

**FIELD REPORT FOR SURFACTANT SAMPLING AT THREE WASTEWATER  
TREATMENT PLANTS AND RECEIVING STREAMS IN THE MIDWEST**

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## 1.0 INTRODUCTION

EA Engineering, Science, and Technology, Inc. (EA) has been contracted to provide sampling support for the Soap and Detergent Association (SDA). The purpose of the sampling effort is to use newly developed analytical methods to quantify field concentrations of the surfactants alkylethoxylates (AE), alkylethoxyl sulfates/alkyl sulfates (AES/AS), and laurel alkyl sulfates (LAS) in media at three wastewater treatment plants and associated receiving streams. Sites were selected using data from U.S. Environmental Protection Agency (USEPA) databases, discussions with plant operators, and site visits. EA and SDA Task Force personnel conducted the sampling in late September and early October of 2003.

### 1.1 SITE SELECTION

A series of conference calls were conducted between EA and members of the SDA Sediment Surfactant Task Force to determine the criteria for site selection. Site selection began with the USEPA wastewater treatment plant database. Members of the SDA Task Force used a GIS database to provide a listing of all sites within 300 miles of EA offices capable of supporting the effort. This list is provided Appendix A. This list was further narrowed by selecting plants with the following criteria:

- USEPA code 5 status, which indicates relatively high efficiency (10 - 25 mg BOD/L and/or nutrient removal)
- a 7Q10 flow dilution factor between 1 and 3;
- population base between 10,000 and 50,000 people;
- dilution factor at mean flow of less than 20 mgd; and
- less than 20 percent of influent received from industrial sources.

These criteria were chosen to focus the effort on moderately sized, relatively efficient plants with primarily residential inputs of the target surfactants. Low dilution factors in receiving streams were chosen to target conditions that are most favorable for surfactant persistence in sediment.

It was determined that the largest number of candidate sites best fitting the criteria listed above were found in the vicinity of EA's Chicago, Houston, Dallas, and Maryland offices. Therefore effort focused on these regions. To better evaluate the remaining sites, the Task Force developed a questionnaire for wastewater treatment plant operators. The purpose of this questionnaire was to identify plants that would be representative of a large number of wastewater treatment plant facilities, and to determine any obstacles to sampling. It was agreed that plants with primary and secondary clarification were relatively standard treatment technologies, and that plants with biological nutrient reduction, oxidation ditch, or other methods would be excluded from consideration. This is because such plants are less standard and would not adequately represent standard facilities throughout the U.S.

Mr. William Eckhoff conducted the interviews with WWTP operators and filled out questionnaires for approximately 34 sites. Based on this information, a number of sites were excluded due to the presence of tertiary treatment systems, renovation and construction, or excessive industrial contributions. The list was narrowed to 8 candidate sites.

Site visits were conducted in May and June 2003. Four sites were visited in the midwest and mid-Atlantic region; an additional three sites were visited in Texas; one site denied access. Appendix A includes the data collected during these visits in tables and photographs that were presented to the SDA Task Force in June 2003. The presence of tertiary treatment systems and unsuitable sediments eliminated several sites in Texas and the site in Maryland. Therefore, Lowell, Indiana; Bryan, Ohio; and Wilmington, Ohio were selected for sampling.

## 1.2 SITE DESCRIPTIONS

The facility at Lowell, Indiana serves approximately 16,000 people, and receives no industrial inputs. The plant has a design and peak flow of 4.0 million gallons per day (mgd), and an average flow of 2.4 mgd. Average suspended solids and biological oxygen demand (BOD) are 230 and 300 mg/L in the influent, and 6 and 7 mg/L in the effluent. Plant retention time is approximately 10 hours. The plant utilizes grit and grease removal via bar screens, primary and secondary clarification, fine bubble aeration, and chlorination. The receiving stream at Lowell is Cedar Creek, which has sandy, silty sediments which overlie a hard clay substrate. Predominant land use around the plant is agricultural, and cornfields and thin buffers of forest border Cedar Creek. The creek, which is approximately 3 to 7 meters wide and 15 cm to 60 cm deep, has been channelized, and the shoreline stabilized in areas using cobbles. A map showing the plant in relation to the creek is provided as Figure 1-1.

The facility at Bryan, Ohio serves approximately 8,000 people, and receives 20percent industrial inputs. These industries include a candy factor, die-casting, and tool and sheet metal manufacturers, which treat their wastewater before discharging. The plant has a design flow of 3.2 mgd, an average flow of 2.4 mgd, and peak flow of 8.1 mgd. Average suspended solids and BOD are 180 and 100 mg/L in the influent, and 2 and 2 mg/L in the effluent. The plant utilizes grit and grease removal via bar screens, primary and secondary clarification, fine bubble aeration, anaerobic digestion, and chlorination/dechlorination. The receiving stream is Pidgeon Run, which is joined immediately downstream of the outfall by Ditch 40. The stream substrate is primarily a hard clay bottom overlain by areas of sandy, silty sediments. Predominant land use around the plant is residential and industrial. The stream, which is approximately 3 to 7 meters wide and 15 cm to 60 cm deep, has been channelized, and the shoreline stabilized in areas using cobbles. A map showing the plant in relation to the creek is provided as Figure 1-2.

The facility at Wilmington, Ohio serves approximately 17,000 people, and receives 10percent industrial inputs. These industries include a plastics molding, die-casting, and run-off from an airport. The plant has a design flow of 3.0 mgd, an average flow of 2.0-4.4 mgd, and peak flow of 8.5 mgd. Average suspended solids and BOD are 230 and 300 mg/L in the influent, and 6 and 7 mg/L in the effluent. The plant utilizes grit and grease removal via bar screens, primary and secondary clarification, fine bubble aeration, aerobic digestion, trickling filters, and UV light treatment. The receiving stream is Lytle Creek. The stream substrate is primarily a gravel and cobble bottom overlain by areas of sandy, silty sediments. Predominant land use around the plant is residential and industrial; a landfill is located adjacent to the stream downstream of the plant. Lytle Creek is approximately 3 to 7 meters wide and 15 cm to 60 cm deep; it is bordered by deciduous forest. A map showing the plant in relation to the creek is provided as Figure 1-3.

## **2.0 METHODS**

### **2.1 SAMPLE DESIGN**

At each plant, a 24 hour composite sample was collected of both influent and effluent. Also, sediment, surface water, and sediment interstitial water were collected from 4 locations in the streams receiving water from each plant. Stream locations were also evaluated using USEPA Rapid Bioassessment Protocols (USEPA, 1999). All sampling was conducted in accordance with the sample collection and preparation standard operating procedures (SOPs) provided by the SDA. These are included as Appendix B. A copy of EA's field log entries for the sample effort is included as Appendix C.

The original sample design included one upstream sample location, one location in the zone of initial dilution, one location at the end of the mixing zone, and one location downstream. Field measurements of conductivity demonstrated that the mixing zone for such low flow, narrow streams was usually only 2 or 3 meters long. Therefore, Task force members were consulted, and the sample design was altered to include an upstream, mixing zone, downstream, and far downstream location.

#### **2.1.1 Influent and Effluent Sample Collection**

Influent and effluent samples were collected as 24 hour composites. Discrete samples were collected hourly via ISCO pumps equipped with decontaminated Teflon and silicon tubing. The volume of each discrete sample was determined based on influent and effluent flow rates. These rates are reported in Tables 2-1 through 2-3, and the original flow calculation worksheets are included as Appendix D. A total of 4 L of influent and 5 L of effluent were collected and sent to MRI laboratories for analysis for target surfactants. An additional 125 mL was collected and sent to MRI for analysis for boron.

### **2.1.2 Surface Water Collection**

Surface water samples were collected from each location for chemical analyses. Decontaminated bottles were submerged directly below the surface of the water until full. A total of 5 L of surface water were collected at each location to be analyzed for target surfactants. These were preserved with 8 percent formalin. Additional volume was collected for analysis for boron and for general chemistry parameters listed in Table 2-4; the laboratory data reports for this effort are provided in Appendix F.

### **2.1.3 Sediment and Interstitial Water Collection**

Sediment samples were collected from each sample location for sediment and interstitial water analyses. Sampling was biased towards areas of fine, recently deposited sediments, since these are most likely to contain surfactants. Sediment samples were collected using a petite Ponar grab sampler, and any overlying surface water was decanted from the Ponar. The sample was then placed in a decontaminated 20 L bucket; buckets were decontaminated by washing with tap water from off-site, followed by a brief rinse using deionized water and methanol. A sample of whole sediment was collected for surfactant analyses and placed in a 500 mL container preserved with 8 percent formalin. Additional sample volume was collected and sent for analyses of physical and environmental chemistry parameters listed in Table 2-4; the laboratory data reports for this effort are provided in Appendix F.

Interstitial water was collected via rotating drum separator. Use of this instrument is described in the SOPs in Attachment B. Approximately 2 L of sediment were placed in the drum, which was spun to separate interstitial water. Approximately 20 to 30 sediment grabs, or approximately 30 L of sediment, were required at each site to achieve the required sample volume. A total of 7 L of interstitial water and 500 mL of post-separation sediment were collected per site and taken to MRI for analysis for AE, AES/AS, and LAS. Additional volume was collected and sent for lab analysis of the general physical and chemical parameters listed in Table 2-4; the laboratory data reports for this effort are provided in Appendix F. Interstitial water samples for both surfactants and general chemistry parameters were centrifuged in the laboratory due to the high concentration of suspended solids that were not removed by the rotating drum separator.

Every effort was made to minimize the time elapsed between collection of sediment and preservation. Due to the long distances that samples had to be carried at Lowell, elapsed times ranged from 30 minutes to 90 minutes. Through improved sample management and logistics, elapsed times were decreased at Wilmington and Bryan to approximately 35 minutes or less.

### **2.1.4 Water Quality Measurements**

Physiochemical measurements were collected concurrently with benthic samples at each location including water temperature, dissolved oxygen, pH, conductivity, and oxidation/reduction potential (ORP) using YSI-556 water quality meter. The time of



collection, water depth, and weather conditions were also recorded at each location. Stream flow was measured at three locations across each creek. Water quality measurements were recorded in the field log or on the rapid bioassessment data sheets, which are included as Appendix C.

### **2.1.5 Benthic Invertebrate Collection**

A qualitative assessment of benthic community was conducted using a D-frame dip net (650  $\mu\text{m}$  mesh size). Samples were collected by jabbing the dip net a total of 20 times at each stream location and collecting organisms in the net. The number of jabs for each habitat type was proportional to habitat types present at each location. Every attempt was made to collect samples from similar habitats at each location at each stream. The number of jabs in each habitat type at each location is listed in Table 2-5. Each sample was placed in labeled plastic 1-L jars, preserved with ethanol, and stored for laboratory processing. Samples were processed and specimens identified by EA's taxonomists. The laboratory data sheets for this effort are provided in Appendix E.

### **2.1.6 Habitat Assessment**

In the field, a habitat assessment and physical/chemical field data sheet was completed at each sampling location immediately following the benthos collections. Ten parameters were used to score habitat quality for low gradient streams: epifaunal substrate, pool substrate, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetative protection, and riparian vegetative zone width. Physical/chemical information was recorded which further described the physical characteristics/water quality of the stream locations sampled. This information included surrounding predominant land use features, substrate composition, and sediment and water quality observations.

### **2.1.7 Quality Assurance Samples**

In addition to the samples discussed above, field blanks and duplicates were also collected. At each stream, a complete duplicate water and duplicate sediment sample were collected and sent to MRI for surfactant analyses. Duplicate sediment samples were collected after homogenization. Field blanks were collected by filling sample containers with deionized water concurrently with sampling.

### **2.1.8 Alkylphenol Ethoxylate Samples**

As part of a related effort, additional volume was collected for alkylphenolethoxylate analysis sponsored by the Alkylphenol Ethoxylate Research Council (APERC). An additional 3 L of surface water, 250 mL of sediment, 2 L of interstitial water, 1 L of influent, and 3 L of effluent were collected from the upstream, downstream at the end of the mixing zone, and far downstream locations. These were preserved with 8 percent formalin and sent to DAT Laboratories. In addition, the sample crew collected 2 1-L

spikes (designated FS-E and FS-EC) and a 3 L field blank (designated FB) at each site. Duplicates were collected on the far downstream samples.

## **2.2 SAMPLE NARRATIVE**

Field sampling was conducted on September 18<sup>th</sup>, 19<sup>th</sup> and 30<sup>th</sup>, and on October 1<sup>st</sup> through 3<sup>rd</sup>. Activities at each site took approximately 2 days.

### **2.2.1 Lowell, Indiana**

Sampling began at the Lowell WWTP on September 18, 2003. According to treatment plant operators, there had been very little precipitation during the previous week. The SDA Task Force personnel on-site were Mike Ciarlo (EA), Leonard Dane (EA), Bill Eckhoff (independent contractor), Brad Price (Proctor and Gamble), and Alex Evans (Shell). Messrs. Eckhoff and Evans began sampling influent and effluent, while Messrs. Ciarlo, Dane, and Price began sampling the stream locations. The far downstream location (LOWELL-F) was sampled first. The sample area was located approximately 30 m upstream of the crossing of Road 211 and Cedar Creek, approximately 1000m downstream of the WWTP. This is displayed in Figure 1-1. Sampling began with water quality measurements, flow measurements, habitat assessment, and benthic invertebrate collection. Next, surface water was collected and finally sediment and interstitial water. Total time for sampling the site was approximately 3 hours primarily resulting from the time required to centrifuge sediment. The elapsed time between sample collection and containerization of interstitial water was approximately 45 minutes to 1 hour. Habitat around the sample area consisted of 20 m wide forested banks buffering the stream from open agricultural fields.

The next sample was to be collected at the end of the mixing zone (LOWELL-M). However, based on conductivity measurements, complete mixing was observed within 2 m of the WWTP outfall. Therefore, after consultation amongst SDA Task Force members, the sample was collected 50m feet downstream to provide a data point that was distinguishable from the dilution zone sample. Sampling was performed in the order described above commencing at 1345. The sample area is located in a formerly dredged area with cobble banks; sediments were primarily thin deposits of silt over clay. At 1630, field activities ceased and samples were placed on ice for storage overnight. The elapsed time between sample collection and containerization of interstitial water was approximately 45 minutes to 1.5 hours due to the excessive travel time between the sample location and the centrifuge location; the sample location required that samples be carried through a corn field and driven from a residential area to the treatment plant. Based on the high turbidity of interstitial water samples after centrifugation, it was decided that they would also require laboratory centrifugation before analysis.

On September 19, 2003, the upstream (LOWELL-U) and dilution-zone (LOWELL-D) locations were sampled. Mr. Dane was replaced on the sampling crew by Mr. Jeff Hefel (EA). Elapsed time between sample collection and containerization were 15 minutes to 45 minutes due to travel time. The upstream samples were collected at the crossing of

Cedar Creek and Belshaw Road in an area with wooded banks, approximately 600m above the outfall. Note was made that there was debris at the upstream location such as wood beams and trash, as well as drain pipes leading from residences and fields approximately 70 meters upstream of the sample location; no flow was observed from these drains, which may have been related to nearby residences or agricultural fields. Upstream sediments consisted of soft sandy silts. The dilution zone sample was located directly below the outfall, and sediments were collected from deposits of sandy silt. At 1630, field activities stopped and samples were placed on ice for storage overnight. Mr. Price transported samples to MRI, and the EA field team shipped samples for overnight delivery to DAT and Accutest laboratories.

After this effort, Mr. Al DeCarvalho and available members of the SDA Task Force were consulted, and it was decided that the sample design should be changed to eliminate the distinction between mixing zone and zone of initial dilution. Instead, a single sample would be collected at the outfall to represent the mixing zone, and an additional downstream sample would be collected. It was also agreed that interstitial water samples would require laboratory centrifugation prior to analysis.

### **2.2.2 Bryan, Ohio**

Sampling at Bryan, Ohio began on October 2, 2003. Field personnel included Leonard Dane, Sarah Skelton, and Bill Eckhoff. The dilution/mixing zone, downstream, and far downstream samples were collected October 2<sup>nd</sup>, and the upstream sample was collected October 3<sup>rd</sup>. The far downstream (BRYAN-F) location was sampled at the crossing of Pigeon Run with County Road C50 in an area of mowed fields associated with the WWTP property. The downstream location (BRYAN-D) was sampled 200 m downstream of the outfall, and the mixing zone sample (BRYAN-M) was collected 30m downstream of the outfall. All of these samples are located in areas of hard clay sediments overlain by varying depths of deposited silt. Surrounding land use is mowed land associated with the WWTP facilities. The elapsed time between sample collection and sample preservation was tracked closely; the elapsed time was kept to 5 to 35 minutes.

Based on field observations, it was determined that Ditch 40, which enters Pigeon Run 30 feet below the outfall, contributes significant flow to the stream and should be considered a potential upstream source of surfactants. After consultation with Mr. DeCarvalho via telephone, it was decided that a composite sediment and surface water sample would be collected combining media from both upstream Ditch 40 (BRYAN-U/S) and upstream Pigeon Run (BRYAN-U/U). Based on estimated flow, 60 percent of the sediment and water were collected from Pigeon Run, and the remaining 40 percent from Ditch 40. Separate benthic taxonomy samples were collected from both locations, and separate habitat assessments performed.

At the end of the field effort, Mr. Price transported samples to MRI, and the EA field team shipped samples for overnight delivery to DAT and Accutest laboratories.

### 2.2.3 Wilmington, Ohio

Sampling at Wilmington, Ohio began on September 30, 2003. According to treatment plant operators, there had been very little precipitation during the previous week. Field personnel included Leonard Dane, Sarah Skelton, Brad Price, and Bill Eckhoff. The dilution/mixing zone, downstream, and far downstream samples were collected on September 30<sup>th</sup>, and the upstream sample was collected on October 1<sup>st</sup>. The elapsed time between sample collection and sample preservation was tracked closely; through improvements in sample management and logistics, the elapsed time was decreased to 5 to 35 minutes.

The far downstream sample (WILMINGTON-F) was collected at the crossing of the landfill access road/Penn Central Railroad right-of-way and Lytle Creek. The downstream sample (WILMINGTON-F) was collected 100 m downstream of the outfall, and the mixing zone sample (WILMINGTON-M) was collected 30 meters downstream of the confluence of the small stream formed by the effluent and Lytle Creek. The upstream sample was collected 50 m upstream of the outfall (WILMINGTON-U). It is important to note that there is a large amount of trash and construction rubble along the streambed immediately downstream of the outfall. Halfway through the sampling effort, the pH sensor on the YSI malfunctioned. Despite efforts to repair or replace it, it could not be immediately fixed and pH was not measured at several of the sampling locations.

At the end of both days, Mr. Price transported samples to MRI, and the EA field team shipped samples for overnight delivery to DAT and Accutest laboratories.

## 3.0 RESULTS

### 3.1 WATER QUALITY RESULTS

Water quality measurements including temperature, dissolved oxygen, pH, conductivity, and ORP are reported in Table 3-1, and stream velocity and depth measurements are summarized in Table 3-2. Water temperature ranged from 15.9 to 21.3°C at locations in Cedar Creek (Lowell); water temperature in Pigeon Run (Bryan) ranged from 9.4 to 16.5 °C; and temperatures in Lytle Creek (Wilmington) ranged from 11.3 to 15.4°C. In all three streams, the highest water temperature was recorded at the Mixing Zone sampling location. Dissolved oxygen concentrations ranged from 5.3 to 12.1 mg/L at all sampling locations. Overall, concentrations of dissolved oxygen were within normal and expected ranges except for the Mixing Zone sampling location in Pigeon Run (Bryan), which was supersaturated. Conditions at this location improved with distance downstream.

Because of an instrument malfunction pH measurements were not recorded at all sample locations. The pH measured at sampling locations was found to be within normal ranges and ranged from 6.7 to 7.8. Conductivity ranged from 0.93 to 1.81, 0.66 to 0.96, and 0.72 to 0.82 mS/cm<sup>2</sup> at sampling locations in Cedar Creek (Lowell), Pigeon Run (Bryan), and Lytle Creek (Wilmington), respectively. Measured conductivity values were within

normal and expected ranges. ORP was measured within the water column and approximately -2.5 cm below the stream sediment surface. ORP measurements were similar at all stream sampling locations ranging from 183.5 to 314.1 mV in the water column. Measurements of ORP -2.5 cm below stream sediment surface ranged from 191.7 to 277.5 mV.

### **3.2 SEDIMENT QUALITY RESULTS**

Results of the physical and general chemistry analyses for sediment are summarized in Tables 3-3 through 3-5. Grain size test results indicated that the sediment was predominately comprised of sand (49.8 – 90.6 percent) at all stream locations for Cedar Creek (Lowell), Pigeon Run (Bryan), and Lytle Creek (Wilmington). Bulk density ranged from 1.1 to 1.9 g/mL at all sample locations and moisture content of the sediment ranged from 17.3 to 38.7 percent. Total organic carbon (TOC) concentrations ranged from 5,120 to 19,500 mg/kg in stream sediments. The lowest concentrations of TOC were at the mixing zone location in both Pigeon Run (Bryan) and Lytle Creek (Wilmington) and highest concentrations were measured at the downstream and upstream locations in Cedar Creek (Lowell). Total organic content ranged from 3 to 7.9 percent on a dry weight basis in Cedar Creek (Lowell), from 1.5 to 4.9 percent in Pigeon Run (Bryan), from 15.6 to 19.7 percent in Lytle Creek (Wilmington). Sulfide concentrations were below the reporting limit in sediment from all sampling locations. Sediment plasticity was determined by calculating Atterberg limits. Sediments at Wilmington were consistently non-plastic silts and sands, while sediments at Bryan were more plastic clays. Sediments at Lowell were plastic at some locations and non-plastic at others.

### **3.3 SURFACE AND INTERSTITIAL WATER CHEMISTRY RESULTS**

Results of the surface and interstitial water chemistry analyses are presented in Tables 3-6 through 3-8 and summarized in the following sub-sections.

#### **3.3.1 Surface Water**

BOD concentrations were below the reporting limit at all stream locations except for the Upstream location in Pigeon Run (Bryan) (218 mg/L) and the Far Downstream location in Lytle Creek (Wilmington) (8.2 mg/L). COD concentrations were below the reporting limit except for the Upstream location in Pigeon Run (Bryan) (180mg/L). Total hardness ranged from 292 to 352 mg/L and total dissolved solids ranged from 428 to 595 mg/L at all sample locations. TOC concentrations ranged from 3 to 78 mg/L, with the highest concentrations occurring at the Upstream location in Pigeon Run (Bryan). It is of note that BOD exceeded COD in the Upstream location in Pigeon Run (Bryan); this is unexpected, since COD routinely yields higher values for oxygen demand than BOD. While efforts were made to collect homogenous surface water samples, it is possible that there may have been some heterogeneity between analytical subsamples.

### 3.3.2 Interstitial water

Biological oxygen demand concentrations ranged from 12.5 to 158 mg/L at stream locations in Pigeon Run (Bryan) and Lytle Creek (Wilmington). The highest concentration (158 mg/L) was detected at the Upstream location in Pigeon Run (Bryan). Chemical oxygen demand concentrations ranged from 85 to 270 mg/L at all stream locations. Total hardness ranged from 2,840 to 6,870 mg/L at stream locations in Pigeon Run (Bryan) and concentrations in Lytle Creek (Wilmington) ranged from 650 to 1,670 in Lytle Creek (Wilmington). Total dissolved solids concentrations ranged from 227 to 530 mg/L and TOC concentrations ranged from 5.9 to 2,400 mg/L at all stream locations.

It is of note that BOD exceeded COD in the Upstream location in Pigeon Run (Bryan); this is unexpected, since COD routinely yields higher values for oxygen demand than BOD. While the reason for this is unknown, it is possible that there may have been heterogeneity between analytical sub-samples due to the multiple centrifuge runs required to collect porewater.

## 3.4 BIOLOGICAL AND HABITAT ASSESSMENT RESULTS

The analysis of benthic community data and the habitat assessment follows the USEPA Rapid Bioassessment Protocol developed (USEPA,1999). This process involves the use of a series of metrics or community attributes, each of which reveals some aspect of benthic community structure. For each metric used, a numerical value is determined according the requirements for each particular attribute.

A taxa list with the abundance of benthic organisms collected from Cedar Creek (Lowell), Pigeon Run (Bryan), and Lytle Creek (Wilmington) are reported in Tables 3-9 through 3-11 and summarized below. Metric calculations were performed for benthic data to provide measures of community richness, composition, tolerance/intolerance, and trophic structure.

In addition to the collection of benthic data, a physical characterization and an assessment of habitat quality were performed at each sampling location. The physical characterization describes general land use and physical stream characteristics (e.g. width, depth, flow). Habitat assessment was based on systematic evaluation of a standardized set of parameters (e.g. bottom substrate, bank stability, vegetative cover), weighted to emphasize those that are most biologically significant. Results of the habitat assessment and metric scores are reported in Tables 3-12 through 3-14 and summarized in the following sub-sections.

### 3.4.1 Cedar Creek (Lowell)

The abundance of benthic macroinvertebrates at Cedar Creek (Lowell) sample locations ranged from 99 individuals at the upstream location to 2591 individuals at the mixing zone location. The total number of taxa ranged from 19 at the upstream location to 37 at the mixing zone location and gradually declined farther downstream. The number EPT

taxa ranged from 1 at the upstream location to 6 at the downstream location. The percent tolerant taxa was lowest at the upstream location (20.2 percent) and highest at the mixing zone location (57.9 percent).

Habitat assessment scores for Cedar Creek (Lowell) ranged from 69 at the Mixing Zone location to 113 at the Upstream location. Scores gradually improved downstream from the Mixing zone location. The lowest scores for the Mixing location included channel alteration, channel sinuosity, and vegetative protection.

### **3.4.2 Pigeon Run (Bryan)**

The abundance of benthic macroinvertebrates at Pigeon Run (Bryan) sample locations ranged from 5,057 individuals at the upstream location to 10,458 individuals collected at the mixing zone location. The total number of taxa ranged from 24 at the downstream location to 31 at the sidestream location. The number of EPT taxa ranged from 0 at the mixing zone location to 3 at the far downstream location and percent tolerant taxa ranged from 39.35 percent at the far downstream location to 54.5 percent at the mixing location. Percent tolerant taxa decreased with distance downstream from the mixing zone location.

Habitat assessment scores for Pigeon Run (Bryan) ranged from 86 at the Upstream location to 101 at the Mixing Zone location. The lowest scores for all locations in Pigeon Run (Bryan) was for riparian vegetative zone width and channel sinuosity.

### **3.4.3 Lytle Creek (Wilmington)**

The abundance of benthic macroinvertebrates at Lytle Creek (Wilmington) sample locations ranged from 134 individuals at the upstream location to 9,234 individuals at the far downstream location. Total number of taxa ranged from 23 at the downstream location to 32 at the upstream location. The number of EPT taxa ranged from 0 at the mixing zone location to 4 at the upstream and far downstream locations. The percent tolerant taxa was ranged from 13.4 percent at the upstream location to 59.8 percent at the mixing zone location and gradually decreased with distance downstream from the mixing zone location.

The habitat assessment scores for Lytle Creek (Wilmington) ranged from 108 at the Upstream and Mixing Zone locations to 137 at the Far Downstream location. The lowest score at Lytle Creek (Wilmington) was for bank stability at the Downstream location because of moderate erosion.

## **4.0 CONCLUSIONS**

The field sampling conducted by EA provides data that will be useful in evaluating the conditions under which AE, AES/AS, and LAS persist in sediments. The streams evaluated are relatively similar in terms of sediment type and water quality, although minor variations in flow rates, organic carbon content, and other factors may prove useful

in the event that the target surfactants are detected. These streams also provide differing potential sources of surfactants and surrounding land use.

The rapid bioassessment evaluate conditions of potentially affected stream locations based on comparison of mixing zone and downstream locations, possibly influenced by treatment plant outfalls, to an upstream location. This approach determines if the downstream locations are subjected to environmental stress compared to existing conditions upstream but does not make comparisons to a regional reference or unimpacted location from a pristine environment with similar habitat characteristics.

The habitat assessment scores at the mixing zone and downstream locations were nearly the same or better than the upstream locations at Pigeon Run (Bryan) and Lytle Creek (Wilmington). Habitat condition scores for Cedar Creek (Lowell) were highest at the upstream location, lowest at the mixing zone location, and showed gradual improvement with distance downstream.

