	20.7	19.9
pH	C	8.21	8.06	7.96
	1	8.19	8.01	7.99
	2	8.19	8.09	7.99
	3	8.15	8.11	8.02
	4	8.07	8.12	8.09
	5	8.01	8.14	8.10
D.O. (mg/l)	C	7.9	7.6	7.7
	1	7.9	7.6	7.6
	2	7.9	7.7	7.7
	3	7.8	7.6	7.7
	4	7.8	7.5	7.5
	5	7.8	7.5	7.6
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above mass.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI AGS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-23

SET UP: Date 11/18/97 Time Water Added 1745

Time Animals Added 1800 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaspH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for special study. used only portion ~2L stock #3

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela J. Blasio 11/21/97
Signature Date

TEST I.D.: JRA 92148

US00001393

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:						
Sample Date	11/17/97					
Temp. (°C)	13.4					
Conduct. (uMHOS)	2310					
Salinity (g/kg)	2					
pH	8.24					
Diss. Oxygen (mg/l)	11.5					
Tot. Chlorine (mg/l)	<0.2					
NH3-N (mg/l)	2.6					
Hard (mg/l CaCO3)	141					
Alkln (mg/l CaCO3)	243					
Color/Appearance[1]	CY					
Initials	GH					

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.6						
Salinity (g/kg)	20						
D.O. (mg/l)	17.8						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.01						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	11/18/97						
Temp. (°C)	20.8						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	8.21						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: 81
H1374

TEST ID: JNA 97148

D-213

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 8:30 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.8°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 7.82 Field Total Residual Chlorine _____
Comments/Sample description Bl - 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
Received by Althea Miller Date 11/18/97 Time 0950 #1374
2. Relinquished by Althea Miller Date 11/18/97 Time 1120
Received by J. Hamrick Date 11/18/97 Time 1120
Rel: J. Hamrick 11/18/97 1220 Rec by: S. Hyde 11/18/97

FOR REED LAB USE ONLY

JRA# 97-1312Y Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids –
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/20/94

US00001395

CHAIN OF CUSTODY RECORD & ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
001BH 002BJ	1371	A-1 Control	START / STOP	11/12/97	1040	G	JJ	L	1	1 P	Bioassay	97-13121			
	1372	A-2 Control	START / STOP		1830							97-13122			
	1373	A-3 Control	START / STOP		1855							97-13123			
	1374	B-1 *Fenton's Reagent ppm AFFF	START / STOP		2030							97-13124			
	1375	B-2 ppm AFFF *Fenton's Reagent	START / STOP		1910							97-3125			
	1376	B-3 ppm AFFF *Fenton's Reagent	START / STOP		1930							97-3126			
	1377	Mixed liquor from Reference Control	START / STOP		1045							97-13127			

TYPE
G - GRAB
CF - COMPOSITE, FLOW
CT - COMPOSITE, TIME

MATRIX
L - LIQUID
S - SOLID
GS - GAS
SS - SEMI SOLID
SW - SWIPE

CONTAINER
P - PLASTIC
B - BAG
A - AMBER(glass)
GL - GLASS
C - CARTRIDGE
T - TEFLON
TL - TEFLON LINED LID
V - VOA
H - HEXANE RINSED

PRESERVATIVE
1 - COOL TO 4 C
2 - HNO3, pH<2
3 - H2SO4, pH<2
4 - NaOH, pH>12
5 - HCL, pH<2
6 - 0.008% Na2S2O3, 4 C
7 - FIELD FILTER
8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:
RCRA ( ) HRSD ( )
SDWA ( ) TSCA ( )
CWA ( ) PHOTO ( )
CAA ( ) OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER:
CONTRACT LAB:
INIT.:
DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).*
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!!

SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE

RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 11/18/97 1000
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 11/13/97 1142
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 11/1597 1200
RELINQUISHED BY:	RECD BY:	COMPANY/COMMAND:	DATE/TIME: 11/15 97-1314

US00001397

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1375
11/17/97 1910 Sample No. JRA97-13125

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001398

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	80	45	100	100
48-h LC50:	93.9%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	Trimmed Spearman-Karber		N/A	
Toxic Units (T.U.):	1.06		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1820	11/18/97 1820
Test End:	11/20/97 1820	11/20/97 1830
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/13/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001399

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1910	11/18/97 1820/1820[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	4.0 (—)	20.3 (—)	20.4 (—)
Salinity (g/kg)	2 (—)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	2400 (—)	N/A	N/A
pH	8.02 (—)	7.86 (—)	8.23 (—)
Dissolved Oxygen (mg/l)	10.1 (—)	7.8 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	163 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	301 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	9.0 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001400

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.5 (0.2)	20.5 (0.2)	20.5 (0.2)	20.5 (0.2)	20.5 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.5 (0.1)	7.3 (0.1)	7.0 (0.4)	6.8 (0.5)	6.5 (0.6)
pH	8.01 (0.19)	7.98 (0.11)	7.98 (0.09)	8.02 (0.04)	8.05 (0.12)	8.06 (0.17)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.2)	20.4 (0.2)	20.4 (0.1)	20.4 (0.2)	20.3 (0.1)	20.3 (0)
D.O. (mg/l)	7.7 (0.2)	7.5 (0.1)	7.4 (0.2)	7.0 (0.4)	6.8 (0.5)	6.6 (0.7)
pH	8.10 (0.11)	7.99 (0.12)	7.99 (0.08)	7.99 (0.02)	7.98 (0.06)	7.95 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001401

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	66.0%	1.52	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	50.0%	2.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	93.9%	1.06	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

US00001402

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-2

Date of Test	Invertebrate EC50 %	Vertebrate EC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	66	>100		
11/3/97	50.0	>100		
11/18/97	93.9	>100		

US00001403

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	9	4	45
	5-2	7	5	
Observer:		GH	GH	
Time:		1745	1820	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.5	20.3
	1	20.4	20.7	20.3
	2	20.5	20.7	20.3
	3	20.3	20.2	20.4
	4	20.3	20.2	20.4
	5	20.3	20.6	20.5
pH	C	8.23	7.91	7.88
	1	8.11	7.95	7.89
	2	8.07	7.99	7.89
	3	7.98	8.06	8.01
	4	7.91	8.13	8.11
	5	7.86	8.13	8.18
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.5	7.4	7.5
	2	7.2	7.3	7.3
	3	6.5	7.3	7.2
	4	6.3	7.1	7.1
	5	5.8	6.8	6.9
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above mass.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/13/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-1,2

SET UP: Date 11/18/97 Time Water Added 1755

Time Animals Added 1820 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☒ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela M Brooks 11/21/97
Signature Date

TEST I.D.: TRAF2149

US00001404

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5 .

DATE: 11/18/97 TEST NUMBER: JRA97149 DURATION: 48 H
TOXICANT : B2
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	0
100.00	20	11

SPEARMAN-KARBER TRIM: 45.00%

SPEARMAN-KARBER ESTIMATES: LC50: 93.89
95% CONFIDENCE LIMITS
ARE NOT RELIABLE.

US00001405

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		CH	CH	
Time:		1655	1830	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.6	20.3
	1	20.4	20.5	20.2
	2	20.5	20.5	20.3
	3	20.3	20.6	20.3
	4	20.3	20.4	20.3
	5	20.3	20.3	20.3
pH	C	8.23	8.07	8.01
	1	8.11	7.97	7.88
	2	8.07	7.91	7.91
	3	7.98	8.01	7.98
	4	7.91	8.01	8.02
	5	7.86	7.95	8.01
D.O. (mg/l)	C	7.9	7.6	7.7
	1	7.5	7.6	7.5
	2	7.2	7.5	7.4
	3	6.5	7.3	7.2
	4	6.3	7.1	7.1
	5	5.8	7.1	7.0
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		CH	CH	CH

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 4-2,3

SET UP: Date 11/18/97 Time Water Added 1755

Time Animals Added 1820 Set Up By POIGH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaspH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A365)

Other _____

NOTES: Retest values for previous study. Used only portion ~2L stock C2

DO 5.5 at 1845

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J Moore 11/01/97

Signature Date

TEST I.D.: TRA97149

US00001406

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/12/97						
Temp. (°C)	4.0						
Conduct. (uMHOS)	2400						
Salinity (g/kg)	2						
pH	8.02						
Diss. Oxygen (mg/l)	10.1						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	9.0						
Hard (mg/l CaCO3)	163						
Alkln (mg/l CaCO3)	301						
Color/Appearance[1]	CY						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.3						
Salinity (g/kg)	20						
D.O. (mg/l)	7.8						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.86						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	11/18/97						
Temp. (°C)	20.4						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	8.23						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: 62 / H1375 TEST ID: JNA 97149

US00001407

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County —
NPDES# _____ Pipe/Outfall/Location _____
Instream Waste Conc _____
Sample collected by (print&sign) Jason Fox Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 7:10 pm
— (Composite): From Date — Time —
To Date — Time —
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.9°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes - limit (mg/L) —
Field pH 8.00 Field Total Residual Chlorine _____
Comments/Sample description B2- 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp. Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jeson Date 11/18/97 Time 10:00 am
Received by Heather Duell Date 11/18/97 Time 1050 #1375
2. Relinquished by Heather Duell Date 11/18/97 Time 1130
Received by T. Hawkins Date 11/18/97 Time 1120
Rel: T. Hawkins 11/18/97 @ 1210 Rec: Dr. to Hyd 11/19/97.

FOR REED LAB USE ONLY

JRA# 97-1375 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001408

CHAIN-OF-CUSTODY RECORD & ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
002BH 002BJ	1371	A-1 Control	START	11/12/97	2040	G	JJ	L	1	1P	Bioassay	97-13121			
	1372	A-2 Control	START		1830							97-13122			
	1373	A-3 Control	START		1855							97-13123			
	1374	B-1 1% Fortens Reagent ppm AFFF	START		2030							97-13124			
	1375	B-2 ppm AFFF 1% Fortens Reagent	START		1910							97-13125			
	1376	B-3 ppm AFFF 1% Fortens Reagent	START		1930							97-13126			
	1377	Mixed liquor from Reference Lucta	START		1845							97-13127			

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).*
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!! SAMPLES VERIFICATION
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )
INITIAL:
DATE:

RELINQUISHED BY: C. Esther Bullock	RECD BY: J. Draper	COMPANY/COMMAND: PWC Lab	DATE/TIME: 11/18/97 1000
RELINQUISHED BY: C. Esther Bullock	RECD BY: J. Draper	COMPANY/COMMAND: NAS	DATE/TIME: 11/18/97 1120
RELINQUISHED BY: F. Hansen	RECD BY: [illegible]	COMPANY/COMMAND: FAR	DATE/TIME: 11/18/97 1320
RELINQUISHED BY:	RECD BY: JS Hyde	COMPANY/COMMAND: CIT	DATE/TIME: 11/19/97 1314

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus

Sample I.D. B3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1376
11/17/97 1930 Sample No. JRA97-13126

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001410

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival *M. bahia* 24-h	*M. bahia* 48-h	*C. variegatus* 24-h	*C. variegatus* 48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	95	15	100	100
48-h LC50:	75.2%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	Trimmed Spearman-Karber		N/A	
Toxic Units (T.U.):	1.33		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1840	11/18/97 1840
Test End:	11/20/97 1840	11/20/97 1850
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/13/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001411

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1930	11/18/97 1840/1840[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.9 (—)	20.5 (—)	20.4 (—)
Salinity (g/kg)	2 (—)	22 (—)	20 (—)
Conductivity (uMHOS/cm)	2400 (—)	N/A	N/A
pH	7.99 (—)	7.78 (—)	8.23 (—)
Dissolved Oxygen (mg/l)	10.1 (—)	7.8 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	145 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	361 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	9.6 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001412

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.1)	20.3 (0.2)	20.2 (0.1)	20.3 (0.1)	20.3 (0.1)	20.3 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.6 (0.2)	7.4 (0.2)	7.2 (0.2)	7.0 (0.1)	6.9 (0.2)
pH	7.87 (0.32)	7.83 (0.20)	7.85 (0.17)	7.93 (0.06)	7.99 (0.14)	7.99 (0.19)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	22 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.1)	20.4 (0.1)	20.3 (0)	20.3 (0.1)	20.3 (0.1)	20.4 (0.1)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.1)	7.4 (0.3)	7.2 (0.2)	7.0 (0.1)	6.8 (0.2)
pH	8.10 (0.11)	7.81 (0.27)	7.82 (0.23)	7.89 (0.07)	7.92 (0.08)	7.90 (0.10)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)	22 (0)

US00001413

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	65.0%	1.54	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	45.0%	2.22	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	75.2%	1.33	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-3

Date of Test	Invertebrate EC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/26/97	>100	>100		
9/30/97	65	>100		
11/3/97	45.0	>100		
11/18/97	75.2	>100		

US00001415

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	0	15
	5-2	9	3	
Observer:		GH	GH	
Time:		1650	1840	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.4	20.2
	1	20.5	20.2	20.2
	2	20.3	20.2	20.2
	3	20.3	20.2	20.3
	4	20.3	20.3	20.2
	5	20.5	20.3	20.2
pH	C	8.23	7.73	7.64
	1	8.05	7.74	7.66
	2	8.02	7.84	7.68
	3	7.92	7.99	7.87
	4	7.83	8.08	8.05
	5	7.78	8.08	8.12
D.O. (mg/l)	C	7.4	7.7	7.7
	1	7.8	7.5	7.4
	2	7.6	7.3	7.3
	3	7.4	7.2	7.1
	4	6.9	7.0	7.1
	5	6.6	7.0	7.0
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	22	22	22
Replicate # above mean.		1	2	2
Initials:		GH	GH	GH

NOTES: DO 5.6 at 1845

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/12/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 1-1,2

SET UP: Date 11/18/97 Time Water Added 1820

Time Animals Added 1840 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☐ CP Digisense pH Meter (D9500563)
- ☒ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaPH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela J. Vilcaro 11/21/97

Signature Date

TEST I.D.: JRA 17150

US00001416

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/18/97 TEST NUMBER: JRA97150 DURATION: 48 H
TOXICANT : B3
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	0
100.00	20	17

SPEARMAN-KARBER TRIM: 15.00%

SPEARMAN-KARBER ESTIMATES: LC50: 75.17
95% CONFIDENCE LIMITS
ARE NOT RELIABLE.

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		CH	CH	
Time:		1700	1850	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.3	20.2
	1	20.5	20.4	20.3
	2	20.3	20.3	20.3
	3	20.3	20.3	20.4
	4	20.3	20.2	20.4
	5	20.5	20.4	20.7
pH	C	8.23	8.07	8.01
	1	8.05	7.87	7.52
	2	8.02	7.87	7.56
	3	7.92	7.95	7.81
	4	7.83	7.98	7.96
	5	7.78	7.95	7.97
D.O. (mg/l)	C	7.4	7.8	7.7
	1	7.8	7.6	7.7
	2	7.6	7.4	7.1
	3	7.4	7.1	7.0
	4	6.9	7.1	7.6
	5	6.6	7.0	6.8
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	21	21	21
	5	22	22	22
Replicate # above meas.		1	2	3
Initials:		CH	CH	CH

Species: Cyprinodon variegatus Source: ~~CBI~~ ABS

Hatch Date/Time: 11/15/92

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Instal no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 10,23

SET UP: Date 11/18/92 Time Water Added 1820

Time Animals Added 1840 Set Up By PDGH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP Portaph2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for special chlg. used only possible ~2 L stock #2

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela G. Brewer 11/21/92

Signature Date

TEST I.D.: JRA92150

US00001418

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	11/17/97
Temp. (°C)	3.1
Conduct. (uMHOS)	2400
Salinity (g/kg)	2
pH	7.99
Diss. Oxygen (mg/l)	10.1
Tot. Chlorine (mg/l)	<0.1
NH3-N (mg/l)	9.6
Hard (mg/l CaCO3)	145
Alkln (mg/l CaCO3)	361
Color/Appearance[1]	CY
Initials	GH

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	11/18/97
Temp. (°C)	20.5
Salinity (g/kg)	22
D.O. (mg/l)	7.8
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	7.78
Tot Chlorine (mg/l)	ND
Initials	GH

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	11/18/97
Temp. (°C)	20.4
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.23
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GH

EFFLUENT ID: B3 #1376 TEST ID: JNA97150

US00001419

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk VA 23529

County ~ Pipe/Outfall/Location ~
NPDES# ~ Instream Waste Conc ~
Sample collected by (print&sign) Joson ~~Hoss~~ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 7:30 pm
~ (Composite): From Date ~ Time ~
To Date ~ Time ~
Subsamples comprising composite: n/a
Number ~ Frequency of collection ~ Volume ~
Temperature of sample in sample collection device ~0 °C
Final temperature of effluent at sample collection point 22.3°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? ~ If yes - limit (mg/L) ~
Field pH 7.96 Field Total Residual Chlorine ~
Comments/Sample description B3- 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp. Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by [signature] Date 11/18/97 Time 0950 #1376
2. Relinquished by [signature] Date 11/18/97 Time 1120
Received by [signature] Date 11/18/97 Time 1120
Ref: F. Hamlett 11/18/97 @1210 Rec: Dan E. Hyde 11/18/97 13:

FOR REED LAB USE ONLY

JRA# 97-13126 Arrival Temperature ~ On ice? ~
Color ~ Odor ~ Solids ~
pH ~ DO (mg/L) ~ Conductivity (µmhos/cm) ~ @ ~ °C
Salinity (ppt) ~ TRC (mg/L) ~ Method ~

Rev 5/26/94

US00001420

CHAIN-OF-CUSTODY RECORD & ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
XXXBH XXXBJ	1371	A-1 Control	START	11/12/97	2040	G	JJ	L	1	1 P	Bioassay	97-13121			
	1372	A-2 Control	START		1830							97-13122			
	1373	A-3 Control	START		1855							97-13123			
	1374	B-1 1% Fortens Rep + ppm AFFF	START		2030							97-13124			
	1375	B-2 ppm AFFF + Fortens Rep	START		1910							97-13125			
	1376	B-3 ppm AFFF + Fortens Rep	START		1930							97-13126			
	1377	Mixed Liquor from Reference Lucta	START		1045							97-13127			

TYPE	MATRIX		CONTAINER			PRESERVATIVE	
G - GRAB	L - LIQUID	SW - SWIPE	P - PLASTIC	B - BAG	A - AMBER(glass)	1 - COOL TO 4 C	5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID		GL - GLASS	C - CARTRIDGE		2 - HNO3, pH<2	6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS		T - TEFLON	TL - TEFLON LINED LID		3 - H2SO4, pH<2	7 - FIELD FILTER
	SS - SEMI SOLID		V - VOA	H - HEXANE RINSED		4 - NaOH, pH>12	8 - NONE

TURNAROUND (Days): _____ *(FOR RUSH TURNAROUND STATE REASON BELOW)*

COMMENTS: _____

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:	
RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

O.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!! SAMPLES VERIFICATION INITIAL:
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) DATE:

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 11/18/97 1000
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 11/18/97 1120
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 11/18/97 1320
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME: 11/19/97 1310

US00001421

D-240

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Mixed Liquor
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1377
11/17/97 1045 Sample No. JRA97-13127

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001422

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1725	11/18/97 1725
Test End:	11/20/97 1640	11/20/97 1650
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/14/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001423

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1045	11/18/97 1725/1725[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	4.0 (---)	20.3 (---)	20.7 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	850 (---)	N/A	N/A
pH	8.28 (---)	8.18 (---)	7.95 (---)
Dissolved Oxygen (mg/l)	11.1 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	142 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	287 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	1.8 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001424

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.7)	20.2 (0.6)	20.3 (0.5)	20.2 (0.5)	20.2 (0.5)	20.0 (0.6)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.8 (0.2)	7.8 (0.2)
pH	7.88 (0.09)	7.90 (0.13)	7.94 (0.13)	8.04 (0.07)	8.17 (0.04)	8.28 (0.09)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.7)	20.2 (0.6)	20.2 (0.6)	20.0 (0.4)	20.1 (0.4)	20.1 (0.6)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.1)	7.8 (0.2)	7.7 (0.2)
pH	7.84 (0.15)	7.92 (0.14)	7.96 (0.12)	8.03 (0.09)	8.13 (0.06)	8.21 (0.04)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001425

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/18/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Mix L. R.R.

