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Final

Baseline Ecological Risk Assessment
Sites 11 and 17

Naval District Washington, Indian Head
Indian Head, Maryland

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Contents

Acronyms ..... **v**

1 Introduction **1-1**
1.1 Site Background 1-1
1.1.1 Site 11 1-1
1.1.2 Site 17 1-2
1.2 Results of Steps 1–3A of the Ecological Risk Assessment 1-3
1.3 Chemicals, Media, and Areas of Focus for the BERA 1-3

2 Problem Formulation **2-1**
2.1 Toxicity Evaluation 2-1
2.1.1 Inorganics 2-1
2.1.2 Polycyclic Aromatic Hydrocarbons 2-3
2.1.3 Explosives 2-4
2.2 Conceptual Site Model 2-4
2.2.1 Transport and Exposure Pathways 2-4
2.2.2 Assessment Endpoints 2-5
2.2.3 Risk Hypotheses 2-5
2.2.4 Measurement Endpoints 2-6

3 Investigation Activities **3-1**
3.1 Benthic Invertebrate Community 3-1
3.1.1 Sediment Chemistry 3-2
3.1.2 Bulk Sediment Toxicity 3-3
3.1.3 Benthic Community Structure 3-3
3.1.4 Weight of Evidence 3-4
3.2 Epibenthic Fish Community and Piscivorous Birds 3-4
3.3 Insectivorous Wetland Birds 3-4

4 Results **4-1**
4.1 Sediment Chemistry 4-1
4.2 Bulk Sediment Toxicity 4-2
4.3 Benthic Community Structure 4-3
4.4 Sediment Quality 4-4
4.5 Fish Tissue 4-5
4.6 Invertebrate Tissue 4-7

5 Risk Characterization **5-1**
5.1 Assessment Endpoints 5-1
5.2 Uncertainty 5-1
5.3 Conclusions 5-3
5.4 Risk Management 5-3

6 References **6-1**

Tables

1-1 Media, COCs, and Ecological Receptors Identified for the BERA

2-1 Measurement Endpoints at Sites 11 and 17

3-1 Summary of Surface Water Quality Parameters

4-1 Raw Data, Mean PEC Quotients, and Hazard Indices for Sediment Sample
4-2 Sediment Chemistry Risk Ranking Results
4-3 Summary of Grain Size Distribution and TOC for Sediment Samples
4-4 Summary of Amphipod Exposure to Sediment Toxicity
4-5 Summary of Average B-IBI Score and Risk Ranking
4-6 Summary of Risk Rankings to Assess Sediment Quality
4-7 Critical Residue Values for Fish Tissue
4-8 Calculated Hazard Quotients for COCs
4-9 Comparison of COC Results in Site 11/17 Fish Tissue to Reference Fish Tissue
4-10 Calculated Hazard Quotients for COCs
4-11 Summary of COC Results for Invertebrate Tissue Sample
4-12 Calculated Hazard Quotients for COCs in Marsh Wren

Figures

1-1 Site 11 Topography
1-2 Site 17 Topography

2-1 Conceptual Site Model

3-1 Sediment Sample Location Map
3-2 Reference Sample Location

4-1 Sediment Chemistry Results
4-2 Toxicity Test Results: Amphipod Survival
4-3 Toxicity Test Results: Amphipod Growth
4-4 Toxicity Test Results: Amphipod Reproduction
4-5 Benthic Community Structure Analysis Summary
4-6 Weight of Evidence Summary

5-1 Zinc Concentrations in Sites 11/17 Sediment Samples Collected to Date

Appendixes

A Chemistry Results, Sites 11 and 17 Sediment and Tissue
B Toxicological Evaluation of Sediment Samples
C Benthic Community Structure Analysis
D Benthic Data

Acronyms and Abbreviations

BERA	Baseline Ecological Risk Assessment
B-IBI	Benthic Index of Biotic Integrity
BTAG	Biological Technical Assistance Group
CNO	Chief of Naval Operations
COC	chemical of concern
EPA	U. S. Environmental Protection Agency
ER-L	effects range-low
ER-M	effects range-median
GPS	global positioning system
HQ	hazard quotient
IHIRT	Indian Head Installation Restoration Team
kg	kilogram
L	liter
LOAEL	lowest-observed-adverse-effect level
MFO	mixed-function oxidase
mg	milligram
NDWIH	Naval District Washington, Indian Head
NOAEL	no-observed-adverse-effect level
PAH	polycyclic aromatic hydrocarbon
PEC	probable effect concentration
PEL	probable effect level
RI	remedial investigation
SERA	Screening-Level Ecological Risk Assessment
SQG	sediment quality guideline
TEL	threshold effects level
TOC	total organic carbon

SECTION 1

Introduction

Naval District Washington, Indian Head (NDWIH), is a Navy facility in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, District of Columbia. This report presents the results of a Baseline Ecological Risk Assessment (BERA) for Sites 11 and 17 at NDWIH. This document was prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance (EPA, 1997, 1998) and Chief of Naval Operations (CNO) policy (CNO, 1999). It is a follow-on effort that builds on the Screening-Level Ecological Risk Assessment (SERA) as discussed in CH2M HILL (2004). Figures 1-1 and 1-2 show the locations of Sites 11 and 17, respectively. This BERA has been submitted to the Naval Facilities Engineering Command Washington, NDWIH, The United States Environmental Protection Agency (USEPA), and the Maryland Department of the Environment (MDE).

This document is organized as follows:

- Section 1—Introduction
- Section 2—Problem Formulation
- Section 3—Investigation Activities
- Section 4—Results
- Section 5—Risk Characterization
- Section 6—Risk Management
- Section 7—References

1.1 Site Background

This section provides a summary of the background information for Sites 11 and 17. Detailed site background information is provided in the *Final Remedial Investigation Report for Sites 11, 13, 17, 21, and 25* (herein referred to as "RI report") (CH2M HILL, 2004).

1.1.1 Site 11

Site 11 includes the Caffee Road Landfill (Area A) and the adjacent burn pit area (Area B) (Figure 1-1). The landfill is bordered by an unnamed tidal creek and associated emergent wetland to the west and by Mattawoman Creek to the south (Figure 1-1). A review of historical aerial photos indicated that filling activities have extended the shoreline into Mattawoman Creek as much as 150 feet from its original position. Site reconnaissance by two CH2M HILL ecologists in September 2002 verified that the much of the Mattawoman Creek shoreline next to Site 11 consists of concrete, debris, and fill.

Until the early 1960s, Site 11 was used for the disposal of bulk metal items and trash, rocket motor casings, building debris, rifles, demilitarized ordnance, propellant grain residues, and open-burning residues. The surface covering the landfill had been used until recently as the Decontamination Burn Point, where a large collection of flashed metal parts was stored. ("Flashed metal" refers to metal debris that has been burned to remove trace amounts of

explosive residue.) The metal parts were removed periodically by a metal recycling contractor. With the exception of a new gravel pad, which is now the Decontamination Burn Point, the landfill area has been regraded and seeded. Prior to sample data collected for the RI report (during July and August 2000 and February and March 2002), there were no historical sampling data available for Site 11.

Initial investigations focused on the central and western portions of the site, which are believed to have been the areas of disposal activities. A subsequent literature search conducted at NDWIH revealed that four open-burning pits previously existed along the eastern edge of Site 11 (Area B). Area B was added to the Site 11 RI study area and investigated. The results of the RI and additional background material are presented in CH2M HILL (2001).

Habitats within the vicinity of Site 11 include mixed hardwood and pine forest, tidal emergent wetland, an unnamed stream, and Mattawoman Creek. A mixed hardwood and pine forest is located on the hillsides north of the landfill and west of the wetland. This forest is second or third growth and is dominated by several species of oaks (*Quercus* spp.) with red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and Virginia pine (*Pinus virginiana*). The forest understory is dominated by American holly *(Ilex opaca*). The landfill itself is grass covered.

The tidal wetland is located at the confluence of the unnamed creek and Mattawoman Creek. The marsh is approximately 0.75 acres with exposed mudflats at low tide. The low marsh is dominated by cattail (*Typha* spp.), and the high marsh is dominated by rose mallow (*Hibiscus palustris*), wool grass (*Scirpus cyperinus*), and soft rush (*Juncus effusus*). A sparse mixture of immature trees, including sycamore (*Platanus occidentalis*) and black willow (*Salix nigra*), has become established in the marsh. The marsh edge abutting the landfill is dominated by clumps of wild rye (*Elymus villosus*) and black locust (*Robinia pseudoacacia*).

Fauna previously observed at Site 11 by CH2M HILL natural resources staff include marsh wren (*Cistothorus palustris*), northern flicker (*Colaptes auratus*), American crow (*Corvas brachyrhynchos*), gulls (*Larus* spp.), gray squirrel (*Scirius carolinensis*), and white-tailed deer (*Odocoileus virginianus*).

1.1.2 Site 17

Site 17 is east of and immediately adjacent to Site 11 (Figure 1-2). Site 17 is defined as a 1,000-foot stretch of shoreline along Mattawoman Creek, upstream of Site 11, where metal parts were discarded from the 1960s until the early 1980s. The disposed materials included rocket motor casings, shipping containers, empty drums, and various metal parts. The defined area of this site was expanded in 1997 to include a forested area 100 feet from the shoreline, where dozens of rusted drums were identified.

Mattawoman Creek supports spawning populations of fish, including white perch (*Morone americana*), yellow perch (*Perca flavenscens*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), and largemouth bass (*Micropterus salmoides*). Mattawoman Creek also supports channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), mummichog (*Fundulus heteroclitus*), and various shiner species

(*Notropis* spp.). Vegetation within the intertidal shore includes wild rye (*E. villosus*), rose mallow (*H. palustris*), and *Hydrilla verticillata (Hydrilla),* an invasive, non-native species.

The riparian forested buffer is sparsely vegetated with black locust (*R. pseudoacacia*) and sweet gum (*L. styraciflua*). Japanese honeysuckle (*Lonicera japonica*) is also common within the buffer. Wild rye (*E. villosus*) dominates the herbaceous layer.

1.2 Results of Steps 1–3A of the Ecological Risk Assessment

A SERA and Step 3A were performed as part of the RI for Sites 11 and 17. Both sites were combined for the evaluations because they abut one another, share similar physical characteristics, and are hydrologically connected by Mattawoman Creek. The results of this assessment are presented in greater detail in the RI report. Below is a summary of the SERA and Step 3A results:

- Cadmium, chromium, copper, iron, lead, mercury, silver, and zinc in soil could pose an unacceptable risk to soil invertebrates and plants and were identified as chemicals of concern (COCs).
- Barium, cadmium, copper, cyanide, lead, silver, and zinc in sediment could pose an unacceptable risk to benthic invertebrates or aquatic plants and were identified as COCs. The maximum concentrations of these inorganics were detected in Mattawoman Creek, not in the unnamed creek or tidal wetland.
- Benzo(a)anthracene and explosives-related chemicals (1,3,5-trinitrobenzene; 2,6-dinitrotoluene; 2-amino-4,6-dinitrotoluene; 3-nitrotoluene; and 4-nitrotoluene) in sediment along a 300-foot stretch of Mattawoman Creek (shoreline area between Area A and Area B; see Figure 1-1) could pose an unacceptable risk to benthic invertebrates or aquatic plants and were identified as COCs.
- Copper, lead, and mercury were identified as COCs for upper-trophic-level receptors from potential food web exposures. Copper could pose an unacceptable risk to insectivorous terrestrial mammals. Mercury could pose an unacceptable risk to insectivorous terrestrial mammals and piscivorous birds. Lead could pose an unacceptable risk to insectivorous terrestrial mammals, insectivorous terrestrial birds, carnivorous terrestrial birds, piscivorous birds, and wetland insectivorous birds.

1.3 Chemicals, Media, and Areas of Focus for the BERA

The BERA approach for Sites 11 and 17 was determined by the Indian Head Installation Restoration Team (IHIRT) at several meetings in 2003. On July 16, 2003, the IHIRT agreed that the BERA for Site 11 would include sediment in the unnamed creek and Mattawoman Creek. The Consensus Agreement reached by the team during the July 2003 IHIRT meeting at Indian Head is below:

> Consensus Agreement: Site 11, July 16, 2003, 11:40 a.m. - Team agrees that for Site 11, the BERA for sediments in the unnamed creek and Mattawoman Creek shoreline will be started concurrently with an FS for the waste soil and the upland soils (i.e., Building 24). If the BERA indicates ecological risk for the sediment, then the sediment will be addressed in the FS.

Consequently, this BERA evaluated sediment in the unnamed creek and Mattawoman Creek adjacent to Sites 11 and 17. Soil from the landfill and the upland area was not evaluated because the landfill will be capped, and the team agreed that soils at Site 11 that pose a potentially unacceptable ecological risk would be removed and placed under the cap during cap construction.

During a conference call held on August 4, 2003, to discuss the path forward for Site 17, the IHIRT team, including EPA's Biological Technical Assistance Group (BTAG) agreed that following soil and drum removal, any postremediation soil remaining will be sampled to make sure that regulatory agency–approved, ecological-risk-based action levels for lead, mercury, and zinc (the COCs for soil) are met. Thus, soils at Site 17 were not evaluated in this BERA.

A visual inspection of the areas requiring additional investigation (excluding the landfill area) showed that aquatic vegetation was growing and exhibiting no obvious signs of stress. Additionally, the ecological risk assessment findings presented in the Mattawoman Creek Study (TetraTech NUS, 2002) suggest that aquatic vegetation in Mattawoman Creek is not at risk. This conclusion was based on chemical analysis of *Hydrilla* samples and the documented steady increase in submerged aquatic vegetation in Mattawoman Creek since 1995. Based on TetraTech NUS's (2002) conclusions, plants were excluded from consideration in the BERA.

Based on comments received from BTAG, the COC list for upper-trophic-level receptors was expanded to include chemicals whose concentrations were estimated to exceed toxicity threshold on the basis of the no-observed-adverse-effects level (NOAEL) (i.e., zinc for piscivorous birds and insectivorous wetland birds). Additionally, mercury and silver exposure for upper-trophic-level receptors would also be further evaluated to reduce the uncertainty in the risk estimates for these metals, although silver was not identified as exceeding the NOAEL-based toxicity value.

Potential risks to fishes from site-related chemicals in the sediments were not evaluated directly in the SERA. Although findings from the Mattawoman Creek Study (TetraTech NUS, 2002) for Area 1 (portion of the creek adjacent to Sites 11 and 17) suggest that risks to fishes are minimal, the fish used for the study were not collected immediately adjacent to the site. Therefore, the potential risks to fishes associated specifically with sediments adjacent to Sites 11 and 17 were unknown. To address this data gap, epibenthic fishes were included in the BERA as potential receptors. Potential risks to epibenthic fishes were evaluated for the four bioaccumulative metals (lead, mercury, silver, and zinc) identified for other upper-trophic-level receptors. Benzo(a)anthracene and explosives-related chemicals were detected at low frequencies and at low concentrations. Polycyclic aromatic hydrocarbons (PAHs), in general, are metabolized and depurated rapidly. The fate and transport information for the nitroaromatic (explosives-related) compounds suggests their limited persistence in aquatic environments. Therefore, PAHs and nitroaromatics are unlikely to pose a significant risk to mobile aquatic receptors and were not included as COCs for fishes.

The direct-contact and foodchain COCs on which the BERA focused, organized by receptor, are shown in Table 1-1.

TABLE 1-1
Media, COCs, and Ecological Receptors Identified for the BERA

Medium, COC	Benthic Invertebrates	Epibenthic Fishes	Piscivorous Birds	Insectivorous Wetland Birds
Barium	✓	—	—	—
Cadmium	✓	—	—	—
Copper	✓	—	—	—
Lead	✓	✓	✓	✓
Mercury	✓	✓	✓	✓
Silver	✓	✓	✓	✓
Zinc	✓	✓	✓	✓
Benzo(a)anthracene	✓	—	—	—
1,3,5-trinitrobenzene	✓	—	—	—
2,6-dinitrotoluene	✓	—	—	—
2-amino-4,6-dinitrotoluene	✓	—	—	—
3-nitrotoluene	✓	—	—	—
4-nitrotoluene	✓	—	—	—

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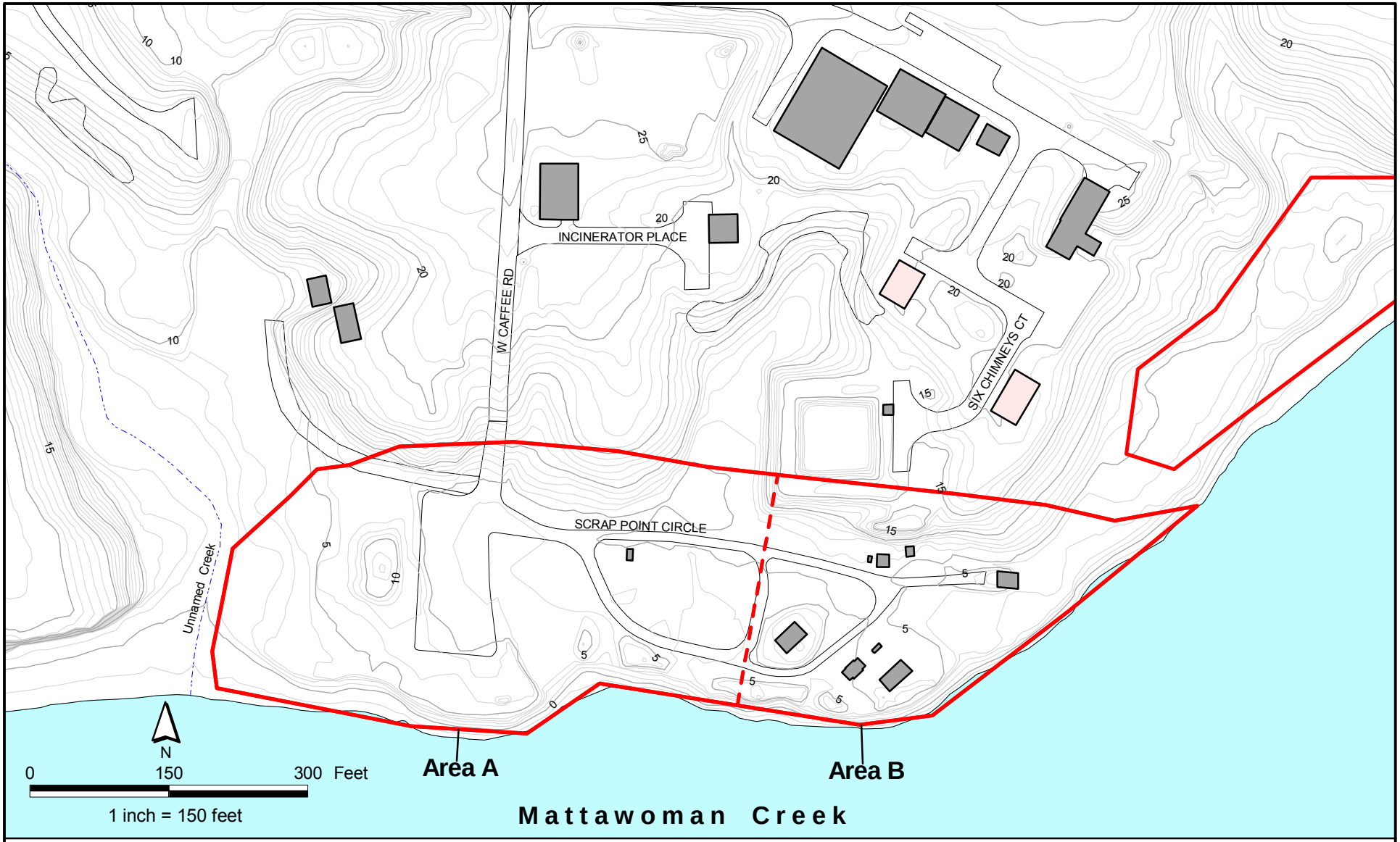

LEGEND

- IR Sites
- Buildings
- Demolished Buildings
- Railroads
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Roads
- Wooded Area
- Dense Wooded Area
- Unidentified Creek
- Boundary Between Area A and Area B
  - -- Area A Sampled July 20, 2000 - August 9, 2000
  - -- Area B Sampled February 25, 2002 - March 26, 2002

Figure 1-1
Site 11 Topography
Sites 11 & 17 BERA
NDWIH, Indian Head, Maryland

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LEGEND

- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Dense Wooded Area

N

0 60 120 Feet

1 inch = 120 feet

Figure 1-2
Site 17 Topography
Sites 11 & 17 BERA
NDWIH, Indian Head, Maryland

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SECTION 2

Problem Formulation

The BERA problem formulation is a revision of the previous problem formulation from the SERA and focuses the BERA on the key chemicals, exposure pathways, and receptors that were identified in previous steps of the assessment. This revised problem formulation consists of an evaluation of the toxicity of COCs and a refined conceptual model. The conceptual model includes a discussion of exposure pathways, assessment endpoints, and risk hypotheses.

2.1 Toxicity Evaluation

The COCs selected include barium, cadmium, copper, iron, lead, mercury, silver, and zinc, benzo(a)anthracene, 1,3,5-trinitrobenzene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 3-nitrotoluene, and 4-nitrotoluene. Based on the results of Step 3A, COCs could pose a risk to populations of soil invertebrates and insectivorous terrestrial birds inhabiting upland areas surrounding the landfill (Area A), the burn pit area (Area B), and drum storage area (Site 17). COCs may also pose a risk to populations of benthic invertebrates in Mattawoman Creek.

2.1.1 Inorganics

Barium. Barium occurs in nature combined with other elements such as sulfur or carbon with oxygen, in the form of the minerals barite ($BaSO_4$) and witherite ($BaCO_3$). Background barium concentrations in sediment at Indian Head ranged from 5.8 to 175 mg/kg (TetraTech NUS, 2002). Some barium compounds dissolve easily in water and are found in lakes, rivers, and streams. Barium is found in most soils and foods at low levels.

Cadmium. Freshwater aquatic species are more sensitive to toxic effects of cadmium than marine organisms. Cadmium has a toxic effect on reproduction functions in fish and other aquatic life (Eisler, 1985). Most of the toxicity data available for cadmium are from marine sediments, with toxic concentrations reported from 0.3 to 41.6 mg/kg (Sample et al., 1997). The screening value used in the ERA is 1.2 mg/kg and is based on an effects range-low (ER-L), which is based on adverse effects to benthic marine organisms (Long et al., 1995). Concentrations of cadmium in background samples ranged from 0.13 to 0.86 mg/kg.

Copper. Copper is a minor nutrient for animals at low concentrations, but is toxic to aquatic life at slightly higher concentrations. The toxic threshold in freshwater sediment varies considerably, as reported in scientific literature, with concentrations ranging from 45 to 1,800 mg/kg (Sample et al., 1997). The variability of the results suggests that various sediment characteristics affect the bioavailability of copper and, thus, its toxicity.

Lead. Lead was identified as a COC for soil invertebrates, benthic invertebrates, and insectivorous terrestrial birds. It was also evaluated as a COC for epibenthic fishes, piscivorous birds, and insectivorous wetland birds. Lead tends to be strongly retained in soil, allowing for very little to reach surface water or groundwater. Leaching from soil to

groundwater is very slow under natural conditions, but increases with increasing soil lead concentration (Boggess, 1977; ATSDR, 1999). In spite of its tendency for strong retention in soil, lead may be transported in particulate form into surface water as a result of soil erosion. Once in surface water, lead can quickly be removed from solution by precipitation of insoluble salts and by adsorption to particulate organic matter and clay minerals.

Due to strong absorption of lead to soil organic matter, the bioavailability of the lead is limited. Organic compounds of lead are more bioavailable than inorganic lead. Lead can be bioaccumulated by plants and animals. In aquatic organisms, the highest lead concentrations are usually seen in benthic organisms and algae, whereas the lowest concentrations tend to be evident in upper-trophic-level predators like carnivorous fish (Eisler, 1988). In vertebrates, lead tends to concentrate in bone matter instead of soft tissue, minimizing movement to higher trophic levels and uptake of lead by predators, especially raptors that regurgitate indigestible material (Stansley and Roscoe, 1996).

In a feeding study, Japanese quail where exposed to dietary lead (as lead acetate) for 12 weeks and were shown to exhibit reproductive effects (Edens et al., 1976). In this study quail were exposed to 1, 10, 100 and 1,000 mg/kg lead in their feed. The lowest-observed-adverse-effect level (LOAEL) for this study was 100 mg/kg since hatching success was adversely affected at this exposure level, but reproduction was not impaired at 10 mg/kg (i.e., the NOAEL). Final LOAEL and NOAEL values of 11.13 and 1.13 mg/kg/day, respectively, were calculated based on body weight and food consumption factors (Sample et al., 1996).

Mercury. Mercury was identified as a COC for benthic invertebrates. It was also evaluated as a COC for epibenthic fishes, piscivorous birds, and insectivorous wetland birds. Mercury occurs in the environment as elemental mercury (Hg_2(II) and Hg(II)), the latter of which is naturally oxidized from elemental mercury (Eisler, 1987). Mercury can combine with other elements, like chlorine, sulfur, and oxygen, to form inorganic mercury compounds, or salts, that usually exist as white powders or crystals. In addition, microbial activity can transform mercury into organic methylmercury (MeHg).

Silver. Silver was determined to be a COC for both soil invertebrates and benthic invertebrates. It was also evaluated as a COC for epibenthic fishes, piscivorous birds, and insectivorous wetland birds. Silver adheres strongly to clay particles found in suspended particulates and sediments. The impact of silver is most likely to occur at the sediment/ water interface. Silver is highly toxic to aquatic organisms (EPA, 1992) and may also biomagnify in some aquatic invertebrates (Adriano, 1986). Elevated concentrations can cause larval mortality, developmental abnormalities, and reduced larval growth in fish (Klein-MacPhee et al., 1984); growth reduction in juvenile mussels (Calabrese et al., 1984); and adverse effects on reproduction in gastropods (Nelson et al., 1983). Silver is toxic to soil microbes and can therefore inhibit the biological transformation of chemicals in the soil (ATSDR, 1990).

Currently, there are no established sediment quality guidelines (SQGs) for silver in freshwater sediments except for the upper effects threshold of 4.5 mg/kg that is based on the results of *Hyalella azteca* bioassays (Buchman, 1999). However, marine values are available, including the threshold-effect level (TEL) of 0.73 mg/kg and probable effect level

(PEL) of 1.77 mg/kg (MacDonald, 1994), and the ER-L and effects-range median (ER-M) of 1.0 and 3.7 mg/kg, respectively (Long et al., 1995).

Zinc. Zinc was determined to be a COC for soil invertebrates, benthic invertebrates, and insectivorous terrestrial birds. It was also evaluated as a COC for epibenthic fishes, piscivorous birds, and insectivorous wetland birds. Zinc occurs in soil primarily as Zn(II). Metallic zinc is insoluble while the solubility of other zinc compounds range from insoluble (oxides, carbonates, phosphates, silicates) to very soluble (sulfates and chlorides). Zinc is an essential element for animal life at low concentrations. It is important in many physiological processes and is involved in cell replication (EPA, 2000). However, in terrestrial species, chronic exposure to excessive zinc can result in softening of bone, anemia, enteropathy, and kidney damage. Zinc is not known to magnify in food chains because excess zinc is eliminated.

2.1.2 Polycyclic Aromatic Hydrocarbons

The PAH group of chemicals was selected as a COC for benthic invertebrates. In general, low-molecular weight PAHs are more soluble than high-molecular weight PAHs and tend to be acutely toxic to aquatic organisms. In aquatic environments, PAHs rapidly become adsorbed to organic and inorganic particulate materials and are deposited in sediments (Neff, 1985). Once adsorbed to sediment, PAHs have limited bioavailability to aquatic organisms (Neff, 1985). However, PAHs deposited in sediments can be toxic to benthic invertebrates. In sediment toxicity tests with the tubificid, *Limnodrilus hoffmeisteri*, Lotufo and Fleeger (1996) observed a median lethal phenanthrene level of 298 mg/kg (sediment organic carbon content = 0.7 percent). In the same study, pyrene levels up to 841 mg/kg were not acutely toxic. Decreases in tubificid reproduction were observed at much lower levels (IC_{25} s [concentration associated with a 25 percent inhibition in measured endpoint relative to control] of 40.5 mg/kg and 59.1 mg/kg for phenanthrene and pyrene, respectively).

In aquatic environments, exposure to ultraviolet light can result in photomodification of some PAHs to products with increased polarity, water solubility, and toxicity compared to the parent compound (Duxbury et al., 1997). Ireland et al. (1996) showed that the photo-induced toxicity of PAHs to the daphnid, *Ceriodaphnia dubia*, occurred frequently during low-flow conditions and wet weather runoff, and was reduced in turbid conditions. In studies on the marine amphipod, *Rhepoxynius abronius*, ultraviolet radiation exposure enhanced the toxicity of fluoranthene and pyrene in sediments, but did not affect the toxicity of acenaphthene and phenanthrene (Swartz et al., 1997). Pelletier et al. (1997) found that the phototoxicity of individual PAHs (anthracene, fluoranthene, pyrene) to marine bivalves *(Mulinia lateralis)* and marine shrimp *(Mysidopsis bahia*) were 12 to >50,000 times that of conventional toxicity. The metabolism of PAHs in fish has been linked to adverse ecological effects including tumor formations and other adverse effects including reproductive impairment.

The capacity to metabolize PAHs varies among organisms. Varanasi et al. (1985 cited in ATSDR, 1995) ranked the extent of benzo(a)pyrene metabolism by aquatic organisms as follows: fish → shrimp → amphipod → crustaceans → mussels. The fact that mussels are ranked last may be because mussels show no or limited mixed-function oxidase (MFO)

activity. MFO is an enzyme system responsible for the initiation of metabolism of various lipophilic organic compounds, including PAHs (Neff, 1985).

2.1.3 Explosives

In general, explosive compounds have one or more nitro groups on the parent molecule. Nitro compounds are reduced to amino compounds and bind to organic matter when released to soil and sediment (Roberts and Hartley, 1992). No information regarding the specific ecotoxicity of 1,3-dinitrobenzene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 3-nitrotoluene, and 4-nitrotoluene was found. However, in general, the fate and transport information for nitro compounds suggests that these compounds have limited persistence in aquatic environments.

Trinitrotoluene, an explosives-related compound used for commercial and military purposes, is only slightly soluble in water and is not volatile. It has been shown to be toxic to benthic invertebrates through aqueous exposure. Reported 48-hour lethal concentration 50 percent values for *Hyalella azetca* (amphipod), *Tanytarsus dissimilis* (midge), and *Lubriculus variegatus* (worm), are 6.5 mg/L, 27.0 mg/L, and 5.2 mg/L (ACOE, 1996).

2.2 Conceptual Site Model

Figure 2-1 presents the conceptual site model for ecological receptors at Sites 11 and 17. The model integrates information regarding the physical characteristics of the site, potentially exposed receptors, sources of contamination, and contaminant mobility (fate and transport) to identify exposure routes, receptors, and endpoints. A well-defined conceptual site model allows for a better understanding of the risks at a site and aids in the identification of the potential need for remediation.

2.2.1 Transport and Exposure Pathways

Erosion of contaminated soil and surface runoff from the landfill area (Area A), the burn pit area (Area B), and Site 17 may have released COCs to the sediments in the unnamed creek and to Mattawoman Creek. Additionally, at Site 11, fill was placed directly in Mattawoman Creek to extend the shoreline outward. COCs may have also entered the wetland and creek by groundwater discharge.

Benthic invertebrates and aquatic plants are potentially exposed to COCs as many of these organisms live directly in or on the sediments. Key exposure routes for invertebrates include ingestion of COCs adsorbed to sediment, and ingestion and direct contact with COCs in the pore water.

Fishes are potentially exposed to COCs through direct contact with sediments, incidental ingestion of sediment during foraging, and consumption of prey that have accumulated COCs in their tissues. The primary risk to fishes at Sites 11 and 17 is likely from ingestion of contaminated prey.

Soil invertebrates are potentially exposed to COCs through direct contact and ingestion of COCs adsorbed to soil. Terrestrial plants are potentially exposed through direct contact and root uptake. However, further evaluation of potential risks to soil invertebrates and terrestrial plants are not considered in BERA because the areas of Site 11 that contain COC

concentrations that pose unacceptable levels of risk will be excavated and placed under the landfill cap. Additionally, a soil removal action is planned for Site 17 to reduce the level of risk to acceptable levels for terrestrial receptors.

Wetland invertebrates may develop body burdens of bioaccumulative COCs. Predators, such as the marsh wren and other insectivorous birds, may be exposed to COCs by preying on these organisms. Lead and zinc may be accumulated, but do not biomagnify through foodchains. Concentrations of other chemicals have been shown to be low enough in the wetland sediment that they do not pose a risk to predators, but may still be impacting the invertebrate community. To varying degrees, some animals inhabiting the area may also be exposed to COCs through incidental ingestion of contaminated sediment.

2.2.2 Assessment Endpoints

Survival, growth, and reproduction of the benthic invertebrate community. Benthic invertebrates serve as a forage base for many aquatic and semi-aquatic species. They also play an important role in the processing and breakdown of organic matter in aquatic systems. Because they have significant direct contact with, and may even consume, sediment benthic invertebrates may be highly exposed to contaminants and develop body burdens. A benthic invertebrate community limited by chemical contamination would support fewer aquatic birds, fish, and amphibians.

Survival, growth, and reproduction of epibenthic fishes. Epibenthic fishes live and forage on the sediment surface. These receptors feed on benthic invertebrates and other fishes and are thus susceptible to exposure to bioaccumulative chemicals.

Growth, survival, and reproduction of piscivorous birds. Avian piscivores (fish eaters), such as the great blue heron (*Ardea herodias*), are important upper-trophic-level consumers in aquatic ecosystems. In this function, they are often reflective of ecosystem health, and are particularly susceptible to toxins that bioaccumulate in the food chain. In their role as a predator, they serve to maintain a balance in fish populations versus forage abundance and available habitat. Many such birds are also valued by society for their visual and vocal traits. The great blue heron was chosen as the surrogate species to represent this assessment endpoint. Fish are preferred prey, but they also feed on amphibians, reptiles, insects, crustaceans, birds, and mammals (Alexander, 1977; Peifer, 1979).

Survival, growth, and reproduction of insectivorous wetland birds. These receptors are second order consumers and are susceptible to exposure to bioaccumulative chemicals. The marsh wren (*Cistothorus palustris*) was selected to represent this endpoint. Marsh wrens inhabit emergent wetlands and consume insects.

2.2.3 Risk Hypotheses

Risk hypotheses are questions about how assessment endpoints could be affected. Risk hypotheses clarify and articulate relationships that are possible through consideration of available data, information from the scientific literature, and the best professional judgment of risk assessors. The risk hypotheses/questions associated with the assessment endpoints are:

- Are the concentrations of the COCs (identified in Section 1.3) in the sediments at Sites 11/17 sufficient to impair the growth, survival, and reproduction in the benthic invertebrate community to the extent that the prey base to support fish and other aquatic insectivores has been adversely affected?
- Is lead, mercury, silver, or zinc from the sediments at Sites 11/17 bioaccumulating in epibenthic fishes to the extent their growth, survival, or reproduction may be impaired?
- Is lead, mercury, silver, or zinc from the sediments at Sites 11/17 bioaccumulating in forage fishes to the extent that the growth, survival, or reproduction of piscivorous birds that forage at the site may be impaired?
- Is lead, mercury, silver, or zinc in the sediments of the unnamed creek and wetland adjacent to Site 11 bioaccumulating in wetland invertebrates to the extent that the growth, survival, or reproduction of insectivorous wetland birds may be impaired?

2.2.4 Measurement Endpoints

Measurement endpoints are measures of biological effects (e.g., laboratory toxicity test results) that are related to each respective assessment endpoint (EPA, 1997). Table 2-1 shows the measurement endpoints associated with each assessment endpoint for the areas of concern at Sites 11 and 17.

TABLE 2-1
Measurement Endpoints at Sites 11 and 17

Assessment Endpoints	Measurement Endpoints
Survival, growth, and reproduction of benthic invertebrate community	Comparison of sediment chemistry results with freshwater consensus-based SQGs proposed by MacDonald et al. (2000).
	Comparison of results of 42-day sediment laboratory toxicity tests (growth, survival, and reproduction) with the amphipod *Hyalella azteca* using site, reference, and control sediment.
	Results of benthic community structure analysis using metrics from the Benthic Index of Biotic Integrity (B-IBI) for tidal freshwater sediments.
Survival, growth, and reproduction of epibenthic fishes	Comparison of lead, mercury, silver, and zinc concentrations in epibenthic fish tissue with critical residue values from the literature.
Survival, growth, and reproduction of piscivorous birds	Comparison of estimated exposure dose to toxicity reference value using site-specific bioaccumulation data obtained from lead, mercury, silver, and zinc concentrations in forage fish tissue to a reference HQ of 1.
Survival, growth, and reproduction of insectivorous wetland birds	Comparison of estimated exposure dose to toxicity reference value using site-specific bioaccumulation data obtained from lead, mercury, silver, and zinc concentrations in invertebrate tissue to a reference HQ of 1. Exposure estimates will also include the chemical contribution from sediment ingestion.

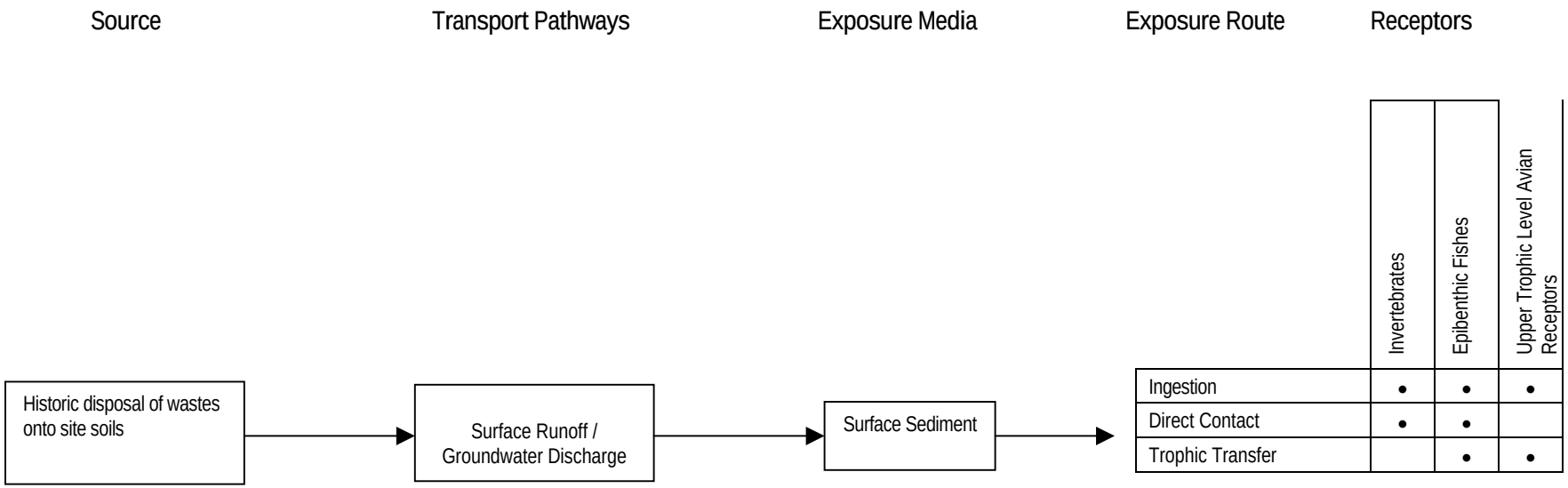

Figure 2-1
Conceptual Site Model
Sites 11/17 BERA
NDWIH, Indian Head, Maryland

SECTION 3

Investigation Activities

Investigation activities for the BERA were conducted at Sites 11 and 17 in August 2004 in accordance with the approved *Final Baseline Ecological Risk Assessment Problem Formulation and Work Plan Sites 11 & 17* (CH2M HILL, 2004). The sampling strategy was designed to assist further characterization of risk at specific areas identified as driving average contaminant concentrations above screening values and to ensure good spatial coverage in the BERA sampling effort. The following sections discuss sampling procedures and laboratory analyses for the various media. Data are presented in Appendices A through C.

3.1 Benthic Invertebrate Community

Sediment and benthic invertebrate samples were collected at Sites 11/17 (Figure 3-1) and at a reference location in Mattawoman Creek (Figure 3-2) between August 11 and 13, 2004. Sample locations were identified using a global positioning system (GPS). All sediment grab samples were collected from approximately 0 to 4 inches below the sediment/water interface using an Eckman dredge.

One sample proposed in the BERA work plan (IS11SD01) could not be collected because the substrate at this location (point of land between sample locations IS11SD02 and IS17SD06) was too hard to collect with the Eckman or a petite Ponar dredge. The substrate in the area consisted of a mixture of rocks, sand, and gravel. Repeated attempts to collect a sample in this general area, both along the shore and away from the shore to a water depth of 18 feet, were unsuccessful.

Sample IS17SD02-0804 was collected approximately 150 feet southwest of the original sample location due to dense *Hydrilla* growth and the observation of large-scale erosional processes on the shoreline and deposition in the area of the original sample location. Suitable sediment grab samples for toxicity testing and benthic invertebrate analysis could not be collected from the original area because the substrate was hard and consisted of primarily sand from the eroded shoreline. The new sample location was identified using GPS.

One reference sample, BGDSD05-0804, was collected during the sampling event. Care was taken to ensure that the reference sediment closely resembled the physical characteristics of the site sediment (i.e., similar grain size and amount of organic material). The sediment reference location was located upstream of Sites 11/17, in the the upgradient area (Area 6) sampled in the Mattawoman Creek BERA (TetraTech NUS, 2002).

Water quality parameters (dissolved oxygen, temperature, salinity) were measured at each sediment sampling location and recorded (Table 3-1). GPS coordinates were also collected for each location. Sample stations are presented in the table below.

Station ID	Location
BGDSD05	Reference Area
IS11SD02	Site 11, Mattawoman Creek
IS11SD03	Site 11, Mattawoman Creek
IS11SD04	Site 11, Mattawoman Creek
IS11SD05	Site 11, Unnamed Creek
IS11SD07	Site 11, Unnamed Creek
IS17SD02	Site 17, Mattawoman Creek
IS17SD06	Site 17, Mattawoman Creek

A sediment quality triad approach was selected to assess potential risk to the benthic invertebrate community. This approach consists of collecting colocated data on (1) sediment chemistry, (2) bulk sediment toxicity, and (3) benthic community structure. At each sampling location, sediment was homogenized and then split two ways: one part for chemical analysis and one part for laboratory toxicity testing. pH and oxidation-reduction potential of the sediment were measured after homogenization, prior to sampling.

For benthic community structure analysis, three replicate grabs were collected immediately adjacent to each sampling station. The grab samples were collected using an Eckman dredge and sieved (500-µm mesh) in the field. Each grab sample was preserved in the field using a 5 percent formalin solution and shipped to the laboratory for identification and enumeration.

3.1.1 Sediment Chemistry

All sediment samples were analyzed for target analyte list metals, PAH, explosives, total organic carbon (TOC), pH, and grain size. Associations between biological and chemical data were evaluated by examining the relationship between SQGs and biological endpoints (i.e., sediment toxicity and indices of benthic community health). The SQGs that were used are the freshwater consensus-based SQGs proposed by MacDonald et al. (2000). These consensus-based SQGs were derived from threshold effects concentrations, the concentration below which adverse effects are not expected to occur, and probable effect concentrations (PEC), the concentrations above which adverse affects are expected to occur more often than not. To develop baseline risk estimates, COC concentrations in the sediment were compared to PECs. Hazard quotients (HQs) were developed by dividing the COC concentrations at each station by the PEC. In addition, to help address the potential biological effects associated with mixtures of contaminants, a mean PEC quotient was calculated by dividing the COC concentration at a station by the PEC for that COC and averaging the quotients. The mean PEC quotient provides a hazard index for sediment contamination by integrating the number and magnitude of PEC exceedances into one unitless number. COCs for which a PEC was not available (barium, silver, and the explosive COCs) were evaluated based on the other analyses in the sediment quality triad.

The sediment chemistry results were ranked as follows for use in the risk characterization:

- \– No COC concentrations exceed the PEC values (HQs < 1)
- \+ Some COC concentrations exceed PEC values, but mean PEC quotient is <1.0
- ++ Mean PEC quotient >1.0

3.1.2 Bulk Sediment Toxicity

Sediment samples were collected for bulk sediment toxicity testing at each site sample location. Toxicity testing methods and results are provided in Appendix B. The amphipod *Hyalella azteca* was used for sediment toxicity testing. This organism was selected because its use is widely accepted and is tolerant of a wide range of salinity and grain sizes, and quality information on reproduction can be obtained during a 42-day test. Additionally, this species is more sensitive to copper, lead, and zinc than is *Chironomus tentans* (midge) (ASTM, 2001; EPA, 2000). The growth, survival, and reproduction of test organisms in site sediment were statistically compared with the results of these parameters from reference and control sediment. The results of the site samples were statistically compared with the results of the reference site sample to determine risk relative to reference conditions in Mattawoman Creek. The results of the reference sample were statistically compared with the results of the laboratory control sample to determine background levels of risk from Mattawoman Creek sediment.

The results of the toxicity tests were ranked as follows for use in the risk characterization:

- \– No effects for all endpoints
- \+ Effects observed for one endpoint
- ++ Effects observed for two or more endpoints

3.1.3 Benthic Community Structure

Benthic community structure was evaluated using benthic community structure analysis. The following benthic community parameters were calculated for each sampling station: taxa richness (i.e., number of species), total abundance, proportion of oligochaetes, and the Benthic Index of Biotic Integrity (B-IBI). The B-IBI is a multiple metric index developed to identify the degree to which the benthic community meets the Chesapeake Bay Program's Benthic Community Restoration Goals (Weisberg et al., 1997). The B-IBI scores ranges from 1-5. Sites with scores greater than or equal to 3 are considered to meet restoration goals, scores from 2.7 to 2.9 are considered marginally degraded, scores from 2.1 to 2.6 are degraded, and scores of 2 or less are severely degraded. This approach has been applied to tidal freshwater systems by including total abundance, percent abundance of pollution-indicative taxa, percent abundance of deposit feeders, and incorporating a tolerance score based on tolerance values assigned in Lenat (1993). The B-IBI score was used to assess health of the benthic community at each sampling station.

The results of the benthic community structure analysis were ranked as follows for use in the risk characterization:

- – B-IBI score indicates no degradation or marginally degraded, but similar to reference
- + B-IBI score indicates degraded community
- ++ B-IBI score indicates severely degraded community

3.1.4 Weight of Evidence

A weight of evidence approach was used to characterize ecological risk to the benthic invertebrate community at Sites 11/17. The weight of evidence was based on an analysis of exposures and effects. The line of evidence for exposure was PEC quotients and the lines of evidence for effects were laboratory toxicity test results and benthic community structure analysis.

The extent to which exposure and adverse effects occur concurrently and are elevated above reference conditions is important for the interpretation of risks. Where this concurrence exists, there is strong evidence of a complete exposure pathway between the contaminants and the receptors of concern. The joint probability of exposure and effects was used to presume the probability of risk for each station, as follows:

- Baseline Risk (i.e., reference): No greater than baseline (–) ranking for both exposure or effects
- Low Risk: No greater than low (+) ranking for either exposure or effects and no greater than baseline (–) ranking for the other
- Intermediate Risk: High (++) ranking for exposure or effects but not both, and no greater than low (+) ranking for other measures
- High Risk: High (++) ranking for both exposure and effects

3.2 Epibenthic Fish Community and Piscivorous Birds

To more accurately quantify the risk to epibenthic fishes and piscivorous birds, forage-size epibenthic fishes were collected adjacent to Site 11 at the terminus of the unnamed creek (Figure 3-1). Two composite samples of multiple fish of the same species were submitted for whole-body chemical analysis (lead, mercury, silver, and zinc). One sample, IS11FSH010804, consisted of 40 *Fundulus* spp. (primarily mummichog, may also have contained a few banded killifish), weighing a total of 110 grams. The other sample, IS11FSH020804, consisted of 23 *Notropis* sp. (small shiner not identified to species), weighing a total of 31 grams.

The COC residues measured in fish tissue were compared to critical reside values from the literature. The COC residues measured in fish tissue were also used to model exposure to piscivorous birds. The great blue heron was used as the surrogate species to represent this receptor group in the exposure modeling.

3.3 Insectivorous Wetland Birds

To more accurately characterize the potential risk to insectivorous wetland birds, common prey items of the marsh wren were collected from the area of the unnamed creek and

surrounding wetland and submitted for chemical analysis (lead, mercury, silver, and zinc). Two composite samples of multiple invertebrate species were submitted for tissue analysis (IS11VBT01-0804 and IS11VBT02-0804). The approximate proportions (by abundance) of the various prey items (by order) were as follows:

- Orthoptera—50% (grasshoppers)
- Coleoptera—30% (mostly Japanese beetles)
- Araneida (Class Arachnida)—5% (spiders)
- Stylommatophora (Class Gastropoda)—5% (terrestrial snails)
- Hemiptera—5% (various true bugs)
- Odonata—2.5% (damselflies)
- Homoptera—2.5% (aphids)

The COC residues measured in the invertebrate (marsh wren prey species) tissue were used to model exposure to insectivorous wetland birds. The marsh wren was used as the surrogate species to represent this receptor group in the exposure modeling. Wren exposure estimates also included the chemical contribution from sediment ingestion. Concentrations of COCs from a total of six sediment/surface soil samples located in the unnamed creek/wetland area (IS11SD05-08004, IS11SD060001, IS11SD07-0804, IS11SS310001, IS11SS330001, and IS11SS340001) were averaged and used in the exposure estimation.

Table 3-1
Summary of Surface Water Quality Parameters
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	Water Depth (feet)	Dissolved Oxygen (mg/L)	Temperature (^{o}C)	Salinity (ppt)	pH	ORP (mV)	Date Measured	Time	Weather
IS11SD02	4	8.62	27.3	0.1	6.9	-160.9	08/12/2004	1130	Sunny; high 80s
IS11SD03	5	9.85	27.4	0.1	6.86	-167	08/12/2004	1030	Sunny; high 80s
IS11SD04	5	8.47	27	0.1	6.86	-158.1	08/12/2004	0930	Sunny; high 80s
IS11SD05	2	4.67	22	0.1	NA	NA	08/13/2004	1000	Overcast; cooler, t-storms night before
IS11SD07	1-2	-	-	-	-	-	-	-	Sunny; high 80s
IS17SD02	3	9.35	29.4	0.1	7.03	-138	08/12/2004	1445	Sunny; high 80s
IS17SD06	4-5	10.01	27.5	0.1	7.06	-281.9	08/12/2004	1246	Sunny; high 80s
BGDSD05	5	4.6	24.6	0.1	6.74	-172.3	08/13/2004	1400	Partly cloudy, 80s

Notes
mg/L = milligram per liter
^{o}C = degrees celsius
ppt = parts per trillion
ORP = Oxidation Reduction Potential
mV = millivolts

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LEGEND

- Sediment sample location
- IR Sites
- Fish collection areas
- Insect collection areas

N

50 0 50 100 150 Feet

Figure 3-1
Sediment Sample Location Map
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

CH2MHILL

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LEGEND
Sediment sample location

N

0 150 300 Feet

Figure 3-2
Reference Sample Location
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

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SECTION 4

Results

This section summarizes the various data collected during the BERA investigation activities and evaluates the chemical, toxicological, and biological data at Sites 11 and 17. Potential risk to the benthic invertebrate community was evaluated using the sediment quality triad. Potential risk to epibenthic fishes was evaluated by comparing COC concentrations in fish tissue to reference fish tissue concentrations from the Mattawoman Creek Study (TetraTech NUS, 2002) and critical reside values from the literature. Potential risk to piscivorous birds was evaluated by modeling exposure using the concentrations of COCs in fish tissue samples. Potential risk to insectivorous wetland birds was evaluated by modeling exposure using the concentrations of COCs in invertebrate tissue samples.

4.1 Sediment Chemistry

All sediment samples were analyzed for target analyte list metals, PAHs, explosives-related chemicals, TOC, pH, and grain size. Table 4-1 summarizes detected COC concentrations. The maximum concentration of barium was measured in the sediment sample from IS11SD02. The maximum concentration of cadmium was measured in the sample collected from IS17SD02. Maximum concentrations of copper, lead, mercury, silver, and zinc were measured in the IS11SD03 sample. The maximum concentration of benzo(a)anthracene was measured in the sediment collected at IS11SD07. Explosives-related chemicals were not detected in any of the sediment samples. The concentrations of three of the COCs (copper, lead, and benzo(a)anthracene) were lowest in the reference sample. With the exception of silver, the minimum concentrations of the other COCs were measured at IS17SD02 and IS17SD06 and were similar to concentrations measured in the reference sediment. The minimum silver concentration was found at IS11SD07.

Concentrations of barium, cadmium, copper, lead, mercury, silver, zinc, and benzo(a)anthracene at each station (each sediment sample) were compared to PECs as described in Section 3.1.1. HQs were calculated by dividing the COC concentrations at each station by the PEC for that COC (Table 4-1). There were four HQs that were greater than 1: lead at IS11SD02 (1.02), IS11D03 (1.72), and IS17SD02 (1.15), and benzo(a)anthracene at IS11SD07 (2).

To help address the potential biological effects associated with mixtures of contaminants, a mean PEC quotient was calculated for each station by averaging the HQs. None of the average HQs were greater than 1, therefore all stations received either + or – risk rankings (Table 4-2). Figure 4-1 shows a plot of the mean PEC quotient versus sediment chemistry for the sediment samples.

TABLE 4-2
Sediment Chemistry Risk Ranking Results

Sample	Sediment Chemistry Risk Ranking
Reference	–
IS11SD02-0804	+
IS11SD03-0804	+
IS11SD04-0804	–
IS11SD05-0804	–
IS11SD07-0804	+
IS17SD02-0804	+
IS17SD06-0804	–

4.2 Bulk Sediment Toxicity

Toxicity tests were conducted with the amphipod (*Hyalella azteca*), which were exposed to sediment collected from seven locations at Sites 11/17 and one reference sediment sample. The toxicity tests were conducted for 42-days with survival, growth, and reproduction as test endpoints. The toxicity testing report, including raw data, summary tables and statistical analyses, is provided in Appendix B.

Grain size distribution curves for the sediment samples are included in Appendix C. The distribution curves reflect similar physical characteristics between the reference sample and site samples. The TOC content of the reference sample (24,000 mg/kg) was within the range measured in the site samples (6,000 to 65,000 mg/kg). Table 4-3 provides a summary of the grain size distribution and TOC for all samples.

TABLE 4-3
Summary of Grain Size Distribution and TOC for Sediment Samples

Sample	Distribution (Percent)					TOC (mg/kg)
	Silt & Clay	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	
Reference	92.9	2.6	1.8	2.1	0.6	24,000
IS11SD02	95.7	2.6	1.1	0.6	0.0	39,000
IS11SD03	90.1	5.0	2.4	1.7	0.8	37,000
IS11SD04	94.6	3.5	1.3	0.6	0.0	28,000
IS11SD05	93.6	6.0	0.4	0.0	0.0	65,000
IS11SD07	88.5	10.6	0.9	0.0	0.0	55,000
IS17SD02	61.7	35.4	2.3	0.6	0.0	6,000
IS17SD06	54.7	39.0	5.1	0.7	0.5	11,000

The mean survival for *H. azteca* in the control sample was 90 percent. This value was above the minimum level of 80 percent specified by the protocol (Appendix B). Mean survival in the reference sample was 79.2 percent and mean survival in the site samples ranged from 77.5 to 94.2 percent.

Test results for survival, growth, and reproduction are presented in Figures 4-2 through 4-4. The results of the toxicity testing showed that exposure of the amphipods to site samples had no statistically significant impact on survival, growth, or reproduction compared to amphipods exposed to the reference sediment. Therefore all site samples received "—" risk rankings, as presented in Table 4-4. The reference location endpoints were below the control sample endpoints at statistically significant levels, which warranted a "++" ranking.

TABLE 4-4
Summary of Amphipod Exposure to Sediment Toxicity

	28-Day Survival		28-Day Growth		42-Day Reproduction		Sediment Toxicity
	Control	Reference	Control	Reference	Control	Reference	Test Risk Ranking
Reference	Sig.	n/a	Sig.	n/a	NS	n/a	++
IS11SD02	NS	NS	Sig.	NS	NS	NS	–
IS11SD03	NS	NS	Sig.	NS	NS	NS	–
IS11SD04	NS	NS	NS	NS	NS	NS	–
IS11SD05	Sig.	NS	NS	NS	NS	NS	–
IS11SD07	NS	NS	NS	NS	NS	NS	–
IS17SD02	NS	NS	NS	NS	NS	NS	–
IS17SD06	NS	NS	NS	NS	NS	NS	–

Sig. – Significant Difference (alpha = 0.05).
NS – No Significant Difference.
n/a – Not Applicable.

4.3 Benthic Community Structure

The results of the benthic community structure analysis are presented in Appendix D. The B-IBI score for each sediment sample was calculated based on four metrics: total abundance (number of organisms per square meter), abundance of pollution-indicative taxa (percent), abundance of deep deposit-feeders (percent), and tolerance score. The B-IBI value was calculated for each replicate and the average of the replicate scores was reported as the B-IBI score for each station. Community conditions were found to meet restoration goals (B-IBI greater than or equal to 3) at each station except for IS11SD05 and IS11SD07. For both of these stations, the B-IBI scores suggest that the benthic community is "severely degraded" in the unnamed creek.

The benthic community structure data are summarized in Table 4-5 and in Figure 4-5.

4.4 Sediment Quality

A weight of evidence approach was used to characterize ecological risk to the benthic invertebrate community at Sites 11/17. As described in Section 3.1.4, the weight of evidence was based on an analysis of exposures and effects. The line of evidence for exposure was PEC-based hazard quotients and the lines of evidence for effects were laboratory toxicity test results and benthic community structure analysis. These data are summarized in the Table 4-6 and in Figure 4-6.

TABLE 4-5
Summary of Average B-IBI Score and Risk Ranking

Sample	B-IBI Score*	Benthic Community Structure Analysis Risk Ranking
Reference	3.0	–
IS11SD02	4.0	–
IS11SD03	4.5	–
IS11SD04	5.0	–
IS11SD05	2.0	++
IS11SD07	1.5	++
IS17SD02	4.0	–
IS17SD06	3.5	–

*Average of three replicates at each station.