Biological conditions were generally similar at sample locations in Cedar Creek (Lowell), Pigeon Run (Bryan), and Lytle Creek (Wilmington). In all three streams, the lowest total abundance of organisms was found at upstream locations; however, the greatest percent of tolerant taxa was consistently measured at the mixing zone location and generally decreased with distance downstream. The number of EPT taxa also showed similar trends for both Pigeon Run (Bryan) and Lytle Creek (Wilmington), with the lowest number occurring at the mixing zone location and gradually increasing with distance downstream. Overall, the environmental effects of the treatment plant outfall are minimally apparent in the biological conditions in the direct vicinity of the mixing zone and generally decrease with distance downstream. The comparatively moderate to high abundance of organisms found at the mixing zone and downstream locations at all streams may suggest the influence of increased stream flow on the enhancement of habitat conditions.

## 5.0 REFERENCES

- USEPA. 1999. Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. U.S. Environmental Protection Agency Office of Water, Washington, D.C. EPA 841-B-99-002.



**FIGURES**



Figure 1-1  
Location of Lowell, Indiana WWTP and Cedar Creek Sample Locations



Figure 1-2  
Location of Bryan, Ohio WWTP and Pigeon Run Sample Locations

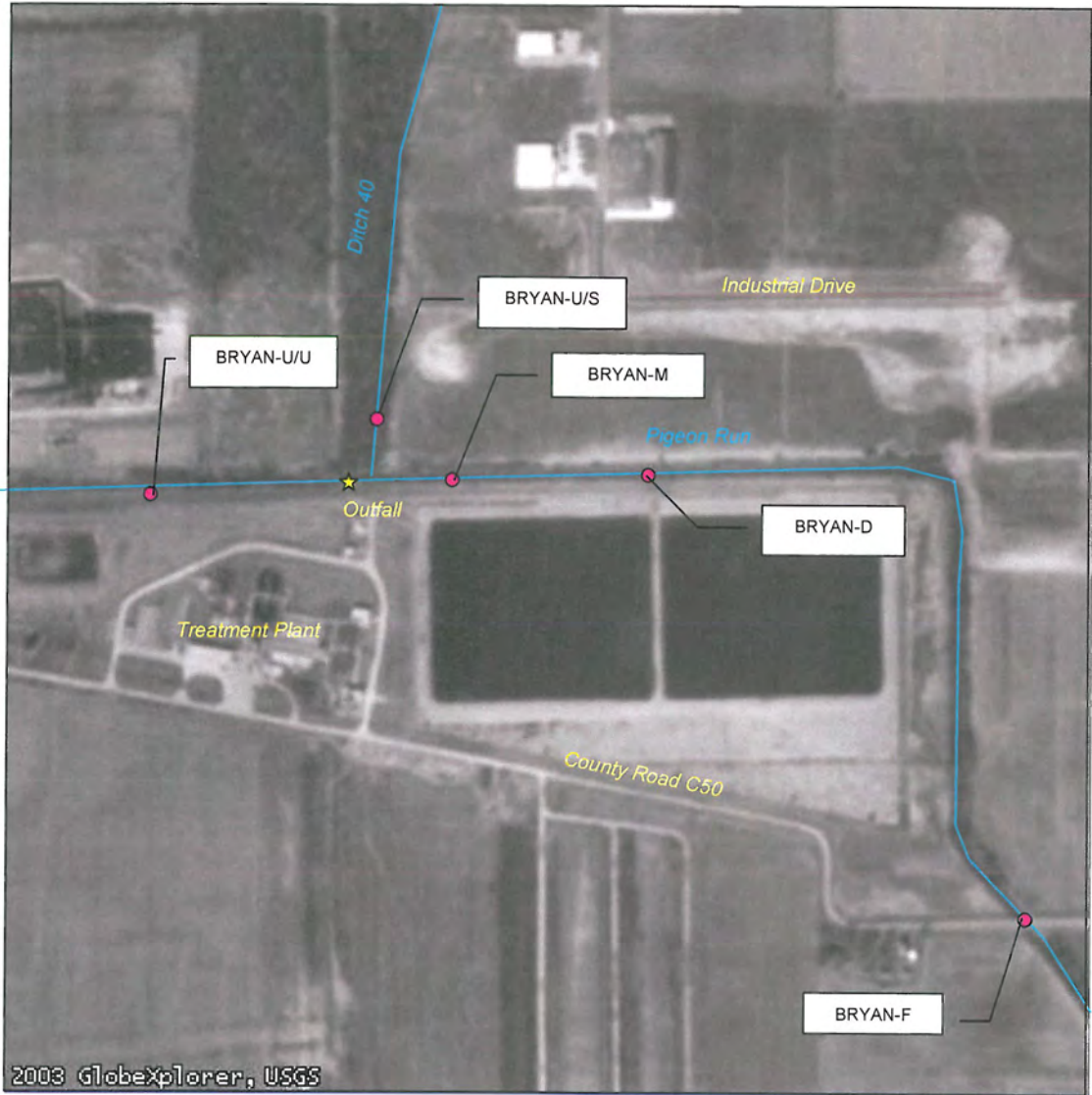
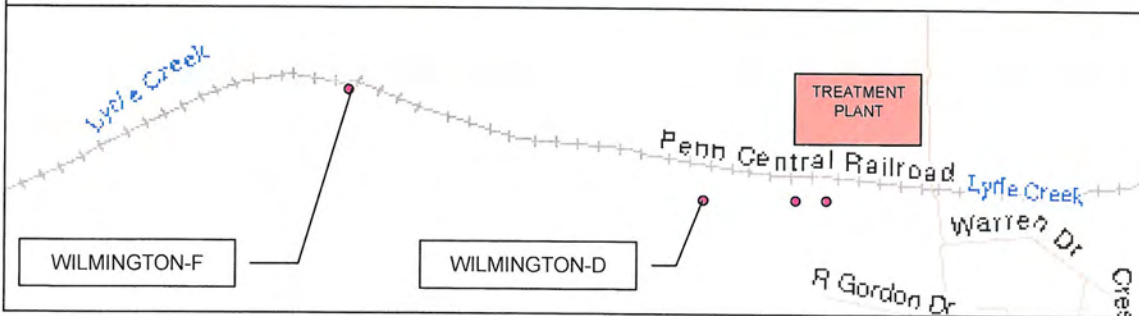


Figure 1-3  
Location of Wilmington, Ohio WWTP and Pigeon Run Sample Locations



Expanded view:



**TABLES**



TABLE 1-1 STREAM SAMPLING DATES, TIMES, AND LOCATIONS FOR CEDAR CREEK, INDIANA AND PIGEON RUN AND LYTLE CREEK, OHIO

Geographic Location	Stream	Sample Location	Sample Designation	Date	Time (CST)	Coordinates	
						Latitude	Longitude
Lowell, IN	Cedar Creek	Upstream	Lowell-U	09/19/03	0700	41 15.615 N	87 24.786 W
		Mixing Zone (Outfall)	Lowell-D	09/19/03	0800	41 15.615 N	87 24.767 W
		Downstream	Lowell-M	09/18/03	1330	41 15.614 N	87 24.786 W
		Far Downstream	Lowell-F	09/18/03	0900	41 14.120 N	87 24.899 W
Bryan, OH	Pigeon Run	Upstream	Bryan-U/U	10/03/03	0800	--	--
		Side Stream*	Bryan-U/S	10/03/03	0845	41 27.836 N	84 31.557 W
		Mixing Zone (Outfall)	Bryan-M	10/02/03	1430	41 27.809 N	84 31.520 W
		Downstream**	Bryan-D	10/02/03	1130	41 27.811 N	84 31.431 W
		Far Downstream	Bryan-F	10/02/03	0800	41 27.605 N	84 31.172 W
		Upstream	Wilmington-U	10/01/03	0830	39 26.267 N	83 51.205 W
Wilmington, OH	Lytle Creek	Mixing Zone (Outfall)	Wilmington-M	09/30/03	1300	39 26.288 N	83 51.205 W
		Downstream	Wilmington-D	09/30/03	1100	39 26.277 N	83 51.413 W
		Far Downstream	Wilmington-F	09/30/03	0845	39 26.305 N	83 51.742 W

\* - At Bryan, the upstream sample was a flow-weighted composite of sediment and water from upstream locations in Pigeon Run and Ditch 40.

\*\* - Sample designations were changed between the Mixing Zone and Downstream locations between sites, because the original sample design was changed.

**TABLE 2-1 FLOW WEIGHTED COMPOSITE SAMPLING  
FROM THE LOWELL, INDIANA WASTEWATER  
TREATMENT PLANT (OCTOBER 2003)**

SAMPLE ID	DATE	TIME	STP FLOW (10 <sup>6</sup> GAL/DAY)	VOLUME OF SAMPLE FOR COMPOSITE (ml)
1	09/18/03	11:10	2.20	215
2	09/18/03	12:10	2.40	234
3	09/18/03	13:10	2.55	249
4	09/18/03	14:10	2.45	239
5	09/18/03	15:10	2.25	220
6	09/18/03	16:10	2.15	210
7	09/18/03	17:10	2.20	215
8	09/18/03	18:10	2.20	215
9	09/18/03	19:10	2.20	215
10	09/18/03	20:10	2.30	225
11	09/18/03	21:10	2.35	229
12	09/18/03	22:10	2.48	242
13	09/18/03	23:10	2.45	239
14	09/19/03	0:10	2.40	234
15	09/19/03	1:10	2.23	218
16	09/19/03	2:10	2.08	203
17	09/19/03	3:10	1.90	186
18	09/19/03	4:10	1.80	176
19	09/19/03	5:10	1.60	156
20	09/19/03	6:10	1.50	146
21	09/19/03	7:10	1.60	156
22	09/19/03	8:10	1.80	176
23	09/19/03	9:10	2.00	195
24	09/19/03	10:10	2.15	210
<b>MEAN</b>			2.14	208.5
<b>MIN</b>			1.50	146
<b>MAX</b>			2.55	249

**TABLE 2-2 FLOW WEIGHTED COMPOSITE SAMPLING  
FROM THE BRYAN, OHIO WASTEWATER TREATMENT  
PLANT (SEPTEMBER-OCTOBER 2003)**

<b>SAMPLE ID</b>	<b>DATE</b>	<b>TIME</b>	<b>STP FLOW (10<sup>6</sup> GAL/DAY)</b>	<b>VOLUME OF SAMPLE FOR COMPOSITE (ml)</b>
1	10/02/03	11:30	2.5	270
2	10/02/03	12:30	2.4	259
3	10/02/03	13:30	2.4	259
4	10/02/03	14:30	2.4	259
5	10/02/03	15:30	2.2	238
6	10/02/03	16:30	2.1	227
7	10/02/03	17:30	2.2	238
8	10/02/03	18:30	2.0	216
9	10/02/03	19:30	2.2	239
10	10/02/03	20:30	2.3	248
11	10/02/03	21:30	2.5	270
12	10/02/03	22:30	2.2	238
13	10/02/03	23:30	2.1	227
14	10/03/03	0:30	2.0	216
15	10/03/03	1:30	2.0	216
16	10/03/03	2:30	2.0	216
17	10/03/03	3:30	1.8	194
18	10/03/03	4:30	1.6	173
19	10/03/03	5:30	1.5	162
20	10/03/03	6:30	1.7	184
21	10/03/03	7:30	1.8	194
22	10/03/03	8:30	2.2	238
23	10/03/03	9:30	2.3	248
24	10/03/03	10:30	2.3	248
<b>MEAN</b>			2.1	228.2
<b>MIN</b>			1.5	162
<b>MAX</b>			2.5	270



**TABLE 2-3 FLOW WEIGHTED COMPOSITE SAMPLING  
FROM THE WILMINGTON, OHIO WASTEWATER  
TREATMENT PLANT (OCTOBER 2003)**

<b>SAMPLE ID</b>	<b>DATE</b>	<b>TIME</b>	<b>STP FLOW (10<sup>6</sup> GAL/DAY)</b>	<b>VOLUME OF SAMPLE FOR COMPOSITE (ml)</b>
1	09/30/03	12:05	2.05	223
2	09/30/03	13:05	2.21	241
3	09/30/03	14:05	2.17	237
4	09/30/03	15:05	2.19	239
5	09/30/03	16:05	2.32	253
6	09/30/03	17:05	2.43	265
7	09/30/03	18:05	2.11	230
8	09/30/03	19:05	2.57	280
9	09/30/03	20:05	2.15	234
10	09/30/03	21:05	2.14	233
11	09/30/03	22:05	1.83	199
12	09/30/03	23:05	2.17	236
13	10/01/03	0:05	1.88	205
14	10/01/03	1:05	1.68	183
15	10/01/03	2:05	1.91	208
16	10/01/03	3:05	1.28	140
17	10/01/03	4:05	1.5	164
18	10/01/03	5:05	1.94	211
19	10/01/03	6:05	1.68	183
20	10/01/03	7:05	1.77	193
21	10/01/03	8:05	2.34	255
22	10/01/03	9:05	2.31	252
23	10/01/03	10:05	2.68	292
24	10/01/03	11:05	2.4	262
<b>MEAN</b>			2.07125	225.75
<b>MIN</b>			1.28	140
<b>MAX</b>			2.68	292

**Table 2-4 Physical and chemical parameters analyzed in sediment, interstitial water, and surface water**

<b>Media</b>	<b>Laboratory parameters and methods</b>
<b>Sediment</b>	Moisture content
	Bulk density
	Grain size
	Total organic carbon
	Total sulfide
	Organic matter content
	Kjeldahl nitrogen
	Total phosphorous
	Atterberg Limits/Plasticity Index
	Cation exchange capacity
<b>Surface water</b>	Total dissolved solids
	Total organic carbon
	Biological oxygen demand
	Chemical oxygen demand
	Hardness
<b>Interstitial water</b>	Total dissolved solids
	Total organic carbon
	Biological oxygen demand
	Chemical oxygen demand
	Hardness

TABLE 2-5 BENTHIC INVERTEBRATE SAMPLING HABITAT TYPES

Treatment Plant	Stream	Sample Location	Habitat type (% and number of jabs)						
			Submerged macrophytes	Cobble	Snag	Vegetation	Sand/Soft substrate	Other	
Lowell, IN	Cedar Creek	Upstream	0	0	10	6	4	0	
		Mixing Zone (Outfall)	0	0	2	2	16	0	
		Downstream	0	0	2	2	0	16 (gravelly clay)	
Bryan, OH	Pigeon Run	Far Downstream	0	0	2	4	14	0	
		Upstream	0	0	0	18	2	0	
		Side Stream	0	0	2	9	9	0	
		Mixing Zone (Outfall)	0	0	0	6	14	0	
		Downstream	0	0	0	6	14	0	
Wilmington, OH	Lytle Creek	Far Downstream	4	2	0	2	0	10 (silt/muck)	
		Upstream	0	4	4	2	10	0	
		Mixing Zone (Outfall)	0	4	2	2	12	0	
		Downstream	0	6	4	2	8	0	
		Far Downstream	0	5	2	2	11	0	

**TABLE 3-1 PHYSIOCHEMICAL PARAMETERS MEASURED IN STREAM SAMPLE LOCATIONS (SEPTEMBER-OCTOBER 2003)**

Stream	Sample Location	Water Quality Parameters						
		Water Temperature (C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm2)	ORP	ORP (-1 inch below sediment)	
Cedar Creek (Lowell)	Upstream	16.64	5.25	7.71	0.929	233.6	*	
	Mixing Zone (Outfall)	17.3	6.75	7.76	1.492	240.8	238.8	
	Downstream	21.29	9.01	7.69	1.805	234.5	208.9	
	Far Downstream	15.93	7.14	6.67	1.529	314.1	277.5	
Pigeon Run (Bryan)	Upstream	9.41	9.31	*	0.659	213.8	*	
	Side Stream	7.66	9.97	*	0.729	189.4	*	
	Mixing Zone (Outfall)	16.49	12.12	*	0.924	227.5	*	
	Downstream	14.47	11.2	*	0.964	229.4	*	
	Far Downstream	10.14	9.89	*	0.903	173.9	*	
Lytle Creek (Wilmington)	Upstream	11.32	9.29	*	0.754	195.6	*	
	Mixing Zone (Outfall)	15.38	8.72	*	0.825	222.5	*	
	Downstream	14.25	8.75	7.75	0.798	234.1	*	
	Far Downstream	12.97	8.34	7.79	0.717	183.5	191.7	

\* Parameter was not measured because of instrument malfunction  
 ORP = Oxidation/Reduction Potential

**TABLE 3-2 DEPTH (FT) AND FLOW VELOCITY (FT/S) MEASUREMENTS ACROSS STREAMS (ORIENTED DOWNSTREAM) AT SAMPLE LOCATIONS (SEPTEMBER-OCTOBER 2003)**

Stream	Sample Location	Channel width (m)	Left Side		Middle		Right Side	
			*Depth (m)	Velocity (m/s)	*Depth (m)	Velocity (m/s)	*Depth (m)	Velocity (m/s)
Cedar Creek (Lowell)	Upstream	5	0.3	0.003	0.7	0.003	0.4	0.006
	Mixing Zone (Outfall)	4	0.2	0.183	0.2	0.207	0.2	0.040
	Downstream	5	0.2	0.076	0.4	0.091	0.2	0.171
	Far Downstream	4	0.3	0.393	0.2	0.012	0.1	-0.005
Pigeon Run (Bryan)	Upstream	5	0.1	0.158	0.1	0.122	0.1	0.076
	Side Stream	6	0.2	0.058	0.1	0.085	0.2	0.110
	Mixing Zone (Outfall)	10	0.2	0.165	0.2	0.192	0.2	0.165
	Downstream	9	0.2	0.402	0.1	0.158	0.1	0.091
	Far Downstream	7	0.2	0.308	0.2	0.469	0.1	0.351
Lytle Creek (Wilmington)	Upstream	10	0.1	0.003	0.2	0.128	0.2	0.067
	Mixing Zone (Outfall)	10	0.3	0.155	0.2	0.110	0.2	0.110
	Downstream	8	0.1	0.113	0.1	0.162	0.1	0.128
	Far Downstream	6	0.5	0.204	0.5	-0.003	0.2	-0.040

\*Total depth of stream location, velocity measurements were taken at mid-depth.

TABLE 3-3 PHYSICAL CHARACTERISTICS AND GENERAL CHEMISTRY PARAMETERS IN SEDIMENT  
FROM CEDAR CREEK, LOWELL, INDIANA (OCTOBER 2003)

ANALYTE	UNITS	RL	MIXING ZONE			
			UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
GRAVEL	%	--	7.5	8	0	22
SAND	%	--	66	64	88	70
SILT+CLAY	%	--	27	28	31	9.6
BULK DENSITY	G/ML	--	1.2	1.5	1.1	1.6
CATION EXCHANGE CAPACITY	MG/KG	370	4970	708	4880	1760
MOISTURE	%	--	35.5	26.6	38.7	23.4
NITROGEN, TOTAL KJELDAHL	MG/KG	24	922	150	1130	177
SULFIDE	MG/KG	--	<6.2	<5.5	<6.5	<5.3
TOTAL ORGANIC CARBON	MG/KG	1200	12200	5400	19500	5330
TOTAL ORGANIC CONTENT	%	0.01	3.2	3	5.4	7.9
PLASTICITY INDEX	--	--	16	Non-plastic	19	Non-plastic

TABLE 3-4 PHYSICAL CHARACTERISTICS AND GENERAL CHEMISTRY PARAMETERS IN SEDIMENT FROM  
PIGEON RUN, BRYAN, OHIO (OCTOBER 2003)

ANALYTE	UNITS		RL	UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
	%	G/ML					
GRAVEL	--		--	45.6	36	12	5.3
SAND	--		--	49.8	61.6	82.4	73.2
SILT+CLAY	--		--	4.7	2.6	5.5	21.5
BULK DENSITY		G/ML	--	1.5	1.8	1.6	1.5
CATION EXCHANGE CAPACITY		MG/KG	370	<370	1030.0	1230.0	4360.0
MOISTURE		%	--	17.5	18.2	22.2	26.3
NITROGEN, TOTAL KJELDAHL		MG/KG	24	173.0	184.0	212.0	482.0
SULFIDE		MG/KG	4	<4.0	<4.0	<4.0	<4.0
TOTAL ORGANIC CARBON		MG/KG	1200	9610.0	5480.0	11400.0	9570.0
TOTAL ORGANIC CONTENT		%	0.01	4.9	2.1	1.7	1.5
PLASTICITY INDEX		--	--	19	20	13	26

TABLE 3-5 PHYSICAL CHARACTERISTICS AND GENERAL CHEMISTRY PARAMETERS IN SEDIMENT FROM  
 LYTTLE CREEK, WILMINGTON, OHIO (SEPTEMBER-OCTOBER 2003)

ANALYTE*	UNITS		RL				
	UPSTREAM	MIXING ZONE		DOWNSTREAM	FAR DOWNSTREAM		
GRAVEL	%	2.6	--	1.9	3.3	4.3	
SAND	%	89.1	--	88.6	90.4	90.6	
SILT+CLAY	%	8.3	--	9.5	6.3	5.1	
BULK DENSITY	G/ML	1.7	--	1.7	1.9	1.8	
CATION EXCHANGE CAPACITY	MG/KG	882	370	1870	685	1180	
MOISTURE	%	21.2	--	20.1	17.3	18.6	
NITROGEN, TOTAL KJELDAHL	MG/KG	24	24	167	116	113	
SULFIDE	MG/KG	5	5	<5.0	<5.0	<5.0	
TOTAL ORGANIC CARBON	MG/KG	1200	1200	5120	8560	5700	
TOTAL ORGANIC CONTENT	%	0.01	0.01	18.9	17.6	19.7	
PLASTICITY INDEX	--		--	Non-plastic	Non-plastic	Non-plastic	



**TABLE 3-6A GENERAL CHEMISTRY PARAMETERS IN SURFACE WATER FROM CEDAR CREEK, LOWELL, INDIANA  
(SEPTEMBER-OCTOBER 2003)**

ANALYTE	UNITS		RL	UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
	MG/L	3.3					
BIOLOGICAL OXYGEN DEMAND (5-DAY)	MG/L	3.3		<3.3	<3.3	8.5	<3.3
CHEMICAL OXYGEN DEMAND	MG/L	20		<20	<20	<20	<20
HARDNESS, TOTAL AS CaCO <sub>3</sub>	MG/L	4		416	416	430	436
SOLIDS, TOTAL DISSOLVED	MG/L	10		624	919	1000	989
TOTAL ORGANIC CARBON	MG/L	1		4.5	4.1	4.2	3.6

**TABLE 3-6B GENERAL CHEMISTRY PARAMETERS IN PORE WATER FROM CEDAR CREEK, LOWELL, INDIANA  
(SEPTEMBER-OCTOBER 2003)**

ANALYTE	UNITS		RL	UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
	MG/L	3.3					
BIOLOGICAL OXYGEN DEMAND (5-DAY)	MG/L	3.3		<3.3	8	10.2	<3.3
CHEMICAL OXYGEN DEMAND	MG/L	20		52.5	<20	170	32.5
HARDNESS, TOTAL AS CaCO <sub>3</sub>	MG/L	4		728	1320	12	524
SOLIDS, TOTAL DISSOLVED	MG/L	10		794	823	1120	910
TOTAL ORGANIC CARBON	MG/L	1		7.1	8.8	13.3	9.4



**TABLE 3-8A GENERAL CHEMISTRY PARAMETERS IN SURFACE WATER FROM LYTLE CREEK, WILMINGTON, OHIO  
(SEPTEMBER-OCTOBER 2003)**

ANALYTE	UNITS	RL	CONCENTRATION			
			UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
BIOLOGICAL OXYGEN DEMAND (5-DAY)	MG/L	3.3	<3.3	<3.3	<3.3	8.2
CHEMICAL OXYGEN DEMAND	MG/L	20	<20	<20	<20	<20
HARDNESS, TOTAL AS CaCO <sub>3</sub>	MG/L	4	344	314	326	292
SOLIDS, TOTAL DISSOLVED	MG/L	10	476	504	479	428
TOTAL ORGANIC CARBON	MG/L	1	3	3.6	3.4	3.9

**TABLE 3-8B GENERAL CHEMISTRY PARAMETERS IN PORE WATER FROM LYTLE CREEK, WILMINGTON, OHIO  
(SEPTEMBER-OCTOBER 2003)**

ANALYTE	UNITS	RL	CONCENTRATION			
			UPSTREAM	MIXING ZONE	DOWNSTREAM	FAR DOWNSTREAM
BIOLOGICAL OXYGEN DEMAND (5-DAY)	MG/L	3.3	21.2	12.5	18.3	18.1
CHEMICAL OXYGEN DEMAND	MG/L	20	143	270	125	190
HARDNESS, TOTAL AS CaCO <sub>3</sub>	MG/L	4	650	1670	868	664
SOLIDS, TOTAL DISSOLVED	MG/L	10	440	338	337	227
TOTAL ORGANIC CARBON	MG/L	1	52.4	5.9	11.4	126

TABLE 3-9 BENTHIC MACROINVERTEBRATES COLLECTED FROM CEDAR CREEK, LOWELL, INDIANA

TAXON	LOWELL			
	Upstream	Mixing Zone	Downstream	Far Downstream
<b>Turbellaria</b>		67	24	19
<b>Oligochaeta</b>	6	83	12	47
<b>Erpobdellidae</b>				
<i>Mooreobdella microstoma</i>		1	6	
<b>Isopoda</b>				
<b>Asellidae</b>				
<i>Caecidotea sp</i>	4	167	6	21
<b>Amphipoda</b>				
<b>Gammaridae</b>				
<i>Gammarus fasciatus</i>	1	117		
<b>Decapoda</b>				
<b>Cambaridae</b>				
<i>Orconectes propomgus</i>	6	1	1	
<i>Orconectes virilis</i>			2	
<b>Insecta</b>				
<b>Ephemeroptera</b>				
<b>Baetidae</b>				
<i>Baetis intercalaris</i>		36	38	20
<b>Heptageniidae</b>				
<i>Stenacron</i>	46	150	12	28
<b>Tricorythidae</b>				
<i>Tricorythodes</i>		19	6	
<b>Odonata</b>				
<b>Calopterygidae</b>				
<i>Calopteryx sp</i>		21		9
<b>Coenagrionidae</b>				
<i>Argia sp.</i>		2		20
<i>Enallagma</i>	5	35		
<b>Hemiptera</b>				
<b>Gerridae</b>				
<i>Rheumatobates</i>	1			
<b>Belostomatidae</b>				
<i>Belastoma sp</i>		2		
<b>Corixidae</b>	4		1	
<i>Palmacorixa</i>	2			
<i>Sigara</i>		3		
<b>Nepidae</b>				
<i>Ranatra</i>	1			
<b>Megaloptera</b>				
<b>Sialidae</b>				
<i>Sialis</i>	1			9
<b>Trichoptera</b>				
<b>Hydropsychidae</b>				
<i>Cheumatopsyche</i>		104	403	300
<i>Hydrosyche betteni</i>			91	123
<i>Hydrosyche simulans</i>			3	66
<b>Hydroptilidae</b>				
<i>Hydroptila</i>		17		
<b>Coleoptera</b>				
<b>Dytiscidae</b>				
<i>Laccophilus maculosus</i>		1	1	
<i>Coptotomus sp</i>			6	
<b>Halplidae</b>				
<i>Pelodytes</i>		20		

TABLE 3-9 (continued)

TAXON	LOWELL			
	Upstream	Mixing Zone	Downstream	Far Downstream
<b>Elmidae</b>				
<i>Ancronyx variegatus</i>				2
<i>Dubiraphia sp</i>	2	3	8	22
<i>Macronychus glabratus</i>			8	
<i>Stenelmis sp</i>		17		
<i>Tropisternus</i>		1	2	
<b>Diptera</b>				
<b>Chironomidae</b>				
<i>Procladius</i>	1		65	29
<i>Ablabesmyia mallochi</i>		17		
<i>Thienemannimyia</i>	1		12	9
<i>Thienemanniella xena</i>			6	
<i>Cricotopus bicinetus</i>		167	24	28
<i>Cricotopus tremulus</i>		17	24	
<i>Parakiefferiella</i>			6	
<i>Chironomus</i>	3	750	250	
<i>Dicrotendipes modestus</i>		33	6	
<i>Dicrotendipes nemodestus</i>		33		
<i>Glyptotendipes</i>	1			
<i>Polypedilum flavum</i>		33	125	94
<i>Polypedilum haterale</i>				66
<i>Polypedilum illinoense</i>	10	450	42	675
<i>Polypedilum scalaenum</i>			6	
<i>Stictochrinomus sp</i>		17		
<i>Paratanytarsus</i>		33	12	
<i>Rhenotanytarsus</i>				28
<i>Tanytarsus</i>		33		
<i>Tanytarsus guerlus</i>		33		9
<b>Simuliidae</b>				
<i>Simulium</i>			1	99
<b>Tipulidae</b>				
<i>Tipula sp</i>		19		
<b>Hydrobiidae</b>				
<i>Ammicola</i>	3	20	12	
<b>Lymnaeidae</b>				
<i>Fossaria sp</i>			1	
<b>Physellidae</b>				
<i>Physella</i>		51	1	20
<b>Ancylidae</b>				
<i>Ferrissia</i>			1	
<i>Corbicula fluminea</i>		18	12	19
<b>Pisidiidae</b>				
<i>Sphaerium</i>	1			
<b>TOTAL NO. OF ORGANISMS</b>	99	2591	1236	1771
<b>TOTAL NO. TAXA</b>	19	37	36	25
<b>NO. EPT TAXA</b>	1	5	6	5
<b>PERCENT TOLERANT TAXA</b>	20.2	57.93	26.7	43.48