Date of Test	Invertebrate EC50 %	Vertebrate EC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		

US00001427

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1740	1740	

		Day 0	Day 1	Day 2
TEMP	C	20.2	20.6	19.4
	1	20.6	20.5	19.5
	2	20.6	20.6	19.2
	3	21.4	20.6	19.6
	4	20.3	20.6	19.6
	5	20.3	20.4	19.4
pH	C	7.95	7.91	7.78
	1	8.04	7.89	7.78
	2	8.06	7.94	7.81
	3	8.09	8.00	7.96
	4	8.14	8.21	8.16
	5	8.18	8.35	8.32
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.9	7.8	7.7
	2	7.9	7.7	7.6
	3	7.9	7.8	7.5
	4	7.9	7.9	7.5
	5	7.9	7.8	7.5
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/14/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 9,1-2

SET UP: Date 11/18/97 Time Water Added 1710

Time Animals Added 1725 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☒ Sartorius R160P Balance (40020093)
- ☐ SP PortaPH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela M Bloom 11/20/97

Signature Date

TEST I.D.: TRA97144

US00001428

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		GH	GH	
Time:		1730	1650	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.5	19.4
	1	20.6	20.4	19.5
	2	20.6	20.4	19.5
	3	20.4	20.3	19.6
	4	20.3	20.4	19.7
	5	20.3	20.5	19.4
pH	C	7.95	7.90	7.67
	1	8.04	7.95	7.76
	2	8.06	8.06	7.83
	3	8.09	8.08	7.93
	4	8.14	8.18	8.07
	5	8.18	8.26	8.20
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.8	7.7
	2	7.9	7.8	7.7
	3	7.9	7.9	7.8
	4	7.9	7.5	7.6
	5	7.9	7.8	7.5
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 7-2-3

SET UP: Date 11/18/97 Time Water Added 1710

Time Animals Added 1725 Set Up By PDlGH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: Reduced volume for special study. Used only outside ~2L shark #2

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

David G Blaine 11/21/97
Signature Date

TEST I.D.: JRA 7-144

US00001429

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/17/97						
Temp. (°C)	4.0						
Conduct. (uMHOS)	850						
Salinity (g/kg)	4						
pH	8.28						
Diss. Oxygen (mg/l)	11.1						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	1.8						
Hard (mg/l CaCO3)	142						
Alkln (mg/l CaCO3)	287						
Color/Appearance[1]	CY						
Initials	EH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.3						
Salinity (g/kg)	20						
D.O. (mg/l)	7.9						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.18						
Tot Chlorine (mg/l)	ND						
Initials	EH						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date	11/18/97						
Temp. (°C)	20.7						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.95						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	EH						

EFFLUENT ID: mixed liquor #1377 TEST ID: JNA97144

US00001430

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH, 0003AD
PWC No. 1378
11/17/97 1100 Sample No. JRA97-13128

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001432

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	80	100	100
25.0	10	0	100	100
50.0	100	60	85	5
100	0	0	0	0
48-h LC50:	23.3%		36.6%	
95% Confidence Limits:	18.4-29.5		34.2-39.2	
Calculation Method:	Spearman-Karber		Spearman-Karber	
Toxic Units (T.U.):	4.29		2.73	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/18/97 1720	11/18/97 1720
Test End:	11/20/97 1620	11/20/97 1730
Organism Source:	CBI stock cultures	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/14/97	11/15/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.2-20.8°C	19.2-20.8°C
Test Aerated?[1]:	Yes	Yes
Aeration Initiation Date/Time:	11/18 1700	11/18 1700

US00001433

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/17/97 1100	11/18/97 1720/1720[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.3 (---)	20.8 (---)	20.7 (---)
Salinity (g/kg)	N/A	22 (---)	20 (---)
Conductivity (uMHOS/cm)	1100 (---)	N/A	N/A
pH	7.15 (---)	7.41 (---)	7.95 (---)
Dissolved Oxygen (mg/l)	7.9 (---)	7.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	126 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	460 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	29.0 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001434

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.1 (0.6)	20.2 (0.6)	20.1 (0.8)	20.0 (0.8)	20.1 (0.8)	20.6 (0.3)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.5 (0.5)	7.3 (0.6)	6.5 (1.8)	5.6 (2.5)
pH	7.84 (0.09)	7.86 (0.06)	7.88 (0.20)	7.76 (0.29)	7.84 (0.40)	7.74 (0.47)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)	22 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.1 (0.6)	20.1 (0.6)	20.1 (0.6)	20.0 (0.6)	20.1 (0.6)	20.3 (0.7)
D.O. (mg/l)	7.8 (0.1)	7.7 (0.2)	7.3 (0.8)	7.1 (1.1)	6.6 (1.7)	5.6 (2.8)
pH	7.84 (0.09)	7.84 (0.04)	7.85 (0.17)	7.83 (0.36)	7.91 (0.46)	7.84 (0.60)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	21 (0)	21 (0)	22 (0)

US00001435

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	8.1%	12.35	N/A	N/A	3.5%	28.57	N/A	N/A
11/3/97	12.5%	8.00	N/A	N/A	19.7%	5.08	N/A	N/A
11/18/97*	23.3%	4.29	N/A	N/A	36.6%	2.73	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.0)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1029.5 mg/l (881.7-1202.0)
Control Chart LC50 (95% C.L.):	1079.5 mg/l (896.5-1262.5)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate EC50%	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		
11/3/97	12.5	19.7		
11/18/97	23.3	36.6		

US00001437

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	80
	2-2	10	6	
25	3-1	2	0	0
	3-2	0	0	
50	4-1	10	7	60
	4-2	10	5	
100	5-1	0	0	0
	5-2	0	0	
Observer:		GH	GH	
Time:		1715	1020	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.2	19.5
	1	20.7	20.3	19.5
	2	20.8	20.3	19.3
	3	20.7	20.2	19.2
	4	20.8	20.4	19.2
	5	20.8	20.4	—
pH	C	7.95	7.80	F.78
	1	7.85	7.92	7.80
	2	7.65	8.00	7.98
	3	7.42	7.92	7.94
	4	7.38	8.00	8.14
	5	7.41	8.07	—
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.5	7.8	7.8
	2	6.9	7.8	7.8
	3	6.7	7.7	7.6
	4	4.5	7.5	7.6
	5	3.8	7.4	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	21	21	21
	4	21	21	21
	5	22	22	—
Replicate # above meas.		2	2	1
Initials:		CH	GH	GH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/14/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-2, 3

SET UP: Date 11/18/97 Time Water Added 1700

Time Animals Added 1720 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☐ CP Digisense pH Meter (D9500563)
- ☒ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaPH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Aeration began 1700

Unusual deviations or observations recorded visually (Wind, etc.) or made using meas. D.O., sal. etc. P.D. 11/19/97

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela J. Bosco 11/21/97

Signature Date

TEST I.D.: TRA97143

US00001438

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5 -

DATE: 11/18/97 TEST NUMBER: JRA97143 DURATION: 48 H
TOXICANT : FEED STOCK
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	4
25.00	20	20
50.00	20	8
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 23.33
95% LOWER CONFIDENCE: 18.42
95% UPPER CONFIDENCE: 29.54

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

US00001439

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	1	5
	4-2	7	0	
100	5-1	0	0	0
	5-2	0	0	
Observer:		GH	GH	
Time:		1645	1750	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.1	19.6
	1	20.7	19.8	19.7
	2	20.8	19.9	19.7
	3	20.7	19.9	19.5
	4	20.8	19.8	19.6
	5	20.8	19.8	—
pH	C	7.95	7.80	7.78
	1	7.85	7.87	7.80
	2	7.85	7.95	7.95
	3	7.92	8.10	7.98
	4	7.89	8.04	8.11
	5	7.91	8.06	—
D.O. (mg/l)	C	7.9	7.8	7.7
	1	7.9	7.8	7.8
	2	6.4	7.8	7.8
	3	5.8	7.7	7.2
	4	4.6	7.6	7.5
	5	3.60	7.6	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	21	21
	4	21	21	21
	5	22	22	—
Replicate # above meas.		2	2	2
Initials:		GH	GH	GH

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 11/15/97

Acclimation water: HWM ASW ☐ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.2 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☒ Artemia _____ /d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 6-1,2

SET UP: Date 11/18/97 Time Water Added 1700

Time Animals Added 1720 Set Up By PD/GH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaspH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Reduced volume for special study. Used only portion of 2L stock #2

Aeration began 1700

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Pamela D. Blasco 11/21/97

Signature Date

TEST I.D.: JRA 97143

US00001440

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5 .

DATE: 11/18/97 TEST NUMBER: JRA97143 DURATION: 48 H
TOXICANT : FEED STOCK
SPECIES: C VARIEGATUS

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	19
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 36.60
95% LOWER CONFIDENCE: 34.21
95% UPPER CONFIDENCE: 39.16

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/17/97						
Temp. (°C)	23						
Conduct. (uMHOS)	1100						
Salinity (g/kg)	21						
pH	7.15						
Diss. Oxygen (mg/l)	7.9						
Tot. Chlorine (mg/l)	<0.0						
NH3-N (mg/l)	29.0						
Hard (mg/l CaCO3)	126						
Alkln (mg/l CaCO3)	460						
Color/Appearance[1]	OB						
Initials	GH						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid SI -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/18/97						
Temp. (°C)	20.8						
Salinity (g/kg)	22						
D.O. (mg/l)	7.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.41						
Tot Chlorine (mg/l)	ND						
Initials	GH						

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date	11/18/97						
Temp. (°C)	20.2						
Conduct. (uMHOS)	NA						
Salinity (g/kg)	20						
pH	7.45						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	NA						
Alkln (mg/l CaCO3)	NA						
Initials	GH						

EFFLUENT ID: Feed Stock #1328 TEST ID: JRA 97143

US00001441

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Foss Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 11:00am
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.6°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 - 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 7.36 Field Total Residual Chlorine _____
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp. Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by Althea Trella Date 11/18/97 Time 1950 # 1378
2. Relinquished by Althea Trella Date 11/18/97 Time 1120
Received by J Hauser Date 11/18/97 Time 1620
Rel. J. Hauser 11/18/97 @ 1210 Rec. by P. Hyde 11/18/97

FOR REED LAB USE ONLY

JRA# 97-13138 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ – °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/13/94

US00001442

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

CONTINUATION SHEET

SHEET 2 OF 2

ENVIRONMENTAL
PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

P.O.C.: Douglas Kirk
COMMAND: ODAM

LAB USE ONLY LINE ITEM #	SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESENT VIEW
000.28H	1378	Feed Stock	START	11/7/97	1100	G	JJ	L	1	1P	Biomass	97-1/3/28			
000.28J			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												

COMMENTS:

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.
2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM – 3:30 PM).

D.O. NUMBER:
CONTRACT LAB:
CONTRACT NO.(S):
INIT.:
DATE:
OFFICIAL USE ONLY

**FOR LAB USE ONLY!! SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY: Cathleen Dueller	REC'D BY: A Rapp	COMPANY/COMMAND: PWC Lab	DATE/TIME: 11/12/97 1100
RELINQUISHED BY: Cathleen Dueller	REC'D BY: E. Hamm	COMPANY/COMMAND: BES	DATE/TIME: 11/13/97 1120
RELINQUISHED BY: E. Hamm	REC'D BY: [illegible]	COMPANY/COMMAND: JAA	DATE/TIME: 11/13/97 1210
RELINQUISHED BY:	REC'D BY: D. Hyde	COMPANY/COMMAND: CAI	DATE/TIME: 11/13/97 1310

Toxicity Test Sample Chain of Custody 1371
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign): Joson C Fos Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 8:40 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 23.0°C
Is sample collection device chilled? YES Is sample packed on ice for shipment? YES
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? NO If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 7.88 Field Total Residual Chlorine _____
Comments/Sample description A1 - control, (4 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by Althea Quillen Date 11/18/97 Time 1050 # 1371
2. Relinquished by Althea Quillen Date 11/18/97 Time 1120
Received by J Daniel Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (umhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001444

Toxicity Test Sample Chain of Custody
(Please complete all information)

1372

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Hoss Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 6:30 pm
– (Composite): From Date – Time –
To Date – Time –

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 23.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.84 Field Total Residual Chlorine _____
Comments/Sample description A2 - control (2 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
   Received by Arthur Juilla Date 11/18/97 Time 1050 #1372
2. Relinquished by Arthur Juilla Date 11/18/97 Time 1120
   Received by J. Hawes Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 8/25/94

US00001445

Toxicity Test Sample Chain of Custody
(Please complete all information)

1373

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location –
NPDES# – Instream Waste Conc –
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 6:55 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number – Frequency of collection – Volume –
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.3°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.98 Field Total Residual Chlorine –
Comments/Sample description A3 - Control (2 hr aeration)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
   Received by Heather Miller Date 11/18/97 Time 0950 #1373
2. Relinquished by Heather Miller Date 11/18/97 Time 1120
   Received by J. Hawes Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# – Arrival Temperature – On ice? –
Color – Odor – Solids –
pH – DO (mg/L) – Conductivity (umhos/cm) – @ – °C
Salinity (ppt) – TRC (mg/L) – Method –

Rev 5/15/95

US00001446

Toxicity Test Sample Chain of Custody
(Please complete all information)

1374

Facility Old Dominion University
Address Norfolk, VA 23529

County –
NPDES# _____
Pipe/Outfall/Location _____
Instream Waste Conc _____
Sample collected by (print&sign) Jason C Fos Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 8:30 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0 °C
Final temperature of effluent at sample collection point 22.8°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 7.82 Field Total Residual Chlorine _____
Comments/Sample description B1 - 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
Received by Arthur Bille Date 11/18/97 Time 0950 #1374
2. Relinquished by Arthur Bille Date 11/18/97 Time 1120
Received by T. Hauser Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/96

US00001447

Toxicity Test Sample Chain of Custody
(Please complete all information)

1375

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason C Fosa Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 7:10 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.9°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 - 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 8.00 Field Total Residual Chlorine _____
Comments/Sample description B2 - 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
Received by Esther Suelo Date 11/18/97 Time 1050 #1375
2. Relinquished by Esther Suelo Date 11/18/97 Time 1120
Received by T. Hansley Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (umhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001448

Toxicity Test Sample Chain of Custody
(Please complete all information)

1376

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 7:30 pm
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.3°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.96 Field Total Residual Chlorine _____
Comments/Sample description B3- 60 ppm AFFF + Fenton's Reagent

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 11/18/97 Time 10:00 am
Received by Heather Miller Date 11/18/97 Time 0950 #1376
2. Relinquished by Heather Miller Date 11/18/97 Time 1120
Received by J Hamlet Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 3/15/94

US00001449

Toxicity Test Sample Chain of Custody
(Please complete all information)

1377

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location —
NPDES# — Instream Waste Conc —
Sample collected by (print&sign) Jason C Hoffman Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 10:45 am
— (Composite): From Date — Time —
To Date — Time —
Subsamples comprising composite: n/a
Number — Frequency of collection — Volume —
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.8°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.23 Field Total Residual Chlorine —
Comments/Sample description Mixed Liquor (from Reference Reactor)

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms)
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
Received by Heather Driscoll Date 11/18/97 Time 1958 #1377
2. Relinquished by Heather Driscoll Date 11/19/97 Time 1120
Received by J. Harrell Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# — Arrival Temperature — On ice? —
Color — Odor — Solids —
pH — DO (mg/L) — Conductivity (µmhos/cm) — @ — °C
Salinity (ppt) — TRC (mg/L) — Method —

Rev 5/15/96

US00001450

Toxicity Test Sample Chain of Custody
(Please complete all information) 1378

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 11/17/97 Time 11:00 am
– (Composite): From Date – Time –
To Date – Time –
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 22.6°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.36 Field Total Residual Chlorine _____
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Jason Date 11/18/97 Time 10:00 am
Received by Althea Trella Date 11/18/97 Time 1950 #1378
2. Relinquished by Althea Trella Date 11/18/97 Time 1120
Received by F Hauser Date 11/18/97 Time 1120

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (umhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001451

CHAIN-OF-CUSTODY RECORD & ANALYSIS REQUEST FORM

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
ENVIRONMENTAL PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 433-2239 EXT: FAX: 433-2995
J.O. #: 1912290
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
XXXBH XXXBJ	1371	A-1 Control	START / STOP	11/12/97	2040	G	JJ	L	1	1 P	Bioassay	97-13121			don
	1372	A-2 Control	START / STOP		1930							97-13122			
	1373	A-3 Control	START / STOP		1855							97-13123			
	1374	B-1 1% Fortons Reagent ppm AFFF	START / STOP		2030							97-13124			
	1375	B-2 ppm AFFF Fortons Reagent	START / STOP		1910							97-13125			
	1376	B-3 ppm AFFF Fortons Reagent	START / STOP		1930							97-13126			
	1377	from Reference Mixed Liquor Fraction	START / STOP		1045							97-13127			

D-271

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): _____ (FOR RUSH TURNAROUND STATE REASON BELOW)
COMMENTS: _____

REGULATION APPLIED:
RCRA ( ) HRSD ( )
SDWA ( ) TSCA ( )
CWA ( ) PHOTO ( )
CAA ( ) OTHER ( )