TABLE 4-6
Summary of Risk Rankings to Assess Sediment Quality

Sample	Sediment Chemistry Risk Rankings	Toxicity Test Risk Rankings	Benthic Community Structure Risk Rankings	Summary of Risk to Benthic Community
Reference (BGDSD05)	–	++	–	Intermediate
IS11SD02	+	–	–	Low
IS11SD03	+	–	–	Low
IS11SD04	–	–	–	Baseline
IS11SD05	–	–	++	Intermediate
IS11SD07	+	–	++	Intermediate
IS17SD02	+	–	–	Low
IS17SD06	–	–	–	Baseline

The weight of evidence suggests that the benthic invertebrate community at IS11SD05 and IS11SD07 is at intermediate risk (Figure 4-6). This finding is primarily based on the analysis of the benthic invertebrate community structure, which revealed a degraded benthic community dominated by Tubificid worms. An abundance of Tubificid worms is generally an indication of an organically enriched or oxygen-deficient environment. The degraded condition of the benthic invertebrate community is likely related to physical limitations of the habitat. There is little freshwater flow in the creek and there is an abundance of organic material in the creek (i.e., plant material and woody debris), which likely results in high biological oxygen demand from decomposition, which decreases dissolved oxygen concentrations. Water quality parameters were not collected at IS11SD07 because they were inadvertently omitted during field sampling. However, the dissolved oxygen at station IS11SD05, which was located at the terminus of the creek, was relatively low at 4.67 mg/L (Table 3-1), which shows that biological oxygen demand is likely impacting the habitat quality in the unnamed creek. It is likely that the dissolved oxygen at IS11SD07 was even lower because there is less tidal exchange of water at that location than at the terminus of the creek.

There were no significant adverse effects observed in the toxicity tests at stations IS11SD05 and IS11SD07 and only one HQ exceeded 1.0 (benzo(a)anthracene. Therefore the risk to the benthic community and the degraded nature of the benthic invertebrate community does not appear to be due to site-related chemicals.

Ecological risk at IS11SD04 and IS17SD06 was characterized as baseline (i.e., risk is equivalent to or less than that of the reference condition).

Sediment at IS11SD02, IS11SD03, and IS17SD02 was found to pose low risk to the benthic invertebrate community at these locations. The low risk finding is based on the fact that although there were exceedances of the lead PEC value at these locations, no statistically significant adverse effects compared to the ref. Location were found in the toxicity tests or the benthic community structure analysis.

4.5 Fish Tissue

To characterize ecological risk to epibenthic fishes, COC residues in fish tissue (whole body) were compared to critical residue values from the literature. The critical residue values selected, and their sources, are presented in Table 4-7. HQs were calculated for each sample (species) and are presented in Table 4-8.

Hazard quotients for lead, mercury, and silver for both species sets were less than 1.0. The results of this evaluation show that the zinc concentration in the *Fundulus* spp. sample was below the critical residue value, but that the zinc concentration in the *Notropis* sp. sample exceeded the critical residue value. Therefore this comparison suggests that some species of fish are possibly at risk from zinc in the sediments at Sites 11/17. There is some uncertainty in this finding because the critical residue value used in the evaluation was obtained from a study using a different species, flagfish (*Jordanella floridae*). The 40 mg/kg critical residue value represents a tissue concentration that caused reduced growth in flagfish, but had no effect on survival. The extrapolation of *Jordanella* findings to *Notropis* creates uncertainty in the risk assessment.

TABLE 4-8
Calculated Hazard Quotients for COCs

COC	IS11FSH010804 *Fundulus* spp. (mg/kg, wet weight)	IS11FSH020804 *Notropis* sp. (mg/kg, wet weight)	Critical Residue Value	*Fundulus* HQ	*Notropis* HQ
Lead	0.16	0.31	26.2	0.01	0.01
Mercury	0.029	0.018	1.36	0.02	0.01
Silver	0.023(ND)	0.023(ND)	1.3	0.01	0.01
Zinc	35.4	51.7	40.0	0.89	**1.29**

Table 4-9 compares fish tissue residues in fish caught at Sites 11/17 with reference fish tissue residues from fish caught in the reference area of Mattawoman Creek, Area 6 in the Mattawoman Creek Study (TetraTech NUS, 2002). Although different fish species are represented, the data suggest that fishes in the vicinity of Sites 11/17 are acquiring body burdens of zinc at concentrations above background conditions. The other COCs were not detected in the reference samples and the detection limits were not reported. However, the data suggest that lead, mercury, and silver are not bioaccumulating in fishes in the vicinity of Sites 11/17 at concentrations that warrant concern.

TABLE 4-9
Comparison of COC Results in Site 11/17 Fish Tissue to Reference Fish Tissue

COC	IS11FSH010804 *Fundulus* spp.	IS11FSH020804 *Notropis* sp.	Pumpkinseed	Shiner (Golden and Spottail)
Lead	0.16	0.31	ND	ND
Mercury	0.029	0.018	ND	ND
Silver	0.023(ND)	0.023(ND)	ND	ND
Zinc	35.4	51.7	15.1	35.1

ND, not detected (detection limit not reported).
All values in milligrams per kilogram (wet weight)

The whole-body fish tissue concentrations (average of the two species) were used to refine the risk estimate for piscivorous birds. The great blue heron was chosen as the surrogate species to represent this receptor group. The same ingestion-based exposure model used in the SERA and Step 3A was used to estimate risk for piscivorous birds (CH2M HILL, 2001). A percent moisture content of 75 percent (Sample and Suter, 1994) was assumed to convert the fish tissue data from wet weight to dry weight for the exposure calculations. Calculated LOAEL-based HQs for the great blue heron are presented in Table 4-10. As the table shows, all HQs were less than 1 for this receptor, indicating that the COCs are not bioaccumulating in fish tissue at levels likely to pose an unacceptable risk to piscivorous birds at Sites 11 and 17.

TABLE 4-10
Calculated Hazard Quotients for COCs

COC	Hazard Quotient (Great Blue Heron)
Lead	<0.01
Mercury	0.21
Silver	<0.01
Zinc	0.23

4.6 Invertebrate Tissue

To refine the risk estimate for insectivorous wetland birds at Sites 11/17, COC concentrations in the wetland insect samples were used (average of the two samples) to provide a site-specific estimate of exposure. Invertebrate tissue data are presented in Table 4-11. Each sample represents a composite sample of the various insects collected, as described in Section 3.3.

TABLE 4-11
Summary of COC Results for Invertebrate Tissue Samples

COC	IS11VBT01-0804 (mg/kg, wet weight)	IS11VBT02-0804 (mg/kg, wet weight)
Lead	0.57	0.27
Mercury	0.036	0.022
Silver	0.15	0.056
Zinc	46	44.5

The marsh wren was used as the surrogate insectivorous wetland bird for food chain exposure. The same ingestion-based exposure model used in the SERA and Step 3A was used to estimate risk for insectivorous wetland birds (CH2M HILL, 2001). A percent moisture content of 65 percent (Sample and Suter, 1994) was assumed to convert the insect tissue data from wet weight to dry weight for the exposure calculations. Calculated LOAEL-based HQs are presented in Table 4-12.

TABLE 4-12
Calculated Hazard Quotients for COCs in Marsh Wren

COC	Hazard Quotient (Marsh Wren)
Silver	<0.01
Zinc	0.25
Lead	0.15
Mercury	0.28

All HQs were less than 1, suggesting that the COCs are not posing an unacceptable risk to insectivorous wetland birds at Sites 11/17.

Table 4-1
Raw Data, Mean PEC Quotients, and Hazard Indices for Sediment Samples
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	BGDSD05	PEC	HQ	IS11SD02	PEC	HQ	IS11SD03	PEC	HQ	IS11SD04	PEC	HQ	IS11SD05	PEC	HQ	IS11SD07	PEC	HQ	IS17SD02	PEC	HQ	IS17SD02	PEC	HQ	IS17SD06	PEC	HQ
Sample ID	BGDSD05-0804			IS11SD02-0804			IS11SD03-0804			IS11SD04-0804			IS11SD05-0804			IS11SD07-0804			IS17SD02-0804			IS17SD40-0804			IS17SD06-0804		
Sample Date	08/12/04			08/12/04			08/12/04			08/12/04			08/11/04			08/11/04			08/12/04			08/12/04			08/12/04		
Inorganics (MG/KG)																											
Barium	80.7	NA	-	181	NA	-	166	NA	-	160	NA	-	105	NA	-	111	NA	-	106	NA	-	44.2 J	NA	-	54.1	NA	-
Cadmium	0.89 J	4.98	0.18	1.60 J	4.98	0.32	2.40	4.98	0.48	1.10 J	4.98	0.22	0.81 J	4.98	0.16	1.10 J	4.98	0.22	2.50	4.98	0.50	0.69 J	4.98	0.14	0.44 J	4.98	0.09
Copper	14.8	149	0.10	79.1	149	0.53	113	149	0.76	58.2	149	0.39	29.1	149	0.20	36.0	149	0.24	98.9	149	0.66	39.7	149	0.27	21.7	149	0.15
Lead	19.2	128	0.15	130	128	**1.02**	220	128	**1.72**	79.0	128	0.62	36.0	128	0.28	55.6	128	0.43	147	128	**1.15**	58.2	128	0.45	39.7	128	0.31
Mercury	0.12	1.06	0.11	0.27	1.06	0.25	0.39	1.06	0.37	0.19	1.06	0.18	0.19	1.06	0.18	0.16	1.06	0.15	0.33	1.06	0.31	0.17	1.06	0.16	0.094	1.06	0.09
Silver	0.88 J	NA	-	4.20 J	NA	-	6.80	NA	-	3.00 J	NA	-	1.20 J	NA	-	0.67 J	NA	-	1.60 J	NA	-	1.1 J	NA	-	1.90 J	NA	-
Zinc	94.5	459	0.21	287	459	0.63	370	459	0.81	218	459	0.47	102	459	0.22	135	459	0.29	287	459	0.63	116	459	0.25	90.6	459	0.20
Semivolatile Organic Compounds (UG/KG)																											
Benzo(a)anthracene	12 U	1050	0.01	130	1050	0.12	97.0	1050	0.09	26.0	1050	0.02	79.0	1050	0.08	2,100	1050	**2**	460	1050	0.44	230	1050	0.22	32.0	1050	0.03
Explosives (UG/KG)																											
1,3,5-Trinitrobenzene	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-
2,6-Dinitrotoluene	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-
2-Amino-4,6-dinitrotoluene	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-	100 U	NA	-
3-Nitrotoluene	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-
4-Nitrotoluene	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-	200 U	NA	-
Other Parameters (MG/KG)																											
% Solids	54	-	-	30.0	-	-	35.0	-	-	35.0	-	-	39.0	-	-	44.0	-	-	26.0	-	-	56	-	-	57.0	-	-
Total organic carbon (TOC)	24,000	-	-	39,000	-	-	37,000	-	-	28,000	-	-	65,000	-	-	55,000	-	-	32,000	-	-	6,000	-	-	11,000	-	-
pH	6.1	-	-	6.50	-	-	6.30	-	-	6.50	-	-	6.00	-	-	5.80	-	-	6.50	-	-	6.5	-	-	6.50	-	-
Mean PEC Quotient			0.13			0.48			0.71			0.32			0.19			0.56			0.62			0.25			0.15
Sediment Chemistry Hazard Index			-			+			+			-			-			+			+			-			-

Notes
J = Estimated
NA = PEC is not available (MacDonald, 2000)
U = Undetected
Bold font indicates that the HQ is greater than 1

Table 4-7
Critical Residue Values for Fish Tissue
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Chemical	Screening Value (mg/kg)	Tissue Benchmark (mg/kg, wet)	Benchmark Type	Species Scientific Name	Species Common Name	Effect	Tissue	Exposure Route	Life-Stage	Reference	Comments
Lead	26.2	26.2	LOAEL	*Pimephales promelas*	Fathead minnow	Behavior	Whole body	Water	Juvenile	Environmental Residues Effects Database (ACOE)	Significant reduction in feeding rate and ability to capture and eat prey.
Mercury	1.36	1.36	LOAEL	*Pimephales promelas*	Fathead minnow	Reduced Growth	Whole body	Water	Adult	Spry and Wiener, 1991	41-week exposure; aqueous mercuric chloride
Silver	1.3	0.13	NOAEL	*Oncorhynchus mykiss*	Rainbow trout	Survival - no effect	Whole body	Water	Embryo	Guadagnolo et al. 2001	32 day exposure ($AgNO_3$, hardness 120); Reported value NOAEL (converted to LOAEL with uncertainty factor of 10).
Zinc	40	40	LOAEL	*Jordanella floridae*	Flagfish	Survival - no effect; Growth - reduced	Whole body	Water	Larvae - Adult	Jarvinen and Ankley, 1999	100 day exposure

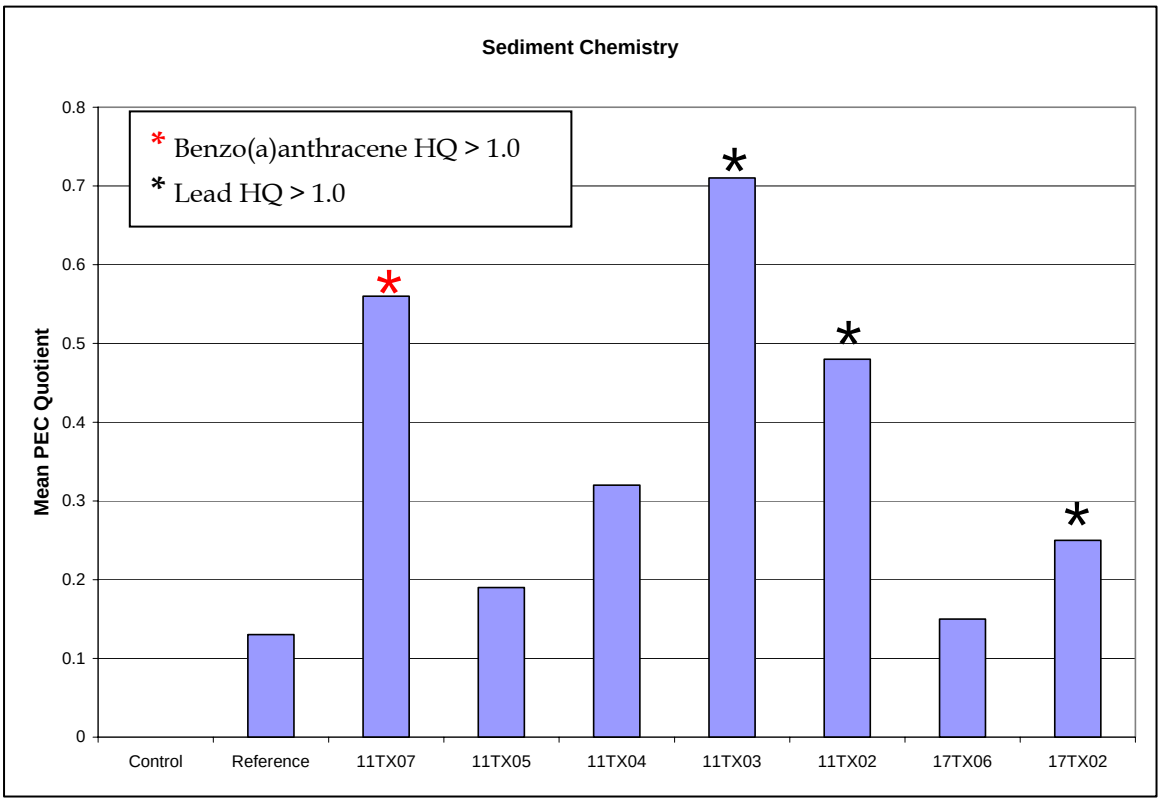

Figure 4-1
Sediment Chemistry Results
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

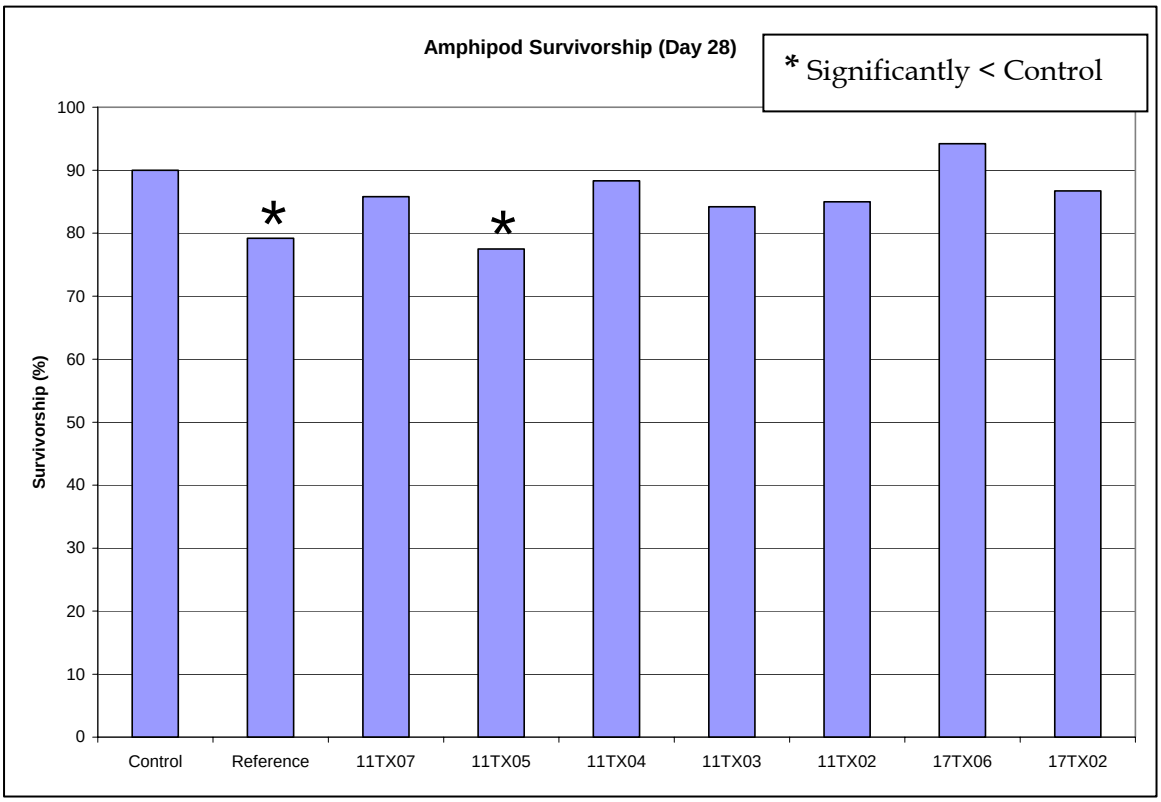

Figure 4-2
Toxicity Test Results: Amphipod Survival
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

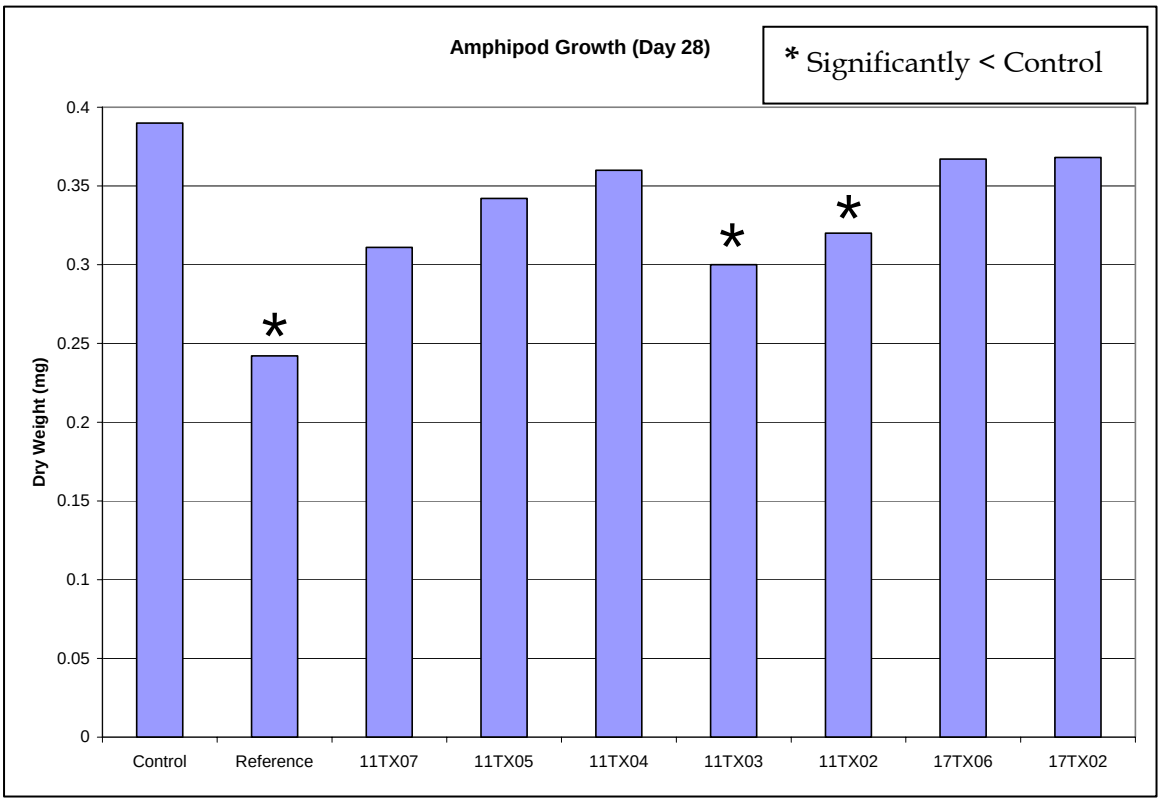

Figure 4-3
Toxicity Test Results: Amphipod Growth
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

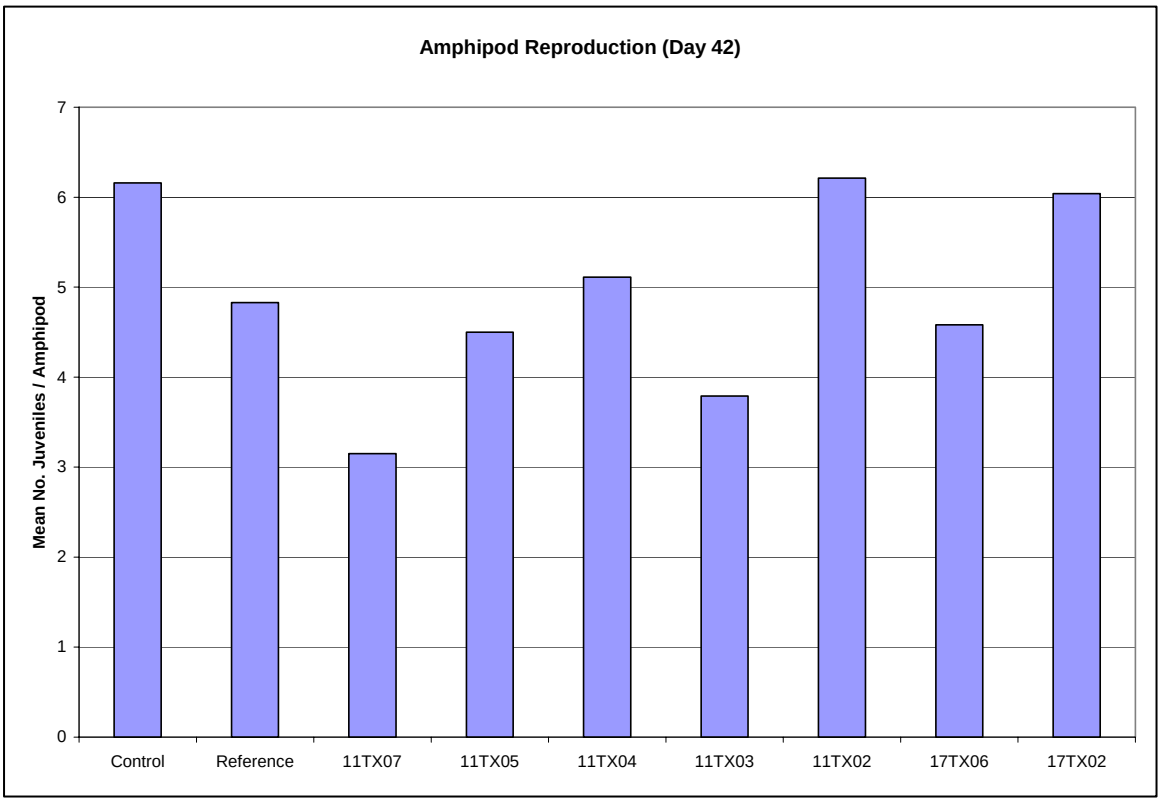

Figure 4-4
Toxicity Test Results: Amphipod Reproduction
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

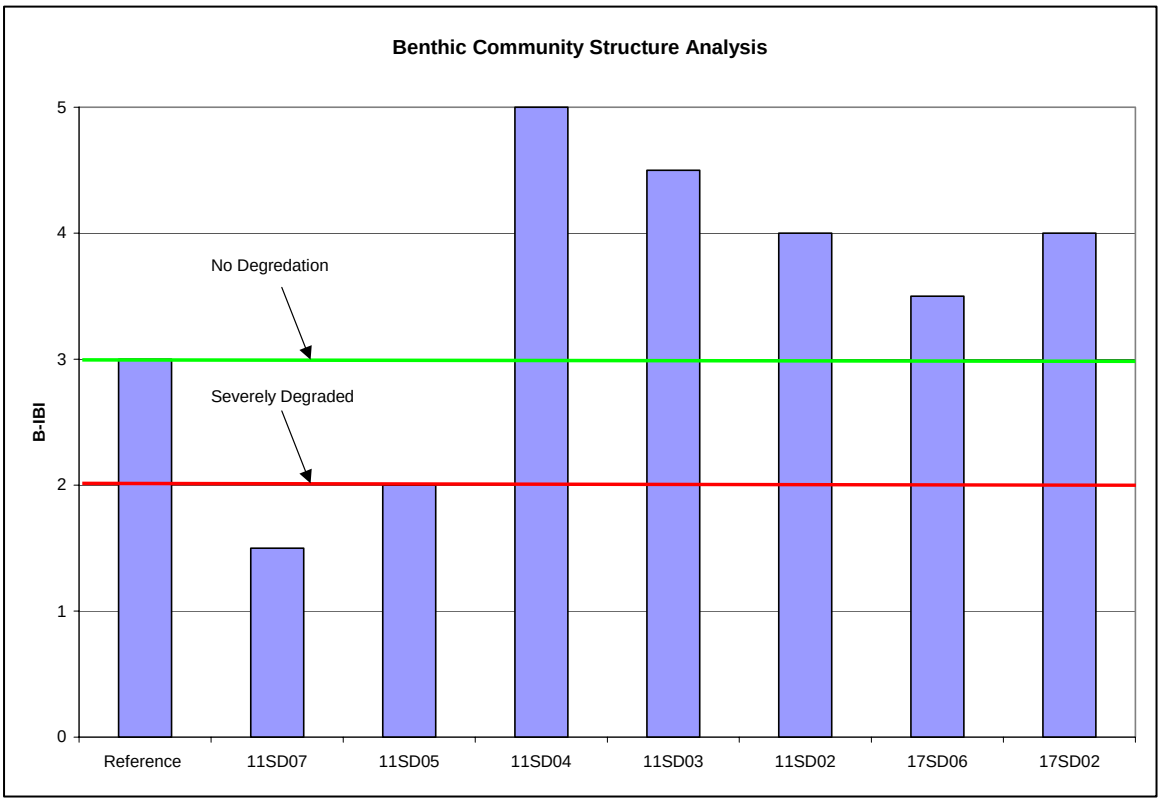

Figure 4-5
Benthic Community Structure Analysis Summary
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

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LEGEND

- Sediment sample location
- IR Sites
- Fish collection areas
- Insect collection areas

Sediment Chemistry Screening (PECs)
Sediment Toxicicty Test Summary
Benthic Community Structure Analysis
Weight of Evidence Summary

N

50 0 50 100 150 Feet

Figure 4-6
Weight of Evidence Summary
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

CH2MHILL

SECTION 5

Risk Characterization

5.1 Assessment Endpoints

Risk for each of the assessment endpoints is characterized as follows:

Survival, growth, and reproduction of the benthic invertebrate community—The results of the sediment quality triad evaluation indicate that contaminants in the sediment at Sites 11/17 pose baseline to low risk to the benthic invertebrate community. The benthic invertebrate community in the unnamed creek is degraded and at an intermediate level of risk, but the impairment does not seem to be from site-related contaminants.

Survival, growth, and reproduction of epibenthic fishes—The results of fish tissue analysis indicate that zinc is accumulating in the tissue of fish utilizing the site. In the case of *Notropis* sp., based on comparison to critical residue values and background fish tissue values, this accumulation poses a potentially unacceptable risk to this genus.

Growth, survival, and reproduction of piscivorous birds—The results of fish tissue analysis indicate that the COCs are not bioaccumulating in fish to levels that pose unacceptable risk to piscivorous birds.

Survival, growth, and reproduction of insectivorous wetland birds—The results of invertebrate tissue analysis indicate that the COCs are not bioaccumulating in wetland insects to levels that pose unacceptable risk to insectivorous wetland birds.

5.2 Uncertainty

At Site 11, one sediment sample proposed in the BERA work plan could not be collected because no sediment was present at that location (substrate was sand, gravel, and cobble). This location was the source of the maximum concentrations of barium, copper, and lead in the initial RI samples. Although samples were collected upgradient and downgradient of this area and found to represent baseline or low risk to benthic invertebrates, this gap in spatial coverage could introduce some uncertainty. Although the lack of fine sediments and organic material in this area suggests that it is not a depositional area.

The results of the sediment bioassays indicated that site sediment was not significantly more toxic to benthic organisms than that of the reference sediment (as measured by survival, growth, and reproduction of the test organisms). However, as noted in Table 4-4, the growth and survival of test organisms exposed to the reference sediment was significantly lower than that of test organisms exposed to laboratory control sediment. This difference introduces some uncertainty into the evaluation. However, comparison to reference sediment from the same aquatic system is appropriate because toxicity in sediment bioassays can often be caused by natural factors or "confounding factors" such as ammonia, sulfide, grain size, dissolved oxygen, or pH rather than by chemicals in the sediment.

Dissolved oxygen and pH were monitored daily and were found to be within the protocol criteria throughout the duration of the tests. Therefore, dissolved oxygen and pH were not considered potential confounding factors. Sulfide was not measured in test sediments and may have contributed to the observed toxicity. This represents a source of uncertainty in interpreting the results of the sediment bioassays. Sulfide is produced by anaerobic decomposition of organic matter and can be abundant in organically-rich sediment. The biological effects of sulfides in sediment are poorly understood, but sulfide can be directly toxic to aquatic organisms or can reduce metal aqueous concentrations and therefore toxicity by forming insoluble metal sulfide complexes (Wang and Chapman, 1999). However, considering that abundant dissolved oxygen was maintained in the overlying water in the test chambers and that sulfide is formed under anoxic conditions, it is possible that sulfide may not have been created and therefore not have contributed to the observed toxicity.

Ammonia was monitored weekly for the duration of the testing (see Appendix B). Ammonia was never detected in the laboratory control, but was detected in the reference sample and all site samples on the first day of the testing, at concentrations ranging from 1.1 to 4.6 mg/L. The reference sample contained the highest ammonia concentration on the first day of testing. Ammonia concentrations decreased in all but one sample by day 7, with concentrations ranging from not detected to 4.0 mg/L. Only sample IS11TX05 showed an increase in ammonia, with an initial concentration of 3.2 mg/L, which increased to 4.0 mg/L by day 7. Ammonia was detected in only one sample by day-14, the reference sample at a concentration of 0.2 mg/L. Ammonia was not detected in any samples after day 14. The presence of ammonia in the reference sample and site samples during the first week of testing is a potential confounding factor that introduces uncertainty into the interpretation of the bioassay results. Ammonia could have contributed to the reduced growth and survival in the reference sample relative to the laboratory control. Only one site sample (IS11TX05) displayed significantly less survival than the laboratory control sample; this is also the only sample that showed an increase in ammonia concentration over the first week of testing. Two site samples also showed significantly less growth than the laboratory control sample (IS11TX03 and IS11TX02); although the ammonia concentrations in these samples decreased considerably by day-7 to not detected and 1.2 mg/L, respectively.

Differences in the physical properties of the sediments can also add confounding effects. However, the site sediment and reference and control sediment were similar in grain size distribution and TOC content. Therefore, the physical characteristics of the test sediments were not considered confounding factors. It is also possible that the physical mixing of the site sediments during field collection may have caused disassociation of chemicals from the sediment, thus increasing their bioavailability and toxicity. Thus, there are potential sources of uncertainty surround the observed toxicity, which may or may not be attributable to these confounding factors.

Another source of uncertainty lies in the use of critical residue values from the literature to evaluate potential risk to fishes from body burdens of COCs. The critical residue value used in the evaluation of zinc (40 mg/kg) was for flagfish. This value represents a whole-body tissue concentration that was found to reduce the growth of this species, but did not affect survival. Although zinc toxicological data for *Fundulus* spp. and *Notropis* sp. were not available, and this value represented the best data available for a small freshwater fish

species. The extrapolation in using a toxicological value from one species to evaluate risk to a different species does introduce uncertainty into the analyses.

Other tissue residue values for zinc in the literature include a value of 60 mg/kg (whole-body, 80-day exposure to zinc sulfate) for Atlantic salmon, which produced no effect on growth or survival in this species (Jarvinen and Ankely, 1999). Another tissue residue value of 280 mg/kg (whole body, 134-day exposure to zinc sulfate) was found for guppy (*Poecilia reticulata*). No effect was found at this concentration on growth, survival, or reproduction for this species (Jarvinen and Ankely, 1999).

The critical residue values used for lead and mercury were based studies on fathead minnow (*Pimephales promelas*), and the critical residue value used for silver was based on a study of rainbow trout (*Oncorhynchus mykiss*). Toxicological data for *Fundulus* spp. and *Notropis* sp. were not available for these metals; therefore there is similar uncertainty in extrapolating from one species to another to evaluate risk with these comparisons. Toxicological data based on whole-body samples from fish species most similar to *Fundulus* spp. or *Notropis* sp. were used where possible to minimize uncertainty. The uncertainty surrounding the conclusion for lead, mercury, and silver is likely not significant however, considering that the concentrations of lead and mercury were well below the critical residue values and that silver was not detected in the fish tissue.

5.3 Conclusions

Conditions in the unnamed creek pose an unacceptable risk to benthic invertebrates, but evidence suggests that the risk is not related to COCs from Sites 11/17.

There is the potential for an unacceptable risk to epibenthic fishes from zinc in some sediment areas along the shoreline of Site 11.

The bioaccumulative COCs (lead, mercury, silver, and zinc) do not post unacceptable risk to piscivorous birds and wetland insectivorous birds.

5.4 Risk Management

The results of the BERA suggest that ecological risk at Sites 11/17 can be characterized by: (1) the risk to benthic invertebrates in the unnamed creek, which is resulting in a degraded benthic community, and (2) the apparent risk to epibenthic fishes from zinc bioaccumulation.

It is suspected that the degraded benthic invertebrate community in the unnamed creek is not related to COCs from Sites 11/17. The physical nature of the creek (high biological oxygen demand and low dissolved oxygen) may be contributing to the degraded condition of the benthic invertebrate community.

The apparent risk to fishes from zinc in site sediments should be addressed as part of the remedial alternatives considered in the feasibility study for the Site 11 landfill and upland soils. The distribution of zinc in site sediment is shown in Figure 5-1. The highest zinc concentrations are found in sediments along the immediate shoreline of Site 11. Zinc concentrations are considerably lower in sediments away from the immediate shoreline,

where the samples were collected to support the BERA and where no unacceptable risk to the benthic invertebrate community was found. It is likely that the apparent risk to epibenthic fishes from zinc is primarily due to the zinc in the sediments along the immediate shoreline of Site 11.

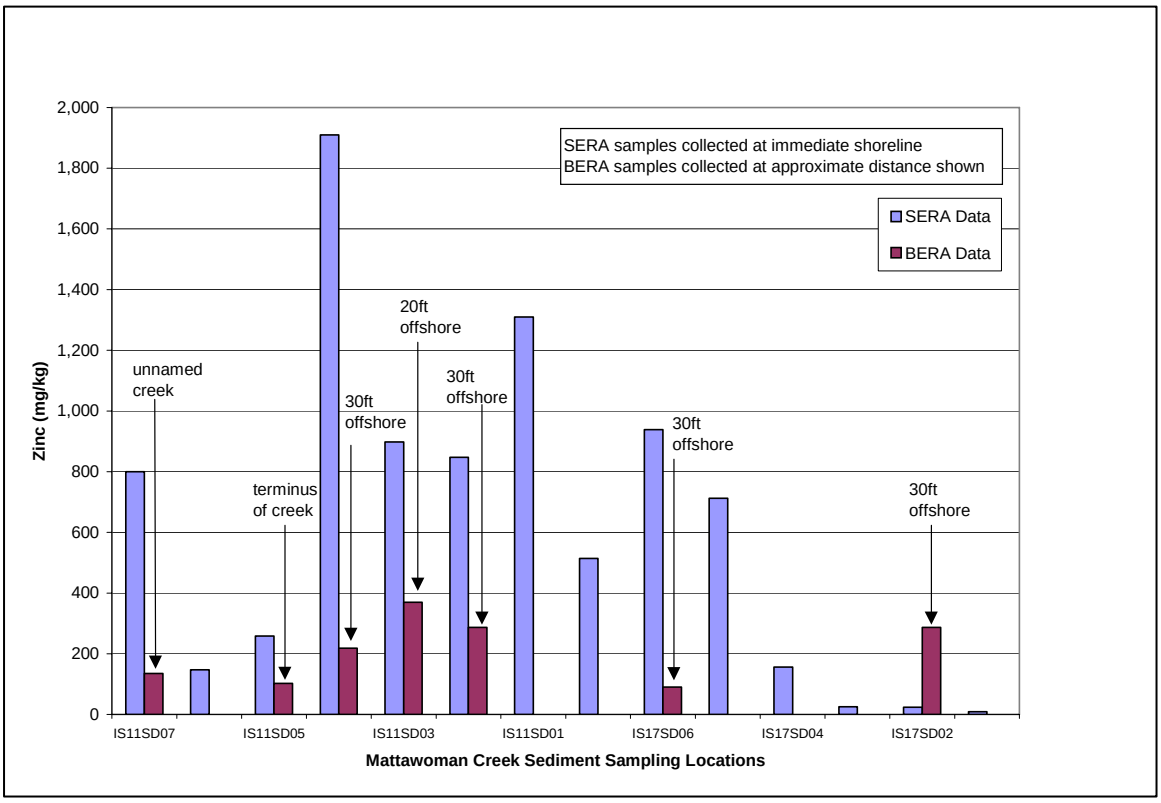

Figure 5-1
Zinc Concentrations in Sites 11/17 Sediment Samples Collected to Date
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

SECTION 6

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Appendix A
Chemistry Results, Sites 11 and 17 Sediment and Tissue

Table A-1
Analytical Results for Sediment Samples
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	BGDSD05		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD07		IS17SD02				IS17SD06	
Sample ID	BGDSD05-0804		IS11SD02-0804		IS11SD03-0804		IS11SD04-0804		IS11SD05-0804		IS11SD07-0804		IS17SD02-0804		IS17SD40-0804		IS17SD06-0804	
	Reference														Duplicate			
Sample Date	08/13/04		08/12/04		08/12/04		08/12/04		08/11/04		08/11/04		08/12/04		08/12/04		08/12/04	
Chemical Name																		
Semi-volatile Organic Compounds (UG/KG)																		
Acenaphthene	12	U	22	U	19	U	19	U	17	U	390		79		34		12	U
Acenaphthylene	12	U	22	U	19	U	19	U	17	U	53		26		15		12	U
Anthracene	12	U	40		29		19	U	28		590		230		110		12	U
Benzo(a)anthracene	12	U	130		97		26		79		2,100		460		230		32	
Benzo(a)pyrene	12	U	130		100		30		110		2,100		400		200		33	
Benzo(b)fluoranthene	12	U	160		120		42		220		2,700		560		270		48	
Benzo(g,h,i)perylene	12	U	80		75		23		84		1,400		200		110		23	
Benzo(k)fluoranthene	12	U	63		43		19	U	41		860		170		110		16	
Chrysene	12	U	120		80		27		100		1,700		420		230		30	
Dibenz(a,h)anthracene	12	U	22	U	19	U	19	U	17	U	340		26	U	35		12	U
Fluoranthene	12	U	240		170		46		190		3,500		1,000		570		51	
Fluorene	12	U	22	U	19	U	19	U	19		220		91		38		12	U
Indeno(1,2,3-cd)pyrene	12	U	73		62		21		75		1,300		200		110		21	
Naphthalene	12	U	22	U	19	U	19	U	17	U	64		26	U	12	U	12	U
Phenanthrene	12	U	120		62		19		67		2,000		650		300		18	
Pyrene	12	U	170		120		35		120		2,900		590		310		36	
Explosives (UG/KG)																		
1,3,5-Trinitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
1,3-Dinitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,4,6-Trinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,4-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,6-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Amino-4,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
3-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
4-Amino-2,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
4-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
HMX	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Nitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
Nitroglycerin	1,800	J	17,000	U	3,200	J	2,500	J	13,000	R	11,000	U	20,000	U	8,900	U	8,800	U
PETN	500	U	660		500	U	500	U	500	U	500	U	500	U	500	U	500	U
RDX	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Tetryl	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U

Table A-1
Analytical Results for Sediment Samples
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	BGDSD05		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD07		IS17SD02				IS17SD06	
Sample ID	BGDSD05-0804		IS11SD02-0804		IS11SD03-0804		IS11SD04-0804		IS11SD05-0804		IS11SD07-0804		IS17SD02-0804		IS17SD40-0804		IS17SD06-0804	
	Reference														Duplicate			
Sample Date	08/13/04		08/12/04		08/12/04		08/12/04		08/11/04		08/11/04		08/12/04		08/12/04		08/12/04	
Chemical Name																		
Total Metals (MG/KG)																		
Aluminum	9,450		20,900		16,800		17,000		7,580		9,840		11,800		4,800		6,310	
Antimony	1	R	2.3	L	3.3	L	2.2	L	1.6	J	1.3	U	2.3	UL	1.1	UL	1.1	UL
Arsenic	4.2		9.8		10.2		8		8.5		13.4		9.4		3.8		2.7	
Barium	80.7		181		166		160		105		111		106		44.2	J	54.1	
Beryllium	0.8	J	1.7	J	1.3	J	1.4	J	0.82	J	0.96	J	1.1	J	0.45	J	0.52	J
Boron	3.5		6.3	U	4.9	U	5.5	U	4.3	U	3.8	U	6.7	U	3.3	U	3.2	U
Cadmium	0.89	J	1.6	J	2.4		1.1	J	0.81	J	1.1	J	2.5		0.69	J	0.44	J
Calcium	1,410	J	2,810	J	2,440	J	6,880	J	1,970		1,740		8,160	J	1,580	J	1,110	J
Chromium	16.4		38.7		36		32		14.7		16.2		34.5		14.9		12.8	
Cobalt	9.4	J	23.7		19.2		20.3		14.8		14.7		16.3	J	6.4	J	8.1	J
Copper	14.8		79.1		113		58.2		29.1		36		98.9		39.7		21.7	
Iron	16,200		39,700		39,200		35,900		23,900		42,300		33,700		14,100		12,000	
Lead	19.2		130		220		79		36		55.6		147		58.2		39.7	
Magnesium	1,320		3,940		3,270		3,260		1,020	J	972	J	1,790	J	751	J	1,110	
Manganese	437		1,660		1,150		1,450		665		359		790		323		318	
Mercury	0.12		0.27		0.39		0.19		0.19		0.16		0.33		0.17		0.094	
Molybdenum	0.45	B	1.4	J	1.2	J	1.2	J	1.2	B	1	B	1.5	J	0.66	J	0.34	J
Nickel	13.4		36.5		32.8		30.1		14.5		18.3		25.1		10.4		11.5	
Potassium	832	J	2,110		1,620	J	1,750	J	854	J	776	J	1,240	J	518	J	696	J
Selenium	0.95	J	0.8	U	0.62	U	1.1	J	1.5	B	1.2	B	0.85	U	0.58	J	0.41	U
Silver	0.88	J	4.2	J	6.8		3	J	1.2	J	0.67	J	1.6	J	1.1	J	1.9	J
Sodium	205	J	491	J	357	J	572	J	333	J	245	J	358	J	163	U	157	U
Thallium	1.5	U	3.1	U	2.4	U	2.7	U	2.1	U	1.9	U	3.3	U	1.6	U	1.6	U
Vanadium	21.6		54.9		45.2		45.7		30.9		45.4		33.5		13.9		16.6	
Zinc	94.5		287		370		218		102		135		287		116		90.6	
Wet Chemistry																		
% Solids	54		30		35		35		39		44		26		56		57	
Total organic carbon (TOC) (MG/KG)	24,000		39,000		37,000		28,000		65,000		55,000		32,000		6,000		11,000	
pH	6.1		6.5		6.3		6.5		6		5.8		6.5		6.5		6.5	

Notes
NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UL - Not detected; reporting limit is biased low
A shaded cell indicates the parameter is detected.

Table A-2
Detections in Sediment Samples
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	BGDSD05		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD07		IS17SD02				IS17SD06	
Sample ID	BGDSD05-0804		IS11SD02-0804		IS11SD03-0804		IS11SD04-0804		IS11SD05-0804		IS11SD07-0804		IS17SD02-0804		IS17SD40-0804		IS17SD06-0804	
	Reference														Duplicate			
Sample Date	08/13/04		08/12/04		08/12/04		08/12/04		08/11/04		08/11/04		08/12/04		08/12/04		08/12/04	
Chemical Name																		
Semi-volatile Organic Compounds (UG/KG)																		
Acenaphthene	12	U	22	U	19	U	19	U	17	U	390		79		34		12	U
Acenaphthylene	12	U	22	U	19	U	19	U	17	U	53		26		15		12	U
Anthracene	12	U	40		29		19	U	28		590		230		110		12	U
Benzo(a)anthracene	12	U	130		97		26		79		2,100		460		230		32	
Benzo(a)pyrene	12	U	130		100		30		110		2,100		400		200		33	
Benzo(b)fluoranthene	12	U	160		120		42		220		2,700		560		270		48	
Benzo(g,h,i)perylene	12	U	80		75		23		84		1,400		200		110		23	
Benzo(k)fluoranthene	12	U	63		43		19	U	41		860		170		110		16	
Chrysene	12	U	120		80		27		100		1,700		420		230		30	
Dibenz(a,h)anthracene	12	U	22	U	19	U	19	U	17	U	340		26	U	35		12	U
Fluoranthene	12	U	240		170		46		190		3,500		1,000		570		51	
Fluorene	12	U	22	U	19	U	19	U	19		220		91		38		12	U
Indeno(1,2,3-cd)pyrene	12	U	73		62		21		75		1,300		200		110		21	
Naphthalene	12	U	22	U	19	U	19	U	17	U	64		26	U	12	U	12	U
Phenanthrene	12	U	120		62		19		67		2,000		650		300		18	
Pyrene	12	U	170		120		35		120		2,900		590		310		36	
Explosives (UG/KG)																		
Nitroglycerin	1,800	J	17,000	U	3,200	J	2,500	J	13,000	R	11,000	U	20,000	U	8,900	U	8,800	U
PETN	500	U	660		500	U	500	U	500	U	500	U	500	U	500	U	500	U
Total Metals (MG/KG)																		
Aluminum	9,450		20,900		16,800		17,000		7,580		9,840		11,800		4,800		6,310	
Antimony	1	R	2.3	L	3.3	L	2.2	L	1.6	J	1.3	U	2.3	UL	1.1	UL	1.1	UL
Arsenic	4.2		9.8		10.2		8		8.5		13.4		9.4		3.8		2.7	
Barium	80.7		181		166		160		105		111		106		44.2	J	54.1	
Beryllium	0.8	J	1.7	J	1.3	J	1.4	J	0.82	J	0.96	J	1.1	J	0.45	J	0.52	J
Boron	3.5		6.3	U	4.9	U	5.5	U	4.3	U	3.8	U	6.7	U	3.3	U	3.2	U
Calcium	1,410	J	2,810	J	2,440	J	6,880	J	1,970		1,740		8,160	J	1,580	J	1,110	J
Chromium	16.4		38.7		36		32		14.7		16.2		34.5		14.9		12.8	
Cobalt	9.4	J	23.7		19.2		20.3		14.8		14.7		16.3	J	6.4	J	8.1	J
Copper	14.8		79.1		113		58.2		29.1		36		98.9		39.7		21.7	

Table A-2
Detections in Sediment Samples
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID	BGDSD05		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD07		IS17SD02				IS17SD06	
Sample ID	BGDSD05-0804		IS11SD02-0804		IS11SD03-0804		IS11SD04-0804		IS11SD05-0804		IS11SD07-0804		IS17SD02-0804		IS17SD40-0804		IS17SD06-0804	
	Reference														Duplicate			
Sample Date	08/13/04		08/12/04		08/12/04		08/12/04		08/11/04		08/11/04		08/12/04		08/12/04		08/12/04	
Chemical Name																		
Iron	16,200		39,700		39,200		35,900		23,900		42,300		33,700		14,100		12,000	
Lead	19.2		130		220		79		36		55.6		147		58.2		39.7	
Magnesium	1,320		3,940		3,270		3,260		1,020	J	972	J	1,790	J	751	J	1,110	
Manganese	437		1,660		1,150		1,450		665		359		790		323		318	
Mercury	0.12		0.27		0.39		0.19		0.19		0.16		0.33		0.17		0.094	
Molybdenum	0.45	B	1.4	J	1.2	J	1.2	J	1.2	B	1	B	1.5	J	0.66	J	0.34	J
Nickel	13.4		36.5		32.8		30.1		14.5		18.3		25.1		10.4		11.5	
Potassium	832	J	2,110		1,620	J	1,750	J	854	J	776	J	1,240	J	518	J	696	J
Selenium	0.95	J	0.8	U	0.62	U	1.1	J	1.5	B	1.2	B	0.85	U	0.58	J	0.41	U
Silver	0.88	J	4.2	J	6.8		3	J	1.2	J	0.67	J	1.6	J	1.1	J	1.9	J
Sodium	205	J	491	J	357	J	572	J	333	J	245	J	358	J	163	U	157	U
Vanadium	21.6		54.9		45.2		45.7		30.9		45.4		33.5		13.9		16.6	
Zinc	94.5		287		370		218		102		135		287		116		90.6	
Wet Chemistry																		
% Solids	54		30		35		35		39		44		26		56		57	
Total organic carbon (TOC) (MG/KG)	24,000		39,000		37,000		28,000		65,000		55,000		32,000		6,000		11,000	
pH	6.1		6.5		6.3		6.5		6		5.8		6.5		6.5		6.5	

Notes
NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UL - Not detected; reporting limit is biased low
A shaded cell indicates the parameter is detected.

Table A-3
Fish Tissue Results
Sites 11 and 17 BERA
NDWIH, Indian Head, Maryland

Station ID **Sample ID** **Sample Date**	IS11FSH02 IS11FSH020804 08/13/04	IS11FSHTX01 IS11FSH010804 08/13/04
Chemical Name		
Total Metals (MG/KG)		
Lead	0.31 K	0.16 K
Mercury	0.018 K	0.029 K
Silver	0.023 U	0.023 U
Zinc	51.7	35.4
Wet Chemistry		
Lipids (%)	0.08	0.16

Notes
K - Reported value may be biased high
U - Analyte not detected
A shaded cell indicates the parameter is detected.

Appendix B
Toxicological Evaluation of Sediment Samples

TOXICOLOGICAL EVALUATION OF SEDIMENT SAMPLES

***Hyalella azteca* Survival, Growth and Reproduction Sediment Toxicity Tests**
Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation
Indian Head, Maryland

Prepared For

CH2M Hill, Incorporated
13921 Park Center Road
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By

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1 Lafayette Road
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September 2004
Reference Number 12414-04-09

TABLE OF CONTENTS

1.0 INTRODUCTION 3

2.0 MATERIAL AND METHODS 3

2.1 General Methods, Biological Evaluations 3
2.2 Test Species 3
2.3 Test Sample and Laboratory Control Sediment 3
2.4 *Hyalella azteca* Survival, Growth, and Reproduction Toxicity Tests 4
2.5 Statistical Analysis 5
2.6 Quality Control 5
2.7 Protocol Deviations 6

3.0 RESULTS AND DISCUSSION 6

3.1 *Hyalella azteca* 28 Day Survival and Growth Evaluation 6
3.2 *Hyalella azteca* Reproduction Evaluation 7
3.3 Summary 7

4.0 REFERENCES 7

LIST OF TABLES

Table 1. Summary of Sample Collection Information. 8

Table 2. Summary of Endpoints 8

Table 3. Summary of Day 28 Survival Data 9

Table 4. Summary of Day 28 Growth Data 10

Table 5. Summary of Day 42 Survival Data 11

Table 6. Summary of Day 42 Reproduction Data 12

Table 7. Summary of Water Qualities 13

Table 8. Reference Toxicant Evaluation 14

Appendix A: Raw Data and Statistical Support 15

TOXICOLOGICAL EVALUATION OF SEDIMENT SAMPLES

Hyalella azteca Survival, Growth and Reproduction Sediment Toxicity Tests Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation Indian Head, Maryland

1.0 INTRODUCTION

Toxicity tests expose groups of organisms to environmental samples, a laboratory control and/or a field reference site for a specified period to assess potential impacts on a variety of endpoints, such as survival, growth or reproduction. Analysis of variance techniques are used to determine the relative toxicity of the samples as compared to the laboratory control and/or field reference site.

This report presents the results of chronic exposure survival and reproduction toxicity tests conducted on twenty-four sediment samples collected from the Naval District Washington, Indian Head project site, CTO-122 Site 11/17. The samples were provided by CH2M Hill, Incorporated, Boston, Massachusetts. Testing was based on programs and protocols developed by the ASTM (2001) and US EPA (2000). The toxicity of the samples was assessed by conducting long term survival, growth, and reproduction toxicity tests using the freshwater amphipod, *Hyalella azteca*. Toxicity tests and supporting analyses were performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire.

2.0 MATERIALS AND METHODS

2.1 General Methods, Biological Evaluations

Toxicological and analytical protocols used in this program follow procedures outlined in *Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates* (ASTM 2001), *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates* (US EPA 2000) and *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (APHA 1998). These protocols provide standard approaches for physical and chemical analysis and for the evaluation of toxicological effects of sediments on aquatic invertebrates.

2.2 Test Species

H. azteca were obtained from Aquatic Research Organisms, Hampton, New Hampshire. Organisms were approximately 10 days old at the start of the assay.

2.3 Test Samples and Laboratory Control Sediment

A total of eight sediment samples from the Indian Head project site were received at ESI between August 12 and 14, 2004. Once received, samples were inspected, to determine integrity, given unique sample numbers and logged into the laboratory sample management database. Once logged into the sample management database samples were placed in a secure refrigerated, 2 - 4 °C, storage area until required. A listing of sample sites, sample collection, and receipt information is summarized in Table 1.

The control substrate was an artificial sediment consisting primarily of silica sand, with approximately 1-2% organic material by weight (EnviroSystems SOP QA-1466). Organic matter consisted of fine detritus collected from a surface water impoundment in Hampton Falls, New Hampshire. The water in the container was changed daily.

Overlying water for the sediment toxicity tests was a mixture of natural surface water, collected from Bow Lake, Strafford, New Hampshire, and moderately hard reconstituted water. Use of natural surface water mixed with artificial reconstituted water is recommended by the protocol (EPA 2000, ASTM 2001).

2.4 *Hyalella azteca* Survival, Growth, and Reproduction Toxicity Tests

The 42 day amphipod survival and reproduction test is divided into two exposure periods: an initial 28 day survival and growth evaluation followed by a 14 day reproduction evaluation. Sediment tests were conducted according to ASTM Method E 1706-95 (2001) and EPA methods (2000). Endpoints of the initial 28 day exposure were survival and growth, measured as dry weight. Endpoints for the additional 14 day exposure included survival and juvenile production. The assays were started on September 1, the initial growth and survival portion of the assay was terminated on September 29 and the reproduction portion of the assay was terminated on October 13, 2004.

The site sediment and laboratory control sediment treatments consisted of 12 replicates with 10 organisms/replicate. Test vessels were 400 mL glass beakers containing approximately 100 mL of sediment and 250 mL of overlying water. The overlying water volume to sediment surface area ratio was approximately 7:1. Test vessels were drilled at a consistent height above their bases and the hole covered with Nytex® screen. The screened hole facilitated water exchange without compromising organisms. Vessels were maintained in a water bath during the assay. Depth of the water in the bath was set to be approximately 1 cm below the drain hole in the test vessel to eliminate flow of water from the bath into the test vessel. The water bath was maintained in a limited-access temperature controlled room. Temperatures in the room and water bath were independently maintained at 23 ±1°C. The photoperiod in the test chamber was set at 16:8 hour light:dark. Light was provided by cool white flourescent bulbs.

One day prior to test initiation (Day -1), control and test sediments were sieved using a 2 mm sieve to remove rocks, twigs, and other debris. Sediments were placed in the test vessels. Overlying water was immediately added, and the vessels were left undisturbed overnight to settle. Floating detritus was removed the next morning. The next day (Day 0), organisms were added to test. Organisms were added below the water surface at test initiation, using a large-bore glass pipet.

Overlying water in each replicate was renewed daily after collection of water quality data. The volume of water added to each test chamber was approximately 500 mL or two volumes. Water exchanges were facilitated by use of a distribution system designed to provide equal, regulated, flow to each chamber. The system was activated manually by the addition of water during the assay.

Prior to the daily overlying water renewal, temperature, specific conductance, pH, and dissolved oxygen were measured in one replicate of each treatment. Alkalinity, ammonia, and hardness of the overlying water were measured weekly from test initiation until day 28. Water quality data collected at the start and end of the assay are summarized in Table 7. Daily overlying water quality records and weekly alkalinity, ammonia and hardness data are provided in Appendix A. Each replicate was fed 1.0 mL of a yeast/trout chow/alfalfa suspension after the daily renewal.

After 28 days exposure, all replicates of each test treatment were terminated to collect data for initial survival. Each test chamber was gently swirled to loosen the sediments and the test material was dumped into an 8" stainless steel sieve with a 0.35 mm mesh screen. The sediments were washed through the sieve using synthetic, moderately hard reconstituted water and material left on the screen was sorted to recover of the organisms. This process was continued until the entire sample was evaluated. Organisms collected from the first four replicates were set aside to determine growth. Organisms from the remaining eight replicates of each treatment were returned to test vessels containing overlying water and a piece of Nytex® screen.

Surviving amphipods from the four replicates identified for 28 day survival and growth analysis were counted and placed on tared weighing pans. Pans were dried overnight at 70°C to obtain dry weight to the nearest 0.01 mg. The mean dry weight of surviving organisms was determined to assess growth.

Surviving amphipods from the remaining eight replicates were enumerated and then returned to test chambers, containing a 2x4 cm piece of Nytex® screen as a substrate, filled with a 50:50 mix of natural surface water and moderately hard reconstituted water. The test vessels were returned to the water bath for the additional 14 day exposure. During the 14 day period water quality monitoring, water exchanges and feeding were conducted in the same manner as during the initial 28 day exposure. Survival was monitored on Days 35 and 42, and was calculated as the percentage of organisms alive in the remaining eight replicates of each test treatment. Survival data for Days 35 and 42 is presented in Table 2. Reproduction was monitored on Days 35 and 42.