TABLE 3-10 BENTHIC MACROINVERTEBRATES COLLECTED FROM PIGEON RUN,  
BRYAN, OHIO

TAXON	Bryan				
	Upstream	Sidestream	Mixing Zone	Downstream	Farther Downstream
<i>Turbellaria</i>			50	50	2
<i>Oligochaeta</i>	1167	2400	5050	3600	1950
<b>Hirudinea</b>					
<b>Glossiphoniidae</b>					
<i>Helobdella stagnalis</i>	2		50		
<i>Helobdella triserialis</i>				50	
<b>Hirudinidae</b>					
<i>Haemopsis sp</i>	2		1		
<b>Erpobdellidae</b>					
<i>Erpobdella punctata</i>	82				52
<b>Decapoda</b>					
<b>Cambaridae</b>					
<i>Orconectes rusticus</i>		1			
<b>Insecta</b>					
<b>Ephemeroptera</b>					
<b>Baetidae</b>					
<i>Callibaetis</i>		51			
<b>Tricorythidae</b>					
<i>Tricorythodes</i>					1
<b>Caenidae</b>					
<i>Caenis sp</i>		150		150	
<b>Odonata</b>					
<b>Calopterygidae</b>					
<i>Calopteryx sp</i>		1	1		
<i>Hetaerina sp</i>	104				50
<b>Coenagrionidae</b>					
<i>Argia sp.</i>	52	200	150		300
<i>Enallagma</i>	678	1152	1550	2151	2100
<b>Aeshnidae</b>					
<i>Boyeria vinosa</i>	26				
<i>Anax sp</i>		50			
<b>Libellulidae</b>					
<i>Plathemis sp</i>		50			
<i>Plathemis lydia</i>			50	50	
<b>Hemiptera</b>					
<b>Belostomatidae</b>					
<i>Belastoma sp</i>	3	1	3		
<b>Corixidae</b>					
<i>Hesperocorixa sp</i>		1			
<b>Notonectidae</b>					
<i>Notonecta sp</i>				50	
<b>Trichoptera</b>					
<b>Hydropsychidae</b>					
<i>Hydropsyche betteni</i>	52				1
<b>Hydroptilidae</b>					
<i>Hydroptila</i>					53
<b>Coleoptera</b>					
<b>Dytiscidae</b>					
<i>Hydroporus sp</i>				50	
<i>Laccophilus maculosus</i>		50	51	51	
<i>Coptotomus sp</i>			50		

TABLE 3-10 (continued)

TAXON	Bryan				
	Upstream	Sidestream	Mixing Zone	Downstream	Farther-Downstream
<b>Halipidae</b>					
<i>Peltodytes</i>		100	400	251	50
<b>Elmidae</b>					
<i>Dubiraphia sp</i>					50
<i>Tropisternus</i>	28		51	51	
<i>Berosus sp</i>	29	1500	1350	953	2100
<i>Enochrus sp</i>	1				
<b>Diptera</b>					
<b>Chironomidae</b>					
<i>Procladius</i>	104		150	50	151
<i>Ablabesmyia sp</i>			50		
<i>Ablabesmyia mallochi</i>				50	
<i>Telopelopia</i>		100			50
<i>Thienemannimyia</i>	26	50	50	50	50
<i>Cricotopus bicinetus</i>	570	1150	300	800	1200
<i>Cricotopus tremulus</i>	622	200	100	500	350
<i>Hydrobaneus</i>		100		50	
<i>Nanocladius sp</i>	26				
<i>Nanocladius distinctus</i>		50			
<i>Phaenospectra punctipes</i>				50	
<i>Chironomus</i>	52	50	50		
<i>Dicrotendipes nemodestus</i>					100
<i>Microtendipes</i>					50
<i>Polypedilum illinoense</i>		350	100	100	250
<i>Stictochrinomus sp</i>			50		
<i>Paratanytarsus</i>	26	150	200	550	150
<i>Rhenotanytarsus</i>		100			
<i>Tanytarsus</i>	26				
<i>Tanytarsus glabrescens</i>		50			50
<b>Culicidae</b>					
<i>Anopheles sp</i>		50	50		50
<b>Tipulidae</b>					
<i>Tipula sp</i>		52	200	50	
<b>Lymnaeidae</b>					
<i>Stagnicola</i>	104	200	100	200	200
<b>Physellidae</b>					
<i>Physella</i>	779	600	200	352	501
<b>Planorbidae</b>					
<i>Promenetus</i>		50			
<b>Pisidiidae</b>					
<i>Musculium</i>	469				
<i>Pisidium</i>	27	50	51		53
<b>TOTAL NO. OF ORGANISMS</b>	5057	9059	10458	10259	9914
<b>TOTAL NO. TAXA</b>	25	31	28	24	26
<b>NO. EPT TAXA</b>	1	2	0	1	3
<b>PERCENT TOLERANT TAXA</b>	50.78	50.78	54.5	47.3	39.35

**TABLE 3-11 BENTHIC MACROINVERTEBRATES COLLECTED FROM  
LYTLE CREEK, WILMINGTON, OHIO**

TAXON	Wilmington			
	Upstream	Mixing Zone	Downstream	Far Downstream
<b>Turbellaria</b>		2	1	
<b>Oligochaeta</b>	10	829	93	1100
<b>Hirudinea</b>				
<b>Glossiphoniidae</b>				
<i>Helobdella stagnalis</i>		7		
<b>Erpobdellidae</b>				
<i>Erpobdella punctata</i>	1			1
<i>Mooreobdella microstoma</i>		21		
<b>Isopoda</b>				
<b>Asellidae</b>				
<i>Lirceus</i>	6	7	1	1
<b>Amphipoda</b>				
<b>Gammaridae</b>				
<i>Cragonyx</i>	6	21	1	1396
<b>Decapoda</b>				
<b>Cambaridae</b>				
<i>Orconectes propomgus</i>				1
<b>Insecta</b>				
<b>Ephemeroptera</b>				
<b>Baetidae</b>				
<i>Baetis intercalaris</i>	3		1	299
<b>Odonata</b>				
<b>Calopterygidae</b>				
<i>Calopteryx sp</i>	8	165	12	383
<b>Coenagrionidae</b>				
<i>Argia sp.</i>		7	6	44
<i>Enallagma</i>	1	71	15	256
<b>Aeshnidae</b>				
<i>Boyeria vinosa</i>	1			
<i>Aeshna</i>	1			
<b>Corduliidae</b>				
<i>Somatochlora</i>		14	1	
<b>Hemiptera</b>				
<b>Gerridae</b>				
<i>Gerris</i>		7	2	
<b>Notonectidae</b>				
<i>Mesovelia sp</i>	1			
<b>Trichoptera</b>				
<b>Hydropsychidae</b>				
<i>Cheumatopsyche</i>	7		1	2200
<i>Hydropsyche betteni</i>	11			423
<i>Ceratopsyche morosa</i>	7		1	2200
<b>Coleoptera</b>				
<b>Dryopidae</b>				
<i>Helichus</i>			1	
<b>Elmidae</b>				
<i>Stenelmis sp</i>	1			



TABLE 3-11 (continued)

TAXON	Wilmington			
	Upstream	Mixing Zone	Downstream	Far Downstream
<b>Diptera</b>				
<b>Chironomidae</b>	7		7	212
<i>Ablabesmyia mallochi</i>		14		
<i>Thienemannimyia</i>			2	
<i>Corynoneura</i>	2			
<i>Brillia</i>	1			
<i>Cricotopus bicinetus</i>				42
<i>Parakiefferiella</i>				
<i>Phaenospectra punctipes</i>		14	3	
<i>Parametriocnemus</i>			1	
<i>Chironomus</i>				
<i>Cryptochironomus</i>				42
<i>Dicrotendipes modestus</i>			1	
<i>Dicrotendipes nemodestus</i>			1	42
<i>Dicrotendipes simpsoni</i>	2		1	
<i>Glyptotendipes</i>				
<i>Heterotrissocladius</i>			1	
<i>Microtendipes</i>				
<i>Polypedilum fallax</i>				42
<i>Polypedilum flavum</i>	1	7		
<i>Polypedilum haterale</i>				
<i>Polypedilum illinoense</i>	3	14	2	42
<i>Polypedilum scalaenum</i>				
<i>Stenochironomus</i>	6			
<i>Stictochrinomus sp</i>	2			
<i>Paratanytarsus</i>	14	121	15	169
<i>Tribelos</i>		7	1	
<i>Rhenotanytarsus</i>	14	36	5	
<i>Tanytarsus</i>			1	212
<i>Tanytarsus glabrescens</i>	4	21	1	42
<i>Tanytarsus guerlus</i>	2	21	3	
<b>Simuliidae</b>				
<i>Simulium</i>	3			
<b>Tipulidae</b>				
<i>Tipula sp</i>		7	5	43
<b>Empididae</b>				
<i>Hemerodromia sp</i>	4			
<b>Stratiomyidae</b>				
<i>Euparyphus</i>	1			
<b>Gastropoda</b>				
<b>Lymnaeidae</b>				
<i>Stagnicola</i>	1			
<b>Physellidae</b>				
<i>Physella</i>	2	14	8	42
<b>Ancylidae</b>				
<i>Ferrissia</i>	1	1	1	
<i>Corbicula fluminea</i>		7		
<b>TOTAL NO. OF ORGANISMS</b>	134	1435	195	9234
<b>TOTAL NO. OF TAXA</b>	32	24	31	23
<b>NO. EPT TAXA</b>	4	0	3	4
<b>PERCENT TOLERANT TAXA</b>	13.43	59.79	53.57	13.73

**TABLE 3-12 SUMMARY OF HABITAT QUALITY EVALUATED AT CEDAR CREEK,  
LOWELL, OHIO (OCTOBER 2003)\***

Habitat Parameters	Location			
	Upstream	Mixing Zone	Downstream	Far Downstream
1. Epifaunal substrate/available cover	13	6	12	5
2. Pool substrate	8	6	6	8
3. Pool variability	13	11	12	13
4. Sediment deposition	10	13	9	6
5. Channel flow status	12	11	12	10
6. Channel alteration	13	0	1	17
7. Channel sinuosity	6	0	2	12
8. Bank stability				
Left bank	5	6	3	2
Right bank	5	6	6	3
9. Vegetative protection				
Left bank	7	0	2	2
Right bank	7	2	4	2
10. Riparian vegetative zone width				
Left bank	7	3	3	5
Right bank	7	5	3	5
Total Score	113	69	75	90
Percent Upstream	100	61.1	66.4	79.6

\* Scores based on ranges listed on Habitat Assessment Field Data Sheet for low gradient streams.

KEY TO RANGES			
Parameter No.	Condition Category		
	Optimal	Suboptimal	Marginal
1 to 7	16 - 20	11 - 15	6 - 10
8 to 10	9 - 10	6 - 8	3 - 5
			Poor
			0 - 5
			0 - 2

**TABLE 3-13 SUMMARY OF HABITAT QUALITY EVALUATED AT PIGEON RUN, BRYAN, OHIO  
(OCTOBER 2003)\***

Habitat Parameters	Location				
	Upstream	Side stream	Mixing Zone	Downstream	Far Downstream
1. Epifaunal substrate/available cover	8	12	8	8	7
2. Pool substrate	3	12	8	3	13
3. Pool variability	1	2	7	1	8
4. Sediment deposition	13	8	17	17	9
5. Channel flow status	18	14	18	18	18
6. Channel alteration	8	8	8	8	1
7. Channel sinuosity	1	3	1	1	1
8. Bank stability					
Left bank	9	7	9	9	9
Right bank	9	7	9	9	9
9. Vegetative protection					
Left bank	7	7	7	7	7
Right bank	7	7	7	7	7
10. Riparian vegetative zone width					
Left bank	1	1	1	1	1
Right bank	1	1	1	1	1
<b>Total Score</b>	<b>86</b>	<b>89</b>	<b>101</b>	<b>90</b>	<b>91</b>
<b>Percent Upstream</b>	<b>100</b>	<b>100</b>	<b>115</b>	<b>103</b>	<b>104</b>

\* Scores based on ranges listed on Habitat Assessment Field Data Sheet for low gradient streams.

\*\* Percent for non-reference locations calculated from mean score of both reference locations

Parameter No.	Condition Category		
	Optimal	Suboptimal	Poor
<b>1 to 7</b>	16 - 20	11 - 15	6 - 10
<b>8 to 10</b>	9 - 10	6 - 8	3 - 5

**TABLE 3-14 SUMMARY OF HABITAT QUALITY EVALUATED AT LYTLE CREEK, WILMINGTON, OHIO (SEPTEMBER-OCTOBER 2003)\***

Habitat Parameters	Location			
	Upstream	Mixing Zone (Outfall)	Downstream	Far Downstream
1. Epifaunal substrate/available cover	8	8	8	13
2. Pool substrate	8	8	8	18
3. Pool variability	8	8	8	16
4. Sediment deposition	8	8	13	8
5. Channel flow status	8	13	13	13
6. Channel alteration	18	13	18	18
7. Channel sinuosity	8	8	13	13
8. Bank stability				
Left bank	7	7	4	7
Right bank	7	7	4	4
9. Vegetative protection				
Left bank	7	7	9	9
Right bank	7	7	9	5
10. Riparian vegetative zone width				
Left bank	7	7	7	5
Right bank	7	7	7	8
<b>Total Score</b>	<b>108</b>	<b>108</b>	<b>121</b>	<b>137</b>
<b>Percent Upstream</b>	<b>100</b>	<b>100</b>	<b>112</b>	<b>126.9</b>

\* Scores based on ranges listed on Habitat Assessment Field Data Sheet for low gradient streams.

KEY TO RANGES			
Parameter No.	Condition Category		
	Optimal	Suboptimal	Marginal
<b>1 to 7</b>	16 - 20	11 - 15	6 - 10
<b>8 to 10</b>	9 - 10	6 - 8	3 - 5
			0 - 2
			0 - 5
			0 - 2

**APPENDIX A**  
**DATA AND SITE VISIT MATERIALS USED TO SELECT STUDY SITES**



Table 1

Summary of data from site visits to selected waste water treatment plants for the Soap and Detergent Association sediment study

Treatment Plant	Lowell, Indiana	Bryan, Ohio	Wilmington, Ohio	Westminster, Maryland
<b>Treatment Characteristics</b>				
<b>Treatment systems</b>	Grit/grease removal Primary clarifiers Aeration tanks Secondary clarifiers Chlorination	Grit/grease removal Primary clarifiers Aeration tanks Secondary clarifiers Anaerobic digester Chlorination/dechlorination	Grit/grease removal Primary clarifiers Aeration tanks Secondary clarifiers Aerobic digester UV Light Trickling filters Aerated contact tanks	Grit/grease removal Primary clarifiers Aeration tanks Secondary clarifiers Aerobic digester Chlorination/dechlorination Biological nutrient removal (aerobic, anaerobic and anoxic zones)
<b>Approximate Population Served</b>	16,000	8,000	12,500	17,000
<b>Percent and type of Industries</b>	None	20%; candy factory; die-casting, sheet metal and tool manufacturers, which have their own treatment systems that discharge to the WWTP; airport	10%; plastics molding and die-casting; airport	None
<b>Plant Design Flow</b>	4.0MGD	3.2MGD	3.0MGD	4.0MGD
<b>Average Plant Flow</b>	2.4MGD	2.4MGD	1.5MGD	2.0-4.4MGD
<b>Peak Flow</b>	4.0MGD	8.1MGD	8.5MGD	4.4MGD
<b>Average Influent BOD</b>	230	180	200	230
<b>Average Effluent BOD</b>	6	2	3	6
<b>Average Influent Suspended Solids</b>	300	100	100-250	300
<b>Average Effluent Suspended Solids</b>	7	2	4	7
<b>Approximate Plant Detention Time</b>	10 hrs		8hrs	16-18 hrs
<b>Special considerations</b>	None	- Supernatant is recycled to head of plant; influent must be sampled from nearby manhole.	None	- Septic tank pump-out and landfill leachate is sometimes processed through the plant during the week; influent and effluent will have to be sampled on the weekend. - Supernatant is recycled to head of plant; influent must be sampled from nearby manhole.
<b>Stream Characteristics</b>				
<b>Receiving stream name</b>	Cedar Creek	Pigeon Run	Lyle Creek	Little Pipe Creek
<b>Approximate width</b>	10-20 feet	10-20 feet	10-20 feet	5 to 15 feet
<b>Approximate depth</b>	6 in. to 2 feet	6 in. to 2 feet	6 in. to 2 feet	6 in. to 2 feet
<b>Stream bottom/sediment type</b>	Soft bottom; sediments are silty sands overlain in areas with a thin layer of fine silt	Hard clay bottom; sediments are massive gray clay overlain in areas by deposited silty sand or gravel	Gravel and cobble bottom; sediments include small areas of sandy silt deposition	Gravel and cobble bottom; sediments include scattered areas of sandy silt deposition and, in a few areas exposed clay substrate

Table 1  
 Summary of data from site visits to selected waste water treatment plants for the Soap and Detergent Association sediment study

Treatment Plant	Lowell, Indiana	Bryan, Ohio	Wilmington, Ohio	Westminster, Maryland
Shoreline habitat	Stream is surrounded by agricultural fields; shoreline consists of either large cobble riprap or steep, eroding banks	Stream is surrounded by residential/commercial and agricultural land; shoreline consists of either large cobble riprap or steep, eroding grassy banks	Stream is surrounded by wooded land; banks slope gradually	Stream is surrounded by agricultural fields; shoreline consists of a thin buffer of shrubs with steep, eroding banks
Other considerations	- Approximately 6 to 12 months ago, the stream was cleared of debris and areas were dredged; shoreline was stabilized in places with cobbles. - A survey of fish species was performed and 44 were identified.	- Shoreline has been stabilized in places with cobbles. - A second stream enters the receiving stream approximately 40 feet downstream of the outfall	- Downstream contains a large amount of landfill debris, such as asphalt slabs, pipes, and construction debris.	None
<i>On-site measurements, late May 2003*</i>				
Temperature (degrees C)	17.92	23.57	17.91	13.86
Conductivity (mS/cm)	0.583	0.862	0.588	0.399
Salinity (ppt)	0.28	0.42	0.29	0.19
pH	7.81	8.99	8.50	8.53
Redox potential (ORP)	64.2	86.9	55.0	110.6
Turbidity (NTU)	23.4	4.5	23.6	3.0

\* - It is important to note that all streams were demonstrated temporary high flows due to recent precipitation. Samples were collected upstream of outfall. Dissolved oxygen readings were all above 80%.



## Lowell, IN Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall and Cedar Creek. The arrow indicates direction of stream flow. As evident in this photograph, surrounding land use is agricultural.

## Lowell, IN Waste Water Treatment Plant



The shoreline near the outfall was cleared of debris and the banks were stabilized with cobbles last year.



Downstream creek habitats include scattered riffles alternating with a soft sandy bottom.

## Lowell, IN Waste Water Treatment Plant



Upstream flows are slower and silty sands are more predominant.



Sediments include areas where a thin layer of dark, fine silts has been deposited over silty sand.

## Bryan, OH Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall, Pigeon Run, and an adjoining drainage (Ditch 40). Arrows indicate direction of stream flow. One of several manufacturing facilities in the area is visible in the upper right hand corner.

## Bryan, OH Waste Water Treatment Plant



The shoreline around the outfall (indicated by the red arrow) has been stabilized with cobbles.



The outfall (red arrow) is approximately 30 feet upstream of the convergence of Pigeon Run and Ditch 40 (white arrow); Ditch 40 contributes a lower but significant flow.

## Bryan, OH Waste Water Treatment Plant



The cobbles end at the stream edge; sediments include silty sand and gravel deposited over a hard clay bottom; banks of deposited silty sands are located immediately downstream of the outfall.



Where there has been no shoreline stabilization, heavily eroded banks contribute sediment to the stream; manufacturing facilities are visible in the background.

## Wilmington, OH Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall and Lytle Creek. Arrow indicates direction of stream flow. The open area in the upper left hand corner is the Wilmington landfill. The plant includes trickling filters.

## Wilmington, OH Waste Water Treatment Plant



The outfall (red arrows) is located at the head of a 40 foot long drainage into Lytle Creek. The stream bottom consists of gravel and cobbles with areas of silty sand deposition.



The flow from the outfall (red arrow) can be seen as it merges with the waters of Lytle Creek. The stream is buffered by a 40 foot strip of forest on either side.



## Wilmington, OH Waste Water Treatment Plant



Immediately downstream of the outfall, the bank and stream bottom include large pieces of debris, including construction debris, asphalt, and pipes (white arrows).

## Westminster, MD Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall and Little Pipe Creek. Arrow indicates direction of stream flow. The plant includes biological nutrient reduction.

## Westminster, MD Waste Water Treatment Plant



The outfall provides a significant portion of the flow into Little Pipe Creek



At the time of the site visit, flows were high due to recent precipitation.

## Westminster, MD Waste Water Treatment Plant



Upstream of the outfall, the creek is bordered by 20 foot strips of shrubs and trees. The stream bottom is primarily cobbles, with fewer areas of sediment deposition.



Downstream from the outfall the stream widens and there are a number of depositional areas where silty sands have collected.

Table 2  
Summary of data from site visits to selected waste water treatment plants for the Soap and Detergent Association sediment study

Treatment Plant	Cleburne, Texas	Harker Heights, Texas	Taylor, Texas
<i>Treatment Characteristics</i>			
<b>Treatment systems</b>	Grit/grease removal Activated sludge aeration tanks Secondary clarifiers Aerobic digesters Chlorination/dechlorination	Grit/grease removal Activated sludge aeration tanks (50%) Oxidation ditch for 50% Secondary clarifiers Aerobic digester UV Light	Grit/grease removal Activated sludge aeration tanks Secondary clarifiers Chlorination/dechlorination
<b>Approximate Population Served</b>	24,000	17,000	18,000
<b>Percent and type of industries</b>	17%; plastics, concrete, insulation, and drywall manufacture	None	None
<b>Plant Design Flow</b>	7.3MGD	3.0MGD	4.0MGD
<b>Average Plant Flow</b>	2.5MGD	1.7MGD	2.0MGD
<b>Average Influent BOD</b>	120	200	50(200)
<b>Average Effluent BOD</b>	2 to 6	4	Not detected
<b>Average Influent Suspended Solids</b>	100 to 200	200	50 to 100(200-300)
<b>Average Effluent Suspended Solids</b>	2 to 4	1.7	Not detected
<b>Approximate Plant Detention Time</b>	6 to 8 hours	6 to 8 hours	8 hours
<b>Special considerations</b>	- Supernatant is recycled to head of plant; sampling must be scheduled to avoid recycling of supernatant. -Plant receives septic pump-out five days each week. Sampling should be timed to avoid this. -Effluent is reclaimed for use in a power plant at flows of over 5-6MGD. Sampling should be scheduled around this.	-Plant includes an oxidation ditch.  -Killeen and Fort Hood WWTPs are upstream	None
<i>Stream Characteristics</i>			
<b>Receiving stream name</b>	Buffalo Creek	Nolan Creek	Mustang Creek
<b>Approximate width</b>	10-20 feet	10-20 feet	5 to 15 feet
<b>Approximate depth</b>	4 feet at outfall; 6 in. To 2 feet elsewhere	6 in. to 2 feet	6 in. to 2 feet

Table 2  
 Summary of data from site visits to selected waste water treatment plants for the Soap and Detergent Association sediment study

Treatment Plant	Cleburne, Texas	Harker Heights, Texas	Taylor, Texas
Stream bottom/sediment type	Soft bottom; sediments include depositions of sandy silty clay and some riffles.	Limestone bedrock; in areas where sediment has been deposited, it consists almost entirely of gravel; a few areas include small amounts of leaves, fine sand, and a thin (<5mm) film of silt.	Gravel bottom with clayey bank and substrate; most deposited sediments are gravel and coarse sands; there are areas of exposed clay along the bank.
Shoreline habitat	Stream is surrounded by woods and agricultural fields; shoreline consists of eroding grassy and wooded banks.	Shoreline consists of eroded limestone and silty gravel beds.	Stream is surrounded by agricultural fields; shoreline consists of a thin buffer of shrubs with steep, eroding banks.
Other considerations	<ul style="list-style-type: none"> <li>- Area around outfall is a deep impoundment.</li> <li>- Because there are few road crossings, upstream and downstream locations will require alternate access, i.e. walking along the stream banks from the outfall.</li> </ul>	<ul style="list-style-type: none"> <li>- No fine grained sediments are available for sampling.</li> </ul>	<ul style="list-style-type: none"> <li>- Few fine grained sediments are available for sampling.</li> <li>- Because there are few road crossings, upstream and downstream locations will require alternate access, i.e. walking along the stream banks from the outfall.</li> <li>- Streambed runs dry within 1/8 mile upstream.</li> </ul>
<i>On-site measurements, early June 2003</i>			
Temperature (degrees C)	27.72	26.97	26.83
Conductivity (mS/cm)	0.492	0.652	0.677
Salinity (ppt)	0.23	0.32	0.33
pH	8.43	8.49	8.40
Redox potential (ORP)	89.0	67.9	94.0
Turbidity (NTU)	7.2	3.6	6.9

## Cleburne, TX Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall and Buffalo Creek. The arrow indicates direction of stream flow.

## Cleburne, TX Waste Water Treatment Plant



Effluent from the outfall (red arrow) enters a partially impounded portion of the stream that is approximately 3 to 4 feet deep. The white arrow indicates a floating pipe which acts as a barrier for windblown foam.



The impoundment is approximately 20 feet wide; water leaves over a riffle at the southwestern end (white arrow). Since there are no nearby road crossings, upstream and downstream samples would have to be collected relatively close to the outfall.



## Cleburne, TX Waste Water Treatment Plant



Immediately upon exiting the outfall, effluent passes over a flume of small boulders to improve oxygenation.



The creek shoreline and deposited sediments consist of sandy silty clays.

## Harker Heights, TX Waste Water Treatment Plant



The above map is labeled to show the location of the treatment plant in relation to the outfall and Nolan Creek. The arrow indicates direction of stream flow. Nolan Creek receives inputs from the larger Killeen and Fort Hood WWTPs upstream.

## Harker Heights, TX Waste Water Treatment Plant



The stream bottom around the outfall is primarily limestone bedrock.



The white arrow indicates a bed of deposited sediment where the effluent and stream flow meet. This sediment consists almost entirely of gravel. Areas 1/4 mile upstream and downstream contained a slightly higher content of fine sands, but gravel consistently accounts for the majority of the sediment.

## Taylor, TX Waste Water Treatment Plant



The above aerial photograph is labeled to show the location of the treatment plant in relation to the outfall and Mustang Creek. The arrow indicates direction of stream flow.

## Taylor, TX Waste Water Treatment Plant



At the time of the site visit, the outfall (red arrow) contributed roughly 75% of the total stream flow, while the upstream portion of Mustang Creek (white arrow) contributed approximately 25%..



The stream bottom consists primarily of pebbles overlaying a clay substrate. There are a few scattered areas where the clayey banks and substrate are exposed. There are almost no areas of deposited fine sediments.

## Taylor, TX Waste Water Treatment Plant



Downstream the creek widens to 15 to 20 feet; depths remain shallow. Since there are no downstream road crossings, downstream samples would have to be collected relatively close (several hundred feet) to the outfall.



It would also be necessary to collect upstream samples from nearby the outfall (several hundred feet) since the creek bed is dry at the nearest road crossing only 1/8 mile upstream.

**APPENDIX B**  
**STANDARD OPERATING PROCEDURES FOR SURFACTANT SAMPLING**

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## Procedure for Sediment Interstitial Water Separation

### Overview:

This protocol describes the method for separating interstitial water from a large volume (2-4Liter) sediment sample. The procedure involves a two-step separation using a rotating drum to remove the interstitial water from the sediment sample and a final clarification using a high speed centrifuge.