SAMPLING/COLLECTION CHARGE: $
POSSIBLE SAMPLE HAZARDS:
COMMENTS:

SAMPLE DISPOSAL: (1)RETURN TO CLIENT ( )DISPOSAL BY LAB

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S). *
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

**FOR LAB USE ONLY!! SAMPLES VERIFICATION INITIAL:
REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) DATE:

RELINQUISHED BY: Stephen Bubb	RECD BY: [illegible]	COMPANY/COMMAND: PWC Lab	DATE/TIME: 11/13/97 1000
RELINQUISHED BY: Stephen Bubb	RECD BY: [illegible]	COMPANY/COMMAND: PWC	DATE/TIME: 11/13/97 1100
RELINQUISHED BY: [illegible]	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 11/13/97 1320
RELINQUISHED BY:	RECD BY: [illegible]	COMPANY/COMMAND: [illegible]	DATE/TIME: 11/14/97 1312

US00001452

US00001453

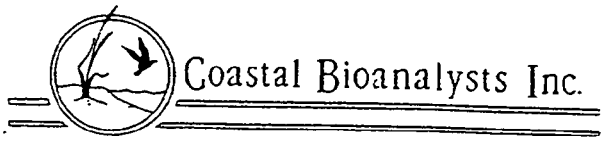
APPENDIX D-5

BNR Inhibition Pass-Through Acute Toxicity Test Results

120 ppm AFFF Pretreated with Fenton's Reagent

US00001454

US00001455



ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1394
12/1/97 1725 Sample No. JRA97-13676

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	90	100	100
100	100	0	100	100
48-h LC50:	66.0%		>100%	
95% Confidence Limits:	60.1-72.4		N/A	
Calculation Method:	Spearman-Karber		N/A	
Toxic Units (T.U.):	1.52		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1740	12/2/97 1740
Test End:	12/4/97 1700	12/4/97 1705
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001457

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1725	12/2/97 1740/1740[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.2 (---)	20.5 (---)	20.1 (---)
Salinity (g/kg)	2 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	2680 (---)	N/A	N/A
pH	8.17 (---)	8.00 (---)	8.24 (---)
Dissolved Oxygen (mg/l)	12.9 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	211 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	439 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	2.6 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.4 (0.3)	20.4 (0.2)	20.4 (0.1)	20.5 (0.2)	20.5 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.9 (0)	7.9 (0)	7.9 (0.1)	7.9 (0.1)	7.9 (0.1)
pH	8.14 (0.09)	8.15 (0.08)	8.16 (0.05)	8.16 (0.02)	8.15 (0.07)	8.13 (0.11)
Salinity (g/kg)	21 (1)	21 (1)	21 (1)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.4)	20.5 (0.4)	20.5 (0.4)	20.6 (0.4)	20.6 (0.3)	20.6 (0.3)
D.O. (mg/l)	7.9 (0)	7.9 (0)	7.9 (0.1)	7.9 (0)	7.9 (0.1)	7.9 (0.1)
pH	8.17 (0.07)	8.18 (0.07)	8.17 (0.04)	8.16 (0.01)	8.15 (0.07)	8.12 (0.11)
Salinity (g/kg)	21 (1)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)

US00001459

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	65.0%	1.54	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	45.0%	2.22	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	69.1%	1.45	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97*	66.0%	1.52	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-3

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/26/97	>100	>100		
9/30/97	65	>100		
11/3/97	45.0	>100		
11/18/97	75.2	>100		
11/25/97	69.1	>100		
12/2/97	66.0	>100		

US00001461

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB4W)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	90
	4-2	10	8	
100	5-1	10	0	0
	5-2	10	0	
Observer:		SD	C-B	
Time:		1745	1700	

		Day 0	Day 1	Day 2
TEMP	C	20.1	20.4	20.6
	1	20.1	20.5	20.6
	2	20.2	20.5	20.6
	3	20.3	20.5	21.5
	4	20.3	20.5	20.6
	5	20.5	20.5	20.4
pH	C	8.24	8.09	8.09
	1	8.24	8.11	8.10
	2	8.21	8.14	8.12
	3	8.17	8.16	8.14
	4	8.07	8.19	8.19
	5	8.00	8.20	8.19
D.O. (mg/l)	C	7.9	8.0	7.9
	1	7.9	7.9	7.9
	2	7.9	7.9	7.9
	3	7.9	7.8	7.9
	4	8.0	7.8	7.8
	5	8.0	7.8	7.8
SALIN (g/kg)	C	20	20	21
	1	20	21	21
	2	20	21	21
	3	20	20.	20+
	4	20	20	20
	5	20	20	20
Replicate # above mean.		1	2	1
Initials:		GB	SD	BB

Species: Mysidopsis bahia Source: IWF CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 5-1,2

SET UP: Date 12/2/97 Time Water Added 1730

Time Animals Added 1746 Set Up By CB/BB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500583)
- ☐ Sartorius R160P Balance (40020083)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A028329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaspH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/5/97 Date

TEST I.D.: JRA9716b

US00001462

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 12/2/97 TEST NUMBER: JRA97166 DURATION: 48 H
TOXICANT : B3
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	2
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 65.98
95% LOWER CONFIDENCE: 60.12
95% UPPER CONFIDENCE: 72.41

US00001463

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		SD	CB	
Time:		1555	1705	

		Day 0	Day 1	Day 2
TEMP	C	20.1	20.9	20.5
	1	20.1	20.9	20.6
	2	20.2	21.0	20.3
	3	20.3	21.0	20.6
	4	20.3	20.8	20.6
	5	20.5	20.9	20.4
pH	C	8.24	8.18	8.10
	1	8.24	8.18	8.11
	2	8.20	8.18	8.13 (8.21)
	3	8.17	8.17	8.15
	4	8.07	8.16	8.21
	5	8.00	8.16	8.21
D.O. (mg/l)	C	7.9	7.9	7.9
	1	7.9	7.9	7.9
	2	7.9	7.8	7.9
	3	7.9	7.9	7.9
	4	8.0	7.9	7.8
	5	8.0	7.9	7.8
SALIN (g/kg)	C	20	21	21
	1	20	21	21
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		CB	SD	BB

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 6-1-2

SET UP: Date 12/2/97 Time Water Added 1730 1740

Time Animals Added 1550 Set Up By CB/BB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN81A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaspH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

[signature] 12/5/97 Date

TEST I.D.: JLA97166

US00001464

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	12/11/97
Temp. (°C)	13.2
Conduct. (uMHOS)	12680
Salinity (g/kg)	12
pH	8.17
Diss. Oxygen (mg/l)	12.9
Tot. Chlorine (mg/l)	<DL
NH3-N (mg/l)	2.6
Hard (mg/l CaCO3)	211
Alkln (mg/l CaCO3)	439
Color/Appearance[1]	CY
Initials	GB

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	12/12/97
Temp. (°C)	20.5
Salinity (g/kg)	26
D.O. (mg/l)	7.9
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	8.20
Tot Chlorine (mg/l)	NA
Initials	GB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓	ACUTE
Date	12/12/97
Temp. (°C)	20.1
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.24
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GB

EFFLUENT ID: B3 # 1394 TEST ID: JRA971664

D-284

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JDSON/[illegible] Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.5°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.10 Field Total Residual Chlorine
Comments/Sample description B3

Type of test(s) to be performed Mysid Shrimp, Cryprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

	Print & Sign Names			
1.	Relinquished by Dr. Hajide Erten-Unal	Date 12/02/97	Time 10:00 am	9:00 am BH
	Received by Althea Zuille	Date 12/2/97	Time 0915	#1374
2.	Relinquished by Althea Zuille	Date 12/2/97	Time 1040	
	Received by [illegible]	Date 12/2/97	Time 1040	

Rel: F. Hamer 12/2/97 1115

FOR REED LAB USE ONLY

JRA# 97-1367 C Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method –

See CBL for EPA 445

Rev 5/16/94

US00001466

Print & Sign Names

Relinquished by		Date	Time
Received by		Date 12-2-97	Time
Relinquished by		Date 12-2-97	Time
Received by	Pam Blanco	Date 12-2-97	Time 1220

US00001467

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1393
12/1/97 1725 Sample No. JRA97-13675

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001468

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	80	100	100
100	70	5	100	100
48-h LC50:	63.9%		>100%	
95% Confidence Limits:	55.2-74.0		N/A	
Calculation Method:	Trimmed Spearman-Karber		N/A	
Toxic Units (T.U.):	1.56		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1710	12/2/97 1715
Test End:	12/4/97 1655	12/4/97 1650
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001469

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1725	12/2/97 1710/1715[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.6 (---)	20.5 (---)	20.1 (---)
Salinity (g/kg)	2 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	2610 (---)	N/A	N/A
pH	8.22 (---)	8.02 (---)	8.25 (---)
Dissolved Oxygen (mg/l)	12.7 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	209 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	392 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	3.0 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.4 (0.3)	20.4 (0.3)	20.5 (0.2)	20.5 (0.1)	20.5 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.2)	7.8 (0.2)	7.8 (0.2)	7.7 (0.3)
pH	8.14 (0.09)	8.16 (0.13)	8.16 (0.10)	8.16 (0.04)	8.15 (0.04)	8.14 (0.10)
Salinity (g/kg)	21 (1)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.6 (0.5)	20.6 (0.4)	20.5 (0.3)	20.6 (0.3)	20.6 (0.3)	20.6 (0.2)
D.O. (mg/l)	7.9 (0)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.2)	7.7 (0.3)
pH	8.15 (0.09)	8.17 (0.12)	8.17 (0.09)	8.15 (0.04)	8.14 (0.04)	8.11 (0.08)
Salinity (g/kg)	21 (1)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	66.0%	1.52	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	50.0%	2.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	42.1%	2.38	N/A	N/A	72.6%	1.38	N/A	N/A
12/2/97*	63.9%	1.56	N/A	N/A	72.6%	1.38	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-2

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	66	>100		
11/3/97	50.0	>100		
11/18/97	93.9	>100		
11/25/97	42.1	72.6		
11/25/97	63.9	72.6		

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1392
12/1/97 1925 Sample No. JRA97-13674

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	95	95
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	95	95
100	95	70	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1650	12/2/97 1650
Test End:	12/4/97 1705	12/4/97 1710
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001475

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1925	12/2/97 1650/1650[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (---)	20.8 (—)	20.4 (—)
Salinity (g/kg)	2 (---)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	2580 (---)	N/A	N/A
pH	8.46 (---)	8.05 (—)	8.10 (—)
Dissolved Oxygen (mg/l)	12.0 (—)	7.9 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	193 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	367 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	9.6 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	72	>100		
11/3/97	50.5	>100		
11/18/97	>100	>100		
11/25/97	40.2	>100		
11/25/97	>100	>100		

US00001477

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	7	70
	5-2	9	7	
Observer:		PB	PB	
Time:		1640	1705	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.2	20.4
	1	20.4	20.2	20.4
	2	20.6	20.3	20.5
	3	20.8	20.2	20.6
	4	20.8	20.3	20.7
	5	20.8	20.3	20.7
pH	C	8.10	7.98	8.06
	1	8.09	7.98	8.06
	2	8.09	8.04	8.09
	3	8.08	8.09	8.13
	4	8.04	8.16	8.29
	5	8.05	8.24	8.29
D.O. (mg/l)	C	7.7	7.6	7.9
	1	7.9	7.8	7.9
	2	7.9	7.9	7.7
	3	7.9	7.9	7.8
	4	7.9	7.9	7.7
	5	7.9	8.0	7.6
SALIN (g/kg)	C	20	20+	20+
	1	20	20+	20+
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		PB	SD	PB

Species: Mysidopsis bahia Source: IMF CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp (Range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D Cycle: ☒ Other: _____ Randomization template no. 6-12

SET UP: Date: 12/2/97 Time Water Added: 1645

Time Animals Added: 1650 Set Up By: GS/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☒ CP Digisense pH Meter (B9500563)
- ☐ Corning 240 pH Meter (SN:6268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP Portasal2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: JRA971C9

US00001478

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	95
	1-2	9	9	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	95
	4-2	9	9	
100	5-1	10	10	100
	5-2	10	10	
Observer:		SD	PB	
Time:		1605	1710	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.5	20.5
	1	20.4	20.6	20.5
	2	20.6	20.5	20.6
	3	20.8	20.5	20.6
	4	20.8	20.6	20.6
	5	20.8	20.7	20.7
pH	C	8.16	8.09	8.06
	1	8.09	8.08	8.07
	2	8.09	8.11	8.10
	3	8.08	8.16	8.13
	4	8.04	8.18	8.29
	5	8.05	8.22	8.28
D.O. (mg/l)	C	7.9	8.0	7.9
	1	7.9	7.8	7.8
	2	7.9	7.9	7.7
	3	7.9	7.9	7.6
	4	7.9	7.9	7.7
	5	7.9	7.8	7.6
SALIN (g/kg)	C	20	21	21
	1	20	21	21
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		GB	SD	PB

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range) 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 413

SET UP: Date 12/2/97 Time Water Added 1645

Time Animals Added 1656 Set Up By GB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digaense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020083)
- ☐ SP Portasal2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/5/97 Date

TEST I.D.: SLA97164

US00001479

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:	
Sample Date	12/11/97
Temp. (°C)	3.4
Conduct. (uMHOS)	2580
Salinity (g/kg)	2
pH	8.46
Diss. Oxygen (mg/l)	12.0
Tot. Chlorine (mg/l)	LDL
NH3-N (mg/l)	9.6
Hard (mg/l CaCO3)	193
Alkln (mg/l CaCO3)	367
Color/Appearance[1]	CY
Initials	GB

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:	ACUTE
Date	12/12/97
Temp. (°C)	20.8
Salinity (g/kg)	20
D.O. (mg/l)	7.9
Aeration Rate	—
Aeration Time (min)	—
Adjust. D.O. (mg/l)	—
pH	8.05
Tot Chlorine (mg/l)	ND
Initials	GB

DILUTION WATER CHARACTERISTICS: DMW: HWM:✓	ACUTE
Date	12/12/97
Temp. (°C)	20.4
Conduct. (uMHOS)	NA
Salinity (g/kg)	20
pH	8.18
Diss. Oxygen (mg/l)	7.9
Hard (mg/l CaCO3)	NA
Alkln (mg/l CaCO3)	NA
Initials	GB

EFFLUENT ID: B1 TEST ID: JRA97164

d 1398

US00001480

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson/JJson Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 7:25 pm
_____(Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.32 Field Total Residual Chlorine _____
Comments/Sample description B1

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erten-Unal Date 12/02/97 Time 10:00 am 9.00 am BU
Received by Aytten Juille Date 12/2/97 Time 0915 #1352
2. Relinquished by Aytten Juille Date 12/2/97 Time 1040
Received by JHarris Date 12/2/97 Time 1040
Rel: JHarris 12/2/97 1115

FOR REED LAB USE ONLY

JRA# 97-13674 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ — °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

yes
CBI
for EPPL 0145

Rev 9/14/94

US00001481

Print & Sign Names

Relinquished by _____ Date _____ Time _____

Rcvd: ~~Received~~ Rec'd by Lat Shiff Date 12-2-97 Time _____

Relinquished by Lat Shiff Date 12-2-97 Time _____

Received by Pam Blasco Date 12-2-97 Time 1230

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1391
12/1/97 1725 Sample No. JRA97-13673

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001484

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	95	95	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1635	12/2/97 1620
Test End:	12/4/97 1535	12/4/97 1520
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Acration necessary when D.O. concentration ≤4.0 mg/l.

US00001485

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1725	12/2/97 1635/1620[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.5 (---)	20.9 (---)	20.3 (---)
Salinity (g/kg)	1 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	980 (---)	N/A	N/A
pH	8.01 (---)	8.07 (---)	8.14 (---)
Dissolved Oxygen (mg/l)	12.1 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	161 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	257 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	2.2 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.2)	20.5 (0.1)	20.5 (0.2)	20.6 (0.2)	20.6 (0.1)	20.7 (0.2)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.2)	7.8 (0.1)	7.8 (0.2)	7.7 (0.2)	7.7 (0.2)
pH	8.07 (0.07)	8.08 (0.08)	8.10 (0.07)	8.11 (0.06)	8.17 (0.08)	8.22 (0.13)
Salinity (g/kg)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.1)	20.4 (0.2)	20.4 (0.3)	20.4 (0.3)	20.5 (0.3)	20.6 (0.3)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.1)	7.9 (0.1)	7.8 (0.1)	7.7 (0.2)	7.8 (0.2)
pH	8.05 (0.08)	8.05 (0.09)	8.05 (0.07)	8.07 (0.05)	8.15 (0.06)	8.22 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001487

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-3

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		
11/25/97	>100	>100		
12/2/97	>100	>100		

US00001489

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	95
	5-2	9	9	
Observer:		1605	1535	
Time:		SD	PB	

		Day 0	Day 1	Day 2
TEMP	C	20.3	20.6	20.4
	1	20.5	20.6	20.4
	2	20.2	20.5	20.3
	3	20.7	20.7	20.3
	4	20.7	20.7	20.5
	5	20.9	20.6	20.5
pH	C	8.14	8.07	8.01
	1	8.14	8.12	7.99
	2	8.13	8.14	8.02
	3	8.11	8.17	8.05
	4	8.08	8.23	8.19
	5	8.02	8.25	8.30
D.O. (mg/l)	C	7.9	8.0	7.8
	1	7.9	8.0	7.7
	2	7.9	7.8	7.7
	3	7.9	7.9	7.6
	4	7.9	7.8	7.5
	5	7.9	7.9	7.5
SALIN (g/kg)	C	20	21	21
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		GK	SD	PB

Species: Mysidopsis bahia Source: ~~IDF~~ CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 1-12

SET UP: Date 12/2/97 Time Water Added 1615

Time Animals Added 1635 Set Up By CB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (09500583)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: JRA 9116 3

US00001490

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	PB	
Time:		1620	1520	

		Day 0	Day 1	Day 2
TEMP	C	20.3	20.5	20.4
	1	20.5	20.2	20.4
	2	20.7	20.1	20.3
	3	20.7	20.2	20.4
	4	20.7	20.2	20.5
	5	20.9	21.3	20.5
pH	C	8.14	8.02	8.00
	1	8.14	8.05	7.96
	2	8.13	8.02	8.01
	3	8.11	8.12	8.03
	4	8.08	8.19	8.18
	5	8.07	8.26	8.32
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.9	7.8
	2	7.9	7.9	7.8
	3	7.9	7.8	7.7
	4	7.9	7.8	7.5
	5	7.9	7.9	7.5
SALIN (g/kg)	C	20	20+	20+
	1	20	20+	20+
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		LB	SD	PB