2.5 Statistical Analysis

Survival, growth and juvenile production data were analyzed using CETIS® software to determine significant differences between the test sediments and both the associated laboratory control and reference sediments. Data sets were evaluated to determine normality of distribution and homogeneity of sample variance. Data sets were subsequently evaluated using the appropriate parametric or non-parametric Analysis of Variance (ANOVA) statistic. Pair-wise comparisons were made using the appropriate statistical evaluation, including the t-Test and Mann-Whitney U tests. Statistical difference was evaluated at $\alpha=0.05$.

2.6 Quality Control

As part of the laboratory quality control program, reference toxicant evaluations are conducted by ESI on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. The 96 hour *H. azteca* reference toxicant was conducted during the month of September 2004, using cadmium chloride as the reference toxicant. Results were within one standard deviation of ESI's historic mean for the species. Results are summarized in Table 8.

2.7 Protocol Deviations

Review of data collected during this assay indicates one area where methods or results deviated from mandated or suggested protocols. Temperature data collected by the data logger documented 18 out of over 1000 temperature readings, 1.7%, were at 19.5°C. None of the readings made during the daily water quality monitoring sessions fell below the protocol's lower limit of 20°C.

It is the opinion of the Study Director that these deviations did not affect the outcome of the tests.

3.0 RESULTS AND DISCUSSION

Table 1 provides a summary of sample collection and receipt information. Table 2 provides a summary of survival, growth, and reproduction endpoints. Survival and growth data from the initial 28 day exposure are summarized in Tables 3 and 4, respectively. Tables 5 and 6 summarize day 42 survival and reproduction data. Water quality data collected during the assays is summarized in Table 7. Reference toxicant data is summarized in Table 8. Support data, including copies of laboratory bench sheets, statistical analyses and individual endpoint summaries, are provided in Appendix A.

3.1 *Hyalella azteca* Initial 28 Day Survival and Growth Evaluation

At the end of the initial 28 day exposure period, mean survival in Laboratory Control sediment was 90.0%. Survival in the individual replicates ranged from 70% to 100%. Amphipods recovered from Laboratory Control sediment had a mean dry weight of 0.390 mg/amphipod with dry weights in the individual replicates ranging from 0.320 to 0.447 mg/amphipod. The dry weight of a representative group of amphipods at the start of the assay was 0.024 mg/individual. The minimum test acceptability criteria for survival in the laboratory control is 80%. The minimum acceptable criteria for growth is a demonstration of increased dry weight after 28 days exposure. These data indicate that the organisms were healthy and not stressed by handling.

Temperature data collected in a surrogate test chamber during the 42 day exposure period documented a mean temperature of 22.9°C, with values ranging from 19.5 to 26.0°C. Temperature data collected during the daily water quality monitoring indicated values ranging from 20 to 24°C. Test acceptability criteria requires a mean temperature of 23±1°C, with maximum temporary fluctuations of 23±3°C. Review of collected temperature data indicates that 1.7% of the hourly collected values were below the minimum protocol temporary temperature of 20°C; The minimum temperature value was 19.5°C. No temperatures varied above the maximum protocol temperature of 26°C.

On Day 28, mean survival in the project reference site sediment, BGDTX05, was 79.2%, with survival in individual replicates ranging from 70% to 100%. Mean dry weight of surviving amphipods, collected from the 28 day growth replicates, was 0.242 mg/amphipod.

Survival and growth data for the individual project site sediment samples are summarized in Tables 3 and 4, respectively.

3.2 *Hyalella azteca* Reproduction Evaluation

Data collected during the additional 14 day exposure period was used to assess impacts on amphipod survival and reproduction. Survival data collected on Days 35 and 42 are presented in Table 2. Summaries of survival and reproduction data collected on Day 42 of the tests are presented in Tables 5 and 6, respectively. In cases where juveniles but no live females were recovered the replicates were removed from the statistical analysis data set for juveniles per female amphipod. Also, replicates discovered without any surviving males at Day 42, and without juveniles were removed from the data set. Detailed survival and reproduction data for day 35 is provided the data appendix.

Review of juvenile production in the laboratory control treatment showed a mean production of 6.16 juvenile per surviving female between days 29 and 42 of the assay. Mean production in the project reference site sediment during the 14 day period was 4.83 juveniles per surviving female.

3.3 Summary

Review of endpoints indicates that none of the sediment samples had a significant impact on survival, growth or reproduction of the amphipod, *H. azteca*, when compared to the corresponding reference site BGDTX05.

When endpoints were evaluated against the corresponding laboratory control sediment, four sediments, BGDTX05 (reference site), IS11TX05, IS11TX03, IS11TX02 and IS17TX06 had a significant impact on survival or growth of the amphipod, *H. azteca*. Reproduction data analysis indicated that none of the sediments had a significant impact on reproduction based on the number of juveniles produced per female amphipod alive at Day 42.

4.0 REFERENCES

APHA. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20th Edition. Washington D.C.

ASTM. 2001. Annual Book of ASTM Standards. Volume 11.05. *Test Methods for Measuring the Toxicity of sediment-Associated Contaminants with Freshwater Invertebrates*. E 1706-00. ASTM, Philadelphia.

U.S. EPA. 2000. *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*. Second Edition. EPA/600-R-99/064.

EnviroSystems SOP QA-1466: 42 Day Assessment Toxicity of Sediments To The Amphipod, *Hyalella azteca* based on Survival and Growth.

TABLE 1. Summary of Sample Collection Information. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Project Site	Project Sample ID	ESI Reference	Matrix	Collection Date	Collection Time	Receipt Date	Receipt Time
Site 11/17	IS11TX05	12414-04	Sediment	08/11/04	1100	08/12/04	0950
Site 11/17	IS11TX07	12414-05	Sediment	08/11/04	1200	08/12/04	0950
CTO-122	IS17TX02	12414-06	Sediment	08/12/04	1450	08/13/04	1000
CTO-122	IS11TX04	12414-07	Sediment	08/12/04	1000	08/13/04	1000
CTO-122	IS11TX03	12414-08	Sediment	08/12/04	1040	08/13/04	1000
CTO-122	IS11TX02	12414-09	Sediment	08/12/04	1135	08/13/04	1000
CTO-122	IS17TX06	12414-10	Sediment	08/12/04	1240	08/13/04	1000
CTO-122	BGDTX05 (Reference)	12414-11	Sediment	08/13/04	-	08/14/04	1020

TABLE 2. Summary of Endpoints: *H. azteca* Survival, Growth and Reproduction Sediment Toxicity Tests. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

		DAY 28 ENDPOINTS		DAY 42 ENDPOINTS			
		Mean Survival	Mean Dry Weight	Mean Survival Day 35	Mean Survival Day 42	Mean # Juveniles per Amphipod	Mean # Juveniles per ♀Amphipod
	UNITS	(%)	(mg)	(%)	(%)	At Day 35	At Day 42
Test Acceptability Performance Criteria:		80%	>Start Weight (0.024 mg/org)	Protocol Does Not Specify Test Acceptability Criteria for Day 35 and Day 42 Endpoints			
Specification Level:		Must	Must				
PROJECT SITE	ESI ID						
Laboratory Control	00	90.0	0.390	86.3	61.3	0.72	6.16
BGDTX05 (Reference)	11	**79.2**	**0.242**	**66.3**	**33.8**	0.91	4.83
IS11TX05	04	**77.5**	0.342	**73.8**	61.3	0.66	4.50
IS11TX07	05	85.8	0.311	82.5	76.3	0.41	3.15
IS17TX02	06	86.7	0.368	77.5	57.5	1.01	6.04
IS11TX04	07	88.3	0.360	86.3	47.5	0.55	5.11
IS11TX03	08	84.2	**0.300**	**72.5**	48.8	0.43	3.79
IS11TX02	09	85.0	**0.320**	**71.8**	**32.5**	0.76	6.21
IS17TX06	10	94.2	0.367	80.0	**27.5**	0.41	4.58

Values in **BOLD** type face are statistically different, less than, that observed in the laboratory control. All sites were not statistically different, less than, that observed in the project reference site.

TABLE 3. Summary of Day 28 Survival Data: *H. azteca*. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Sample Site	ESI Ref	Mean Recovery	Distribution	Variance	t Value	Critical t Value	p Value	Statistically Significant Difference ‡
Statistical Comparisons Against Laboratory Control Treatment								
Lab Control	00	90.0%						
BGDTX05	11	79.2%	Normal	Equal	2.4721	1.7171	0.0108	YES
IS11TX05	04	77.5%	Normal	Equal	2.6753	1.7171	0.0069	YES
IS11TX07	05	85.8%	Normal	Equal	1.3080	1.7171	0.1022	NO
IS11TX02	06	86.7%	Normal	Equal	0.8664	1.7171	0.1978	NO
IS11TX04	07	88.3%	Non-normal	Equal	71.5000	-	0.4887	NO
IS11TX03	08	84.2%	Normal	Equal	1.2790	1.7171	0.1071	NO
IS11TX02	09	85.0%	Normal	Equal	1.1248	1.7171	0.1364	NO
IS17TX06	10	94.2%	Non-normal	Equal	38.5000	-	0.9702	NO
Statistical Comparisons Against Reference Site								
BGDTX05	11	79.2%						
IS11TX05	04	77.5%	Normal	Equal	0.2698	1.7171	0.3949	NO
IS11TX07	05	85.8%	Normal	Equal	-1.4485	1.7171	0.9192	NO
IS11TX02	06	86.7%	Non-normal	Equal	42.0000	-	0.9556	NO
IS11TX04	07	88.3%	Normal	Equal	-1.8393	1.7171	0.9603	NO
IS11TX03	08	84.2%	Normal	Equal	-0.9908	1.7171	0.8337	NO
IS11TX02	09	85.0%	Normal	Equal	-1.1734	1.7171	0.8734	NO
IS17TX06	10	94.2%	Non-normal	Equal	26.0000	-	0.9966	NO

NOTES:

‡ Statistical significance evaluated at $\alpha = 0.05$.

TABLE 4. Summary of Day 28 Growth Data: *H. azteca*. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Sample Site	ESI Ref	Mean Dry Wt (mg)	Distribution	Variance	t Value	Critical t Value	p Value	Statistically Significant Difference ‡
Statistical Comparisons Against Laboratory Control Treatment								
Lab Control	00	0.390						
BGDTX05	11	0.242	Normal	Equal	4.4026	1.9432	0.0023	YES
IS11TX05	04	0.342	Normal	Equal	0.9740	1.9432	0.1838	NO
IS11TX07	05	0.311	Normal	Equal	1.4125	1.9432	0.1038	NO
IS11TX02	06	0.368	Normal	Equal	0.4805	1.9432	0.3239	NO
IS11TX04	07	0.360	Normal	Equal	0.6191	1.9432	0.2793	NO
IS11TX03	08	0.300	Normal	Equal	2.3951	1.9432	0.0268	YES
IS11TX02	09	0.320	Normal	Equal	2.1547	1.9432	0.0373	YES
IS17TX06	10	0.367	Normal	Equal	0.7592	1.9432	0.2382	NO
Statistical Comparisons Against Reference Site								
BGDTX05	11	0.242						
IS11TX05	04	0.342	Normal	Equal	-2.2124	1.9432	0.9655	NO
IS11TX07	05	0.311	Normal	Equal	-1.3043	1.9432	0.8800	NO
IS11TX02	06	0.368	Normal	Equal	-3.1062	1.9432	0.9895	NO
IS11TX04	07	0.360	Normal	Equal	-2.5972	1.9432	0.9796	NO
IS11TX03	08	0.300	Normal	Equal	-1.7522	1.9432	0.9349	NO
IS11TX02	09	0.320	Normal	Equal	-2.8772	1.9432	0.9859	NO
IS17TX06	10	0.367	Normal	Equal	-5.1352	1.9432	0.9989	NO

NOTES:

‡ Statistical significance evaluated at $\alpha = 0.05$.

TABLE 5. Summary of Day 42 Survival Data: *H. azteca*. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Sample Site	ESI Ref	Mean Survival	Distribution	Variance	t Value	Critical t Value	p Value	Statistically Significant Difference ‡
Statistical Comparisons Against Laboratory Control Treatment								
Lab	00	61.3%						
BGDTX05	11	33.8%	Normal	Equal	2.9513	1.7613	0.0053	YES
IS11TX05	04	61.3%	Normal	Equal	-0.0598	1.7613	0.5234	NO
IS11TX07	05	76.3%	Normal	Equal	-2.2592	1.7613	0.9798	NO
IS11TX02	06	57.5%	Normal	Equal	0.2832	1.7613	0.3906	NO
IS11TX04	07	47.5%	Normal	Equal	1.7236	1.7613	0.0534	NO
IS11TX03	08	48.8%	Normal	Equal	1.5284	1.7613	0.0743	NO
IS11TX02	09	32.3%	Normal	Unequal	2.0413	1.8596	0.0378	YES
IS17TX06	10	27.5%	Normal	Equal	2.9803	1.7613	0.0050	YES
Statistical Comparisons Against Reference Site								
BGDTX05	11	33.8%						
IS11TX05	04	61.3%	Normal	Equal	-2.6359	1.7613	0.9902	NO
IS11TX07	05	76.3%	Normal	Equal	-4.3095	1.7613	0.9996	NO
IS11TX02	06	57.5%	Normal	Equal	-2.0050	1.7613	0.9677	NO
IS11TX04	07	47.5%	Normal	Equal	-1.4252	1.7613	0.9120	NO
IS11TX03	08	48.8%	Normal	Equal	-1.5305	1.7613	0.9259	NO
IS11TX02	09	32.3%	Normal	Equal	0.0531	1.7613	0.4792	NO
IS17TX06	10	27.5%	Normal	Equal	0.5620	1.7613	0.2915	NO

NOTES:

‡ Statistical significance evaluated at $\propto = 0.05$.

Table 6. Summary of Day 42 Reproduction Data: *H. azteca*. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Sample Site	ESI Ref	Mean No. Juveniles/ Female	Distribution	Variance	t Value	Critical t Value	p Value	Statistically Significant Difference ‡
Statistical Comparisons Against Laboratory Control Treatment								
Lab	00	6.16						
BGDTX05	11	4.83	Normal	Equal	0.6478	1.7823	0.2647	NO
IS11TX05	04	4.50	Normal	Equal	0.7623	1.76131	0.2293	NO
IS11TX07	05	3.15	Normal	Equal	1.7346	1.7613	0.0524	NO
IS11TX02	06	6.04	Normal	Equal	0.0544	1.7613	0.4787	NO
IS11TX04	07	5.11	Normal	Equal	0.5310	1.7823	0.3026	NO
IS11TX03	08	3.79	Normal	Equal	1.3395	1.7613	0.1009	NO
IS11TX02	09	6.21	Normal	Equal	-0.0239	1.7823	0.5093	NO
IS17TX06	10	4.58	Normal	Equal	0.6589	1.8125	0.2624	NO
Statistical Comparisons Against Reference Site								
BGDTX05	11	4.83						
IS11TX05	04	4.50	Normal	Equal	0.17522	1.78229	0.4319	NO
IS11TX07	05	3.15	Normal	Equal	1.5082	0.1782	0.0787	NO
IS11TX02	06	6.04	Normal	Equal	-0.6768	1.7823	0.7443	NO
IS11TX04	07	5.11	Normal	Equal	-0.2341	1.8125	0.5902	NO
IS11TX03	08	3.79	Normal	Equal	0.8822	1.7823	0.1975	NO
IS11TX02	09	6.21	Normal	Equal	-0.8486	1.8125	0.7920	NO
IS17TX06	10	4.58	Normal	Equal	0.1857	1.8596	0.4286	NO

NOTES:

Data is inclusive of Day 35 and Day 42 reproduction observations and is based on Day 42 female survival.

All replicates with no surviving females omitted from statistical analysis.

‡ Statistical significance evaluated at $\propto = 0.05$.

TABLE 7. Summary of Water Qualities. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

Sample Site	ESI REF	Day	Alkalinity (mg/L)	Ammonia (mg/L)	Hardness (mg/L)	Conductivity (µmhos/cm)	pH (SU)
MHR/POND	-	0	11	ND	41	-	-
		28	39	ND	52	-	-
		42	32	ND	50	-	-
LAB	00	0	ND	ND	39	141	6.83
		28	35	ND	59	212	7.12
IS11TX05	04	0	21	3.2	47	187	7.00
		28	48	ND	65	214	7.14
IS11TX07	05	0	ND	1.5	48	172	6.90
		28	41	ND	58	209	7.19
IS11TX02	06	0	30	2.1	55	189	7.23
		28	49	ND	59	218	7.22
IS11TX04	07	0	18	3.1	53	211	7.20
		28	76	ND	97	290	7.79
IS11TX03	08	0	19	2.1	52	184	7.26
		28	68	ND	95	260	7.92
IS11TX02	09	0	16	3.1	58	199	7.27
		28	74	ND	96	270	7.96
IS17TX06	10	0	ND	1.1	57	170	7.31
		28	70	ND	89	240	7.86
BGDTX05	11	0	22	4.6	50	200	7.23
		28	42	ND	61	208	7.76

Notes:
ND - Not detected.

Method Reporting limits for Ammonia = 0.1 mg/L
Alkalinity = 10 mg/L

Additional water quality data can be found in Appendix A.

TABLE 8. Reference Toxicant Evaluation: *H. azteca*. Naval District Washington, Indian Head CTO-122, Site 11/17 Sediment Evaluation. September - October 2004.

REFERENCE TOXICANT EVALUATION
(Results are expressed as ppm Cadmium)

Species	Start	LC-50	Historic	Number	±1 Std	±2 Std
H. azteca	09/01/04	0.001	0.015	38	0.031	0.062

Note: Reference toxicant testing was conducted at ESI. The historic mean for *H. azteca* survival represents the mean determined from the ESI-conducted reference toxicant testing database.

APPENDIX A
RAW DATA
STATISTICAL SUPPORT

Contents	Number of Pages
H. azteca Survival and Reproduction Sediment Toxicity Tests	
Daily Water Quality Bench Sheets	12
Temperature Profile	1
Day 28 Survival Summary	2
Day 28 Organism Recovery Bench Sheets	12
Day 28 Survival Statistical Analysis	17
Day 28 Dry Weight Summary	1
Day 0 Start Dry Weight Bench Sheet & Calculation Spreadsheet	2
Day 28 Dry Weight Data Bench Sheets	2
Day 28 Growth Statistical Analysis	17
Day 35 Survival Summary Sheets	2
Day 35 Survival Bench Sheets	6
Day 35 Survival Statistical Analysis	17
Day 42 Survival Summary Sheets	2
Day 42 Survival Statistical Analysis	17
Day 42 Reproduction Summary Sheets	2
Day 42 Reproduction Bench Sheets	7
Day 42 Reproduction Statistical Analysis	17
Analytical Data Print out	1
Organism History Record	10
Sample Receipt Logs and Chain of Custody Records	5
	152

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	Lab				-1				Water Quality Station #	S/C Meter #	ΔH_2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	9.0	141.3	6.83	21	9.1	139.8	6.51	21	2	330i	✓	9/1/04	DHB
1	8.2	146.7	6.83	20	7.8	143.0	7.02	20	1	330i	✓	9/2/04	DHB
2	7.9	148.0	6.84	20	8.0	144.4	6.76	20	2	330i	✓	9/3/04	DHB
3	8.0	144.2	6.91	20	8.2	145.1	6.88	20	1	330I	✓	9/4	CW
4	7.8	149	7.26	20	8.0	146	7.15	20	1	330i	✓	9/5	m
5		[illegible]		[illegible]		[illegible]		[illegible]					
6	8.2	162.7	7.01	21	7.9	163.3	6.90	20	2	330i	✓	9/7/04	DHB
7	7.5	158.9	6.97	20	7.6	159.4	6.96	20	2	330i	✓	9/8/04	DHB
8	7.5	165.5	7.00	20	7.5	162.5	6.98	20	2	330i	✓	9/9/04	DHB
9	7.3	166.1	6.88	21	7.5	163.4	6.97	20	1	330i	✓	9/10/04	DHB
10	7.2	171.3	6.90	20	7.3	167.3	6.93	20	1	330I	✓	9/11/04	CW
11	7.3	155	6.94	21	7.6	155	6.98	21	1	330i	✓	9/12/04	BB
12	8.0	165.5	6.94	24	8.1	163.8	7.09	24	2	330i	✓	9/13/04	DHB
13	7.9	175	7.20	23	8.0	166	7.23	23	1	330i	✓	9/14/04	DHB
14	8.2	177	6.98	22	8.3	169	7.19	22	2	330i	✓	9/15/04	DHB
15	7.0	182	7.10	21	7.4	172	7.09	21	1	330i	✓	9/16/04	DHB
16	[illegible]	180	7.18	22	7.7	168	7.12	22	2	330i	✓	9/17/04	DHB
17	7.6	176	7.18	21	7.6	174	7.06	21	1	330i	✓	9/18	KP
18	7.5	185	7.14	23	7.6	171	7.18	23	1	330i	✓	9/19	m
19	7.4	191	6.96	22	7.4	180	6.93	22	2	330i	✓	9/20/04	BB
20	7.6	195	7.23	23	7.8	188	7.20	22	1	330i	✓	9/21/04	DHB
21	7.9	192	7.29	23	8.0	188	7.27	22	2	330i	✓	9/22/04	DHB
22	7.6	196	6.95	22	7.7	191	7.01	22	2	330i	✓	9/23/04	DHB
23	7.8	198	6.95	22	7.7	196	7.02	22	2	330i	✓	9/24/04	DHB
24	8.1	203	6.99	22	8.2	202	7.03	22	2	330i	✓	9/25/04	BB
25	6.7	195	7.22	23	7.2	194	7.23	22	1	330i	✓	9/26/04	DHB
26	8.2	203	7.08	23	8.0	205	7.05	22	2	330i	/	9/27/04	✓
27	6.8	201	7.17	23	6.8	201	7.16	22	1	330i	/	9/28/04	✓
28	7.0	212	7.12	24	7.1	213	7.10	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	Lab				-1				Water Quality Station#	S/C Meter #	ΔH_2O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.7	217	7.59	23	8.7	190	7.83	23	2	330i	✓	9/30/04	BB
30	7.6	232	7.53	24	7.9	229	7.65	24	2	330i	✓	10/1/04	DHB
31	7.8	230	7.32	25	7.6	227	7.44	25	2	330I	✓	10/2	CW
32	7.8	216	7.60	25	8.0	212	7.55	25	2	330i	✓	10/3	m
33	7.4	220	7.38	24	7.6	218	7.48	24	1	330i	✓	10/4/04	BB
34	8.2	223	7.58	24	8.2	219	7.67	24	1	330i	✓	10/5/04	DHB
35	8.2	216	7.57	25	8.0	216	7.60	24	1	330i	✓	10/6/04	DHB
36	7.5	212	7.50	24	7.6	210	7.51	24	1	330i	✓	10/7/04	DHB
37	7.2	227	7.43	22	7.5	225	7.45	23	2	330i	✓	10/8/04	DHB
38	7.2	235	7.27	23	7.5	236	7.44	24	1	330I	✓	10/9	CW
39	7.8	239	7.85	26	7.9	244	7.88	25	1	330i	✓	10/10	m
40	7.6	243	7.33	25	7.9	248	7.57	25	2	330i	✓	10/11/04	DHB
41	7.8	229	7.25	25	7.8	236	7.42	25	2	330i	✓	10/12/04	DHB
42	7.7	232	7.50	24	7.9	237	7.54	24	2	330I	✓	10/13/04	DHB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	-2				-3				Water Quality Station #	S/C Meter #	ΔH2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	8.6	144.8	6.42	21	9.1	155.5	6.89	21	2	330i	✓	9/1/04	DAB
1	7.8	162.3	6.70	20	8.0	168.4	7.01	20	1	330i	✓	9/2/04	DAB
2	7.9	160.2	6.70	20	8.0	161.4	6.96	20	2	330i	✓	9/3/04	DAB
3	7.4	160.9	6.85	20	8.0	163.2	6.49	20	1	330I	✓	9/4	CW
4	7.7	185	6.61	19	8.0	167	7.02	19	1	330i	✓	9/5	CW
5													
6	7.8	189.4	6.55	20	7.8	179.7	6.97	20	2	330i	✓	9/7/04	DAB
7	7.6	174.7	6.70	20	7.5	172.2	6.92	20	2	330i	✓	9/8/04	DAB
8	7.4	171.7	6.87	20	7.6	176.4	7.01	20	2	330i	✓	9/9/04	DAB
9	7.8	167.5	6.78	20	7.7	176.0	7.06	20	1	330i	✓	9/10/04	DAB
10	7.9	166.3	6.76	20	7.7	175.9	6.97	20	1	330I	✓	9/11	CW
11	7.7	159	6.88	21	7.7	167	6.99	21	1	330i	✓	9/12/04	BB
12	8.1	165.0	7.09	23	8.1	174.5	7.21	23	2	330i	✓	9/13/04	DAB
13	8.0	165	7.18	22	8.0	176	7.32	23	1	330i	✓	9/14/04	DAB
14	8.4	167	7.20	21	8.3	180	7.28	22	2	330i	✓	9/15/04	DAB
15	7.2	169	6.97	21	7.1	183	7.03	21	1	330i	✓	9/16/04	DAB
16	7.3	168	7.00	22	7.3	180	6.99	22	2	330i	✓	9/17/04	DAB
17	7.4	164	7.01	21	7.2	176	7.10	21	1	330i	✓	9/18	KC
18	7.7	165	7.16	22	7.6	194	7.25	22	1	330i	✓	9/19	m
19	7.4	173	6.90	22	7.4	198	6.93	22	2	330i	✓	9/20/04	BB
20	7.6	179	7.18	22	7.6	202	7.22	22	1	330i	✓	9/21/04	DAB
21	7.9	179	7.24	21	8.1	199	7.34	22	2	330i	✓	9/22/04	DAB
22	7.5	195	7.20	22	7.5	203	7.15	22	2	330i	✓	9/23/04	DAB
23	7.6	191	7.04	21	7.6	210	7.08	21	2	330i	✓	9/24/04	DAB
24	8.2	196	7.00	22	8.3	214	6.97	22	2	330i	✓	9/25/04	DB
25	7.5	188	7.26	22	7.6	212	7.38	22	1	330i	✓	9/26/04	DAB
26	7.7	198	7.06	22	7.8	215	7.11	22	2	330i	✓	9/27/04	✓
27	6.4	197	7.17	22	6.6	210	7.16	22	1	330i	✓	9/28/04	✓
28	7.1	205	7.12	24	7.1	220	7.18	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	-2				-3				Water Quality Station#	S/C Meter #	ΔH2O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.6	192	7.84	23	8.7	192	7.84	23	2	330i	✓	9/30/04	BB
30	7.9	218	7.64	24	7.8	219	7.65	24	2	330i	✓	10/1/04	DAB
31	7.4	221	7.57	25	7.7	220	7.57	25	2	330I	✓	10/2	CW
32	8.0	206	7.65	25	7.5	206	7.52	25	2	330I	✓	10/3	"
33	7.6	216	7.57	24	7.5	215	7.54	24	1	330i	✓	10/4/04	BB
34	8.0	218	7.68	24	8.1	216	7.68	24	1	330i	✓	10/5/04	DAB
35	8.0	214	7.55	24	7.8	212	7.56	24	1	330i	✓	10/6/04	DAB
36	7.4	206	7.49	25	7.6	203	7.51	25	1	330i	✓	10/7/04	DAB
37	7.5	224	7.46	23	7.5	214	7.39	23	2	330i	✓	10/8/04	DAB
38	7.1	235	7.50	24	7.0	228	7.49	24	1	330I	✓	10/9	CW
39	8.0	244	7.88	25	7.7	237	7.73	25	1	330i	✓	10/10	"
40	7.8	246	7.61	25	7.5	245	7.56	25	2	330i	✓	10/11/04	DAB
41	7.9	228	7.50	25	8.0	228	7.49	25	2	330i	✓	10/12/04	DAB
42	7.8	232	7.54	24	7.7	231	7.49	24	2	330i	✓	10/13/04	DAB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	-4				-5				Water Quality Station #	S/C Meter #	ΔH_2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	8.8	186.6	7.00	21	8.3	172.2	6.90	21	2	330i	✓	9/1/04	DHB
1	7.5	231.0	7.17	20	7.4	207.0	7.21	20	1	330i	✓	9/2/04	DHB
2	7.7	207.0	7.14	20	7.6	192.8	7.11	20	2	330i	✓	9/3/04	DHB
3	7.5	211.6	6.99	20	7.3	198.3	7.15	20	1	330I	✓	9/4	CW
4	7.4	236	7.40	19	7.3	212	7.39	19	1	330i	✓	9/5	m
5		~~222 DHB~~		~~20 DHB~~									
6	7.2	222.0	7.26	20	7.3	208.0	7.25	20	2	330i	✓	9/7/04	DHB
7	7.1	202.0	7.26	20	7.5	188.4	7.41	20	2	330i	✓	9/8/04	DHB
8	7.1	197.2	7.26	20	7.2	185.4	7.23	20	2	330i	✓	9/9/04	DHB
9	7.3	189.5	7.24	20	6.8	180.4	7.17	20	1	330i	✓	9/10/04	DHB
10	7.0	185.6	7.01	20	7.1	178.9	7.02	20	1	330I	✓	9/11	CW
11	6.7	169	7.01	21	6.7	165	7.01	21	1	330i	✓	9/12/04	BB
12	7.7	169.7	7.30	23	7.6	170.9	7.33	23	2	330i	✓	9/13/04	DHB
13	7.4	169	7.35	22	7.5	171	7.36	22	1	330i	✓	9/14/04	DHB
14	8.2	171	7.38	21	8.2	172	7.37	21	2	330i	✓	9/15/04	DHB
15	6.7	175	7.08	22	6.7	176	7.04	22	1	330i	✓	9/16/04	DHB
16	7.0	174	7.03	22	6.9	173	7.00	22	2	330i	✓	9/17/04	DHB
17	6.6	178	7.14	21	6.8	176	7.12	21	1	330i	✓	9/18	KK
18	7.0	172	7.28	22	7.5	165	7.32	22	1	330i	✓	9/19	m
19	7.2	181	6.96	22	6.8	177	6.97	22	2	330i	✓	9/20/04	BB
20	7.5	188	7.23	22	7.6	186	7.28	22	1	330i	✓	9/21/04	DHB
21	7.7	191	7.40	21	7.7	187	7.37	21	2	330i	✓	9/22/04	DHB
22	7.1	198	7.14	22	7.3	191	7.17	22	2	330i	✓	9/23/04	DHB
23	7.6	199	7.16	21	7.7	198	7.18	21	2	330i	✓	9/24/04	DHB
24	8.4	201	7.16	22	8.4	201	7.21	22	2	330i	✓	9/25/04	BB
25	7.0	201	7.41	22	7.4	196	7.43	22	1	330i	✓	9/26/04	DHB
26	7.6	208	7.13	22	7.8	203	7.17	22	2	330i	✓	9/27/04	✓
27	6.0	204	7.22	22	7.8	201	7.27	22	1	330i	✓	9/28/04	✓
28	6.4	214	7.19	24	7.6	209	7.19	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	-4				-5				Water Quality Station#	S/C Meter #	ΔH2O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.4	210	7.81	23	8.6	221	7.80	23	2	330i	✓	9/30/04	BB
30	7.7	215	7.62	24	7.8	228	7.67	24	2	330i	✓	10/1/04	DAB
31	7.9	218	7.51	25	7.6	228	7.54	25	2	330I	✓	10/2	CW
32	7.7	203	7.63	25	7.7	221	7.61	25	2	330i	✓	10/3	LB
33	7.3	213	7.50	24	7.4	225	7.50	24	1	330i	✓	10/4/04	BB
34	7.9	215	7.64	24	7.9	225	7.65	24	1	330i	✓	10/5/04	DAB
35	7.9	212	7.51	24	7.8	221	7.49	24	1	330i	✓	10/6/04	DAB
36	7.4	204	7.47	25	7.3	214	7.45	25	1	330i	✓	10/7/04	DAB
37	7.3	217	7.33	23	7.2	227	7.30	23	2	330i	✓	10/8/04	DAB
38	7.0	231	7.40	24	7.1	237	7.37	24	1	330I	✓	10/9	CW
39	7.1	240	7.68	25	7.6	247	7.67	25	2	330i	✓	10/10	[illegible]
40	7.5	250	7.53	25	7.6	252	7.56	25	2	330i	✓	10/11/04	DAB
41	7.4	232	7.44	25	7.6	241	7.46	25	2	330i	✓	10/12/04	DAB
42	7.5	235	7.46	24	7.8	242	7.47	24	2	330i	✓	10/13/04	DAB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	-6				-7				Water Quality Station #	S/C Meter #	ΔH_2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	8.9	188.8	7.23	21	8.7	211.0	7.20	21	2	330i	✓	9/1/04	DHB
1	7.4	236.0	7.42	20	7.0	273.0	7.33	20	1	330i	✓	9/2/04	DHB
2	7.7	235.0	7.41	20	7.6	253.0	7.30	20	2	330i	✓	9/3/04	DHB
3	7.2	237.1	7.36	20	7.4	243.8	7.21	20	1	330I	✓	9/4	CW
4	7.6	257	7.20	19	7.0	231	7.34	20	1	330i	✓	9/5	u
5													
6	7.4	255.0	7.55	20	6.7	241.0	7.28	20	2	330i	✓	9/7/04	DHB
7	7.2	235.0	7.35	20	6.8	220.0	7.39	20	2	330i	✓	9/8/04	DHB
8	7.3	211.0	7.40	20	6.7	198.3	7.27	20	2	330i	✓	9/9/04	DHB
9	6.9	202.0	7.34	20	6.6	189.3	7.22	20	1	330i	✓	9/10/04	DHB
10	7.1	203	7.14	20	7.0	191.9	7.04	20	1	330I	✓	9/11	CW
11	6.8	165	7.11	21	6.7	166	7.10	21	1	330i	✓	9/12/04	BB
12	7.9	186.8	7.51	23	7.8	183.0	7.52	23	2	330i	✓	9/13/04	DHB
13	7.9	195	7.49	23	7.6	193	7.52	22	1	330i	✓	9/14/04	DHB
14	8.4	194	7.53	21	8.2	199	7.64	22	2	330i	✓	9/15/04	DHB
15	7.0	201	7.28	22	7.3	214	7.54	22	1	330i	✓	9/16/04	DHB
16	7.3	201	7.20	22	7.2	221	7.60	22	2	330i	✓	9/17/04	DHB
17	7.4	198	7.25	21	7.3	218	7.70	21	1	330i	✓	9/18	KK
18	7.1	191	7.43	22	7.4	226	7.86	22	1	330i	✓	9/19	m
19	6.9	206	7.00	22	6.8	243	7.76	22	2	330i	✓	9/20/04	BB
20	7.4	213	7.36	22	7.5	257	7.85	22	1	330i	✓	9/21/04	DHB
21	7.9	228	7.47	21	7.9	277	7.82	22	2	330i	✓	9/22/04	DHB
22	7.2	218	7.23	22	7.1	262	7.68	22	2	330i	✓	9/23/04	DHB
23	7.5	215	7.22	22	7.4	269	7.70	22	2	330i	✓	9/24/04	DHB
24	8.4	219	7.23	22	8.3	271	7.63	22	2	330i	✓	9/25/04	BB
25	7.0	221	7.47	22	6.9	295	7.94	22	1	330i	✓	9/26/04	DHB
26	8.0	230	7.34	22	7.9	296	7.74	22	2	330i	✓	9/27/04	✓
27	6.4	216	7.31	22	5.6	282	7.20	22	1	330i	✓	9/28/04	✓
28	6.7	218	7.22	24	6.2	290	7.79	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	-6				-7				Water Quality Station#	S/C Meter #	ΔH₂O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.4	193	7.85	23	8.4	194	7.85	23	2	330i	✓	9/30/04	BB
30	7.8	216	7.58	24	7.6	209	7.65	24	2	330i	✓	10/1/04	DAB
31	7.3	221	7.57	25	7.8	218	7.55	25	2	330I	✓	10/2	CW
32	7.6	221	7.62	25	7.5	230	7.59	25	2	330i	✓	10/3	m
33	7.2	223	7.48	24	7.3	231	7.47	24	1	330i	✓	10/4/04	BB
34	7.7	221	7.62	24	7.8	232	7.65	24	1	330i	✓	10/5/04	DAB
35	7.6	217	7.47	24	7.9	232	7.51	24	1	330i	✓	10/6/04	DAB
36	7.2	208	7.44	25	7.2	234	7.43	25	1	330i	✓	10/7/04	DAB
37	7.2	223	7.28	23	7.4	246	7.32	23	2	330i	✓	10/8/04	DAB
38	7.0	234	7.36	24	7.1	222	7.38	24	1	330I	✓	10/9	CW
39	7.9	245	7.78	25	7.6	230	7.64	25	1	330i	✓	10/10	m
40	7.5	247	7.54	25	7.4	232	7.52	25	2	330i	✓	10/11/04	DAB
41	7.4	231	7.47	25	7.4	233	7.45	25	2	330i	✓	10/12/04	DAB
42	7.6	233	7.47	24	6.6	234	7.37	24	2	330i	✓	10/13/04	DAB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	-8				-9				Water Quality Station #	S/C Meter #	ΔH_2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	9.1	184.4	7.26	21	9.0	199.4	7.27	21	2	330i	✓	9/1/04	DHB
1	6.9	238.0	7.28	20	7.1	255.0	7.35	20	1	330i	✓	9/2/04	DHB
2	7.5	228.0	7.28	20	7.5	235.0	7.29	20	2	330i	✓	9/3/04	DHB
3	7.3	231.4	7.04	20	7.4	233.6	7.18	20	1	330I	✓	9/4	CW
4	7.0	237	7.34	20	7.1	239	7.42	20	1	330i	✓	9/5	h
5													
6	6.8	223.0	7.19	20	6.8	232.0	7.18	20	2	330i	✓	9/7/04	DHB
7	6.8	197.1	7.16	20	7.0	210.0	7.14	20	2	330i	✓	9/8/04	DHB
8	6.8	186.2	7.21	20	6.9	193.0	7.16	20	2	330i	✓	9/9/04	DHB
9	7.2	181.5	7.21	20	6.8	184.1	7.15	20	1	330i	✓	9/10/04	DHB
10	7.3	186.0	7.02	20	6.4	185.8	7.00	20	1	330I	✓	9/11	CW
11	6.6	154	7.13	21	6.6	150	7.10	21	1	330i	✓	9/12/04	BB
12	7.9	181.2	7.53	23	8.0	169.1	7.39	24	2	330i	✓	9/13/04	DHB
13	7.2	194	7.54	22	7.6	180	7.53	23	1	330i	✓	9/14/04	DHB
14	8.2	196	7.64	21	8.3	186	7.60	22	2	330i	✓	9/15/04	DHB
15	7.0	205	7.58	22	6.9	197	7.51	22	1	330i	✓	9/16/04	DHB
16	7.5	211	7.60	22	7.2	203	7.55	22	2	330i	✓	9/17/04	DHB
17	7.4	217	7.78	21	7.3	200	7.74	21	1	330i	✓	9/18	KK
18	7.5	192	7.98	22	7.1	229	7.96	22	1	330i	✓	9/19	m
19	6.9	220	7.81	22	6.9	237	7.79	22	2	330i	✓	9/20/04	BB
20	7.7	238	7.97	22	7.3	243	7.93	22	1	330i	✓	9/21/04	DHB
21	8.1	268	7.95	22	7.9	261	7.98	22	2	330i	✓	9/22/04	DHB
22	7.2	272	7.87	22	6.9	261	7.97	22	2	330i	✓	9/23/04	DHB
23	7.5	279	7.86	21	7.4	258	7.98	22	2	330i	✓	9/24/04	DHB
24	8.4	266	7.87	22	8.3	263	8.00	22	2	330i	✓	9/25/04	BB
25	7.1	283	8.10	22	6.8	283	8.17	22	1	330i	✓	9/26/04	DHB
26	7.6	283	7.86	22	7.7	285	7.88	22	2	330i	✓	9/27/04	r
27	5.4	258	7.95	22	5.4	268	7.98	23	1	330i	✓	9/28/04	r
28	6.2	260	7.92	24	6.1	270	7.96	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	-8				-9				Water Quality Station#	S/C Meter #	ΔH2O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.4	216	7.84	23	8.3	209	7.88	23	2	330i	✓	9/30/04	BB
30	7.8	218	7.67	24	7.8	215	7.68	24	2	330i	✓	10/1/04	DAB
31	7.4	224	7.53	25	7.6	222	7.51	25	2	330I	✓	10/2	CW
32	7.4	233	7.59	25	7.3	233	7.58	25	2	330i	✓	10/3	CW
33	7.2	232	7.48	24	7.1	229	7.45	24	1	330i	✓	10/4/04	BB
34	8.0	230	7.68	24	7.7	226	7.64	24	1	330i	✓	10/5/04	DAB
35	7.8	230	7.52	24	7.7	226	7.53	24	1	330i	✓	10/6/04	DAB
36	7.3	232	7.47	25	7.3	230	7.48	25	1	330i	✓	10/7/04	DAB
37	7.1	245	7.31	23	7.4	243	7.34	23	2	330i	✓	10/8/04	DAB
38	7.0	223	7.37	24	7.2	215	7.38	24	1	330I	✓	10/9	CW
39	7.5	233	7.64	25	7.6	223	7.68	25	1	330i	✓	10/10	CW
40	7.6	234	7.52	25	7.7	226	7.38	25	2	330i	✓	10/11/04	DAB
41	7.3	235	7.47	25	7.1	230	7.40	25	2	330i	✓	10/12/04	DAB
42	7.5	231	7.43	24	7.8	228	7.49	24	2	330i	✓	10/13/04	DAB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:

H. azteca SEDIMENT ASSAY
Daily Water Quality Measurements & Feeding Record

STUDY #: 12414	Client: CH2MHill	Overlying Water: MHR/Pond	START DATE: 9/1/04

DAY	-10				-11				Water Quality Station #	S/C Meter #	ΔH2O fed	DATE	INIT
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	Temp. (°C)	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP (°C)					
0	9.1	170.0	7.31	21	9.1	199.8	7.23	21	2	330i	✓	9/1/04	DHB
1	7.4	198.2	7.34	21	7.5	245.0	7.32	20	1	330i	✓	9/2/04	DHB
2	7.6	198.6	7.28	20	7.6	227.0	7.26	20	2	330i	✓	9/3/04	DHB
3	7.4	194.3	7.24	20	7.3	229.6	7.29	20	1	330I	✓	9/4	CW
4	7.1	219	7.45	20	7.4	241	7.47	20	1	330i	✓	9/5	m
5													
6	7.0	195.0	7.31	20	7.1	255.0	7.30	20	2	330i	✓	9/7/04	DHB
7	7.2	188.7	7.26	20	7.3	221.0	7.26	20	2	330i	✓	9/8/04	DHB
8	7.5	182.2	7.29	20	7.3	205.0	7.27	20	2	330i	✓	9/9/04	DHB
9	6.9	181.4	7.28	21	7.0	196.1	7.20	21	1	330i	✓	9/10/04	DHB
10	6.9	191.2	7.09	20	7.2	195.4	7.07	20	1	330I	✓	9/11	CW
11	6.7	165	7.18	21	6.7	183	7.09	21	1	330i	✓	9/12/04	BB
12	7.7	192.6	7.71	24	7.9	182.3	7.51	24	2	330i	✓	9/13/04	DHB
13	7.6	213	7.81	23	7.3	178	7.52	23	1	330i	✓	9/14/04	DHB
14	8.1	210	7.88	22	8.3	176	7.53	22	2	330i	✓	9/15/04	DHB
15	7.2	227	8.29	22	7.0	186	7.17	22	1	330i	✓	9/16/04	DHB
16	7.6	229	8.05	22	7.4	186	7.09	22	2	330i	✓	9/17/04	DHB
17	7.7	224	8.11	21	7.5	182	7.13	21	1	330i	✓	9/18/04	KK
18	7.0	256	8.26	22	6.8	208	7.54	22	1	330i	✓	9/19	m
19	6.7	251	8.12	22	6.7	214	7.49	22	2	330i	✓	9/20/04	BB
20	7.3	250	8.08	22	7.6	210	7.44	22	1	330i	✓	9/21/04	DHB
21	8.0	262	7.98	22	8.0	209	7.75	22	2	330i	✓	9/22/04	DHB
22	7.0	256	7.92	22	7.8	210	7.57	22	2	330i	✓	9/23/04	DHB
23	7.3	247	7.92	22	7.5	205	7.56	22	2	330i	✓	9/24/04	DHB
24	8.4	247	7.90	22	8.4	222	7.70	22	2	330i	✓	9/25/04	BB
25	6.4	259	7.95	22	7.5	212	7.81	22	1	330	✓	9/26/04	DHB
26	7.6	255	7.82	23	7.7	201	7.55	22	2	330i	✓	9/27/04	✓
27	5.7	230	7.88	23	6.3	202	7.75	22	1	330i	✓	9/28/04	✓
28	6.1	240	7.86	24	6.3	208	7.76	24	2	330i	✓	9/29/04	BB

Pull Alkalinity, Hardness, Ammonia Day 0, 7, 14, 21, 28
23° C
Feed 1 mL of YCT/Replicate Daily
Two Volume Additions Daily

Hyalella azteca 42-Day CHRONIC EXPOSURE SEDIMENT ASSAY

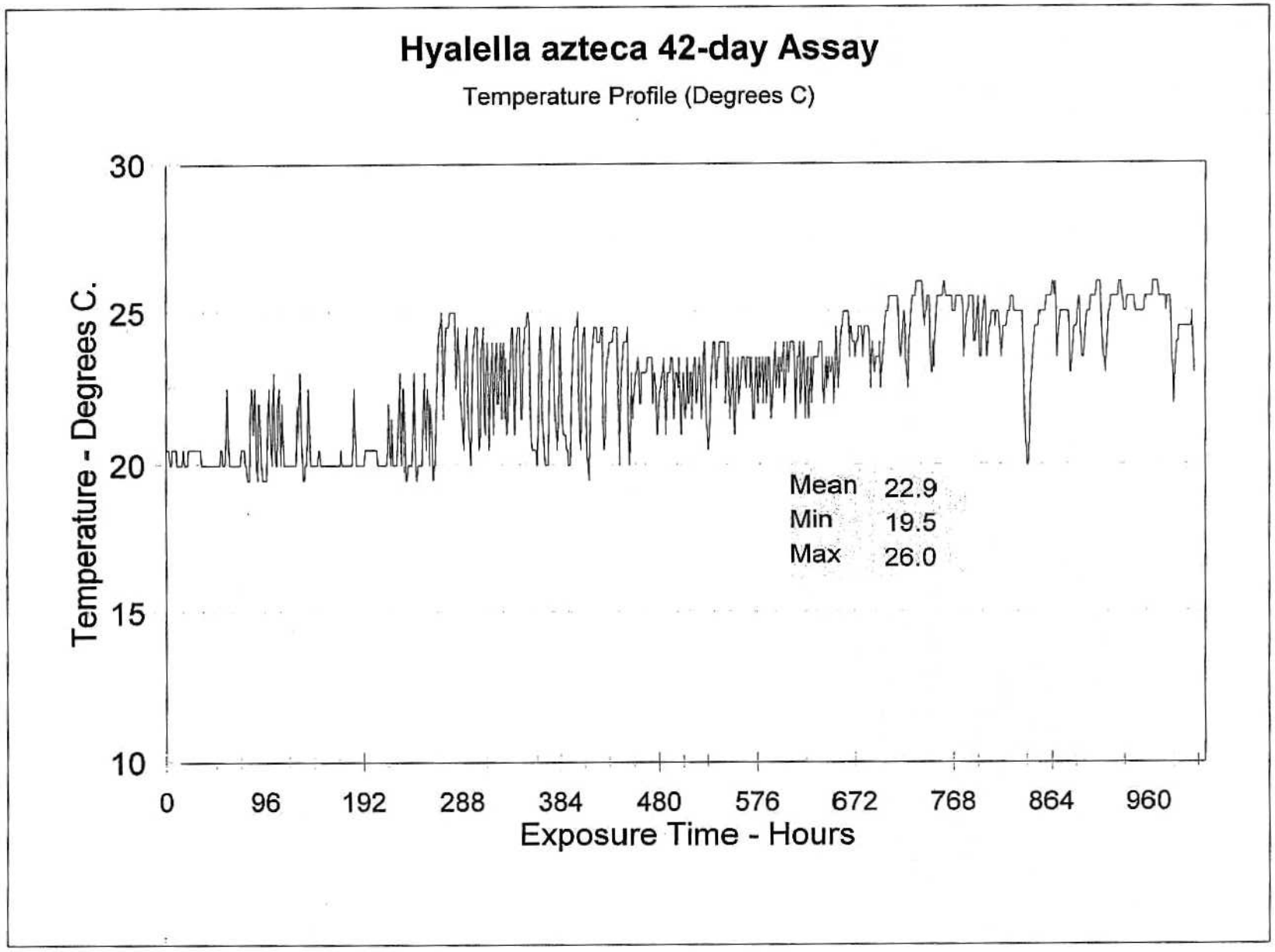
Daily Water Quality Measurements & Feeding Record

STUDY #12414	CLIENT: CH2MHill	OVERLYING WATER: MHR/Pond	START DATE: 09/01/04

DAY	-10				-11				Water Quality Station#	S/C Meter #	ΔH_2O fed	Date	INITIAL
	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C	D.O. (mg/L)	Cond. (µMHOS/cm)	pH (SU)	TEMP °C					
29	8.4	183	7.85	23	8.4	189	7.87	23	2	330i	✓	9/30/04	BB
30	7.7	207	7.62	24	7.9	206	7.69	24	2	330i	✓	10/1/04	DHB
31	7.5	217	7.41	25	8.1	219	7.43	25	2	330I	✓	10/2	CW
32	7.7	229	7.60	25	7.0	236	7.60	25	2	330i	✓	10/3	CW
33	6.8	228	7.40	24	6.9	233	7.44	24	1	330i	✓	10/4/04	BB
34	7.6	227	7.63	24	8.0	232	7.58	24	1	330i	✓	10/5/04	DHB
35	7.5	227	7.57	25	7.5	231	7.47	25	1	330i	✓	10/6/04	DHB
36	7.2	231	7.46	25	7.4	224	7.49	25	1	330i	✓	10/7/04	DHB
37	6.8	244	7.29	23	7.3	237	7.32	23	2	330i	✓	10/8/04	DHB
38	6.4	217	7.31	24	6.8	196	7.35	24	1	330I	✓	10/9	CW
39	7.4	226	7.60	26	7.6	203	7.69	26	1	330i	✓	10/10	CW
40	7.3	240	7.43	25	7.6	216	7.55	25	2	330i	✓	10/11/04	DHB
41	7.1	236	7.38	25	7.4	220	7.43	26	2	330i	✓	10/12/04	DHB
42	7.1	231	7.44	24	7.6	218	7.42	25	2	330i	✓	10/13/04	DHB

Feed YCT daily at a rate of 1 mL per vessel 23 °C Aerate if DO is below 2.5 mg/L Two volume additions daily

NOTES:


Hyalella azteca 42-day Assay
Temperature Profile (Degrees C)
Temperature - Degrees C.
30
25
20
15
10
0
96
192
288
384
480
576
672
768
864
960
Exposure Time - Hours
Mean 22.9
Min 19.5
Max 26.0

STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head - CTO-122 Site 11/17
TASK: Hyalella azteca 42 Day Assay
DATA: Day 28 Survival
START DATE: 09/01/04
END DATE: 09/29/04

Sample Site	ESI Ref	Rep	Number Recoverec	Percent Recovery	Mean Recovery	Std Dev	CV	Normal Distribution	Homogeneous Variance	t Value	Critical t Value	p Value	Statistically Significant Difference	As Compared To	
Lab Control	0	A	9	90%	90.0%	0.0816	9.1%								
	0	B	9	90%											
	0	C	10	100%											
	0	D	9	90%											
	0	E	9	90%											
	0	F	9	90%											
	0	G	7	70%											
	0	H	8	80%											
	0	I	9	90%											
	0	J	10	100%											
	0	K	10	100%											
	0	L	9	90%											
IS11TX05	4	A	7	70%	77.5%	0.1299	16.8%	Normal	Equal	2.6753	1.7171	0.0069	YES	Lab	
	4	B	8	80%				Normal	Equal	0.2698	1.7171	0.3949	NO	BGDTX05	
	4	C	7	70%											
	4	D	9	90%											
	4	E	8	80%											
	4	F	10	100%											
	4	G	8	80%											
	4	H	6	60%											
	4	I	6	60%											
	4	J	6	60%											
	4	K	9	90%											
	4	L	9	90%											
IS11TX07	5	A	8	80%	85.8%	0.0759	8.8%	Normal	Equal	1.3080	1.7171	0.1022	NO	Lab	
	5	B	9	90%				Normal	Equal	-1.4485	1.7171	0.9192	NO	BGDTX05	
	5	C	7	70%											
	5	D	9	90%											
	5	E	10	100%											
	5	F	8	80%											
	5	G	8	80%											
	5	H	9	90%											
	5	I	8	80%											
	5	J	9	90%											
	5	K	9	90%											
	5	L	9	90%											
IS11TX02	6	A	8	80%	86.7%	0.0943	10.9%	Normal	Equal	0.8664	1.7171	0.1978	NO	Lab	
	6	B	10	100%				Non-normal	Equal	42.0000	-	0.9556	NO	BGDTX05	Mann-Whi
	6	C	10	100%											
	6	D	9	90%											
	6	E	9	90%											
	6	F	8	80%											
	6	G	7	70%											
	6	H	8	80%											
	6	I	8	80%											
	6	J	9	90%											
	6	K	10	100%											
	6	L	8	80%											
IS11TX04	7	A	7	70%	88.3%	0.1280	14.5%	Non-normal	Equal	71.5000	-	0.4887	NO	Lab	Mann-Whi

	7	B	9	90%				Normal	Equal	-1.8393	1.7171	0.9603	NO	BGDTX05	
	7	C	9	90%											
	7	D	6	60%											
	7	E	10	100%											
	7	F	8	80%											
	7	G	10	100%											
	7	H	10	100%											
	7	I	10	100%											
	7	J	10	100%											
	7	K	8	80%											
	7	L	9	90%											
IS11TX03	8	A	10	100%	84.2%	0.1187	14.1%	Normal	Equal	1.2790	1.7171	0.1071	NO	Lab	
	8	B	10	100%				Normal	Equal	-0.9908	1.7171	0.8337	NO	BGDTX05	
	8	C	10	100%											
	8	D	9	90%											
	8	E	8	80%											
	8	F	8	80%											
	8	G	8	80%											
	8	H	8	80%											
	8	I	6	60%											
	8	J	9	90%											
	8	K	7	70%											
	8	L	8	80%											
IS11TX02	9	A	8	80%	85.0%	0.1118	13.2%	Normal	Equal	1.1248	1.7171	0.1364	NO	Lab	
	9	B	10	100%				Normal	Equal	-1.1734	1.7171	0.8734	NO	BGDTX05	
	9	C	10	100%											
	9	D	9	90%											
	9	E	8	80%											
	9	F	7	70%											
	9	G	8	80%											
	9	H	9	90%											
	9	I	7	70%											
	9	J	10	100%											
	9	K	7	70%											
	9	L	9	90%											
IS17TX06	10	A	10	100%	94.2%	0.1382	14.7%	Non-normal	Equal	38.5000	1.7171	0.9702	NO	Lab	Mann-Whi
	10	B	10	100%				Non-normal	Equal	26.0000	-	0.9966	NO	BGDTX05	Mann-Whi
	10	C	10	100%											
	10	D	10	100%											
	10	E	10	100%											
	10	F	10	100%											
	10	G	5	50%											
	10	H	10	100%											
	10	I	9	90%											
	10	J	10	100%											
	10	K	10	100%											
	10	L	9	90%											
BGDTX05	11	A	8	80%	79.2%	0.1115	14.1%	Normal	Equal	2.4721	1.7171	0.0108	YES	Lab	
	11	B	7	70%											
	11	C	8	80%											
	11	D	9	90%											
	11	E	7	70%											
	11	F	7	70%											
	11	G	10	100%											
	11	H	10	100%											
	11	I	7	70%											
	11	J	7	70%											
	11	K	8	80%											
	11	L	7	70%											

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
LabA	9:30	9	
LabB	9:35	9	
LabC	9:38	10	
Lab D	9:42	9	
LabE	9:45	9	
Lab F	9:52	9	
Lab G	9:58	7	
Lab H	10:03	8	
Lab I	10:07	9	
Lab J	10:11	10	
Lab K	10:14	10	
Lab L	10:19	9	
-5A	10:40	8	
-5B	10:53	9	
-5C	10:57	7	
-5D	11:00	9	

ANALYST: B. Anbogast
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
H. azteca SEDIMENT ASSAY

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-1A	1000	9	
-1B	1003	9	
-1C	1006	9	
-1D	1010	8	
-1H	1012	9	
-1I	1015	9	
-1L	1018	8	
-3A	1020	6	
-3B	1022	10	
-3C	1024	8	
-3D	1025	10	
-3E	1026	8	
-3F	1028	9	
-3G	1029	9	
-3H	1031	8	
-3I	1033	9	

ANALYST: AH
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
H. azteca SEDIMENT ASSAY

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
3J	1036	10	
3K	1038	10	
3L	1039	9	
-4A	1043	7	
-4B	1047	8	
-4C	1055	7	
-4D	1058	9	
-4E	1101	7 8 ⊗ 9/29 XH	
-4F	1107	10	
-4J	1110	6	
-6A	1116	8	
-6B	1117	10	
-6C	1118	10	
-6D	1120	9	
-6E	1121	9	
-6F	1123	8	

ANALYST: XH
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-2D	1127	7	
-11E	1215	7	
-11F	1220	7	

ANALYST: BJB
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-1E	0958	9	
-1F	1004	8	
-1G	1008	8	
-1J	1014	7	
-1K	1020	7	
-2E	1026	7	
-2F	1032	8	
-2G	1040	4	
-2H	1045	6	
-2I	1050	9	
-2J	1058	6	
-2K	1102	9	
-2L	1106	9	
-2A	1110	7	
-2B	1115	6	
-2C	1122	4	

ANALYST: BB
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-5E	11:09	10	
-5F	11:11	8	
-5G	11:15	8	
-5H	11:19	9	
-4L	11:27	9	
-8A	11:34	10	
-8B	11:37	10	
-8C	11:40	10	
-8D	11:43	9	
-8E	11:45	8	
-8F	11:48	8	
-8G	11:50	8	
-8H	11:53	8	
-8I	11:57	6	
-8J	11:59	9	
-8K	12:02	7	

ANALYST: B. Arbogast
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-8L	12:07	8	
-11G	12:20	10	
-11H	12:24	10	
-11I	12:35	7	
-11K	12:49	8	
-11J	12:53	7	
-11L	12:56	7	