### Equipment Required

*Note: All equipment that will come in contact with samples must be cleaned as described in the separate apparatus cleaning procedures. Avoid use of detergent-based cleaners at all times during the sampling and handling of samples.*

#### Field Equipment:

- 1) Rotating Drum Separator (Figure 1 &2) : Equipped with screens (coarse= 60 mesh, middle = 200mesh Fine = 325 mesh, 43micron opening, 316SS McMaster-Carr woven wire cloth ) to retain sediment and teflon tubing to transfer liquid directly to sample bottle. *Note: Requires 24V power supply (2 auto batteries in series)*
- 2) Battery Chargers (2): Trickle charge for recharging the drum separator's batteries.
- 3) Sample Bottles: Pre-cleaned 1 Liter glass bottle with polyseal screw closure
- 4) Sample Jar – Solids: Pre-cleaned 16 oz. wide-mouth polyethylene jar with poly-lined closure
- 5) Intermediate Sample Containers(2): 1-2 Gallon Polyethylene or Stainless Steel bucket
- 6) Coolers (2) with ice: One for sample storage, the second for holding sample bottle during collection.
- 7) Formalin (37-38% Formaldehyde Solution): For sample preservation
- 8) Spatula (1-2" wide) or large metal spoon: For transferring sediment to drum
- 9) Sediment Collection Equipment: Hand corer (Wildlife Supply Company - Buffalo, New York 14216 or KC Denmark - Holmbladsvej 19 - DK-8600 Silkeborg - Denmark), Petite Ponar grab sampler (Wildlife Supply Company - Buffalo, New York 14216), manual draw-scoop sampler or other device.

#### Laboratory Equipment:

- 1) Centrifuge: Sorvall RC5 with GSA rotor(or equivalent) and refrigeration capable of centrifuging 150mL Pyrex / Corex centrifuge bottles at 1600G.
- 2) Corex C1265 Centrifuge Bottle with screw closure(150mL nominal capacity) *Note: Larger (or smaller) bottles may be used if they will withstand 1600G.*
- 3) Top-Load balance: 1500g minimum capacity

### Safety Considerations

- The rotating drum centrifuge is a prototype piece of equipment which should be used by trained, experienced personnel. The unit has energized mechanical parts which pose a pinch hazard. All covers must be secured before operating. Interlocks are in place on all covers and must not be disabled. In addition, the apparatus is powered by two twelve volt batteries which are a potential electrical hazard. Never touch more than one battery terminal at a time.
- Laboratory centrifugation will be performed using a standard laboratory centrifuge which must be balanced and operated in accordance with the manufacturer's safety guidelines.
- Formalin is used as a preservative and is irritating to skin, eyes and is a suspect cancer hazard. Read the material safety data sheet before use. Use only in a well-ventilated area, using appropriate personal protective equipment. Individual containers of formalin must not contain more than 30mL of formalin (or the solution must be  $\leq 10\%$  buffered formalin).



## Sample Collection

Locate a region in the stream that has suitable sediment and is expected to fit the experiment design criteria. A field conductivity probe is helpful in identifying regions where wastewater treatment plant effluent is well-mixed into the stream.

Collection of an appropriate sediment sample should minimize the potential co-mingling of overlying water. In addition, the sample should emphasize surface sediment (top 1-3 inches) rather than deep sediment cores. These samples may be collected using either a hand corer (decanting overlying water and discarding deep sediment core sections), a ponar grab sampler (decanting overlying water and deep sediment) or other available current best practices.

At each sampling location, collect a 4 Liter sample of overlying stream water and preserve immediately with formalin (320mL/4Liters=8% v/v).

## Separating Interstitial Water

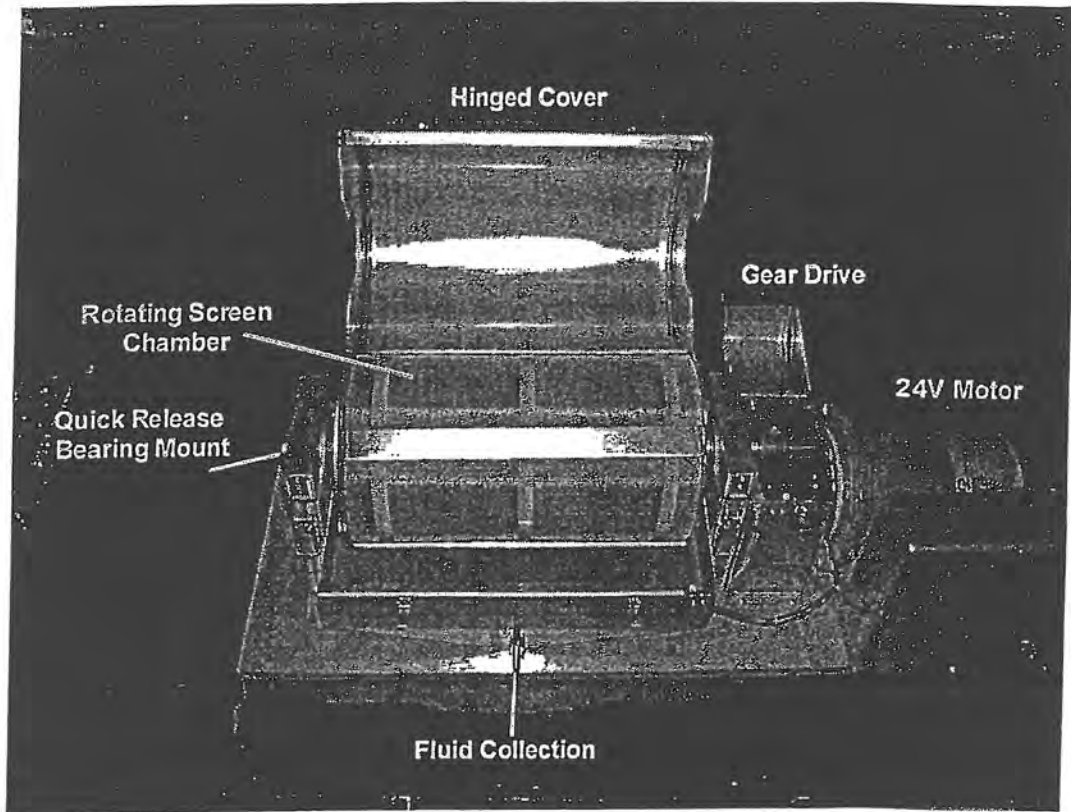
### Field Procedure

- 1) Connect the battery jumper from the positive pole of the first battery to the negative pole of the second battery (NOT ACROSS THE SAME BATTERY!). The batteries are now connected in series and will provide 24 volt power for the motor.
- 2) Connect the motor of the drum separator to the appropriate poles of the two batteries.
- 3) Place a clean intermediate sample bottle (1Liter glass bottle containing 10mL formalin) in a cooler with ice. Locate the cooler near the separator so the collection tube can be placed directly into the sample bottle.
- 4) Connect the collection tube to the separator. At each new site, discard the first portion of interstitial water to pass through the tube then place the end of the tube in a sample bottle.
- 5) Collect a sample of sediment for processing. The optimum sample size is 2-6 Liters. Place a small portion (25-50g) of composite sediment into a widemouth sediment sample jar (containing 25mL formalin). Place a second portion into a widemouth sediment sample jar without preservative for additional characterization.
- 6) On the rotating drum separator, remove the drum and open the endcap by unscrewing the thumbscrews and removing the endplate.
- 7) Add enough sediment to the center of the drum to fill it at least half full.
- 8) Re-fasten the endplate using all four thumbscrews.
- 9) Place the drum into the holder, making sure the bearings sit in the appropriate positions and the drive gear is engaged with the motor gear.
- 10) Secure the bearing clamps and all safety covers
- 11) Switch on the motor and either discard (first use) or collect the separated water directly into the sample bottle. Continue until no significant water is seen moving to the sample bottle (1-2minutes)
- 12) Replace the sample bottle as needed, placing filled bottles in a cooler with ice.
- 13) When done, switch off the separator, allow to stop spinning and remove the drum. Remove a small portion (25-50g) of the separated solids into a widemouth sediment sample jar (containing 25mL formalin). Rinse the separator drum in stream water upstream from any discharge point or significantly below the field sampling location. Alternatively, the device may be rinsed with clean tap water(no detergents!) to remove residual sediment.
- 14) Repeat steps 5-13 until six 1 liter bottles have been filled with interstitial water.

### Laboratory Procedure

- 1) Transfer a portion of the separated interstitial water sample to a 150mL centrifuge bottle. Repeat for an even number of bottles. Following filling the bottles should be balanced (by weight) for centrifugation.
- 2) Centrifuge the samples at 4°C at 1600G (3500rpm on Sorvall GSA rotor). The resulting water should be free of visible particles.
- 3) Decant the clear water into a pre-clean 1 Liter sample bottle containing 50mL of formalin (total sample to 8% v/v formalin). Leave a small air-space above the sample to permit expansion which may occur during transport. Label the bottle, tape cap to prevent leakage and place in a plastic bag to contain any possible breakage. Ship on ice to the laboratory for analysis.
- 4) For preserved sediment samples, estimate the final volume of sediment and add sufficient formalin to make to a total of 8% v/v (recall each container initially had 25mL of formalin). Do not add preservative to the unpreserved subsample.

**Figure 1: Rotating Drum Separator**



**Figure 2: Drum Separator, End View of Chamber**



# Sampling Equipment Cleaning Protocol

## Laboratory Area Preparation

Identify an area in the laboratory which will be free of all detergent-based cleaning materials. Remove all laboratory cleaning agents (dish detergents, laundry detergents, countertop cleaners, Alconox, etc.) and liquid hand cleaners (Dial, Softsoap, Safeguard etc) from the laboratory. Bar Soaps free of synthetic detergents (only tallowate/cocoate/palm kernalate on the label, such as Ivory) may be used in the area. Wipe all counters and benches with water and, if possible, alcohol to remove detergent residues. Avoid using paper products (such as paper towels or disposable shop towels) which may have surface coatings or treatments including detergents or surfactants. Laboratory wipes such as "Kimwipes" are typically used.

**At no point should sampling equipment be washed with any detergent cleaning product either by hand or as used in commercial dishwashing equipment.**

## Pre-Cleaning Procedures

### Sample Bottles – (Stream water, Influent and Effluent samples)

Description: Glass, 4 Liter amber glass jugs with teflon-faced screw closure. If possible bottles should be covered with a safety coating to minimize risk of breakage. Empty solvent bottles (with labels removed) are an excellent low-cost source of clean bottles. Bottles should be visually free of residues and foreign materials. Do not use "pre-cleaned" containers as sold by vendors such as I-Chem or Eagle-Picher or others since they do not disclose the detailed pre-cleaning process which may leave detergent residues.

Pre-cleaning: All interior surfaces of bottles and closures should be thoroughly rinsed *at least* twice with 50-100mL of a moderately polar solvent (tetrahydrofuran or ethyl acetate) followed by two rinses with 20-30mL of HPLC grade methanol. If the bottles previously contained only a clean solvent and were never rinsed with water, only the final methanol rinses are required. Collect rinses for appropriate disposal. Allow the bottle to drain and air dry inverted in a location free of any cleaning or detergent ingredients. Once dry, cap tightly and place in a sealed bag for transport.

### Sample Bottles – (Interstitial water samples)

Description: Glass, 1 Liter clear glass Boston round bottles with polyseal or teflon-faced screw closure. Bottles should be visually free of residues and foreign materials. Do not use "pre-cleaned" containers as sold by vendors such as I-Chem or Eagle-Picher or others since they do not disclose the detailed pre-cleaning process which may leave detergent residues.

Pre-cleaning: All interior surfaces of bottles and closures should be thoroughly rinsed *at least* twice with 20-30mL of a moderately polar solvent (tetrahydrofuran or ethyl acetate) followed by two rinses with 20-30mL of HPLC grade methanol. Collect rinses for appropriate disposal. Allow the bottle to drain and air dry inverted in a location free of any cleaning or detergent ingredients. Once dry, cap tightly and place in a sealed bag for transport.

### Sample Jars – (Sediment samples)

Description: Polyethylene, 1 Liter wide mouth jars with polyethylene lined closures. Jars should be visually free of residues and foreign materials. Do not use "pre-cleaned" containers as sold by vendors such as I-Chem or Eagle-Picher or others since they do not disclose the detailed pre-cleaning process which may leave detergent residues.

Pre-cleaning: All interior surfaces of bottles and closures should be thoroughly rinsed *at least* twice with 20-30mL of a moderately polar solvent (tetrahydrofuran or ethyl acetate) followed by two rinses with 20-30mL of HPLC grade methanol. Collect rinses for appropriate disposal. Allow the bottle to

drain and air dry inverted in a location free of any cleaning or detergent ingredients. Once dry, cap tightly and place in a sealed bag for transport.

## **ISCO Sample Collection Bottles**

Description: Glass, 350mL with teflon or polyethylene lined closures (ISCO part 601683132, sampler holds 24) Bottles should be visually free of residues and foreign materials. Stubborn residues may be removed using a dedicated stiff bottle brush which is free of any detergent residues (pre-rinse brush with solvents such as methanol and ethyl acetate)

Pre-cleaning: All interior surfaces of bottles and closures should be thoroughly rinsed *at least* twice with 20-30mL of a moderately polar solvent (tetrahydrofuran or ethyl acetate) followed by two rinses with 20-30mL of HPLC grade methanol. Collect rinses for appropriate disposal. Allow the bottle to drain and air dry inverted in a location free of any cleaning or detergent ingredients. Once dry, cap tightly and place in a sealed bag for transport.

Post-Cleaning: After use, rinse with large volumes of hot water and remove any residues using a detergent-free bottle brush. Rinse with a small amount of methanol, allow to air-dry inverted in a detergent-free area and store tightly capped.

## **Centrifuge Bottles**

Description: Glass, 150mL capacity with polyseal or teflon lined closure. Residues may be removed using a dedicated wire-shaft bottle brush that was precleaned with solvent rinses. All interior surfaces of bottles and closures should be thoroughly rinsed twice with 20-30mL of a moderately polar solvent (tetrahydrofuran or ethyl acetate) followed by two rinses with 20-30mL of reagent grade methanol. Collect rinses for appropriate disposal. Allow to air-dry inverted in a detergent-free area prior to use.

## **Sampling Tubing**

**ISCO Samplers:** (0.325 inch ID Teflon tubing): Fill tubing with ~50mL of ethyl acetate and rinse by rolling the tubing coils until the solvent has passed from one end to the other. Repeat with ~50mL of HPLC grade methanol and allow to drain dry. Store in a sealed plastic bag until needed. Before use, rinse the tubing with a small quantity (50-100mL) of representative water sample before collection of an analytical sample.

**ISCO Samplers:** (0.325 inch ID Silicone Peristaltic Pump tubing): Rinse a length of new tubing with 50-100mL of reagent grade methanol, allowing to drain and air dry in a detergent-free environment and store in a sealed plastic bag until needed. Rinse the tubing with a small quantity (50-100mL) of a representative water sample before collecting an analytical sample.

## **Sediment Collectors and Separators:**

After storage and before field use, rinse all sample contact surfaces with pure tap water and then with methanol (using a wash bottle). Once in the field, rinse all sample-contact surfaces with overlying water from an un-impacted area of the stream (upstream from any significant inputs)

Following field use, rinse the apparatus with a high pressure pure water stream (NO DETERGENTS OR ANTIFOAM AGENTS!) taking care to dispose of residual sediment appropriately. A clean (detergent-free!) spatula or bristle brush may help remove stubborn solid residues. If using a sink, protect your drain from sediment. Store all equipment dry and covered.

## DRAFT PROTOCOL

### COLLECTION OF WATERS AND SEDIMENTS FOR NPE SURFACTANT ANALYSIS

#### Background

The SDA sediment survey is designed to profile the occurrence and distribution of the common surfactants LAS, AE and AS/AES in receiving streams around discharge points of wastewater treatment plants. NPE (nonylphenol ethoxylates) are major surfactants in municipal wastewater streams as well. The APE Research Council (APERC) is having additional amounts of the same samples collected and shipped to the APERC contract laboratory.

#### Objective

APERC has joined the monitoring effort in order to determine the comparative aquatic environmental profile of NPE. The samples are to be packed in pre-cleaned glass bottles into ice chests, with formalin preservative, and shipped overnight to the laboratory.

#### Program

The SDA field sampling contractor is to follow these steps at each of the three sites:

Receive sampling kits (pre-cleaned bottles filled to 8% by volume with formalin in ice chests, spike solution ampoules) sent from DAT, Inc., 800-733-8644, 7715 Corporate Blvd., Plain City, OH 43064, [datlab@infinet.com](mailto:datlab@infinet.com), contact: Keith Souchereau.

Collect samples, attach indelible labels, pack in ice:

**Water column** grabs or composites, 3 x 1L, from **upstream, mixing zone and downstream**, total = 9.

- Labels: Stream U (3), Stream M (3), Stream D (3)

**Additional** downstream water, 3 x 1L (duplicates).

Labels: Stream D dup (3)

Centrifuged **sediment**, 1 x 250mL, from **upstream, mixing zone and downstream**, total = 3.

- Labels: Sed U (1), Sed M (1), Sed D (1)

**Additional** downstream centrifuged sediment, 1 x 250mL (duplicate).

- Label: Sed D dup

**Pore water**, 2 x 1L, from **upstream, mixing zone and downstream**, total = 6. Volume of water should be at least 0.7L per bottle.

- Labels: Pore U (2), Pore M (2), Pore D (2)

**WWTP influent**, 1 x 1L.

Label: Influent

**WWTP effluent**, 3 x 1L.

- Labels: Effluent (3)

Additional upstream water, 1 x 1L, into which 1 ampoule of NP/NPE stock solution is emptied (**field spike**).

- Label: FS-E

Additional upstream water, 1 x 1L, into which 1 ampoule of NPEC stock solution is emptied (**field spike**).

- Label: FS-EC

Tap or potable well water (**field blank**), 3 x 1L.

- Label: FB (3)

Ship samples (27 1L and 4 250mL bottles) to DAT by overnight carrier.

Provide copies of field measurements, summary and final reports to:

APERC, 866-APER-NA, 1250 Connecticut Ave., NW, Suite 700, Washington, DC 20036 (electronically and hard copy) and

Carter Naylor, 307-326-8653, HC 63, Box154, Saratoga, WY 82331;  
after 09/25/03 512-345-3347, 8103 Forest Mesa Dr., Austin, TX 78759,  
[chknaylor@aol.com](mailto:chknaylor@aol.com) (electronically)

CGN 08-11-03

**APPENDIX C**  
**FIELD LOG ENTRIES AND RAPID BIOASSESSMENT FIELD DATA SHEETS**

---



9-17-03

SDA sediment sampling event  
Lowell, IN

10AM - Beggs travel to BWI to Chicago  
Conferred shipping addresses  
with Accutest

DAT

CONTACT Numbers

ACCUTEST - STEVEN WARREN - 301-924-1467

Analyses - Dayton OH

DAT - Keitel - 614-873-0710  
800 - 733-8644

DAT LABS  
7715 Corporate Blvd.

Plain City, OH 43064

Brad Price - PRG - 513-627-1236  
Call: 513-585-1805

Scott Dyer - PRG - 513-627-1163

Bill Eckhoff - 513-542-6782

Call 513-295-5476

Alex Evans - 281-544-7708

1:30

~~1:30 PM~~ Arrive Chicago, rent car, drive  
to Deerfield office

1530 Arrive Deerfield

- Accutest bottles broke  
in shipping, replacements  
are being reset

1630 Decontam. equipment w/  
gross rinses & methanol  
- placed in clean plastic bags

7000 Calibrated YSI  
r

9-18-03

730 AM Arrive in Lowell

Met Brad, Bill, Alex

0830 Arrive Lowell w/ WTP

Weather 70's, Clear  
Little precip. in last week  
Met Terry & Discuss logistics  
~~Plans~~ Gave Bill Eckhardt bottles  
for APERC samples

Brad suggested sampling  
for doms/transect at  
Rd. 211 instead of 206

0900 Began sampling  
Lowell - Fat bridge crossing  
on Rte. 211

- Water quality & bankline  
sampling first

Depth:	Flow
L 1.1 ft	1.29 ft/s
M 0.5 ft	0.04 ft/s
R 0.2 ft	-0.017 ft/s

Water quality

Temp: 15.93°C

Cond: 1.529 ms/cm<sup>2</sup>

DO<sub>2</sub>: 72.2%

DO: 7.4 mg/L

pH: 7.67

ORP: 314.1

Sediment:

ORP at 2 inch below surface  
277.5

Habitat observations

(grass bank)

Winding stream bed

Frogs

Fish - Carp & embryo

Benthic macroinvertebrates

Completed RBP habitat & benthos

For my

- Leonard page benthic sample

20 jars

14 - sand / soft substrate

4 - vegetation

2 - logs

0940 Collected Arc west SW sample  
cap & can of benthic  
inverte sampling

0940 Collected SDA sed, SW, pore

1030 Collected APERC  
SD, SW, pore

For sediment - collected 2  
petite papers - composited in  
decorated buckets, well  
rinsed

GPS - 41° 14.120N

087° 24.899W

EPF - 7M

WGS 84

1345 Arrive and begin  
sampling at  
Lowville - Mixing

Depth: L 0.8 ft 0.60 ft / S  
M 0.8 ft 0.68 ft / S  
R 0.5 ft 0.13 ft / S

GPS: 41°15.614 N 87°24.786 W  
EP: 9 m

Cord above outfall,  $\approx$  0.999  
Cord at effluent 2.413  
Cord downstream 1.6 - 1.8  
Decided that effluent  
mixed rapidly, sampled  
 $\approx$  150 ft downstream  
surface water

Temp 21.29  
Cond 1.865  
DO% 102.1%  
DO 9.01  
pH 7.69  
ORP 234.5

Sediment @ RP 208.9

1356 Sampled sediment  
85W

1530 Accidents 5W

~~RP~~  
7M.C

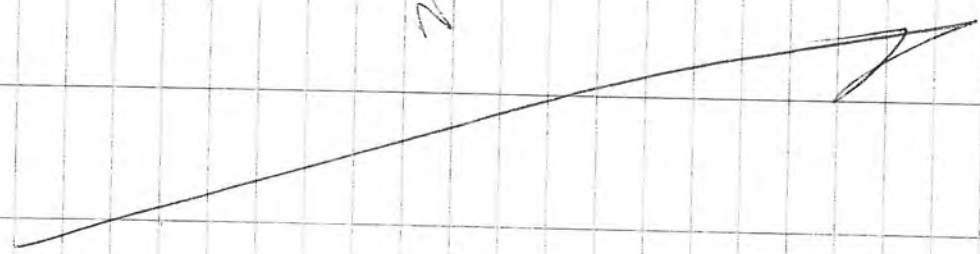


9-19-03

Nike Claudio Jeff Hefel  
0700 Arrive at site - too early, too  
access residential yard  
- sampling SW at upstream  
Lower - 0

Weather: 3 low 60's, overcast,  
chance of rain; no rain  
Previous night

20C



~~Depth~~ Flow |  
L - 0.01 ft/s |  
M - 0.01 ft/s |  
R - ~~0.02 ft/s~~ |  
width 320ft  
WQ

Depth  
1.0ft  
2.3ft  
1.2ft

Temp: 16.64°C  
Cond 0.929 mg/cm<sup>2</sup>  
DO 5.5 mg/L  
DO 5.25 DO mg/L  
pH 7.7  
Redox 233.6 ORP

730 - Collected SW  
Sent for Analysis

LAT LONG

41° 15.615 N  
68° 24.786 W

EPE 50 M

0730 - also collected spites

0800 Received permission  
to use Hubers driveway

0810 - Collected SW for DAT  
& Acc. Low 6 L - D - & Acc. 3 X  
LOW E C - D - Dup  
Sed for Acc. 5

41° 15.644 N  
87° 24.767 W

17.30°C  
1.492 mS/cm  
70.5% DO  
6.75 mg/L DO

7.76 pH  
240.8 ~~ORP~~ ORP  
Sed 238.8 ~~ORP~~ ORP

	Flow	DEPTH
L	0.25	0.8
M	0.30	1.2
R	0.56	0.6

Collected at base of Hubers  
& stream mix

9/29/03 - Leonard Dane, Sarah Stelton

Started Sampling @ For #s 0830

Sediment is good for spinning.  
Needed 4 5 gal pails for all  
of our pore H<sub>2</sub>O

Sarah did Bag 55 SW while } @ all  
Bred then did pore H<sub>2</sub>O } sites

pH Portion of 457 Braks @

The mixing zone while trying to  
get opp beneath SW. 555 SW

Finished all but up site

10/1/03

Finished up withing to shipped samples  
and drove to Bryan

10/2/03

0900 Arrived @ Plant @ 10:00  
0830 Started Sampling For 10:00  
Stream very silty, clayie

Ponar grabs

~ 0930

~ 0950

~ 10:30

SPun  
0930 - 0947  
0957 - 10:18  
0930 - 0946

@ Downstream

Ponar grabs

~ 12:00

~ 12:45

Sampling for  
10:00 - 10:30

1210 - 1235

1250 - 1305

Byran - End of Mixing Zone

Penar Grab

~ 15:05

~ 15:35

16:05

SPUR

15:08 - 15:30

15:40 - 15:47

16:10 - 16:20

Byran - U/S

10-3-03

~~Byran Penar Grab~~

~ 10:40

~ 11:00

SPUR

10:45 - 10:55

11:00 - 11:15

Side Stream

Penar Grabs

~ 11:30

10-3-03

SPUR

11:36 - 11:55

10/3/03

measured velocity in Side Stream

3 Up stream Sample pts

U/S

1.25

1.40

1.52

1.17

1.39

1.58

S/S

1.36

1.28

1.19

37.83

28

42%

Decided to take 6 - 40 ft

composite



**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(FRONT)**

STREAM NAME <u>CEDAR CREEK</u>		LOCATION <u>LOWELL-U (UPSTREAM)</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY <u>SOAP &amp; DETERGENT ASSOC.</u>	
INVESTIGATORS <u>MIKE CIARLO, JEFF HEFEL</u>			
FORM COMPLETED BY <u>MIKE CIARLO</u>		DATE <u>9-19-03</u> TIME <u>0700</u> AM PM	REASON FOR SURVEY <u>SEDIMENT SAMPLING</u>

<b>WEATHER CONDITIONS</b>	<p>Now</p> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> 50% showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<p>Past 24 hours</p> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 50% <input checked="" type="checkbox"/>	<p>Has there been a heavy rain in the last 7 days?  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Air Temperature <u>60</u> °F</p> <p>Other _____</p>
<b>SITE LOCATION/MAP</b>	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>APPROX. 1000 FT UPSTREAM FROM OUTFALL; SAFE UPSTREAM OF BELSHAW ROAD</u></p>		
<b>STREAM CHARACTERIZATION</b>	<p>Stream Subsystem  <input checked="" type="checkbox"/> Perennial    <input type="checkbox"/> Intermittent    <input type="checkbox"/> Tidal</p> <p>Stream Origin  <input type="checkbox"/> Glacial    <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane    <input checked="" type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog    <input type="checkbox"/> Other _____</p> <p>Stream Type  <input checked="" type="checkbox"/> Coldwater    <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km<sup>2</sup></p>		

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources <b>FIELD DRAIN 100 FEET UPSTREAM</b> <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____			
<b>INSTREAM FEATURES</b>	Estimated Reach Length <u>50</u> m Estimated Stream Width <u>5</u> m Sampling Reach Area <u>250</u> m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth <u>1</u> m Surface Velocity <u>0.01 ft</u> /sec (at thalweg)		Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark <u>0.5</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle _____ % <input checked="" type="checkbox"/> Run <u>100</u> % <input type="checkbox"/> Pool _____ % <del>BRIDGE</del> AT BRIDGE Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>LARGE WOODY DEBRIS</b>	LWD <u>10</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>5</u> %			
<b>WATER QUALITY</b>	Temperature <u>16.64</u> °C Specific Conductance <u>0.929</u> mS/cm Dissolved Oxygen <u>5.25 DO</u> mg/L <u>55.5%</u> pH <u>7.71</u> ORP <u>233.6</u> Turbidity _____ WQ Instrument Used <u>YSI</u>		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input checked="" type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input checked="" type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Turbidity (if not measured)</b> <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input checked="" type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input checked="" type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <u>ORP 210.2</u> <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <input checked="" type="checkbox"/> WOOD & METAL DEBRIS Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	<del>25</del> 25%
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	10%
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)	40%	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	20%			
Clay	< 0.004 mm (slick)	<del>20</del> 40%			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>CEDAR CREEK</u>		LOCATION <u>LOWELL-U CUPSTREAM</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT <u>87° 24.786W</u> LONG <u>41° 15.615</u>		RIVER BASIN _____	
STORET # _____		AGENCY <u>SOAP &amp; DETERGENT ASSOC.</u>	
INVESTIGATORS <u>MIKE CIARLO &amp; JEFF HEPEL</u>			
FORM COMPLETED BY <u>MIKE CIARLO</u>		DATE <u>9-19-03</u> TIME <u>0700</u> AM PM	REASON FOR SURVEY <u>SEDIMENT SAMPLING</u>