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 10-12

SET UP: Date 12/2/97 Time Water Added 1615

Time Animals Added 1620 Set Up By LB/PD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: TRAA7163

US00001491

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	12/11/97						
Temp. (°C)	3.5						
Conduct. (uMHOS)	980						
Salinity (g/kg)	1						
pH	8.01						
Diss. Oxygen (mg/l)	12.1						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	2.2						
Hard (mg/l CaCO3)	141						
Alkln (mg/l CaCO3)	257						
Color/Appearance[1]	CX						
Initials	GB						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							12/12/97
Temp. (°C)							20.9
Salinity (g/kg)							20
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							8.07
Tot Chlorine (mg/l)							ND
Initials							GB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							12/12/97
Temp. (°C)							20.3
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							8.14
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GB

EFFLUENT ID: A3 4 13 91 TEST ID: JCA97163

US00001492

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 7.88 Field Total Residual Chlorine
Comments/Sample description A3 · Control w/ 2 hour aeration

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) Variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erten-Unal Date 12/02/97 Time 10:00 am 9:00 am
Received by Date 12/2/97 Time 0915 #1391
2. Relinquished by Date 12/2/97 Time 1040
Received by Date 12/2/97 Time 10 40
Rel: 12/2/97 1115

FOR REED LAB USE ONLY

JRA# 97-13673 Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ — °C
Salinity (ppt) TRC (mg/L) Method

see COC form COC 0195

Rev 5/16/94

US00001493

Print & Sign Names

Relinquished by _____ Date _____ Time _____

Received by Lab staff Date 12-2-97 Time _____

Relinquished by Lab staff Date 12-2-97 Time _____

Received by Pam Blanco Date 12-2-97 Time 1220

US00001495

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1390
12/1/97 1725 Sample No. JRA97-13672

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001496

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1640	12/2/97 1635
Test End:	12/4/97 1545	12/4/97 1540
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001497

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1725	12/2/97 1640/1635[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.7 (---)	20.8 (---)	20.4 (—)
Salinity (g/kg)	1 (---)	20 (---)	20 (—)
Conductivity (uMHOS/cm)	990 (---)	N/A	N/A
pH	8.05 (---)	8.07 (---)	8.07 (—)
Dissolved Oxygen (mg/l)	11.9 (—)	7.9 (---)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	146 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	277 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	1.2 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.4 (0.2)	20.3 (0.2)	20.4 (0.1)	20.4 (0.2)	20.4 (0.3)
D.O. (mg/l)	7.9 (0.1)	7.9 (0)	7.9 (0)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)
pH	8.01 (0.07)	8.01 (0.06)	8.00 (0.08)	8.05 (0.06)	8.12 (0.03)	8.20 (0.12)
Salinity (g/kg)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.1)	20.4 (0.1)	20.4 (0.1)	20.4 (0.1)	20.4 (0.2)	20.5 (0.3)
D.O. (mg/l)	7.9 (0.1)	7.9 (0)	7.9 (0.1)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)
pH	8.02 (0.08)	8.03 (0.05)	8.03 (0.08)	8.08 (0.07)	8.14 (0.05)	8.19 (0.10)
Salinity (g/kg)	21 (1)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-2

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		
11/25/97	>100	>100		
12/2/97	>100	>100		

US00001501

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	PB	
Time:		1600	1545	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.3	20.5
	1	20.4	20.2	20.5
	2	20.5	20.1	20.4
	3	20.5	20.3	20.3
	4	20.4	20.3	20.3
	5	20.8	20.2	20.3
pH	C	8.07	8.02	793
	1	8.07	7.99	796
	2	8.08	8.00	792
	3	8.10	8.06	7.99
	4	8.09	8.13	814
	5	8.07	8.26	828
D.O. (mg/l)	C	7.9	8.0	79
	1	7.9	7.9	79
	2	7.9	7.9	7.9
	3	7.9	7.7	7.7
	4	7.9	7.6	7.7
	5	7.9	7.6	7.7
SALIN (g/kg)	C	20	21	21
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	21	20	20
Replicate # above meas.		1	2	1
Initials:		CB	SO	PB

Species: Mysidopsis bahia Source: ~~IRF~~ CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 4-2,3

SET UP: Date 12/2/97 Time Water Added 1625

Time Animals Added 1640 Set Up By CB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020083)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A028329)
- ☐ Corning 240 pH Meter (SN5288)
- ☐ SP PortaPH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

✓

TEST I.D.: TRA 97162

US00001502

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	PB	
Time:		1610	1540	

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.3	20.5
	1	20.4	20.4	20.5
	2	20.5	20.4	20.4
	3	20.5	20.3	20.4
	4	20.6	20.2	20.4
	5	20.8	20.4	20.3
pH	C	8.07	8.05	7.93
	1	8.07	8.05	7.97
	2	8.08	8.07	7.93
	3	8.10	8.13	8.00
	4	8.09	8.19	8.16
	5	8.07	8.22	8.22
D.O. (mg/l)	C	7.9	8.0	7.9
	1	7.8	7.9	7.9
	2	7.9	7.8	7.9
	3	7.9	7.9	7.8
	4	7.9	7.8	7.8
	5	7.9	7.7	7.7
SALIN (g/kg)	C	20	21	21
	1	20	21	21
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		GB	SD	AB

Species: Cyprinodon variegatus Source: CBI AQS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-12

SET UP: Date 12/2/97 Time Water Added 1625

Time Animals Added 1635 Set Up By GB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020083)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN6268)
- ☐ SP Portaph2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature _____ Date 12/5/97

TEST I.D.: JRA97162

US00001503

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	12/11/97						
Temp. (°C)	2.7						
Conduct. (uMHOS)	490						
Salinity (g/kg)	1						
pH	8.05						
Diss. Oxygen (mg/l)	11.9						
Tot. Chlorine (mg/l)	<0.0						
NH3-N (mg/l)	1.2						
Hard (mg/l CaCO3)	146						
Alkln (mg/l CaCO3)	277						
Color/Appearance[1]	CY						
Initials	KB						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							12/12/97
Temp. (°C)							20.8
Salinity (g/kg)							20
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							8.07
Tot Chlorine (mg/l)							ND
Initials							GB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							12/12/97
Temp. (°C)							20.4
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							8.07
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GB

EFFLUENT ID: A2 (41340) TEST ID: SILA971202

US00001504

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson/JHam Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
_____(Composite): From Date _____ Time _____
To Date _____ Time _____
Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.8°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.03 Field Total Residual Chlorine _____
Comments/Sample description AZ - control w/ 2 hour aeration

Type of test(s) to be performed Mysid shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erten-Unal Date 12/02/97 Time 10:00 am 9:00 am JEU
   Received by Althea Dulle Date 12/2/97 Time 0915 #1390
2. Relinquished by Althea Dulle Date 12/2/97 Time 1040
   Received by J Hamm Date 12/2/97 Time 1040
   Rel: J. Hamm 12/2/97 1115

FOR REED LAB USE ONLY

JRA# 97-13672 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ — °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

see OBI for CPDL 0195

Rev 5/16/94

US00001505

Print & Sign Names

Relinquished by		Date	Time
Received by		Date 12-2-97	Time
Relinquished by		Date 12-2-97	Time
Received by		Date 12-2-97	Time 1220

US00001507

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1389
12/1/97 1925 Sample No. JRA97-13671

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001508

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	100
50.0	100	100	100	100
100	100	100	90	90
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1630	12/2/97 1630
Test End:	12/4/97 1550	12/4/97 1555
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Acration necessary when D.O. concentration ≤4.0 mg/l.

US00001509

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.4 (0.2)	20.4 (0.2)	20.4 (0.1)	20.3 (0.2)	20.2 (0.2)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.2)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)
pH	8.04 (0.23)	8.06 (0.19)	8.10 (0.14)	8.13 (0.09)	8.20 (0.01)	8.26 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	19 (0)	19 (0)	18 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.3)	20.3 (0.2)	20.2 (0.2)	20.2 (0.2)	20.2 (0.2)	20.0 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)
pH	8.09 (0.18)	8.08 (0.16)	8.11 (0.12)	8.15 (0.06)	8.20 (0.02)	8.26 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	19 (0)	19 (0)	18 (0)

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/24/97 0945	11/25/97 1505/1515[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	1.0 (---)	20.0 (---)	20.5 (---)
Salinity (g/kg)	N/A	18 (---)	20 (---)
Conductivity (uMHOS/cm)	1406 (---)	N/A	N/A
pH	8.16 (---)	8.15 (---)	8.27 (---)
Dissolved Oxygen (mg/l)	10.9 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	104 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	139 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	N/A	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001511

ODI/OCEANA Sample I.D. Mother Liquor
11-24-97 Sample 97-13440 Test ID: JR.A97152

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	95	100	100
12.5	100	95	100	100
25.0	100	90	100	100
50.0	100	80	100	100
100	100	55	100	100
48-h LC50:		>100%		>100%
95% Confidence Limits:		N/A		N/A
Calculation Method:		N/A		N/A
Toxic Units (T.U.):		<1.00		<1.00

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1505	11/25/97 1515
Test End:	11/27/97 1530	11/27/97 1540
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/25/97	11/22/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001512

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Mother Liquor
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1379
11/24/97 0945 Sample No. JRA97-13440

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001514

APPENDIX D-6

BNR Inhibition Pass-Through Acute Toxicity Test Results

480 ppm AFFF Pretreated with Fenton's Reagent

US00001516

US00001517

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.5°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.10 Field Total Residual Chlorine
Comments/Sample description B3

Type of test(s) to be performed Mysid shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Huyde Erten-Unal Date 12/02/97 Time 10:00am 9:00am
Received by Date 12/2/97 Time 0915 #1374
2. Relinquished by Date 12/2/97 Time 1040
Received by Date 12/2/97 Time 1040

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/16/94

US00001518

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

CONTINUATION SHEET

SHEET 2 OF 2

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

ENVIRONMENTAL

P.O.C.: Douglas Kirk
COMMAND: Oceana

LAB USE ONLY LINE ITEM #	SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATIVE
6002RH-2BJ	1394	B-3	START	12/1/97	1725	G	JJ	L	1	1	Bioassay				
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												
			START												
			STOP												

COMMENTS:

1. *CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S).* *ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. *SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM – 3:30 PM).*

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

FOR LAB USE ONLY!! SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( ) INITIAL: DATE:

RELINQUISHED BY: Arthur Mello	REC'D BY:	COMPANY/COMMAND: BES	DATE/TIME: 12/1/97 1045
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

D-338

US00001519

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JDoson/[illegible] Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.5°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes - limit (mg/L) —
Field pH 8.08 Field Total Residual Chlorine
Comments/Sample description B2

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 12/02/97 Time 10:00 am 9:00 am
Received by Althea Zirille Date 12/2/97 Time 0915 #1393
2. Relinquished by Althea Zirille Date 12/2/97 Time 1040
Received by [illegible] Date 12/2/97 Time 10 40

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/16/94

US00001520

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/JJm Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 7:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.32 Field Total Residual Chlorine
Comments/Sample description BI

Type of test(s) to be performed Mysid Shrimp, Cyprinoden
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erten-Unal Date 12/02/97 Time 10:00 am 9.00 am BM
Received by Althea Miller Date 12/2/97 Time 0915 #1352
2. Relinquished by Althea Miller Date 12/2/97 Time 1040
Received by Date 12/2/97 Time 1040

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/15/94

US00001521

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JTOSON/JHam Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 7.88 Field Total Residual Chlorine
Comments/Sample description A3. Control w/ 2 hour aeration

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erfen-Unal Date 12/02/97 Time 10:00 am 9:00 am SW
Received by Arthur Duell Date 12/2/97 Time 0915 #1391
2. Relinquished by Arthur Duell Date 12/2/97 Time 1040
Received by J Hamm Date 12/2/97 Time 10 40

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/15/94

US00001522

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County –
Pipe/Outfall/Location
NPDES#
Instream Waste Conc
Sample collected by (print&sign) JDoson/[illegible] Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 5:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.8°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.03 Field Total Residual Chlorine
Comments/Sample description A2 - Control w/ 2 hour aeration

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erfen-Unal Date 12/02/97 Time ~~10:00 am~~ 9:00 am
Received by Althea Dulles Date 12/2/97 Time 0915 #1570
2. Relinquished by Althea Dulles Date 12/2/97 Time 1040
Received by [illegible] Date 12/2/97 Time 1040

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/16/94

US00001523

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/[signature] Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 7:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.33 Field Total Residual Chlorine
Comments/Sample description A1 - Control w/ 4 hour aeration

Type of test(s) to be performed Mysid Shrimp, Cyprinoden
(Specify organisms) Variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 12/02/97 Time 10:00 am ~~9:00 am~~ SNL
Received by Althea Jniell Date 12/2/97 Time 9:15 #1389
2. Relinquished by Althea Jniell Date 12/3/97 Time 1040
Received by J. Hanson Date 12/3/97 Time 1040

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/16/94

US00001524

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 11:00 am
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.9°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 6.97 Field Total Residual Chlorine
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erfen-Unal Date 12/02/97 Time ~~10:00 am~~ 9:00 am
Received by Attica Mullen Date 12/2/97 Time 0915 #1388
2. Relinquished by Attica Mullen Date 12/2/97 Time 1040
Received by L. Stevens Date 12/2/97 Time 1050

FOR REED LAB USE ONLY

JRA# Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (umhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

Rev 5/16/94

US00001525

CHAIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

CLIENT INFORMATION

COMPANY/COMMAND: Oceana CODE:
CONTACT: Douglas Kirk
PHONE: 3-2239 EXT: FAX:
J.O. #: 191 229.0
SIGNATURE: on file
PERMIT NO.:

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER	PRESERVATION VERIFIED BY
0002BH			START												
0002BJ	1387	A1 - Control	STOP	12/10/07	1945	G	J.J.	L	1	1P	BIOASSAY	8.44	25.°C		VH
	1388	A2 - Control	START												
			STOP		1945							8.06	26 °C		
	1389	A3 = + Defoamer	START												
			STOP		1945							7.99	25.8°C		
	1390	B1 - Defoamer	START												
			STOP		1945							8.26	25 °C		
	1391	B2 - 120 PPM Defoamer AFFF	START												
			STOP		1945							7.99	25 °C		
	1392	B3 - 120 PPM Defoamer AFFF	START												
			STOP		1945							8.21	25.2 °C		
	1393	mother Liquor - R/R	START												
			STOP		1945							8.19	25. °C		

TYPE	MATRIX	CONTAINER	PRESERVATIVE
G - GRAB	L - LIQUID SW - SWIPE	P - PLASTIC B - BAG A - AMBER(glass)	1 - COOL TO 4 C 5 - HCL, pH<2
CF - COMPOSITE, FLOW	S - SOLID	GL - GLASS C - CARTRIDGE	2 - HNO3, pH<2 6 - 0.008% Na2S2O3, 4 C
CT - COMPOSITE, TIME	GS - GAS	T - TEFLON TL - TEFLON LINED LID	3 - H2SO4, pH<2 7 - FIELD FILTER
	SS - SEMI SOLID	V - VOA H - HEXANE RINSED	4 - NaOH, pH>12 8 - NONE

TURNAROUND (Days): 20 (FOR RUSH TURNAROUND STATE REASON BELOW)

COMMENTS:

SAMPLE DISPOSAL: ( )RETURN TO CLIENT ( )DISPOSAL BY LAB

REGULATION APPLIED:

RCRA ( )	HRSD ( )
SDWA ( )	TSCA ( )
CWA ( )	PHOTO ( )
CAA ( )	OTHER ( )

SAMPLING/COLLECTION CHARGE: $

POSSIBLE SAMPLE HAZARDS:

COMMENTS:

D.O. NUMBER: INIT.:
CONTRACT LAB: DATE:
CONTRACT NO.(S):
OFFICIAL USE ONLY

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S). *
*ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.

2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

FOR LAB USE ONLY!! SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

D-345

US00001526

PWC
1394

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson / _____ Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 10 am
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____
Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____
*Temperature of sample in sample collection device 0 °C
Final temperature of effluent at sample collection point 26.2 °C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 6.78 Field Total Residual Chlorine _____
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9 am
Received by Lethea Miller Date 12/11/97 Time 0910 1394
2. Relinquished by A Miller Date 12-11-97 Time 11:00
Received by Boyd S Hill Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (umhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001527

AIN-OF-CUSTODY RECORD

& ANALYSIS REQUEST FORM

CONTINUATION SHEET

SHEET 2 OF 2

ENVIRONMENTAL

PWC ENVIRONMENTAL LABORATORY
CODE 930 BLDG Z-140
9742 MARYLAND AVENUE
NORFOLK, VA 23511 - 3095
PH: (757)445-8851 FAX: (757)445-8852

P.O.C.: Douglas Kick
COMMAND: OCEANA

LAB USE ONLY LINE ITEM #	LAB USE ONLY SAMPLE NO	SAMPLE ID/LOCATION	SAMPLE TAKEN	ON DATE	AT TIME	TYPE	SAMPLED BY	MATRIX	PRESERVATIVE	# OF SAMPLES /CONTAINERS	ANALYSIS	FIELD READINGS pH	FIELD READINGS TEMPERATURE	FIELD READINGS OTHER
0002BJ	1394	Feed stock	START	12/10/97	10:00	G	JJ	L	1	1P	BIO ASSAY	6.78	26.2°C	
0002BH			STOP	0hr	—									
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											
			START											
			STOP											

COMMENTS:

1. CUSTOMER IS RESPONSIBLE FOR ALL CHARGES NECESSARY FOR THE PROCESSING AND ANALYSIS OF SAMPLE(S). * ALL RUSH SAMPLES ARE SUBJECT TO SURCHARGE.
2. SAMPLES RECEIVED AFTER 2:00 PM MON. -- THURS. AND 1:00 PM ON FRIDAY WILL BE PROCESSED THE NEXT BUSINESS DAY (7:00 AM -- 3:30 PM).