ANALYST: B. Arbogast
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
H. azteca SEDIMENT ASSAY

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-4I	1106	6	~~IIII~~ I
-4H	1112	6	~~IIII~~ I
-4G	1118	8	
-4K	1124	9	
-5I	1129	8	
-5J	1132	9	
-5K	1135	9	
-5L	1138	9	
-9A	1144	8	
-9B	1145	10	
-9C	1147	10	
-9D	1148	9	
-9E	1151	8	
-9F	1153	7	
-9G	1155	8	
-9H	1157	9	

ANALYST: [illegible]
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-9I	1200	7	
-9J	1201	10	
-9K	1203	7	
-9L	1205	9	

ANALYST: _____
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
-6G	1125	7	
-6H	1127	8	
-6I	1129	8	
-6J	1131	9	
-6K	1133	10	
-6L	1135	8	
7A	1137	7	
7B	1138	9	
7C	1140	9	
7D	1148	~~5~~ 6 ZH 9/29	
7E	1150	10	
7F	1152	8	
7G	1153	10	
7H	1155	10	
7I	1156	10	
7J	1157	10	

ANALYST: ZH
DATE: 9/29/07

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
7K	1159	8	
7L	1201	9	
-10A	1204	10	
-10B	1205	10	
-10C	1207	10	
-10D	1208	10	
-10E	1209	10	
-10F	1210	10	
10G	1211	5	
10H	1212	10	
10I	1214	9	
10J	1215	10	
10K	1216	10	
10L ~~10K~~	1218	9	
11A	1221	8	
11B	1227	7	

ANALYST: AH
DATE: 9/29/04

ESI STUDY# 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 28:

SAMPLE ID	TIME	#LIVE	COMMENTS
11C	1231	8	
11D	1233	9	

ANALYST: dH
DATE: 9/29

CETIS Test Summary

Report Date: 22 Oct-04 11:11 PM
Link: 01-6544-1101

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Test No:	12-4416-9497	Test Type:	Hyalella (42d)	Duration:	43d 0h
Start Date:	01 Sep-04 12:00 PM	Protocol:	EPA/600/R-99/064 (2000)	Species:	Hyalella azteca
Ending Date:	14 Oct-04 12:00 PM	Dil Water:	50/50 Mix of Surface Water and MHR	Source:	Aquatic Research Organisms, NH
Setup Date:	01 Sep-04 12:00 PM	Brine:	Not Applicable		

Sample No:	06-0771-3563	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	01 Sep-04	Code:	12414-00	Project:	Ecologcal Risk Assessment
Receive Date:	01 Sep-04	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	12h (4 °C)	Station:	Lab Control -00		
Sample No:	03-7896-9779	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	11 Aug-04 11:00 AM	Code:	12414-04	Project:	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 1h (4 °C)	Station:	IS11TX05 12414-04		
Sample No:	16-1142-2769	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	11 Aug-04 12:00 PM	Code:	12414-05	Project:	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 0h (4 °C)	Station:	IS11TX07 12414-05		
Sample No:	19-4503-7964	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 02:50 PM	Code:	12414-06	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 21h (4 °C)	Station:	IS17TX02 12414-06		
Sample No:	07-7263-2686	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 10:00 AM	Code:	12414-07	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 2h (4 °C)	Station:	IS11TX04 12414-07		
Sample No:	09-3049-9344	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 10:40 AM	Code:	12414-08	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 1h (4 °C)	Station:	IS11TX03 12414-08		
Sample No:	06-0576-7762	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 11:35 AM	Code:	12414-09	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 0h (4 °C)	Station:	IS11TX02 12414-09		
Sample No:	07-9383-1931	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 12:40 PM	Code:	12414-10	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 23h (4 °C)	Station:	IS17TX06 12414-10		
Sample No:	08-0384-6290	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	13 Aug-04	Code:	12414-11	Project:	Ecologcal Risk Assessment
Receive Date:	14 Aug-04 10:20 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 12h (4 °C)	Station:	BGDTX05 12414-11		

CETIS Test Summary

Report Date: 22 Oct-04 11:11 PM
Link: 01-6544-1101

28d Proportion Survived Summary

Sample Code	Reps	Mean	Minimum	Maximum	SE	SD	CV
12414-00	12	0.90000	0.70000	1.00000	0.02462	0.08528	9.48%
12414-11	12	0.79167	0.70000	1.00000	0.03362	0.11645	14.71%
12414-04	12	0.77500	0.60000	1.00000	0.03917	0.13568	17.51%
12414-05	12	0.85833	0.70000	1.00000	0.02289	0.07930	9.24%
12414-06	12	0.86667	0.70000	1.00000	0.02843	0.09847	11.36%
12414-07	12	0.88333	0.60000	1.00000	0.03860	0.13371	15.14%
12414-08	12	0.84167	0.60000	1.00000	0.03580	0.12401	14.73%
12414-09	12	0.85000	0.70000	1.00000	0.03371	0.11677	13.74%
12414-10	12	0.94167	0.50000	1.00000	0.04167	0.14434	15.33%

28d Proportion Survived Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-04	0.70000	0.80000	0.70000	0.90000	0.80000	1.00000	0.80000	0.60000	0.60000	0.60000
	0.90000	0.90000								
12414-05	0.80000	0.90000	0.70000	0.90000	1.00000	0.80000	0.80000	0.90000	0.80000	0.90000
	0.90000	0.90000								
12414-06	0.80000	1.00000	1.00000	0.90000	0.90000	0.80000	0.70000	0.80000	0.80000	0.90000
	1.00000	0.80000								
12414-07	0.70000	0.90000	0.90000	0.60000	1.00000	0.80000	1.00000	1.00000	1.00000	1.00000
	0.80000	0.90000								
12414-08	1.00000	1.00000	1.00000	0.90000	0.80000	0.80000	0.80000	0.80000	0.60000	0.90000
	0.70000	0.80000								
12414-09	0.80000	1.00000	1.00000	0.90000	0.80000	0.70000	0.80000	0.90000	0.70000	1.00000
	0.70000	0.90000								
12414-10	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.50000	1.00000	0.90000	1.00000
	1.00000	0.90000								

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:00 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.72941	5.31967	0.37741	Equal Variances
Distribution	Shapiro-Wilk W	0.90098	0.88421	0.02335	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1256011	0.1256011	1	6.11	0.02164	Significant Effect
Error	0.4521474	0.0205522	22			
Total	0.57774849	0.1461533	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-11	2.47211	1.71714	0.0108	0.1005	Significant Effect

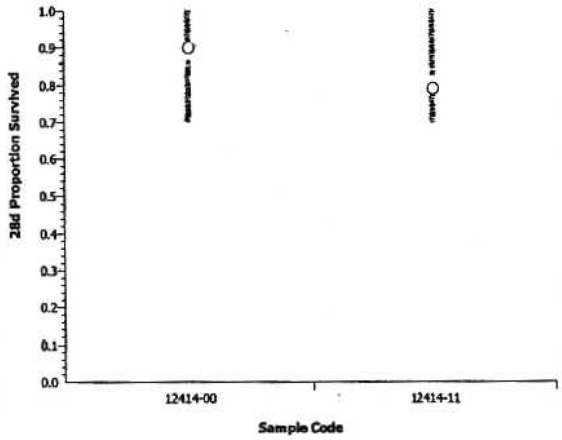
Data Summary

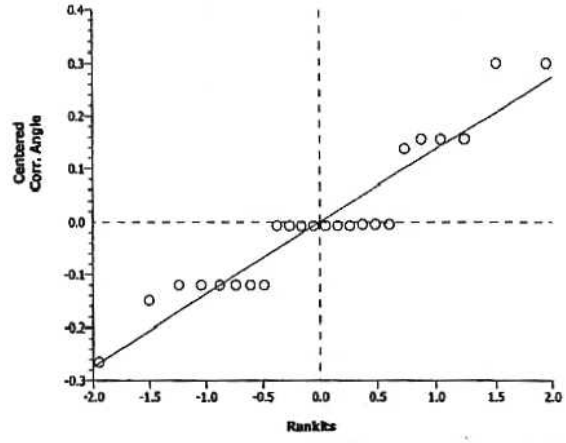
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:00 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.95956	5.31967	0.27981	Equal Variances
Distribution	Shapiro-Wilk W	0.93315	0.88421	0.12045	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1595004	0.1595004	1	7.16	0.01382	Significant Effect
Error	0.4902735	0.0222852	22			
Total	0.64977393	0.1817856	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-04	2.67530	1.71714	0.0069	0.10465	Significant Effect

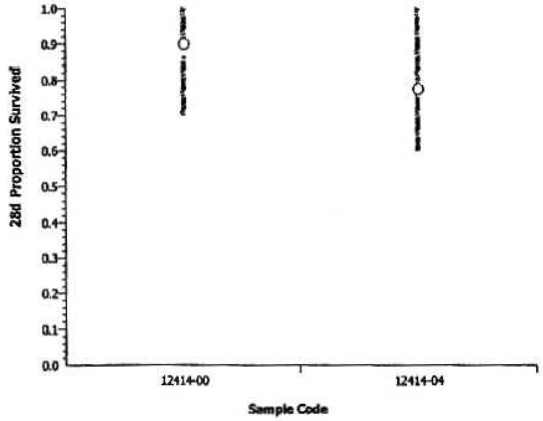
Data Summary

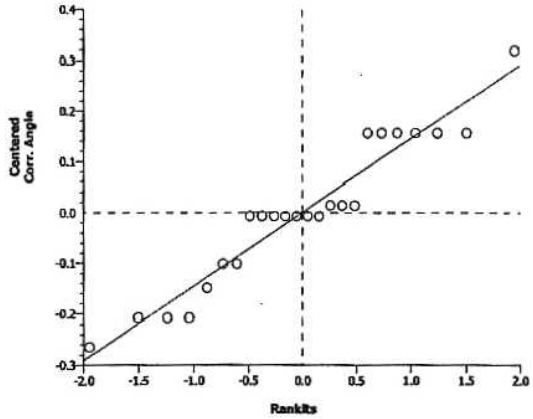
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-04	12	0.77500	0.60000	1.00000	0.13568	1.09343	0.88608	1.41202	0.17179

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-04	0.70000	0.80000	0.70000	0.90000	0.80000	1.00000	0.80000	0.60000	0.60000	0.60000
	0.90000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:00 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.20892	5.31967	0.75858	Equal Variances
Distribution	Shapiro-Wilk W	0.95342	0.88421	0.32679	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0235396	0.0235396	1	1.71	0.20437	Non-Significant Effect
Error	0.3026866	0.0137585	22			
Total	0.32622623	0.0372981	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-05	1.30802	1.71714	0.1022	0.08223	Non-Significant Effect

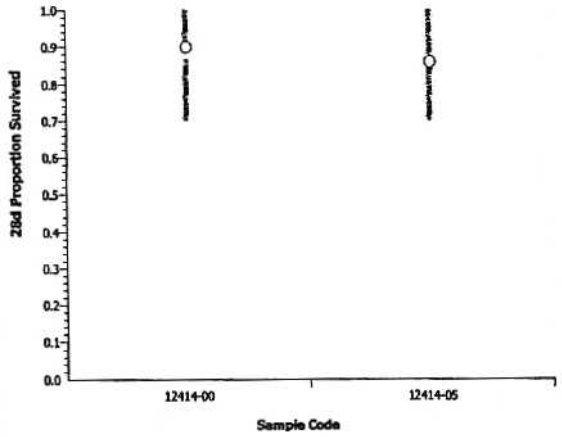
Data Summary

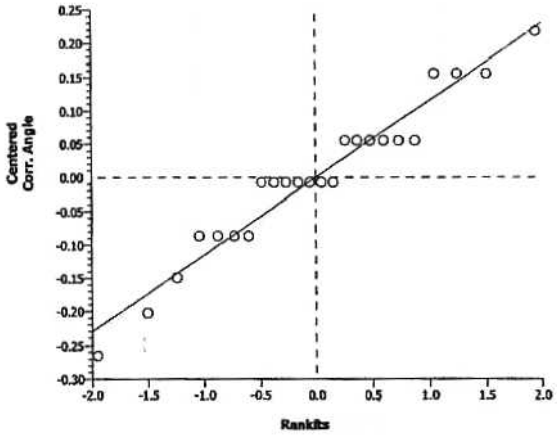
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-05	12	0.85833	0.70000	1.00000	0.07930	1.19384	0.99116	1.41202	0.11161

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-05	0.80000	0.90000	0.70000	0.90000	1.00000	0.80000	0.80000	0.90000	0.80000	0.90000
	0.90000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:00 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.37501	5.31967	0.60641	Equal Variances
Distribution	Shapiro-Wilk W	0.93596	0.88421	0.13884	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0134232	0.0134232	1	0.75	0.39564	Non-Significant Effect
Error	0.3934391	0.0178836	22			
Total	0.40686227	0.0313068	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-06	0.86636	1.71714	0.1978	0.09375	Non-Significant Effect

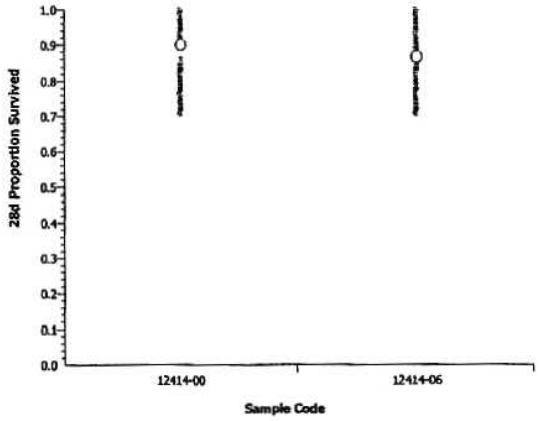
Data Summary

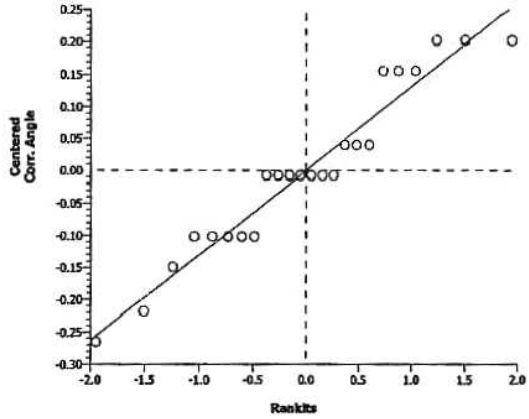
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-06	12	0.86667	0.70000	1.00000	0.09847	1.20917	0.99116	1.41202	0.14390

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-06	0.80000	1.00000	1.00000	0.90000	0.90000	0.80000	0.70000	0.80000	0.80000	0.90000
	1.00000	0.80000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.23743	5.31967	0.19744	Equal Variances
Distribution	Shapiro-Wilk W	0.87563	0.88421	0.00651	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0013339	0.0013339	1	0.05	0.81721	Non-Significant Effect
Error	0.536305	0.0243775	22			
Total	0.53763887	0.0257114	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-00		12414-07	71.5		0.4887	4	Non-Significant Effect

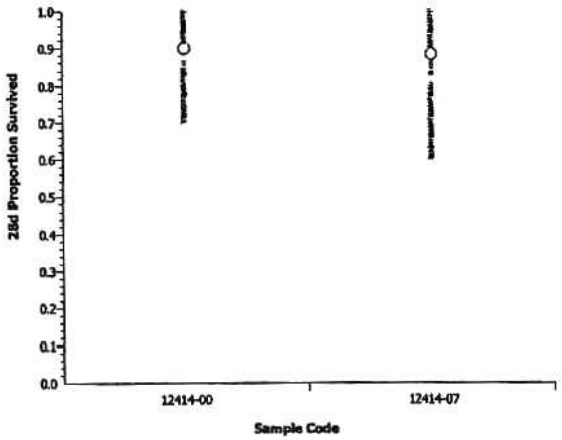
Data Summary

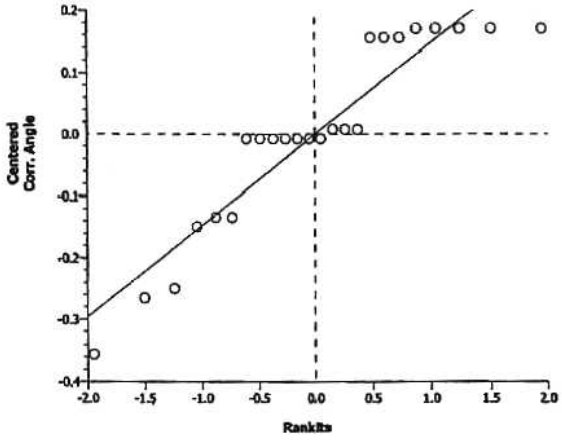
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-07	12	0.88333	0.60000	1.00000	0.13371	1.24156	0.88608	1.41202	0.18356

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-07	0.70000	0.90000	0.90000	0.60000	1.00000	0.80000	1.00000	1.00000	1.00000	1.00000
	0.80000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.92931	5.31967	0.29088	Equal Variances
Distribution	Shapiro-Wilk W	0.94107	0.88421	0.17937	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0360807	0.0360807	1	1.64	0.21423	Non-Significant Effect
Error	0.4852619	0.0220574	22			
Total	0.52134262	0.0581380	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-08	1.27897	1.71714	0.1071	0.10411	Non-Significant Effect

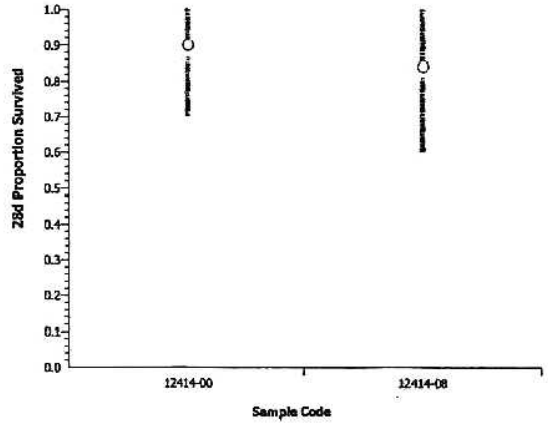
Data Summary

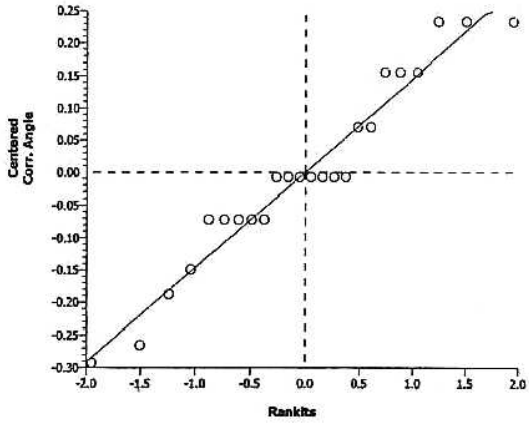
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-08	12	0.84167	0.60000	1.00000	0.12401	1.17893	0.88608	1.41202	0.17046

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-08	1.00000	1.00000	1.00000	0.90000	0.80000	0.80000	0.80000	0.80000	0.60000	0.90000
	0.70000	0.80000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.79612	5.31967	0.34575	Equal Variances
Distribution	Shapiro-Wilk W	0.94297	0.88421	0.19716	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0266382	0.0266382	1	1.27	0.27279	Non-Significant Effect
Error	0.4631991	0.0210545	22			
Total	0.48983731	0.0476927	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-09	1.12481	1.71714	0.1364	0.10172	Non-Significant Effect

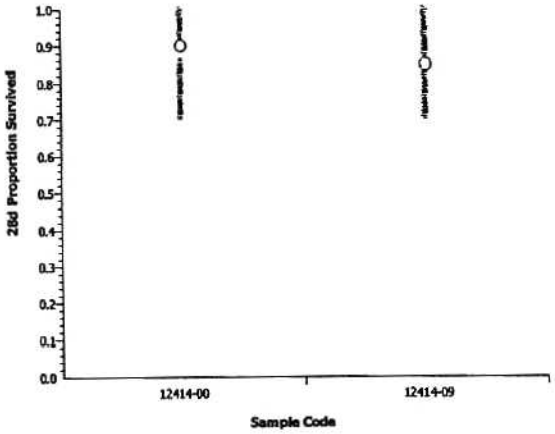
Data Summary

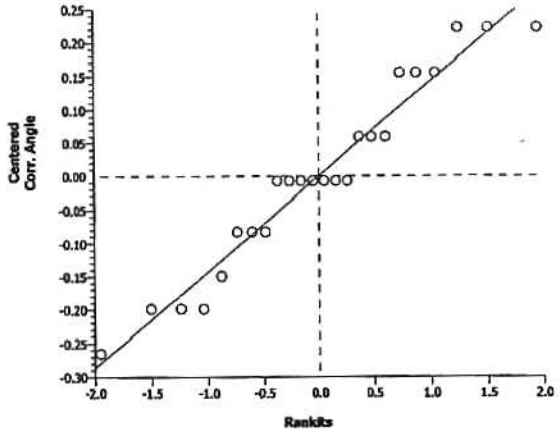
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-09	12	0.85000	0.70000	1.00000	0.11677	1.18984	0.99116	1.41202	0.16447

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-09	0.80000	1.00000	1.00000	0.90000	0.80000	0.70000	0.80000	0.90000	0.70000	1.00000
	0.70000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.23446	5.31967	0.19816	Equal Variances
Distribution	Shapiro-Wilk W	0.75498	0.88421	0.00002	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0348052	0.0348052	1	1.43	0.24464	Non-Significant Effect
Error	0.5358124	0.0243551	22			
Total	0.57061755	0.0591603	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-00		12414-10	38.5		0.9702	2	Non-Significant Effect

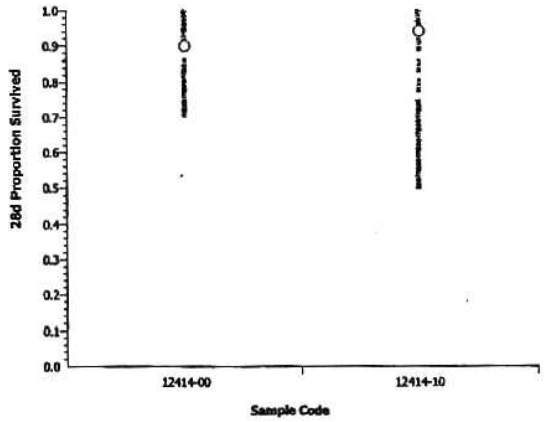
Data Summary

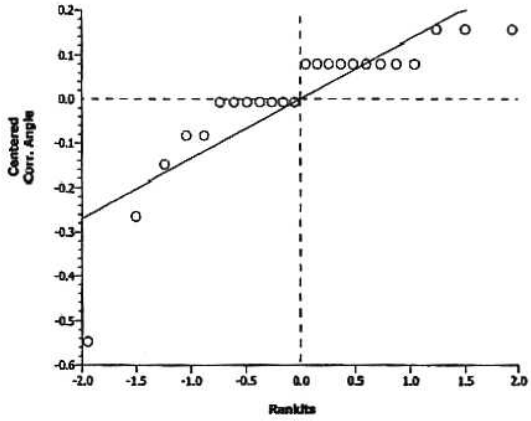
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	12	0.90000	0.70000	1.00000	0.08528	1.25647	0.99116	1.41202	0.12272
12414-10	12	0.94167	0.50000	1.00000	0.14434	1.33264	0.78540	1.41202	0.18344

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	1.00000	0.90000	0.90000	0.90000	0.70000	0.80000	0.90000	1.00000
	1.00000	0.90000								
12414-10	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.50000	1.00000	0.90000	1.00000
	1.00000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.13308	5.31967	0.83954	Equal Variances
Distribution	Shapiro-Wilk W	0.89435	0.88421	0.01667	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0020225	0.0020225	1	0.07	0.78980	Non-Significant Effect
Error	0.6111056	0.0277775	22			
Total	0.61312815	0.0298001	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-04	0.26984	1.71714	0.3949	0.11684	Non-Significant Effect

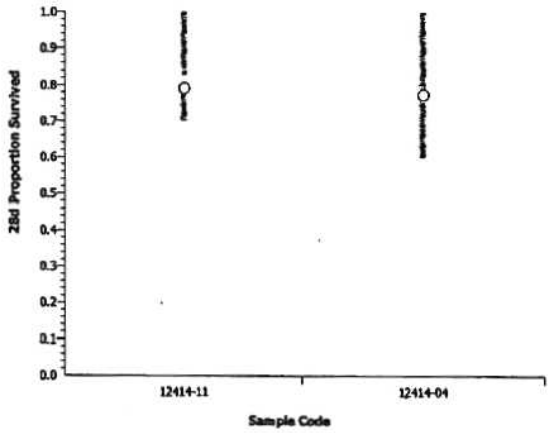
Data Summary

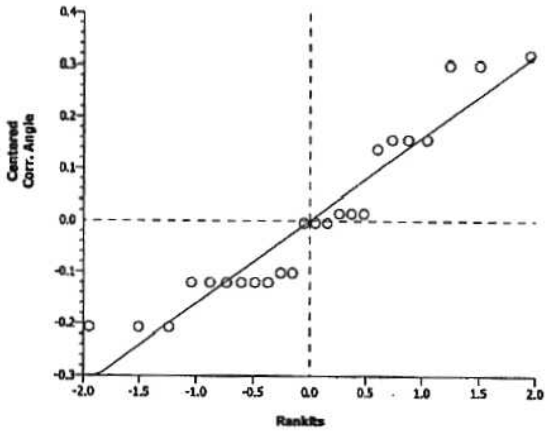
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-04	12	0.77500	0.60000	1.00000	0.13568	1.09343	0.88608	1.41202	0.17179

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-04	0.70000	0.80000	0.70000	0.90000	0.80000	1.00000	0.80000	0.60000	0.60000	0.60000
	0.90000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.09072	5.31967	0.23691	Equal Variances
Distribution	Shapiro-Wilk W	0.88932	0.88421	0.01293	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0403915	0.0403915	1	2.10	0.16158	Non-Significant Effect
Error	0.4235187	0.0192509	22			
Total	0.46391014	0.0596423	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-05	-1.4485	1.71714	0.9192	0.09726	Non-Significant Effect

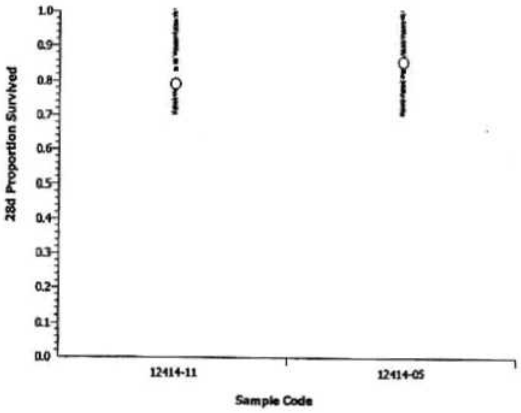
Data Summary

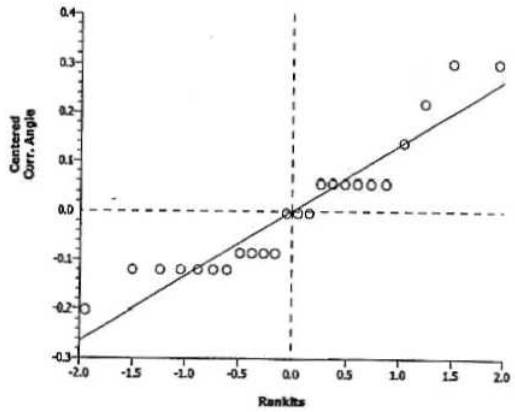
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-05	12	0.85833	0.70000	1.00000	0.07930	1.19384	0.99116	1.41202	0.11161

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-05	0.80000	0.90000	0.70000	0.90000	1.00000	0.80000	0.80000	0.90000	0.80000	0.90000
	0.90000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.25774	5.31967	0.71038	Equal Variances
Distribution	Shapiro-Wilk W	0.86525	0.88421	0.00389	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0569032	0.0569032	1	2.43	0.13298	Non-Significant Effect
Error	0.5142711	0.023376	22			
Total	0.57117438	0.0802792	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-11		12414-06	42		0.9556	4	Non-Significant Effect

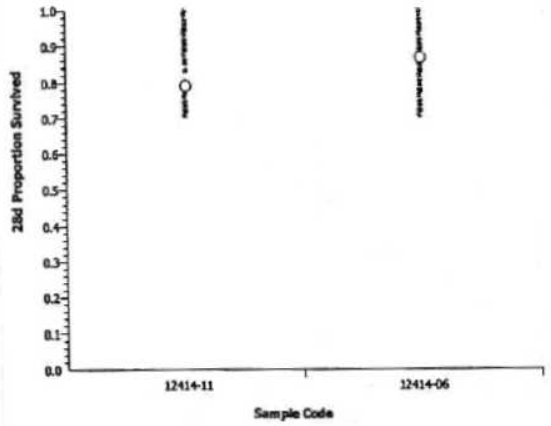
Data Summary

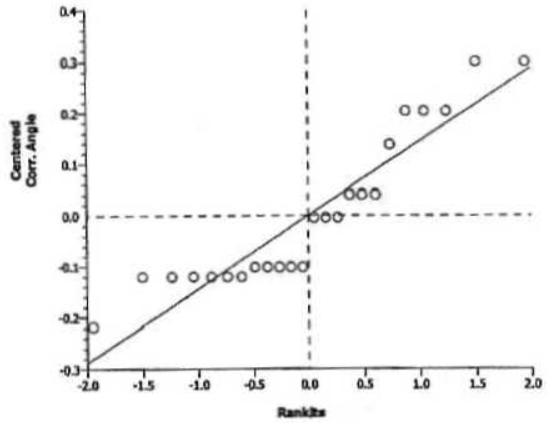
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-06	12	0.86667	0.70000	1.00000	0.09847	1.20917	0.99116	1.41202	0.14390

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-06	0.80000	1.00000	1.00000	0.90000	0.90000	0.80000	0.70000	0.80000	0.80000	0.90000
	1.00000	0.80000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:01 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.29375	5.31967	0.67672	Equal Variances
Distribution	Shapiro-Wilk W	0.93559	0.88421	0.13629	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1010474	0.1010474	1	3.38	0.07941	Non-Significant Effect
Error	0.657137	0.0298699	22			
Total	0.75818438	0.1309173	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-07	-1.8393	1.71714	0.9603	0.12116	Non-Significant Effect

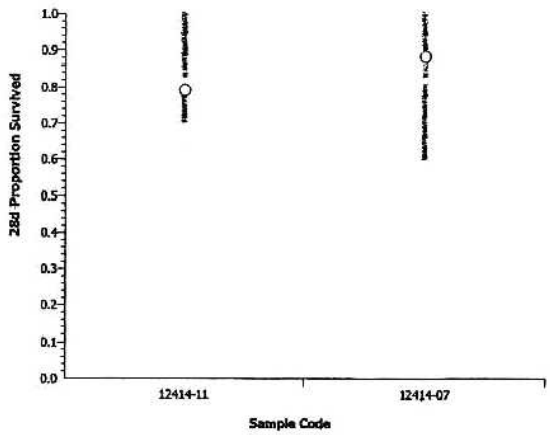
Data Summary

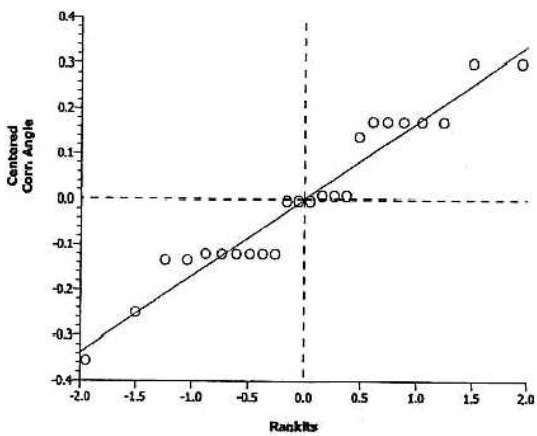
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-07	12	0.88333	0.60000	1.00000	0.13371	1.24156	0.88608	1.41202	0.18356

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-07	0.70000	0.90000	0.90000	0.60000	1.00000	0.80000	1.00000	1.00000	1.00000	1.00000
	0.80000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:02 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.11559	5.31967	0.85929	Equal Variances
Distribution	Shapiro-Wilk W	0.90458	0.88421	0.02803	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0270449	0.0270449	1	0.98	0.33256	Non-Significant Effect
Error	0.606094	0.0275497	22			
Total	0.63313890	0.0545946	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-08	-0.9908	1.71714	0.8337	0.11636	Non-Significant Effect

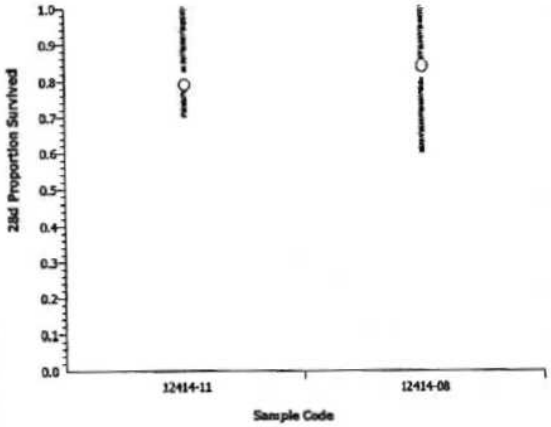
Data Summary

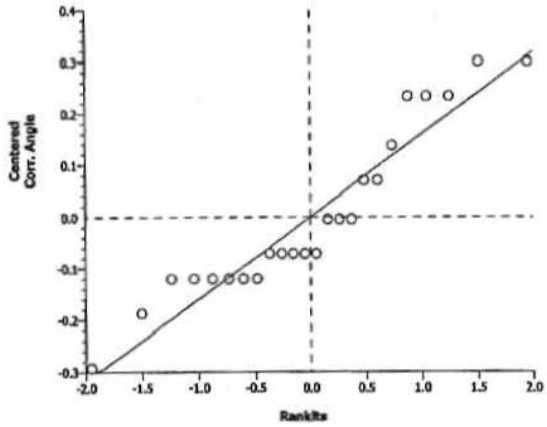
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-08	12	0.84167	0.60000	1.00000	0.12401	1.17893	0.88608	1.41202	0.17046

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-08	1.00000	1.00000	1.00000	0.90000	0.80000	0.80000	0.80000	0.80000	0.60000	0.90000
	0.70000	0.80000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:02 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.03858	5.31967	0.95107	Equal Variances
Distribution	Shapiro-Wilk W	0.89328	0.88421	0.01579	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0365538	0.0365538	1	1.38	0.25317	Non-Significant Effect
Error	0.5840312	0.0265469	22			
Total	0.620585	0.0631006	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-09	-1.1734	1.71714	0.8734	0.11422	Non-Significant Effect

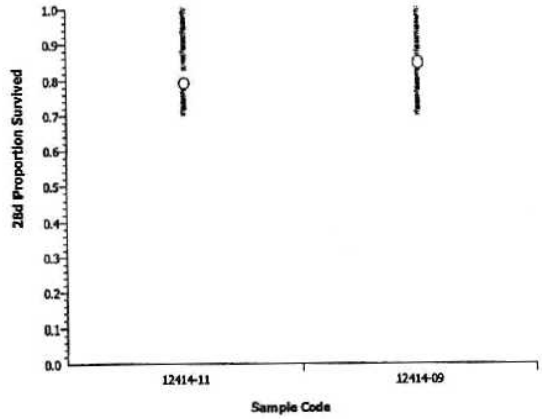
Data Summary

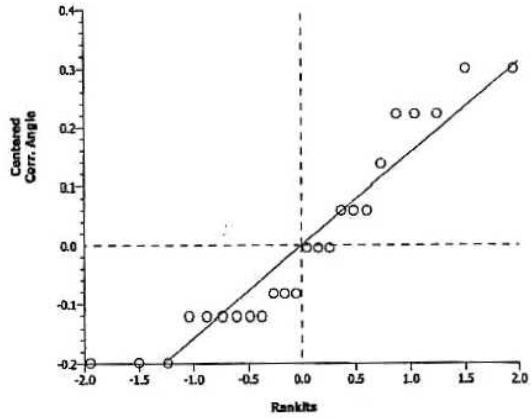
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-09	12	0.85000	0.70000	1.00000	0.11677	1.18984	0.99116	1.41202	0.16447

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-09	0.80000	1.00000	1.00000	0.90000	0.80000	0.70000	0.80000	0.90000	0.70000	1.00000
	0.70000	0.90000								

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:02 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.29203	5.31967	0.67829	Equal Variances
Distribution	Shapiro-Wilk W	0.85212	0.88421	0.00204	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2926419	0.2926419	1	9.80	0.00486	Significant Effect
Error	0.6566445	0.0298475	22			
Total	0.94928640	0.3224894	23			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-11		12414-10	26		0.9966	4	Non-Significant Effect

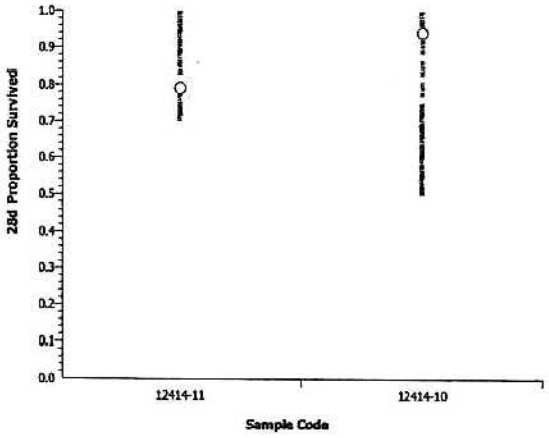
Data Summary

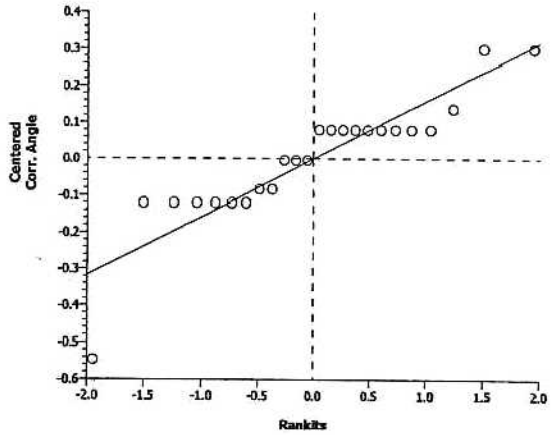
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	12	0.79167	0.70000	1.00000	0.11645	1.11179	0.99116	1.41202	0.16138
12414-10	12	0.94167	0.50000	1.00000	0.14434	1.33264	0.78540	1.41202	0.18344

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.80000	0.70000	0.80000	0.90000	0.70000	0.70000	1.00000	1.00000	0.70000	0.70000
	0.80000	0.70000								
12414-10	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.50000	1.00000	0.90000	1.00000
	1.00000	0.90000								

Graphics





STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head - CTO-122 Site 11/17
TASK: Hyalella azteca 42 Day Assay
DATA: Day 28 Dry Weight Data
START DATE: 09/01/04
END DATE: 09/29/04

Start Dry Weight: 0.024

Sample Site	ESI Ref	Rep	Tare Wt (Grams)	Final Wt (Grams)	Net Dry W	Number Recovered	Mean Dry Wt (mg)	Site Mean Dry Wt	Std Dev	CV	Normal Distribution	Homogeneous Variance	t Value	Critical t Value	p Value	Statistically Significant Difference	As Compared To
Lab Control	0	A	0.21236	0.21638	0.00402	9	0.447	0.389	0.0462	11.86%							-
	0	B	0.20938	0.21306	0.00368	9	0.409										-
	0	C	0.20783	0.21165	0.00382	10	0.382										
	0	D	0.20568	0.20856	0.00288	9	0.320										
IS11TX05	4	A	0.20784	0.21085	0.00301	7	0.430	0.342	0.0701	20.47%	Normal	Equal	0.9740	1.9432	0.1838	NO	Lab
	4	B	0.20999	0.21191	0.00192	8	0.240				Normal	Equal	-2.2124	1.9432	0.9655	NO	BGDTX05
	4	C	0.21005	0.21268	0.00263	7	0.376										
	4	D	0.20799	0.21090	0.00291	9	0.323										
IS11TX07	5	A	0.20957	0.21165	0.00208	8	0.260	0.311	0.0845	27.18%	Normal	Equal	1.4125	1.9432	0.1038	NO	Lab
	5	B	0.20616	0.20858	0.00242	9	0.269				Normal	Equal	-1.3043	1.9432	0.8800	NO	BGDTX05
	5	C	0.21250	0.21570	0.00320	7	0.457										
	5	D	0.20898	0.21130	0.00232	9	0.258										
IS11TX02	6	A	0.21159	0.21443	0.00284	8	0.355	0.368	0.0610	16.57%	Normal	Equal	0.4805	1.9432	0.3239	NO	Lab
	6	B	0.21358	0.21667	0.00309	10	0.309				Normal	Equal	-3.1062	1.9432	0.9895	NO	BGDTX05
	6	C	0.21086	0.21425	0.00339	10	0.339										
	6	D	0.20768	0.21191	0.00423	9	0.470										
IS11TX04	7	A	0.21026	0.21235	0.00209	7	0.299	0.360	0.0702	19.54%	Normal	Equal	0.6191	1.9432	0.2793	NO	Lab
	7	B	0.21019	0.21326	0.00307	9	0.341				Normal	Equal	-2.5972	1.9432	0.9796	NO	BGDTX05
	7	C	0.21429	0.21717	0.00288	9	0.320										
	7	D	0.21249	0.21536	0.00287	6	0.478										
IS11TX03	8	A	0.20644	0.20968	0.00324	10	0.324	0.300	0.0451	15.05%	Normal	Equal	2.3951	1.9432	0.0268	YES	Lab
	8	B	0.20896	0.21122	0.00226	10	0.226				Normal	Equal	-1.7522	1.9432	0.9349	NO	BGDTX05
	8	C	0.20857	0.21161	0.00304	10	0.304										
	8	D	0.20848	0.21159	0.00311	9	0.346										
IS11TX02	9	A	0.21088	0.21384	0.00296	8	0.370	0.320	0.0313	9.78%	Normal	Equal	2.15467	1.9432	0.0373	YES	Lab
	9	B	0.21108	0.21418	0.00310	10	0.310				Normal	Equal	-2.8772	1.9432	0.9859	NO	BGDTX05
	9	C	0.20913	0.21197	0.00284	10	0.284										
	9	D	0.20897	0.21181	0.00284	9	0.316										
IS17TX06	10	A	0.21097	0.21471	0.00374	10	0.374	0.367	0.0235	6.40%	Normal	Equal	0.7592	1.9432	0.2382	NO	Lab
	10	B	0.21040	0.21384	0.00344	10	0.344				Normal	Equal	-5.1352	1.9432	0.9989	NO	BGDTX05
	10	C	0.20866	0.21268	0.00402	10	0.402										
	10	D	0.20764	0.21111	0.00347	10	0.347										
BGDTX05	11	A	0.20726	0.20875	0.00149	8	0.186	0.242	0.0347	14.30%	Normal	Equal	4.4026	1.9432	0.0023	YES	Lab
	11	B	0.21045	0.21214	0.00169	7	0.241										
	11	C	0.20871	0.21091	0.00220	8	0.275										
	11	D	0.21176	0.21416	0.00240	9	0.267										

Hyalella azteca Sediment Evaluation

STUDY NUMBER: 12414 **CLIENT:** CH2M Hill

PROJECT: Indian Head **START DATE:** 9/1/04

	REP	TARE WEIGHT (G)	*H. azteca*+ FOIL (G)	NET WEIGHT (mg)	# *H. azteca*	MEAN DRY WEIGHT PER Individual (mg)
START ORGANISMS	A	0.20599	0.20627			
	B	0.20902	0.20924			
	C	0.20869	0.20893	see spreadsheet		
	D	0.20929	0.20949			
RECORDED BY:		[illegible]	[illegible]			
DATE:		9/2/04	9/3/04			

NOTES: Use 10 Amphipods per replicate to set start weight

STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head
TASK: Hyalella azteca 42 Day Assay
DATA: Day 0 Dry Weight Data
START DATE: 09/01/04

Sample Site	ESI Ref	Rep	Tare Wt (Grams)	Final Wt (Grams)	Net Dry Wt (Grams)	Number Weighed	Mean Dry Wt (mg)	Site Mean Dry Wt	Std Dev	CV
Lab	0	A	0.20599	0.20627	0.00028	10	0.028	0.024	0.0034	14.53%
	0	B	0.20902	0.20924	0.00022	10	0.022			
	0	C	0.20869	0.20893	0.00024	10	0.024			
	0	D	0.20929	0.20949	0.00020	10	0.020			

H.azteca DRY WEIGHTS

CLIENT: CH2M Hill

TEST END DATE: 09/29/04

STUDY #: 12414

SPECIES: *H. azteca*

CONC	REP	TARE WT (g)	*H. azteca* + FOIL(g)
LAB	A	0.21236	0.21638
	B	0.20938	0.21306
	C	0.20783	0.21165
	D	0.20568	0.20856
1	A	0.20915	0.21189
	B	0.20604	0.20788
	C	0.21288	0.21493
	D	0.21085	0.21230
2	A	0.20596	0.20729
	B	0.20617	0.20783
	C	0.21057	0.21097
	D	0.20942	0.21035
3	A	0.21201	0.21410
	B	0.21180	0.21496
	C	0.21053	0.21304
	D	0.21012	0.21251
4	A	0.20784	0.21085
	B	0.20999	0.21191
	C	0.21005	0.21268
	D	0.20799	0.21090
5	A	0.20957	0.21165
	B	0.20616	0.20858
	C	0.21250	0.21570
	D	0.20898	0.21130
6	A	0.21159	0.21443
	B	0.21358	0.21667
	C	0.21086	0.21425
	D	0.20768	0.21191
7	A	0.21026	0.21235
	B	0.21019	0.21326
	C	0.21429	0.21717
	D	0.21249	0.21536
DATE:		9/29/04	9/30/04
TIME:		1035	0950
INIT:		[illegible]	[illegible]

H.azteca DRY WEIGHTS

CLIENT: CH2M Hill TEST END DATE: 09/29/04

STUDY #: 12414 SPECIES: *H. azteca*

CONC	REP	TARE WT (g)	*H. azteca* + FOIL(g)
8	A	0.20644	0.20968
	B	0.20896	0.21122
	C	0.20857	0.21161
	D	0.20848	0.21159
9	A	0.21088	0.21384
	B	0.21108	0.21418
	C	0.20913	0.21197
	D	0.20897	0.21181
10	A	0.21097	0.21471
	B	0.21040	0.21384
	C	0.20866	0.21268
	D	0.20764	0.21111
11	A	0.20726	0.20875
	B	0.21045	0.21214
	C	0.20871	0.21091
	D	0.21176	0.21416
	A		
	B		
	C		
	D		
	A		
	B		
	C		
	D		
	A		
	B		
	C		
	D		
	A		
	B		
	C		
	D		

DATE:	9/29/04	9/30/04
TIME:	1035	0950
INIT:	✓	✓

CETIS Test Summary

Report Date: 22 Oct-04 11:10 PM
Link: 01-6544-1101

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Test No:	12-4416-9497	**Test Type:**	Hyalella (42d)	**Duration:**	43d 0h
Start Date:	01 Sep-04 12:00 PM	**Protocol:**	EPA/600/R-99/064 (2000)	**Species:**	Hyalella azteca
Ending Date:	14 Oct-04 12:00 PM	**Dil Water:**	50/50 Mix of Surface Water and MHR	**Source:**	Aquatic Research Organisms, NH
Setup Date:	01 Sep-04 12:00 PM	**Brine:**	Not Applicable		

Sample No:	06-0771-3563	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	01 Sep-04	**Code:**	12414-00	**Project:**	Ecologcal Risk Assessment
Receive Date:	01 Sep-04	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	12h (4 °C)	**Station:**	Lab Control -00		
Sample No:	03-7896-9779	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 11:00 AM	**Code:**	12414-04	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 1h (4 °C)	**Station:**	IS11TX05 12414-04		
Sample No:	16-1142-2769	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 12:00 PM	**Code:**	12414-05	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 0h (4 °C)	**Station:**	IS11TX07 12414-05		
Sample No:	19-4503-7964	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 02:50 PM	**Code:**	12414-06	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 21h (4 °C)	**Station:**	IS17TX02 12414-06		
Sample No:	07-7263-2686	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:00 AM	**Code:**	12414-07	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 2h (4 °C)	**Station:**	IS11TX04 12414-07		
Sample No:	09-3049-9344	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:40 AM	**Code:**	12414-08	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 1h (4 °C)	**Station:**	IS11TX03 12414-08		
Sample No:	06-0576-7762	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 11:35 AM	**Code:**	12414-09	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 0h (4 °C)	**Station:**	IS11TX02 12414-09		
Sample No:	07-9383-1931	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 12:40 PM	**Code:**	12414-10	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 23h (4 °C)	**Station:**	IS17TX06 12414-10		
Sample No:	08-0384-6290	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	13 Aug-04	**Code:**	12414-11	**Project:**	Ecologcal Risk Assessment
Receive Date:	14 Aug-04 10:20 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 12h (4 °C)	**Station:**	BGDTX05 12414-11		

CETIS Test Summary

Report Date: 22 Oct-04 11:10 PM
Link: 01-6544-1101

28d Mean Dry Weight Summary

Sample Code	Reps	Mean	Minimum	Maximum	SE	SD	CV
12414-00	12	0.38950	0.32000	0.44700	0.02673	0.05346	13.72%
12414-11	12	0.24225	0.18600	0.27500	0.02011	0.04021	16.60%
12414-04	12	0.34225	0.24000	0.43000	0.04048	0.08096	23.66%
12414-05	12	0.31100	0.25800	0.45700	0.04873	0.09745	31.33%
12414-06	12	0.36825	0.30900	0.47000	0.03523	0.07046	19.13%
12414-07	12	0.35950	0.29900	0.47800	0.04042	0.08084	22.49%
12414-08	12	0.30000	0.22600	0.34600	0.02612	0.05223	17.41%
12414-09	12	0.32000	0.28400	0.37000	0.01806	0.03611	11.28%
12414-10	12	0.36675	0.34400	0.40200	0.01355	0.02710	7.39%

28d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-11	0.18600	0.24100	0.27500	0.26700	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-04	0.43000	0.24000	0.37600	0.32300	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-05	0.26000	0.26900	0.45700	0.25800	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-06	0.35500	0.30900	0.33900	0.47000	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-07	0.29900	0.34100	0.32000	0.47800	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-08	0.32400	0.22600	0.30400	0.34600	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-09	0.37000	0.31000	0.28400	0.31600	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-10	0.37400	0.34400	0.40200	0.34700	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.76736	47.46723	0.65152	Equal Variances
Distribution	Shapiro-Wilk W	0.93122	0.74935	0.49258	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0433651	0.0433651	1	19.38	0.00456	Significant Effect
Error	0.0134238	0.0022373	6			
Total	0.05678887	0.0456024	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-11	4.4026	1.94318	0.0023	0.06499	Significant Effect

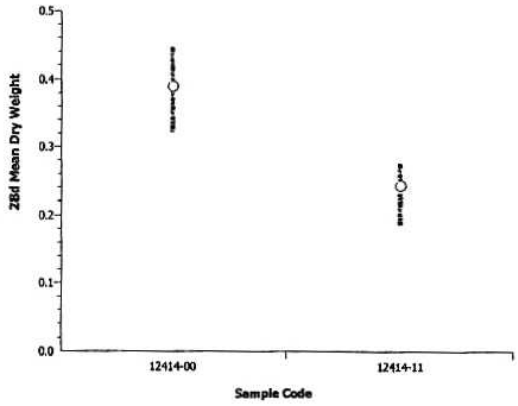
Data Summary

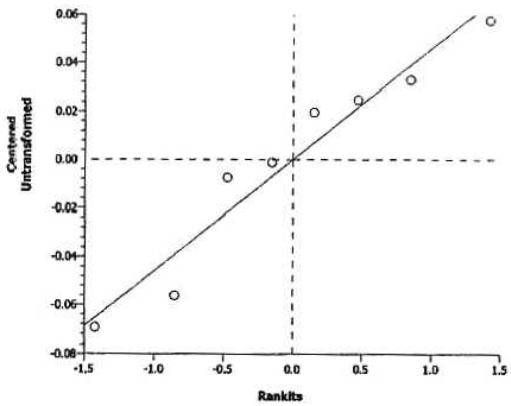
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-11	4	0.24225	0.18600	0.27500	0.04021				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-11	0.18600	0.24100	0.27500	0.26700						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.29380	47.46723	0.51305	Equal Variances
Distribution	Shapiro-Wilk W	0.97496	0.74935	0.92469	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0044651	0.0044651	1	0.95	0.36765	Non-Significant Effect
Error	0.0282378	0.0047063	6			
Total	0.03270288	0.0091714	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-04	0.97404	1.94318	0.1838	0.09426	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-04	4	0.34225	0.24000	0.43000	0.08096				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-04	0.43000	0.24000	0.37600	0.32300						

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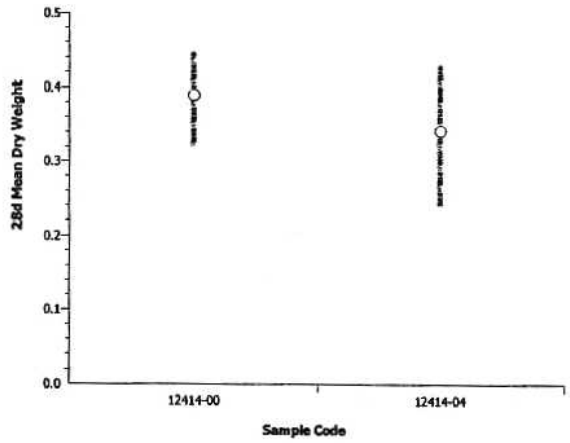

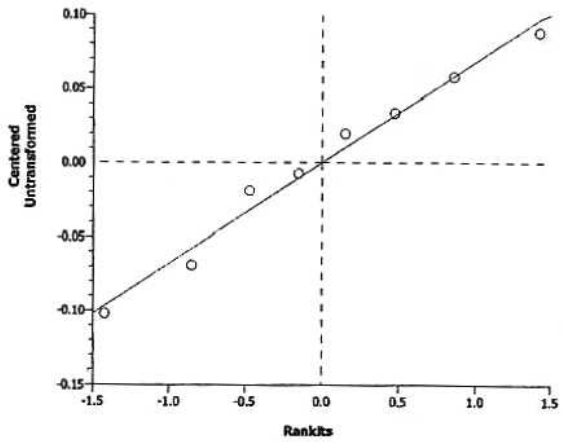

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.32322	47.46723	0.35031	Equal Variances
Distribution	Shapiro-Wilk W	0.87037	0.74935	0.15109	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0123245	0.0123245	1	2.00	0.20751	Non-Significant Effect
Error	0.037063	0.0061772	6			
Total	0.04938750	0.0185017	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-05	1.41251	1.94318	0.1038	0.10799	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-05	4	0.31100	0.25800	0.45700	0.09745				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-05	0.26000	0.26900	0.45700	0.25800						

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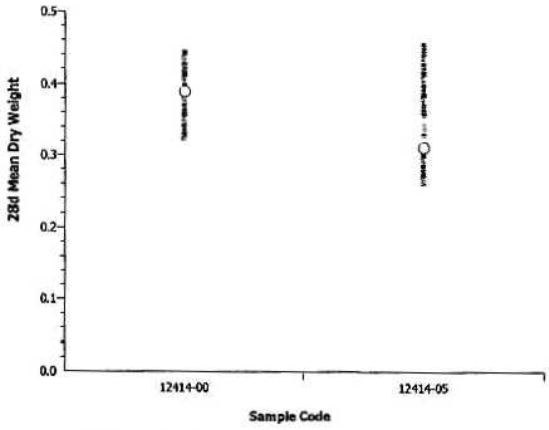

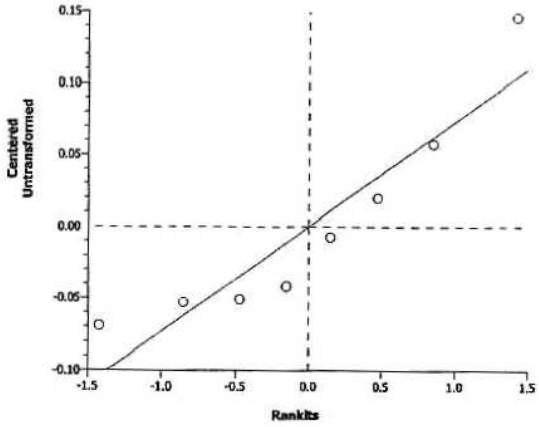

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.73740	47.46723	0.66121	Equal Variances
Distribution	Shapiro-Wilk W	0.95111	0.74935	0.68692	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0009031	0.0009031	1	0.23	0.64787	Non-Significant Effect
Error	0.0234678	0.0039113	6			
Total	0.02437088	0.0048144	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-06	0.48052	1.94318	0.3239	0.08593	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-06	4	0.36825	0.30900	0.47000	0.07046				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-06	0.35500	0.30900	0.33900	0.47000						

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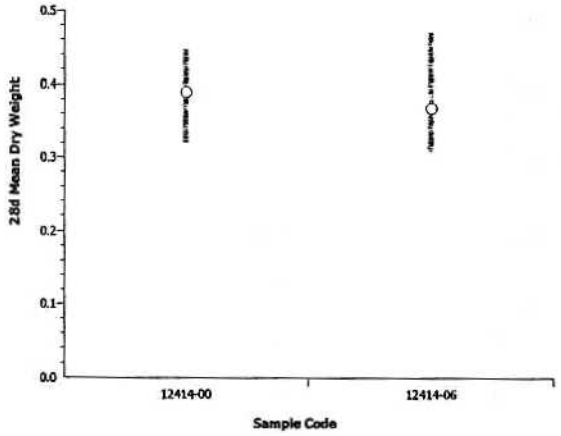

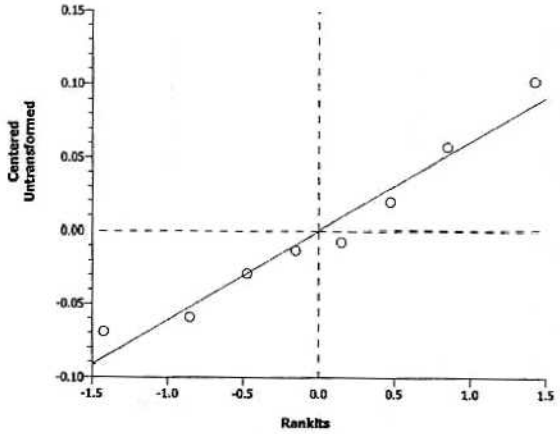

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.28683	47.46723	0.51456	Equal Variances
Distribution	Shapiro-Wilk W	0.93152	0.74935	0.49526	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0018000	0.0018000	1	0.38	0.55861	Non-Significant Effect
Error	0.028178	0.0046963	6			
Total	0.029978	0.0064963	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-07	0.61909	1.94318	0.2793	0.09416	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-07	4	0.35950	0.29900	0.47800	0.08084				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-07	0.29900	0.34100	0.32000	0.47800						