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b> Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	SCORE	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	
	SCORE	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>4. Sediment Deposition</b> Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
	SCORE	20 19 18 17 16	15 14 13 12 11	<u>10</u> 9 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b> Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
	SCORE	20 19 18 17 16	15 14 13 <u>12</u> 11	10 9 8 7 6	5 4 3 2 1 0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Parameters to be evaluated broader than sampling reach

Total Score 113

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <b>CEDAR CREEK</b>	LOCATION <b>LOWELL - U (UPSTREAM)</b>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
<del>LAT</del> <b>41° 15.615</b> <del>LONG</del> <b>87° 24.786</b>	RIVER BASIN _____	
STORET # _____	AGENCY <b>SOAP &amp; DETERGENT ASSOC.</b>	
INVESTIGATORS <b>MIKE CIARLO &amp; JEFF REPEL</b>	LOT NUMBER _____	
FORM COMPLETED BY <b>MIKE CIARLO</b>	DATE <b>9-19-03</b> TIME <b>0700</b> AM PM	REASON FOR SURVEY <b>SEDIMENT SAMPLING</b>

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input checked="" type="checkbox"/> Snags <b>50</b> % <input checked="" type="checkbox"/> Vegetated Banks <b>30</b> % <input type="checkbox"/> Sand <b>20</b> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____  How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat  Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Snags <b>10</b> <input checked="" type="checkbox"/> Vegetated Banks <b>6</b> <input checked="" type="checkbox"/> Sand <b>4</b> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(FRONT)**

STREAM NAME <u>CEDAR CREEK</u>		LOCATION <u>LOWELL - D (DILUTION ZONE)</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT <u>87° 24.767' W</u> LONG <u>41° 15.615' N</u>		RIVER BASIN _____	
STORET # _____		AGENCY <u>SDA</u>	
INVESTIGATORS <u>Mike Ciarlo, Jeff Hefel</u>			
FORM COMPLETED BY <u>Mike Ciarlo</u>		DATE <u>9-19-03</u> TIME <u>0800</u> AM PM	REASON FOR SURVEY <u>SEDIMENT SAMPLING</u>

<b>WEATHER CONDITIONS</b>	<table border="0"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <u>50</u> % <input checked="" type="checkbox"/> %cloud cover  <input type="checkbox"/> clear/sunny             </td> <td style="width: 50%; vertical-align: top;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/> <u>50</u> %  <input checked="" type="checkbox"/> </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <u>50</u> % <input checked="" type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <u>50</u> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Air Temperature <u>60</u> °F Other _____		
<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <u>50</u> % <input checked="" type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <u>50</u> % <input checked="" type="checkbox"/>					
<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) <p align="center"><u>IMMEDIATELY DOWNSTREAM FROM WWTP OUTFALL</u></p>					
<b>STREAM CHARACTERIZATION</b>	<table border="0"> <tr> <td> <b>Stream Subsystem</b>  <input checked="" type="checkbox"/> Perennial   <input type="checkbox"/> Intermittent   <input type="checkbox"/> Tidal             </td> <td> <b>Stream Type</b>  <input checked="" type="checkbox"/> Coldwater   <input type="checkbox"/> Warmwater             </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial  <input type="checkbox"/> Non-glacial montane  <input type="checkbox"/> Swamp and bog             </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup>  <input type="checkbox"/> Spring-fed  <input checked="" type="checkbox"/> Mixture of origins  <input checked="" type="checkbox"/> Other <u>WWTP EFFLUENT</u> </td> </tr> </table>		<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	<b>Catchment Area</b> _____ km <sup>2</sup> <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Mixture of origins <input checked="" type="checkbox"/> Other <u>WWTP EFFLUENT</u>
<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater					
<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	<b>Catchment Area</b> _____ km <sup>2</sup> <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Mixture of origins <input checked="" type="checkbox"/> Other <u>WWTP EFFLUENT</u>					

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources	
			<b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present _____			
<b>INSTREAM FEATURES</b>	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>5</u> m Sampling Reach Area <u>100</u> m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) <u>0.0001</u> km <sup>2</sup> Estimated Stream Depth <u>0.3</u> m <sup>MID</sup> Surface Velocity <u>0.56</u> m/sec (at thalweg)		Canopy Cover <input checked="" type="checkbox"/> OPEN <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>0.5</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input checked="" type="checkbox"/> Riffle <u>5</u> % <input checked="" type="checkbox"/> Run <u>95</u> % <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>LARGE WOODY DEBRIS</b>	LWD <u>1</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>5</u> %			
<b>WATER QUALITY</b>	Temperature <u>17.3</u> °C Specific Conductance <u>1,492</u> µs/cmC Dissolved Oxygen <u>6.75</u> mg/L, <u>70.5</u> % pH <u>7.76</u> Turbidity _____ ORP <u>240.8</u> WQ Instrument Used <u>YSI</u>		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input checked="" type="checkbox"/> Other <u>Chlorine</u> <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
<b>SEDIMENT/SUBSTRATE</b>  <u>ORP 240.8</u>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	<del>5%</del> 5%
Gravel	2-64 mm (0.1"-2.5")	5%			
Sand	0.06-2mm (gritty)	75%	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	20%			
Clay	< 0.004 mm (slick)				

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>CEPHEE CREEK</u>		LOCATION <u>LOWELL - D (DILUTION ZONE)</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT <u>87° 29.767</u> LONG <u>41° 15.415</u>		RIVER BASIN _____	
STORET # _____		AGENCY <u>SOAP &amp; DETERGENT ASSOC.</u>	
INVESTIGATORS <u>Mike Carlo, Jeff Hefel</u>			
FORM COMPLETED BY <u>Mike Carlo</u>		DATE <u>9-19-03</u> TIME <u>0800</u> AM PM	REASON FOR SURVEY <u>SEDIMENT SAMPLING</u>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <b>6</b>	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <b>6</b>	5 4 3 2 1 0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 <b>11</b>	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 <b>13</b> 12 11	10 9 8 7 6	5 4 3 2 1 0	
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 <b>11</b>	10 9 8 7 6	5 4 3 2 1 0	



# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																									
		Optimal					Suboptimal					Marginal					Poor										
Parameters to be evaluated broader than sampling reach	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.										
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0					
	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.										
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0					
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.										
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0	Right Bank		10	9	8	7	6	5	4	3	2	1	0
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0	Left Bank		10	9	8	7	6	5	4	3	2	1	0
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.										
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0	Right Bank		10	9	8	7	6	5	4	3	2	1	0
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0	Left Bank		10	9	8	7	6	5	4	3	2	1	0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.										
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0	Right Bank		10	9	8	7	6	5	4	3	2	1	0
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0	Left Bank		10	9	8	7	6	5	4	3	2	1	0

Total Score 69

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <b>CEDAR CREEK</b>	LOCATION <b>LOWELL - D (DILUTION ZONE)</b>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT <b>97° 24.767</b> LONG <b>119° 15.615N</b>	RIVER BASIN _____	
STORET # _____	<del>AGENCY</del> <b>SOAP &amp; DETERGENT ASSOC.</b>	
INVESTIGATORS <b>Mike Ciarlo, Jeff Heffel</b>	LOT NUMBER _____	
FORM COMPLETED BY <b>Mike Ciarlo</b>	DATE <b>9-19-03</b> TIME <b>0800</b> AM PM	REASON FOR SURVEY <b>SEDIMENT SAMPLING</b>

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input checked="" type="checkbox"/> Snags <b>10</b> % <input checked="" type="checkbox"/> Vegetated Banks <b>10</b> % <input checked="" type="checkbox"/> Sand <b>80</b> % w/mixed gravel <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____  How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat  Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Snags <b>2</b> <input checked="" type="checkbox"/> Vegetated Banks <b>2</b> <input checked="" type="checkbox"/> Sand <b>80</b> w/mixed gravel <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS LAB EVALUATION

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

## PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>CEDAR CREEK</u>		LOCATION <u>LOWELL - F (FAR DOWNSTREAM)</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
<del>LONG</del> <u>41° 14.126N</u> <del>LONG</del> <u>87° 24.899W</u>		RIVER BASIN _____	
STORET # _____		AGENCY CLIENT: <u>SOAP &amp; DETERGENT ASSOCIATION</u>	
INVESTIGATORS <u>Mike Ciarlo &amp; Leonard Dane</u>			
FORM COMPLETED BY <u>Mike Ciarlo / Leonard Dane</u>		DATE <u>9-18-03</u> TIME <u>0900</u> (AM) PM	REASON FOR SURVEY <u>Sediment sampling</u>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Air Temperature <u>~</u> °C Other _____
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) <u>100 FT NORTH OF ROAD 211, LOWELL, IN</u>		
STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other <u>WWTP Effluent</u>		
	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km <sup>2</sup>		

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources	
			Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____			
<b>INSTREAM FEATURES</b>	Estimated Reach Length <u>50</u> m Estimated Stream Width <u>4</u> m Sampling Reach Area <u>200</u> m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) <del>0.02</del> <u>0.0202</u> km <sup>2</sup> Estimated Stream Depth <u>0.2</u> m Mid-depth Surface Velocity <u>1.29</u> m/sec (at thalweg) DEPTH SE 1/2 3/4 FROM PLS 100 100 100		Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>10</u> % <input checked="" type="checkbox"/> Run <u>50</u> % <input checked="" type="checkbox"/> Pool <u>40</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>LARGE WOODY DEBRIS</b>	LWD <u>5</u> m <sup>2</sup> Density of LWD <del>100</del> m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %			
<b>WATER QUALITY</b>	Temperature <u>15.93</u> °C Specific Conductance <u>1.529</u> ms/cm Dissolved Oxygen <u>7.14</u> mg/L, <u>72.2%</u> pH <u>7.67</u> ORP <u>314.1</u> Turbidity _____ WQ Instrument Used <u>YSI</u>		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
<b>SEDIMENT/SUBSTRATE</b>	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ INFREQUENT Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
ORP <u>277.5</u> 3cm deep				

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	<u>5%</u>
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	<u>5%</u>
Gravel	2-64 mm (0.1"-2.5")	<u>10</u>			
Sand	0.06-2mm (gritty)	<u>20</u>	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	<del>60</del> <u>60</u>			
Clay	< 0.004 mm (slick)	<u>10</u>			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>CEDAR CREEK</u>	LOCATION <u>LOWELL - F (FAR DOWNGRADIENT)</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
<del>EAST</del> <u>41° 14.120' N</u> <del>LONG</del> <u>87° 24.899' W</u>	RIVER BASIN _____
STORET # _____	AGENCY <u>SOAP &amp; DETERGENT ASSOCIATION</u>
INVESTIGATORS <u>Mike Carlo &amp; Leonard Dore</u>	
FORM COMPLETED BY <u>Mike Carlo / Leonard Dore</u>	DATE <u>9-18-03</u> TIME <u>0900</u> <sup>AM</sup> PM REASON FOR SURVEY <u>Sediment Sampling</u>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b> Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	
SCORE	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0	
<b>4. Sediment Deposition</b> Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.		
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0	
<b>5. Channel Flow Status</b> Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.		
SCORE	20 19 18 17 16	15 14 13 12 11	<u>10</u> 9 8 7 6	5 4 3 2 1 0	

**HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)**

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Parameters to be evaluated broader than sampling reach

Total Score 90

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>CEDAR CREEK</u>	LOCATION <u>LOWELL-F (FAR DOWNSTREAM)</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT <u>87° 29.899'W</u> LONG <u>41° 14.120'N</u>	RIVER BASIN _____
STORET # _____	AGENCY <u>SOAP &amp; DETERGENT ASSOCIATION</u>
INVESTIGATORS <u>Mike Carlo &amp; Leonard Dane</u>	LOT NUMBER _____
FORM COMPLETED BY <u>Mike Carlo / Leonard Dane</u>	REASON FOR SURVEY <u>Sediment Sampling</u>
DATE <u>9-18-03</u>	TIME <u>0900</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input checked="" type="checkbox"/> Snags <u>10</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>20</u> % <input checked="" type="checkbox"/> Sand <u>70</u> % <sup>SAND/ SILT/ GRAVEL</sup> <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ % <sup>BOTTOM</sup>
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Snags <u>2</u> <input checked="" type="checkbox"/> Vegetated Banks <u>4</u> <input checked="" type="checkbox"/> Sand <u>14</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
GENERAL COMMENTS	SAMPLES ALONG BANKS & BRANCHES, A LONG <del>SLIGHT</del> GRAVEL / SOFT BOTTOM IN RUNS & SLIGHT RIFFLE

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	①	1	2	3	4	Slimes	0	①	2	3	4
Filamentous Algae	①	1	2	3	4	Macroinvertebrates	0	1	②	3	4
Macrophytes	①	1	2	3	4	Fish	0	1	②	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS - FOR LAB EVALUATION

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

## PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>CEDAR CREEK</u>	LOCATION <u>LOWELL - M (MIXING ZONE)</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT <u>87° 29.78' N</u> LONG <u>41° 15.61' W</u>	RIVER BASIN _____	
STORET # _____	AGENCY <u>SOAP &amp; DETERGENT ASSOC.</u>	
INVESTIGATORS <u>Mike Ciarlo &amp; Leonard Dane</u>		
FORM COMPLETED BY <u>Mike Ciarlo &amp; Leonard Dane</u>	DATE <u>9-18-03</u> TIME <u>1330</u> AM PM	REASON FOR SURVEY <u>Sediment sampling</u>

WEATHER CONDITIONS	<p>Now</p> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<p>Past 24 hours</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____	<p>Has there been a heavy rain in the last 7 days?  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Air Temperature <u>27.0</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p style="font-size: 1.2em; text-align: center;"><u>Approx 150ft south of WWTP outfall</u></p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem  <input checked="" type="checkbox"/> Perennial    <input type="checkbox"/> Intermittent    <input type="checkbox"/> Tidal</p> <p>Stream Origin  <input type="checkbox"/> Glacial    <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane    <input checked="" type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog    <input checked="" type="checkbox"/> Other <u>WWTP Effluent</u> </p> <p>Stream Type  <input checked="" type="checkbox"/> Coldwater    <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km<sup>2</sup></p>		



**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources		
			<b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy		
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present _____				
<b>INSTREAM FEATURES</b>	Estimated Reach Length <u>50</u> m Estimated Stream Width <u>4</u> m Sampling Reach Area <u>200</u> m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) <u>0.002</u> km <sup>2</sup> Estimated Stream Depth <u>0.2</u> m <sup>Mid</sup> Surface Velocity <u>0.68</u> ft/sec (at thalweg)		Canopy Cover <input checked="" type="checkbox"/> OPEN <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input checked="" type="checkbox"/> Riffle <u>5</u> % <input checked="" type="checkbox"/> Run <u>95</u> % <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
<b>LARGE WOODY DEBRIS</b>	LWD <u>5</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)				
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>5</u> %				
<b>WATER QUALITY</b>	Temperature <u>21.29</u> °C Specific Conductance <u>1.805</u> Dissolved Oxygen <u>9.01 mg/L, 102.1%</u> pH <u>7.69</u> ORP <u>234.5</u> Turbidity _____ WQ Instrument Used <u>YSI</u>		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input checked="" type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ ORP <u>208.9</u> 3cm below sed surface		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
		<b>Oils</b>			
		<input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse			

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")		Muck-Mud	black, very fine organic (FPOM)	5%
Cobble	64-256 mm (2.5"-10")				
Gravel	2-64 mm (0.1"-2.5")	10	Marl	grey, shell fragments	
Sand	0.06-2mm (gritty)				
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	80			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>CEDAR CREEK</i>	LOCATION <i>LOWELL-M (MIXING ZONE)</i>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT <i>87° 24.786W</i> LONG <i>41° 15.614N</i>	RIVER BASIN _____	
STORET # _____	AGENCY <i>SOAP &amp; DETERGENT ASSOCIATION</i>	
INVESTIGATORS <i>Mike Cirilo / Leonard Dora</i>		
FORM COMPLETED BY <i>Mike Cirilo / Leonard Dora</i>	DATE <i>9-18-03</i> TIME <i>1:30 PM</i>	REASON FOR SURVEY <i>Sediment Sampling</i>

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b> Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	SCORE	20 19 18 17 16	15 14 13 <b>(12)</b> 11	10 9 8 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <b>(6)</b>	5 4 3 2 1 0
	<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	
	SCORE	20 19 18 17 16	15 14 13 <b>(12)</b> 11	10 9 8 7 6	5 4 3 2 1 0
	<b>4. Sediment Deposition</b> Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 <b>(9)</b> 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b> Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
	SCORE	20 19 18 17 16	15 14 13 <b>(12)</b> 11	10 9 8 7 6	5 4 3 2 1 0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal				Suboptimal				Marginal				Poor								
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	<del>5</del>	<del>4</del>	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	<del>5</del>	4	3	<del>2</del>				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Parameters to be evaluated broader than sampling reach

Total Score 75

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>LEDAR CREEK</u>	LOCATION <u>LOWELL-M (Mixing Zone)</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT <u>87° 29.786' W</u> LONG <u>41° 15.614' N</u>	RIVER BASIN _____	
STORET # _____	AGENCY <u>SOAP &amp; DETERGENT ASSOCIATION</u>	
INVESTIGATORS <u>Mike Ciurlo &amp; Leonard Dane</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>Mike Ciurlo / Leonard Dane</u>	DATE <u>9-18-03</u> TIME <del>1330</del> <u>1330</u> AM PM	REASON FOR SURVEY <u>sed sampling</u>

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input checked="" type="checkbox"/> Snags <u>10</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other ( <u>CLAY BOTTOM / SILT &amp; GRAVEL COVER</u> ) <span style="float: right;"><u>80%</u></span>
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Snags <u>2</u> <input checked="" type="checkbox"/> Vegetated Banks <u>2</u> <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other ( <u>CLAY w/ GRAVEL</u> ) <u>16</u>
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	①	2	3	4	Slimes	0	1	②	3	4
Filamentous Algae	①	1	2	3	4	Macroinvertebrates	0	1	②	3	4
Macrophytes	①	1	2	3	4	Fish	0	1	②	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS FOR LAB EVALUATION

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

## PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Lyle Crk</u>	LOCATION <u>Far down - willow notes</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>LD, SS</u>		
FORM COMPLETED BY <u>LD</u>	DATE TIME <u>9/30/03</u> <u>5:20</u> AM PM	REASON FOR SURVEY _____

WEATHER CONDITIONS	<p><b>Now</b></p> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<p><b>Past 24 hours</b></p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____ <input checked="" type="checkbox"/>	<p><b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><b>Air Temperature</b> <u>40</u> °F</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <div style="text-align: center; height: 300px;"> </div>		
STREAM CHARACTERIZATION	<p><b>Stream Subsystem</b>  <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p><b>Stream Origin</b>  <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p><b>Stream Type</b>  <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p><b>Catchment Area</b> _____ km<sup>2</sup></p>		

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

DISTANCE ACROSS STREAM

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources													
			<b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy													
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____															
<b>INSTREAM FEATURES</b>	<b>Estimated Reach Length</b> <u>70</u> m <b>Estimated Stream Width</b> <u>6</u> m <b>Sampling Reach Area</b> _____ m <sup>2</sup> <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km <sup>2</sup> <b>Estimated Stream Depth</b> _____ m <b>Surface Velocity (at thalweg)</b> _____ m/sec		<b>Canopy Cover</b> <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded <b>High Water Mark</b> <u>2</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle <u>25</u> % <input type="checkbox"/> Run <u>50</u> % <input type="checkbox"/> Pool <u>25</u> % <b>Channelized</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Dam Present</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No													
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>MID VELOCITY</th> <th>DEPTH</th> <th>FLOW</th> </tr> <tr> <td>3/4</td> <td>0.5ft</td> <td>-0.13</td> </tr> <tr> <td>1/2</td> <td>1.5ft</td> <td>-0.01</td> </tr> <tr> <td>1/4</td> <td>1.0ft</td> <td>0.67</td> </tr> </table>	MID VELOCITY	DEPTH	FLOW	3/4	0.5ft	-0.13	1/2	1.5ft	-0.01	1/4	1.0ft	0.67	<b>LARGE WOODY DEBRIS</b> <b>LWD</b> _____ m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
MID VELOCITY	DEPTH	FLOW														
3/4	0.5ft	-0.13														
1/2	1.5ft	-0.01														
1/4	1.0ft	0.67														
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>NONE</u> Portion of the reach with aquatic vegetation _____ %															
<b>WATER QUALITY</b>	<b>Temperature</b> <u>17.97</u> °C <b>Specific Conductance</b> <u>0.717</u> <b>Dissolved Oxygen</b> <u>8.34</u> <b>pH</b> <u>7.79</u> <b>Turbidity</b> _____ <b>WQ Instrument Used</b> <u>YSI 556 MP</u>		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____													
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No													

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		5	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	5	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	5
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)	5			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>lytle</u>	LOCATION <u>Wilmington OH - 7/5 - far</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS
LAT <u>39°26.305</u> LONG <u>82°51.742</u>	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS <u>LD, SS</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>9/20/03</u> TIME <u>4:15</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
REASON FOR SURVEY	

	Habitat Parameter	Condition Category																			
		Optimal					Suboptimal					Marginal					Poor				
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).																			
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.																			
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.																			
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.																			
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.																			
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	Right Bank				2	1	0		
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	Left Bank				2	1	0		
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	Right Bank				2	1	0		
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	Left Bank				2	1	0		
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	Right Bank				2	1	0		
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	Left Bank				2	1	0		

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_



## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____		LOT NUMBER _____	
FORM COMPLETED BY _____		DATE _____ AM _____ PM _____	REASON FOR SURVEY _____

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>25</u> % <input type="checkbox"/> Snags <u>5</u> % <input type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand <u>65</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>5</u> <input type="checkbox"/> Snags <u>2</u> <input type="checkbox"/> Vegetated Banks <u>2</u> <input type="checkbox"/> Sand <u>11</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Little Crk</u>	LOCATION <u>D/S Williamsburg</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT <u>39°26.277</u> LONG <u>93°51.413</u>	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>LD, SS, RP</u>	
FORM COMPLETED BY <u>LD</u>	DATE TIME <u>9/30/07</u> <u>11:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
REASON FOR SURVEY _____	

<b>WEATHER CONDITIONS</b>	<table style="width: 100%;"> <tr> <td style="width: 33%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input checked="" type="checkbox"/> %cloud cover  <input checked="" type="checkbox"/> clear/sunny             </td> <td style="width: 33%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/> %             </td> <td style="width: 33%;"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input type="checkbox"/> No  <b>Air Temperature</b> <u>48°F</u>                  Other _____             </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> %	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>Air Temperature</b> <u>48°F</u> Other _____	
<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> %	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>Air Temperature</b> <u>48°F</u> Other _____			
<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center; margin-top: 20px;"> </div>				
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Stream Subsystem</b>  <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal                 </td> <td style="width: 50%;"> <b>Stream Type</b>  <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater                 </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____                 </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>	<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>
<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater				
<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>				

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy								
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____									
<b>INSTREAM FEATURES</b>  MID VELOCITY <table border="1" style="width: 100%; text-align: center;"> <tr> <th>DEPTH</th> <th>FLOW</th> </tr> <tr> <td>3/4</td> <td>0.44</td> </tr> <tr> <td>1/2</td> <td>0.40</td> </tr> <tr> <td>1/4</td> <td>0.34</td> </tr> </table>	DEPTH	FLOW	3/4	0.44	1/2	0.40	1/4	0.34	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>8</u> m Sampling Reach Area _____ m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth _____ m Surface Velocity _____ m/sec	Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____% <input type="checkbox"/> Run _____% <input type="checkbox"/> Pool _____% Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	DEPTH	FLOW								
3/4	0.44									
1/2	0.40									
1/4	0.34									
<b>LARGE WOODY DEBRIS</b>	LWD _____ m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)									
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present <u>Attached Algae</u> Portion of the reach with aquatic vegetation <u>5</u> %									
<b>WATER QUALITY</b>	Temperature <u>14.25</u> °C Specific Conductance <u>8.209</u> Dissolved Oxygen <u>9.75</u> pH <u>7.75</u> Turbidity _____ WQ Instrument Used <u>Sonar 65</u> _____		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____							
<b>SEDIMENT/SUBSTRATE</b>	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse  Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									

DISTANCE ACROSS STREAM

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	30	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Lytle Crk</u>	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET # _____	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY _____	DATE TIME _____ AM PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal				Suboptimal				Marginal				Poor								
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.				Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.				Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.												
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				Channel straight; waterway has been channelized for a long distance.												
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.				Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.				Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.												
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.				50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.				Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.												
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.				Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.				Width of riparian zone <6 meters. little or no riparian vegetation due to human activities.												
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____		LOT NUMBER _____	
FORM COMPLETED BY _____		DATE _____ AM PM	
		REASON FOR SURVEY _____	

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>25</u> % <input type="checkbox"/> Snags <u>10</u> % <input type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand <u>60</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>6</u> <input type="checkbox"/> Snags <u>4</u> <input type="checkbox"/> Vegetated Banks <u>2</u> <input type="checkbox"/> Sand <u>8</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Lytic Creek</u>	LOCATION <u>upstream mixing zone, Wilmington</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT <u>30° 26.28' N</u> LONG <u>93° 51.30' W</u>	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>SS, LD, BP</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>9/3/07</u> TIME <u>1500</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY _____	

<b>WEATHER CONDITIONS</b>	<table style="width: 100%;"> <tr> <td style="width: 33%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input checked="" type="checkbox"/> %cloud cover  <input checked="" type="checkbox"/> clear/sunny                 </td> <td style="width: 33%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> %                 </td> <td style="width: 33%;"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  <b>Air Temperature</b> <u>58</u> °C  <b>Other</b> _____                 </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Air Temperature</b> <u>58</u> °C <b>Other</b> _____	
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<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center; margin-top: 20px;"> </div>				
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Stream Subsystem</b>  <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal                 </td> <td style="width: 50%;"> <b>Stream Type</b>  <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater                 </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____                 </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>	<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>
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# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy							
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____									
<b>INSTREAM FEATURES</b>  MID VELOCITY <table border="1" style="font-size: small;"> <thead> <tr> <th>DEPTH</th> <th>FLOW</th> </tr> </thead> <tbody> <tr> <td>3/4</td> <td>0.6</td> </tr> <tr> <td>1/2</td> <td>0.7</td> </tr> <tr> <td>1/4</td> <td>1.0</td> </tr> </tbody> </table>	DEPTH	FLOW	3/4	0.6	1/2	0.7	1/4	1.0	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	<b>Canopy Cover</b> <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded  High Water Mark _____ m  <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle <u>0</u> % <input type="checkbox"/> Run <u>90</u> % <input type="checkbox"/> Pool <u>10</u> %  Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
DEPTH	FLOW									
3/4	0.6									
1/2	0.7									
1/4	1.0									
<b>LARGE WOODY DEBRIS</b>	LWD _____ m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)									
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>1. N/A</u> Portion of the reach with aquatic vegetation _____ %									
<b>WATER QUALITY</b>	Temperature <u>15.38</u> °C Specific Conductance <u>910.825</u> Dissolved Oxygen <u>87.4%</u> <u>2.72</u> pH _____      ORP <u>222.5</u> Turbidity _____      ORP in sed _____ WQ Instrument Used _____		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____							
<b>SEDIMENT/ SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No							

DISTANCE ACROSS STREAM

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	5	Muck-Mud	black, very fine organic (FPOM)	
Cobble	64-256 mm (2.5"-10")	10	Marl	grey, shell fragments	
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	25			
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				



## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

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LAT _____ LONG _____		RIVER BASIN _____	
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INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

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		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b> Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
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	<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	
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Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			LOT NUMBER _____
FORM COMPLETED BY _____		DATE _____ AM PM	REASON FOR SURVEY _____

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>10</u> % <input type="checkbox"/> Snags <u>5</u> % <input type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand <u>80</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>2</u> <input type="checkbox"/> Snags <u>2</u> <input type="checkbox"/> Vegetated Banks <u>2</u> <input type="checkbox"/> Sand <u>12</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