D.O. NUMBER:
CONTRACT LAB:
CONTRACT NO.(S):
INIT.:
DATE:
OFFICIAL USE ONLY

** FOR LAB USE ONLY ** SAMPLES VERIFICATION

REJECTED ( ) REASON: HOLDING TIME( ) CONTAINERS( ) IMPROPERLY SAMPLED( ) OTHER( )

INITIAL:
DATE:

RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY: Boyd A Hubbard	COMPANY/COMMAND: B.E.S. INC	DATE/TIME: 12/10/97 10:00
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:
RELINQUISHED BY:	REC'D BY:	COMPANY/COMMAND:	DATE/TIME:

D-347

US00001528

Toxicity Test Sample Chain of Custody
(Please complete all information)

PWC 1393

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Jr Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 7:45
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 25.0°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 8.19 Field Total Residual Chlorine _____
Comments/Sample description Mother Liquor from Reference Reactor

Type of test(s) to be performed Mysid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
Received by Heather Miller Date 12/11/97 Time 0910 1393
2. Relinquished by Amelia Ulmer Date 12-11-97 Time 11:00
Received by Boyd S Hubbard Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____°C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001529

Toxicity Test Sample Chain of Custody
(Please complete all information)

PWC 1392

Facility ODU

Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____

NPDES# _____ Instream Waste Conc _____

Sample collected by (print&sign) JJoson/Jfer Affiliation ODU Env Eng Lab

Type of sample ✓ (Grab): Date 12/10/97 Time 7:45 pm

_____ (Composite): From Date _____ Time _____

To Date _____ Time _____

Subsamples comprising composite:

Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C

Final temperature of effluent at sample collection point 25.2°C

*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes

*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)

Is the sample chlorinated? no dechlorinated? no If so, how? _____

Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____

Field pH 8.21 Field Total Residual Chlorine _____

Comments/Sample description B3 – 120 ppm AFFF & Defoamer

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus

(Specify organisms) _____

Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am

   Received by [signature] Date 12/11/97 Time 0910 1392

2. Relinquished by [signature] Date 12-11-97 Time 11:00

   Received by [signature] Date 12-11-97 Time 11:00

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____

Color _____ Odor _____ Solids _____

pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C

Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001530

PWC
1391

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 5:45 pm
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 25°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 7.97 Field Total Residual Chlorine _____
Comments/Sample description B2 - 120 ppm AFFF & defoamer

Type of test(s) to be performed MySid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9 am
   Received by Debbie Miller Date 12/11/97 Time 0910 1391
2. Relinquished by Amelia Ulmer Date 12-11-97 Time 11:00
   Received by Boyd Hobbs Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (umhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001531

Toxicity Test Sample Chain of Custody
(Please complete all information)

PWC-1390

Facility ODU

Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____

NPDES# _____ Instream Waste Conc _____

Sample collected by (print&sign) JJoson/Foo Affiliation ODU Env Eng Lab

Type of sample ✓ (Grab): Date 12/10/97 Time 7:45

_____ (Composite): From Date _____ Time _____

To Date _____ Time _____

Subsamples comprising composite:

Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C

Final temperature of effluent at sample collection point 25°C

*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes

*It is required that all samples remain at 0 - 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)

Is the sample chlorinated? no dechlorinated? no If so, how? _____

Permit with interim chlorine limit? _____ If yes - limit (mg/L) _____

Field pH 8.26 Field Total Residual Chlorine _____

Comments/Sample description BI - Defoamer

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus

(Specify organisms) _____

Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
   Received by Althea Quillen Date 12/11/97 Time 0910 1390
2. Relinquished by _____ Date 12-11-97 Time 1100
   Received by _____ Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____

Color _____ Odor _____ Solids _____

pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C

Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001532

Toxicity Test Sample Chain of Custody
(Please complete all information)

PWC 1389

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 5:45pm
_____(Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 25.8°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 7.99 Field Total Residual Chlorine _____
Comments/Sample description A3 + Defoamer

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
Received by Althea Dailey Date 12/11/97 Time 0910 1389
2. Relinquished by Amelia Williams Date 12-11-97 Time 1100
Received by Boyd Hilton Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____°C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/16/94

US00001533

PWC-1388

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Jason/Fox Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/10/97 Time 5:45 pm
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 26.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 8.06 Field Total Residual Chlorine _____
Comments/Sample description A2 - control

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
Received by Althea Daille Date 12/11/97 Time 0910 1388
2. Relinquished by Amelia V Dunn Date 12-11-97 Time 1100
Received by Boyd Hibbs Date 12-11-97 Time 1100

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001534

Toxicity Test Sample Chain of Custody PWC 1387
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23508

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Joson Affiliation ODU Env Eng Lab
Type of sample _____(Grab): Date 12/10/97 Time 7:45 pm
_____(Composite): From Date _____ Time _____
To Date _____ Time _____
Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 25.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? _____
Permit with interim chlorine limit? _____ If yes – limit (mg/L) _____
Field pH 8.44 Field Total Residual Chlorine _____
Comments/Sample description A1 - Control

Type of test(s) to be performed Mysid Shrimp, Cyprinodon Variegatus
(Specify organisms) _____
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Jennifer Joson Date 12/11/97 Time 9am
Received by Rebecca Dillon Date 12/11/97 Time 0910 1387
2. Relinquished by Amelia / Udum Date 12-11-97 Time 11:00
Received by Boyds Hubbard Date 12-11-97 Time 11:00

FOR REED LAB USE ONLY

JRA# _____ Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

Rev 5/15/94

US00001535

Print & Sign Names

Relinquished by _____ Date _____ Time _____

Received by Lata Uduppa Date 12-2-97 Time _____

Relinquished by Lata Uduppa Date 12-2-97 Time -

Received by Pam Blanco Date 12-2-97 Time 1200

US00001536

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) JJoson/JJson Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 1:30 pm
_____(Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.8°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.11 Field Total Residual Chlorine _____
Comments/Sample description Mixed Liquor from Reference Reactor

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) Variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 12/02/97 Time ~~10:00 am~~ 9:00 am
Received by Cathea Smith Date 12/2/97 Time 0915 #1387
2. Relinquished by Cathea Smith Date 12/2/97 Time 1040
Received by J Howe Date 12/2/97 Time 1040
Ref: Z. Howell 12/2/97 11:15

FOR REED LAB USE ONLY

JRA# 97-13669 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L): _____ Conductivity (µmhos/cm) _____ @ – °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

See COC for ODU-0195

Rev 5/16/94

US00001537

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	12/1/97						
Temp. (°C)	13.4						
Conduct. (uMHOS)	15500						
Salinity (g/kg)	1						
pH	8.16						
Diss. Oxygen (mg/l)	11.1						
Tot. Chlorine (mg/l)	LDL						
NH3-N (mg/l)	1.2						
Hard (mg/l CaCO3)	131						
Alkln (mg/l CaCO3)	258						
Color/Appearance[1]	CY						
Initials	GB						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							12/2/97
Temp. (°C)							20.5
Salinity (g/kg)							20
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							8.14
Tot Chlorine (mg/l)							ND
Initials							GB

DILUTION WATER CHARACTERISTICS:	DMW:	HWM: ✓					ACUTE
Date							12/2/97
Temp. (°C)							20.1
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							8.01
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GB

EFFLUENT ID: MGD Cl2 WIC #1357 TEST ID: JLA97160

US00001538

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	95
	4-2	9	9	
100	5-1	10	10	100
	5-2	10	10	
Observer:		SD	PB	
Time:		1535	1615	

		Day 0	Day 1	Day 2
TEMP	C	20.3	20.6	20.5
	1	20.3	20.6	20.4
	2	20.3	20.7	20.3
	3	20.5	20.5	20.2
	4	20.4	20.6	20.6
	5	20.5	20.6	20.1
pH	C	8.41	8.10	7.94
	1	8.03	8.12	7.99
	2	8.03	8.13	7.99
	3	8.07	8.16	8.10
	4	8.09	8.23	8.14
	5	8.14	8.21	8.34
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.9	7.7
	2	7.9	7.8	7.6
	3	7.9	7.9	7.6
	4	7.9	7.9	7.6
	5	7.9	7.9	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above mass.		1	2	1
Initials:		GB	SD	PB

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 9-1,2

SET UP: Date 12/2/97 Time Water Added 1550

Time Animals Added 1600 Set Up By GB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortaH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature _____ Date 12/5/97

TEST I.D.: JCA971160

US00001539

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	9	90
	3-2	9	9	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		1510	1610	
Time:		SD	PB	

		Day 0	Day 1	Day 2
TEMP	C	20.2	20.7	20.4
	1	20.3	20.6	20.4
	2	20.3	20.6	20.3
	3	20.5	20.6	20.0
	4	20.4	20.5	20.1
	5	20.5	20.7	20.0
pH	C	8.01	8.01	7.93
	1	8.03	8.01	7.97
	2	8.03	8.04	7.98
	3	8.07	8.07	8.09
	4	8.09	8.20	8.13
	5	8.14	8.31	8.34
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.8	7.8
	2	7.9	7.7	7.6
	3	7.9	7.6	7.6
	4	7.9	7.6	7.6
	5	7.9	7.6	7.4
SALIN (g/kg)	C	20	20+	20+
	1	20	20+	20+
	2	20	20+	20+
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	1	1
Initials:		VB	SD	PB

Species: Mysidopsis bahia Source: IWF CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-23

SET UP: Date 12/2/97 Time Water Added 1550

Time Animals Added 1600 Set Up By CB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: JPA97160

US00001540

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Mix L. R.R.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		
11/25/97	>100	>100		
12/2/97	>100	>100		

US00001541

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

US00001542

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.4 (0.2)	20.4 (0.2)	20.4 (0.3)	20.3 (0.2)	20.4 (0.4)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)
pH	7.98 (0.05)	8.00 (0.03)	8.02 (0.03)	8.08 (0.01)	8.14 (0.06)	8.26 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.2)	20.4 (0.2)	20.4 (0.2)	20.4 (0.2)	20.3 (0.3)	20.4 (0.3)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.2)	7.8 (0.2)	7.8 (0.2)	7.7 (0.3)
pH	8.02 (0.08)	8.05 (0.07)	8.05 (0.07)	8.11 (0.05)	8.15 (0.07)	8.26 (0.11)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001543

ODU/OCEANA Sample I.D. Mixed Liquor
12/1/97 Sample 97-13669 Test ID: JRA97160

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1330	12/2/97 1600/1600[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.4 (---)	20.5 (---)	20.1 (---)
Salinity (g/kg)	1 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1500 (---)	N/A	N/A
pH	8.16 (---)	8.14 (---)	8.01 (---)
Dissolved Oxygen (mg/l)	11.1 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	131 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	258 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	1.2 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001544

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	95	90	100	100
50.0	100	100	95	95
100	100	100	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1600	12/2/97 1600
Test End:	12/4/97 1610	12/4/97 1615
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001545

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Mixed Liquor
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1387
12/1/97 1330 Sample No. JRA97-13669

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001546

Print & Sign Names

Relinquished by _____ Date _____ Time _____

Received by Kate Huff Date 12-2-97 Time _____

Relinquished by Kate Huff Date 12-2-97 Time -

Received by Pam Bloeco Date 12-3-97 Time 1220

US00001547

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JJoson/ Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 11:00 am
(Composite): From Date Time
To Date Time

Subsamples comprising composite: n/a
Number Frequency of collection Volume

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.9°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 6.97 Field Total Residual Chlorine
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 12/02/97 Time 10:00 am 9:00 am
Received by Cathleen Mueller Date 12/2/97 Time 0915 #1388
2. Relinquished by Cathleen Mueller Date 12/2/97 Time 1040
Received by J. Hawes Date 12/2/97 Time 1040
Rel: J. Hawes 12/2/97 1115

FOR REED LAB USE ONLY

JRA# 97-13670 Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

see COC for EPDL ONLY

Rev 5/16/94

US00001548

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form effective 1/97)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	12/11/97						
Temp. (°C)	3.2						
Conduct. (uMHOS)	1000						
Salinity (g/kg)	1						
pH	7.66						
Diss. Oxygen (mg/l)	10.6						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	1.233						
Hard (mg/l CaCO3)	150						
Alkln (mg/l CaCO3)	36						
Color/Appearance[1]	CY						
Initials	GB						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
~~Date~~							12/12/97
Temp. (°C)							20.3
Salinity (g/kg)							26
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							~~8.25~~ 7.42
Tot Chlorine (mg/l)							ND
Initials							GB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							12/12/97
Temp. (°C)							20.3
Conduct. (uMHOS)							NA
Salinity (g/kg)							7.1
pH							7.42
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							GB

EFFLUENT ID: feed stock TEST ID: JMA97159

IC 1388

US00001549

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97159 FEED STOCK

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	0	0.0000	0.0000
12.5000	20	0	0.0000	0.0000
25.0000	20	5	0.2500	0.2500
50.0000	20	19	0.9500	0.9500
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 0.028
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

JRA97159 FEED STOCK

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	15.435	8.778	19.623
LC/EC 50.00	30.629	26.083	36.253

US00001550

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	5	75
	3-2	10	10	
50	4-1	10	1	5
	4-2	5	0	
100	5-1	0	0	0
	5-2	0	0	
Observer:		C-H	PB	
Time:		1520	1635	

		Day 0	Day 1	Day 2
TEMP	C	20.1	20.4	20.3
	1	20.3	20.7	20.3
	2	20.4	20.6	20.4
	3	20.3	20.6	20.4
	4	20.3	20.2	20.4
	5	20.3	20.8	—
pH	C	8.25	8.03	7.87
	1	8.30	8.00	7.87
	2	8.22	7.99	7.99
	3	8.07	7.90	8.00
	4	7.76	8.00	8.12
	5	7.42	7.87	—
D.O. (mg/l)	C	7.4	7.8	7.8
	1	7.5	7.2	7.7
	2	7.3	7.2	7.6
	3	6.9	7.3	7.6
	4	6.9	7.3	7.6
	5	6.3	7.2	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	—
Replicate # above meas.		1	2	3
Initials:		HB	HB	PB

Species: Cyprinodon variegatus Source: CBI AGS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 8-23

SET UP: Date 12/2/97 Time Water Added 1515

Time Animals Added 1540 Set Up By CB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A365)

Other: _____

NOTES: # DO. 4,2 1645. Aerating by AO

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: JRA97159

US00001551

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 12/2/97 TEST NUMBER: JRA97159 DURATION: 48 H
TOXICANT : FEED STOCK
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	0
12.50	20	0
25.00	20	0
50.00	20	17
100.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES:	
LC50:	39.23
95% LOWER CONFIDENCE:	35.12
95% UPPER CONFIDENCE:	43.82

US00001552

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	3	0	15
	4-2	10	3	
100	5-1	0	0	0
	5-2	0	0	
Observer:		GH	PS	
Time:		1510	1630	

		Day 0	Day 1	Day 2
TEMP	C	20.1	20.5	20.3
	1	20.3	20.6	20.4
	2	20.4	20.6	20.4
	3	20.3	20.2	20.4
	4	20.3	20.6	20.4
	5	20.3	20.4	—
pH	C	8.25	7.95	7.87
	1	8.36	7.94	7.97
	2	8.22	7.87	7.99
	3	8.07	7.93	8.01
	4	7.76	8.13	8.11
	5	7.92	8.01	—
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.5	7.7	7.7
	2	7.3	7.4	7.6
	3	6.9	7.2	7.6
	4	6.9	7.3	7.7
	5	6.3*	7.2	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	—
Replicate # above meas.		1	1	1
Initials:		CB	CB	CB

NOTES: * DO 4.2 1645. Aeration began.

Species: Mysidopsis bahia Source: IBF CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 7-1,2

SET UP: Date 12/2/97 Time Water Added 1515

Time Animals Added 1530 Set Up By CB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Pamela J Bloom 12/5/97

Signature Date

TEST I.D.: CBA97155

US00001553

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		
11/3/97	12.5	19.7		
11/18/97	23.3	36.6		
11/25/97	9.7	13.8		
12/2/97	39.2	30.6		

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	8.1%	12.35	N/A	N/A	3.5%	28.57	N/A	N/A
11/3/97	12.5%	8.00	N/A	N/A	19.7%	5.08	N/A	N/A
11/25/97	9.7%	10.31	N/A	N/A	13.8%	7.25	N/A	N/A
12/2/97*	39.2%	2.55	N/A	N/A	30.6%	3.27	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
***C. variegatus* - Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.2)	20.4 (0.2)	20.5 (0.1)	20.5 (0.2)	20.4 (0.2)	20.5 (0.3)
D.O. (mg/l)	7.8 (0.1)	7.6 (0.1)	7.4 (0.2)	7.2 (0.4)	7.3 (0.4)	6.8 (0.6)
pH	8.01 (0.21)	8.07 (0.20)	8.03 (0.18)	8.00 (0.07)	8.00 (0.21)	7.72 (0.42)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.3)	20.4 (0.2)	20.5 (0.1)	20.4 (0.2)	20.5 (0.2)	20.6 (0.4)
D.O. (mg/l)	7.8 (0.1)	7.5 (0.3)	7.4 (0.2)	7.3 (0.4)	7.3 (0.4)	6.8 (0.6)
pH	8.05 (0.19)	8.09 (0.18)	8.07 (0.13)	7.99 (0.09)	7.96 (0.18)	7.65 (0.32)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001556

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1100	12/2/97 1530/1540[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia/C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	3.2 (---)	20.3 (---)	20.3 (---)
Salinity (g/kg)	1 (---)	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1000 (---)	N/A	N/A
pH	7.06 (---)	7.42 (---)	8.25 (---)
Dissolved Oxygen (mg/l)	10.6 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	150 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	361 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	33.0 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001557

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	100	100	75
50.0	65	15	75	5
100	0	0	0	0
48-h LC50:	39.2%		30.6%	
95% Confidence Limits:	35.1-43.8		26.1-36.3	
Calculation Method:	Spearman-Karber		Probit	
Toxic Units (T.U.):	2.55		3.27	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	12/2/97 1530	12/2/97 1540
Test End:	12/4/97 1630	12/4/97 1635
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	12/2/97	11/30/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	19.0-20.7°C	19.0-20.7°C
Test Aerated?[1]:	Yes	Yes
Aeration Initiation Date/Time:	12/2 at 1645	12/2 at 1645

[1]Aeration necessary when D.O. concentration ≤4.0 mg/l.