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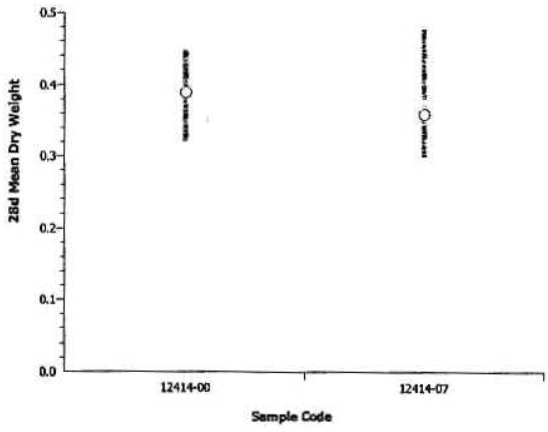

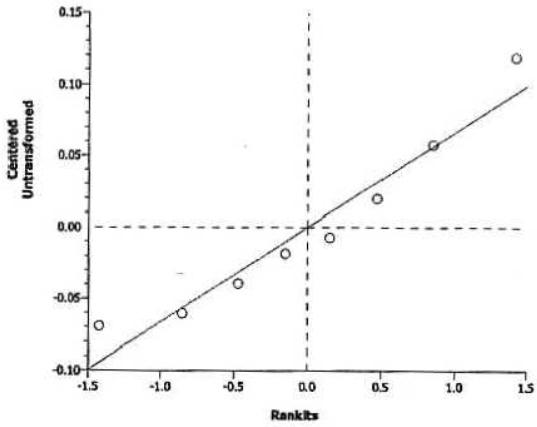

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.04753	47.46723	0.97045	Equal Variances
Distribution	Shapiro-Wilk W	0.89535	0.74935	0.24992	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0160205	0.0160205	1	5.74	0.05366	Non-Significant Effect
Error	0.016757	0.0027928	6			
Total	0.03277750	0.0188133	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-08	2.39506	1.94318	0.0268	0.07261	Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-08	4	0.30000	0.22600	0.34600	0.05223				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-08	0.32400	0.22600	0.30400	0.34600						

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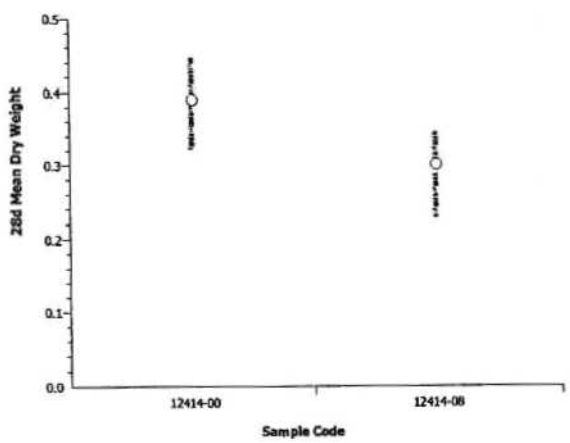

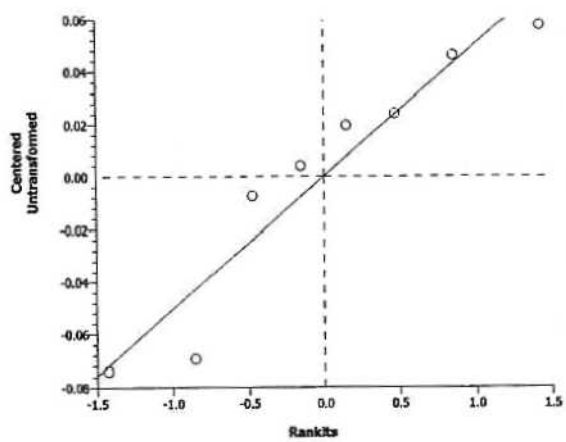

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.19146	47.46723	0.53595	Equal Variances
Distribution	Shapiro-Wilk W	0.95878	0.74935	0.76843	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0096605	0.0096605	1	4.64	0.07462	Non-Significant Effect
Error	0.012485	0.0020808	6			
Total	0.0221455	0.0117413	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-09	2.15467	1.94318	0.0373	0.06268	Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-09	4	0.32000	0.28400	0.37000	0.03611				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-09	0.37000	0.31000	0.28400	0.31600						

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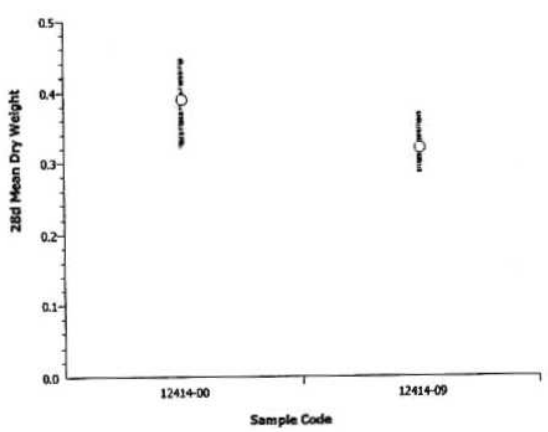

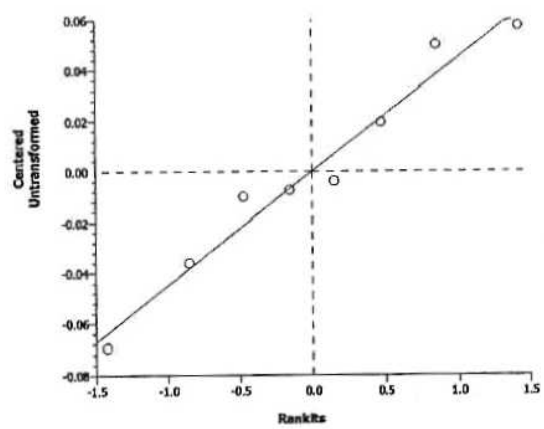

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.89195	47.46723	0.29379	Equal Variances
Distribution	Shapiro-Wilk W	0.98224	0.74935	0.97211	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0010351	0.0010351	1	0.58	0.47650	Non-Significant Effect
Error	0.0107758	0.001796	6			
Total	0.01181088	0.0028311	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-10	0.75919	1.94318	0.2382	0.05823	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	4	0.38950	0.32000	0.44700	0.05346				
12414-10	4	0.36675	0.34400	0.40200	0.02710				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.44700	0.40900	0.38200	0.32000						
12414-10	0.37400	0.34400	0.40200	0.34700						

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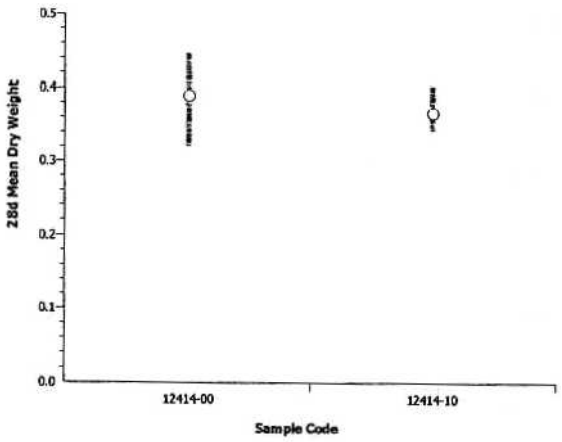
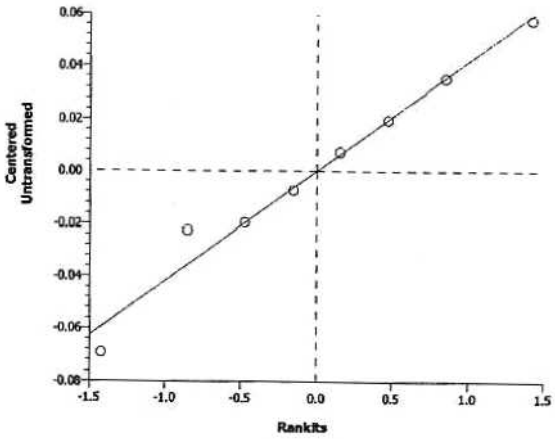




CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:03 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	4.05396	47.46723	0.28042	Equal Variances
Distribution	Shapiro-Wilk W	0.96721	0.74935	0.85534	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.02	0.02	1	4.89	0.06891	Non-Significant Effect
Error	0.0245155	0.0040859	6			
Total	0.04451550	0.0240859	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-04	-2.2124	1.94318	0.9655	0.08783	Non-Significant Effect

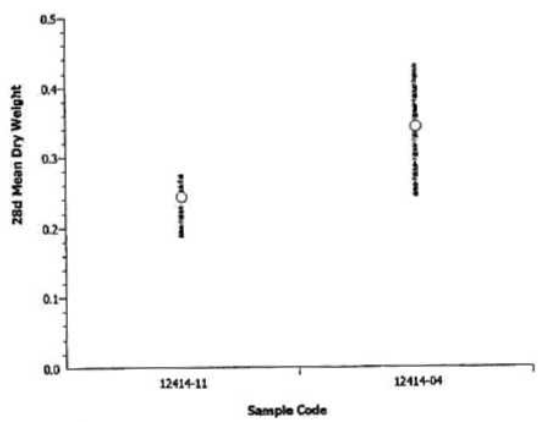
Data Summary

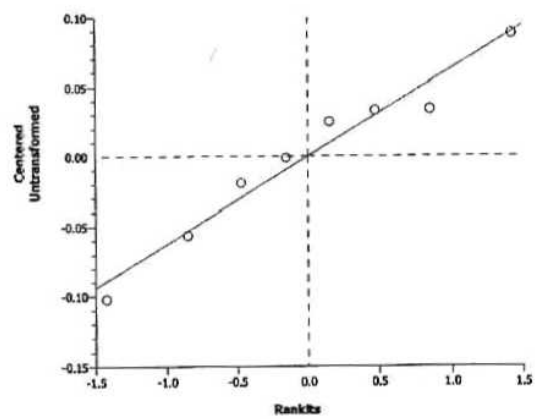
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-04	4	0.34225	0.24000	0.43000	0.08096				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-04	0.43000	0.24000	0.37600	0.32300						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	5.87332	47.46723	0.17997	Equal Variances
Distribution	Shapiro-Wilk W	0.81679	0.74935	0.04834	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0094531	0.0094531	1	1.70	0.23993	Non-Significant Effect
Error	0.0333408	0.0055568	6			
Total	0.04279387	0.0150099	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-05	-1.3043	1.94318	0.8800	0.10243	Non-Significant Effect

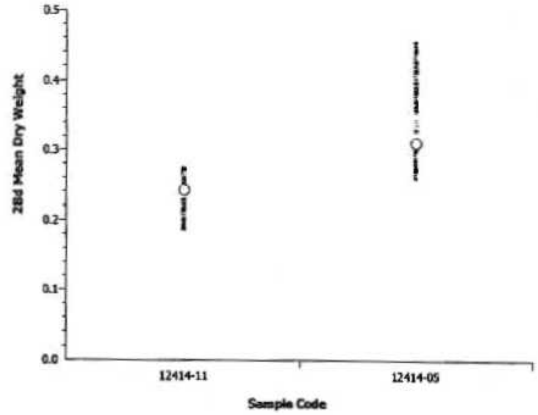
Data Summary

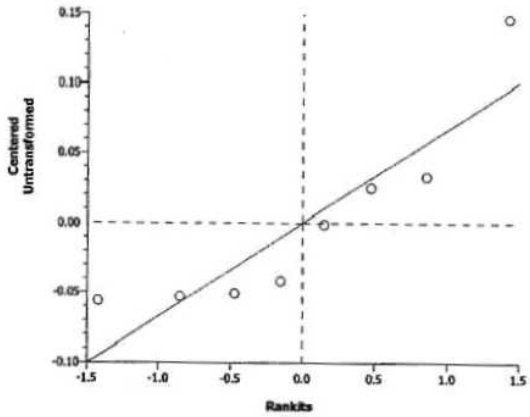
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-05	4	0.31100	0.25800	0.45700	0.09745				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-05	0.26000	0.26900	0.45700	0.25800						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.07061	47.46723	0.38147	Equal Variances
Distribution	Shapiro-Wilk W	0.93235	0.74935	0.50257	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.031752	0.031752	1	9.65	0.02095	Significant Effect
Error	0.0197455	0.0032909	6			
Total	0.0514975	0.0350429	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-06	-3.1062	1.94318	0.9895	0.07882	Non-Significant Effect

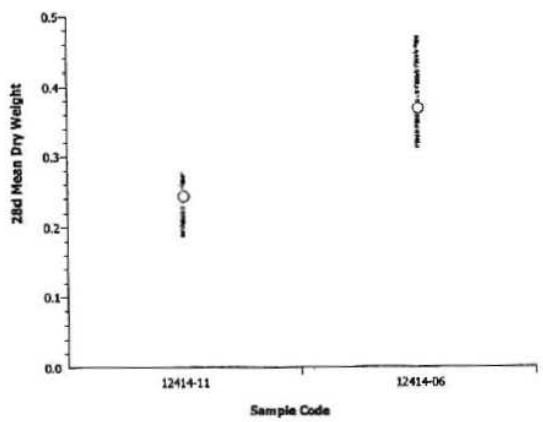
Data Summary

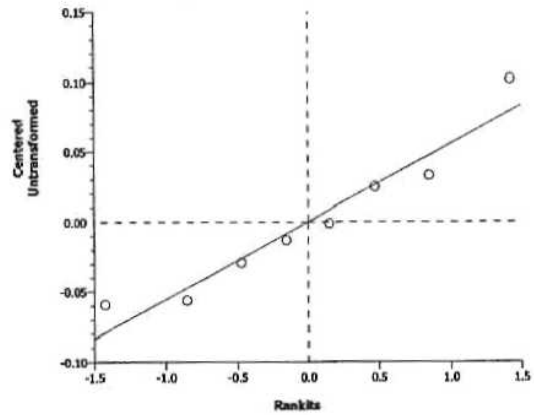
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-06	4	0.36825	0.30900	0.47000	0.07046				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-06	0.35500	0.30900	0.33900	0.47000						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	4.04164	47.46723	0.28140	Equal Variances
Distribution	Shapiro-Wilk W	0.90363	0.74935	0.29394	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0274951	0.0274951	1	6.75	0.04081	Significant Effect
Error	0.0244558	0.004076	6			
Total	0.05195087	0.0315711	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-07	-2.5972	1.94318	0.9796	0.08772	Non-Significant Effect

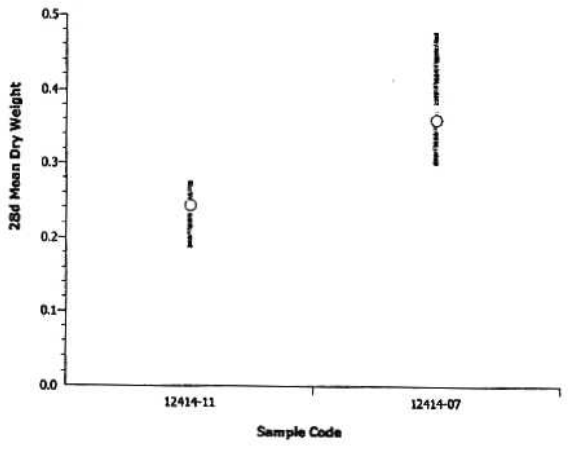
Data Summary

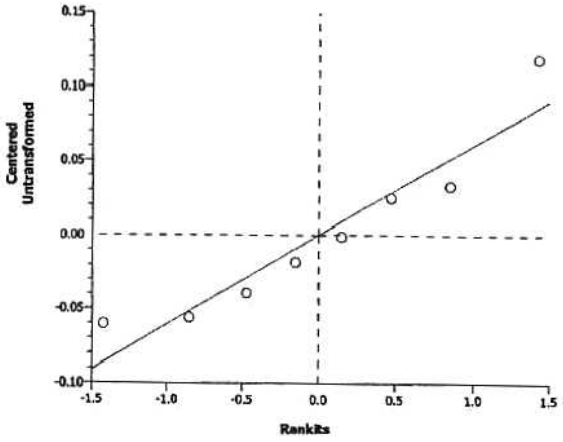
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-07	4	0.35950	0.29900	0.47800	0.08084				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-07	0.29900	0.34100	0.32000	0.47800						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.68716	47.46723	0.67799	Equal Variances
Distribution	Shapiro-Wilk W	0.86913	0.74935	0.14730	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0066701	0.0066701	1	3.07	0.13029	Non-Significant Effect
Error	0.0130348	0.0021725	6			
Total	0.01970487	0.0088426	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-08	-1.7522	1.94318	0.9349	0.06404	Non-Significant Effect

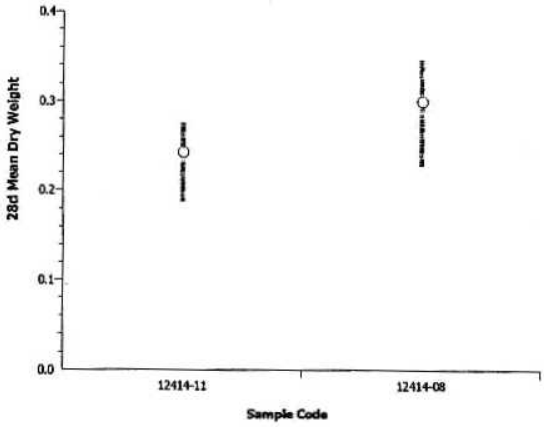
Data Summary

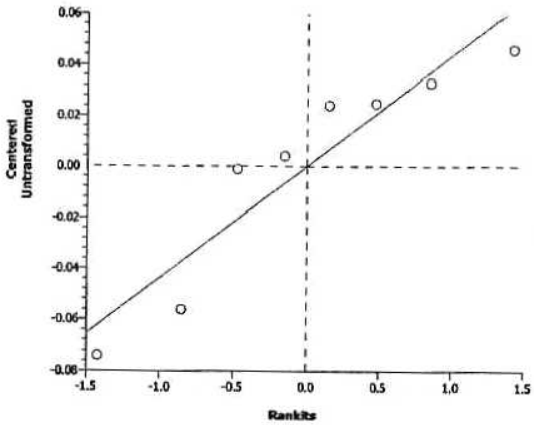
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-08	4	0.30000	0.22600	0.34600	0.05223				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-08	0.32400	0.22600	0.30400	0.34600						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.23997	47.46723	0.86386	Equal Variances
Distribution	Shapiro-Wilk W	0.97150	0.74935	0.89561	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0120901	0.0120901	1	8.28	0.02816	Significant Effect
Error	0.0087627	0.0014605	6			
Total	0.02085288	0.0135506	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-09	-2.8772	1.94318	0.9859	0.05251	Non-Significant Effect

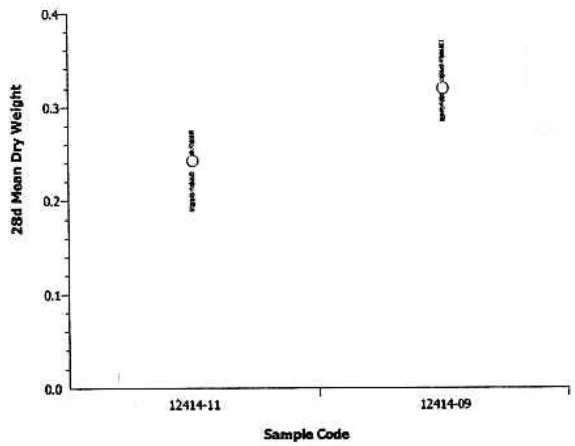
Data Summary

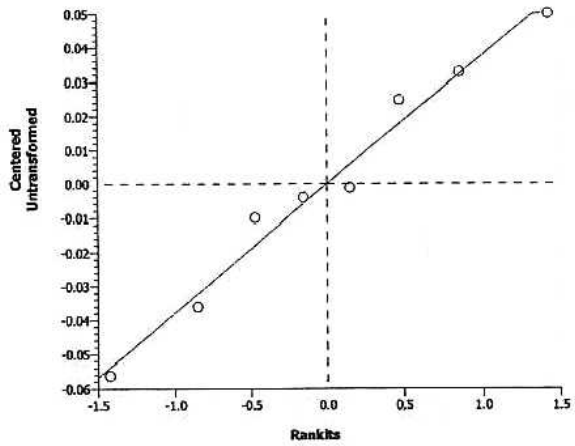
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-09	4	0.32000	0.28400	0.37000	0.03611				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-09	0.37000	0.31000	0.28400	0.31600						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
28d Mean Dry Weight	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:04 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.20213	47.46723	0.53348	Equal Variances
Distribution	Shapiro-Wilk W	0.93407	0.74935	0.51803	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0310005	0.0310005	1	26.37	0.00215	Significant Effect
Error	0.0070535	0.0011756	6			
Total	0.03805400	0.0321761	7			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-10	-5.1352	1.94318	0.9989	0.04711	Non-Significant Effect

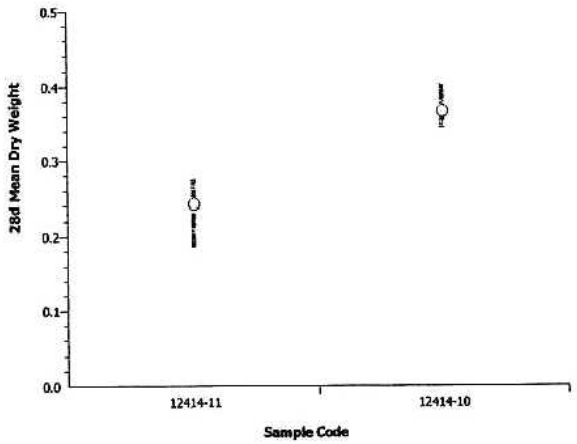
Data Summary

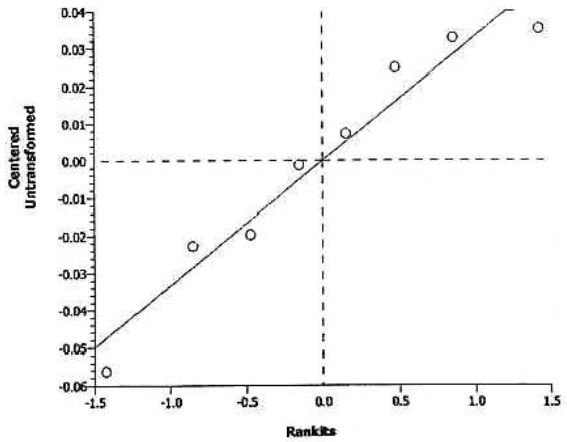
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	4	0.24225	0.18600	0.27500	0.04021				
12414-10	4	0.36675	0.34400	0.40200	0.02710				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.18600	0.24100	0.27500	0.26700						
12414-10	0.37400	0.34400	0.40200	0.34700						

Graphics





STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head - CTO-122 Site 11/17
TASK: Hyalella azteca 42 Day Assay
DATA: Day 35 Survival
START DATE: 09/01/04
END DATE: 10/06/04

Sample Site	ESI Ref	Rep	Number Recovered	Percent Recovery	Mean		Normal Distribution	Homogeneous Variance	t Value	Critical t Value	p Value	Significant Difference	Compared To	
Lab	0	E	9	90%	86.3%	Day 35								
	0	F	9	90%										
	0	G	7	70%										
	0	H	8	80%										
	0	I	8	80%										
	0	J	10	100%										
	0	K	9	90%										
	0	L	9	90%										
IS11TX05	4	E	8	80%	73.8%	Day 35	Normal	Equal	1.87512	1.76131	0.0409	YES	LAB	Mann-Whi
	4	F	9	90%			Normal	Equal	-0.6623	1.7613	0.7407	NO	BGDTX05	
	4	G	7	70%										
	4	H	5	50%										
	4	I	6	60%										
	4	J	6	60%										
	4	K	9	90%										
	4	L	9	90%										
IS11TX07	5	E	10	100%	82.5%	Day 35	Normal	Equal	0.4436	1.7613	0.3321	NO	LAB	
	5	F	8	80%			Normal	Equal	-1.4231	1.7613	0.9117	NO	BGDTX05	
	5	G	8	80%										
	5	H	10	100%										
	5	I	6	60%										
	5	J	9	90%										
	5	K	6	60%										
	5	L	9	90%										
IS11TX02	6	E	8	80%	77.5%	Day 35	Normal	Equal	1.5953	1.7613	0.0665	NO	LAB	
	6	F	8	80%			Non-normal	Equal	24.0000		0.7791	NO	BGDTX05	Mann-Whi
	6	G	7	70%										
	6	H	6	60%										
	6	I	7	70%										
	6	J	8	80%										
	6	K	10	100%										
	6	L	8	80%										
IS11TX04	7	E	7	70%	86.3%	Day 35	Normal	Equal	-0.1066	1.7613	0.5417	NO	LAB	
	7	F	8	80%			Normal	Equal	-1.7857	1.7613	0.9521	NO	BGDTX05	
	7	G	10	100%										
	7	H	10	100%										
	7	I	10	100%										
	7	J	8	80%										
	7	K	7	70%										
	7	L	9	90%										
IS11TX03	8	E	7	70%	72.5%	Day 35	Normal	Equal	3.1260	1.7613	0.0037	YES	LAB	
	8	F	8	80%			Non-normal	Unequal	30.0000		0.5608	NO	BGDTX05	Mann-Whi
	8	G	7	70%										

	8	H	8	80%									
	8	I	6	60%									
	8	J	8	80%									
	8	K	6	60%									
	8	L	8	80%									
IS11TX02	9	E	7	70%	71.8%	Day 35	Normal	Equal	1.9396	1.7613	0.0364	YES	LAB
	9	F	6	55%			Normal	Equal	-0.5671	1.7613	0.7102	NO	BGDTX05
	9	G	6	60%									
	9	H	8	80%									
	9	I	6	60%									
	9	J	10	100%									
	9	K	6	60%									
	9	L	9	90%									
IS17TX06	10	E	8	80%	80.0%	Day 35	Non-normal	Equal	1.0514	1.7613	0.1554	NO	LAB
	10	F	9	90%			Non-normal	Equal	19.5000		0.8828	NO	BGDTX05 Mann-Whi
	10	G	5	50%									
	10	H	8	80%									
	10	I	9	90%									
	10	J	9	90%									
	10	K	7	70%									
	10	L	9	90%									
BGDTX05	11	E	0	0%	66.3%	Day 35	Non-normal	Equal	51.0000		0.0249	YES	LAB
	11	F	6	60%									
	11	G	10	100%									
	11	H	7	70%									
	11	I	7	70%									
	11	J	8	80%									
	11	K	8	80%									
	11	L	7	70%									

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
Lab E	0945	9	III 3	
F		9	~~IIII~~ ~~IIII~~ 10	
G		7	0	
H		8	I 1	
I		8	~~IIII~~ 5	
J		10	~~IIII~~ IIII 9	
K		9	~~IIII~~ II ~~IIII~~ ~~IIII~~ 17	
L	1020	9	~~IIII~~ II 7	
-1 A	1030	9	~~IIII~~ II ~~IIII~~ ~~IIII~~ 17	
F		7	II 2	
G		8	III 3	
H		9	~~IIII~~ ~~IIII~~ ~~IIIII~~ 17	
I		9	IIII 4	
J		4	0	
K		7	IIII 4	
L	1055	7	0	

ANALYST: BB
DATE: 10/6/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
-2 E	1100	5	0	
F		5	0	
G		4	0	
H		6	0	
I		9	0	
J		5	0	
K		5	0	
L	1120	8	2	
-3 E	1125	8	0	
F		8	0	
G		9	~~IIII~~ III 8	
H		7	0	
I		9	III 4	
J		9	~~IIII~~ ~~IIII~~ I 11	
K		8	~~IIII~~ II 7	
L	1145	8	I 1	

ANALYST: BB
DATE: 10/6/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
-4 E	1145	8	III 3	
F		9	III 3	
G		7	0	
H		5	0	
I		6	III 3	
J		6	~~IIII~~ III 8	
K		9	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ 20	
L	1210	9	~~IIII~~ 5	
-5 E	1215	10	~~IIII~~ I 6	
F		8	I 1	
G		8	IIII 4	
H		10	~~IIII~~ 5	
I		6	III 3	
J		9	II 2	
K		6	III 3	
L	1240	9	III 3	

ANALYST: BB
DATE: 10/6/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
-6 E	1326	8	0	
F		8	III 3	
G		7	~~IIII~~ ~~IIII~~ ~~IIII~~ 15	
H		6	~~IIII~~ I 6	
I		7	~~IIII~~ ~~IIII~~ ~~IIII~~ I ~~IIII~~ 21	
J		8	5	
K		10	~~IIII~~ IIII 9	
L	1345	~~7~~ E3 8	0	
-7 E		7	4	
F		8	~~IIII~~ ~~IIII~~ III 13	
G		10	5	
H		10	3	
I		10	3	
J		8	0	
K		7	3	
L	1400	9	6	

ANALYST: BB
DATE: 10/6/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
8 E	1405	7	8	
F		8	5	
G		7	4	
H		8	0	
I		6	0	
J		8	5	
K		~~8~~ E3 6	0	
L	1420	8	4	
9 E	1425	7	4	
F		6	9	
G		6	2	
H		8	5	
I		6	2	
J		10	11	
K		6	3	
L	1445	9	10	

ANALYST: BB
DATE: 10/6/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 35:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	COMMENTS
-10 E	1445	~~9~~ E3 8	~~0~~ E3 2	
F		9	5	
G		5	4	
H		8	0	
I		~~8~~ 9 E3	0	
J		E3 ~~8~~ 9	5	
K		7	8	
L	1505	9	0	
-11 E	1515	0	0	
F		6	9	
G		10	0	
H		7	2	
I		7	8	
J		~~7~~ E3 8	~~11~~ 11	
K		8	5	
L	1530	7	10	

ANALYST: BB
DATE: 10/6/04

CETIS Test Summary

Report Date: 23 Oct-04 11:37 PM
Link: 01-6544-1101

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Test No:	12-4416-9497	Test Type:	Hyalella (42d)	Duration:	43d 0h
Start Date:	01 Sep-04 12:00 PM	Protocol:	EPA/600/R-99/064 (2000)	Species:	Hyalella azteca
Ending Date:	14 Oct-04 12:00 PM	Dil Water:	50/50 Mix of Surface Water and MHR	Source:	Aquatic Research Organisms, NH
Setup Date:	01 Sep-04 12:00 PM	Brine:	Not Applicable		

Sample No:	06-0771-3563	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	01 Sep-04	Code:	12414-00	Project:	Ecologcal Risk Assessment
Receive Date:	01 Sep-04	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	12h (4 °C)	Station:	Lab Control -00		
Sample No:	03-7896-9779	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	11 Aug-04 11:00 AM	Code:	12414-04	Project:	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 1h (4 °C)	Station:	IS11TX05 12414-04		
Sample No:	16-1142-2769	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	11 Aug-04 12:00 PM	Code:	12414-05	Project:	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 0h (4 °C)	Station:	IS11TX07 12414-05		
Sample No:	19-4503-7964	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 02:50 PM	Code:	12414-06	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 21h (4 °C)	Station:	IS17TX02 12414-06		
Sample No:	07-7263-2686	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 10:00 AM	Code:	12414-07	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 2h (4 °C)	Station:	IS11TX04 12414-07		
Sample No:	09-3049-9344	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 10:40 AM	Code:	12414-08	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 1h (4 °C)	Station:	IS11TX03 12414-08		
Sample No:	06-0576-7762	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 11:35 AM	Code:	12414-09	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 0h (4 °C)	Station:	IS11TX02 12414-09		
Sample No:	07-9383-1931	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	12 Aug-04 12:40 PM	Code:	12414-10	Project:	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 23h (4 °C)	Station:	IS17TX06 12414-10		
Sample No:	08-0384-6290	Material:	Freshwater Sedment	Client:	CH2M Hill
Sample Date:	13 Aug-04	Code:	12414-11	Project:	Ecologcal Risk Assessment
Receive Date:	14 Aug-04 10:20 AM	Source:	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 12h (4 °C)	Station:	BGDTX05 12414-11		

CETIS Test Summary

Report Date: 23 Oct-04 11:37 PM
Link: 01-6544-1101

35d Proportion Survived Summary

Sample Code	Reps	Mean	Minimum	Maximum	SE	SD	CV
12414-00	12	0.86250	0.70000	1.00000	0.03239	0.09161	10.62%
12414-11	12	0.66250	0.00000	1.00000	0.10340	0.29246	44.15%
12414-04	12	0.73750	0.50000	0.90000	0.05650	0.15980	21.67%
12414-05	12	0.82500	0.60000	1.00000	0.05590	0.15811	19.17%
12414-06	12	0.77500	0.60000	1.00000	0.04119	0.11650	15.03%
12414-07	12	0.86250	0.70000	1.00000	0.04605	0.13025	15.10%
12414-08	12	0.72500	0.60000	0.80000	0.03134	0.08864	12.23%
12414-09	12	0.72500	0.60000	1.00000	0.05590	0.15811	21.81%
12414-10	12	0.80000	0.50000	0.90000	0.05000	0.14142	17.68%

35d Proportion Survived Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	N/A	N/A	N/A	N/A	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000
	0.90000	0.90000								
12414-11	N/A	N/A	N/A	N/A	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000
	0.80000	0.70000								
12414-04	N/A	N/A	N/A	N/A	0.80000	0.90000	0.70000	0.50000	0.60000	0.60000
	0.90000	0.90000								
12414-05	N/A	N/A	N/A	N/A	1.00000	0.80000	0.80000	1.00000	0.60000	0.90000
	0.60000	0.90000								
12414-06	N/A	N/A	N/A	N/A	0.80000	0.80000	0.70000	0.60000	0.70000	0.80000
	1.00000	0.80000								
12414-07	N/A	N/A	N/A	N/A	0.70000	0.80000	1.00000	1.00000	1.00000	0.80000
	0.70000	0.90000								
12414-08	N/A	N/A	N/A	N/A	0.70000	0.80000	0.70000	0.80000	0.60000	0.80000
	0.60000	0.80000								
12414-09	N/A	N/A	N/A	N/A	0.70000	0.60000	0.60000	0.80000	0.60000	1.00000
	0.60000	0.90000								
12414-10	N/A	N/A	N/A	N/A	0.80000	0.90000	0.50000	0.80000	0.90000	0.90000
	0.70000	0.90000								

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:35 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	7.77935	8.88539	0.01475	Equal Variances
Distribution	Shapiro-Wilk W	0.80102	0.84420	0.00197	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2423132	0.2423132	1	3.35	0.08865	Non-Significant Effect
Error	1.013206	0.0723718	14			
Total	1.25551869	0.314685	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-00		12414-11	51		0.0249	4	Significant Effect

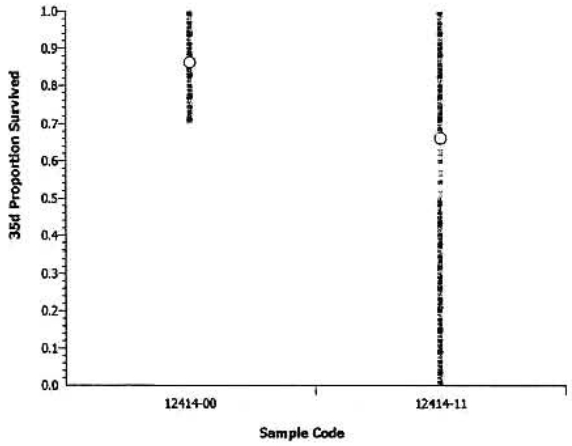
Data Summary

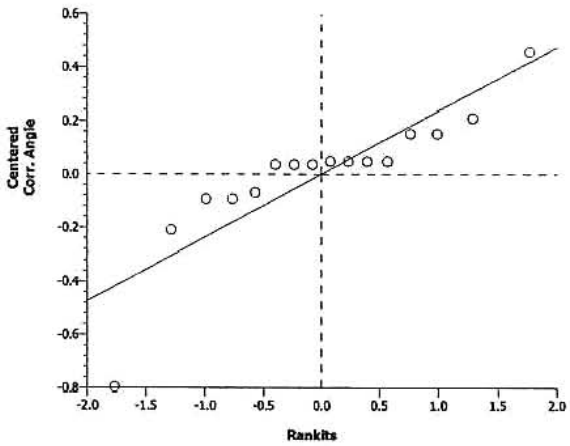
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:35 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.16052	8.88539	0.33099	Equal Variances
Distribution	Shapiro-Wilk W	0.92005	0.84420	0.16823	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0916058	0.0916058	1	3.52	0.08179	Non-Significant Effect
Error	0.3647484	0.0260535	14			
Total	0.45635422	0.1176593	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-04	1.87512	1.76131	0.0409	0.14215	Significant Effect

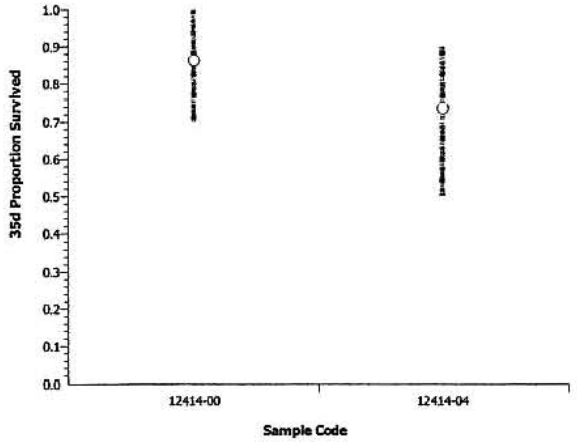
Data Summary

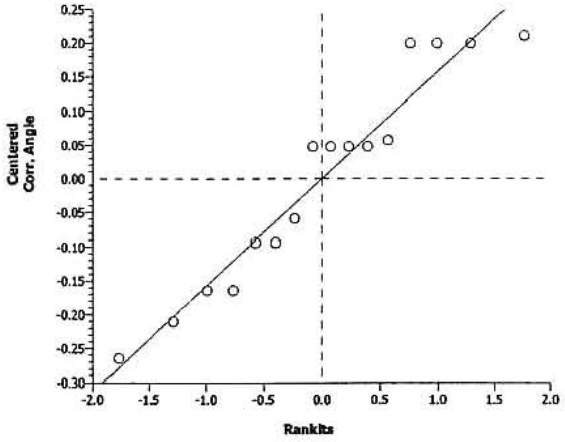
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-04	8	0.73750	0.50000	0.90000	0.15980	1.05037	0.78540	1.24905	0.18873

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-04	0.80000	0.90000	0.70000	0.50000	0.60000	0.60000	0.90000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.58591	8.88539	0.23327	Equal Variances
Distribution	Shapiro-Wilk W	0.93663	0.84420	0.30252	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0058170	0.0058170	1	0.20	0.66411	Non-Significant Effect
Error	0.4138422	0.0295602	14			
Total	0.41965926	0.0353772	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-05	0.44361	1.76131	0.3321	0.15141	Non-Significant Effect

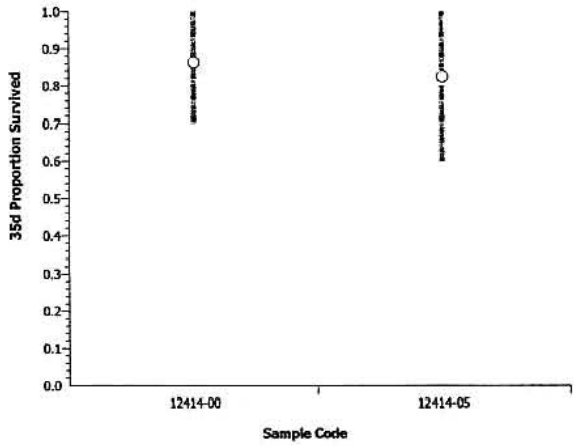
Data Summary

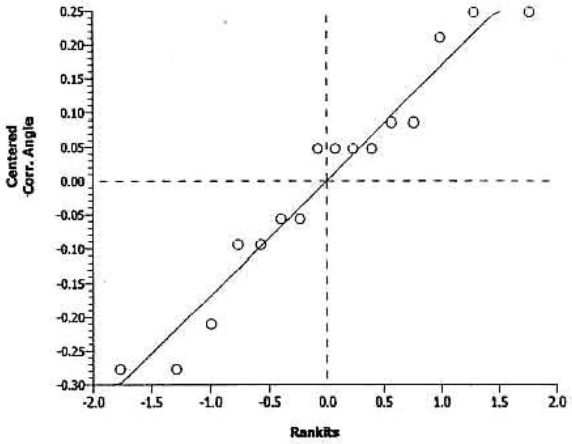
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-05	8	0.82500	0.60000	1.00000	0.15811	1.16357	0.88608	1.41202	0.20648

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-05	1.00000	0.80000	0.80000	1.00000	0.60000	0.90000	0.60000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.43821	8.88539	0.64358	Equal Variances
Distribution	Shapiro-Wilk W	0.90691	0.84420	0.10404	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0511497	0.0511497	1	2.54	0.13297	Non-Significant Effect
Error	0.2813879	0.0200991	14			
Total	0.33253762	0.0712488	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-06	1.59527	1.76131	0.0665	0.12485	Non-Significant Effect

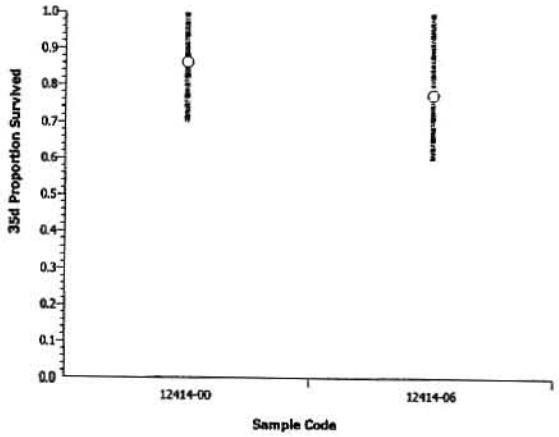
Data Summary

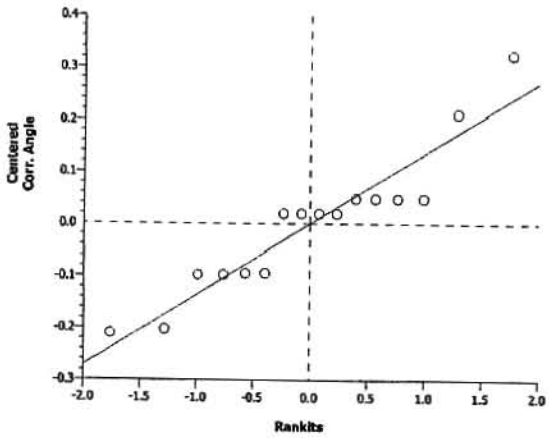
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-06	8	0.77500	0.60000	1.00000	0.11650	1.08863	0.88608	1.41202	0.15399

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-06	0.80000	0.80000	0.70000	0.60000	0.70000	0.80000	1.00000	0.80000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.08736	8.88539	0.35260	Equal Variances
Distribution	Shapiro-Wilk W	0.89031	0.84420	0.05618	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0002894	0.0002894	1	0.01	0.91659	Non-Significant Effect
Error	0.3563052	0.0254504	14			
Total	0.35659459	0.0257398	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-07	-0.1066	1.76131	0.5417	0.14049	Non-Significant Effect

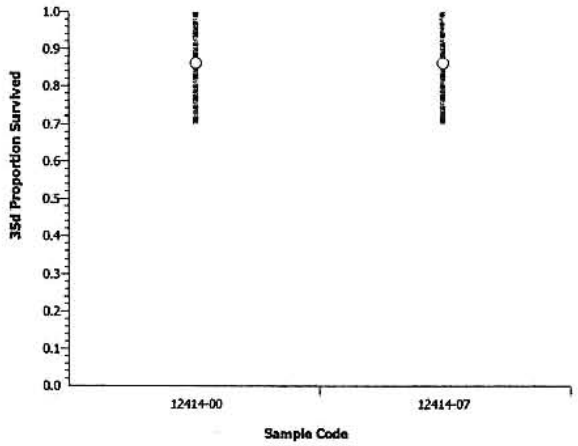
Data Summary

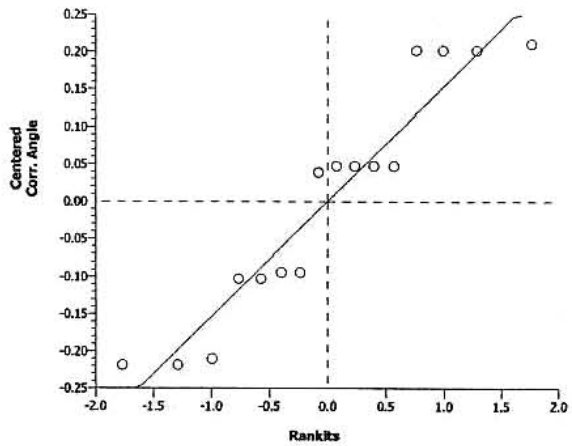
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-07	8	0.86250	0.70000	1.00000	0.13025	1.21021	0.99116	1.41202	0.18551

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-07	0.70000	0.80000	1.00000	1.00000	1.00000	0.80000	0.70000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.70098	8.88539	0.50008	Equal Variances
Distribution	Shapiro-Wilk W	0.93725	0.84420	0.30913	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1279119	0.1279119	1	9.77	0.00744	Significant Effect
Error	0.1832554	0.0130897	14			
Total	0.31116734	0.1410016	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-08	3.12602	1.76131	0.0037	0.10076	Significant Effect

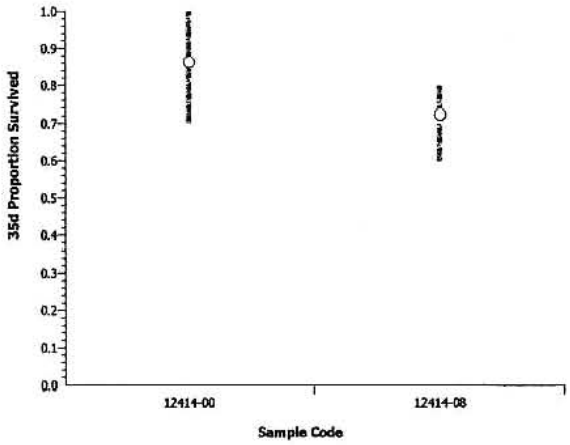
Data Summary

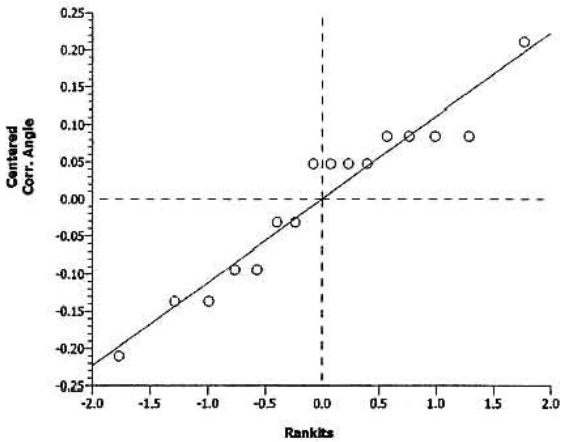
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-08	8	0.72500	0.60000	0.80000	0.08864	1.02288	0.88608	1.10715	0.09845

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-08	0.70000	0.80000	0.70000	0.80000	0.60000	0.80000	0.60000	0.80000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.45847	8.88539	0.25825	Equal Variances
Distribution	Shapiro-Wilk W	0.90953	0.84420	0.11457	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1072526	0.1072526	1	3.76	0.07285	Non-Significant Effect
Error	0.3991342	0.0285096	14			
Total	0.50638679	0.1357622	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-09	1.93958	1.76131	0.0364	0.1487	Significant Effect

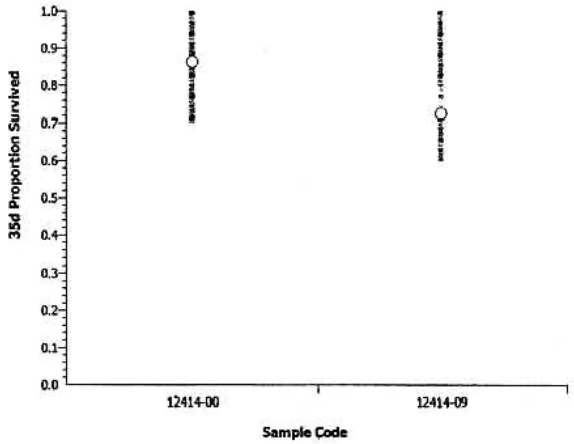
Data Summary

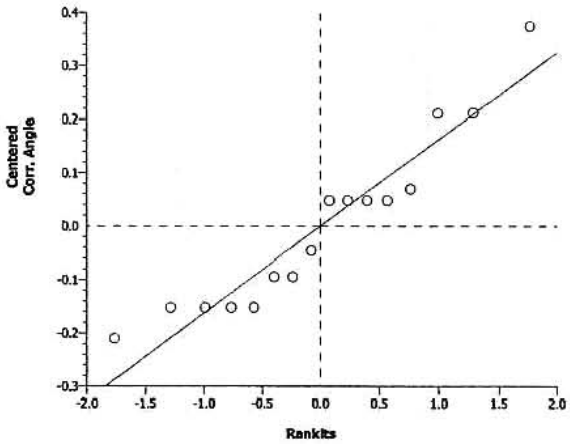
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-09	8	0.72500	0.60000	1.00000	0.15811	1.03796	0.88608	1.41202	0.20133

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-09	0.70000	0.60000	0.60000	0.80000	0.60000	1.00000	0.60000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.69321	8.88539	0.50374	Equal Variances
Distribution	Shapiro-Wilk W	0.92975	0.84420	0.23805	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0245406	0.0245406	1	1.11	0.31090	Non-Significant Effect
Error	0.310817	0.0222012	14			
Total	0.33535760	0.0467418	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-10	1.05137	1.76131	0.1554	0.13122	Non-Significant Effect

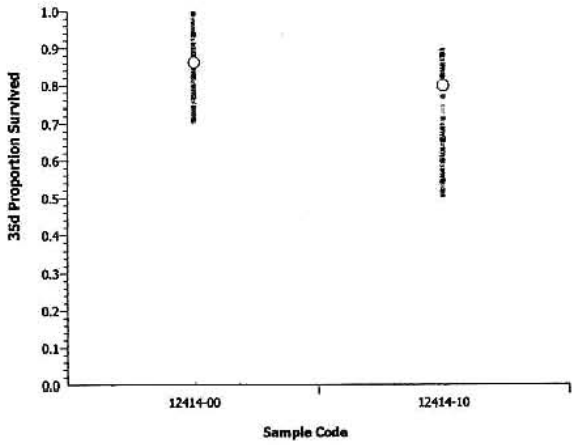
Data Summary

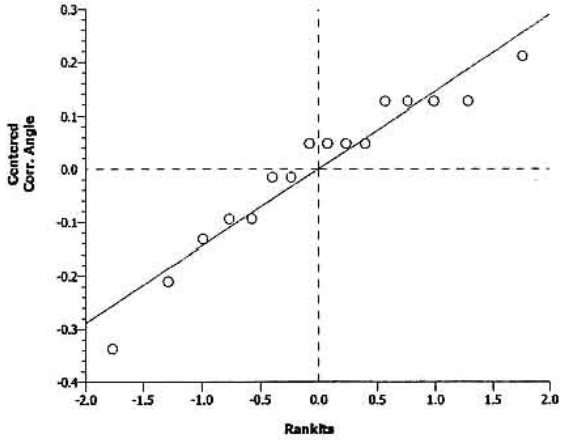
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.86250	0.70000	1.00000	0.09161	1.20171	0.99116	1.41202	0.12840
12414-10	8	0.80000	0.50000	0.90000	0.14142	1.12338	0.78540	1.24905	0.16708

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.90000	0.90000	0.70000	0.80000	0.80000	1.00000	0.90000	0.90000		
12414-10	0.80000	0.90000	0.50000	0.80000	0.90000	0.90000	0.70000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.60069	8.88539	0.11271	Equal Variances
Distribution	Shapiro-Wilk W	0.87608	0.84420	0.03303	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0359438	0.0359438	1	0.44	0.51852	Non-Significant Effect
Error	1.147138	0.0819385	14			
Total	1.18308219	0.1178823	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-04	-0.6623	1.76131	0.7407	0.25209	Non-Significant Effect

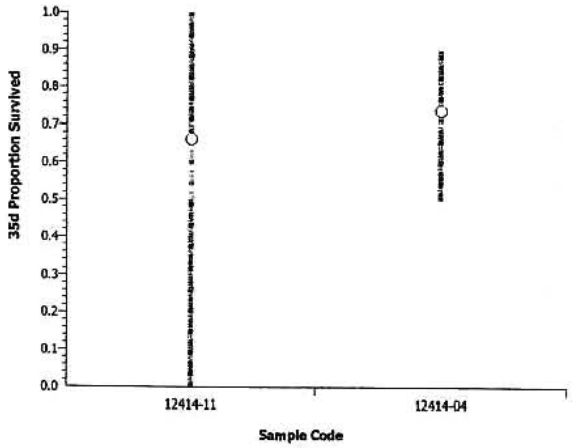
Data Summary

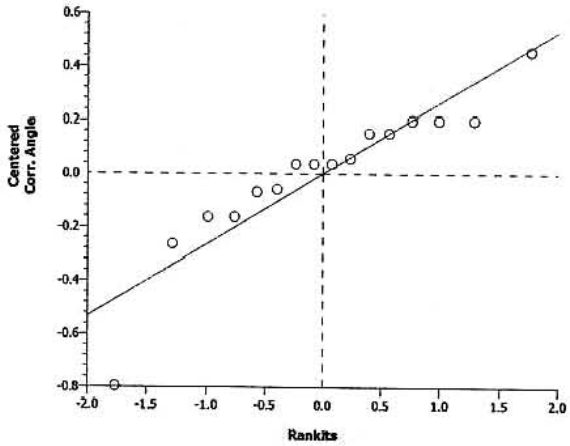
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-04	8	0.73750	0.50000	0.90000	0.15980	1.05037	0.78540	1.24905	0.18873

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-04	0.80000	0.90000	0.70000	0.50000	0.60000	0.60000	0.90000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.00836	8.88539	0.16944	Equal Variances
Distribution	Shapiro-Wilk W	0.88591	0.84420	0.04768	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1730424	0.1730424	1	2.03	0.17661	Non-Significant Effect
Error	1.196232	0.0854452	14			
Total	1.36927465	0.2584876	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-05	-1.4231	1.76131	0.9117	0.25742	Non-Significant Effect

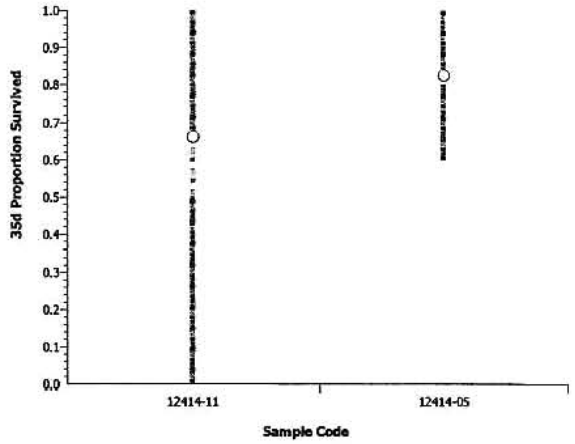
Data Summary

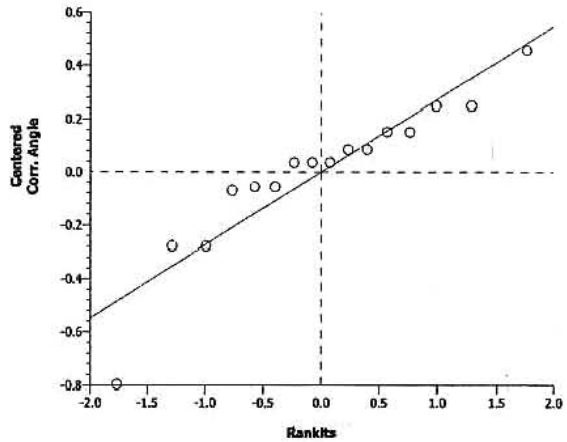
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-05	8	0.82500	0.60000	1.00000	0.15811	1.16357	0.88608	1.41202	0.20648

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-05	1.00000	0.80000	0.80000	1.00000	0.60000	0.90000	0.60000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	5.40907	8.88539	0.04052	Equal Variances
Distribution	Shapiro-Wilk W	0.82299	0.84420	0.00451	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.070804	0.070804	1	0.93	0.35077	Non-Significant Effect
Error	1.063778	0.0759841	14			
Total	1.13458177	0.1467881	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-11		12414-06	24		0.7791	4	Non-Significant Effect

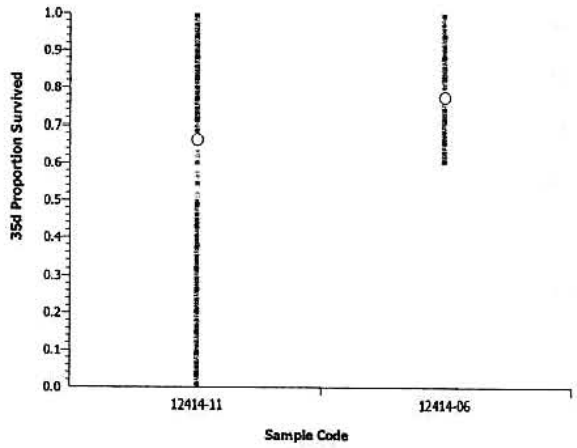
Data Summary

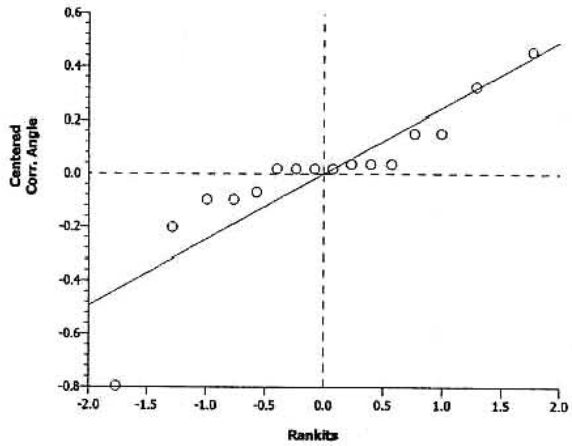
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-06	8	0.77500	0.60000	1.00000	0.11650	1.08863	0.88608	1.41202	0.15399

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-06	0.80000	0.80000	0.70000	0.60000	0.70000	0.80000	1.00000	0.80000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.72689	8.88539	0.10389	Equal Variances
Distribution	Shapiro-Wilk W	0.87218	0.84420	0.02854	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2593519	0.2593519	1	3.19	0.09582	Non-Significant Effect
Error	1.138695	0.0813354	14			
Total	1.39804700	0.3406872	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-07	-1.7857	1.76131	0.9521	0.25116	Non-Significant Effect