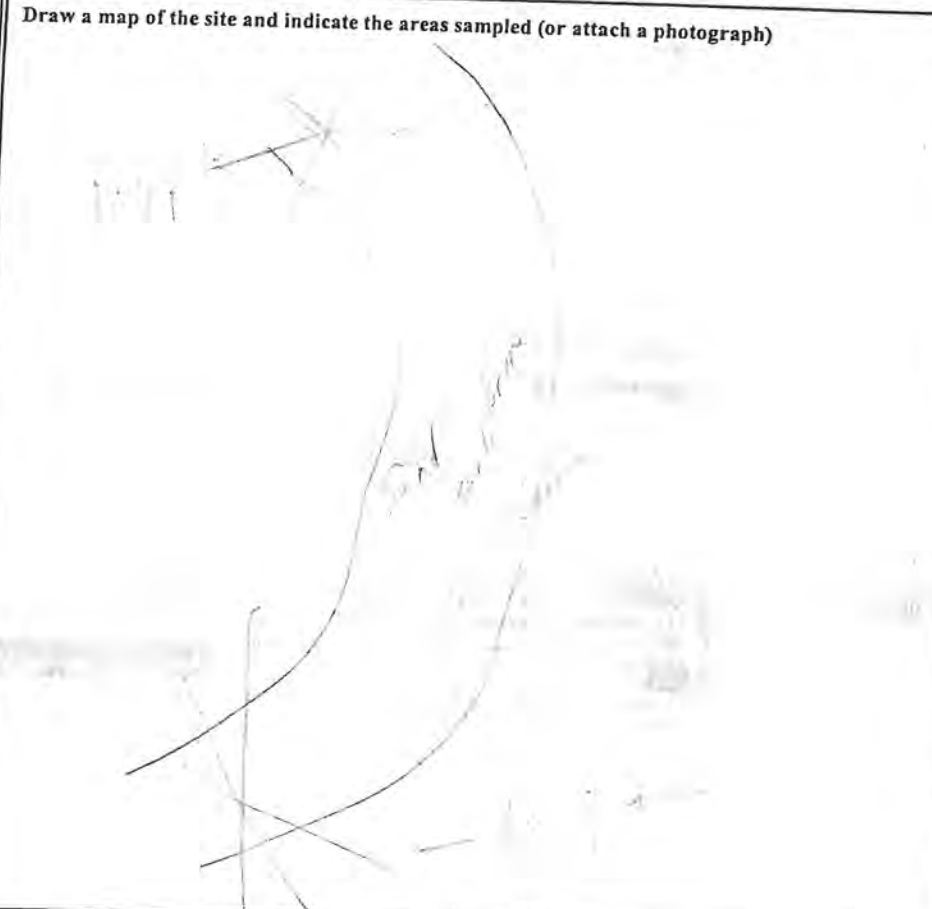
### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygotera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Cypress Creek</u>		LOCATION <u>Wadeable U/S</u>	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT <u>30° 26.567'</u>	LONG <u>83° 51.705'</u>	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LD, SS, BP</u>			
FORM COMPLETED BY <u>LD</u>		DATE <u>10/10/03</u> TIME <u>0930</u> (AM) (PM)	REASON FOR SURVEY _____

<b>WEATHER CONDITIONS</b>	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input type="checkbox"/> %cloud cover _____  <input checked="" type="checkbox"/> clear/sunny                 </td> <td style="width: 50%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> % _____  <input type="checkbox"/> </td> </tr> <tr> <td colspan="2"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                 </td> </tr> <tr> <td colspan="2"> <b>Air Temperature</b> <u>16</u> °E                      Other _____                 </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> % _____ <input type="checkbox"/>	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		<b>Air Temperature</b> <u>16</u> °E Other _____	
<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> % _____ <input type="checkbox"/>						
<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No							
<b>Air Temperature</b> <u>16</u> °E Other _____							
<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) 						
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td> <b>Stream Subsystem</b>  <input type="checkbox"/> Perennial    <input type="checkbox"/> Intermittent    <input type="checkbox"/> Tidal                 </td> <td> <b>Stream Type</b>  <input type="checkbox"/> Coldwater    <input type="checkbox"/> Warmwater                 </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial                      <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane      <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog              <input type="checkbox"/> Other _____                 </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>	<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>		
<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater						
<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

DISTANCE ACROSS STREAM

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy												
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____													
<b>INSTREAM FEATURES</b>	<b>Estimated Reach Length</b> <u>20</u> m <b>Estimated Stream Width</b> <u>10</u> m <b>Sampling Reach Area</b> _____ m <sup>2</sup> <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km <sup>2</sup> <b>Estimated Stream Depth</b> _____ m <b>Surface Velocity (at thalweg)</b> _____ m/sec	<b>Canopy Cover</b> <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded <b>High Water Mark</b> <u>2</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle <u>10</u> % <input type="checkbox"/> Run <u>40</u> % <input type="checkbox"/> Pool <u>50</u> % <b>Channelized</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Dam Present</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: center;">MID VELOCITY</th> <th style="text-align: center;">DEPTH</th> <th style="text-align: center;">FLOW</th> </tr> <tr> <td style="text-align: center;">3/4</td> <td style="text-align: center;">0.6</td> <td style="text-align: center;">0.22</td> </tr> <tr> <td style="text-align: center;">1/2</td> <td style="text-align: center;">0.7</td> <td style="text-align: center;">0.42</td> </tr> <tr> <td style="text-align: center;">1/4</td> <td style="text-align: center;">0.4</td> <td style="text-align: center;">0.31</td> </tr> </table>	MID VELOCITY	DEPTH	FLOW	3/4	0.6	0.22	1/2	0.7	0.42	1/4	0.4	0.31	<b>LWD</b> _____ m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)	
MID VELOCITY	DEPTH	FLOW												
3/4	0.6	0.22												
1/2	0.7	0.42												
1/4	0.4	0.31												
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>None</u> Portion of the reach with aquatic vegetation _____ %													
<b>WATER QUALITY</b>	<b>Temperature</b> <u>13.2</u> °C <b>Specific Conductance</b> <u>0.754</u> <b>Dissolved Oxygen</b> _____ <b>pH</b> _____ <u>ORP 156</u> <b>Turbidity</b> _____ <u>ORP in sed</u> <b>WQ Instrument Used</b> <u>431-556</u> <u>4013191</u>	<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____												
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	<u>10</u>
Boulder	> 256 mm (10")	<u>5</u>	Muck-Mud	black, very fine organic (FPOM)	—
Cobble	64-256 mm (2.5"-10")	<u>10</u>			
Gravel	2-64 mm (0.1"-2.5")	<u>10</u>	Marl	grey, shell fragments	—
Sand	0.06-2mm (gritty)	<u>35</u>			
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ AM _____ PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Lytle Crk</u>		LOCATION <u>Winters U/S</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LD, SS, BP</u>			LOT NUMBER _____
FORM COMPLETED BY <u>LD</u>		DATE _____ AM _____ PM _____	REASON FOR SURVEY _____

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>0</u> % <input type="checkbox"/> Snags <u>10</u> % <input type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand <u>75</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> A-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>4</u> <input type="checkbox"/> Snags <u>4</u> <input type="checkbox"/> Vegetated Banks <u>2</u> <input type="checkbox"/> Sand <u>10</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u> 1 2 3 4	Slimes	<u>0</u> 1 2 3 4
Filamentous Algae	<u>0</u> 1 2 3 4	Macroinvertebrates	0 1 <u>2</u> 3 4
Macrophytes	<u>0</u> 1 2 3 4	Fish	0 <u>1</u> 2 3 4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0 1 2 3 4	Anisoptera	0 1 2 3 4	Chironomidae	0 1 2 3 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 3 4
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Trichoptera	0 1 2 3 4
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Other	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4		
Oligochaeta	0 1 2 3 4	Sialidae	0 1 2 3 4		
Isopoda	0 1 2 3 4	Corydalidae	0 1 2 3 4		
Amphipoda	0 1 2 3 4	Tipulidae	0 1 2 3 4		
Decapoda	0 1 2 3 4	Empididae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Simuliidae	0 1 2 3 4		
Bivalvia	0 1 2 3 4	Tabinidae	0 1 2 3 4		
		Culcidae	0 1 2 3 4		



**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(FRONT)**

STREAM NAME <u>Pigeon Run</u>		LOCATION <u>Bryan - Far downstream</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LD, SS</u>			
FORM COMPLETED BY <u>LD</u>		DATE <u>10/2/03</u> TIME <u>0800</u> (AM) PM	REASON FOR SURVEY _____

WEATHER CONDITIONS	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____ <input checked="" type="checkbox"/>	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>Air Temperature</b> <u>0</u> °C @ <u>0730</u> <b>Other</b> _____
	<b>SITE LOCATION/MAP</b> Draw a map of the site and indicate the areas sampled (or attach a photograph)		
STREAM CHARACTERIZATION	<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal <b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater <b>Catchment Area</b> _____ km <sup>2</sup>	

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy									
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____											
<b>INSTREAM FEATURES</b>	<b>Estimated Reach Length</b> <u>9.0</u> m <b>Estimated Stream Width</b> <u>2</u> m <b>Sampling Reach Area</b> _____ m <sup>2</sup> <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km <sup>2</sup> <b>Estimated Stream Depth</b> _____ m <b>Surface Velocity (at thalweg)</b> _____ m/sec		<b>Canopy Cover</b> <u>NONE</u> <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded  <b>High Water Mark</b> <u>2</u> m  <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle <u>10</u> % <input type="checkbox"/> Run <u>90</u> % <input type="checkbox"/> Pool <u>0</u> %  <b>Channelized</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <b>Dam Present</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									
MID VELOCITY <table border="1" style="font-size: small;"> <tr><th>DEPTH</th><th>FLOW</th></tr> <tr><td>3/4</td><td>0.17</td></tr> <tr><td>1/2</td><td>0.6</td></tr> <tr><td>1/4</td><td>0.6</td></tr> </table>	DEPTH	FLOW	3/4	0.17	1/2	0.6	1/4	0.6	<b>LWD</b> _____ m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
	DEPTH	FLOW										
3/4	0.17											
1/2	0.6											
1/4	0.6											
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input checked="" type="checkbox"/> Rooted emergent <input checked="" type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _____ %											
<b>WATER QUALITY</b>	<b>Temperature</b> <u>10.4</u> °C <b>Specific Conductance</b> <u>1003</u> <b>Dissolved Oxygen</b> <u>8.9</u> <u>8.20</u> <b>pH</b> _____ <b>ORP</b> <u>173</u> <b>Turbidity</b> _____ <b>ORP in sed</b> _____ <b>WQ Instrument Used</b> _____		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____									
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									

DISTANCE ACROSS STREAM

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	30
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	1
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Pigeon Run</u>		LOCATION <u>Bryan - Fardown Stream</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT <u>47° 27.605' N</u> LONG <u>084° 31.120' W</u>		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LD, SS</u>			
FORM COMPLETED BY <u>LD</u>		DATE <u>10/2/05</u> TIME <u>0800</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY _____

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
	<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 <u>9</u> 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 <u>18</u> 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank					Right Bank					Left Bank					Right Bank					
SCORE __ (RB)	Right Bank					Left Bank					Left Bank					Right Bank					
SCORE	10	9	8	7	6	8	7	6	5	4	3	5	4	3	2	1	0	2	1	0	0
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank					Right Bank					Left Bank					Right Bank					
SCORE __ (RB)	Right Bank					Left Bank					Left Bank					Right Bank					
SCORE	10	9	8	7	6	8	7	6	5	4	3	5	4	3	2	1	0	2	1	0	0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank					Right Bank					Left Bank					Right Bank					
SCORE __ (RB)	Right Bank					Left Bank					Left Bank					Right Bank					
SCORE	10	9	8	7	6	8	7	6	5	4	3	5	4	3	2	1	0	2	1	0	0

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>Pigeon Run</i>	LOCATION <i>Bryan-downstream Jar</i>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <i>LD, SS</i>	LOT NUMBER _____
FORM COMPLETED BY <i>LD</i>	DATE _____ AM _____ PM _____
REASON FOR SURVEY _____	

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks <i>5</i> % <input type="checkbox"/> Sand <i>5</i> % <input type="checkbox"/> Submerged Macrophytes <i>10</i> % <input type="checkbox"/> Other ( <i>silt/muck</i> ) <i>75</i> %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <i>2</i> <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks <i>2</i> <input type="checkbox"/> Sand <i>2</i> <input type="checkbox"/> Submerged Macrophytes <i>4</i> <input type="checkbox"/> Other ( <i>silt/muck</i> ) <i>10</i>
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Curculionidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Pigeon Run</u>	LOCATION <u>Bryon - Downstream</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS
LAT <u>41°27.811N</u> LONG <u>84°31.431W</u>	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS <u>LD, SS</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>10/2/03</u> TIME <u>11:30</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
REASON FOR SURVEY	

WEATHER CONDITIONS	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/>	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Air Temperature</b> <u>6.5</u> °C Other _____
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center; margin-top: 20px;"> </div>		
STREAM CHARACTERIZATION	<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal <b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		
	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater <b>Catchment Area</b> _____ km <sup>2</sup>		

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____			
<b>INSTREAM FEATURES</b>  MID VELOCITY DEPTH   FLOW 3/4   0.3   0.30 1/2   0.2   0.52 1/4   0.5   1.32	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>9</u> m Sampling Reach Area _____ m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)		Canopy Cover <u>- open</u> <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>2</u> m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____% <input type="checkbox"/> Run <u>100</u> % <input type="checkbox"/> Pool _____% Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
	LWD <u>0</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)			
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae <u>NONE</u> dominant species present _____ Portion of the reach with aquatic vegetation _____%			
<b>WATER QUALITY</b>	Temperature <u>14.47</u> °C Specific Conductance <u>0.964</u> Dissolved Oxygen <u>11.2</u> - % Sat <u>110.2</u> pH _____ <u>ORP 229.4</u> Turbidity _____ <u>ORP in sed</u> _____ WQ Instrument Used <u>Sonotek</u> <u>with meter</u>		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
<b>SEDIMENT/SUBSTRATE</b>	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

DISTANCE ACROSS STREAM

RDB

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock	<u>- Hard for</u>	<u>40</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u>2</u>
Boulder	> 256 mm (10")	<u>—</u>			
Cobble	64-256 mm (2.5"-10")	<u>—</u>	Muck-Mud	black, very fine organic (FPOM)	<u>—</u>
Gravel	2-64 mm (0.1"-2.5")	<u>—</u>			
Sand	0.06-2mm (gritty)	<u>60</u>	Marl	grey, shell fragments	<u>—</u>
Silt	0.004-0.06 mm	<u>—</u>			
Clay	< 0.004 mm (slick)	<u>—</u>			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>Pigeon Run</i>	LOCATION <i>Bryan Downstream</i>	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS <i>LD, LS</i>		
FORM COMPLETED BY <i>LD</i>	DATE TIME <i>10/22/03</i> <i>1136</i> AM PM	REASON FOR SURVEY _____

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 <b>8</b> 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <b>3</b> 2 1 0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <b>1</b> 0
	<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 <b>17</b> 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 <b>18</b> 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0



# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal				Suboptimal				Marginal				Poor								
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Pigeon Run</u>	LOCATION <u>Pigeon - Georgetown</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS	
LAT <u>          </u> LONG <u>          </u>	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>LD, SS</u>	LOT NUMBER	
FORM COMPLETED BY <u>LD</u>	DATE <u>10/2/03</u> TIME <u>1130</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>0</u> % <input type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks <u>30</u> % <input type="checkbox"/> Sand <u>70</u> % <input type="checkbox"/> Submerged Macrophytes <u>          </u> % <input type="checkbox"/> Other ( <u>          </u> ) <u>          </u> %
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other <u>          </u> How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>          </u> <input type="checkbox"/> Snags <u>          </u> <input type="checkbox"/> Vegetated Banks <u>6</u> <input type="checkbox"/> Sand <u>14</u> <input type="checkbox"/> Submerged Macrophytes <u>          </u> <input type="checkbox"/> Other ( <u>          </u> ) <u>          </u>
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Pigeon Run</u>	LOCATION <u>Bryan - Mixing Zone end</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT <u>41° 27.809N</u> LONG <u>84° 31.520W</u>	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>LD, JS</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>10/2/03</u> TIME <u>11:30</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY _____	

<b>WEATHER CONDITIONS</b>	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input checked="" type="checkbox"/> %cloud cover clear/sunny                 </td> <td style="width: 50%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> %  <input checked="" type="checkbox"/> %                 </td> </tr> <tr> <td colspan="2"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                 </td> </tr> <tr> <td colspan="2"> <b>Air Temperature</b> <u>12°C</u>  <b>Other</b> _____                 </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/> %	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		<b>Air Temperature</b> <u>12°C</u> <b>Other</b> _____	
<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/> %						
<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No							
<b>Air Temperature</b> <u>12°C</u> <b>Other</b> _____							
<b>SITE LOCATION/MAP</b>	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <div style="text-align: center;"> </div>						
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td> <b>Stream Subsystem</b>  <input checked="" type="checkbox"/> Perennial    <input type="checkbox"/> Intermittent    <input type="checkbox"/> Tidal                 </td> <td> <b>Stream Type</b>  <input type="checkbox"/> Coldwater    <input checked="" type="checkbox"/> Warmwater                 </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial                      <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane       <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog               <input type="checkbox"/> Other _____                 </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>	<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>		
<b>Stream Subsystem</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater						
<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy							
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____									
<b>INSTREAM FEATURES</b>  MID VELOCITY <table border="1" style="font-size: small;"> <tr> <th>DEPTH</th> <th>FLOW</th> </tr> <tr> <td>3/4</td> <td>0.7    0.54</td> </tr> <tr> <td>1/2</td> <td>0.5    0.63</td> </tr> <tr> <td>1/4</td> <td>0.5    0.54</td> </tr> </table>	DEPTH	FLOW	3/4	0.7    0.54	1/2	0.5    0.63	1/4	0.5    0.54	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover <u>None - open</u> <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>2</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle _____% <input type="checkbox"/> Run _____% <input type="checkbox"/> Pool _____% Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No
	DEPTH	FLOW								
3/4	0.7    0.54									
1/2	0.5    0.63									
1/4	0.5    0.54									
<b>LARGE WOODY DEBRIS</b> LWD <u>0</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)	<b>AQUATIC VEGETATION</b> <b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>NONE</u> Portion of the reach with aquatic vegetation _____%									
<b>WATER QUALITY</b>	Temperature <u>16.49</u> °C Specific Conductance <u>117.24</u> Dissolved Oxygen <u>12.12</u> % sat @ 15.3 pH _____    ORP <u>227.5</u> Turbidity _____    ORP in sed _____ WQ Instrument Used <u>Same as previous</u>	<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____								
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No								

RD 3  
DISTANCE ACROSS STREAM

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock	- boulders	40	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	-
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)	60	Marl	grey, shell fragments	1
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>Pigeon Run</i>	LOCATION <i>Boyan - End of mining zone</i>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS _____ <i>10, 55</i>	
FORM COMPLETED BY _____ <i>LD</i>	DATE TIME <i>10/2/83</i> AM <input type="radio"/> PM <input checked="" type="radio"/>
REASON FOR SURVEY _____	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal				Suboptimal				Marginal				Poor								
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>Proctor Run</i>	LOCATION <i>Proctor - End of Milling Zone</i>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <i>LD, SS</i>	LOT NUMBER _____
FORM COMPLETED BY <i>LD</i>	DATE <i>10/2/07</i> TIME <i>1430</i> AM <input checked="" type="radio"/> PM <input type="radio"/>
REASON FOR SURVEY _____	

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks <i>30</i> % <input type="checkbox"/> Sand <i>70</i> % <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other ( _____ ) _____%
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks <i>6</i> <input type="checkbox"/> Sand <i>14</i> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

didn't get the bypoints for this location

STREAM NAME <u>Pigeon Run</u>	LOCATION <u>Bryan - Upstream</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>LD, SS</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>10/3/03</u> TIME <u>0800</u> (AM) (PM)
REASON FOR SURVEY _____	

<b>WEATHER CONDITIONS</b>	<table style="width: 100%;"> <tr> <td style="width: 33%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input type="checkbox"/> %cloud cover _____  <input checked="" type="checkbox"/> clear/sunny             </td> <td style="width: 33%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> % _____  <input checked="" type="checkbox"/> </td> <td style="width: 33%;"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  <b>Air Temperature</b> <u>40</u> °F                  Other _____             </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____ <input checked="" type="checkbox"/>	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Air Temperature</b> <u>40</u> °F Other _____			
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<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center; height: 300px;"> </div>						
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td style="width: 33%;"> <b>Stream Subsystem</b>  <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal             </td> <td style="width: 33%;"> <b>Stream Type</b>  <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater             </td> <td style="width: 33%;"> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____             </td> <td colspan="2"></td> </tr> </table>	<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Catchment Area</b> _____ km <sup>2</sup>	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		
<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Catchment Area</b> _____ km <sup>2</sup>					
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# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

DISTANCE ACROSS STREAM

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources  <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy								
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____									
<b>INSTREAM FEATURES</b>	<b>Estimated Reach Length</b> <u>20</u> m <b>Estimated Stream Width</b> <u>5</u> m <b>Sampling Reach Area</b> _____ m <sup>2</sup> <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km <sup>2</sup> <b>Estimated Stream Depth</b> _____ m <b>Surface Velocity (at thalweg)</b> _____ m/sec	<b>Canopy Cover</b> <u>open</u> <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded <b>High Water Mark</b> <u>2</u> m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % <b>Channelized</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <b>Dam Present</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No								
<b>MID VELOCITY</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DEPTH</th> <th>FLOW</th> </tr> </thead> <tbody> <tr> <td><u>3/4</u></td> <td><u>0.3</u></td> </tr> <tr> <td><u>1/2</u></td> <td><u>0.2</u></td> </tr> <tr> <td><u>1/4</u></td> <td><u>0.2</u></td> </tr> </tbody> </table>		DEPTH	FLOW	<u>3/4</u>	<u>0.3</u>	<u>1/2</u>	<u>0.2</u>	<u>1/4</u>	<u>0.2</u>
DEPTH	FLOW									
<u>3/4</u>	<u>0.3</u>									
<u>1/2</u>	<u>0.2</u>									
<u>1/4</u>	<u>0.2</u>									
<b>LARGE WOODY DEBRIS</b>	<b>LWD</b> _____ m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)									
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>Bull Rush</u> Portion of the reach with aquatic vegetation <u>10</u> %									
<b>WATER QUALITY</b>	<b>Temperature</b> <u>9.4</u> °C <b>Specific Conductance</b> <u>650</u> <b>Dissolved Oxygen</b> <u>9.31</u> <u>9.812</u> <b>pH</b> _____ <u>ORP 213.8</u> <b>Turbidity</b> _____ <u>ORP in sed</u> <b>WQ Instrument Used</b> _____	<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____  <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input checked="" type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____								
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No								

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	<u>10</u>
Boulder	> 256 mm (10")		Muck-Mud	black, very fine organic (FPOM)	<u>5</u>
Cobble	64-256 mm (2.5"-10")				
Gravel	2-64 mm (0.1"-2.5")	<u>5</u>	Marl	grey, shell fragments	<u>5</u>
Sand	0.06-2mm (gritty)	<u>20</u>			
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)	<u>25</u>			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Pigpen Run</u>	LOCATION <u>Bryer - upstream</u>
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>LD, SS</u>	
FORM COMPLETED BY <u>LD</u>	DATE <u>10/30/03</u> TIME <u>0800</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
REASON FOR SURVEY _____	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal				Suboptimal				Marginal				Poor								
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.																				
Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.																					
Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																				
The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.																					
Channel straight; waterway has been channelized for a long distance.																					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.																				
Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.																					
Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.																				
50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.																					
Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.																				
Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.																					
Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																					
SCORE __ (LB)	Left Bank				10	9	8	7	6	5	4	3	2				1	0			
SCORE __ (RB)	Right Bank				10	9	8	7	6	5	4	3	2				1	0			

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Pigeon Run</u>		LOCATION <u>3.76 mi - up stream</u>	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LD, SS</u>		LOT NUMBER _____	
FORM COMPLETED BY <u>LD</u>		DATE <u>10/2/03</u>	REASON FOR SURVEY _____
		TIME _____ AM PM	

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks <u>70</u> % <input type="checkbox"/> Sand <u>10</u> % <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other ( _____ ) _____%
<b>SAMPLE COLLECTION</b>	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks <u>18</u> <input type="checkbox"/> Sand <u>2</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	<u>2</u>	3	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	0	1	<u>2</u>	3	4	Fish	0	<u>1</u>	2	3	4

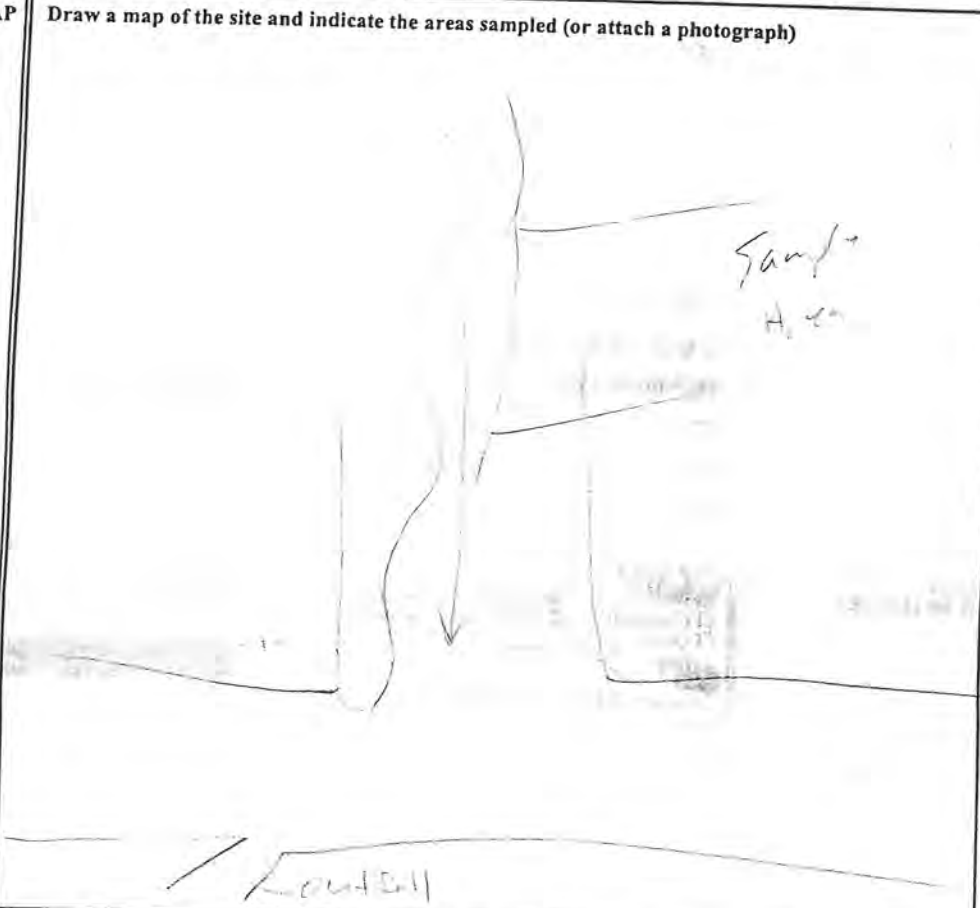
### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME		LOCATION <i>Bryan - Side stream</i>	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT _____	LONG _____	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <i>LD SS</i>			
FORM COMPLETED BY <i>LD</i>		DATE <i>10/1/03</i> TIME <i>0845</i> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM	REASON FOR SURVEY _____

WEATHER CONDITIONS	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Now</b>  <input type="checkbox"/> storm (heavy rain)  <input type="checkbox"/> rain (steady rain)  <input type="checkbox"/> showers (intermittent)  <input type="checkbox"/> %cloud cover _____  <input checked="" type="checkbox"/> clear/sunny             </td> <td style="width: 50%;"> <b>Past 24 hours</b>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> % _____  <input checked="" type="checkbox"/> </td> </tr> <tr> <td colspan="2"> <b>Has there been a heavy rain in the last 7 days?</b>  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No             </td> </tr> <tr> <td colspan="2"> <b>Air Temperature</b> <i>39</i> °C                  Other _____             </td> </tr> </table>	<b>Now</b> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny	<b>Past 24 hours</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____ <input checked="" type="checkbox"/>	<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		<b>Air Temperature</b> <i>39</i> °C Other _____	
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<b>Has there been a heavy rain in the last 7 days?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No							
<b>Air Temperature</b> <i>39</i> °C Other _____							
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)  						
STREAM CHARACTERIZATION	<table style="width: 100%;"> <tr> <td> <b>Stream Subsystem</b>  <input type="checkbox"/> Perennial    <input type="checkbox"/> Intermittent    <input type="checkbox"/> Tidal             </td> <td> <b>Stream Type</b>  <input type="checkbox"/> Coldwater    <input type="checkbox"/> Warmwater             </td> </tr> <tr> <td> <b>Stream Origin</b>  <input type="checkbox"/> Glacial                      <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane      <input type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog              <input type="checkbox"/> Other _____             </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>	<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>		
<b>Stream Subsystem</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<b>Stream Type</b> <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater						
<b>Stream Origin</b> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>						

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET  
(BACK)**

DISTANCE ACROSS STREAM

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources												
			<b>Local Watershed Erosion</b> <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy												
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____														
<b>INSTREAM FEATURES</b>	Estimated Reach Length <u>20</u> m Estimated Stream Width <u>6</u> m Sampling Reach Area _____ m <sup>2</sup> Area in km <sup>2</sup> (m <sup>2</sup> x1000) _____ km <sup>2</sup> Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)		Canopy Cover <u>open</u> <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m <b>Proportion of Reach Represented by Stream Morphology Types</b> <input type="checkbox"/> Riffle _____ % <input checked="" type="checkbox"/> Run <u>100</u> % <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>MID VELOCITY</th> <th>DEPTH</th> <th>FLOW</th> </tr> <tr> <td>3/4</td> <td>0.5</td> <td>0.26</td> </tr> <tr> <td>1/2</td> <td>0.4</td> <td>0.28</td> </tr> <tr> <td>1/4</td> <td>0.5</td> <td>0.19</td> </tr> </table>	MID VELOCITY	DEPTH	FLOW	3/4	0.5	0.26	1/2	0.4	0.28	1/4	0.5	0.19			
MID VELOCITY	DEPTH	FLOW													
3/4	0.5	0.26													
1/2	0.4	0.28													
1/4	0.5	0.19													
<b>LARGE WOODY DEBRIS</b>	LWD <u>0</u> m <sup>2</sup> Density of LWD _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)														
<b>AQUATIC VEGETATION</b>	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input checked="" type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>Rooted emergent</u> Portion of the reach with aquatic vegetation _____ %														
<b>WATER QUALITY</b>	Temperature <u>7.66</u> °C Specific Conductance <u>780</u> Dissolved Oxygen <u>9.97</u> mg/l pH _____ Turbidity _____ WQ Instrument Used _____		<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Turbidity (if not measured)</b> <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____												
<b>SEDIMENT/SUBSTRATE</b>	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <b>Oils</b> <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		<b>Deposits</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")		Muck-Mud	black, very fine organic (FPOM)	5
Cobble	64-256 mm (2.5"-10")		Marl	grey, shell fragments	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)	50			
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	40			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME		LOCATION	
STATION #	RIVERMILE	STREAM CLASS	
LAT <u>41° 27.936 N</u>	LONG <u>89° 31.55 W</u>	RIVER BASIN	
STORET #	AGENCY		
INVESTIGATORS <u>LD SS</u>			
FORM COMPLETED BY <u>LD</u>	DATE <u>4/1/03</u>	TIME <u>08:45</u> AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b> Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>4. Sediment Deposition</b> Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b> Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.																				
	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.										
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)																				
	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.										
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.																				
	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.										
SCORE __ (LB)	Left Bank		10	9		8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank		10	9		8	7	6			5	4	3			2	1	0			
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.																				
	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.										
SCORE __ (LB)	Left Bank		10	9		8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank		10	9		8	7	6			5	4	3			2	1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.																				
	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.										
SCORE __ (LB)	Left Bank		10	9		8	7	6			5	4	3			2	1	0			
SCORE __ (RB)	Right Bank		10	9		8	7	6			5	4	3			2	1	0			

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_



## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION <u>Spring - side stream</u>	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT _____	LONG _____	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>LDSS</u>		LOT NUMBER _____	
FORM COMPLETED BY <u>ED</u>		DATE <u>10/3/03</u> TIME <u>11:45</u> AM PM	REASON FOR SURVEY _____

<b>HABITAT TYPES</b>	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input type="checkbox"/> Snags <u>10</u> % <input type="checkbox"/> Vegetated Banks <u>40</u> % <input type="checkbox"/> Sand <u>40</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags <u>2</u> <input type="checkbox"/> Vegetated Banks <u>9</u> <input type="checkbox"/> Sand <u>9</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS WILL BE EVALUATED IN LAB

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

**APPENDIX D**  
**TREATMENT PLANT INFLUENT AND EFFLUENT SAMPLE LOGS**

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# Lowell, Indiana

## ISCO SAMPLER OPERATION

### STUDY#

THIS IS DOCUMENTATION FOR OPERATION OF THE ISCO SAMPLER - MODEL 3700

A COMPLETE DESCRIPTION OF THE OPERATION OF THIS SAMPLING EQUIPMENT CAN BE FOUND IN THE INSTRUCTION MANUAL - PART# 60-3704-101, REVISION C.