US00001558

US00001559

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed Stock
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. Nō. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1388
12/1/97 1100 Sample No. JRA97-13670

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001560

Print & Sign Names

Relinquished by _____ Date _____ Time _____

Received by [signature] Date 12-2-97 Time _____

Relinquished by [signature] Date 12-2-97 Time -

Received by [signature] Date 12-2-97 Time 1220

US00001561

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location
NPDES# Instream Waste Conc
Sample collected by (print&sign) JTOSON/JHm Affiliation ODU Env. Eng. Lab
Type of sample ✓ (Grab): Date 12/01/97 Time 7:25 pm
(Composite): From Date Time
To Date Time
Subsamples comprising composite: n/a
Number Frequency of collection Volume
Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.0°C
Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? – If yes - limit (mg/L) –
Field pH 8.33 Field Total Residual Chlorine
Comments/Sample description A1 - Control w/ 4 hour aeration

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 12/02/97 Time ~~10:00 am~~ 9:00 am
Received by Date 12/2/97 Time 9:15 #1389
2. Relinquished by Date 12/3/97 Time 1040
Received by J. Hamm Date 12/3/97 Time 1040
Rel: J. Hamm 12/3/97 1115

FOR REED LAB USE ONLY

JRA# 97-13671 Arrival Temperature On ice?
Color Odor Solids
pH DO (mg/L) Conductivity (µmhos/cm) @ °C
Salinity (ppt) TRC (mg/L) Method

See LBI form EPDL 045

Rev 3/16/94

US00001562

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	12/11/97						
Temp. (°C)	2.7						
Conduct. (uMHOS)	1000						
Salinity (g/kg)	1						
pH	8.42						
Diss. Oxygen (mg/l)	11.2						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	1.1						
Hard (mg/l CaCO3)	140						
Alkln (mg/l CaCO3)	252						
Color/Appearance[1]	CY						
Initials	GB						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date							12/12/97
Temp. (°C)							20.8
Salinity (g/kg)							20
D.O. (mg/l)							7.9
Aeration Rate							—
Aeration Time (min)							—
Adjust. D.O. (mg/l)							—
pH							8.20
Tot Chlorine (mg/l)							ND
Initials							TB

DILUTION WATER CHARACTERISTICS: DMW: HWM: ✓							ACUTE
Date							12/12/97
Temp. (°C)							20.3
Conduct. (uMHOS)							NA
Salinity (g/kg)							20
pH							8.07
Diss. Oxygen (mg/l)							7.9
Hard (mg/l CaCO3)							NA
Alkln (mg/l CaCO3)							NA
Initials							CB

EFFLUENT ID: A1 TEST ID: JCA971161

1387

US00001563

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	9	9	90
	5-2	9	9	
Observer:		SM	PB	
Time:		1540	1555	

		Day 0	Day 1	Day 2
TEMP	C	20.3	20.8	20.5
	1	20.3	20.8	20.5
	2	20.4	20.5	20.5
	3	20.6	20.7	20.6
	4	20.6	20.7	20.7
	5	20.8	20.7	20.7
pH	C	8.02	7.85	7.84
	1	8.05	8.10	7.82
	2	8.10	8.12	7.90
	3	8.13	8.13	8.04
	4	8.12	8.25	8.19
	5	8.20	8.30	8.24
D.O. (mg/l)	C	7.9	8.0	7.8
	1	7.9	8.0	7.8
	2	7.9	7.9	7.8
	3	7.9	7.9	7.7
	4	7.9	7.8	7.7
	5	7.9	7.8	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		GH	SM	PB

Species: Cyprinodon variegatus Source: CBI ABS

Hatch Date/Time: 11/30/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range) 19.0 to 20.7

Feeding prior to test: Artemia 24 /d Other: _____

Feeding during test: Not fed ☒ Artemia _____ /d Other: _____

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no: 3-2,3

SET UP: Date 12/2/97 Time Water Added 1610

Time Animals Added 1630 Set Up By GA/PD

INSTRUMENTATION USED

Stem Thermometer Number: A1

☐ YSI D.O. Meter # 1 (SNEB014475)
☒ YSI D.O. Meter # 2 (SN01A028329)
☒ [illegible] pH Meter (D96000683)
☐ Corning 240 pH Meter (SNb268)
☐ [illegible]
☐ [illegible]
☐ [illegible]
☒ [illegible]

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine organism tests (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

TEST I.D.: JRA 97161

US00001564

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1		10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		SD	PB	
Time:		1535	1550	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.6	20.5
	1	20.5	20.6	20.5
	2	20.4	20.6	20.6
	3	20.6	20.5	20.6
	4	20.6	20.4	20.6
	5	20.8	20.4	20.7
pH	C	8.07	7.94	7.93
	1	8.08	7.94	7.82
	2	8.10	8.00	7.89
	3	8.13	8.11	8.00
	4	8.17	8.20	8.15
	5	8.20	8.36	8.26
D.O. (mg/l)	C	7.9	7.8	7.8
	1	7.9	7.8	7.8
	2	7.9	7.7	7.8
	3	7.9	7.7	7.8
	4	7.9	7.6	7.7
	5	7.9	- -	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		GB	SD	PB

Species: Mysidopsis bahia Source: IBT CC

Hatch Date/Time: 12/2/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.0 to 20.7

Feeding prior to test: Artemia 1X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 223

SET UP: Date: 12/2/97 Time Water Added 1610

Time Animals Added 1636 Set Up By GB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☐ Corning 240 pH Meter (SN:5268)
- ☐ SP PortaspH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/5/97 Date

TEST I.D.: JRA97161

US00001565

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

A-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		
11/25/97	>100	>100		
12/2/97	>100	>100		

US00001566

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
12/2/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - **Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	606.9 mg/l (578.6-636.7)
Control Chart LC50 (95% C.L.):	608.2 mg/l (489.3-727.0)
C. variegatus - **Acute**	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	12/2/97-12/4/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1169.7 mg/l (1044.1-1310.5)
Control Chart LC50 (95% C.L.):	1074.9 mg/l (890.8-1259.0)

US00001567

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

***M. bahia* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.2)	20.5 (0.2)	20.5 (0.1)	20.6 (0.1)	20.5 (0.1)	20.6 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.8 (0.1)
pH	7.96 (0.12)	7.95 (0.13)	8.00 (0.11)	8.08 (0.07)	8.17 (0.03)	8.25 (0.05)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

***C. variegatus* Test**

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.5 (0.3)	20.5 (0.3)	20.6 (0.2)	20.6 (0.1)	20.7 (0.1)	20.7 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.1)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.1)
pH	8.00 (0.14)	8.00 (0.16)	8.04 (0.12)	8.10 (0.05)	8.20 (0.03)	8.25 (0.05)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001568

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
12/1/97 1925	12/2/97 1630/1630[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	2.7 (—)	20.8 (—)	20.3 (—)
Salinity (g/kg)	1 (—)	20 (—)	20 (—)
Conductivity (uMHOS/cm)	1000 (—)	N/A	N/A
pH	8.42 (—)	8.20 (—)	8.07 (—)
Dissolved Oxygen (mg/l)	11.2 (—)	7.9 (—)	7.9 (—)
Total Hardness (mg/l as $CaCO_3$)	140 (—)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	252 (—)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (—)	N.D.	N.D.
NH_3-N (mg/l)	1.1 (—)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001569

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97*	>100%	<1.00	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	580.2 mg/l (490.0-700.0)
Control Chart LC50 (95% C.L.):	609.2 mg/l (488.6-729.9)
C. variegatus - Acute	Aquatic Bio Systems, Inc. (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1140.2 mg/l (1019.5-1275.3)
Control Chart LC50 (95% C.L.):	1072.6 mg/l (887.0-1258.2)

US00001570

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Mix L. R.R.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	>100	>100		
11/3/97	>100	>100		
11/18/97	>100	>100		
11/25/97	>100	>100		

US00001571

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	95
	1-2	10	9	
12.5	2-1	10	10	95
	2-2	10	9	
25	3-1	10	8	90
	3-2	10	10	
50	4-1	10	8	80
	4-2	10	8	
100	5-1	10	6	55
	5-2	10	5	
Observer:		PB	SD	
Time:		1510	1530	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.1	20.4
	1	20.7	20.3	20.3
	2	20.6	20.2	20.3
	3	20.5	20.4	20.4
	4	20.1	20.3	20.4
	5	20.0	20.3	20.4
pH	C	8.36	7.99	7.85
	1	8.28	7.96	7.94
	2	8.26	8.04	8.00
	3	8.23	8.10	8.07
	4	8.19	8.21	8.21
	5	8.17	8.32	8.29
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.9	7.7
	2	7.9	7.8	7.6
	3	7.9	7.8	7.7
	4	7.9	7.7	7.5
	5	7.9	7.7	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	19	19	19
	4	19	19	19
	5	18	18	18
Replicate # above mees.		2	1	1
Initials:		PB	PB	SD

Species: Mysidopsis bahia Source: ~~CBI~~ CC

Hatch Date/Time: 11/25/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 19.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-12

SET UP: Date 11/25/97 Time Water Added 1450

Time Animals Added 1505 Set Up By PD/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

DO 7.9 at 200% in 100% Day 0.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/1/97 Date

TEST I.D.: TRA97152

US00001572

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	SO	
Time:		1445	1540	

		Day 0	Day 1	Day 2
TEMP	C	20.6	21.2	20.0
	1	20.5	20.2	20.1
	2	20.4	20.2	20.1
	3	20.3	20.3	19.9
	4	20.0	20.4	20.1
	5	19.9	20.1	20.1
pH	C	8.29	7.99	7.95
	1	8.27	7.97	8.01
	2	8.25	8.04	8.05
	3	8.22	8.11	8.12
	4	8.18	8.20	8.21
	5	8.16	8.30	8.31
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.9	7.8
	2	7.9	7.8	7.7
	3	7.9	7.7	7.7
	4	7.9	7.7	7.6
	5	7.9	7.7	7.6
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	19	19	19
	4	19	19	19
	5	18	18	18
Replicate # above meas.		2	1	2
Initials:		PB	PB	SO

Species: Cyprinodon variegatus Source: ~~cbi~~ ABS

Hatch Date/Time: 11/22/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 3-23

SET UP: Date 11/23/97 Time Water Added 1450

Time Animals Added 1515 Set Up By PD/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Special study, reduced test volume

D.O. 7.9 at 2000 in 1008 Dayo.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/1/97 Date

TEST I.D.: JRA97152

US00001573

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0193)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/24/97						
Temp. (°C)	1.0						
Conduct. (uMHOS)	1406						
Salinity (g/kg)	—						
pH	8.16						
Diss. Oxygen (mg/l)	10.9						
Tot. Chlorine (mg/l)	<PQL.						
NH3-N (mg/l)	<1						
Hard (mg/l CaCO3)	104						
Alkln (mg/l CaCO3)	139						
Color/Appearance[1]	CB						
Initials	PP						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/25/97						
Temp. (°C)	20.0						
Salinity (g/kg)	18						
D.O. (mg/l)	7.9						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.15						
Tot Chlorine (mg/l)	ND						
Initials	PP						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM:					ACUTE
Date	~~11/25/97~~ 11/25/97						
Temp. (°C)	20.5						
Conduct. (uMHOS)	—						
Salinity (g/kg)	20						
pH	8.27						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	—						
Alkln (mg/l CaCO3)	—						
Initials	PP						

EFFLUENT ID: 13A Mother Liquor TEST ID: JRA 97152

US00001574

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) J. JOSON/[illegible] Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 11/24/97 Time 9:45 am
— (Composite): From Date — Time —
To Date — Time —

Subsamples comprising composite: n/a
Number _____ Frequency of collection _____ Volume _____
*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 23.9°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.25 Field Total Residual Chlorine _____
Comments/Sample description Mother Liquor (Supernatant from Reference Reactor)
Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) Variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 11/25/97 Time _____
Received by [illegible] Date 11/25/97 Time 1105 #1379
2. ~~Relinquished~~ Relinquished by [illegible] Date 11-25-97 Time 2:10
Received by P. Blanco Date 11-25-97 Time 1410

FOR REED LAB USE ONLY

JRA# 97-13440 Arrival Temperature _____ On ice? —
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

SW C/SI dm EPA 0165

US00001575

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. Feed Stock
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1380
11/24/97 1035 Sample No. JRA97-13441

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001576

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	80	95	95
12.5	95	30	100	60
25.0	90	5	95	10
50.0	50	0	80	0
100	50	0	70	0
48-h LC50:	9.7%		13.8%	
95% Confidence Limits:	7.5-12.0		11.3-16.8	
Calculation Method:	Probit		Probit	
Toxic Units (T.U.):	10.31		7.25	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1500	11/25/97 1510
Test End:	11/27/97 1510	11/27/97 1520
Organism Source:	Chesapeake Cultures, Inc.	CBI stock cultures
Hatch/harvest Date:	11/25/97	11/24/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	Yes	Yes
Aeration Initiation Date/Time:	11/26 at 1455	11/26 at 1500

[1]D.O. concentration decreased to slightly less than 4.0 mg/l in 100% concentrations on day 2 of both tests, the drop was unanticipated and probably caused by a bacterial bloom (solutions turned milky color overnight). Low D.O. was not the primary cause of toxicity as indicated by low survival in concentrations with adequate D.O. concentration.

US00001577

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/24/97 1035	11/25/97 1500/1510[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	1.1 (---)	20.2 (---)	20.5 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	1638 (---)	N/A	N/A
pH	6.98 (---)	7.31 (---)	8.20 (---)
Dissolved Oxygen (mg/l)	10.8 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	110 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	189 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	37.0 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001578

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.2)	20.3 (0.2)	20.4 (0.2)	20.4 (0.1)	20.4 (0.1)	20.4 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.5 (0.4)	7.4 (0.8)	7.1 (1.1)	6.5 (2.2)	6.4 (2.3)
pH	8.04 (0.15)	7.90 (0.35)	7.82 (0.35)	7.54 (0.32)	7.81 (0.31)	7.74 (0.35)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.4 (0.2)	20.5 (0)	20.4 (0.1)	20.5 (0.2)	20.5 (0.3)	20.5 (0.2)
D.O. (mg/l)	7.9 (0.1)	7.6 (0.4)	7.4 (0.7)	7.1 (1.4)	6.5 (2.1)	6.5 (2.3)
pH	8.00 (0.20)	7.88 (0.33)	7.85 (0.36)	7.83 (0.31)	7.78 (0.42)	7.70 (0.32)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001579

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	8.1%	12.35	N/A	N/A	3.5%	28.57	N/A	N/A
11/3/97	12.5%	8.00	N/A	N/A	19.7%	5.08	N/A	N/A
11/25/97*	9.7%	10.31	N/A	N/A	13.8%	7.25	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	580.2 mg/l (490.0-700.0)
Control Chart LC50 (95% C.L.):	609.2 mg/l (488.6-729.9)
***C. variegatus* - Acute**	CBI Stock Cultures
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	929.5 mg/l (790.9-1092.5)
Control Chart LC50 (95% C.L.):	1077.7 mg/l (897.0-1258.4)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

Feed S.

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	<6.25	31		
2/28/97	Invalid	35		
3/12/97	17.7	52		
3/20/97	19.5	35		
3/26/97	33	34		
9/30/97	8.1	3.5		
11/3/97	12.5	19.7		
11/18/97	23.3	36.6		
11/25/97	9.7	13.8		

US00001581

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	7	80
	1-2	10	9	
12.5	2-1	10	4	30
	2-2	9	2	
25	3-1	8	1	5
	3-2	10	0	
50	4-1	04	0	0
	4-2	06	0	
100	5-1	05	0	0
	5-2	5	0	
Observer:		PB	SD	
Time:		1455	1510	

Oil moribund

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.1	20.4
	1	20.5	20.1	20.4
	2	20.4	20.2	20.5
	3	20.4	20.3	20.4
	4	20.4	20.4	20.3
	5	20.3	20.6	20.4
pH	C	8.21	7.92	7.98
	1	8.19	7.52	8.00
	2	8.07	7.42	7.97
	3	7.87	7.51	8.23
	4	7.56	7.71	8.15
	5	7.34	7.89	8.00
D.O. (mg/l)	C	7.9	7.9	7.7
	1	7.9	7.0	7.7
	2	7.9	6.5	7.7
	3	7.9	5.8	7.6
	4	7.9	4.0	7.7
	5	7.9	3.8	7.6
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above mess.		1	2	2
Initials:		PB	PB	SD

Species: Mysidopsis bahia Source: ~~CBI~~ CC

Hatch Date/Time: 11/25/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.3

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 5-1,2

SET UP: Date 11/25/97 Time Water Added 1440

Time Animals Added 1500 Set Up By PD/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP Portaph2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES:

② Aeration started 11/26 at 1455

① DO at 7.9 2000 in 100% Deg O

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature Date

TEST I.D.: JRA97151 12/1/97

US00001582

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97151 M BAHIA

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	4	0.2000	0.2000
12.5000	20	14	0.7000	0.7000
25.0000	20	19	0.9500	0.9500
50.0000	20	20	1.0000	1.0000
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 0.120
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

JRA97151 M BAHIA

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	2.757	1.020	4.261
LC/EC 50.00	9.702	7.510	12.007

US00001583

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	9	9	95
	1-2	10	10	
12.5	2-1	10	4	60
	2-2	10	8	
25	3-1	9	2	10
	3-2	10	0	
50	4-1	07	0	0
	4-2	09	0	
100	5-1	06	0	0
	5-2	08	0	
Observer:		PB	SD	
Time:		1500	1520	

① All moribund

		Day 0	Day 1	Day 2
TEMP	C	20.4	20.2	20.5
	1	20.5	20.5	20.5
	2	20.3	20.4	20.5
	3	20.5	20.7	20.4
	4	20.5	20.8	20.3
	5	20.3	20.7	20.4
pH	C	8.23	7.93	7.85
	1	8.14	7.51	7.98
	2	8.05	7.44	8.07
	3	7.86	7.50	8.12
	4	7.58	7.49	8.26
	5	7.33	7.96	7.88
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.1	7.7
	2	7.9	6.6	7.6
	3	7.9	5.5	7.8
	4	7.9	4.1	7.5
	5	7.9	②3.8	7.7
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	2
Initials:		PB/PD	PB	SD

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 11/27/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____ /d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 6-1,2

SET UP: Date 11/27/97 Time Water Added 1440

Time Animals Added 1510 Set Up By PB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A368)

Other _____

NOTES: Special study, reduced test volume

D.O. 7.9 at 2000 in 100% Day 0

② Aeration started at 1500 11/26

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

12/1/97 Date

TEST I.D.: JRA97151

US00001584

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

JRA97151 C VARIEGATUS

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
6.2500	20	1	0.0500	0.0500
12.5000	20	8	0.4000	0.4000
25.0000	20	18	0.9000	0.9000
50.0000	20	20	1.0000	1.0000
100.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 0.095
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

JRA97151 C VARIEGATUS

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	4.718	2.385	6.593
LC/EC 50.00	13.814	11.298	16.836

US00001585

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/24/97						
Temp. (°C)	1.1						
Conduct. (uMHOS)	1638						
Salinity (g/kg)	—						
pH	6.98						
Diss. Oxygen (mg/l)	10.8						
Tot. Chlorine (mg/l)	< DL						
NH3-N (mg/l)	3.7						
Hard (mg/l CaCO3)	110						
Alkln (mg/l CaCO3)	184						
Color/Appearance[1]	CB						
Initials	PP						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								ACUTE
Date	11/25/97							
Temp. (°C)	20.2							
Salinity (g/kg)	20							
D.O. (mg/l)	8.0							
Aeration Rate	—							
Aeration Time (min)	—							
Adjust. D.O. (mg/l)	~~8.0~~							
pH	7.31							
Tot Chlorine (mg/l)	NP							
Initials	PP							