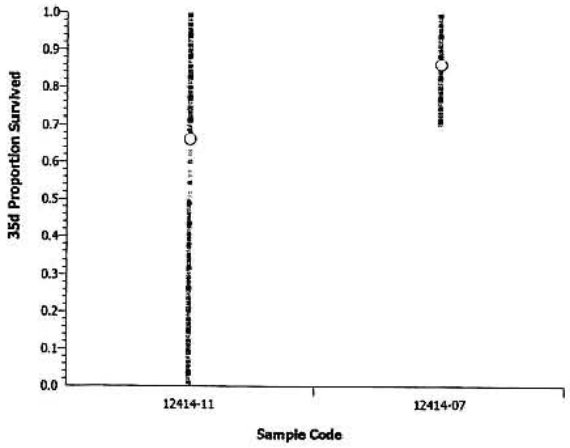
Data Summary

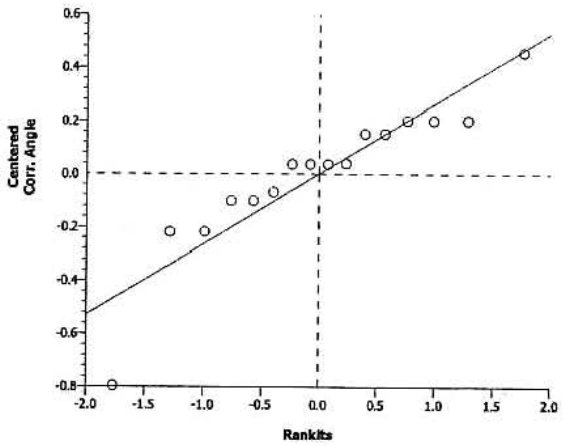
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-07	8	0.86250	0.70000	1.00000	0.13025	1.21021	0.99116	1.41202	0.18551

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-07	0.70000	0.80000	1.00000	1.00000	1.00000	0.80000	0.70000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	13.23255	8.88539	0.00298	Unequal Variances
Distribution	Shapiro-Wilk W	0.77011	0.84420	0.00061	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0181186	0.0181186	1	0.26	0.61627	Non-Significant Effect
Error	0.9656454	0.0689747	14			
Total	0.98376399	0.0870933	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-11		12414-08	30		0.5608	3	Non-Significant Effect

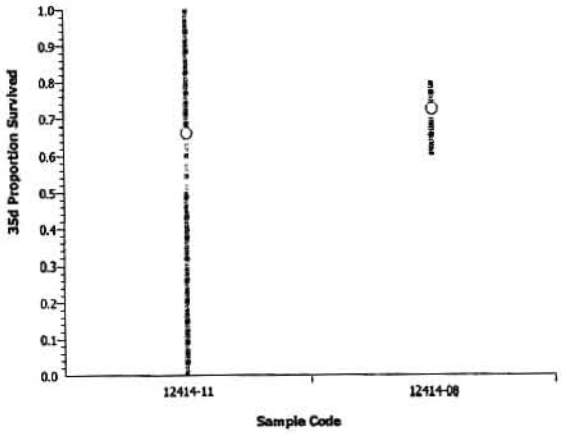
Data Summary

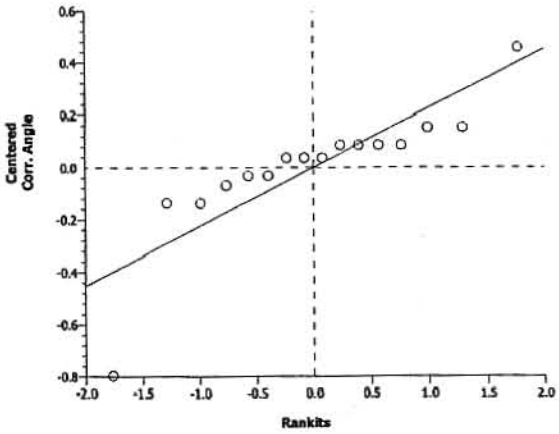
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-08	8	0.72500	0.60000	0.80000	0.08864	1.02288	0.88608	1.10715	0.09845

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-08	0.70000	0.80000	0.70000	0.80000	0.60000	0.80000	0.60000	0.80000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.16431	8.88539	0.15154	Equal Variances
Distribution	Shapiro-Wilk W	0.88012	0.84420	0.03841	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0271455	0.0271455	1	0.32	0.57960	Non-Significant Effect
Error	1.181524	0.0843946	14			
Total	1.20866961	0.1115400	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-09	-0.5671	1.76131	0.7102	0.25584	Non-Significant Effect

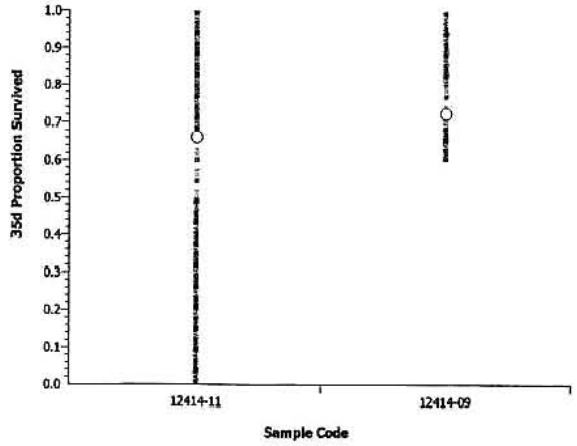
Data Summary

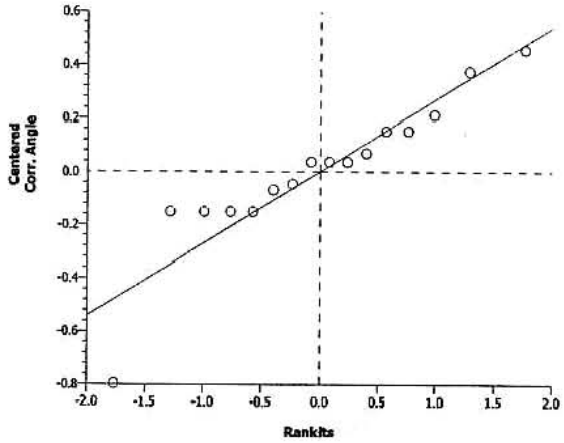
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-09	8	0.72500	0.60000	1.00000	0.15811	1.03796	0.88608	1.41202	0.20133

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-09	0.70000	0.60000	0.60000	0.80000	0.60000	1.00000	0.60000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
35d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	23 Oct-04 11:36 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	4.59445	8.88539	0.06203	Equal Variances
Distribution	Shapiro-Wilk W	0.81554	0.84420	0.00340	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1126265	0.1126265	1	1.44	0.24969	Non-Significant Effect
Error	1.093207	0.0780862	14			
Total	1.20583334	0.1907127	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	Ties	Decision(0.05)
12414-11		12414-10	19.5		0.8828	3	Non-Significant Effect

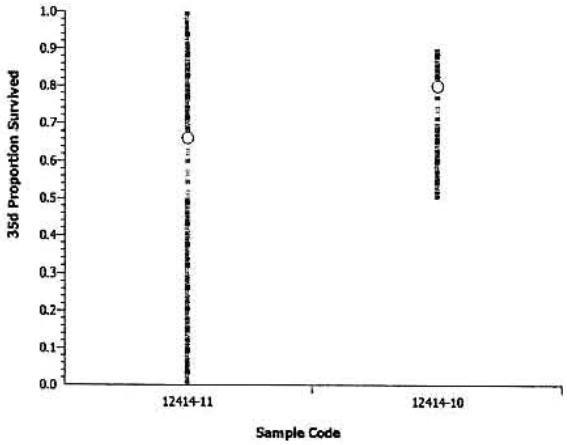
Data Summary

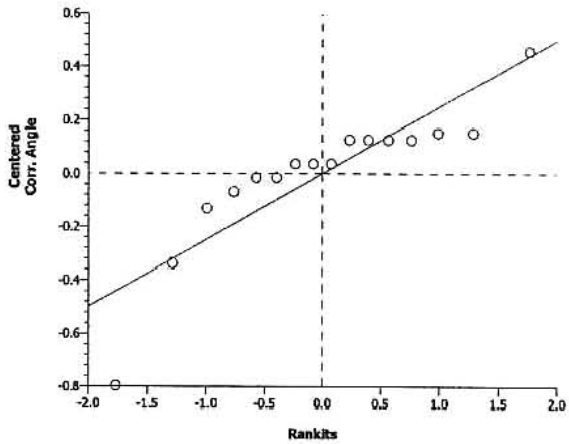
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.66250	0.00000	1.00000	0.29246	0.95558	0.15878	1.41202	0.35813
12414-10	8	0.80000	0.50000	0.90000	0.14142	1.12338	0.78540	1.24905	0.16708

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.60000	1.00000	0.70000	0.70000	0.80000	0.80000	0.70000		
12414-10	0.80000	0.90000	0.50000	0.80000	0.90000	0.90000	0.70000	0.90000		

Graphics





STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head - CTO-122 Site 11/17
TASK: Hyalella azteca 42 Day Assay
DATA: Day 42 Survival
START DATE: 09/01/04
END DATE: 10/13/04

Sample Site	ESI Ref	Rep	Number Recovered	Percent Recovery	Mean	Distribution	Variance	t Value	Critical t Value	p Value	Statistically Significant Difference	As Compared To
Lab	0	E	4	40%	61.3%							
	0	F	6	60%								
	0	G	6	60%								
	0	H	6	60%								
	0	I	7	70%								
	0	J	7	70%								
	0	K	5	50%								
	0	L	8	80%								
IS11TX05	4	E	7	70%	61.3%	Normal	Equal	-0.0598	1.7613	0.5234	NO	LAB
	4	F	9	90%		Normal	Equal	-2.6359	1.7613	0.9902	NO	BGDTX05
	4	G	3	30%								
	4	H	4	40%								
	4	I	6	60%								
	4	J	6	60%								
	4	K	7	70%								
	4	L	7	70%								
IS11TX07	5	E	9	90%	76.3%	Normal	Equal	-2.2592	1.7613	0.9798	NO	LAB
	5	F	8	80%		Normal	Equal	-4.3095	1.7613	0.9996	NO	BGDTX05
	5	G	8	80%								
	5	H	6	60%								
	5	I	7	70%								
	5	J	9	90%								
	5	K	5	50%								
	5	L	9	90%								
IS11TX02	6	E	4	40%	57.5%	Normal	Equal	0.2832	1.7613	0.3906	NO	LAB
	6	F	8	80%		Normal	Equal	-2.0050	1.7613	0.9677	NO	BGDTX05
	6	G	7	70%								
	6	H	2	20%								
	6	I	3	30%								
	6	J	8	80%								
	6	K	9	90%								
	6	L	5	50%								
IS11TX04	7	E	6	60%	47.5%	Normal	Equal	1.7236	1.7613	0.0534	NO	LAB
	7	F	6	60%		Normal	Equal	-1.4252	1.7613	0.9120	NO	BGDTX05
	7	G	8	80%								
	7	H	3	30%								
	7	I	5	50%								

	7	J	3	30%								
	7	K	3	30%								
	7	L	4	40%								
IS11TX03	8	E	3	30%	48.8%	Normal	Equal	1.5284	1.7613	0.0743	NO	LAB
	8	F	7	70%		Normal	Equal	-1.5305	1.7613	0.9259	NO	BGDTX05
	8	G	4	40%								
	8	H	4	40%								
	8	I	6	60%								
	8	J	8	80%								
	8	K	3	30%								
	8	L	4	40%								
IS11TX02	9	E	1	10%	32.3%	Normal	Unequal	2.0413	1.8596	0.0378	YES	LAB
	9	F	2	18%		Normal	Equal	0.0531	1.7613	0.4792	NO	BGDTX05
	9	G	2	20%								
	9	H	3	30%								
	9	I	0	0%								
	9	J	10	100%								
	9	K	1	10%								
	9	L	7	70%								
IS17TX06	10	E	0	0%	27.5%	Normal	Equal	2.9803	1.7613	0.0050	YES	LAB
	10	F	8	80%		Normal	Equal	0.5620	1.7613	0.2915	NO	BGDTX05
	10	G	5	50%								
	10	H	2	20%								
	10	I	4	40%								
	10	J	3	30%								
	10	K	0	0%								
	10	L	0	0%								
BGDTX05	11	E	0	0%	33.8%	Normal	Equal	2.9513	1.7613	0.0053	YES	LAB
	11	F	4	40%								
	11	G	3	30%								
	11	H	1	10%								
	11	I	3	30%								
	11	J	5	50%								
	11	K	7	70%								
	11	L	4	40%								

CETIS Test Summary

Report Date: 22 Oct-04 11:16 PM
Link: 01-6544-1101

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Test No:	12-4416-9497	**Test Type:**	Hyalella (42d)	**Duration:**	43d 0h
Start Date:	01 Sep-04 12:00 PM	**Protocol:**	EPA/600/R-99/064 (2000)	**Species:**	Hyalella azteca
Ending Date:	14 Oct-04 12:00 PM	**Dil Water:**	50/50 Mix of Surface Water and MHR	**Source:**	Aquatic Research Organisms, NH
Setup Date:	01 Sep-04 12:00 PM	**Brine:**	Not Applicable		

Sample No:	06-0771-3563	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	01 Sep-04	**Code:**	12414-00	**Project:**	Ecologcal Risk Assessment
Receive Date:	01 Sep-04	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	12h (4 °C)	**Station:**	Lab Control -00		
Sample No:	03-7896-9779	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 11:00 AM	**Code:**	12414-04	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 1h (4 °C)	**Station:**	IS11TX05 12414-04		
Sample No:	16-1142-2769	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 12:00 PM	**Code:**	12414-05	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 0h (4 °C)	**Station:**	IS11TX07 12414-05		
Sample No:	19-4503-7964	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 02:50 PM	**Code:**	12414-06	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 21h (4 °C)	**Station:**	IS17TX02 12414-06		
Sample No:	07-7263-2686	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:00 AM	**Code:**	12414-07	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 2h (4 °C)	**Station:**	IS11TX04 12414-07		
Sample No:	09-3049-9344	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:40 AM	**Code:**	12414-08	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 1h (4 °C)	**Station:**	IS11TX03 12414-08		
Sample No:	06-0576-7762	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 11:35 AM	**Code:**	12414-09	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 0h (4 °C)	**Station:**	IS11TX02 12414-09		
Sample No:	07-9383-1931	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 12:40 PM	**Code:**	12414-10	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 23h (4 °C)	**Station:**	IS17TX06 12414-10		
Sample No:	08-0384-6290	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	13 Aug-04	**Code:**	12414-11	**Project:**	Ecologcal Risk Assessment
Receive Date:	14 Aug-04 10:20 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 12h (4 °C)	**Station:**	BGDTX05 12414-11		

CETIS Test Summary

Report Date: 22 Oct-04 11:16 PM
Link: 01-6544-1101

42d Proportion Survived Summary

Sample Code	Reps	Mean	Minimum	Maximum	SE	SD	CV
12414-00	12	0.61250	0.40000	0.80000	0.04407	0.12464	20.35%
12414-11	12	0.33750	0.00000	0.70000	0.07778	0.21998	65.18%
12414-04	12	0.61250	0.30000	0.90000	0.06665	0.18851	30.78%
12414-05	12	0.76250	0.50000	0.90000	0.05324	0.15059	19.75%
12414-06	12	0.57500	0.20000	0.90000	0.09210	0.26049	45.30%
12414-07	12	0.47500	0.30000	0.80000	0.06478	0.18323	38.57%
12414-08	12	0.48750	0.30000	0.80000	0.06665	0.18851	38.67%
12414-09	12	0.32500	0.00000	1.00000	0.12211	0.34538	106.27
12414-10	12	0.27500	0.00000	0.80000	0.10133	0.28661	104.22

42d Proportion Survived Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	N/A	N/A	N/A	N/A	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000
	0.50000	0.80000								
12414-11	N/A	N/A	N/A	N/A	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000
	0.70000	0.40000								
12414-04	N/A	N/A	N/A	N/A	0.70000	0.90000	0.30000	0.40000	0.60000	0.60000
	0.70000	0.70000								
12414-05	N/A	N/A	N/A	N/A	0.90000	0.80000	0.80000	0.60000	0.70000	0.90000
	0.50000	0.90000								
12414-06	N/A	N/A	N/A	N/A	0.40000	0.80000	0.70000	0.20000	0.30000	0.80000
	0.90000	0.50000								
12414-07	N/A	N/A	N/A	N/A	0.60000	0.60000	0.80000	0.30000	0.50000	0.30000
	0.30000	0.40000								
12414-08	N/A	N/A	N/A	N/A	0.30000	0.70000	0.40000	0.40000	0.60000	0.80000
	0.30000	0.40000								
12414-09	N/A	N/A	N/A	N/A	0.10000	0.20000	0.20000	0.30000	0.00000	1.00000
	0.10000	0.70000								
12414-10	N/A	N/A	N/A	N/A	0.00000	0.80000	0.50000	0.20000	0.40000	0.30000
	0.00000	0.00000								

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.97013	8.88539	0.08924	Equal Variances
Distribution	Shapiro-Wilk W	0.95515	0.84420	0.55035	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.3696662	0.3696662	1	8.71	0.01052	Significant Effect
Error	0.5941831	0.0424417	14			
Total	0.96384928	0.4121078	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-11	2.95127	1.76131	0.0053	0.18143	Significant Effect

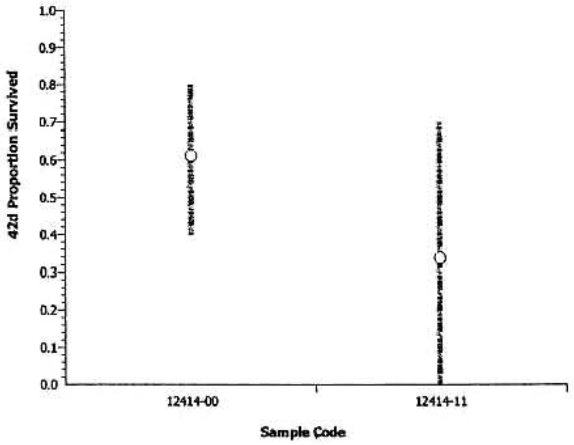
Data Summary

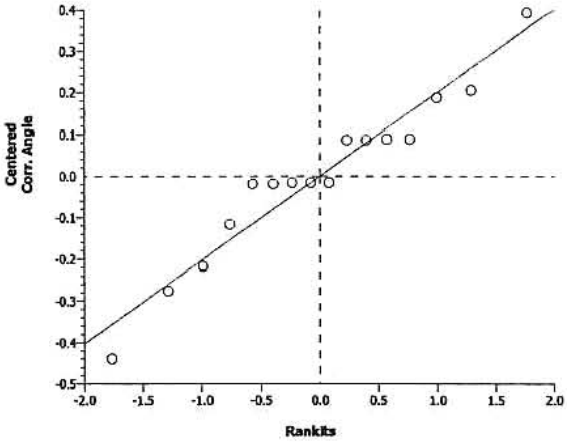
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.47334	8.88539	0.25517	Equal Variances
Distribution	Shapiro-Wilk W	0.94967	0.84420	0.46563	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0001062	0.0001062	1	0.00	0.95313	Non-Significant Effect
Error	0.4152411	0.0296601	14			
Total	0.41534731	0.0297663	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-04	-0.0598	1.76131	0.5234	0.15167	Non-Significant Effect

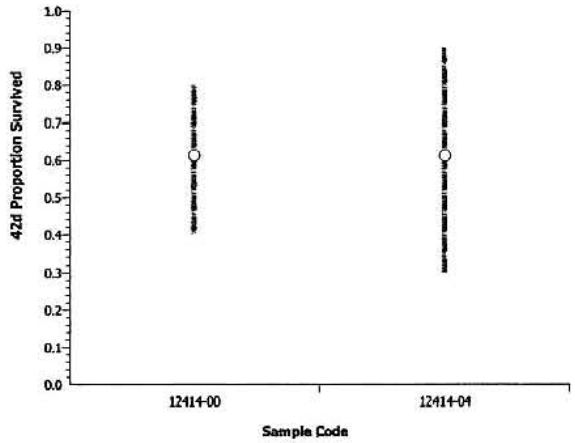
Data Summary

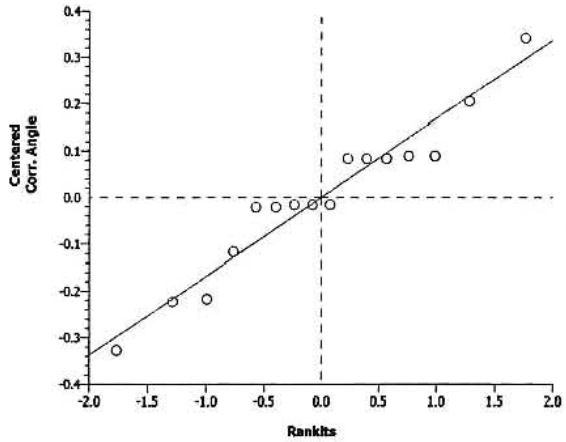
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-04	8	0.61250	0.30000	0.90000	0.18851	0.90738	0.57964	1.24905	0.20553

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-04	0.70000	0.90000	0.30000	0.40000	0.60000	0.60000	0.70000	0.70000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.83571	8.88539	0.44140	Equal Variances
Distribution	Shapiro-Wilk W	0.94589	0.84420	0.41258	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1235972	0.1235972	1	5.10	0.04035	Significant Effect
Error	0.3390122	0.0242152	14			
Total	0.46260945	0.1478124	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-05	-2.2592	1.76131	0.9798	0.13704	Non-Significant Effect

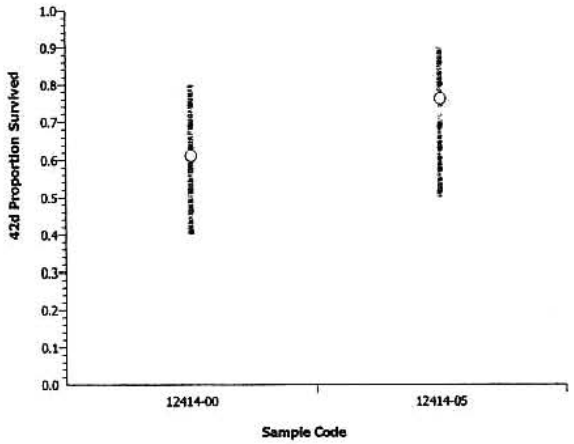
Data Summary

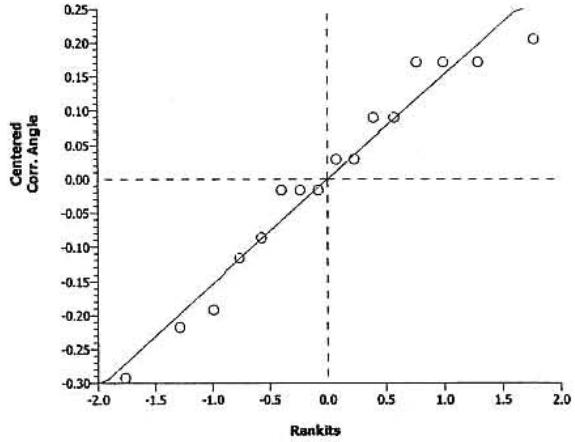
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-05	8	0.76250	0.50000	0.90000	0.15059	1.07801	0.78540	1.24905	0.17706

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-05	0.90000	0.80000	0.80000	0.60000	0.70000	0.90000	0.50000	0.90000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	4.69878	8.88539	0.05857	Equal Variances
Distribution	Shapiro-Wilk W	0.98438	0.84420	0.97815	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0039033	0.0039033	1	0.08	0.78116	Non-Significant Effect
Error	0.6812946	0.0486639	14			
Total	0.68519788	0.0525672	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-06	0.28321	1.76131	0.3906	0.19427	Non-Significant Effect

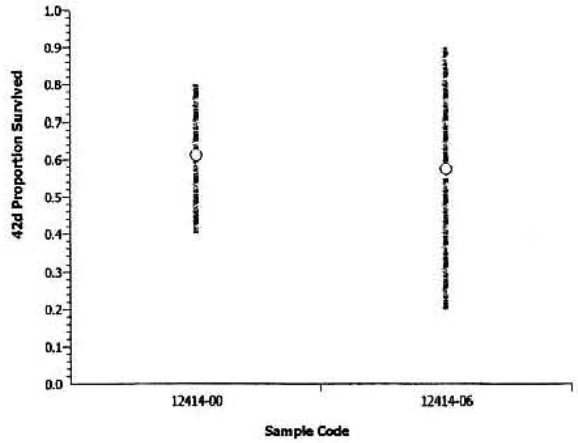
Data Summary

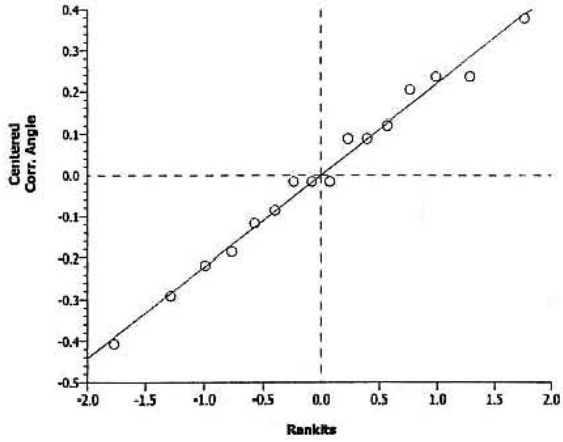
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-06	8	0.57500	0.20000	0.90000	0.26049	0.87099	0.46365	1.24905	0.28328

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-06	0.40000	0.80000	0.70000	0.20000	0.30000	0.80000	0.90000	0.50000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.14299	8.88539	0.33602	Equal Variances
Distribution	Shapiro-Wilk W	0.95018	0.84420	0.47314	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0797316	0.0797316	1	2.97	0.10679	Non-Significant Effect
Error	0.3757471	0.0268391	14			
Total	0.45547864	0.1065706	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-07	1.72358	1.76131	0.0534	0.14427	Non-Significant Effect

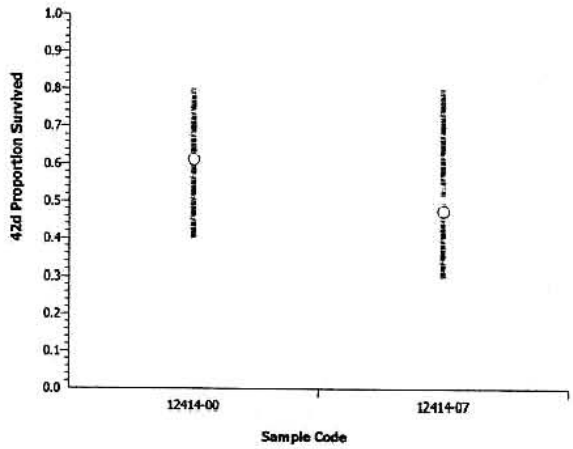
Data Summary

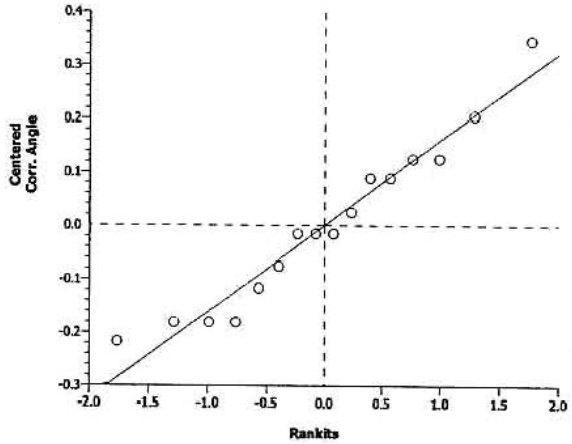
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-07	8	0.47500	0.30000	0.80000	0.18323	0.76104	0.57964	1.10715	0.19131

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-07	0.60000	0.60000	0.80000	0.30000	0.50000	0.30000	0.30000	0.40000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.25985	8.88539	0.30421	Equal Variances
Distribution	Shapiro-Wilk W	0.94472	0.84420	0.39721	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0650239	0.0650239	1	2.34	0.14870	Non-Significant Effect
Error	0.389718	0.027837	14			
Total	0.4547419	0.0928609	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-08	1.52836	1.76131	0.0743	0.14693	Non-Significant Effect

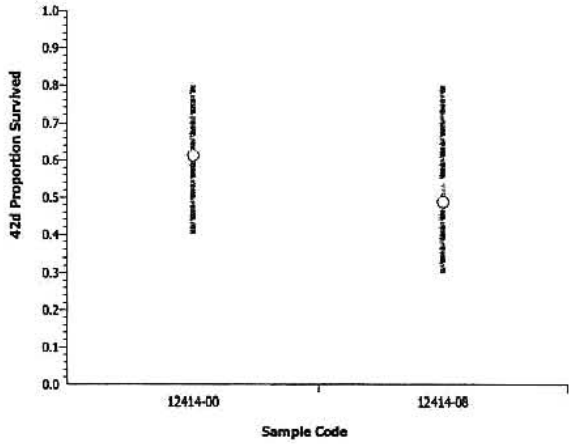
Data Summary

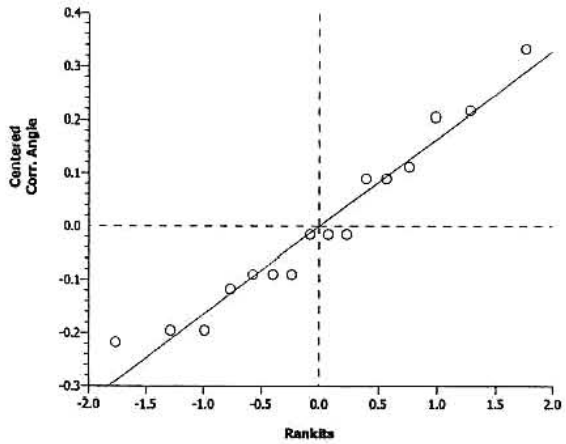
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-08	8	0.48750	0.30000	0.80000	0.18851	0.77473	0.57964	1.10715	0.19646

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-08	0.30000	0.70000	0.40000	0.40000	0.60000	0.80000	0.30000	0.40000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Unequal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	10.02529	8.88539	0.00698	Unequal Variances
Distribution	Shapiro-Wilk W	0.88652	0.84420	0.04879	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.3923211	0.3923211	1	4.17	0.06054	Non-Significant Effect
Error	1.318084	0.0941489	14			
Total	1.71040511	0.48647	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-09	2.04133	1.85955	0.0378	0.28529	Significant Effect

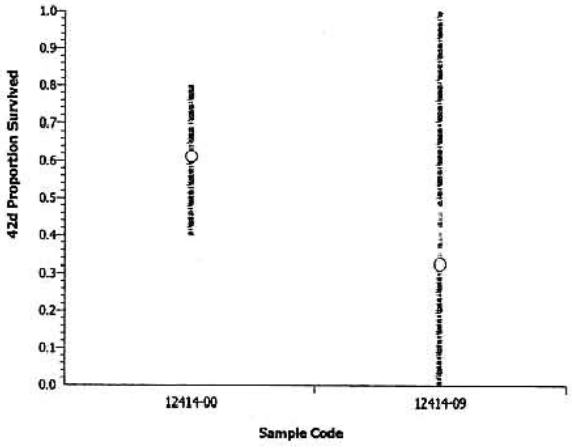
Data Summary

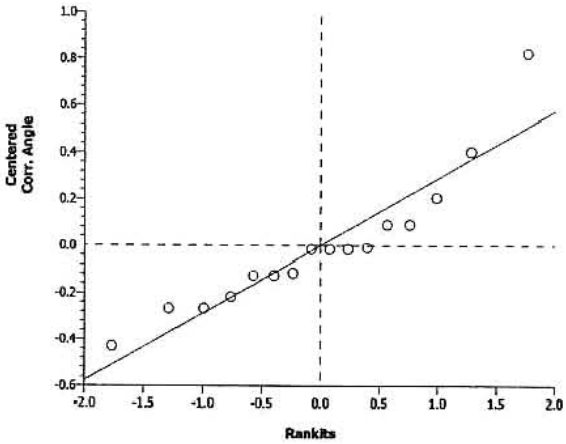
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-09	8	0.32500	0.00000	1.00000	0.34538	0.58905	0.15878	1.41202	0.41379

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-09	0.10000	0.20000	0.20000	0.30000	0.00000	1.00000	0.10000	0.70000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	7.02618	8.88539	0.01973	Equal Variances
Distribution	Shapiro-Wilk W	0.94170	0.84420	0.35933	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.6087575	0.6087575	1	8.88	0.00993	Significant Effect
Error	0.959537	0.0685384	14			
Total	1.56829453	0.6772959	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-10	2.98027	1.76131	0.0050	0.23055	Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	0.61250	0.40000	0.80000	0.12464	0.90223	0.68472	1.10715	0.13069
12414-10	8	0.27500	0.00000	0.80000	0.28661	0.51211	0.15878	1.10715	0.34641

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	0.40000	0.60000	0.60000	0.60000	0.70000	0.70000	0.50000	0.80000		
12414-10	0.00000	0.80000	0.50000	0.20000	0.40000	0.30000	0.00000	0.00000		

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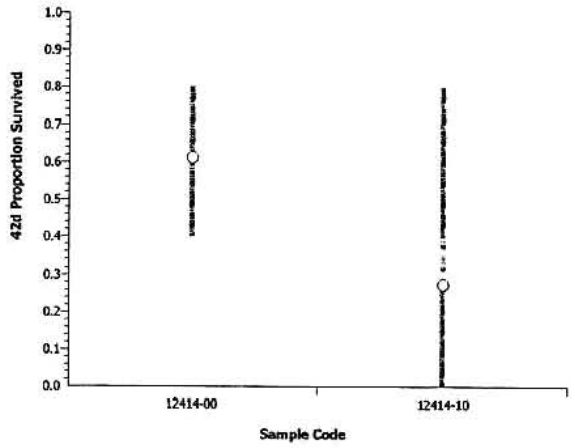

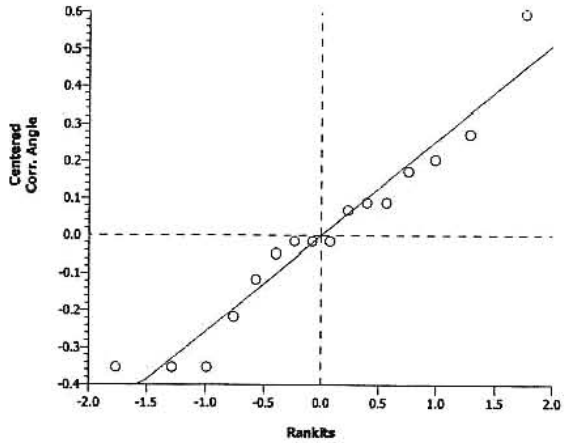

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.60517	8.88539	0.54754	Equal Variances
Distribution	Shapiro-Wilk W	0.94267	0.84420	0.37117	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.3823027	0.3823027	1	6.95	0.01956	Significant Effect
Error	0.7703224	0.0550230	14			
Total	1.15262511	0.4373258	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-04	-2.6359	1.76131	0.9902	0.20658	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-04	8	0.61250	0.30000	0.90000	0.18851	0.90738	0.57964	1.24905	0.20553

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-04	0.70000	0.90000	0.30000	0.40000	0.60000	0.60000	0.70000	0.70000		

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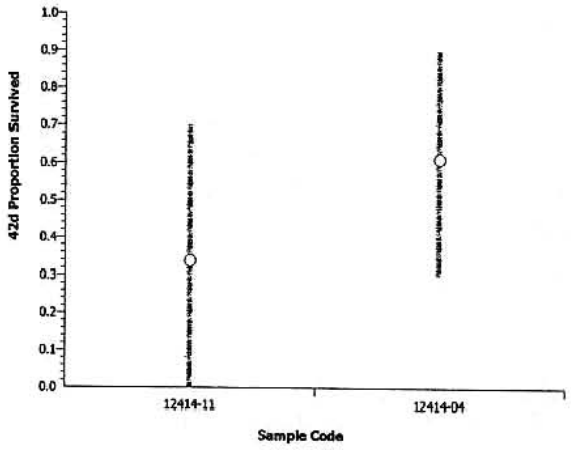

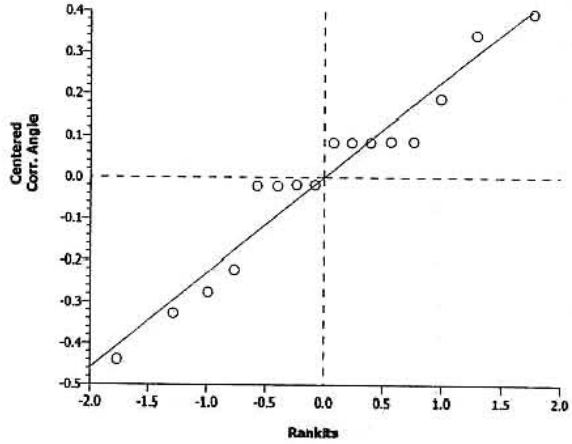

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:06 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.16271	8.88539	0.33037	Equal Variances
Distribution	Shapiro-Wilk W	0.95933	0.84420	0.61996	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.9207665	0.9207665	1	18.57	0.00072	Significant Effect
Error	0.6940935	0.0495781	14			
Total	1.61486	0.9703446	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-05	-4.3095	1.76131	0.9996	0.19609	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-05	8	0.76250	0.50000	0.90000	0.15059	1.07801	0.78540	1.24905	0.17706

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-05	0.90000	0.80000	0.80000	0.60000	0.70000	0.90000	0.50000	0.90000		

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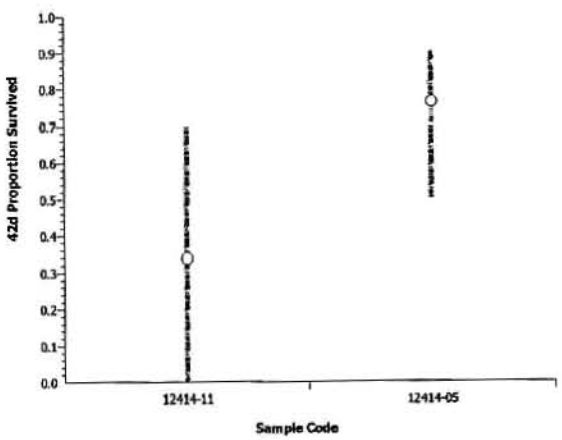

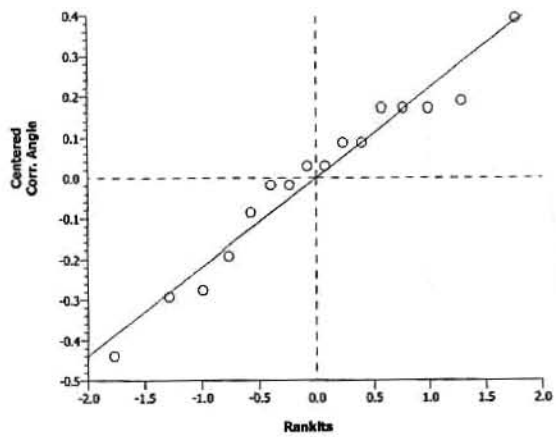

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:07 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.18353	8.88539	0.82977	Equal Variances
Distribution	Shapiro-Wilk W	0.95458	0.84420	0.54106	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2975978	0.2975978	1	4.02	0.06469	Non-Significant Effect
Error	1.036376	0.0740269	14			
Total	1.33397359	0.3716247	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-06	-2.0050	1.76131	0.9677	0.23961	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-06	8	0.57500	0.20000	0.90000	0.26049	0.87099	0.46365	1.24905	0.28328

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-06	0.40000	0.80000	0.70000	0.20000	0.30000	0.80000	0.90000	0.50000		

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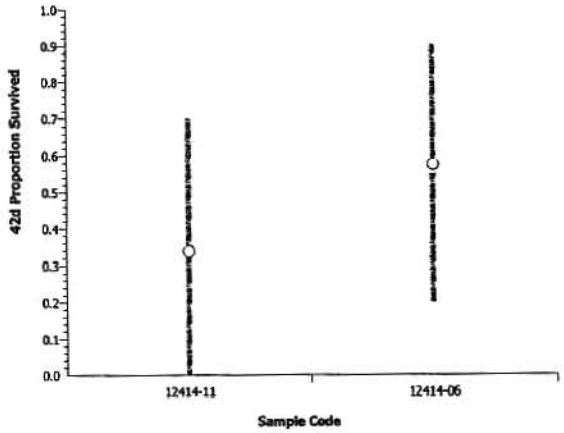
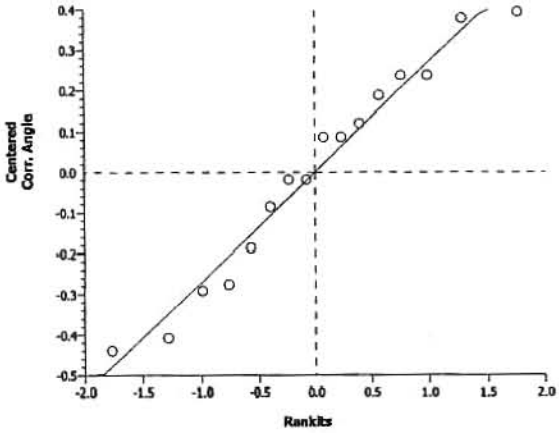




CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:07 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.85261	8.88539	0.43464	Equal Variances
Distribution	Shapiro-Wilk W	0.97884	0.84420	0.93061	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1060375	0.1060375	1	2.03	0.17600	Non-Significant Effect
Error	0.7308283	0.0522020	14			
Total	0.83686587	0.1582396	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-07	-1.4252	1.76131	0.9120	0.20121	Non-Significant Effect

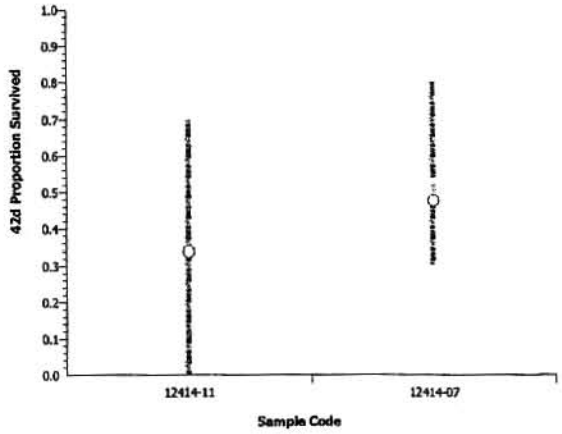
Data Summary

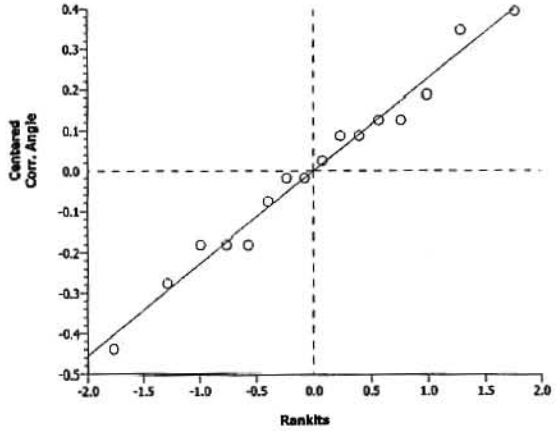
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-07	8	0.47500	0.30000	0.80000	0.18323	0.76104	0.57964	1.10715	0.19131

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-07	0.60000	0.60000	0.80000	0.30000	0.50000	0.30000	0.30000	0.40000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:07 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.75681	8.88539	0.47469	Equal Variances
Distribution	Shapiro-Wilk W	0.98468	0.84420	0.97988	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.1246118	0.1246118	1	2.34	0.14818	Non-Significant Effect
Error	0.7447993	0.0532	14			
Total	0.86941110	0.1778118	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-08	-1.5305	1.76131	0.9259	0.20312	Non-Significant Effect

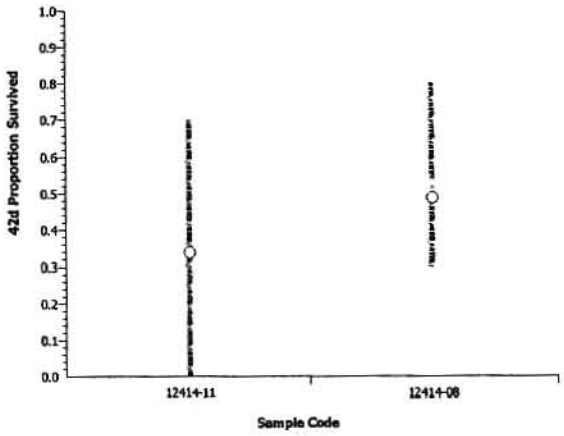
Data Summary

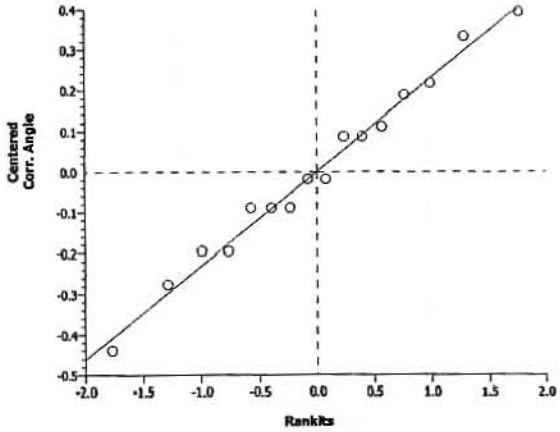
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-08	8	0.48750	0.30000	0.80000	0.18851	0.77473	0.57964	1.10715	0.19646

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-08	0.30000	0.70000	0.40000	0.40000	0.60000	0.80000	0.30000	0.40000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:07 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.52518	8.88539	0.24478	Equal Variances
Distribution	Shapiro-Wilk W	0.93143	0.84420	0.25255	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0003369	0.0003369	1	0.00	0.95841	Non-Significant Effect
Error	1.673165	0.1195118	14			
Total	1.67350206	0.1198487	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-09	0.05309	1.76131	0.4792	0.30445	Non-Significant Effect

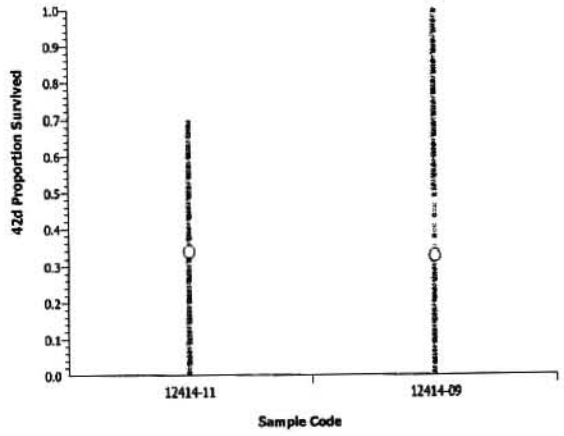
Data Summary

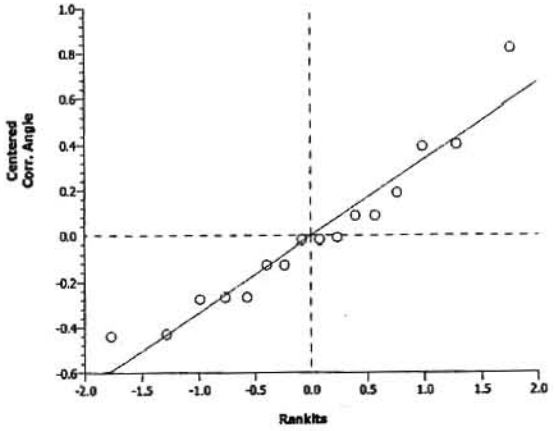
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-09	8	0.32500	0.00000	1.00000	0.34538	0.58905	0.15878	1.41202	0.41379

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-09	0.10000	0.20000	0.20000	0.30000	0.00000	1.00000	0.10000	0.70000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42d Proportion Survived	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:07 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.76976	8.88539	0.46902	Equal Variances
Distribution	Shapiro-Wilk W	0.95044	0.84420	0.47693	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0296623	0.0296623	1	0.32	0.58298	Non-Significant Effect
Error	1.314618	0.0939013	14			
Total	1.34428060	0.1235636	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-10	0.56204	1.76131	0.2915	0.26986	Non-Significant Effect

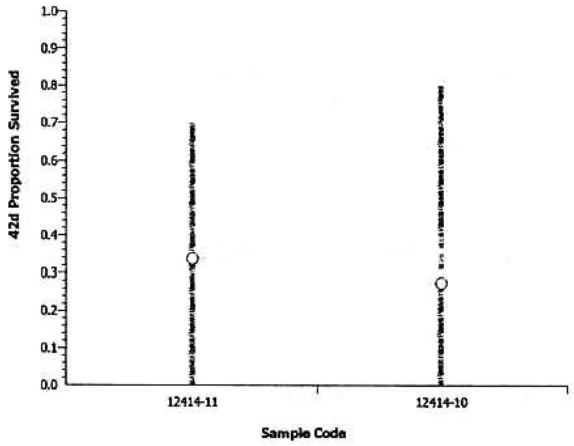
Data Summary

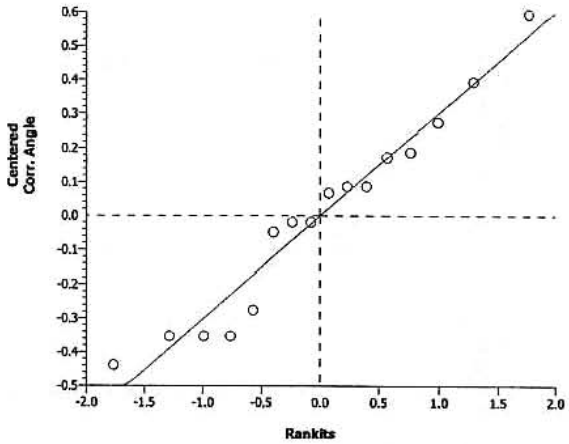
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	8	0.33750	0.00000	0.70000	0.21998	0.59823	0.15878	0.99116	0.26039
12414-10	8	0.27500	0.00000	0.80000	0.28661	0.51211	0.15878	1.10715	0.34641

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	0.00000	0.40000	0.30000	0.10000	0.30000	0.50000	0.70000	0.40000		
12414-10	0.00000	0.80000	0.50000	0.20000	0.40000	0.30000	0.00000	0.00000		

Graphics





STUDY: 12414
CLIENT: CH2M Hill
PROJECT: Indian Head - CTO-122 Site 11/17
TASK: Hyalella azteca 42 Day Assay
DATA: Day 35 & 42 Reproduction
START DATE: 09/01/04
END DATE: 10/13/04

Sample Site	ESI Ref	Rep	# Juveniles Day 35	# Juveniles Day 42	Total # Juveniles	Number Females	Number Males	Mean No. Juveniles/ Amphipod D35	Mean No. Juveniles/ Female D42	Day 42 Statistical Evaluation: Normal Distribution	Homogeneous Variance	t Value	Critical t Value	p Value	Statistically Significant Difference	As Compared To
Lab	0	E	3	4	7	1	3	0.72	6.16							-
	0	F	10	4	14	4	2									-
	0	G	0	0	0	2	4									-
	0	H	1	8	9	3	3									-
	0	I	5	8	13	2	5									
	0	J	9	5	14	1	6									
	0	K	17	5	22	2	3									
	0	L	7	10	17	4	4									
IS11TX05	4	E	3	7	10	3	4	0.66	4.50	Normal	Equal	0.7623	1.76131	0.2293	NO	LAB
	4	F	3	13	16	2	7			Normal	Equal	0.17522	1.78229	0.4319	NO	BGDTX05
	4	G	0	0	0	2	1									
	4	H	0	0	0	2	2									
	4	I	3	8	11	2	4									
	4	J	8	8	16	3	3									
	4	K	20	16	36	3	4									
	4	L	5	8	13	7	0									
IS11TX07	5	E	6	10	16	8	1	0.41	3.15	Normal	Equal	1.7346	1.7613	0.0524	NO	LAB
	5	F	1	7	8	4	4			Normal	Equal	1.5082	0.1782	0.0787	NO	BGDTX05
	5	G	4	13	17	6	2									
	5	H	5	1	6	3	3									
	5	I	3	11	14	2	5									
	5	J	2	4	6	3	6									
	5	K	3	4	7	3	2									
	5	L	3	12	15	3	6									
IS11TX02	6	E	0	0	0	1	3	1.01	6.04	Normal	Equal	0.0544	1.7613	0.4787	NO	LAB
	6	F	3	7	10	2	6			Normal	Equal	-0.6768	1.7823	0.7443	NO	BGDTX05
	6	G	15	26	41	6	1									
	6	H	6	5	11	1	1									
	6	I	21	0	21	2	1									
	6	J	5	3	8	1	7									
	6	K	9	11	20	4	5									
	6	L	0	4	4	2	3									
IS11TX04	7	E	4	0	4	1	5	0.55	5.11	Normal	Equal	0.5310	1.7823	0.3026	NO	LAB
	7	F	13	10	23	3	3			Normal	Equal	-0.2341	1.8125	0.5902	NO	BGDTX05
	7	G	5	7	12	4	4									
	7	H	3	3	6	0	3									
	7	I	3	9	12	2	3									
	7	J	0	0	0	0	3									
	7	K	3	3	6	1	2									
	7	L	6	2	8	2	2									
IS11TX03	8	E	8	5	13	2	1	0.43	3.79	Normal	Equal	1.3395	1.7613	0.1009	NO	LAB
	8	F	5	11	16	3	4			Normal	Equal	0.8822	1.7823	0.1975	NO	BGDTX05
	8	G	4	14	18	3	1									
	8	H	0	3	3	3	1									
	8	I	0	5	5	2	4									
	8	J	5	11	16	4	4									
	8	K	0	4	4	3	0									
	8	L	4	7	11	3	1									
IS11TX02	9	E	4	2	6	1	0	0.76	6.21	Normal	Equal	-0.0239	1.7823	0.5093	NO	LAB
	9	F	9	3	12	1	1			Normal	Equal	-0.8486	1.8125	0.7920	NO	BGDTX05
	9	G	2	3	5	2	0									
	9	H	5	2	7	1	2									

	9	I	2	0	2	0	0									
	9	J	11	29	40	8	2									
	9	K	3	0	3	0	1									
	9	L	10	9	19	4	3									
IS17TX06	10	E	2	3	5	0	0	0.41	4.58	Normal	Equal	0.6589	1.8125	0.2624	NO	LAB
	10	F	5	5	10	4	4			Normal	Equal	0.1857	1.8596	0.4286	NO	BGDTX05
	10	G	4	15	19	3	2									
	10	H	0	0	0	0	2									
	10	I	0	15	15	3	1									
	10	J	5	4	9	2	1									
	10	K	8	7	15	0	0									
	10	L	0	0	0	0	0									
BGDTX05	11	E	0	0	0	0	0	0.91	4.83	Normal	Equal	0.6478	1.7823	0.2647	NO	LAB
	11	F	9	1	10	4	0									
	11	G	0	12	12	2	1									
	11	H	2	0	2	0	1									
	11	I	8	9	17	2	1									
	11	J	11	10	21	4	1									
	11	K	5	4	9	4	3									
	11	L	10	8	18	4	0									

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42: 10/14/04

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	# Female SH	COMMENTS
LAB E	1040	4	4	1	IIII
LAB F	1044	6	~~0~~ 4	4	IIII
LAB G	1047	6	0	2	
LAB H	1052	6	8	3	~~IIII~~ III
LAB I	1059	~~6~~ 7	8	2	~~IIII~~ III
LAB J	1104	7	~~4~~ 5	1	~~IIII~~
LAB K	1109	5	5	2	~~IIII~~
LAB L	1117	8	10	4	~~IIII~~ ~~IIII~~
-1 E	1134	8	14	5	~~IIII~~ ~~IIII~~ IIII
-1 F	1141	~~6~~ 7	1	4	I
-1 G	1147	8	3	5	III
-1 H	1151	8	7	5	~~IIII~~ II
-1 I	1155	4	3	3	III
-1 J	1200	3	1	1	I
-1 K	1300	5	7	2	~~IIII~~ II
-1 L	1303	2	0	0	

ANALYST: [illegible]
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	AH 10/14 # Female	COMMENTS
-2E	1309	5	3	4	III
-2F	1312	5	0	2	
-2G	1315	3	0	1	
-2H	1318	5	0	3	
-2I	1325	8	7	4	~~IIII~~ II
-2J	1331	5	7	4	~~IIII~~ II
-2K	1336	5	3	3	III
-2L	1341	8	3	3	III
-4E	1351	7	7	3	~~IIII~~ I
-4F	1400	9	13	2	~~IIII~~ ~~IIII~~ III
-4G	1403	3	0	2	
-4H	1406	4	0	2	
-4I	1412	6	8	2	~~IIII~~ III
-4J	1418	6	8	3	~~IIII~~ III
-4K	1422	7	16	3	~~IIII~~ ~~IIII~~ ~~IIII~~ I
-4L	1427	7	8	7	~~IIII~~ III

ANALYST: _____
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	10/14 AH # Female	COMMENTS
-3E	1324	~~1~~ 2	0	1	
-3F	1327	1	0	0	
3G	1329	2	4	1	
3H	1332	0	0	–	
3I	1335	6	6	4	
3J	1339	1	0	1	
3K	1341	4	3	3	
3L	1344	3	0	1	
5E	1350	9	10	8	
5F	1354	8	7	4	
5G	1358	8	13	6	
5H	1401	6	1	3	
5I	1405	7	11	2	
5J	1409	9	4	3	
5K	1412	5	4	3	
5L	1417	9	12	3	

ANALYST: Lm
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	RH 10/14/04 # Female	COMMENTS
6E	1425	4	0	1	
6F	1430	8	7	2	
6G	1436	7	26	6	
6H	1443	2	5	1	
6I	1447	3	0	2	
6J	1449	8	3	1	
6K	1453	9	11	4	
6L	1457	5	4	2	
9E	1509	1	2	1	
9F	1512	2	3	1	
9G	1517	1+1=2	3	2	
9H	1521	3	2	1	
9I	1524	0	0	~~8~~ RH 10/14	
9J	1526	10	29	8	
9K	1530	1	0	0	
9L	1532	7	9	4	

ANALYST: VM
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	ZH 10/14/04 # Female	COMMENTS
-7E	1437	6	0	1	
-7F	1439	6	10	3	卌 卌
-7G	1443	8	7	4	卌 ||
-7H	1447	3	3	0	|||
-7I	1450	5	9	2	卌 ||||
-7J	1457	~~2~~ 3	0	0	
-7K	1502	3	3	1	|||
-7L	1510	4	2	2	||
-10E	1517	0	3	—	|||
-10F	1528	8	5	4	卌
-10G	1537	5	15	3	卌 卌 卌 卌
-10H	1542	2	0	0	
-10I	1548	4	15	3	卌 卌 卌
-10J	1555	3	4	2	||||
-10K	1602	0	7	-	卌 ||
-10L	1605	0	0	—	

ANALYST: _____
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
***H. azteca* SEDIMENT ASSAY**

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	RH 10/14/04 # Female	COMMENTS
11F	1540	4	1	4	
11G	1543	3	12	2	
11H	1546	1	0	0	

ANALYST: M
DATE: 10/13/04

ESI STUDY # 12414 CH2M Hill
H. azteca SEDIMENT ASSAY

DAY 42:

SAMPLE ID	TIME	#LIVE ADULTS	# LIVE JUVENILES	# Female (~~1H~~ 1414)	COMMENTS
-8E	1450	III (3)	~~IIII~~ (5)	2	
-8F	1510	~~IIII~~ II (7)	~~IIII~~ ~~IIII~~ I (11)	3	
-8G	1520	IIII (4)	~~IIII~~ ~~IIII~~ IIII (14)	3	
-8H	1530	IIII (4)	III (3)	3	
-8I	1535	~~IIII~~ I (6)	~~IIII~~ (5)	2	
-8J	1540	~~IIII~~ III (8)	~~IIIII~~ ~~IIII~~ I (11)	4	
-8K	1545	III (3)	IIII (4)	3	
-8L	1550	IIII (4)	~~IIII~~ II (7)	3	
-11K	1595	~~IIII~~ II (7)	IIII (4)	4	
-11L	1600	IIII (4)	~~IIII~~ III (8)	4	
-11I	1605	III (3)	~~IIII~~ IIII (9)	2	
-11J	1610	~~IIII~~	~~IIII~~ ~~IIII~~ 10	4	

ANALYST: KK

DATE: 1610 10/19/04

CETIS Test Summary

Report Date: 22 Oct-04 11:14 PM
Link: 01-6544-1101

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Test No:	12-4416-9497	**Test Type:**	Hyalella (42d)	**Duration:**	43d 0h
Start Date:	01 Sep-04 12:00 PM	**Protocol:**	EPA/600/R-99/064 (2000)	**Species:**	Hyalella azteca
Ending Date:	14 Oct-04 12:00 PM	**Dil Water:**	50/50 Mix of Surface Water and MHR	**Source:**	Aquatic Research Organisms, NH
Setup Date:	01 Sep-04 12:00 PM	**Brine:**	Not Applicable		

Sample No:	06-0771-3563	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	01 Sep-04	**Code:**	12414-00	**Project:**	Ecologcal Risk Assessment
Receive Date:	01 Sep-04	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	12h (4 °C)	**Station:**	Lab Control -00		
Sample No:	03-7896-9779	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 11:00 AM	**Code:**	12414-04	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 1h (4 °C)	**Station:**	IS11TX05 12414-04		
Sample No:	16-1142-2769	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	11 Aug-04 12:00 PM	**Code:**	12414-05	**Project:**	Ecologcal Risk Assessment
Receive Date:	12 Aug-04 09:50 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	21d 0h (4 °C)	**Station:**	IS11TX07 12414-05		
Sample No:	19-4503-7964	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 02:50 PM	**Code:**	12414-06	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 21h (4 °C)	**Station:**	IS17TX02 12414-06		
Sample No:	07-7263-2686	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:00 AM	**Code:**	12414-07	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 2h (4 °C)	**Station:**	IS11TX04 12414-07		
Sample No:	09-3049-9344	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 10:40 AM	**Code:**	12414-08	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 1h (4 °C)	**Station:**	IS11TX03 12414-08		
Sample No:	06-0576-7762	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 11:35 AM	**Code:**	12414-09	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	20d 0h (4 °C)	**Station:**	IS11TX02 12414-09		
Sample No:	07-9383-1931	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	12 Aug-04 12:40 PM	**Code:**	12414-10	**Project:**	Ecologcal Risk Assessment
Receive Date:	13 Aug-04 10:00 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 23h (4 °C)	**Station:**	IS17TX06 12414-10		
Sample No:	08-0384-6290	**Material:**	Freshwater Sedment	**Client:**	CH2M Hill
Sample Date:	13 Aug-04	**Code:**	12414-11	**Project:**	Ecologcal Risk Assessment
Receive Date:	14 Aug-04 10:20 AM	**Source:**	Indian Head Site 11/47 - CTO-122		
Sample Age:	19d 12h (4 °C)	**Station:**	BGDTX05 12414-11		

CETIS Test Summary

Report Date: 22 Oct-04 11:14 PM
Link: 01-6544-1101

42 d Juveniles per Female Summary

Sample Code	Reps	Mean	Minimum	Maximum	SE	SD	CV
12414-00	12	6.15625	0	14	1.60561	4.54135	73.77%
12414-11	12	4.83333	2.25	8.5	0.95234	2.33274	48.26%
12414-04	12	4.50298	0	12	1.45798	4.12380	91.58%
12414-05	12	3.14583	2	7	0.65876	1.86326	59.23%
12414-06	12	6.04167	0	11	1.36232	3.85321	63.78%
12414-07	12	5.11111	3	7.66667	0.70798	1.73419	33.93%
12414-08	12	3.79167	1	6.5	0.73379	2.07546	54.74%
12414-09	12	6.20833	2.5	12	1.31088	3.21098	51.72%
12414-10	12	4.58333	2.5	6.33333	0.79495	1.5899	34.69%

42 d Juveniles per Female Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25	N/A	N/A
	N/A	N/A								
12414-11	2.5	6	8.5	5.25	2.25	4.5	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-04	3.33333	8	0	0	5.5	5.33333	12	1.85714	N/A	N/A
	N/A	N/A								
12414-05	2	2	2.83333	2	7	2	2.33333	5	N/A	N/A
	N/A	N/A								
12414-06	0	5	6.83333	11	10.5	8	5	2	N/A	N/A
	N/A	N/A								
12414-07	4	7.66667	3	6	6	4	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-08	6.5	5.33333	6	1	2.5	4	1.33333	3.66667	N/A	N/A
	N/A	N/A								
12414-09	6	12	2.5	7	5	4.75	N/A	N/A	N/A	N/A
	N/A	N/A								
12414-10	2.5	6.33333	5	4.5	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A								

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.78999	14.20045	0.16156	Equal Variances
Distribution	Shapiro-Wilk W	0.95731	0.82506	0.64730	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	6.000372	6.000372	1	0.42	0.52930	Non-Significant Effect
Error	171.5755	14.29796	12			
Total	177.575888	20.298332	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-11	0.64782	1.78229	0.2647	3.63964	Non-Significant Effect

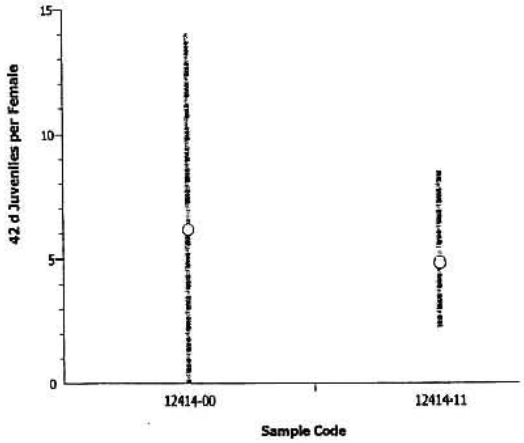
Data Summary

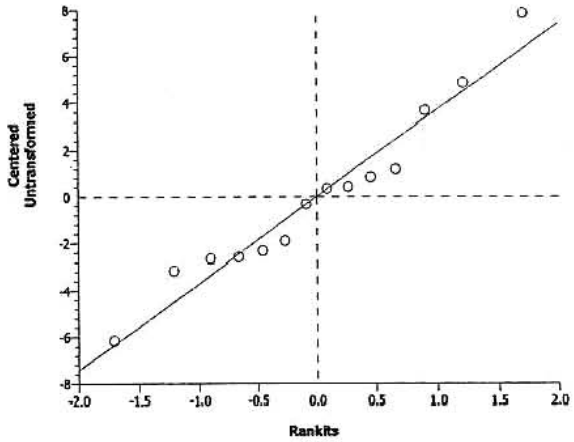
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-11	6	4.83333	2.25	8.5	2.33274				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-11	2.5	6	8.5	5.25	2.25	4.5				

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.21276	8.88539	0.80562	Equal Variances
Distribution	Shapiro-Wilk W	0.94103	0.84420	0.35144	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	10.93326	10.93326	1	0.58	0.45853	Non-Significant Effect
Error	263.4074	18.81481	14			
Total	274.340636	29.748069	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-04	0.7623	1.76131	0.2293	3.81993	Non-Significant Effect

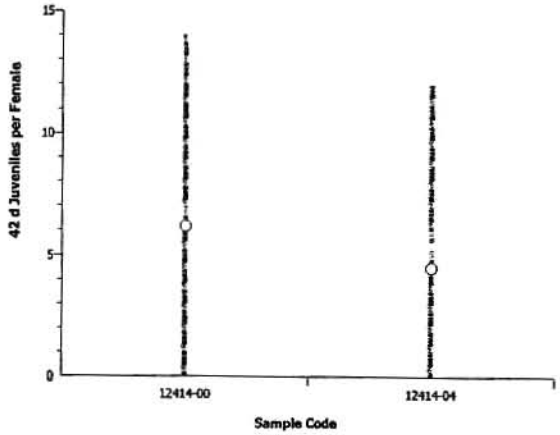
Data Summary

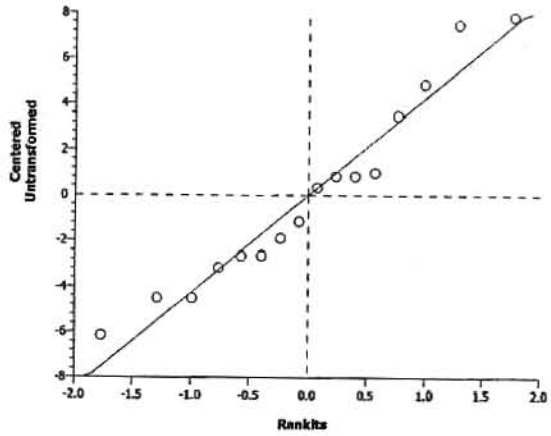
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-04	8	4.50298	0	12	4.12380				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-04	3.33333	8	0	0	5.5	5.33333	12	1.85714		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	5.94053	8.88539	0.03147	Equal Variances
Distribution	Shapiro-Wilk W	0.93742	0.84420	0.31094	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	36.25043	36.25043	1	3.01	0.10476	Non-Significant Effect
Error	168.6693	12.0478	14			
Total	204.919701	48.29824	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-05	1.73461	1.76131	0.0524	3.05675	Non-Significant Effect

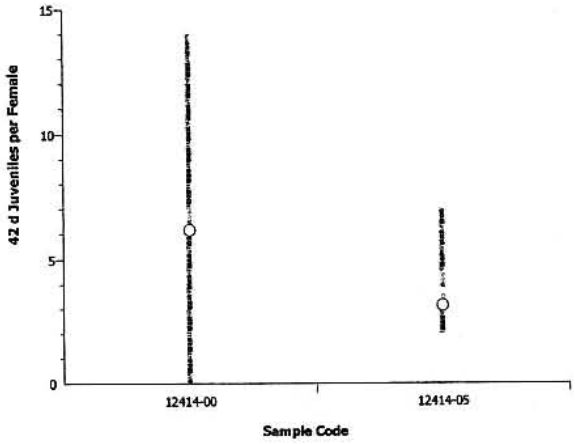
Data Summary

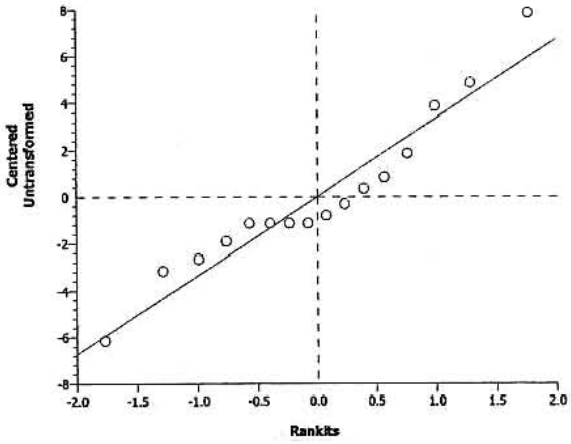
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-05	8	3.14583	2	7	1.86326				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-05	2	2	2.83333	2	7	2	2.33333	5		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.38907	8.88539	0.67548	Equal Variances
Distribution	Shapiro-Wilk W	0.96682	0.84420	0.75024	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0525174	0.0525174	1	0.00	0.95737	Non-Significant Effect
Error	248.2977	17.73555	14			
Total	248.350262	17.788071	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-06	0.05442	1.76131	0.4787	3.70876	Non-Significant Effect

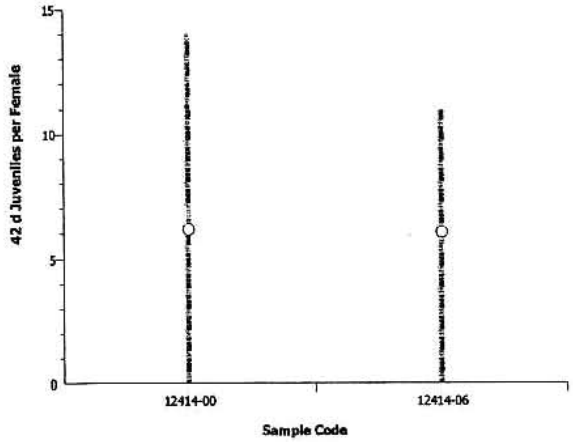
Data Summary

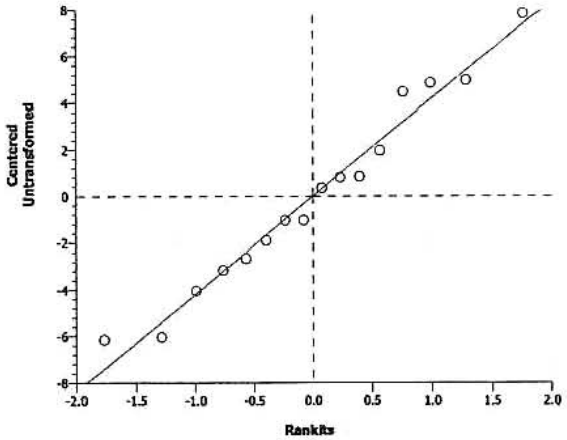
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-06	8	6.04167	0	11	3.85321				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-06	0	5	6.83333	11	10.5	8	5	2		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	6.85770	14.20045	0.04993	Equal Variances
Distribution	Shapiro-Wilk W	0.95716	0.82506	0.64493	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	3.745081	3.745081	1	0.28	0.60513	Non-Significant Effect
Error	159.4042	13.28369	12			
Total	163.149302	17.028767	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-07	0.53097	1.78229	0.3026	3.50817	Non-Significant Effect

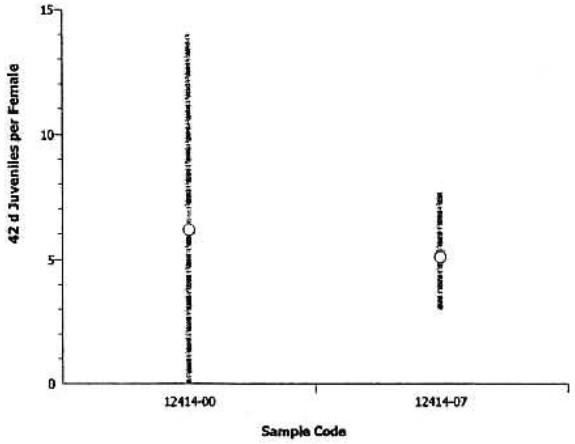
Data Summary

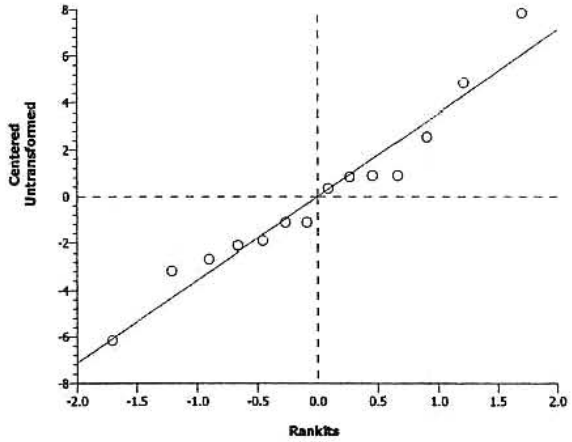
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-07	6	5.11111	3	7.66667	1.73419				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-07	4	7.66667	3	6	6	4				

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	4.78786	8.88539	0.05580	Equal Variances
Distribution	Shapiro-Wilk W	0.96820	0.84420	0.77399	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	22.36502	22.36502	1	1.79	0.20176	Non-Significant Effect
Error	174.52	12.46571	14			
Total	196.884975	34.830729	15			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-08	1.33945	1.76131	0.1009	3.10931	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-08	8	3.79167	1	6.5	2.07546				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-08	6.5	5.33333	6	1	2.5	4	1.33333	3.66667		

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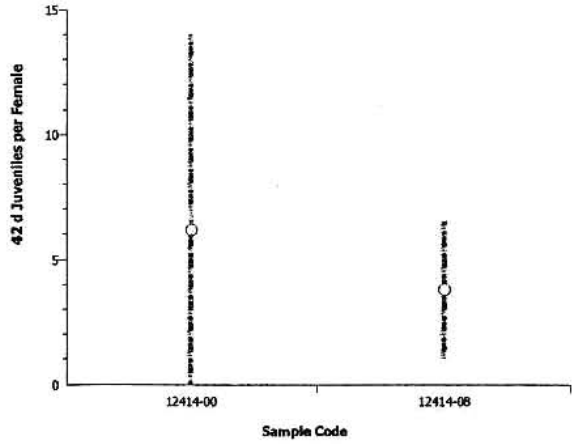

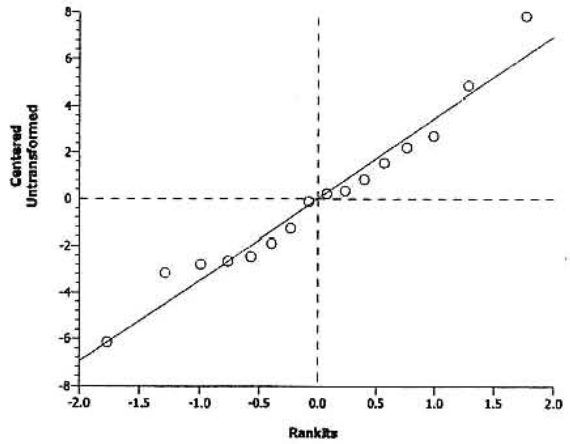

CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **EnviroSystems, Inc.**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.00030	14.20045	0.46273	Equal Variances
Distribution	Shapiro-Wilk W	0.94292	0.82506	0.44456	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.0093006	0.0093006	1	0.00	0.98135	Non-Significant Effect
Error	195.9193	16.32661	12			
Total	195.928566	16.335907	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-09	-0.0239	1.78229	0.5093	3.88928	Non-Significant Effect

Data Summary

		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-09	6	6.20833	2.5	12	3.21098				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-09	6	12	2.5	7	5	4.75				

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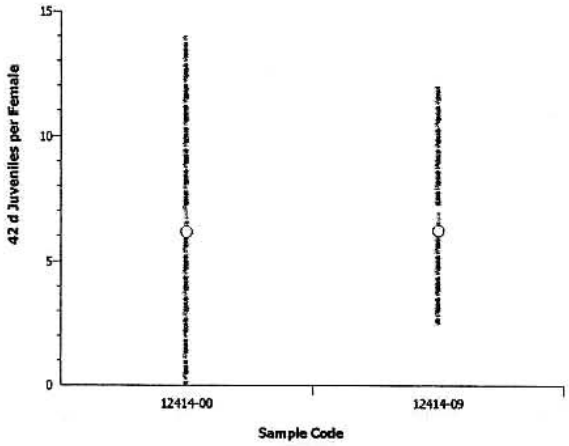
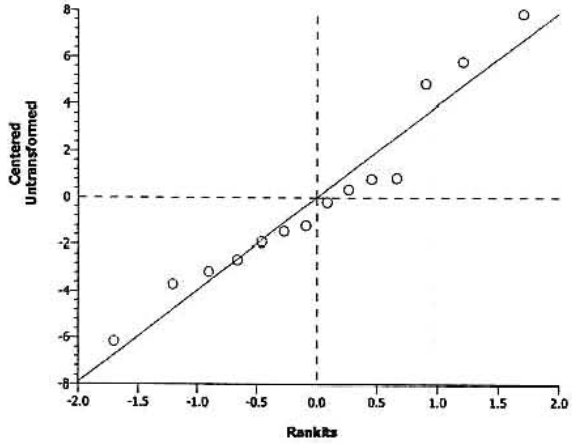




CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	8.15890	44.43410	0.11231	Equal Variances
Distribution	Shapiro-Wilk W	0.95567	0.80465	0.66828	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	6.597512	6.597512	1	0.43	0.52482	Non-Significant Effect
Error	151.9505	15.19505	10			
Total	158.548028	21.792564	11			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-00		12414-10	0.65893	1.81246	0.2624	4.32649	Non-Significant Effect

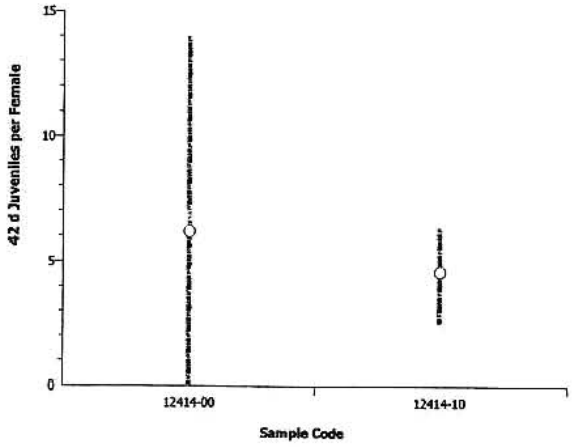
Data Summary

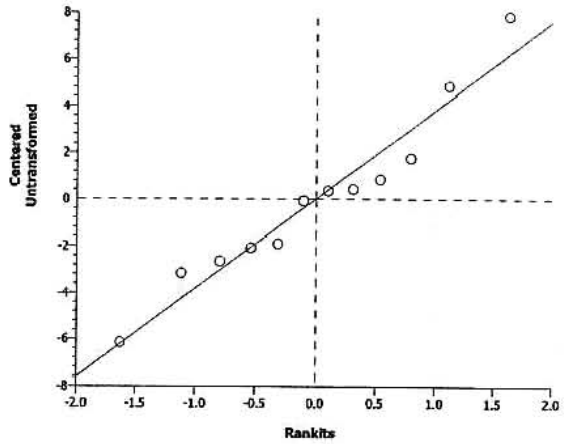
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-00	8	6.15625	0	14	4.54135				
12414-10	4	4.58333	2.5	6.33333	1.5899				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-00	7	3.5	0	3	6.5	14	11	4.25		
12414-10	2.5	6.33333	5	4.5						

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	3.12510	14.20045	0.22802	Equal Variances
Distribution	Shapiro-Wilk W	0.94807	0.82506	0.51210	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.37418	0.37418	1	0.03	0.86383	Non-Significant Effect
Error	146.2485	12.18738	12			
Total	146.622685	12.561556	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-04	0.17522	1.78229	0.4319	3.36029	Non-Significant Effect

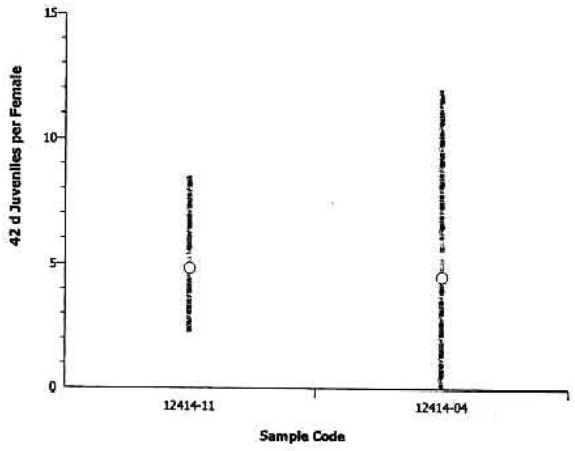
Data Summary

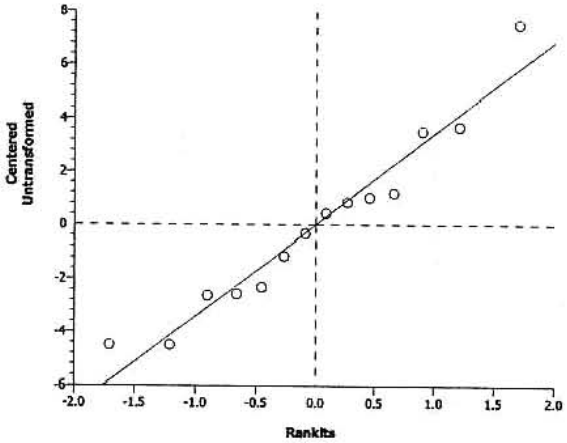
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-04	8	4.50298	0.00000	12.0000	4.12380				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.5	6	8.5	5.25	2.25	4.5				
12414-04	3.33333	8	0	0	5.5	5.33333	12	1.85714		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.56742	9.52206	0.56753	Equal Variances
Distribution	Shapiro-Wilk W	0.89549	0.82506	0.10265	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	9.763392	9.763392	1	2.27	0.15739	Non-Significant Effect
Error	51.51042	4.292535	12			
Total	61.2738104	14.055927	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-05	1.50815	1.78229	0.0787	1.99424	Non-Significant Effect

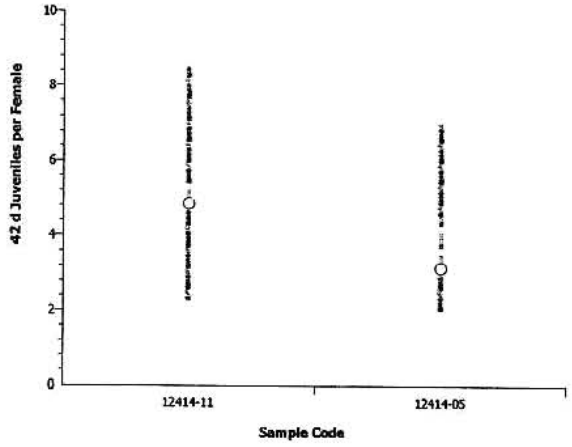
Data Summary

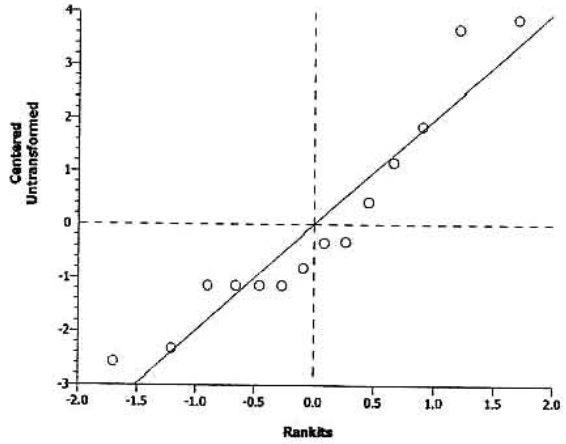
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-05	8	3.14583	2.00000	7.00000	1.86326				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.50000	6.00000	8.50000	5.25000	2.25000	4.50000				
12414-05	2.00000	2.00000	2.83333	2.00000	7.00000	2.00000	2.33333	5.00000		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:08 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.72843	14.20045	0.28677	Equal Variances
Distribution	Shapiro-Wilk W	0.97929	0.82506	0.94835	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	5.005952	5.005952	1	0.46	0.51136	Non-Significant Effect
Error	131.1389	10.92824	12			
Total	136.144838	15.934193	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-06	-0.6768	1.78229	0.7443	3.18197	Non-Significant Effect

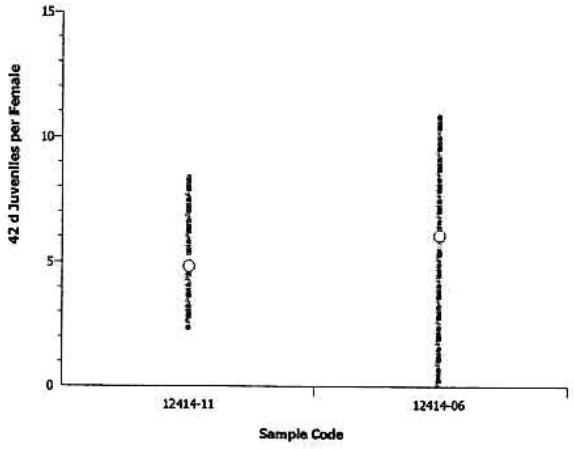
Data Summary

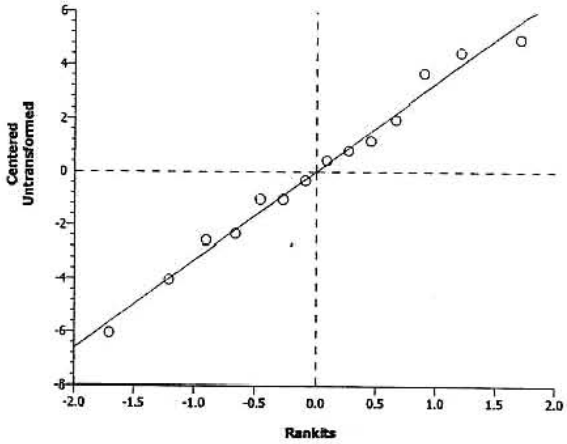
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-06	8	6.04167	0.00000	11.0000	3.85321				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.5	6	8.5	5.25	2.25	4.5				
12414-06	0	5	6.83333	11	10.5	8	5	2		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:09 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.80942	14.93961	0.53093	Equal Variances
Distribution	Shapiro-Wilk W	0.95179	0.80465	0.61556	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2314815	0.2314815	1	0.05	0.81964	Non-Significant Effect
Error	42.24537	4.224537	10			
Total	42.4768504	4.4560184	11			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-07	-0.2341	1.81246	0.5902	2.15079	Non-Significant Effect

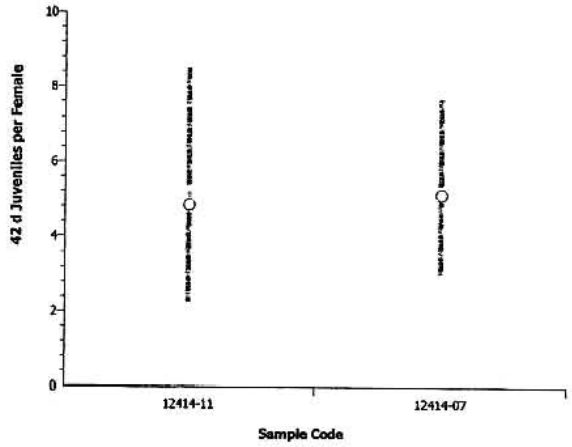
Data Summary

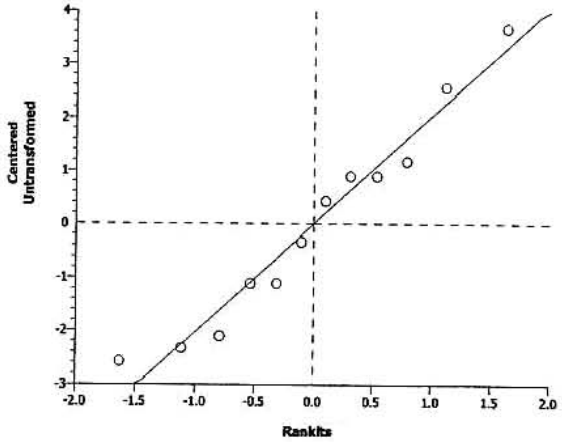
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-07	6	5.11111	3.00000	7.66667	1.73419				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.50000	6.00000	8.50000	5.25000	2.25000	4.50000				
12414-07	4.00000	7.66667	3.00000	6.00000	6.00000	4.00000				

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:09 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.26329	9.52206	0.74973	Equal Variances
Distribution	Shapiro-Wilk W	0.94454	0.82506	0.46506	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	3.720238	3.720238	1	0.78	0.39500	Non-Significant Effect
Error	57.36111	4.780093	12			
Total	61.0813489	8.5003309	13			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-08	0.88220	1.78229	0.1975	2.10445	Non-Significant Effect

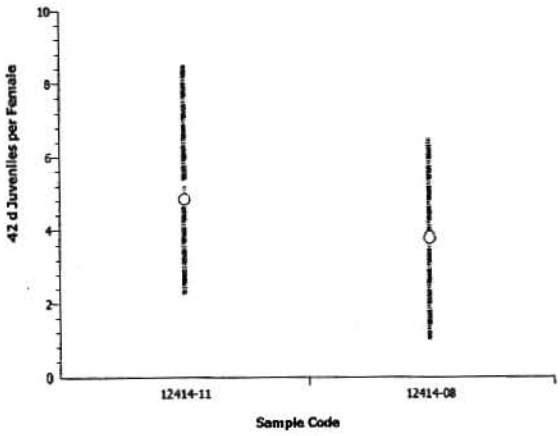
Data Summary

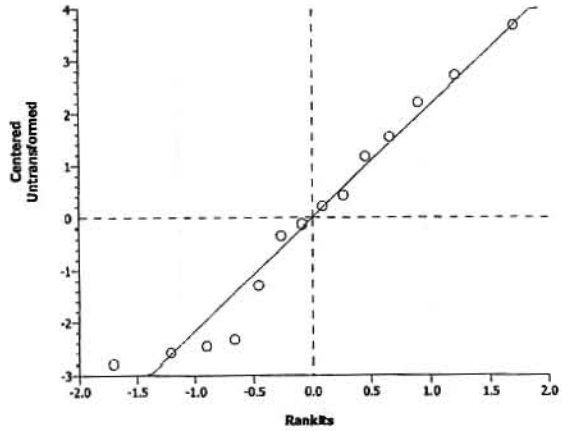
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-08	8	3.79167	1.00000	6.50000	2.07546				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.50000	6.00000	8.50000	5.25000	2.25000	4.50000				
12414-08	6.50000	5.33333	6.00000	1.00000	2.50000	4.00000	1.33333	3.66667		

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:09 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.89472	14.93961	0.49998	Equal Variances
Distribution	Shapiro-Wilk W	0.94152	0.80465	0.48570	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	5.671875	5.671875	1	0.72	0.41595	Non-Significant Effect
Error	78.76041	7.876042	10			
Total	84.4322891	13.547917	11			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-09	-0.8486	1.81246	0.7920	2.93672	Non-Significant Effect

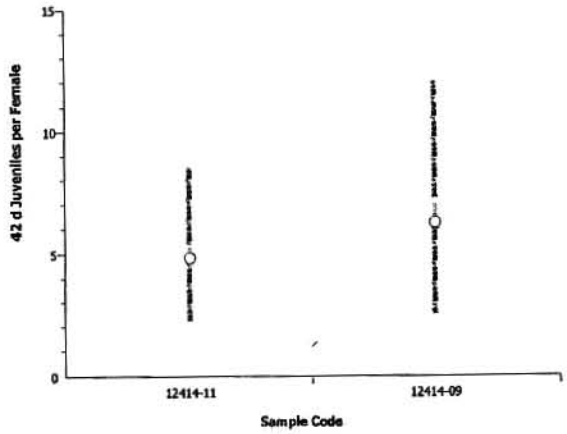
Data Summary

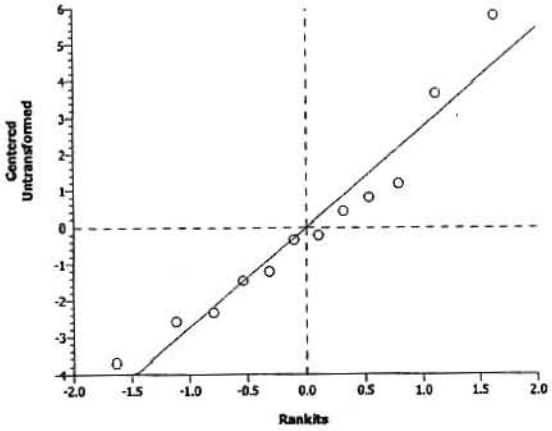
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-09	6	6.20833	2.50000	12.0000	3.21098				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.5	6	8.5	5.25	2.25	4.5				
12414-09	6	12	2.5	7	5	4.75				

Graphics





CETIS Analysis Detail

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
42 d Juveniles per Female	Comparison	01-6544-1101	01-6544-1101	22 Oct-04 11:09 PM	CETISv1.025

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed				N/A		

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.15275	45.39164	0.56089	Equal Variances
Distribution	Shapiro-Wilk W	0.94643	0.78055	0.59600	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.15	0.15	1	0.03	0.85729	Non-Significant Effect
Error	34.79167	4.348958	8			
Total	34.9416679	4.4989585	9			

Group Comparisons

Sample	vs	Sample	Statistic	Critical	P Level	MSD	Decision(0.05)
12414-11		12414-10	0.18572	1.85955	0.4286	2.50319	Non-Significant Effect

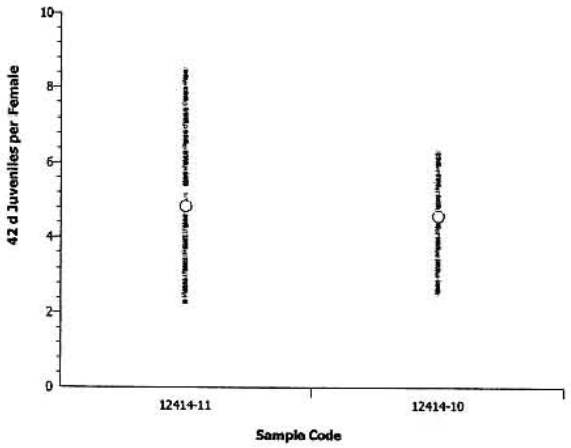
Data Summary

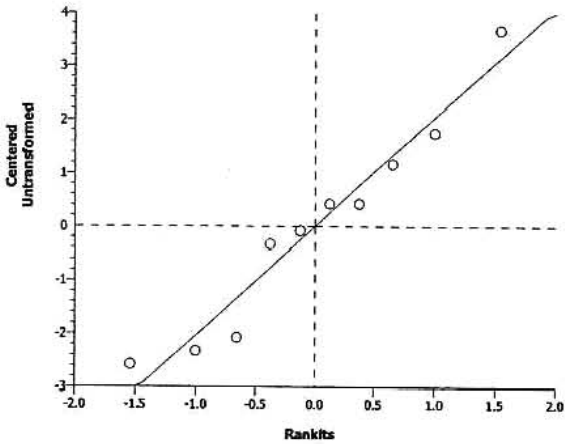
		Original Data				Transformed Data			
Sample Code	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
12414-11	6	4.83333	2.25000	8.50000	2.33274				
12414-10	4	4.58333	2.50000	6.33333	1.58990				

Data Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12414-11	2.50000	6.00000	8.50000	5.25000	2.25000	4.50000				
12414-10	2.50000	6.33333	5.00000	4.50000						

Graphics





Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: LAB
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-013	ND	10	mg/L as CaCO3	09/01/04	09/15/04 1046	EPA 310.2
7	Alkalinity	12414-052	15	10	mg/L as CaCO3	09/08/04	09/15/04 1048	EPA 310.2
14	Alkalinity	12414-091	27	10	mg/L as CaCO3	09/15/04	09/15/04 1251	EPA 310.2
21	Alkalinity	12414-130	30	10	mg/L as CaCO3	09/22/04	09/23/04 1603	EPA 310.2
28	Alkalinity	12414-169	35	10	mg/L as CaCO3	09/29/04	10/04/04 1238	EPA 310.2
0	Ammonia-N	12414-039	ND	0.1	mg/L as N	09/01/04	09/03/04 1032	APHA 4500-NH3 G
7	Ammonia-N	12414-078	0.6	0.1	mg/L as N	09/08/04	09/13/04 1322	APHA 4500-NH3 G
14	Ammonia-N	12414-117	ND	0.1	mg/L as N	09/15/04	09/17/04 1058	APHA 4500-NH3 G
21	Ammonia-N	12414-156	ND	0.1	mg/L as N	09/22/04	09/29/04 1148	APHA 4500-NH3 G
28	Ammonia-N	12414-195	ND	0.1	mg/L as N	09/29/04	09/29/04 1202	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-026	39	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-065	47	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-104	52	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-143	58	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-182	59	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: MHR/POND
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-012	11	10	mg/L as CaCO3	09/01/04	09/02/04 1018	EPA 310.2
7	Alkalinity	12414-051	17	10	mg/L as CaCO3	09/08/04	09/15/04 1047	EPA 310.2
14	Alkalinity	12414-090	23	10	mg/L as CaCO3	09/15/04	09/15/04 1251	EPA 310.2
21	Alkalinity	12414-129	33	10	mg/L as CaCO3	09/22/04	09/23/04 1602	EPA 310.2
28	Alkalinity	12414-168	39	10	mg/L as CaCO3	09/29/04	10/04/04 1237	EPA 310.2
35	Alkalinity	12414-207	37	10	mg/L as CaCO3	10/06/04	10/12/04 1158	EPA 310.2
42	Alkalinity	12414-210	32	10	mg/L as CaCO3	10/13/04	10/18/04 1421	EPA 310.2
0	Ammonia-N	12414-038	ND	0.1	mg/L as N	09/01/04	09/03/04 1029	APHA 4500-NH3 G
7	Ammonia-N	12414-077	ND	0.1	mg/L as N	09/08/04	09/13/04 1321	APHA 4500-NH3 G
14	Ammonia-N	12414-116	ND	0.1	mg/L as N	09/15/04	09/17/04 1055	APHA 4500-NH3 G
21	Ammonia-N	12414-155	ND	0.1	mg/L as N	09/22/04	09/29/04 1144	APHA 4500-NH3 G
28	Ammonia-N	12414-194	ND	0.1	mg/L as N	09/29/04	09/29/04 1201	APHA 4500-NH3 G
35	Ammonia-N	12414-209	ND	0.1	mg/L as N	10/06/04	10/08/04 1339	APHA 4500-NH3 G
42	Ammonia-N	12414-212	ND	0.1	mg/L as N	10/13/04	10/15/04 1128	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-025	41	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-064	51	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-103	51	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-142	55	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-181	52	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111
35	Hardness as CaCO3	12414-208	58	0.3	mg/L	10/06/04	10/13/04	200.7 EPA 600/R-94/111
42	Hardness as CaCO3	12414-211	50	0.3	mg/L	10/13/04	10/14/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -004
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-017	21	10	mg/L as CaCO3	09/01/04	09/02/04 1020	EPA 310.2
7	Alkalinity	12414-056	70	10	mg/L as CaCO3	09/08/04	09/15/04 1051	EPA 310.2
14	Alkalinity	12414-095	46	10	mg/L as CaCO3	09/15/04	09/15/04 1256	EPA 310.2
21	Alkalinity	12414-134	35	10	mg/L as CaCO3	09/22/04	09/23/04 1606	EPA 310.2
28	Alkalinity	12414-173	48	10	mg/L as CaCO3	09/29/04	10/04/04 1241	EPA 310.2
0	Ammonia-N	12414-043	3.2	0.1	mg/L as N	09/01/04	09/03/04 1036	APHA 4500-NH3 G
7	Ammonia-N	12414-082	4	0.1	mg/L as N	09/08/04	09/13/04 1326	APHA 4500-NH3 G
14	Ammonia-N	12414-121	ND	0.1	mg/L as N	09/15/04	09/17/04 1104	APHA 4500-NH3 G
21	Ammonia-N	12414-160	ND	0.1	mg/L as N	09/22/04	09/29/04 1152	APHA 4500-NH3 G
28	Ammonia-N	12414-199	ND	0.1	mg/L as N	09/29/04	09/29/04 1211	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-030	47	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-069	63	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-108	59	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-147	64	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-186	65	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -005
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-018	ND	10	mg/L as CaCO3	09/01/04	09/02/04 1021	EPA 310.2
7	Alkalinity	12414-057	42	10	mg/L as CaCO3	09/08/04	09/15/04 1051	EPA 310.2
14	Alkalinity	12414-096	27	10	mg/L as CaCO3	09/15/04	09/15/04 1256	EPA 310.2
21	Alkalinity	12414-135	33	10	mg/L as CaCO3	09/22/04	09/23/04 1606	EPA 310.2
28	Alkalinity	12414-174	41	10	mg/L as CaCO3	09/29/04	10/04/04 1242	EPA 310.2
0	Ammonia-N	12414-044	1.5	0.1	mg/L as N	09/01/04	09/03/04 1037	APHA 4500-NH3 G
7	Ammonia-N	12414-083	2	0.1	mg/L as N	09/08/04	09/13/04 1326	APHA 4500-NH3 G
14	Ammonia-N	12414-122	ND	0.1	mg/L as N	09/15/04	09/17/04 1105	APHA 4500-NH3 G
21	Ammonia-N	12414-161	ND	0.1	mg/L as N	09/22/04	09/29/04 1152	APHA 4500-NH3 G
28	Ammonia-N	12414-200	ND	0.1	mg/L as N	09/29/04	09/29/04 1213	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-031	48	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-070	51	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-109	53	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-148	60	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-187	58	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -006
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-019	30	10	mg/L as CaCO3	09/01/04	09/02/04 1021	EPA 310.2
7	Alkalinity	12414-058	51	10	mg/L as CaCO3	09/08/04	09/15/04 1051	EPA 310.2
14	Alkalinity	12414-097	30	10	mg/L as CaCO3	09/15/04	09/15/04 1256	EPA 310.2
21	Alkalinity	12414-136	48	10	mg/L as CaCO3	09/22/04	09/23/04 1606	EPA 310.2
28	Alkalinity	12414-175	49	10	mg/L as CaCO3	09/29/04	10/04/04 1242	EPA 310.2
0	Ammonia-N	12414-045	2.1	0.1	mg/L as N	09/01/04	09/03/04 1037	APHA 4500-NH3 G
7	Ammonia-N	12414-084	1.5	0.1	mg/L as N	09/08/04	09/13/04 1330	APHA 4500-NH3 G
14	Ammonia-N	12414-123	ND	0.1	mg/L as N	09/15/04	09/17/04 1106	APHA 4500-NH3 G
21	Ammonia-N	12414-162	ND	0.1	mg/L as N	09/22/04	09/29/04 1153	APHA 4500-NH3 G
28	Ammonia-N	12414-201	ND	0.1	mg/L as N	09/29/04	09/29/04 1214	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-032	55	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-071	68	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-110	59	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-149	69	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-188	59	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -007
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-020	18	10	mg/L as CaCO3	09/01/04	09/02/04 1021	EPA 310.2
7	Alkalinity	12414-059	27	10	mg/L as CaCO3	09/08/04	09/15/04 1052	EPA 310.2
14	Alkalinity	12414-098	34	10	mg/L as CaCO3	09/15/04	09/15/04 1257	EPA 310.2
21	Alkalinity	12414-137	68	10	mg/L as CaCO3	09/22/04	09/23/04 1607	EPA 310.2
28	Alkalinity	12414-176	76	10	mg/L as CaCO3	09/29/04	10/04/04 1242	EPA 310.2
0	Ammonia-N	12414-046	3.1	0.1	mg/L as N	09/01/04	09/03/04 1044	APHA 4500-NH3 G
7	Ammonia-N	12414-085	0.4	0.1	mg/L as N	09/08/04	09/13/04 1331	APHA 4500-NH3 G
14	Ammonia-N	12414-124	ND	0.1	mg/L as N	09/15/04	09/17/04 1107	APHA 4500-NH3 G
21	Ammonia-N	12414-163	ND	0.1	mg/L as N	09/22/04	09/29/04 1154	APHA 4500-NH3 G
28	Ammonia-N	12414-202	ND	0.1	mg/L as N	09/29/04	09/29/04 1215	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-033	53	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-072	59	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-111	67	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-150	100	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-189	97	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -008
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-021	19	10	mg/L as CaCO3	09/01/04	09/02/04 1022	EPA 310.2
7	Alkalinity	12414-060	20	10	mg/L as CaCO3	09/08/04	09/15/04 1052	EPA 310.2
14	Alkalinity	12414-099	32	10	mg/L as CaCO3	09/15/04	09/15/04 1257	EPA 310.2
21	Alkalinity	12414-138	67	10	mg/L as CaCO3	09/22/04	09/23/04 1607	EPA 310.2
28	Alkalinity	12414-177	68	10	mg/L as CaCO3	09/29/04	10/04/04 1243	EPA 310.2
0	Ammonia-N	12414-047	2.1	0.1	mg/L as N	09/01/04	09/03/04 1046	APHA 4500-NH3 G
7	Ammonia-N	12414-086	ND	0.1	mg/L as N	09/08/04	09/13/04 1332	APHA 4500-NH3 G
14	Ammonia-N	12414-125	ND	0.1	mg/L as N	09/15/04	09/17/04 1108	APHA 4500-NH3 G
21	Ammonia-N	12414-164	ND	0.1	mg/L as N	09/22/04	09/29/04 1155	APHA 4500-NH3 G
28	Ammonia-N	12414-203	ND	0.1	mg/L as N	09/29/04	09/29/04 1216	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-034	52	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-073	55	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-112	63	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-151	97	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-190	95	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -009
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-022	16	10	mg/L as CaCO3	09/01/04	09/02/04 1023	EPA 310.2
7	Alkalinity	12414-061	27	10	mg/L as CaCO3	09/08/04	09/15/04 1052	EPA 310.2
14	Alkalinity	12414-100	32	10	mg/L as CaCO3	09/15/04	09/15/04 1257	EPA 310.2
21	Alkalinity	12414-139	63	10	mg/L as CaCO3	09/22/04	09/23/04 1607	EPA 310.2
28	Alkalinity	12414-178	74	10	mg/L as CaCO3	09/29/04	10/04/04 1243	EPA 310.2
0	Ammonia-N	12414-048	3.1	0.1	mg/L as N	09/01/04	09/03/04 1047	APHA 4500-NH3 G
7	Ammonia-N	12414-087	1.2	0.1	mg/L as N	09/08/04	09/13/04 1333	APHA 4500-NH3 G
14	Ammonia-N	12414-126	ND	0.1	mg/L as N	09/15/04	09/17/04 1108	APHA 4500-NH3 G
21	Ammonia-N	12414-165	ND	0.1	mg/L as N	09/22/04	09/29/04 1156	APHA 4500-NH3 G
28	Ammonia-N	12414-204	ND	0.1	mg/L as N	09/29/04	09/29/04 1217	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-035	58	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-074	59	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-113	58	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-152	90	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-191	96	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -010
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-023	ND	10	mg/L as CaCO3	09/01/04	09/02/04 1023	EPA 310.2
7	Alkalinity	12414-062	31	10	mg/L as CaCO3	09/08/04	09/15/04 1053	EPA 310.2
14	Alkalinity	12414-101	66	10	mg/L as CaCO3	09/15/04	09/15/04 1258	EPA 310.2
21	Alkalinity	12414-140	82	10	mg/L as CaCO3	09/22/04	09/23/04 1608	EPA 310.2
28	Alkalinity	12414-179	70	10	mg/L as CaCO3	09/29/04	10/04/04 1243	EPA 310.2
0	Ammonia-N	12414-049	1.1	0.1	mg/L as N	09/01/04	09/03/04 1048	APHA 4500-NH3 G
7	Ammonia-N	12414-088	ND	0.1	mg/L as N	09/08/04	09/13/04 1357	APHA 4500-NH3 G
14	Ammonia-N	12414-127	ND	0.1	mg/L as N	09/15/04	09/17/04 1109	APHA 4500-NH3 G
21	Ammonia-N	12414-166	ND	0.1	mg/L as N	09/22/04	09/29/04 1159	APHA 4500-NH3 G
28	Ammonia-N	12414-205	ND	0.1	mg/L as N	09/29/04	09/29/04 1218	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-036	57	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-075	60	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-114	77	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-153	120	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-192	89	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Report No: 12414
Project: CH2MHill - Indian Head Project

Sample ID: -011
Matrix: Water

Day	Parameter	Lab ID	Result	Quant Limit	Units	Date Sampled	Date of Analysis	Method/Reference
0	Alkalinity	12414-024	22	10	mg/L as CaCO3	09/01/04	09/02/04 1024	EPA 310.2
7	Alkalinity	12414-063	28	10	mg/L as CaCO3	09/08/04	09/15/04 1054	EPA 310.2
14	Alkalinity	12414-102	18	10	mg/L as CaCO3	09/15/04	09/15/04 1258	EPA 310.2
21	Alkalinity	12414-141	26	10	mg/L as CaCO3	09/22/04	09/23/04 1608	EPA 310.2
28	Alkalinity	12414-180	42	10	mg/L as CaCO3	09/29/04	10/04/04 1244	EPA 310.2
0	Ammonia-N	12414-050	4.6	0.1	mg/L as N	09/01/04	09/03/04 1049	APHA 4500-NH3 G
7	Ammonia-N	12414-089	3.4	0.1	mg/L as N	09/08/04	09/13/04 1334	APHA 4500-NH3 G
14	Ammonia-N	12414-128	0.2	0.1	mg/L as N	09/15/04	09/17/04 1110	APHA 4500-NH3 G
21	Ammonia-N	12414-167	ND	0.1	mg/L as N	09/22/04	09/29/04 1200	APHA 4500-NH3 G
28	Ammonia-N	12414-206	ND	0.1	mg/L as N	09/29/04	09/29/04 1219	APHA 4500-NH3 G
0	Hardness as CaCO3	12414-037	50	0.3	mg/L	09/01/04	09/02/04	200.7 EPA 600/R-94/111
7	Hardness as CaCO3	12414-076	54	0.3	mg/L	09/08/04	09/09/04	200.7 EPA 600/R-94/111
14	Hardness as CaCO3	12414-115	52	0.3	mg/L	09/15/04	09/16/04	200.7 EPA 600/R-94/111
21	Hardness as CaCO3	12414-154	56	0.3	mg/L	09/22/04	09/29/04	200.7 EPA 600/R-94/111
28	Hardness as CaCO3	12414-193	61	0.3	mg/L	09/29/04	10/01/04	200.7 EPA 600/R-94/111

NOTES:
ND - Not detected

Aquatic Research Organisms

DATA SHEET

I. **Organism History**

Species: Hyalella azteca

Source: Lab reared X Hatchery reared____ Field collected____

Hatch date 8/25/04 Receipt date____

Lot number 08.25.04 HA Strain ARO F2

Brood Origination US FWS MO

II. **Water Quality**

Temperature 23 °C Salinity <1 ppt DO 7.8

pH 7.6 Hardness ≈150 ppm

III. **Culture Conditions**

System: FW static renewal

Diet: Flake Food X Phytoplankton____ Trout Chow X

Brine Shrimp____ Rotifers____ Other____

Prophylactic Treatments:____

Comments:____

IV. **Shipping Information**

Client: ESI # of Organisms: 1600

Carrier: Pick-up Date Shipped: 9/1/04

Biologist: [signature]

1 - 800 - 927 - 1650

PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

EDI

GPL LABORATORIES, LLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: NDW Indian Head Site 11/17
Client: CH2M HILL
Send Results To: John Burgess
Address: 25 New Chardon, Ste 300
Boston, MA 02114
Phone: 617-523-2002 x224

Turnaround Time
# of Containers
Container Type: Bucket
Preservative Used: 2
Type of Analysis

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Sediment Toxicity Test (ASTM E1706)	Lab Cooler No.	CLIENT COMMENTS
1S11TX05	8/11/04	1100	Sed	SB	X		42-day Hyalella
1S11TX07	8/11/04	1200	Sed	SB	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	8/11/04 1600			[signature]	8/12/04 0950

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. _____

GPL ~~LABORATORIES, LLP~~ ESI

7210A ~~Corporate Court~~
~~Frederick, MD~~ 21703
~~(301) 694~~-5310
Fax ~~(301)~~ 620-0731

Contract #/Billing Reference: 145185. AR. ER

1 of 1 Pgs.

Project: Indian Head- CTO 122
Client: CH2M Hill
Send Results To: John Burgess/CH2M
Address: 25 New Chardon St, Ste 300 Boston, MA 02114
Phone: (617) 523-2002 x 224

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	SEDIMENT TOX TEST										CLIENT COMMENTS
Turnaround Time															
# of Containers					2										
Container Type					Bucke										
Preservative Used					ICE										
Type of Analysis															Lab Cooler No.
IS17TX02	8/12/04	1450	SD TOX	JB, CP	2										

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	8/12/04 1700			[signature]	8/13/04 1000

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			As Rec'd temp 4°C	

G.P. W.O. _____

~~GPL LABORATORIES, LLLP~~ ESI

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference: 145185.AR.ER

1 of 1 Pgs.

Project: Indian Head- CTO122
Client: CH2M Hill
Send Results To: John Burgess/CH2M
Address: 25 New Chardon St, Ste 300
Boston, MA 02114
Phone: (617) 523-2002 x 224

Turnaround Time	
# of Containers	2
Container Type	Bucket
Preservative Used	ICE
Type of Analysis	SEDIMENT TOX TEST

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	SEDIMENT TOX TEST	Lab Cooler No.	CLIENT COMMENTS
IS11TX04	8/12/04	1000	SD TOX	JB, CP	2		
IS11TX03	↓	1040	SD TOX	JB, CP	2		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
				[signature]	8/12/04 1000

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			6°C as read temp	

G.P. W.O. _____

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7210A Corporate Court
~~Frederick, MD 21703~~
~~(301) 694-5310~~
Fax ~~(301) 630-0731~~

Contract #/Billing Reference: 145185. AR. ER

1 of 1 Pgs.

Project: Indian Head - CTO 122
Client: CH2M Hill
Send Results To: John Burgess / CH2M
Address: 25 New Chardon St, Ste 300
Boston, MA 02114
Phone: (617) 523-2002 x 224

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	SEDIMENT TOX TEST										CLIENT COMMENTS
Turnaround Time															
# of Containers					2										
Container Type					Bucke										
Preservative Used					ICE										
Type of Analysis															Lab Cooler No.
IS 11 TX 02	8/12/04	1135	SD TOX	JB, CP	2										
IS17 TX 06	↓	1240	SD TOX	JB, CP	2										

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	8/12/04 1700			[signature]	8/13/04 1000

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			As Rec'd temp 7°C	

G.P. W.O. _____

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference: 156175.AR.FI

1 of 1 Pgs.