DILUTION WATER CHARACTERISTICS:	DMW:	HWM:					ACUTE
Date	11/3/97						
Temp. (°C)	20.5						
Conduct. (uMHOS)	—						
Salinity (g/kg)	20						
pH	8.20						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	—						
Alkln (mg/l CaCO3)	—						
Initials	PO						

1380

EFFLUENT ID: Feedstock TEST ID: JRA 97151

US00001586

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Woson Affiliation ODU Env Eng Lab
Type of sample ✓ (Grab): Date 11/24/97 Time 10:35 am
— (Composite): From Date — Time —
To Date — Time —

Subsamples comprising composite:
Number — Frequency of collection — Volume —

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 - 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? n/a
Permit with interim chlorine limit? — If yes - limit (mg/L) —
Field pH 6.72 Field Total Residual Chlorine _____
Comments/Sample description Feed Stock

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms)
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Müjde Erten-Unal Date 11/25/97 Time _____
   Received by Althea Quilla Date 11/25/97 Time 1105 #1380
2. Relinquished by Wanda Borja Date 11-25-97 Time 2:10
   Received by P. Blasco Date 11-25-97 Time 1410

FOR REED LAB USE ONLY

JRA# 97-13441 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ — °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

success for EPDL 0195

Rev 5/16/94

US00001587

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. A1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1381
11/24/97 1950 Sample No. JRA97-13442

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001588

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival *M. bahia* 24-h	*M. bahia* 48-h	*C. variegatus* 24-h	*C. variegatus* 48-h
0	100	100	100	100
6.3	100	100	100	100
12.5	100	100	100	100
25.0	100	95	100	100
50.0	100	85	100	95
100	100	55	100	100
48-h LC50:	>100%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	N/A		N/A	
Toxic Units (T.U.):	<1.00		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1520	11/25/97 1525
Test End:	11/27/97 1550	11/27/97 1600
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/25/97	11/22/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001589

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB4R)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	95
	C-2	10	9	
6.25	1-1	10	9	95
	1-2	10	10	
12.5	2-1	10	10	95
	2-2	10	9	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	9	85
	4-2	10	8	
100	5-1	10	8	75
	5-2	10	7	
Observer:		PB	SM	
Time:		1530	1640	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.1	20.5
	1	20.5	20.3	20.4
	2	20.4	20.1	20.4
	3	20.3	20.1	20.4
	4	20.0	20.0	20.3
	5	20.0	20.0	20.4
pH	C	8.36	8.04	8.25
	1	8.34	8.03	8.22
	2	8.28	8.10	8.08
	3	8.22	8.12	8.16
	4	8.09	8.22	8.25
	5	8.00	8.22	8.26
D.O. (mg/l)	C	7.9	7.9	7.7
	1	7.9	7.8	7.8
	2	7.9	7.8	7.6
	3	7.9	7.7	7.7
	4	7.9	7.7	7.5
	5	7.9	7.7	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		2	1	1
Initials:		PB	PB	SM

Species: Mysidopsis bahia Source: ~~CBI~~ CC

Hatch Date/Time: 11/25/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 2-1,2

SET UP: Date 11/25/97 Time Water Added 1600

Time Animals Added 1630 Set Up By PB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A368)

Other: _____

NOTES: _____

D.O. 7.9 & at 2000 in 100% Day 0.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/11/97 Date

TEST I.D.: JRA97155

US00001590

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	9	95
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	SD	
Time:		1650	1650	

		Day 0	Day 1	Day 2
TEMP	C	20.4	19.9	20.0
	1	20.4	19.9	20.0
	2	20.3	20.0	20.0
	3	20.2	20.1	19.9
	4	20.1	20.2	19.9
	5	20.0	20.1	19.8
pH	C	8.35	8.09	8.09
	1	8.33	8.12	8.12
	2	8.30	8.11	8.15
	3	8.23	8.23	8.19
	4	8.12	8.26	8.24
	5	8.02	8.26	8.25
D.O. (mg/l)	C	7.9	7.9	7.8
	1	7.9	7.8	7.8
	2	7.9	7.7	7.6
	3	7.9	7.7	7.6
	4	7.9	7.7	7.6
	5	7.9	7.6	7.5
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		2	1	2
Initials:		PB	PB	SD

Species: Cyprinodon variegatus Source: ~~CBI~~ ABS

Hatch Date/Time: 11/22/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.7 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 5-1,2

SET UP: Date 11/22/97 Time Water Added 1600

Time Animals Added 1645 Set Up By PD/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNEB014475)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ CP Digisense pH Meter (09500563)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (BS2360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Special study, reduced test Volume

D.O. 7.9 at 2000 in 100% Day 6.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/1/97 Date

TEST I.D.: JRA 97155

US00001591

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/24/97						
Temp. (°C)	0.8						
Conduct. (uMHOS)	1611						
Salinity (g/kg)	—						
pH	8.17						
Diss. Oxygen (mg/l)	11.0						
Tot. Chlorine (mg/l)	<DL						
NH3-N (mg/l)	9.2						
Hard (mg/l CaCO3)	114						
Alkln (mg/l CaCO3)	179						
Color/Appearance[1]	CB						
Initials	PP						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/25/97						
Temp. (°C)	20.5						
Salinity (g/kg)	20						
D.O. (mg/l)	7.9						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.00						
Tot Chlorine (mg/l)	ND						
Initials	RP						

DILUTION WATER CHARACTERISTICS:	DMW:	HWM:					ACUTE
Date	11/25/97						
Temp. (°C)	20.0						
Conduct. (uMHOS)	—						
Salinity (g/kg)	20						
pH	8.30						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	—						
Alkln (mg/l CaCO3)	—						
Initials	PD						

EFFLUENT ID: 1383 Control A3 TEST ID: IRA 97155

US00001592

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County — Pipe/Outfall/Location —
NPDES# — Instream Waste Conc —
Sample collected by (print&sign) Olson/Olson Affiliation ODU EnvEng Lab
Type of sample ✓ (Grab): Date 11/24/97 Time 5:25 pm
— (Composite): From Date — Time —
To Date — Time —

Subsamples comprising composite:
Number — Frequency of collection — Volume —

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 24.8°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? —
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.15 Field Total Residual Chlorine —
Comments/Sample description A3 - control

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms)
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 11/25/97 Time —
Received by [signature] Date 11/25/97 Time 1105 #1383
2. Relinquished by [signature] Date 11-25-97 Time 2:10
Received by [signature] Date 11-25-97 Time 1410

FOR REED LAB USE ONLY

JRA# 97-13444 Arrival Temperature — On ice? —
Color — Odor — Solids —
pH — DO (mg/L) — Conductivity (µmhos/cm) — @ — °C
Salinity (ppt) — TRC (mg/L) — Method —

SW 020 Air EPA 0195

US00001593

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B1
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1384
11/24/97 2100 Sample No. JRA97-13445

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001594

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival *M. bahia* 24-h	*M. bahia* 48-h	*C. variegatus* 24-h	*C. variegatus* 48-h
0	100	100	100	100
6.3	100	100	100	95
12.5	100	100	100	95
25.0	100	75	100	100
50.0	100	45	100	100
100	95	0	100	100
48-h LC50:	40.2%		>100%	
95% Confidence Limits:	32.8-49.6		N/A	
Calculation Method:	Probit		N/A	
Toxic Units (T.U.):	2.49		<1.00	

Acute Test Information:

	M. bahia Test	*C. variegatus* Test
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1650	11/25/97 1650
Test End:	11/27/97 1700	11/27/97 1715
Organism Source:	Chesapeake Cultures, Inc.	Aquatic Bio Systems, Inc.
Hatch/harvest Date:	11/25/97	11/22/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001595

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/24/97 2100	11/25/97 1650/1650[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*-*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	1.1 (---)	20.0 (---)	20.5 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	4670 (---)	N/A	N/A
pH	8.32 (---)	7.97 (---)	8.30 (---)
Dissolved Oxygen (mg/l)	10.8 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	176 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	242 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	12.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001596

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.3)	20.3 (0.3)	20.2 (0.2)	20.3 (0.2)	20.2 (0)	20.1 (0.2)
D.O. (mg/l)	7.8 (0.1)	7.8 (0.2)	7.8 (0.1)	7.7 (0.2)	7.7 (0.3)	7.7 (0.3)
pH	8.11 (0.25)	8.11 (0.17)	8.09 (0.11)	8.09 (0.03)	8.11 (0.06)	8.11 (0.12)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.3)	20.1 (0.4)	20.1 (0.2)	20.0 (0.2)	20.0 (0.1)	20.0 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.9 (0.1)	7.8 (0.2)	7.8 (0.1)	7.7 (0.3)	7.6 (0.3)
pH	8.17 (0.19)	8.15 (0.17)	8.14 (0.13)	8.13 (0.05)	8.10 (0.02)	8.09 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001597

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	72.0%	1.39	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	50.5%	1.98	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97*	40.2%	2.49	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	580.2 mg/l (490.0-700.0)
Control Chart LC50 (95% C.L.):	609.2 mg/l (488.6-729.9)
C. variegatus - Acute	Aquatic Bio Systems, Inc (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	1140.2 mg/l (1019.5-1275.3)
Control Chart LC50 (95% C.L.):	1072.6 mg/l (887.0-1258.2)

US00001598

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-1

Date of Test	Invertebrate LC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	72	>100		
11/3/97	50.5	>100		
11/18/97	>100	>100		
11/25/97	40.2	>100		

US00001599

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	7	75
	3-2	10	8	
50	4-1	10	5	45
	4-2	10	4	
100	5-1	10	2	0
	5-2	9	0	
Observer:		PB	SD	
Time:		1550	1700	

		Day 0	Day 1	Day 2
TEMP	C	20.5	20.0	20.2
	1	20.6	20.0	20.4
	2	20.5	20.0	20.3
	3	20.4	20.1	20.3
	4	20.2	20.2	20.2
	5	20.0	20.1	20.3
pH	C	8.39	8.01	7.93
	1	8.30	8.05	7.99
	2	8.19	8.10	8.08
	3	8.07	8.13	8.07
	4	8.04	8.15	8.15
	5	7.97	8.16	8.20
D.O. (mg/l)	C	7.9	7.9	7.7
	1	7.9	7.9	7.6
	2	7.9	7.8	7.7
	3	7.9	7.8	7.5
	4	7.9	7.7	7.4
	5	7.9	7.7	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		2	1	2
Initials:		PB	PB	SD

Species: Mysidopsis bahia Source: ~~CBI~~ CC

Hatch Date/Time: 11/25/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 7-1,2

SET UP: Date 11/25/97 Time Water Added 1620

Time Animals Added 1650 Set Up By PB/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

DO 7.9 @ 2000 in 10% Dry 0.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/1/97 Date

TEST I.D.: JRA 97156

US00001600

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:						
Sample Date	11/24/97					
Temp. (°C)	1.1					
Conduct. (uMHOS)	4670					
Salinity (g/kg)	—					
pH	8.32					
Diss. Oxygen (mg/l)	10.8					
Tot. Chlorine (mg/l)	<D.L.					
NH3-N (mg/l)	13.5					
Hard (mg/l CaCO3)	7176					
Alkln (mg/l CaCO3)	292					
Color/Appearance[1]	C/P					
Initials	PD					

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:						ACUTE
Date	11/25/97					
Temp. (°C)	20.0					
Salinity (g/kg)	20					
D.O. (mg/l)	7.9					
Aeration Rate	—					
Aeration Time (min)	—					
Adjust. D.O. (mg/l)	—					
pH	7.97					
Tot Chlorine (mg/l)	ND.					
Initials	PD					

DILUTION WATER CHARACTERISTICS: DMW: HWM:						ACUTE
Date	11/25/97					
Temp. (°C)	20.5					
Conduct. (uMHOS)	—					
Salinity (g/kg)	20					
pH	8.30					
Diss. Oxygen (mg/l)	7.9					
Hard (mg/l CaCO3)	—					
Alkln (mg/l CaCO3)	—					
Initials	PD					

EFFLUENT ID: 1384 Control B1 TEST ID: JKA 97156

US00001601

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County – Pipe/Outfall/Location –
NPDES# – Instream Waste Conc –
Sample collected by (print&sign)_____ Affiliation_____
Type of sample ✓ (Grab): Date 11/24/97 Time 9:00 ~~8:35~~ pm
_____(Composite): From Date_____ Time_____
To Date_____ Time_____

Subsamples comprising composite:
Number_____ Frequency of collection_____ Volume_____

*Temperature of sample in sample collection device 0°C
Final temperature of effluent at sample collection point 24.2°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? – dechlorinated? – If so, how? –
Permit with interim chlorine limit? – If yes – limit (mg/L) –
Field pH 8.35 Field Total Residual Chlorine_____
Comments/Sample description BI

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten Unal Date 11/25/97 Time_____
Received by Agnes Griffith Date 11/25/97 Time 1105 #1384
2. Relinquished by David Boyd Date 11-25-97 Time 2:10
Received by P. Blanco Date 11-25-97 Time 1410

FOR REED LAB USE ONLY

JRA# 97-13445 Arrival Temperature_____ On ice?_____
Color_____ Odor_____ Solids_____
pH_____ DO (mg/L)_____ Conductivity (µmhos/cm)_____ @_____°C
Salinity (ppt)_____ TRC (mg/L)_____ Method_____

SW
CBI
SFM
EAD
DIAS

Rev 5/15/94

US00001602

US00001603

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests
Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B2
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1385
11/24/97 1945 Sample No. JRA97-13446

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001604

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival			
	M. bahia		*C. variegatus*	
	24-h	48-h	24-h	48-h
0	100	100	100	100
6.3	100	95	100	95
12.5	100	80	100	100
25.0	100	85	100	85
50.0	100	55	100	85
100	65	0	95	20
48-h LC50:	42.1%		72.6%	
95% Confidence Limits:	32.7-54.3		63.8-82.7	
Calculation Method:	Trimmed Spearman-karber		Trimmed Spearman-karber	
Toxic Units (T.U.):	2.38		1.38	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1655	11/25/97 1710
Test End:	11/27/97 1730	11/27/97 1740
Organism Source:	Chesapeake Cultures, Inc.	CBI stock cultures
Hatch/harvest Date:	11/25/97	11/17/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001605

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/24/97 1945	11/25/97 1655/1710[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*-*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	1.0 (---)	20.2 (---)	20.1 (---)
Salinity (g/kg)	N/A	20 (---)	20 (---)
Conductivity (uMHOS/cm)	4900 (---)	N/A	N/A
pH	8.20 (---)	7.91 (---)	8.31 (---)
Dissolved Oxygen (mg/l)	10.9 (---)	8.0 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	176 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	260 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	17.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001606

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.1 (0.2)	20.2 (0.2)	20.3 (0.1)	20.3 (0.2)	20.2 (0.1)	20.1 (0.2)
D.O. (mg/l)	7.8 (0.2)	7.8 (0.1)	7.8 (0.1)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)
pH	8.06 (0.21)	8.04 (0.21)	8.05 (0.15)	8.01 (0.12)	8.01 (0.08)	8.10 (0.14)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.0 (0.3)	20.0 (0.4)	20.0 (0.3)	20.0 (0.2)	19.9 (0.1)	20.0 (0.1)
D.O. (mg/l)	7.8 (0.2)	7.7 (0.2)	7.7 (0.2)	7.7 (0.2)	7.6 (0.3)	7.5 (0.4)
pH	8.09 (0.22)	8.04 (0.22)	8.04 (0.18)	8.03 (0.12)	8.00 (0.13)	8.05 (0.13)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)

US00001607

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	66.0%	1.52	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	50.0%	2.00	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97*	42.1%	2.38	N/A	N/A	72.6%	1.38	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

***M. bahia* - Acute**	Chesapeake Cultures, Inc. (same batch as test)
Reference Test Dates:	11/25/97-11/27/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	580.2 mg/l (490.0-700.0)
Control Chart LC50 (95% C.L.):	609.2 mg/l (488.6-729.9)
***C. variegatus* - Acute**	CBI Stock Cultures
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	929.5 mg/l (790.9-1092.5)
Control Chart LC50 (95% C.L.):	1077.7 mg/l (897.0-1258.4)

US00001608

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-2

Date of Test	Invertebrate EC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/20/97	>100	>100		
3/26/97	>100	>100		
9/30/97	66	>100		
11/3/97	50.0	>100		
11/18/97	93.9	>100		
11/25/97	42.1	72.6		

US00001609

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	9	95
	1-2	10	10	
12.5	2-1	10	9	80
	2-2	10	7	
25	3-1	10	9	85
	3-2	10	7	
50	4-1	10	5	55
	4-2	10	6	
100	5-1	9	0	0
	5-2	4	0	
Observer:		PB	SD	
Time:		1555	1730	

		Day 0	Day 1	Day 2	
TEMP	C	20.3	20.0	20.1	
	1	20.4	20.1	20.2	
	2	20.4	20.2	20.2	
	3	20.1	20.5	20.3	
	4	20.1	20.3	20.2	
	5	19.9	20.2	20.3	SD
pH	C	8.30	7.93	8.931	7.96
	1	8.27	7.99	7.97	7.85
	2	8.21	8.02	7.98	7.91
	3	8.09	8.07	8.07	7.88
	4	8.00	8.09	8.13	7.93
	5	7.94	8.19	8.20	8.17
D.O. (mg/l)	C	7.9	7.8	7.6	
	1	7.9	7.7	7.7	
	2	7.9	7.7	7.7	
	3	7.9	7.6	7.5	
	4	7.9	7.6	7.6	
	5	7.9	7.6	7.1	
SALIN (g/kg)	C	20	20	20	
	1	20	20	20	
	2	20	20	20	
	3	20	20	20	
	4	20	20	20	
	5	20	20	20	
Replicate # above meas.		1	2	2	
Initials:		PB	PB	SD	

Species: Mysidopsis bahia Source: ~~CBI~~ CC

Hatch Date/Time: 11/25/97

Acclimation water: HWM ASW ☒ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2x /d Other: _____

Feeding during test: Not fed ☐ Artemia 1x /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 5.23

SET UP: Date 11/25/97 Time Water Added 1645 PB

Time Animals Added 1655 Set Up By PB/PB

SS PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Corning 240 pH Meter (SN:5268)
- ☐ Sartorius R160P Balance (40020093)
- ☐ SP PortapH2 Meter (852360)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: _____

D.O. 7.9 at 2000 in 100% Day6.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/1/97 Date

TEST I.D.: JRA 97 157

US00001610

'RIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/25/97 TEST NUMBER: JRA97157 DURATION: 48 H
TOXICANT : B2
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	1
12.50	20	4
25.00	20	3
50.00	20	9
100.00	20	20