Project: INDIAN HEAD CTO 122
Client: CH2M HILL
Send Results To: John Burgess / CH2M HILL
Address: 25 New Chardon St., Ste. 300
Boston, MA 02114
Phone: 617.523.2002 x224

Turnaround Time	
# of Containers	2
Container Type	bucket
Preservative Used	ice
Type of Analysis	sediment toxicity

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Sediment Toxicity	Lab Cooler No.	CLIENT COMMENTS
BGDTX05	8/13/04		Sed	CP, JB	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John Burgess	8/13/04 1730	[signature]		[signature]	8/14/04 1020

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			Temp - 6°C Seals in place. ice remaining in cooler.	6°C

G.P. W.O. _____

Appendix C
Benthic Community Structure Analysis

GEOTECHNICAL LOG

Method: ASTM D422
Date: 08-13-04
Client: CH2M HILL
Review by/date: 08/21/04
Analyst: I.O.E
Project Name: CTO 122, Indian Head,

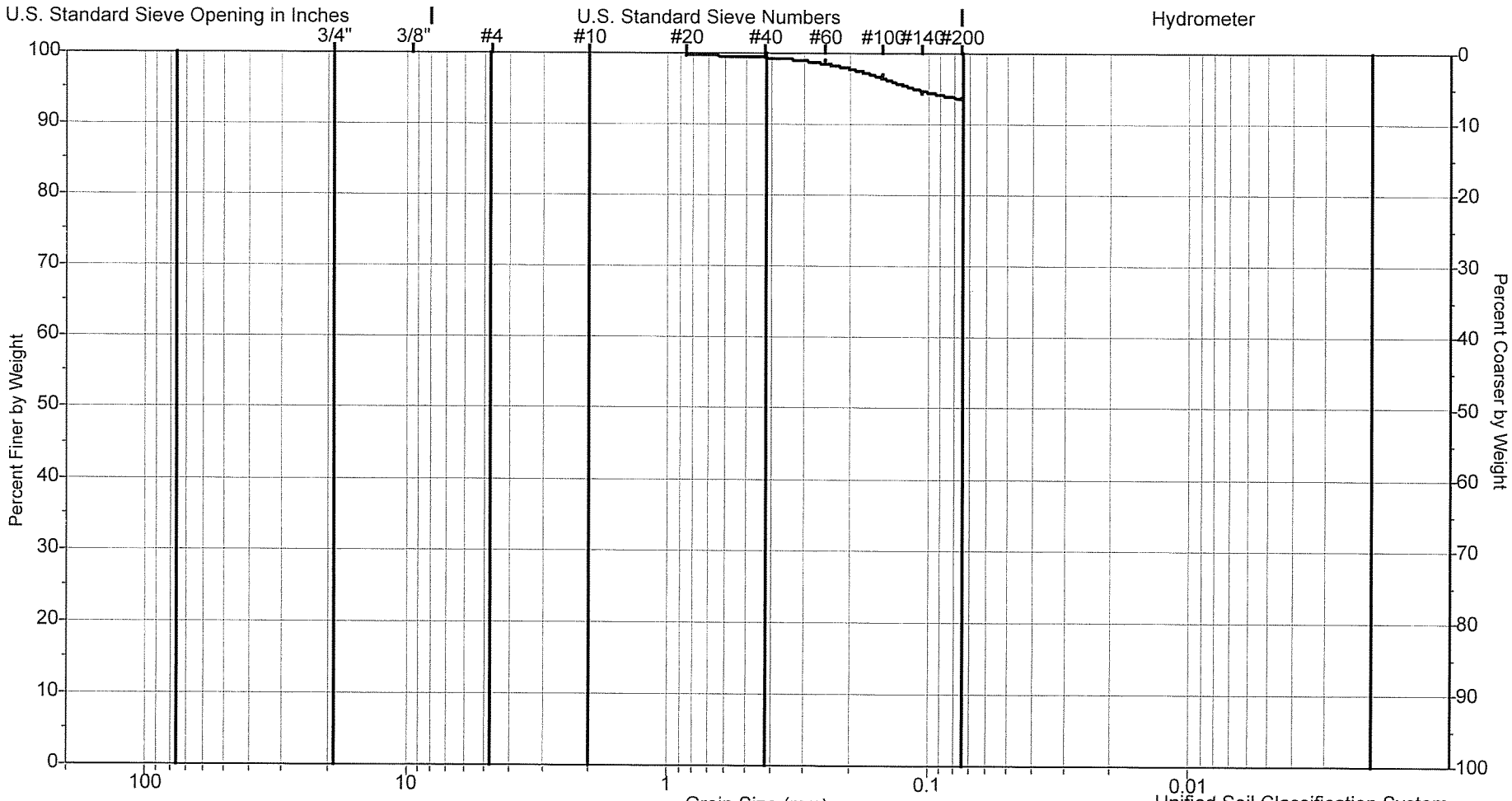
Lab ID	Frac.	Client ID	Wet Weight (g)	Air Dry Weight (g)	Cont Wt (g)	Weight Retained Sieve Size									
						# 3/4	# 3/8	# 4	# 10	# 20	# 40	# 60	# 100	# 140	# 200
408068	001	IS11SD05-0804	700.2	423.0	9.7	0.0	0.0	0.0	0.0	1.0	0.5	3.0	8.0	10.0	3.8
↓	002	IS11SD07-0804	811.0	550.0	9.7	0.0	0.0	0.0	0.0	1.0	3.5	6.2	28.3	15.2	7.5
408086	006	BGDSD05-0804	520.2	180.0	9.7	0.0	1.0	3.0	0.5	1.0	2.0	2.0	1.0	1.0	0.5
408088	001	IS11SD04-0804	589.2	270.0	9.7	0.0	0.0	1.0	0.5	1.0	2.4	3.0	2.3	2.2	1.6
↓	002	IS11SD03-0804	560.0	280.5	9.7	0.0	2.0	3.0	1.7	2.0	4.4	5.0	4.0	2.5	2.0
	004	IS11SD02-0804	589.2	290.0	9.7	0.0	0.0	1.0	0.5	1.0	2.0	2.0	1.7	2.1	1.6
	005	IS17SD06-0804	580.4	365.1	9.7	0.0	1.7	1.0	1.4	5.2	13.0	98.0	29.3	7.3	4.0
	006	IS17SD02-0804	589.0	360.0	9.7	0.0	0.0	0.0	2.0	2.0	6.1	20.0	74.0	20.0	10.0

I.O.E 8/25/04

Comments:

GPL Laboratories	Sample No. 408068-001	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS11SD05-0804	Test Date: 8/13/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408068-001	< 0	< 0	99	0.35	0	0	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408068
Borehole ID:
Sample ID: 408068-001
Test ID: D422
Test Date: 8/13/04

Client: CH2M HILL
Description:
Location: IS11SD05-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 700.2
Dry Sample Weight: 423
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 414
Air Dried Weight: 691.2
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	0	0
#4	4.75	0	0
#10	2	0	0
#20	0.85	1	1
#40	0.425	0.5	1.5
#60	0.25	3	4.5
#100	0.15	8	12.5
#140	0.106	10	22.5
#200	0.075	3.8	26.3

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

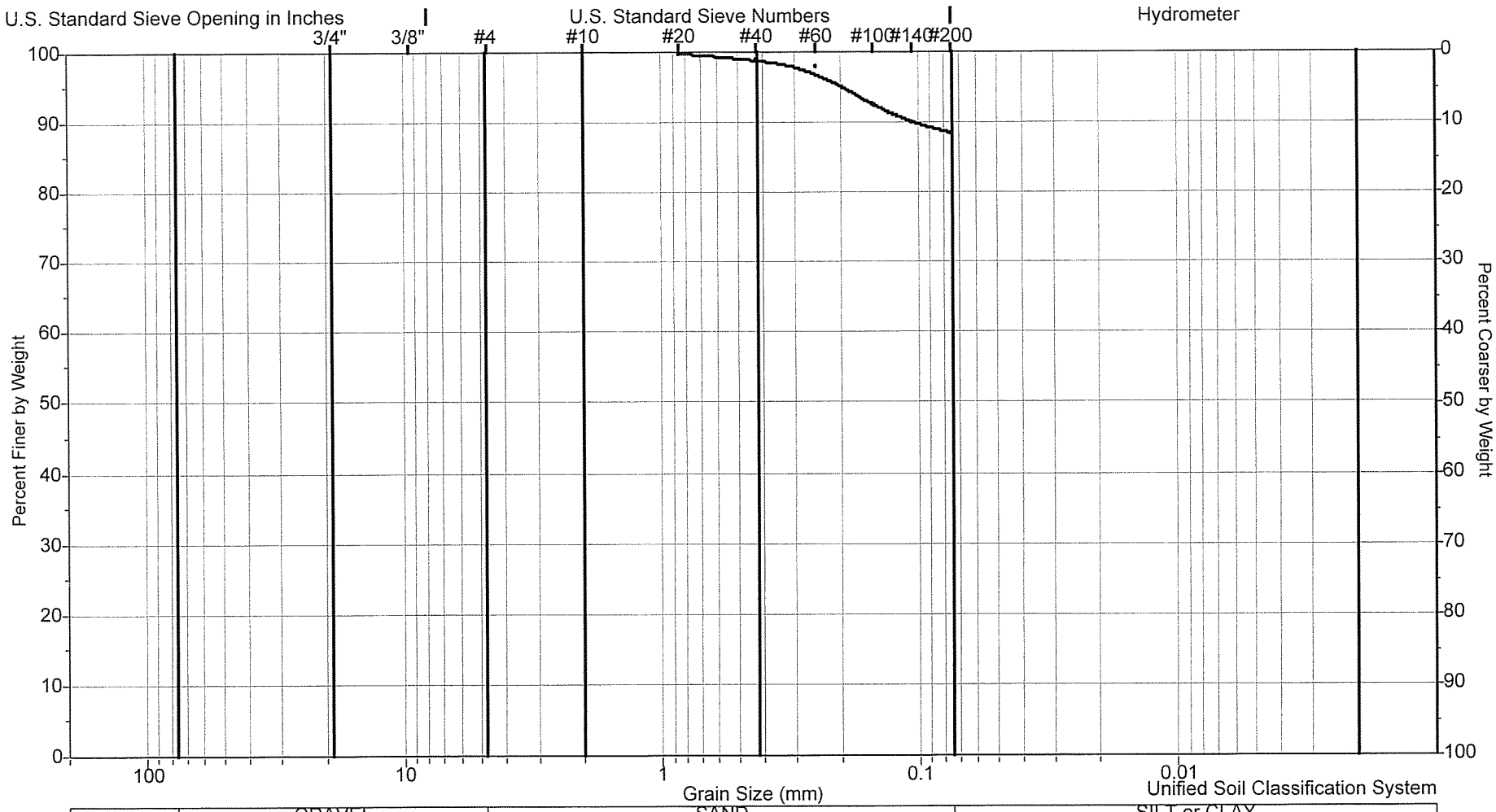
30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
0.85	99.7
0.425	99.6
0.25	98.9
0.15	96.9
0.106	94.5
0.075	93.6

GPL Laboratories	Sample No. 408068-002	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS11SD07-0804	Test Date: 8/13/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408068-002	< 0	< 0	99	1.1	0	0	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408068
Borehole ID:
Sample ID: 408068-002
Test ID: D422
Test Date: 8/13/04

Client: CH2M HILL
Description:
Location: IS11SD07-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 811
Dry Sample Weight: 550
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 541
Air Dried Weight: 802
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	0	0
#4	4.75	0	0
#10	2	0	0
#20	0.85	1	1
#40	0.425	3.5	4.5
#60	0.25	6.2	10.7
#100	0.15	28.3	39
#140	0.106	15.2	54.2
#200	0.075	7.5	61.7

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
0.85	99.8
0.425	99.1
0.25	98
0.15	92.7
0.106	89.9
0.075	88.5

GEOTECHNICAL LOG

Method: ASTM D422
Date: 08-13-04
Client: CH2M HILL
Review by/date: 08/21/04
Analyst: I.O.E
Project Name: CTO 122, Indian Head,

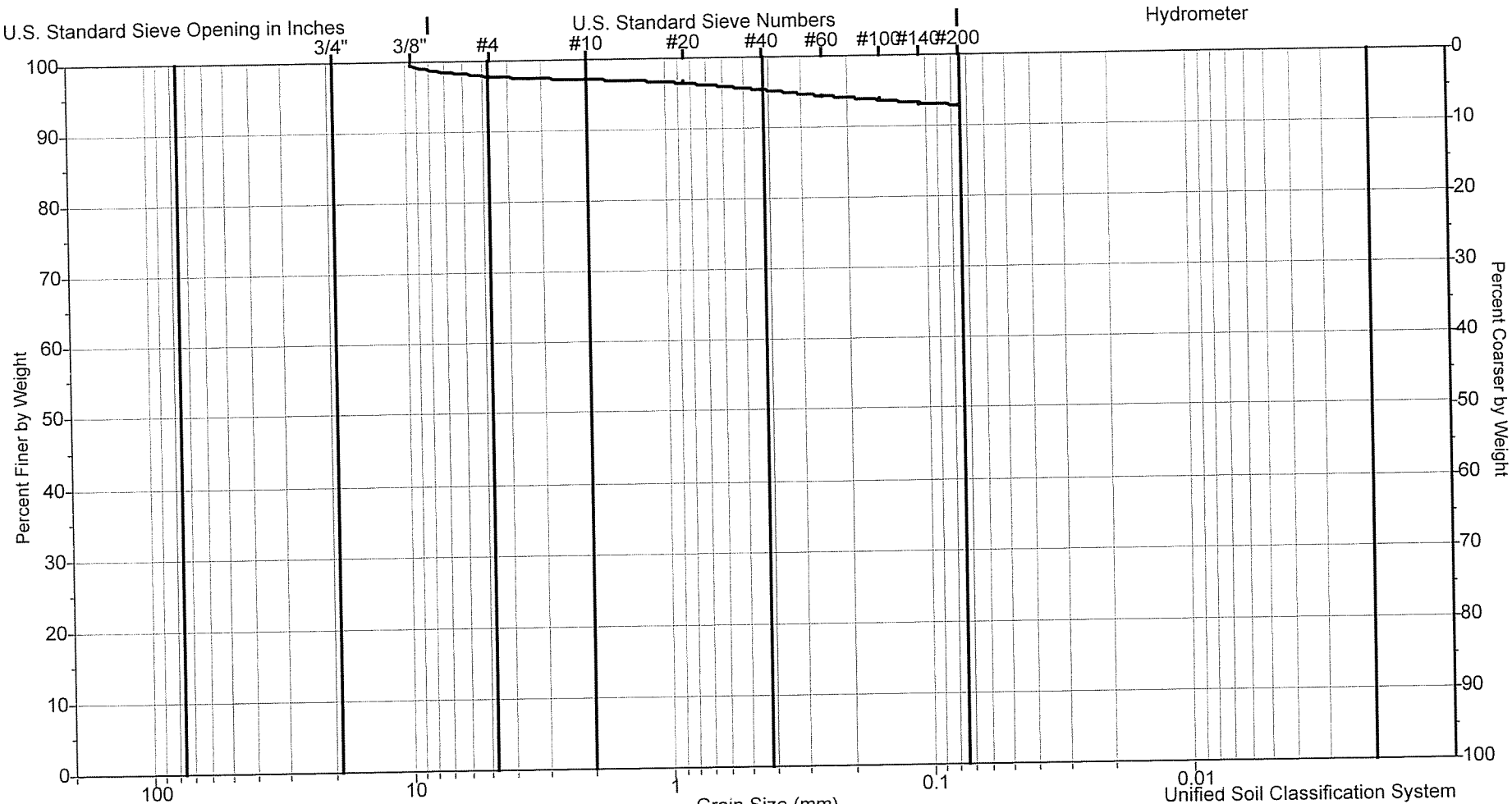
Lab ID	Frac.	Client ID	Wet Weight (g)	Air Dry Weight (g)	Cont Wt (g)	Weight Retained Sieve Size # 3/4	# 3/8	# 4	# 10	# 20	# 40	# 60	# 100	# 140	# 200
408068	001	IS11SD05-0804	700.2	423.0	9.7	0.0	0.0	0.0	0.0	1.0	0.5	3.0	8.0	10.0	3.8
↓	002	IS11SD07-0804	811.0	550.0	9.7	0.0	0.0	0.0	0.0	1.0	3.5	6.2	28.3	15.2	7.5
408086	006	BGDSD05-0804	520.2	180.0	9.7	0.0	1.0	3.0	0.5	1.0	2.0	2.0	1.0	1.0	0.5
408088	001	IS11SD04-0804	589.2	270.0	9.7	0.0	0.0	1.0	0.5	1.0	2.4	3.0	2.3	2.2	1.6
↓	002	IS11SD03-0804	560.0	280.5	9.7	0.0	2.0	3.0	1.7	2.0	4.4	5.0	4.0	2.5	2.0
	004	IS11SD02-0804	589.2	290.0	9.7	0.0	0.0	1.0	0.5	1.0	2.0	2.0	1.7	2.1	1.6
	005	IS17SD06-0804	580.4	365.1	9.7	0.0	1.7	1.0	1.4	5.2	13.0	98.0	29.3	7.3	4.0
	006	IS17SD02-0804	589.0	360.0	9.7	0.0	0.0	0.0	2.0	2.0	6.1	20.0	74.0	20.0	10.0

I.O.E 8/25/04

Comments:

GPL Laboratories	Sample No. 408086-006	Project Name: CTO 122 , INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: BGDSD05-0804	Test Date: 8/19/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408086-006	< 0	< 0	95	1.9	0.61	1.6	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408086
Borehole ID:
Sample ID: 408086-006
Test ID: D422
Test Date: 8/19/04

Client: CH2M HILL
Description:
Location: BGDSD05-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 520.2
Dry Sample Weight: 180
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 171
Air Dried Weight: 511.2
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	1	1
#4	4.75	3	4
#10	2	0.5	4.5
#20	0.85	1	5.5
#40	0.425	2	7.5
#60	0.25	2	9.5
#100	0.15	1	10.5
#140	0.106	1	11.5
#200	0.075	0.5	12

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
9.5	99.4
4.75	97.6
2	97.3
0.85	96.7
0.425	95.5
0.25	94.4
0.15	93.8
0.106	93.2
0.075	92.9

GEOTECHNICAL LOG

Method: ASTM D422
Date: 08-13-04
Client: CH2M HILL
Review by/date: 08/20/04
Analyst: I.O.E
Project Name: CTO 122, Indian Head,

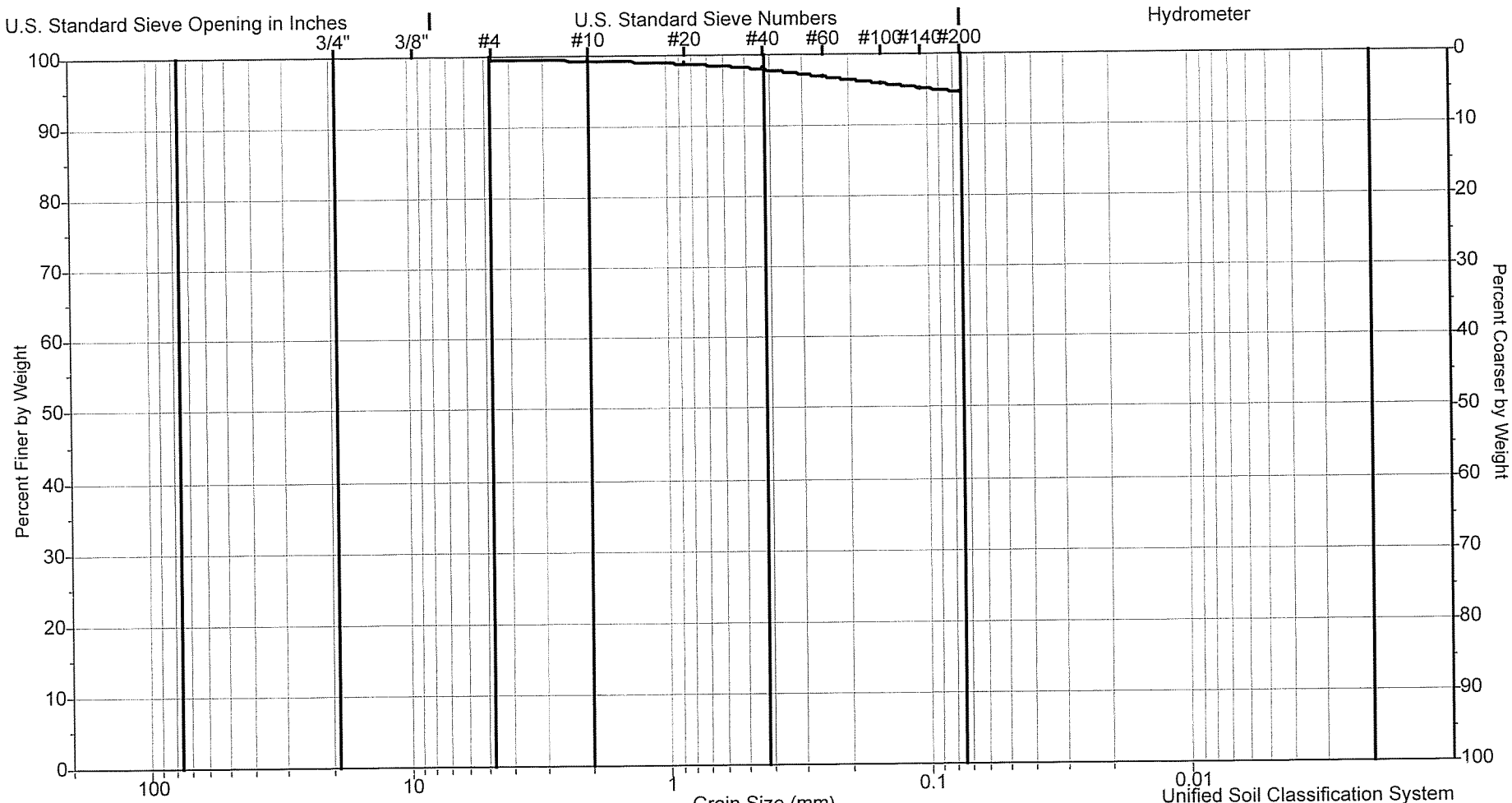
Lab ID	Frac.	Client ID	Wet Weight (g)	Air Dry Weight (g)	Cont Wt (g)	Weight Retained Sieve Size # 3/4	# 3/8	# 4	# 10	# 20	# 40	# 60	# 100	# 140	# 200
408068	001	IS11SD05-0804	700.2	423.0	9.7	0.0	0.0	0.0	0.0	1.0	0.5	3.0	8.0	10.0	3.8
↓	002	IS11SD07-0804	811.0	550.0	9.7	0.0	0.0	0.0	0.0	1.0	3.5	6.2	28.3	15.2	7.5
408086	006	BGDSD05-0804	520.2	180.0	9.7	0.0	1.0	3.0	0.5	1.0	2.0	2.0	1.0	1.0	0.5
408088	001	IS11SD04-0804	589.2	270.0	9.7	0.0	0.0	1.0	0.5	1.0	2.4	3.0	2.3	2.2	1.6
	002	IS11SD03-0804	560.0	280.5	9.7	0.0	2.0	3.0	1.7	2.0	4.4	5.0	4.0	2.5	2.0
	004	IS11SD02-0804	589.2	290.0	9.7	0.0	0.0	1.0	0.5	1.0	2.0	2.0	1.7	2.1	1.6
	005	IS17SD06-0804	580.4	365.1	9.7	0.0	1.7	1.0	1.4	5.2	13.0	98.0	29.3	7.3	4.0
	006	IS17SD02-0804	589.0	360.0	9.7	0.0	0.0	0.0	2.0	2.0	6.1	20.0	74.0	20.0	10.0

I.O.E 8/25/04

Comments:

GPL Laboratories	Sample No. 408088-001	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS11SSD04-0804	Test Date: 8/19/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408088-001	< 0	< 0	98	1.4	0.32	0	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408088
Borehole ID:
Sample ID: 408088-001
Test ID: D422
Test Date: 8/19/04

Client: CH2M HILL
Description:
Location: IS11SSD04-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 589.2
Dry Sample Weight: 270
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 261
Air Dried Weight: 580.2
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	0	0
#4	4.75	1	1
#10	2	0.5	1.5
#20	0.85	1	2.5
#40	0.425	2.4	4.9
#60	0.25	3	7.9
#100	0.15	2.3	10.2
#140	0.106	2.2	12.4
#200	0.075	1.6	14

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

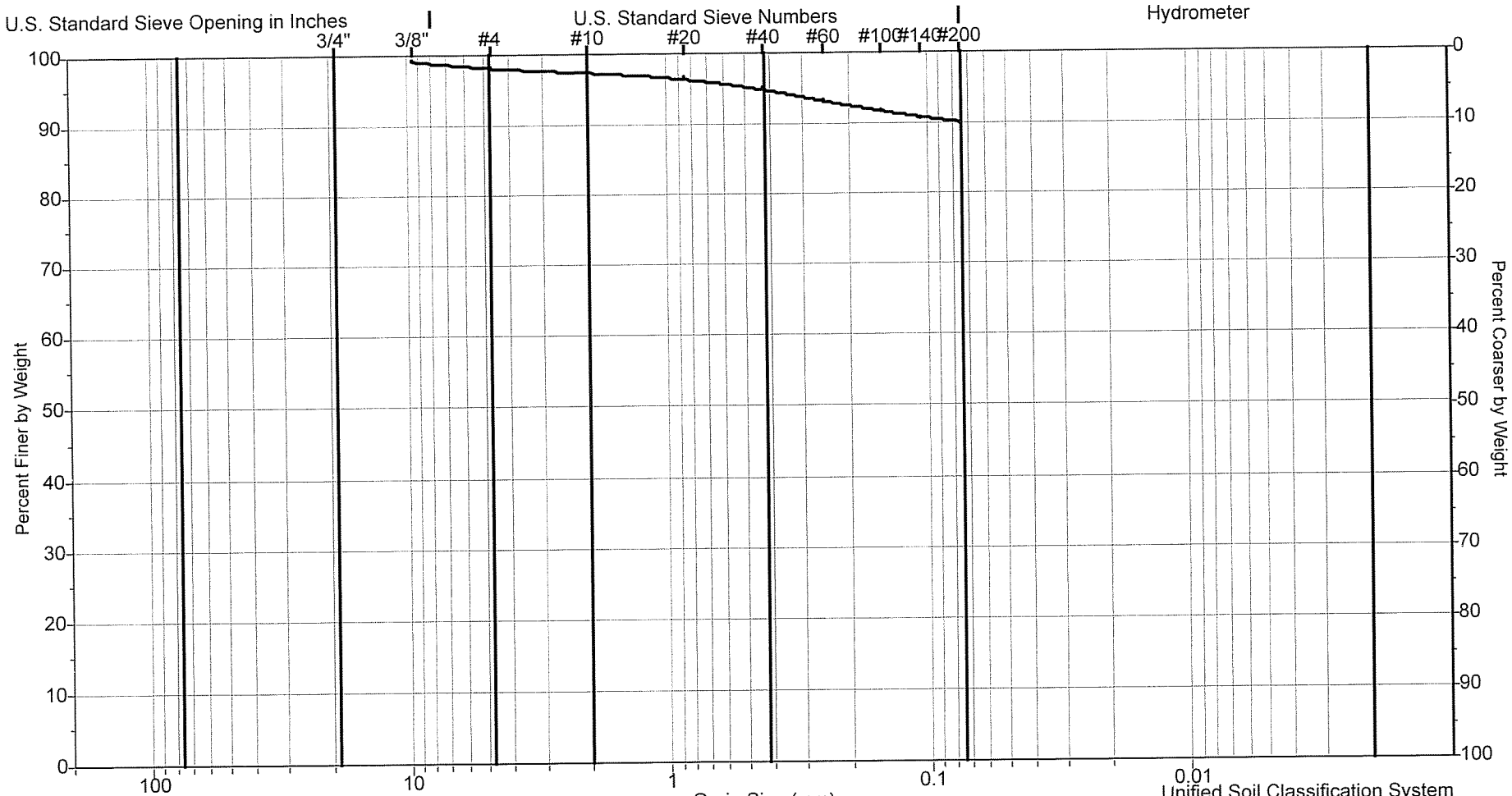
30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
4.75	99.6
2	99.4
0.85	99
0.425	98.1
0.25	96.9
0.15	96
0.106	95.2
0.075	94.6

GPL Laboratories	Sample No. 408088-002	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS11SD03-0804	Test Date: 8/19/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408088-002	< 0	< 0	95	2.6	0.76	1.1	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408088
Borehole ID:
Sample ID: 408088-002
Test ID: D422
Test Date: 8/19/04

Client: CH2M HILL
Description:
Location: IS11SD03-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 560
Dry Sample Weight: 280.5
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 271.5
Air Dried Weight: 551
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	2	2
#4	4.75	3	5
#10	2	1.7	6.7
#20	0.85	2	8.7
#40	0.425	4.4	13.1
#60	0.25	5	18.1
#100	0.15	4	22.1
#140	0.106	2.5	24.6
#200	0.075	2	26.6

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

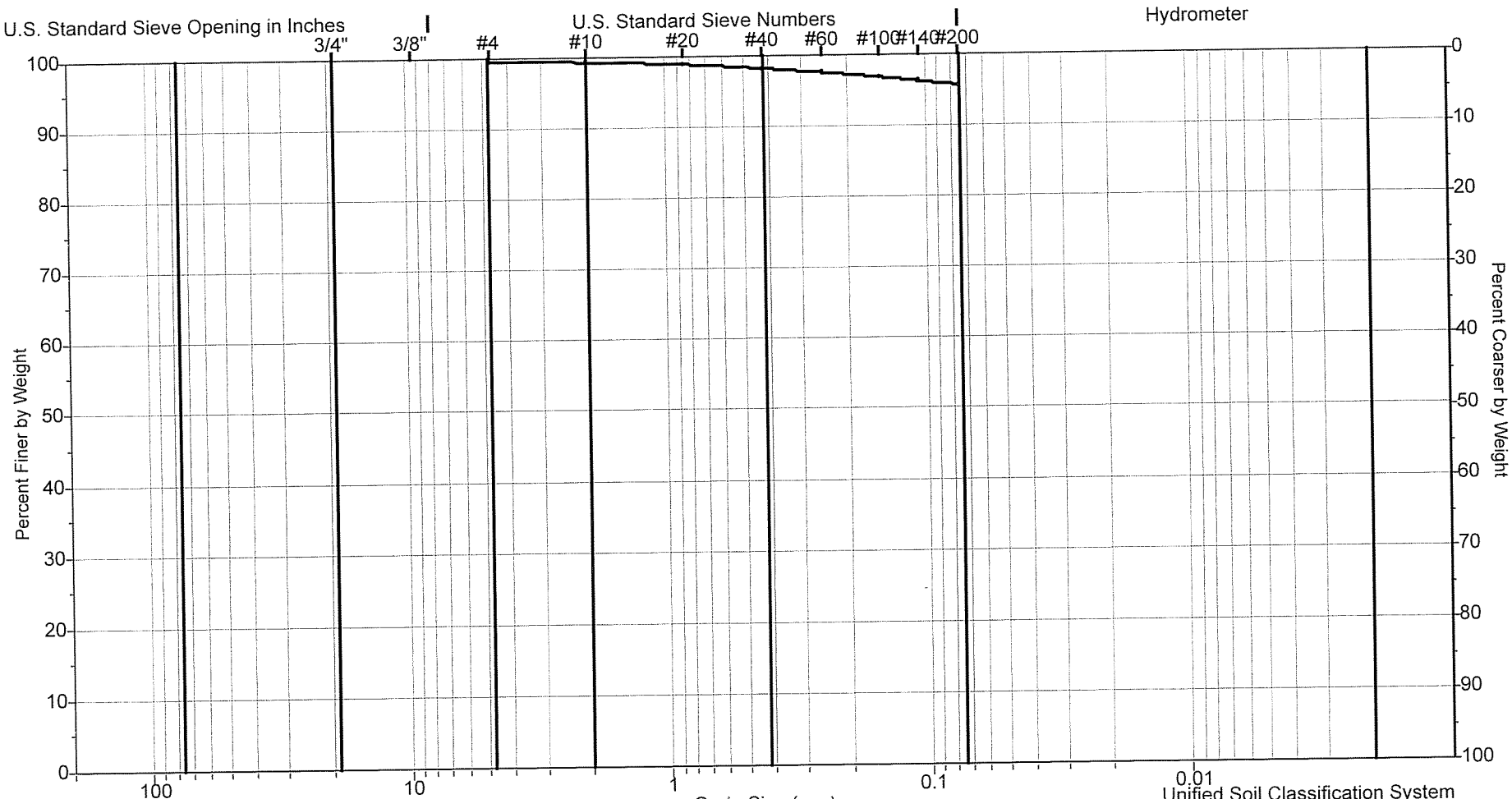
30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
9.5	99.2
4.75	98.1
2	97.5
0.85	96.7
0.425	95.1
0.25	93.3
0.15	91.8
0.106	90.9
0.075	90.1

GPL Laboratories	Sample No. 408088-004	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS11SD02-0804	Test Date: 8/19/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408088-004	< 0	< 0	98	1.1	0.29	0	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408088
Borehole ID:
Sample ID: 408088-004
Test ID: D422
Test Date: 8/19/04

Client: CH2M HILL
Description:
Location: IS11SD02-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 589.2
Dry Sample Weight: 290
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 281
Air Dried Weight: 580.2
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	0	0
#4	4.75	1	1
#10	2	0.5	1.5
#20	0.85	1	2.5
#40	0.425	2	4.5
#60	0.25	2	6.5
#100	0.15	1.7	8.2
#140	0.106	2.1	10.3
#200	0.075	1.6	11.9

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

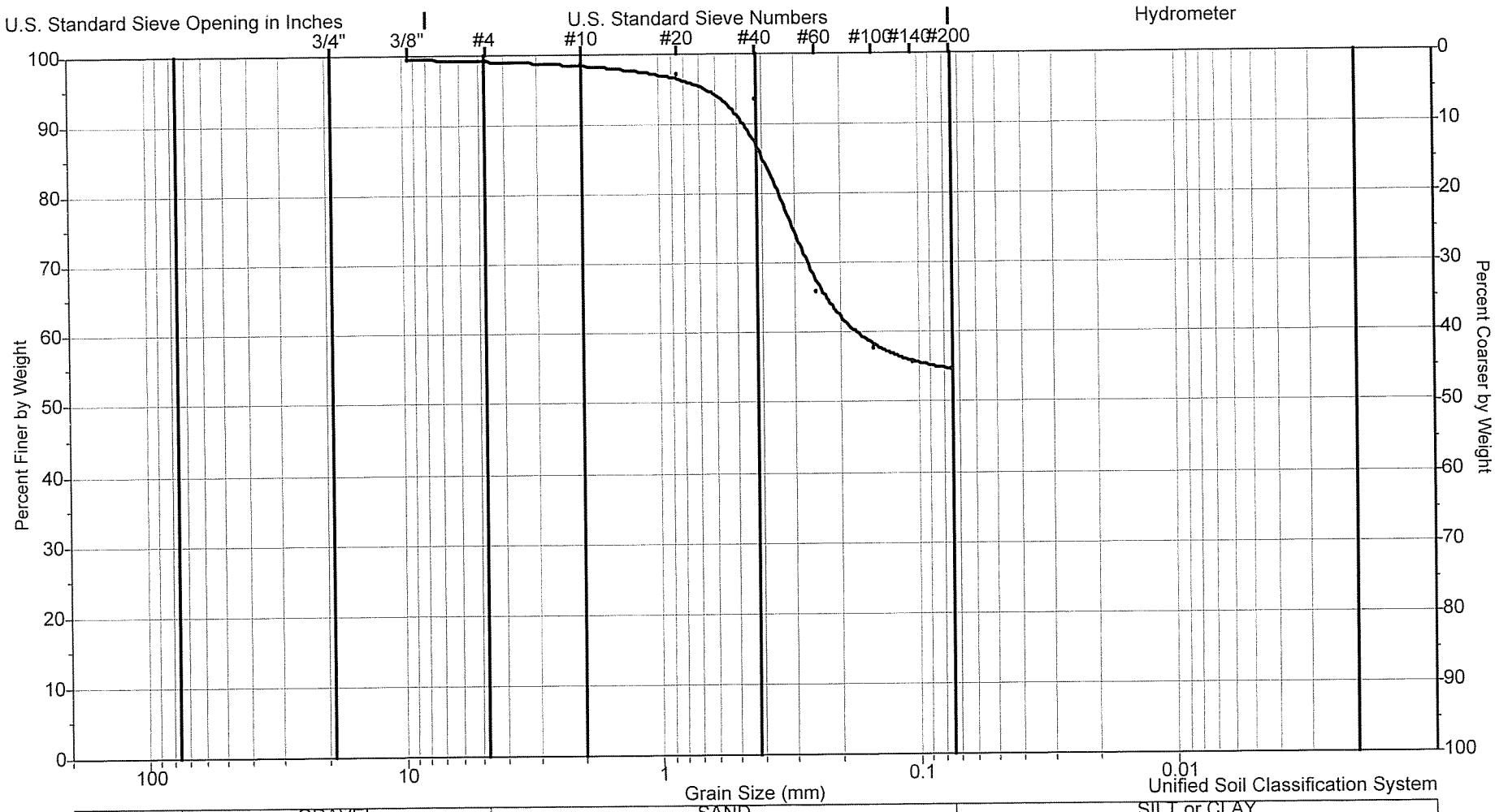
30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
4.75	99.6
2	99.4
0.85	99.1
0.425	98.3
0.25	97.6
0.15	97
0.106	96.3
0.075	95.7

GPL Laboratories	Sample No. 408088-005	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS17SD06-0804	Test Date: 11/3/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408088-005	< 0	< 0	86	12	0.73	0.39	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408088
Borehole ID:
Sample ID: 408088-005
Test ID: D 422
Test Date: 11/3/04

Client: CH2M HILL
Description:
Location: IS17SD06-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 580.4
Dry Sample Weight: 365.1
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 356.1
Air Dried Weight: 571.4
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	1.7	1.7
#4	4.75	1	2.7
#10	2	1.4	4.1
#20	0.85	5.2	9.3
#40	0.425	13	22.3
#60	0.25	98	120.3
#100	0.15	29.3	149.6
#140	0.106	7.3	156.9
#200	0.075	4	160.9

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

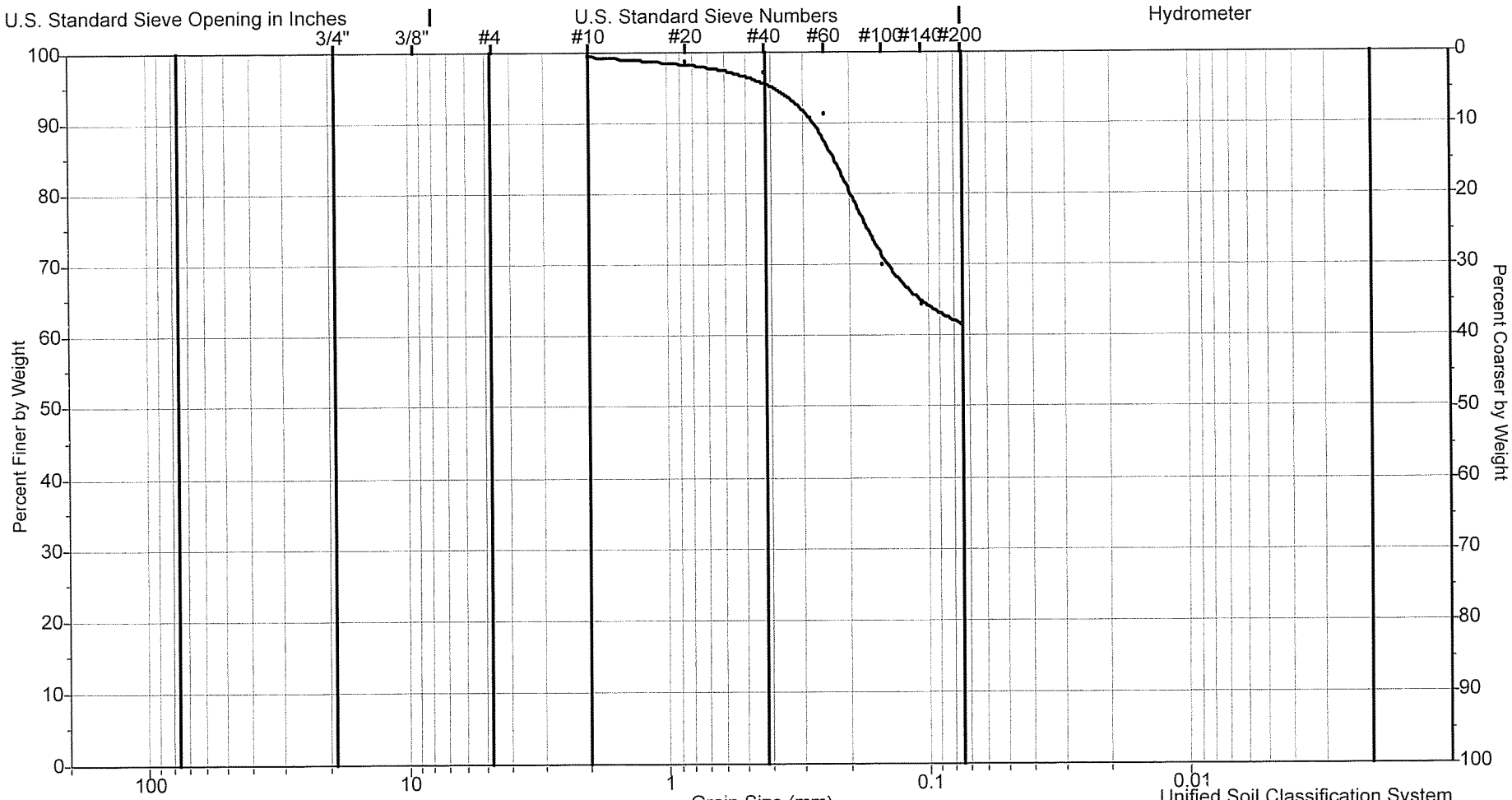
30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
9.5	99.5
4.75	99.2
2	98.8
0.85	97.3
0.425	93.7
0.25	66.1
0.15	57.9
0.106	55.8
0.075	54.7

GPL Laboratories	Sample No. 408088-006	Project Name: CTO 122, INDIAN HEAD
	Client: CH2M HILL	ASTM 422, Grain Size Distribution Graph
	Location: IS17SD02-0804	Test Date: 8/19/04

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
.	408088-006	< 0	< 0	95	4	0	0	0	0



Unified Soil Classification System

	GRAVEL		SAND			SILT or CLAY	
	coarse	fine	coarse	medium	fine	Silt	Clay

Sieve Data Sheet

Project: 408088
Borehole ID:
Sample ID: 408088-006
Test ID: D422
Test Date: 8/19/04

Client: CH2M HILL
Description:
Location: IS17SD02-0804
Source:
Northing: 0
Easting: 0
Collected By:
User Defined:

Wet Sample Weight: 589
Dry Sample Weight: 360
Pan Weight: 9.7
Split Sample: No
Oven Dried Weight: 351
Air Dried Weight: 580
Hydrometer Sample Weight: 0
Hydrometer Pan Weight: 0
Hydrometer Weight Retained: 0
Specific Gravity: 2.5
Hydrometer Type: 151H
User Defined:

Sieve Size Data

Sieve	Size (mm)	Weight Retained	Cumulative Weight
3/4"	19	0	0
3/8"	9.5	0	0
#4	4.75	0	0
#10	2	2	2
#20	0.85	2	4
#40	0.425	6.1	10.1
#60	0.25	20	30.1
#100	0.15	74	104.1
#140	0.106	20	124.1
#200	0.075	10	134.1

Hydrometer Data

Time	Reading	Temperature
0	0	0
1	0	0
2	0	0
5	0	0
15	0	0

30	0	0
60	0	0
250	0	0
1440	0	0

Results

Size (mm)	Percent Passing
2	99.4
0.85	98.8
0.425	97.1
0.25	91.4
0.15	70.2
0.106	64.5
0.075	61.7

Appendix D
Benthic Data

Benthic Macroinvertebrates Result for Sample BGDSD05, NDWIH, Indian Head, Maryland

Station: **BGDSD05**
Sample Date: 13 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Oligochaeta								
Tubificidae								
Limnodrilus sp. (1)	tubeworm	9.8	9	7	4	20	290	60.6%
Quistadrilus multisetosus	tubeworm	10.0			1	1	14	3.0%
Rhynchobdella								
Glossiphoniidae								
Batracobdella phalera	leech	7.1		1		1	14	3.0%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	1	1	2	4	58	12.1%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0		1	3	4	58	12.1%
Diptera								
Chironomidae								
Coelotanypus sp.	midge	6.2	2			2	29	6.1%
Cryptochironomus fulvus gr.	midge	6.7	1			1	14	3.0%
Total Taxa			4	4	4	**7**		100.0%
Total Specimens			13	10	10	33		

Metric	Value	Score
Abundance (no./sq.meter)	**478**	**1**
Abundance of Pollution-indicative Taxa (%) (1)	**60.6%**	**3**
Abundance of Deep Deposit Feeders (%)	**63.6%**	**5**
Tolerance Score (Water Quality Class)	**8.53 ("Poor")**	**3**
	IBI Score (Ave.)	**3.0**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS11BG02, NDWIH, Indian Head, Maryland

Station: **IS11BG02**
Sample Date: 12 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Oligochaeta								
Tubificidae								
Limnodrilus sp. [1]	tubeworm	9.8	13	13	9	35	507	44.3%
Limnodrilus hoffmeisteri	tubeworm	9.8	3	1		4	58	5.1%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	2	1		3	43	3.8%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0	1		27	28	406	35.4%
Trichoptera								
Hydroptilidae								
Ochrotrichia sp.	caddisfly	7.2	1			1	14	1.3%
Diptera								
Chironomidae								
Clinotanypus sp.	midge	8.0	1	3	4	8	116	10.1%
Total Taxa			6	4	3	**6**		100.0%
Total Specimens			21	18	40	79		

Metric	Value	Score
Abundance (no./sq.meter)	**1145**	**5**
Abundance of Pollution-indicative Taxa (%) [1]	**52.4%**	**3**
Abundance of Deep Deposit Feeders (%)	**52.4%**	**5**
Tolerance Score (Water Quality Class)	**8.11 ("Poor")**	**3**
	IBI Score (Ave.)	**4.0**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS11BG03, NDWIH, Indian Head, Maryland

Station: **IS11BG03**
Sample Date: 12 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Oligochaeta								
Tubificidae								
Limnodrilus sp. [1]	tubeworm	9.8	6	11	24	41	594	47.1%
Limnodrilus hoffmeisteri	tubeworm	9.8	17			17	246	19.5%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	2		4	6	87	6.9%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0			1	1	14	1.1%
Ephemeroptera								
Ephemeridae								
Hexagenia sp.	mayfly	4.7		2		2	29	2.3%
Diptera								
Chironomidae								
Clinotanypus sp.	midge	8.0	6		14	20	290	23.0%
Total Taxa			4	2	4	**6**		100.0%
Total Specimens			31	13	43	87		

Metric	Value	Score
Abundance (no./sq.meter)	**1261**	**5**
Abundance of Pollution-indicative Taxa (%) [1]	**66.6%**	**3**
Abundance of Deep Deposit Feeders (%)	**66.6%**	**5**
Tolerance Score (Water Quality Class)	**8.98 ("Poor")**	**3**
	IBI Score (Ave.)	**4.5**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS11BG04, NDWIH, Indian Head, Maryland

Station: **IS11BG04**
Sample Date: 12 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Oligochaeta								
Tubificidae								
Limnodrilus sp. [1]	tubeworm	9.8	6	10	9	25	362	25.5%
Limnodrilus hoffmeisteri	tubeworm	9.8		3	6	9	130	9.2%
Limnodrilus udekemianus	tubeworm	9.7		3		3	43	3.1%
Arhynchobdellida								
Erpobdelidae								
Mooreobdella sp.	leech	7.8	1			1	14	1.0%
Mesogastropoda								
Hydrobiidae								
Amnicola sp.	dusky snail	4.8	9	10	1	20	290	20.4%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	3	1	4	8	116	8.2%
Sphaeriidae								
Musculium sp.	fingernail clam	5.0	5	3		8	116	8.2%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0		1	1	2	29	2.0%
Diptera								
Chironomidae								
Clinotanypus sp.	midge	8.0	3		2	5	72	5.1%
Coelotanypus sp.	midge	6.2	5	8		13	188	13.3%
Glyptotendipes sp.	midge	8.5	2			2	29	2.0%
Nanocladius sp.	midge	7.2		1		1	14	1.0%
Parachironomus sp.	midge	9.2		1		1	14	1.0%
Total Taxa			8	10	6	**13**		100.0%
Total Specimens			34	41	23	98		

Metric	Value	Score
Abundance (no./sq.meter)	**1420**	**5**
Abundance of Pollution-indicative Taxa (%) [1]	**34.7%**	**5**
Abundance of Deep Deposit Feeders (%)	**37.8%**	**5**
Tolerance Score (Water Quality Class)	**7.37 ("Fair")**	**5**
	IBI Score (Ave.)	**5.0**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS11BG05, NDWIH, Indian Head, Maryland

Station: **IS11BG05**
Sample Date: 11 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Nematoda	roundworm	6.0	1	2		3	43	0.7%
Tricladida								
Planariidae								
Dugesia tigrina	flatworm	7.5	1	2	1	4	58	0.9%
Oligochaeta								
Tubificidae								
Ilyodrilus templetoni	tubeworm	9.4	5	1	1	7	101	1.6%
Limnodrilus sp. (1)	tubeworm	9.8	74	37	22	133	1928	31.1%
Limnodrilus hoffmeisteri	tubeworm	9.8	74	56	17	147	2130	34.3%
Quistadrilus multisetosus	tubeworm	10.0	20	46	1	67	971	15.7%
Rhynchobdella								
Glossiphoniidae								
Gloiobdella elongata	leech	9.9		8	12	20	290	4.7%
Basommatophora								
Physidae								
Physella sp.	pouch snail	9.1	1			1	14	0.2%
Mesogastropoda								
Hydrobiidae								
Amnicola sp.	dusky snail	4.8	1	16	3	20	290	4.7%
Pleuroceridae								
Pleurocera sp.	horn snail	6.0			1	1	14	0.2%
Valvatidae								
Valvata tricarinata	valvatid snail	2.0		1		1	14	0.2%
Veneroida								
Sphaeriidae								
Musculium sp.	fingernail clam	5.0	1			1	14	0.2%
Pisidium sp,	pill clam	6.8	1	6	2	9	130	2.1%
Coleoptera								
Hydrophilidae								
Berosus sp.	scavenger beetle	8.6		1		1	14	0.2%
Diptera								
Chironomidae								
Clinotanypus sp.	midge	8.0		5	4	9	130	2.1%
Polypedilum halterale gr.	midge	7.2	1		1	2	29	0.5%
Procladius sp.	midge	9.3		1		1	14	0.2%
Tabanidae								
Chrysops sp.	deer fly	7.3	1			1	14	0.2%
Total Taxa			12	13	11	**18**		100.0%
Total Specimens			181	182	65	428		

Metric	Value	Score
Abundance (no./sq.meter)	**6203**	**1**
Abundance of Pollution-indicative Taxa (%) (1)	**65.4%**	**3**
Abundance of Deep Deposit Feeders (%)	**82.7%**	**3**
Tolerance Score (Water Quality Class)	**9.38 ("Poor")**	**1**
	IBI Score (Ave.)	**2.0**
	Community Condition	**Severely Degraded**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS11BG07, NDWIH, Indian Head, Maryland

Station: **IS11BG07**
Sample Date: 11 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Nematoda	roundworm	6.0	1	1		2	29	0.1%
Oligochaeta								
Tubificidae								
Branchiura sowerybi	tubeworm	8.4	30	26	46	102	1478	7.1%
Bothrioneurum vejdovskyanu	tubeworm	10.0		2	57	59	855	4.1%
Ilyodrilus templetoni	tubeworm	9.4	13	2	3	18	261	1.3%
Limnodrilus sp. (1)	tubeworm	9.8	579	178	118	875	12681	60.9%
Limnodrilus cervix	tubeworm	10.0			117	117	1696	8.1%
Limnodrilus claparedianus	tubeworm	9.9			39	39	565	2.7%
Limnodrilus hoffmeisteri	tubeworm	9.8		34	118	152	2203	10.6%
Limnodrilus profundicola	tubeworm	5.0			39	39	565	2.7%
Quistadrilus multisetosus	tubeworm	10.0		1		1	14	0.1%
Arhynchobdellida								
Erpobdelidae								
Mooreobdella sp.	leech	7.8		3		3	43	0.2%
Rhynchobdella								
Glossiphoniidae								
Batracobdella phalera	leech	7.1			1	1	14	0.1%
Gloiobdella elongata	leech	9.9		1		1	14	0.1%
Veneroida								
Sphaeriidae								
Pisidium sp,	pill clam	6.8	6	8	5	19	275	1.3%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0	1			1	14	0.1%
Decapoda								
Cambaridae								
Orconectes sp.	crayfish	2.7	1			1	14	0.1%
Diptera								
Chironomidae								
Chironomus sp.	midge	9.8		1		1	14	0.1%
Clinotanypus sp.	midge	8.0	1	3	1	5	72	0.3%
Tabanidae								
Chrysops sp.	deer fly	7.3		1		1	14	0.1%
Total Taxa			8	13	11	**19**		100.0%
Total Specimens			632	261	544	1437		

Metric	Value	Score
Abundance (no./sq.meter)	**20826**	**1**
Abundance of Pollution-indicative Taxa (%) (1)	**71.5%**	**3**
Abundance of Deep Deposit Feeders (%)	**97.6%**	**1**
Tolerance Score (Water Quality Class)	**9.53 ("Poor")**	**1**
	IBI Score (Ave.)	**1.5**
	Community Condition	**Severely Degraded**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS17BG06, NDWIH, Indian Head, Maryland

Station: **IS17BG06**
Sample Date: 12 August 2004
Habitat Classification: Tidal Freshwater
Gear: Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Nematoda	roundworm	6.0	1	1		2	29	0.7%
Tricladida								
Planariidae								
Dugesia tigrina	flatworm	7.5	3		2	5	72	1.8%
Oligochaeta								
Tubificidae								
Ilyodrilus templetoni	tubeworm	9.4		1		1	14	0.4%
Limnodrilus sp. (1)	tubeworm	9.8	32	28	23	83	1203	29.3%
Limnodrilus hoffmeisteri	tubeworm	9.8	48		17	65	942	23.0%
Limnodrilus profundicola	tubeworm	5.0			5	5	72	1.8%
Mesogastropoda								
Hydrobiidae								
Amnicola sp.	dusky snail	4.8		4	6	10	145	3.5%
Pleuroceridae								
Pleurocera sp.	horn snail	6.0	5	3		8	116	2.8%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	4	1	3	8	116	2.8%
Mactridae								
Rangia cuneata	softshell clam	6.0	1		1	2	29	0.7%
Sphaeriidae								
Musculium sp.	fingernail clam	5.0		3	10	13	188	4.6%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0			2	2	29	0.7%
Ephemeroptera								
Caenidae								
Caenis sp.	mayfly	7.6	1		1	2	29	0.7%
Trichoptera								
Hydroptilidae								
Ochrotrichia sp.	caddisfly	7.2			2	2	29	0.7%
Diptera								
Ceratopogonidae								
Bezzia sp.	biting midge	6.0	1		2	3	43	1.1%
Chaoboridae								
Chaoborus punctipennis	phantom midge	8.5	1			1	14	0.4%
Chironomidae								
Chironomus sp.	midge	9.8		1		1	14	0.4%
Clinotanypus sp.	midge	8.0	10	4	2	16	232	5.7%
Coelotanypus sp.	midge	6.2	9	6	20	35	507	12.4%
Glyptotendipes sp.	midge	8.5	2	1	3	6	87	2.1%
Nanocladius sp.	midge	7.2		1	2	3	43	1.1%
Parachironomus sp.	midge	9.2	2	1	2	5	72	1.8%
Polypedilum halterale gr.	midge	7.2	2		3	5	72	1.8%
Total Taxa			15	13	18	**23**		100.0%
Total Specimens			122	55	106	283		

Metric	Value	Score
Abundance (no./sq.meter)	**4101**	**3**
Abundance of Pollution-indicative Taxa (%) (1)	**52.3%**	**3**
Abundance of Deep Deposit Feeders (%)	**54.5%**	**5**
Tolerance Score (Water Quality Class)	**8.25 ("Poor")**	**3**
	IBI Score (Ave.)	**3.5**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.

Benthic Macroinvertebrates Result for Sample IS17SD02, NDWIH, Indian Head, Maryland

Station:	**IS17SD02**
Sample Date:	12 August 2004
Habitat Classification:	Tidal Freshwater
Gear:	Petite Ponar (0.023 square meters)

Taxon	Common Name	Tol.	Replicate A	Replicate B	Replicate C	Total	Density	Pct.
Tricladida								
Planariidae								
Dugesia tigrina	flatworm	7.5		4	7	11	159	2.2%
Oligochaeta								
Tubificidae								
Branchiura sowerybi	tubeworm	8.4	9	1	8	18	261	3.6%
Ilyodrilus templetoni	tubeworm	9.4	11	10	20	41	594	8.2%
Limnodrilus sp. (1)	tubeworm	9.8	47	10	57	114	1652	22.8%
Limnodrilus cervix	tubeworm	10.0	20	20	15	55	797	11.0%
Limnodrilus hoffmeisteri	tubeworm	9.8	20	21		41	594	8.2%
Limnodrilus profundicola	tubeworm	5.0		5		5	72	1.0%
Basommatophora								
Physidae								
Physella sp.	pouch snail	9.1			1	1	14	0.2%
Mesogastropoda								
Hydrobiidae								
Amnicola sp.	dusky snail	4.8	6	4	6	16	232	3.2%
Pleuroceridae								
Pleurocera sp.	horn snail	6.0		2		2	29	0.4%
Veneroida								
Corbiculidae								
Corbicula fluminea	Asiatic clam	6.3	1	2	2	5	72	1.0%
Sphaeriidae								
Musculium sp.	fingernail clam	5.0	2	1		3	43	0.6%
Amphipoda								
Gammaridae								
Gammarus sp.	sideswimmer	6.0	4	97	81	182	2638	36.4%
Talitridae								
Hyalella azteca	sideswimmer	7.9		2		2	29	0.4%
Ephemeroptera								
Caenidae								
Caenis sp.	mayfly	7.6		1		1	14	0.2%
Ephemeridae								
Baetis sp	mayfly	6.0			2	2	29	0.4%
Diptera								
Chironomidae								
Clinotanypus sp.	midge	8.0		1		1	14	0.2%
Total Taxa			9	15	10	**17**		100.0%
Total Specimens			120	181	199	500		

Metric	Value	Score
Abundance (no./sq.meter)	**7246**	**1**
Abundance of Pollution-indicative Taxa (%) (1)	**31.0%**	**5**
Abundance of Deep Deposit Feeders (%)	**54.8%**	**5**
Tolerance Score (Water Quality Class)	**7.99 ("Poor)"**	**5**
	IBI Score (Ave.)	**4.0**
	Community Condition	**Meets Restoration Goals**

(1) Immature worms placed in the taxon *Limnodrilus sp.* were considered to be tubificids without capilliform chaetae.