SPEARMAN-KARBER TRIM: 5.00%

SPEARMAN-KARBER ESTIMATES: LC50: 42.12
95% LOWER CONFIDENCE: 32.65
95% UPPER CONFIDENCE: 54.33

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

US00001611

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV4R)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	15	10	100
	C-2	10	10	
6.25	1-1	10	10	95
	1-2	10	9	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	8	85
	3-2	10	9	
50	4-1	10	8	85
	4-2	10	~~10~~ 9	
100	5-1	10	7	~~80~~
	5-2	9	7	
Observer:		PB	SO	
Time:		1700	1740	

		Day 0	Day 1	Day 2
TEMP	C	20.4	19.9	19.8
	1	20.5	19.9	19.7
	2	20.3	19.9	19.8
	3	20.2	20.1	19.8
	4	20.2	20.0	19.8
	5	20.0	20.1	20.0
pH	C	8.34	7.95	7.98
	1	8.28	8.00	7.84
	2	8.23	8.01	7.88
	3	8.11	8.07	7.89
	4	8.01	8.12	7.86
	5	7.96	8.20	7.99
D.O. (mg/l)	C	7.9	7.8	7.6
	1	7.9	7.7	7.6
	2	7.9	7.7	7.5
	3	7.9	7.6	7.5
	4	7.9	7.6	7.4
	5	7.8	7.5	7.2
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	20	20	20
Replicate # above meas.		1	2	1
Initials:		PB	PB	SO

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 11/17/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.7 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☑ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. _____

SET UP: Date 11/27/97 Time Water Added 1645

Time Animals Added 1710 Set Up By SO/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SN:E8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN:91A026329)
- ☐ Corning 240 pH Meter (SN:5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other: _____

NOTES: Special study, reduced test volume

D.O. 7.9 at 2000 in 100% Dsw 0.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: _____

Signature 12/1/97 Date

TEST I.D.: TRA 97 157

US00001612

'RIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/25/97 TEST NUMBER: JRA97157 DURATION: 48 H
TOXICANT : B2
SPECIES: C VARIEGATUS

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	1
12.50	20	0
25.00	20	3
50.00	20	3
100.00	20	16

SPEARMAN-KARBER TRIM: 20.00%

SPEARMAN-KARBER ESTIMATES: LC50: 72.62
95% LOWER CONFIDENCE: 63.81
95% UPPER CONFIDENCE: 82.65

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

US00001613

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/24/97						
Temp. (°C)	1.0						
Conduct. (uMHOS)	4900						
Salinity (g/kg)	—						
pH	8.20						
Diss. Oxygen (mg/l)	10.9						
Tot. Chlorine (mg/l)	<0.1						
NH3-N (mg/l)	17.5						
Hard (mg/l CaCO3)	176						
Alkln (mg/l CaCO3)	260						
Color/Appearance[1]	CB						
Initials	FO						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/25/97						
Temp. (°C)	20.2						
Salinity (g/kg)	—						
D.O. (mg/l)	8.0						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	7.91						
Tot Chlorine (mg/l)	ND						
Initials	PO						

DILUTION WATER CHARACTERISTICS: DMW: HWM:							ACUTE
Date	11/25/97						
Temp. (°C)	20.1						
Conduct. (uMHOS)	—						
Salinity (g/kg)	20						
pH	8.31						
Diss. Oxygen (mg/l)	7.9						
Hard (mg/l CaCO3)	—					—	
Alkln (mg/l CaCO3)	—						
Initials	FO						

EFFLUENT ID: 1335 CANYON B2 TEST ID: 112497157

US00001614

Toxicity Test Sample Chain of Custody
(Please complete all information)

Facility Old Dominion University
Address Norfolk, VA 23529

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Wilson Affiliation ODU EnvEng Lab
Type of sample ✓ (Grab): Date 11/24/97 Time 7:45 pm
_____ (Composite): From Date _____ Time _____
To Date _____ Time _____

Subsamples comprising composite:
Number _____ Frequency of collection _____ Volume _____

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 24.5°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? — dechlorinated? — If so, how? —
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.20 Field Total Residual Chlorine —
Comments/Sample description B2

Type of test(s) to be performed Mysid Shrimp, Cyprinodon
(Specify organisms) variegatus
Method of shipment Delivery by ODU

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 11/25/97 Time _____
Received by Debbie Mielle Date 11/25/97 Time 1105 #1385
2. Relinquished by Mary de Boyd Date 11-25-97 Time 2:15
Received by P. Blaoic Date 11-25-97 Time 1416

FOR REED LAB USE ONLY

JRA# 97-13416 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

sw cyprinodon CPP DIAS

US00001615

Coastal Bioanalysts Inc.

ODU/Oceana
Acute Effluent Toxicity Tests

Mysidopsis bahia & Cyprinodon variegatus
Sample I.D. B3
Contract No. N00187-93-D-9748
Delivery Order No. 0235
J.O. No. 1912290, Item No. 0002BJ, 0002BH
PWC No. 1386
11/24/97 1900 Sample No. JRA97-13447

Submitted to:

Ms. Merrill Anderson-Ashcraft
Navy Public Works Center
Code 930, Building Z-140
Norfolk, VA 23511

By:
Coastal Bioanalysts, Inc.
P.O. Box 626
Gloucester Point, VA 23062
(804) 642-0168

US00001616

Coastal Bioanalysts Inc.

I. TEST RESULTS

Table 1. Summary Acute Test Results

% Effluent Concentration	Mean (%) Organism Survival *M. bahia* 24-h	*M. bahia* 48-h	*C. variegatus* 24-h	*C. variegatus* 48-h
0	100	100	100	100
6.3	100	90	100	100
12.5	100	95	100	100
25.0	100	95	100	100
50.0	100	95	100	100
100	10	0	100	100
48-h LC50:	69.1%		>100%	
95% Confidence Limits:	N/A		N/A	
Calculation Method:	Trimmed Spearman-karber		N/A	
Toxic Units (T.U.):	1.45		<1.00	

Acute Test Information:

	***M. bahia* Test**	***C. variegatus* Test**
Test Type:	48-h Static	48-h Static
End Point:	Survival	Survival
Test Start:	11/25/97 1720	11/25/97 1725
Test End:	11/27/97 1750	11/27/97 1800
Organism Source:	CBI stock cultures	CBI stock cultures
Hatch/harvest Date:	11/21/97	11/17/97
Acclimation Salinity:	20 g/kg	20 g/kg
Acclimation Temperature:	18.9-20.8°C	18.9-20.8°C
Test Aerated?[1]:	No	No
Aeration Initiation Date/Time:	N/A	N/A

US00001617

Coastal Bioanalysts Inc.

Sample Collection Date/Time	Sample Use Dates/Times	Aeration[2] Rate/Time	Pretreatment/ Adjustment
11/24/97 1900	11/25/97 1720/1725[3]	n/a	HWM Salts

[2]Aeration often necessary to reduce sample oxygen concentration to 100% saturation after warming.
[3]*M. bahia*/*C. variegatus* test time.

Table 2. Effluent and Dilution Water [4] Chemical & Physical Characteristics (Mean Value (Standard Deviation))

Parameter	Initial Effluent	Adjusted Effluent	Dilution Water
Temperature (°C)	0.9 (---)	20.8 (---)	20.9 (---)
Salinity (g/kg)	N/A	21 (---)	20 (---)
Conductivity (uMHOS/cm)	4780 (---)	N/A	N/A
pH	8.22 (---)	8.01 (---)	8.34 (---)
Dissolved Oxygen (mg/l)	11.0 (---)	7.9 (---)	7.9 (---)
Total Hardness (mg/l as $CaCO_3$)	176 (---)	N/A	N/A
Alkalinity (mg/l as $CaCO_3$)	244 (---)	N/A	N/A
Total Chlorine (mg/l)	<D.L. (---)	N.D.	N.D.
NH_3-N (mg/l)	18.5 (---)	N.D.	N.D.

[4]Effluent parameters measured upon receipt of sample in lab and after adjustment on day of use. Dilution water (Wimex hw-Marinemix in ASTM Type I deionized water) values measured after preparation of diluent on day of use.

US00001618

Coastal Bioanalysts Inc.

II. WATER QUALITY

Table 3. Water Quality Summary

M. bahia Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.3 (0.4)	20.2 (0.4)	20.3 (0.3)	20.2 (0.3)	20.1 (0.2)	20.1 (0.1)
D.O. (mg/l)	7.9 (0)	7.8 (0.1)	7.8 (0.1)	7.8 (0.2)	7.7 (0.2)	7.7 (0.3)
pH	8.04 (0.27)	7.95 (0.37)	7.84 (0.35)	8.00 (0.17)	8.05 (0.06)	8.12 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)

C. variegatus Test

Mean Value (Standard Deviation)

Parameter	Control	6.3%	12.5%	25%	50%	100%
Temperature (°C)	20.2 (0.3)	20.2 (0.3)	20.1 (0.2)	19.9 (0.1)	20.0 (0.1)	20.0 (0.1)
D.O. (mg/l)	7.9 (0.1)	7.8 (0.1)	7.8 (0.1)	7.8 (0.2)	7.8 (0.2)	7.8 (0.2)
pH	8.06 (0.27)	8.07 (0.24)	8.05 (0.20)	7.97 (0.18)	8.04 (0.07)	8.07 (0.08)
Salinity (g/kg)	20 (0)	20 (0)	20 (0)	20 (0)	20 (0)	21 (0)

US00001619

Coastal Bioanalysts Inc.

III. OUTFALL DATA SUMMARY

Table 4. Cumulative Data Summary - Acute & Chronic Tests
(Tests conducted on this outfall by CBI)

	Invertebrate				Vertebrate			
	Acute Tests		Chronic Tests		Acute Tests		Chronic Tests	
Test Date	LC50	T.U.	NOEC	T.U.	LC50	T.U.	NOEC	T.U.
9/30/97	65.0%	1.54	N/A	N/A	>100%	<1.00	N/A	N/A
11/3/97	45.0%	2.22	N/A	N/A	>100%	<1.00	N/A	N/A
11/25/97*	69.1%	1.45	N/A	N/A	>100%	<1.00	N/A	N/A

*Results submitted with this report

IV. QUALITY ASSURANCE

M. bahia - Acute	CBI Stock Cultures
Reference Test Dates:	11/20/97-11/22/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	343, 490, 700, 1000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	574.8 mg/l (532.7-620.2)
Control Chart LC50 (95% C.L.):	610.6 mg/l (488.4-732.8)
C. variegatus - Acute	CBI Stock Cultures
Reference Test Dates:	11/18/97-11/20/97
Reference Toxicant:	KCl (Sigma "Ultra" Lot#76H10391)
Test Concentrations:	432, 720, 1200, 2000 mg/l
Control Survival:	100%
LC50 Reference test (95% C.L.):	929.5 mg/l (790.9-1092.5)
Control Chart LC50 (95% C.L.):	1077.7 mg/l (897.0-1258.4)

CUMULATIVE DATA SUMMARY

NPDES Permit #: N/A

Oceana - ODU

B-3

Date of Test	Invertebrate EC50 %	Vertebrate LC50 %	Invertebrate NOEC %	Vertebrate NOEC %
2/12/97	>100	>100		
2/28/97	Invalid	>100		
3/12/97	>100	>100		
3/26/97	>100	>100		
9/30/97	65	>100		
11/3/97	45.0	>100		
11/18/97	75.2	>100		
11/25/97	69.1	>100		

US00001621

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form AMB48)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	90
	1-2	10	8	
12.5	2-1	10	10	95
	2-2	10	9	
25	3-1	10	9	95
	3-2	10	10	
50	4-1	10	10	95
	4-2	10	9	
100	5-1	0	0	0
	5-2	2	0	
Observer:		FB	SD	
Time:		1640	1750	

		Day 0	Day 1	Day 2
TEMP	C	20.7	20.2	20.0
	1	20.7	20.5	20.0
	2	20.6	20.3	20.1
	3	20.5	20.0	20.1
	4	20.2	20.1	19.9
	5	20.1	20.1	20.0
pH	C	8.35	7.92	7.85
	1	8.30	7.99	7.57
	2	8.21	7.79	7.52
	3	8.12	8.07	7.86
	4	8.09	8.09	7.98
	5	8.03	8.15	8.17
D.O. (mg/l)	C	7.9	7.9	7.9
	1	7.9	7.8	7.7
	2	7.9	7.9	7.7
	3	7.9	7.9	7.6
	4	7.9	7.8	7.5
	5	7.9	7.9	7.4
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	21	21	21
Replicate # above mens.		1	2	2
Initials:		PB	PB	SD

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 11/21/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.9 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☐ Artemia 1X /d Other: _____

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. 8-1,2

SET UP: Date 11/25/97 Time Water Added 1710

Time Animals Added 1720 Set Up By PD/PB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortaH2 Meter (B52360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

D.O 7.9 at 2000 in 100% Day 6.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/1/97 Date

TEST I.D.: JRA 97 158

US00001622

RIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 11/25/97 TEST NUMBER: JRA97158 DURATION: 48 H
TOXICANT : B3
SPECIES: M BAHIA

RAW DATA: Concentration (%)	Number Exposed	Mortalities
.00	20	0
6.25	20	2
12.50	20	1
25.00	20	1
50.00	20	1
100.00	20	20

SPEARMAN-KARBER TRIM: 6.25%

SPEARMAN-KARBER ESTIMATES: LC50: 69.10
95% CONFIDENCE LIMITS
ARE NOT RELIABLE.

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

US00001623

COASTAL BIOANALYSTS, INC. NPDES STATIC ACUTE/SALTWATER (Form ACV4R)

% Effluent	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
6.25	1-1	10	10	100
	1-2	10	10	
12.5	2-1	10	10	100
	2-2	10	10	
25	3-1	10	10	100
	3-2	10	10	
50	4-1	10	10	100
	4-2	10	10	
100	5-1	10	10	100
	5-2	10	10	
Observer:		PB	SO	
Time:		1715	1900	

		Day 0	Day 1	Day 2
TEMP	C	20.6	20.1	20.0
	1	20.5	20.0	20.0
	2	20.3	20.1	19.9
	3	20.0	19.9	19.9
	4	20.1	20.0	19.9
	5	20.0	20.1	20.0
pH	C	8.37	7.90	7.91
	1	8.33	8.00	7.87
	2	8.37	7.99	7.89
	3	8.16	7.81	7.95
	4	8.04	8.10	7.97
	5	8.00	8.16	8.05
D.O. (mg/l)	C	7.9	7.9	7.6
	1	7.9	7.8	7.7
	2	7.9	7.9	7.7
	3	7.9	7.9	7.6
	4	7.9	7.8	7.6
	5	7.9	7.9	7.6
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	20
	5	21	21	21
Replicate # above rows.		1	2	1
Initials:		PB	PB	SO

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 11/17/97

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 18.7 to 20.8

Feeding prior to test: Artemia 2X /d Other: _____

Feeding during test: Not fed ☒ Artemia _____/d Other: _____

Chamber size: 300 ml ☐ 500 ml ☒ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: _____ Randomization template no. _____

SET UP: Date 11/29/97 Time Water Added 1710

Time Animals Added 1725 Set Up By PD/PD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other _____

NOTES: Special study, reduced test volume

D.O. 7.4 at 2000 in 100% D.O.

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments _____

Signature 12/1/97 Date

TEST I.D.: JRA 97158

US00001624

COASTAL BIOANALYSTS INC. EFFLUENT/DILUTION WATER DATA (Form EFDL0195)

INITIAL (ARRIVAL) EFFLUENT CHARACTERISTICS:							
Sample Date	11/24/97						
Temp. (°C)	0.9						
Conduct. (uMHOS)	4780						
Salinity (g/kg)	—						
pH	8.22						
Diss. Oxygen (mg/l)	11.0						
Tot. Chlorine (mg/l)	< D.L.						
NH3-N (mg/l)	15.5						
Hard (mg/l CaCO3)	176						
Alkln (mg/l CaCO3)	244						
Color/Appearance[1]	CB						
Initials	LP						

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

EFFLUENT ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:							ACUTE
Date	11/25/97						
Temp. (°C)	20.8						
Salinity (g/kg)	20.21						
D.O. (mg/l)	7.9						
Aeration Rate	—						
Aeration Time (min)	—						
Adjust. D.O. (mg/l)	—						
pH	8.01						
Tot Chlorine (mg/l)							
Initials							

DILUTION WATER CHARACTERISTICS:	DMW:	HWM:					ACUTE
Date	11/25/97						
Temp. (°C)	20.9						
Conduct. (uMHOS)	—						
Salinity (g/kg)	20						
pH	8.34						
Diss. Oxygen (mg/l)	7.9					—	
Hard (mg/l CaCO3)	—						
Alkln (mg/l CaCO3)	—						
Initials	LP						

EFFLUENT ID: 1386 Control-03 TEST ID: JRA97138

US00001625

Toxicity Test Sample Chain of Custody
(Please complete all information)

REED & ASSOCIATES

Facility Old Dominion University
Address Norfolk, VA 23529

County _____ Pipe/Outfall/Location _____
NPDES# _____ Instream Waste Conc _____
Sample collected by (print&sign) Woson Affiliation ODU EnvEng lab
Type of sample ✓ (Grab): Date 11/24/97 Time 7:00 pm
_____ (Composite): From Date — Time —
To Date — Time —

Subsamples comprising composite:
Number — Frequency of collection — Volume —

*Temperature of sample in sample collection device ~0°C
Final temperature of effluent at sample collection point 24.0°C
*Is sample collection device chilled? yes Is sample packed on ice for shipment? yes
*It is required that all samples remain at 0 – 4°C during collection period and shipment for data to be accepted by the appropriate Regulatory Agency (Do not freeze!)
Is the sample chlorinated? no dechlorinated? no If so, how? —
Permit with interim chlorine limit? — If yes – limit (mg/L) —
Field pH 8.20 Field Total Residual Chlorine —
Comments/Sample description B3

Type of test(s) to be performed Mysid Shrimp, Cyprinodon variegatus
(Specify organisms)
Method of shipment _____

Print & Sign Names

1. Relinquished by Dr. Mujde Erten-Unal Date 11/25/97 Time _____
Received by Alyssa Douglas Date 11/25/97 Time 1405 #1386
2. Relinquished by _____ Date 11-25-97 Time 2:10
Received by P. Blanco Date 11-25-97 Time 1410

FOR REED LAB USE ONLY

JRA# 97-1343 Arrival Temperature _____ On ice? _____
Color _____ Odor _____ Solids _____
pH _____ DO (mg/L) _____ Conductivity (µmhos/cm) _____ @ _____ °C
Salinity (ppt) _____ TRC (mg/L) _____ Method _____

yes CBI or GRO 01?

US00001626