BELOW ARE THE SETTINGS MADE ON THE SAMPLER COMPUTER PRIOR TO BEGINNING THE SAMPLING CYCLE.

- 1) 3 SAMPLERS WILL BE USED IN THIS STUDY. ARE ALL SAMPLERS PROGRAMED TO OPERATE THE SAME yes.
- 2) SAMPLER IS SET FOR SEQUENTIAL SAMPLING yes.
- 3) SAMPLER IS SET FOR (TIME OR FLOW) PACED SAMPLING Time.
- 4) SAMPLING FREQUENCY, - 1 HOURS AND 0 MINUTES.
- 5) VOLUME OF SAMPLE TAKEN AT EACH SAMPLING 310 ml.
- 6) SUCTION LINE LENGTH (FEET), RAW 4, PRI. EFF N.A., FINAL EFF 9.
- 7) NUMBER OF SAMPLES TAKEN IN SAMPLING CYCLE 24.
- 8) SAMPLING STARTED IN POSITION # 1.
- 9) SAMPLING CYCLE STARTED, - DATE 9/18/03, TIME 11:10 am
- 10) SAMPLING CYCLE ENDED, - DATE 9/19/03, TIME 10:10 am
- 11) COMPUTER PROGRAMED TO PURGE SUCTION LINE BEFORE AND AFTER EACH SAMPLING yes.

WA Eckhoff  
9/19/03

Samples transported to P+G/MVZ in  
Cincinnati on 9/19/03, WE

Lowell, Indiana

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN

Lowell, Indiana

Million Gallons per Day

TYPE SAMPLE Raw WHERE TAKEN

Influent - Primary Structure

FACTOR USED FOR CALC. 97.66

SAMPLE # MID \_\_\_\_\_

SAMPLE NUMBER	DATE	TIME	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
---------------	------	------	------------------------------	--

1	9/18/03	11:10am	2.20	215
2		12:10pm	2.40	234
3		1:10	2.55	249
4		2:10	2.45	239
5		3:10	2.25	220
6		4:10	2.15	210
7		5:10	2.20	215
8		6:10	2.20 we	215
9		7:10	2.20 9/19/03	215
10		8:10	2.30	225
11		9:10	2.35	229
12		10:10	2.48	242
13	9/18/03	11:10pm	2.45	239
14	9/19/03	12:10am	2.40	234
15		1:10	2.23	218
16		2:10	2.08	203
17		3:10	1.90	186
18		4:10	1.80	176
19		5:10	1.60	156
20		6:10	1.50	146
21		7:10	1.60	156
22		8:10	1.80	176
23		9:10	2.00	195
24	9/19/03	10:10am	2.15	210

William S. Eckert 9/19/03 Ave 2.14

# Lowell, Indiana

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN Million Gallons per Day

Lowell, Indiana

TYPE SAMPLE Final WHERE TAKEN Just after Cl<sub>2</sub> Contact Chamber

FACTOR USED FOR CALC. 97.66 SAMPLE # MID \_\_\_\_\_

SAMPLE NUMBER	DATE	TIME	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
1	9/18/03	11:10am	2.20	215
2		12:10pm	2.40	234
3		1:10	2.55	249
4		2:10	2.45	239
5		3:10	2.25	220
6		4:10	2.15	210
7		5:10	2.20	215
8		6:10	2.20 <sup>wa</sup> 9/19/03	215
9		7:10	2.20	215
10		8:10	2.30	225
11		9:10	2.35	229
12		10:10	2.48	242
13	9/18/03	11:10pm	2.45	239
14	9/19/03	12:10am	2.40	234
15		1:10	2.23	218
16		2:10	2.08	203
17		3:10	1.90	186
18		4:10	1.80	176
19		5:10	1.60	156
20		6:10	1.50	146
21		7:10	1.60	156
22		8:10	1.80	176
23		9:10	2.00	195
24	9/19/03	10:10am	2.15	210

2 Isco samplers were used at this sampling location in order to obtain the required volume of sample. Both samplers were operated the same and the composite samples were formed in the same way.

William A. Telehoff 9/19/03

# Bryan, Ohio

## ISCO SAMPLER OPERATION

### STUDY#

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BELOW ARE THE SETTINGS MADE ON THE SAMPLER COMPUTER PRIOR TO BEGINNING THE SAMPLING CYCLE.

- 1) 3 SAMPLERS WILL BE USED IN THIS STUDY. ARE ALL SAMPLERS PROGRAMED TO OPERATE THE SAME yes.
- 2) SAMPLER IS SET FOR SEQUENTIAL SAMPLING yes.
- 3) SAMPLER IS SET FOR (TIME OR FLOW) PACED SAMPLING Time.
- 4) SAMPLING FREQUENCY, - 1 HOURS AND 0 MINUTES.
- 5) VOLUME OF SAMPLE TAKEN AT EACH SAMPLING 280 ml.
- 6) SUCTION LINE LENGTH (FEET), RAW 9, PRI. EFF N.A., FINAL EFF 7.
- 7) NUMBER OF SAMPLES TAKEN IN SAMPLING CYCLE 24.
- 8) SAMPLING STARTED IN POSITION # 1. <sup>WE</sup><sub>10/2/03</sub>
- 9) SAMPLING CYCLE STARTED, - DATE 11:30 am TIME 11:30 am
- 10) SAMPLING CYCLE ENDED, - DATE 10/3/03 TIME 10:30 am
- 11) COMPUTER PROGRAMED TO PURGE SUCTION LINE BEFORE AND AFTER EACH SAMPLING yes.

William A Echehoff 10/3/03

Samples transported to P+G/MVL in Cincinnati on 10/3/03. WE

# Bryan, Ohio

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN Million Gallons per Day

TYPE SAMPLE Raw WHERE TAKEN Aeration/Grit Removal Tank

FACTOR USED FOR CALC. 108 SAMPLE # MID \_\_\_\_\_

SAMPLE NUMBER	DATE TAKEN	TIME TAKEN	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
---------------	------------	------------	------------------------------	--

1	10/2/03	11:30 am	2.5	270
2		12:30 pm	2.4	259
3		1:30	2.4	259
4		2:30	2.4	259
5		3:30	2.2	238
6		4:30	2.1	227
7		5:30	2.2	238
8		6:30	2.0	216
9		7:30	2.2	238
10		8:30	2.3	248
11		9:30	2.5	270
12		10:30	2.2	238
13	10/2/03	11:30 pm	2.1	227
14	10/3/03	12:30 am	2.0	216
15		1:30	2.0	216
16		2:30	2.0	216
17		3:30	1.8	194
18		4:30	1.6	173
19		5:30	1.5	162
20		6:30	1.7	184
21		7:30	1.8	194
22		8:30	2.2	238
23		9:30	2.3	248
24	10/3/03	10:30	2.3	248

10/3/03 10:30 A. E. ... 10/3/03

**Bryan, Ohio**

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN Million Gallons per Day

TYPE SAMPLE Final WHERE TAKEN At The Parshall Flume - Cl2 Contact side  
FACTOR USED FOR CALC. 108 SAMPLE # MID \_\_\_\_\_

SAMPLE NUMBER	DATE	TIME	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
---------------	------	------	------------------------------	--

1	10/2/03	11:30 am	2.5	270
2		12:30 pm	2.4	259
3		1:30	2.4	259
4		2:30	2.4	259
5		3:30	2.2	238
6		4:30	2.1	227
7		5:30	2.2	238
8		6:30	2.0	216
9		7:30	2.2	238
10		8:30	2.3	248
11		9:30	2.5	270
12		10:30	2.2	238
13	10/2/03	11:30 pm	2.1	227
14	10/3/03	12:30 am	2.0	216
15		1:30	2.0	216
16		2:30	2.0	216
17		3:30	1.8	194
18		4:30	1.6	173
19		5:30	1.5	162
20		6:30	1.7	184
21		7:30	1.8	194
22		8:30	2.2	238
23		9:30	2.3	248
24	10/3/03	10:30	2.3	248

2 Isco samplers were used at this sampling location in order to obtain the required volume of sample. Both samplers were operated the same and the composite samples were formed in the same way.

William A. Echeburto 10/3/03



# Wilmington, Ohio

## ISCO SAMPLER OPERATION

### STUDY#

THIS IS DOCUMENTATION FOR OPERATION OF THE ISCO SAMPLER - MODEL 3700

A COMPLETE DESCRIPTION OF THE OPERATION OF THIS SAMPLING EQUIPMENT CAN BE FOUND IN THE INSTRUCTION MANUAL - PART# 50-3704-101, REVISION C.

BELOW ARE THE SETTINGS MADE ON THE SAMPLER COMPUTER PRIOR TO BEGINNING THE SAMPLING CYCLE.

- 1) 3 SAMPLERS WILL BE USED IN THIS STUDY. ARE ALL SAMPLERS PROGRAMED TO OPERATE THE SAME yes.
- 2) SAMPLER IS SET FOR SEQUENTIAL SAMPLING yes.
- 3) SAMPLER IS SET FOR (TIME OR FLOW) PACED SAMPLING Time.
- 4) SAMPLING FREQUENCY, - 1 HOURS AND 0 MINUTES.
- 5) VOLUME OF SAMPLE TAKEN AT EACH SAMPLING 290 ml.
- 6) SUCTION LINE LENGTH (FEET), RAW 8, PRI. EFF N.A., FINAL EFF 8.
- 7) NUMBER OF SAMPLES TAKEN IN SAMPLING CYCLE 24.
- 8) SAMPLING STARTED IN POSITION # 1.
- 9) SAMPLING CYCLE STARTED, - DATE 9/30/03, TIME 12:05 p.m
- 10) SAMPLING CYCLE ENDED, - DATE 10/1/03, TIME 11:05 am
- 11) COMPUTER PROGRAMED TO PURGE SUCTION LINE BEFORE AND AFTER EACH SAMPLING yes.

William S Eckhoff

10/1/03

Samples transported to P+G/MVL in  
Cincinnati on 10/1/03. WE

Wilmington, Ohio

STUDY#

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN

Million Gallons per Day

TYPE SAMPLE } Raw WHERE TAKEN just after bar screen

FACTOR USED FOR CALC.  $\frac{117 \text{ Wg}}{109}$  SAMPLE # MID

SAMPLE NUMBER	DATE	TIME	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
1	9/30/03	12:05 pm	2.05	<del>240</del> 223 <sup>Wg</sup> 10/1/03
2		1:05	2.21	<del>259</del> 241 <sup>Wg</sup> 10/1/03
3		2:05	2.17	237
4		3:05	2.19	239
5		4:05	2.32	253
6		5:05	2.43	265
7		6:05	2.11	230
8		7:05	2.57	280
9		8:05	2.15	234
10		9:05	2.14	233
11		10:05	1.83	199
12	9/30/03	11:05 pm	2.17	236
13	10/1/03	12:05 am	1.88	205
14		1:05	1.68	183
15		2:05	1.91	208
16		3:05	1.28	140
17		4:05	1.50	164
18		5:05	1.94	211
19		6:05	1.68	183
20		7:05	1.77	193
21		8:05	2.34	255
22		9:05	2.31	252
23		10:05	2.68	292
24	10/1/03	11:05 am	2.40	262

William A. Telechak 10/1/03 Ave flow 2.05

Wilmington, Ohio

THIS IS THE DOCUMENTATION FOR THE COMPOSITING OF HOURLY SAMPLES TAKEN WITH THE ISCO SAMPLER. THE COMPOSITING IS BASED ON SEWAGE TREATMENT PLANT FLOW AS DESCRIBED BELOW. STP FLOW EXPRESSED IN Million Gallons per Day.

TYPE SAMPLE Final WHERE TAKEN Just before UV light disinfection

FACTOR USED FOR CALC.  $\frac{117}{109}$  <sup>WE</sup> <sub>10/1/03</sub> SAMPLE # MID \_\_\_\_\_

SAMPLE NUMBER	DATE SAMPLE TAKEN	TIME SAMPLE TAKEN	STP FLOW AT TIME OF SAMPLING	CALCULATED VOLUME OF SAMPLE TO GO INTO COMPOSITE
---------------	-------------------	-------------------	------------------------------	--

1	9/30/03	12:05 pm	2.05	<del>240</del> 223
2		1:05	2.21	<del>259</del> 241
3		2:05	2.17	237
4		3:05	2.19	239
5		4:05	2.32	253
6		5:05	2.43	265
7		6:05	2.11	230
8		7:05	2.57	280
9		8:05	2.15	234
10		9:05	2.14	233
11		10:05	1.83	199
12	9/30/03	11:05 pm	2.17	236
13	10/1/03	12:05 am	1.88	205
14		1:05	1.68	183
15		2:05	1.91	208
16		3:05	1.28	140
17		4:05	1.50	164
18		5:05	1.94	211
19		6:05	1.68	183
20		7:05	1.77	193
21		8:05	2.34	255
22		9:05	2.31	252
23		10:05	2.68	292
24	10/1/03	11:05 am	2.40	262

2 Isco samplers were used at this sampling location in order to obtain the required volume of sample. Both samplers were operated the same and the composite sample was formed the same way.

William A. Eckhardt 10/1/03

**APPENDIX E**  
**LABORATORY BENTHIC MACROINVERTEBRATE IDENTIFICATION**  
**DATA SHEETS**

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Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody: Seep + Detergent - Lowell Date: 9-18-03 Page 1 of 1 Identified by: M.E. Snee  
 Time of Collection    Station 1 Sample Type: HD Serial #: 1

Taxa	Taxa Code	Total Count (1/1)	Comments
Oligochaeta		6	
Stenonema		4	
Rheumatobates		1	
Niphargus		2	
Caecidotea sp.		4	
Ceratomyxus fasciatus		1	
Sialis sp.		1	
Ranatra sp.		1	
Orthoneura propinqua		6	
Amphibia sp.		3	
Sphaerium		1	
Enallagma sp.		5	
Asynellidae sp.		4	
Psephenidae sp.		2	Count as sp
Chironomidae (P)		1	
Polypedilum illinoense		10	
Thienemannimyia sp		1	
Chironomus sp.		3	
Glyptotendipes sp		1	
		1	



Benthic Macroinvertebr Laboratory Bench Sheet

Waterbody: Scout Detergent - Lower Well outfall Date: 9-18-03 Page 1 of 2 Identified by: M.E. Sneen  
 Time of Collection 1407401 Station 2 Sample Type: HD Serial #: 0

Taxa	Taxa Code	Total Count (1/1)	(1/1)	(1/6)	Comments
Alacantia		83			
Amphicarpus sp.		104	(4)	(5)	
Hydropsyche sp.		17		(1)	
Stenonema		150		(9)	
Trichoptera		19	(2)	(1)	
Baetis		36	(3)	(2)	
Coenocentrus		18	(1)	(1)	
Asiatotendipes		167		(10)	
Chironomus tentaculatus		117	(7)		
Limnocalanus		67	(4)		
Polychaeta		2	(2)		
Caprellidae		21	(4)	(1)	
Enallagma		35	(2)	(2)	
Araucario		2			
Substratum		17			
Peltoniadeles		20	(3)	(1)	
Physella		19	(2)	(1)	
Ammonoeba		51	(1)	(3)	
Oronotus fragrans		20	(3)	(1)	
Nitidulidae		1	(1)		
Macrobrachium		3	(3)		
Leucophaea maculosa		1	(1)		
Synsura		1	(1)		
Tropidocera		3	(3)		
Chironomidae (P)		1	(1)		
Polypodium illinoense		133		(8)	
Polypodium flavum		450		(27)	
Chironomus bicinctus grp.		33		(2)	
Chironomus tremulus grp.		167		(10)	
Chironomus sp.		17		(1)	
Ablabesmyia mallochii		750		(45)	
		17		(1)	

Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project:

Time of Collection

Station

Date:

Page 2 of 2

Identified by: M.E. Sheen

Sample Type: HD

Serial #:

Qual  Serial #:

Taxa

Taxa Code

Total Count (1/1)

Comments

Nicotendipes neomolestus  
 Nicotendipes molestus  
 Tanytarsus sp.  
 Paratanytarsus sp.  
 Stictochironomus sp.  
 Tanytarsus gieslii grp

(16)

(2)

(2)

(2)

(2)

(1)

(2)

33

33

33

33

17

33



Benthic Macroinvertebrates Laboratory Bench Sheet

Waterbody/project: Serp + Netergent - Lower 11 End of mixing Date: 9-18-03 Page 1 of 2 Identified by: M.E. Sneed  
 Time of Collection: 14:40 Station 3 Sample Type: HD Serial #: 3

Taxa	Taxa Code	Total Count (1/1)	(1/1) (5/84)	Comments
Algaebata		12	(2)	
Siphon		12	(2)	
Beetle intermedia		38	(2)	
Trematodes sp		6	(1)	
Chironomidae sp		403	(10)	
Chironomidae sp		12	(2)	
Chironomidae (P)		65	(11)	
Trematoda		24	(4)	
Caecidota sp		6	(1)	
Ameba sp		12	(2)	
Macronychus glabratus		8	(2)	
Nitidulid sp		8	(2)	
Physella sp		1	(1)	
Ferrissia sp		1	(1)	
Hydroscapha betteri		91	(2)	
Mooreobolus microstoma		6	(1)	
Coelotomus sp		6	(1)	
Calopteryx sp		1	(1)	
Fasziella sp		1	(1)	
Trogasterius sp		1	(1)	
Laccophilus maculosis		2	(2)	
Corixidae sp		1	(1)	
Hydroptera similans		1	(1)	
Simulium sp		3	(3)	
Oreoretus propinquus		1	(1)	
Oreoretus virilis		1	(1)	
Polyperilum illinoense		2	(2)	
Polyperilum scabrae grp		42	(7)	
Polyperilum flavum		6	(1)	
Chironomus sp		125	(2)	
Thienemannella xen		250	(42)	
Paratanytarsus sp		6	(1)	
		12	(2)	

Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project:

Time of Collection

Station

Date:

Page 2 of 2

Identified by: M.E. Sneen

Sample Type:

HD

Qual

Serial #:

Taxa	Taxa Code	Total Count (1/1)	Sample Type: HD	Qual	Serial #	Comments
<i>Chironomus tentulus</i> gmp		24	(5/84)			
<i>Chironomus bicornatus</i> gmp		24	(4)			
<i>Tanytarsus querulus</i>		6	(4)			
<i>Parakiefferiella</i> sp.		6	(1)			
<i>Thienemannimyia</i> gmp.		12	(1)			
<i>Dicranotendipes modestus</i>		6	(2)			
			(1)			

Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody.. reject: Seep + Detergent-Low Date: 9-18-03 Page 1 of 1 Identified by: M.E. Sneed  
 Time of Collection Station 4 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Taxa	Taxa Code	Total Count (1/1)	Sample Type: (Y)	HD	Qual	Serial #: 4	Comments
Oligochaeta		47	(7)	(3)			
Caedidatea sp		21	(2)				
Turbellaria		19					
Chironomidae (P)		29	(1)	(3)			
Chironomopsysphe sp.		30		(3)			
Colevia fluminea		19		(2)			
Argia sp.		20	(1)	(2)			
Physa sp.		20	(1)	(2)			
Simulium sp		99	(5)	(10)			
Baetis imrealaris		20	(1)	(2)			
Lucinophila sp.		22	(3)	(2)			
Anuronyx variegatus		2	(2)				
Hydropsyche netteni		123	(1)	(13)			
Hydropsyche similans		66		(7)			
Sialis		9		(1)			
Calopteryx sp.		9		(1)			
Stenonon		28		(3)			
Polyperilium illinoense		675		(72)			
Polyperilium flavum		94		(10)			
Tramantaria quertus		9		(1)			
Krotonantarsus		28		(3)			
Chironomus biniectus grp		28		(3)			
Thienemannimyia grp.		9		(1)			
Polyperilium laterale grp.		66		(7)			
Fredlandius		9		(1)			



Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Sloop + Detergent - Wilmington v/s 14074.0 Date: 10-1-03 Page 1 of 2 Identified by: M.E. Sneen  
 Time of Collection:    Station 1 Sample Type: HD Qual Serial #: 1

Taxa	Taxa Code	Total Count (1/1)	Comments
Oligochaeta		10	
Colopteryx sp.		8	
Enallagma sp.		1	
Aeshna sp.		1	
Boyeria vinosa		1	
Chironomopsycha sp.		2	
Chironomidae (P)		7	
Crangonyx sp.		6	
Lironeis sp.		6	
Ferrissia sp.		1	
Physella sp.		2	
Stagnum sp.		1	
Eriophlella punctata punctata		1	
Baetis intercalaris		3	
Mesovela sp.		1	
Hemerodromia sp.		4	
Simulium sp.		3	
Sternus sp.		1	
Ceratopsyche morosa		7	
Hydropsyche betteni-		1	
Pteronarcys tarsus		1	
Neonarcys tarsus		1	
Thienemannimyia grp		9	
Caryoneura		2	
Polyptilum flavum		1	
Polyptilum illinoense		3	
Tanytarsus glabrescens grp		4	
Tanytarsus guerlus grp		2	
Briffa		1	
Dicranolipes simpsoni		2	
Stenochironomus		6	
Stictochironomus		2	



Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Sage + Neversent - Wilmington mixing 14074.01 Date: 9-30-03 Page 1 of 1 Identified by: M.E. Sneed

Time of Collection       Station 2 Sample Type: HD Qual (a) Serial #: 2

Taxa	Taxa Code	Total Count (1/1)	(%)	(1/4)	Comments
Oligochaeta		829		(116)	
Tubellaria		2	(2)		
Ferrissia sp.		1	(1)		
Calopteryx sp.		165	(1)	(23)	
Enallagma sp.		71		(10)	
Argia sp.		7		(1)	
Craononyx sp.		21		(3)	
Chironomidae		14		(2)	
Littoreus sp.		7		(1)	
Physella sp.		14		(2)	
Corbicula Clumosa		7		(1)	
Sarracenia sp.		14		(2)	
Hebidella stagnalis		7		(1)	
Moronobdella macrostoma		21		(3)	
Tipula sp.		7		(1)	
Gerris sp.		7		(1)	
Panantarsus		121		(17)	
Phaenopsectra punctipes		14		(2)	
Tribolius		7		(1)	
Polypedilum illinoense		14		(2)	
Polypedilum flavum		7		(1)	
Abdoemys malleoh.		14		(1)	
Tantarsus querulus		21		(3)	
Rheotantarsus		36		(5)	
Tantarsus glabersens		21		(3)	





Benthic Macroinvertebra' Laboratory Bench Sheet

Waterbody/Project: Soap + Detergent - Millington B/S 14074.01 Date: 9-30-03 Page 1 of 1 Identified by: M.E. Sneen

Time of Collection:

Station: 3

Sample Type: HD

Qual Serial #: 3

Taxa	Taxa Code	Total Count (1/1)	Comments
Oligoneura		9	
Ceratopsyche morosa		3	
Cheumatopsyche		1	
Tibellina		1	
Psephenus sp.		8	
Ferrissia sp.		1	
Calopteryx sp.		1	
Craugastor		1	
Ablabesmatidae (F)		7	
Gerris sp.		2	
Amblyops		6	
Amblyops maculatus		1	
Tribia sp.		5	
Sarraceniidae sp.		1	
Enallagma sp.		15	
Psephenus sp.		1	
Psephenus sp.		1	
Liriodromus sp.		1	
Paratanytarsus		15	
Nicotanytarsus nemodestus		1	
Dicranotanytarsus simpsoni		1	
Phaenopspectra punctipes		3	
Tanytarsus quertus grp.		3	
Heterotanytarsus		1	
Rheotanytarsus		5	
Tanytarsus sp.		1	
Tanytarsus glaber-scens grp.		1	
Thiemannimyia grp.		2	
Parametricnemus		1	
Polydromus illinoense		2	
Dicranotanytarsus modestus		1	
Tribelos		1	
			Count as taxa

Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project:

Time of Collection

Station

Date:

Page \_\_\_ of \_\_\_

Identified by: M.E. Sneen

Sample Type: HD

Qual Serial #: \_\_\_\_\_

Taxa Code

Taxa

Total Count (1/1)

Comments

Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Soap + Detergent - Wilmington Far B/S 14024.01 Date: 9-30-03 Page 1 of 1 Identified by: M.E. Sneen

Time of Collection

Station 4

Sample Type:

HD

Qual Serial #: 4

Taxa	Taxa Code	Total Count (1/1)	(1)	(1/26)	Comments
Oligoneura		1	1	0	(26)
Coelopteryx sp.		3	3	0	(9)
Ceratopsyche morosa		2	2	0	(52)
Chenopodopsyche		1	1	4	(34)
Laetis intercalaris		2	2	9	(7)
Lirinus sp.		1	1	1	
Grammatodes rusticus		1	1	1	
Araia sp.		4	4	4	(1)
Ecdyonura sp.		2	2	5	(6)
Ephemerella punctata punctata		1	1	1	
Tipula sp.		4	4	3	(1)
Hydropsyche betteni		4	4	2	(10)
Parapsyche sp.		1	1	3	(33)
Physella sp.		4	4	2	(1)
Chironomidae (f)		2	2	1	(5)
Dicranotendipes neomolestus		4	4	2	(1)
Tanytarsus sp.		2	2	1	(5)
Paratanytarsus		1	1	6	(4)
Microtopus bicinctus		4	4	2	(1)
Tanytarsus glabrescens sp.		4	4	2	(1)
Cryptotendipes		4	4	2	(1)
Polypedilum fallax grp		4	4	2	(1)
Polypedilum illinoense		4	4	2	(1)



Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Soap + Detergent - Bryan US 14074.01 Date: 10-3-03 Page 1 of 1 Identified by: M.E. Snee

Time of Collection: Station 1 Sample Type: HD Serial #: 1

Taxa	Taxa Code	Total Count (1/1)	(1)	(7/27)	Comments
<i>Allogasteria</i>		1	1	(45)	
<i>Belostomatia</i> sp.		3	3		
<i>Encallagma</i> sp.		6	4	(26)	
<i>Trichopterus</i> sp.		2	2	(1)	
<i>Ephemera</i> sp.		1	1		
<i>Ephemera pumata pumata</i>		8	4	(3)	
<i>Hebertella stagnalis</i>		2	2		
<i>Hemiptera</i> sp.		2	2		
<i>Psephenus</i> sp.		7	1	(36)	
<i>Pseudis</i> sp.		7	1	(1)	
<i>Psephenus</i> sp.		4	2	(18)	
<i>Psephenus</i> sp.		9	3	(1)	
<i>Chironomidae</i> (P)		1	1	(4)	
<i>Argia</i> sp.		5	2	(2)	
<i>Haemaphysalis</i> sp.		1	1	(4)	
<i>Empoasca</i> sp.		2	2	(1)	
<i>Hydropsyche</i> sp.		5	2	(2)	
<i>Stygopoda</i> sp.		1	1	(4)	
<i>Cricotopus bicinctus</i> grp		5	7	(22)	
<i>Cricotopus tremulus</i> grp		6	2	(24)	
<i>Nannochloris</i> sp.		2	2	(1)	
<i>Tanytarsus</i> sp.		2	2	(1)	
<i>Chironomus</i>		5	2	(2)	
<i>Paratanytarsus</i>		2	2	(1)	
<i>Thienemannimyia</i> grp		2	2	(1)	



Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Sand + Detergent - Bryon mixing 14034.01 Date: 10-2-03 Page 1 of 1 Identified by: M.E. Sneed  
 Time of Collection: 2 Station 2 Sample Type: HD Qual Serial #: 2

Taxa	Taxa Code	Total Count (1/1)	(X)	(Y)	Comments
Oligochaeta		50	50	(10)	
Tubellaria		50	50	(1)	
Chironomidae (P)		150	150	(3)	
Argia sp.		150	150	(3)	
Enallagma sp.		150	150	(31)	
Platnemis lydia		50	50	(1)	
Berosus sp.		1350	1350	(27)	
Tropisternus sp.		51	51	(1)	
Pisidium sp.		51	51	(1)	
Capitulum sp.		50	50	(1)	
Polychaetes		400	400	(8)	
Lamprolaima maculosus		51	51	(1)	
Helminthia stagnalis		50	50	(1)	
Tipula sp.		200	200	(4)	
Anopheles sp.		50	50	(1)	
Procladius sp.		200	200	(4)	
Stygomyia sp.		100	100	(2)	
Belostomatid sp.		3	3	(3)	
Galathea sp.		1	1	(1)	
Haemaphys sp.		1	1	(1)	
Chironomus		50	50	(1)	
Chironomus bicinctus grp		300	300	(6)	
Chironomus tentans grp		100	100	(2)	
Paratanytarsus		200	200	(4)	
Abietomyia sp.		50	50	(1)	
Polypedilum illinoense		100	100	(2)	
Stictochironomus		50	50	(1)	
Thienemanniya grp.		50	50	(1)	





Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Soap + Detergent - Bryan D/S 14074.01 Date: 10-2-03 Page 1 of 1 Identified by: M.E. Snee  
 Time of Collection: Station 3 Sample Type: HD Qual Serial #: 3

Taxa	Taxa Code	Total Count (1/1)	(X)	(Y)	Comments
Diglossina		3600		(72)	
Tubificora		50		(1)	
Chironomidae (P)		50		(1)	
Emilagma sp		2151	(1)	(43)	
Platnemus lydia		50		(1)	
Polydora sp.		251	(1)	(5)	
Berosus sp.		953	(3)	(19)	
Procladius sp.		352	(2)	(7)	
Stygicoida sp		200		(4)	
Tropocyclops sp.		51	(1)	(1)	
Asynellus maculosus		51	(1)	(1)	
Tipula sp.		50		(1)	
Helophila triserialis		50		(1)	
Caenis sp		150		(3)	
Hydropsyche sp.		50		(1)	
Notonecta sp.		50		(1)	
Abletomyia mollischi		50		(1)	
Microtopis tremulus grp		500		(10)	
Microtopis bicinctus grp		800		(16)	
Paratanytarsus		550		(11)	
Hydrobaenus		50		(1)	
Thienemannimyia grp		50		(1)	
Polyperilum illinoense		100		(2)	
Phaenopsectra punctipes		50		(1)	



Benthic Macroinvertebrate Laboratory Bench Sheet

Waterbody/Project: Soak + Detergent - Bryan - Falls 1407401 Date: 10-2-03 Page 1 of 1 Identified by: M.E. Sneed

Time of Collection: 4 Station 4 Sample Type: HD Serial #: 4

Taxa	Taxa Code	Total Count (1/1)	(Y)	(1/2)	Comments
<i>Baetacea</i>		1950	(1)	(1/2)	
<i>Tubificora</i>		2	(2)	(39)	
<i>Chironomidae (P)</i>		151	(1)	(3)	
<i>Argia sp.</i>		300		(6)	
<i>Ephydra sp.</i>		2100		(42)	
<i>Limnoria sp.</i>		50		(1)	
<i>Paludicola sp.</i>		50		(1)	
<i>Berosus sp.</i>		2100		(42)	
<i>Psephenus sp.</i>		501	(1)	(10)	
<i>Psephenus sp.</i>		53	(3)	(1)	
<i>Hydropsyche sp.</i>		51	(1)	(1)	
<i>Exocoetia punctata punctata</i>		52	(2)	(1)	
<i>Nubivipha sp.</i>		50		(1)	
<i>Anopheles sp.</i>		50		(1)	
<i>Stygomyia sp.</i>		200		(4)	
<i>H. heteri</i>		1	(1)		
<i>Triagostoides sp.</i>		1	(1)		
<i>Microtendipes</i>		50		(1)	
<i>Polypedilum illinoense</i>		250		(5)	
<i>Microtopus bicinctus grp</i>		1200		(24)	
<i>Microtopus tremulus grp</i>		350		(7)	
<i>Paratanytarsus</i>		150		(3)	
<i>Tanytarsus glabrescens grp</i>		50		(1)	
<i>Trinemannimyia grp.</i>		50		(1)	
<i>Telofelopia</i>		50		(1)	
<i>Microtendipes neomolestus</i>		100		(2)	
		50		(1)	



Benthic Macroinvertebra Laboratory Bench Sheet

Waterbody/Project: Sloop + Detergent - Bryan - Sidestream 140740 Date: 10-3-03 Page 1 of 1 Identified by: M.E. Sneen

Time of Collection:    Station 5 Sample Type: HD Qual Serial #: 5

Taxa	Taxa Code	Total Count (1/1)	(1)	(2)	Comments
Oligoneata		2400	(1)	(48)	
Belostomatina sp.			(1)		
Tipula sp.		52	(2)	(1)	
Chironomus sp.		51	(1)	(1)	
Procladius sp.		1152	(2)	(23)	
Chironomus sp.		1	(1)		
Chironomus sp.		1	(1)		
Chironomus ruscarius		1	(1)		
Physella sp.		600		(12)	
Procladius sp.		100		(2)	
Procladius sp.		50		(1)	
Streblospio sp.		200		(4)	
Lacandonia maculosa		50		(1)	
Berosus sp.		1500		(30)	
Procladius sp.		150		(3)	
Procladius sp.		50		(1)	
Procladius sp.		200		(4)	
Procladius sp.		50		(1)	
Procladius sp.		50		(1)	
Theremanniomyia grp		50		(1)	
Paratanytarsus		150		(3)	
Polypedilum illinoense		350		(7)	
Rhectanytarsus		100		(2)	
Chironomus		50		(1)	
Chironomus bicinctus grp		1150		(23)	
Chironomus tremulus grp		200		(4)	
Hydrobaenus		100		(2)	
Tanytarsus glaberrimensis grp		50		(1)	
Tetopelebia		100		(2)	
Pteronotus		50		(1)	
Nannociadus distinctus		50		(1)	



**APPENDIX F**  
**LABORATORY PHYSICAL AND CHEMICAL PARAMETER DATA REPORTS**

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FOR N49894



FEB 10 2004

BCP/EA

January 29, 2004

Mr. Mike Ciarlo  
EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

Dear Mr. Ciarlo:

During a recent review of the calculations used for determining particle size data, Accutest concluded that the definition used for the method did not match the specifications of the ASTM method, necessitating changes to the Accutest approach. These changes have impacted data previously delivered to your organization.

Accutest had previously defined gravel as particles passing through the 3-inch sieve and retained on the 3/8-inch sieve. Sand was defined as particles passing through the No. 4 sieve and retained on the No. 100 sieve. Silt, clay, and colloids were defined as particles retained and passing through the No. 200 sieve.

These definitions vary slightly from the definitions found in method ASTM D422. The definitions from ASTM-D422 are as follows:

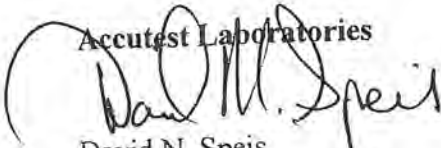
- Gravel is defined as particles passing through the 3-inch sieve and retained on the No. 4 sieve.
- Sand is defined as particles passing through the No. 4 sieve and retained on the No. 200 sieve.
- Silt, clay, and colloids are defined as particles passing through the 200 sieve.

Accutest has edited the particle size reporting procedures to reflect the ASTM particle size definitions to assure that the data is reported to the ASTM specification. The % gravel, % sand, and % silt, clay, and colloids values for the enclosed jobs have been recalculated using the ASTM definitions. The updated results have been appended to the Accutest database.

We apologize for any inconvenience this may have caused you. If you have any additional questions, please feel free to contact me or your Accutest client services representative.

Sincerely,

Accutest Laboratories

  
David N. Speis

Director, Corporate Quality Assurance





Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49894

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Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 8



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.

### Sample Summary

EA Engineering

Job No: N49894

Soap and Detergent Association (SDA), Sediment Sampling  
 Project No: 1407401.0001

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
N49894-1	10/03/03	10:50 LD	10/04/03	SO	Soil	BRYAN-SED-U
N49894-2	10/02/03	12:30 LD	10/04/03	SO	Soil	BRYAN-SED-D
N49894-3	10/02/03	15:15 LD	10/04/03	SO	Soil	BRYAN-SED-M
N49894-4	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F
N49894-5	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F-DUP

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Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-U	<b>Date Sampled:</b> 10/03/03
<b>Lab Sample ID:</b> N49894-1	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 82.5
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	77.0		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	54.5		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	35.4		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	31.6		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	22.4		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	13.2		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.8		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.1		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	4.7		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	45.6		%	1	10/27/03	ST	ASTM D422-63
% Sand	49.8		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	4.7		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	<370	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	17.5		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	173	24	mg/kg	1	10/09/03 10:13	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	9610	1200	mg/kg	1	10/23/03 12:53	SJG	CORP ENG 81M/SW9060M
Total Organic Content	4.9	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	BRYAN-SED-D	<b>Date Sampled:</b>	10/02/03
<b>Lab Sample ID:</b>	N49894-2	<b>Date Received:</b>	10/04/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	77.8
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	96.7		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	87.7		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	62.7		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	55.3		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	34.2		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	15.8		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.7		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.5		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	5.3		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	3		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	12		%	1	10/27/03	ST	ASTM D422-63
% Sand	82.4		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	5.3		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.6		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1230	400	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	22.2		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	212	25	mg/kg	1	10/09/03 10:14	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	11400	1300	mg/kg	1	10/23/03 13:05	SJG	CORP ENG 81M/SW9060M
Total Organic Content	1.7	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-M	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49894-3	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 81.8
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	93.0		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	64.2		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	40.5		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	36.4		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	26.4		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	15.1		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	4.5		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	2.9		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	2.6		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	36		%	1	10/27/03	ST	ASTM D422-63
% Sand	61.6		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	2.6		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.8		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1030	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	18.2		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	184	24	mg/kg	1	10/09/03	10:15 VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	5480	1200	mg/kg	1	10/23/03	13:24 SJG	CORP ENG 81M/SW9060M
Total Organic Content	2.1	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-F	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49894-4	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 73.7
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	99.5		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	94.7		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	83.4		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	81.4		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	75.5		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	66.4		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	47.7		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	22.8		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	22.0		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	10		%	1	10/27/03	ST	ASTM D422-63
% Gravel	5.3		%	1	10/27/03	ST	ASTM D422-63
% Sand	73.2		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	21.5		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4360	420	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	26.3		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	482	26	mg/kg	1	10/09/03 10:16	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon <sup>b</sup>	9570	1400	mg/kg	1	10/23/03 13:48	SJG	CORP ENG 81M/SW9060M
Total Organic Content	1.5	0.010	%	1	10/27/03	MW	ASTM D2974-87

(a) Data extrapolated from higher and lower data points due to possible analytical problem with hydrometer analysis at short analysis times.

(b) Multiple injections indicate possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-F-DUP	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49894-5	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 81.0
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	98.1		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	93.5		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	82.9		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	80.8		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	74.3		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	65.2		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	47.4		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	24.9		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	23.7		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
% Gravel	6.5		%	1	10/27/03	ST	ASTM D422-63
% Sand	69.8		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	23.6		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4300	380	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	19		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	385	24	mg/kg	1	10/09/03 10:18	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	6440	1200	mg/kg	1	10/23/03 14:13	SJG	CORP ENG 81M/SW9060M
Total Organic Content	6.2	0.010	%	1	10/24/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.







January 29, 2004

Mr. Mike Ciarlo  
EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

Dear Mr. Ciarlo:

During a recent review of the calculations used for determining particle size data, Accutest concluded that the definition used for the method did not match the specifications of the ASTM method, necessitating changes to the Accutest approach. These changes have impacted data previously delivered to your organization.

Accutest had previously defined gravel as particles passing through the 3-inch sieve and retained on the 3/8-inch sieve. Sand was defined as particles passing through the No. 4 sieve and retained on the No. 100 sieve. Silt, clay, and colloids were defined as particles retained and passing through the No. 200 sieve.

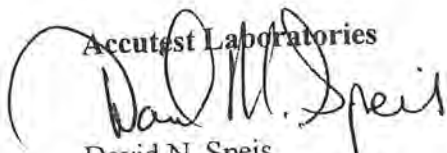
These definitions vary slightly from the definitions found in method ASTM D422. The definitions from ASTM-D422 are as follows:

- Gravel is defined as particles passing through the 3-inch sieve and retained on the No. 4 sieve.
- Sand is defined as particles passing through the No. 4 sieve and retained on the No. 200 sieve.
- Silt, clay, and colloids are defined as particles passing through the 200 sieve.

Accutest has edited the particle size reporting procedures to reflect the ASTM particle size definitions to assure that the data is reported to the ASTM specification. The % gravel, % sand, and % silt, clay, and colloids values for the enclosed jobs have been recalculated using the ASTM definitions. The updated results have been appended to the Accutest database.

We apologize for any inconvenience this may have caused you. If you have any additional questions, please feel free to contact me or your Accutest client services representative.

Sincerely,

Accutest Laboratories  
  
David N. Speis  
Director, Corporate Quality Assurance

Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N48765

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Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 16



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

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## Sample Summary

EA Engineering

Job No: N48765

Soap and Detergent Association (SDA), Sediment Sampling  
Project No: 1407401.0001

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
N48765-1	09/19/03	07:30 MC	09/22/03	AQ	Water	LOWELL-STREAM-U
N48765-2	09/18/03	15:30 MC	09/22/03	AQ	Water	LOWELL-STREAM-M
N48765-3	09/19/03	08:10 MC	09/22/03	AQ	Water	LOWELL-STREAM-D
N48765-4	09/18/03	09:40 MC	09/22/03	AQ	Water	LOWELL-STREAM-F
N48765-5	09/19/03	12:00 MC	09/22/03	AQ	Water	LOWELL-PORE-U
N48765-6	09/18/03	17:00 MC	09/22/03	AQ	Water	LOWELL-PORE-M
N48765-7	09/19/03	09:45 MC	09/22/03	AQ	Water	LOWELL-PORE-D
N48765-8	09/18/03	12:10 MC	09/22/03	AQ	Water	LOWELL-PORE-F
N48765-9	09/19/03	11:30 MC	09/22/03	SO	Solid	LOWELL-SED-U
N48765-10	09/18/03	17:00 MC	09/22/03	SO	Solid	LOWELL-SED-M
N48765-11	09/19/03	08:10 MC	09/22/03	SO	Solid	LOWELL-SED-D
N48765-12	09/18/03	09:40 MC	09/22/03	SO	Solid	LOWELL-SED-F
N48765-13	09/19/03	08:10 MC	09/22/03	AQ	Water	LOWELL-STREAM-D-DUP

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-STREAM-U	<b>Date Sampled:</b> 09/19/03
<b>Lab Sample ID:</b> N48765-1	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/22/03 15:50	MIC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	416	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	624	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.5	1.0	mg/l	1	09/24/03 19:47	LE	415.1/9060 M/5310B M

(a) Sample received and analyzed out of the holding time.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-STREAM-M	<b>Date Sampled:</b> 09/18/03
<b>Lab Sample ID:</b> N48765-2	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	8.5	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	430	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	1000	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.2	1.0	mg/l	1	09/24/03 19:54	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

## Report of Analysis

<b>Client Sample ID:</b>	LOWELL-STREAM-D	<b>Date Sampled:</b>	09/19/03
<b>Lab Sample ID:</b>	N48765-3	<b>Date Received:</b>	09/22/03
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	416	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	919	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.1	1.0	mg/l	1	09/24/03 20:00	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-STREAM-F	<b>Date Sampled:</b> 09/18/03
<b>Lab Sample ID:</b> N48765-4	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	436	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	989	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	3.6	1.0	mg/l	1	09/24/03 20:06	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-PORE-U	<b>Date Sampled:</b> 09/19/03
<b>Lab Sample ID:</b> N48765-5	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	52.5	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	728	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	794	10	mg/l	1	09/26/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	7.1	1.0	mg/l	1	09/30/03 12:32	MW	415.1/9060 M/5310B M

(a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

(b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.



## Report of Analysis

<b>Client Sample ID:</b> LOWELL-PORE-M	<b>Date Sampled:</b> 09/18/03
<b>Lab Sample ID:</b> N48765-6	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	10.2	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	170	80	mg/l	4	10/13/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	12.0	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	1120	10	mg/l	1	09/25/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	13.3	1.0	mg/l	1	09/30/03 12:39	MW	415.1/9060 M/5310B M

(a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

(b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-PORE-D	<b>Date Sampled:</b> 09/19/03
<b>Lab Sample ID:</b> N48765-7	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	8.0	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	1320	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	823	10	mg/l	1	09/26/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	8.8	1.0	mg/l	1	09/30/03 12:45	MW	415.1/9060 M/5310B M

(a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

(b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-PORE-F	<b>Date Sampled:</b> 09/18/03
<b>Lab Sample ID:</b> N48765-8	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	32.5	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	524	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	910	10	mg/l	1	09/25/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	9.4	1.0	mg/l	1	09/30/03 12:52	MW	415.1/9060 M/5310B M

- (a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.
- (b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

## Report of Analysis

<b>Client Sample ID:</b>	LOWELL-SED-U	<b>Date Sampled:</b>	09/19/03
<b>Lab Sample ID:</b>	N48765-9	<b>Date Received:</b>	09/22/03
<b>Matrix:</b>	SO - Solid	<b>Percent Solids:</b>	64.5
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	98.5		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	92.5		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	89.6		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	89.2		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	87.1		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	80.4		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	44.3		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	28.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	27.0		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	10		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	8		%	1	10/13/03	ST	ASTM D422-63
% Gravel	7.5		%	1	10/13/03	ST	ASTM D422-63
% Sand	66		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	27		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.2		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4970	480	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	35.5		%	1	09/25/03	TC	EPA 160.3 M
Nitrogen, Total Kjeldahl	922	92	mg/kg	3	09/30/03 14:43	VLP	EPA 351.2 M
Phosphorus, Total	144	36	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<6.2	6.2	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	12200	1600	mg/kg	1	10/03/03 11:11	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	3.2	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	LOWELL-SED-M	<b>Date Sampled:</b>	09/18/03
<b>Lab Sample ID:</b>	N48765-10	<b>Date Received:</b>	09/22/03
<b>Matrix:</b>	SO - Solid	<b>Percent Solids:</b>	61.3
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	98.7		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	92.1		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	80.7		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	79.6		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	75.6		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	69.7		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	48.0		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	30.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	27.7		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	10		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	7		%	1	10/13/03	ST	ASTM D422-63
% Gravel	8.0		%	1	10/13/03	ST	ASTM D422-63
% Sand	64		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	28		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.1		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4880	510	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	38.7		%	1	09/25/03	TC	EPA 160.3 M
Nitrogen, Total Kjeldahl	1130	95	mg/kg	3	09/30/03 14:44	VLP	EPA 351.2 M
Phosphorus, Total	149	37	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<6.5	6.5	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	19500	1600	mg/kg	1	10/03/03 11:22	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	5.4	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-SED-D	<b>Date Sampled:</b> 09/19/03
<b>Lab Sample ID:</b> N48765-11	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> SO - Solid	<b>Percent Solids:</b> 73.4
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	100		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	99.8		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	99.7		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	98.9		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	96.0		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	64.2		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	13.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	11.9		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/13/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/13/03	ST	ASTM D422-63
% Sand	88		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	12		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	708	430	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	26.6		%	1	09/25/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	150	26	mg/kg	1	09/30/03 12:36	VLP	EPA 351.2 M
Phosphorus, Total	155	31	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<5.5	5.5	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	5400	1400	mg/kg	1	10/03/03 13:17	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	3.0	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b> LOWELL-SED-F	<b>Date Sampled:</b> 09/18/03
<b>Lab Sample ID:</b> N48765-12	<b>Date Received:</b> 09/22/03
<b>Matrix:</b> SO - Solid	<b>Percent Solids:</b> 76.6
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	96.9		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	78.4		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	64.9		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	63.1		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	57.4		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	52.7		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	32.4		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	9.6		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	8.3		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1		%	1	10/13/03	ST	ASTM D422-63
% Gravel	22		%	1	10/13/03	ST	ASTM D422-63
% Sand	70		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	8.3		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.6		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1760	400	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	23.4		%	1	09/25/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	177	26	mg/kg	1	09/30/03 12:37	VLP	EPA 351.2 M
Phosphorus, Total	391	29	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<5.3	5.3	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	5330	1300	mg/kg	1	10/03/03 15:41	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	7.9	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	LOWELL-STREAM-D-DUP	<b>Date Sampled:</b>	09/19/03
<b>Lab Sample ID:</b>	N48765-13	<b>Date Received:</b>	09/22/03
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/24/03 10:00	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	412	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved	781	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	5.1	1.0	mg/l	1	09/24/03 20:13	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

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RL = Reporting Limit



# CHAIN OF CUSTODY

2235 Route 130, Dayton NJ 08810  
 TEL: 732-329-0200 FAX: 732-329-3499/3480  
 www.accutest.com



<b>Company Name</b> EA Engineering 15 Loveton Circle Sparks MD 21093 Project Contact: Mike Ciarlo Phone # 410-771-1950 Sampler's Name: Mike Ciarlo & Leonard Dora		<b>Client / Reporting Information</b> Project Name: SDA Sediment Sampling Street: [blank] City: [blank] State: [blank] Project # 1407401.0001 Fax # [blank] Client Purchase Order # TBA		<b>Project Information</b> Project Name: SDA Sediment Sampling Street: [blank] City: [blank] State: [blank] Project # 1407401.0001 Fax # [blank] Client Purchase Order # TBA		<b>Requested Analysis</b> Matrix Codes: DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OL - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Waste LAB USE ONLY		<b>FED-EX Tracking #</b> Bottle Order Control # Accutest Job # 148765 + X										
Accutest Sample #	Field ID / Point of Collection	SUMMA #	MECH Val #	Collection		Number of preserved Bottles					Matrix	# of bottles	Comments / Remarks					
				Date	Time	Served By	MC	PC	TC	BC				EC	HC			
1	LOWELL - STREAM - U			9-18-03	730	MC						X						
2	LOWELL - STREAM - M			9-18-03	1530	MC						X						
3	LOWELL - STREAM - D			9-19-03	0810	MC						X						
4	LOWELL - STREAM - F			9-18-03	0940	MC						X						
5	LOWELL - PORE - U			9-19-03	1200	MC						X						
6	LOWELL - PORE - M			9-18-03	1700	MC						X						
7	LOWELL - PORE - D			9-19-03	0945	MC						X						
8	LOWELL - PORE - F			9-18-03	1210	MC						X						
	BORELL INC																	
	BORELL INC																	

**Turnaround Time (Business Days)**  
 Approved By: / Date: \_\_\_\_\_

Std. 15 Business Days  
 10 Day RUSH  
 5 Day RUSH  
 3 Day EMERGENCY  
 2 Day EMERGENCY  
 1 Day EMERGENCY  
 Other \_\_\_\_\_

**Data Deliverable Information**  
 Commercial "A"  
 Commercial "B"  
 NJ Reduced  
 NJ Full  
 Other \_\_\_\_\_

**Commercial "A" = Results Only**

**Sample Custody must be documented below each time samples change possession, including courier delivery**

Requisitioned by:	Received by:
3	1
Date Time: 9-19-03	Date Time: 9-19-03
Requisitioned by:	Received by:
3	2
Date Time:	Date Time:
Requisitioned by:	Received by:
5	4
Date Time:	Date Time:

**Emergency & Rush TIA data available VIA LabLink**

**Comments / Remarks:**  
 MCL, MCH, VC 10/ EXYS, sub  
 BOD's over out of H.L. & 8/10/03  
 A Dupes spec. of 11/10/03  
 A Dupes spec. of 11/10/03

**Requisitioned by:** [Signature]  
**Received by:** [Signature]  
**Date Time:** 9-19-03  
**Requisitioned by:** [Signature]  
**Received by:** [Signature]  
**Date Time:** 9-19-03  
**Requisitioned by:** [Signature]  
**Received by:** [Signature]  
**Date Time:** 9-19-03

**Preserved when applicable**  On log   
 Cooler Temp. 16.0 17.0

# CHAIN OF CUSTODY

2235 Route 1, Dayton NJ 08810  
 TEL: 732-329-0200 FAX: 732-329-3499/3480  
 www.accutest.com



<b>Company Name</b> EA Engineering Address: 15 Loreton Circle City: Sparks MD 21093 Project Contact: Mike Corbo Phone #: 410-771-4950 Sampler's Name: Michael Corbo, Lead Analyst, Self-Help		<b>Client / Reporting Information</b> Project Name: SDA Sediment Sampling Street: [Blank] City: [Blank] State: [Blank] Project #: 14079010001 Fax #: [Blank] Client Purchase Order #: TBA		<b>Project Information</b> Bottle Order Control #: N48765 + X Accutest Job #: [Blank]	
<b>Requested Analysis</b> TCC, TSS, Sludge, Organic Matter Brown, Silty Red Denim Kroll, N, T, P Arterberg Limits CEC		<b>Matrix Codes</b> DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY		<b>Matrix Codes</b> DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY	
<b>Turnaround Time (Business Days)</b> Approved By / Date: [Blank]		<b>Date Deliverable Information</b> FULL CLP NYASP Category A NYASP Category B State Forms EDO Format Commercial 'A' = Results Only		<b>Comments / Remarks</b> [Blank]	
<b>Accutest Sample #</b> -9 LOWELL - SED - U -10 LOWELL - SED - M -11 LOWELL - SED - D -12 LOWELL - SED - F -13 Lowell - stream - D - Dup.		<b>Collection</b> Date: 9-19-03, 9-18-03, 9-19-03, 9-18-03, 9/19/03 Time: 1130, 1700, 0810, 0940, 0810 Matrix: SDA, SDA, SDA, SDA, SDA # of bottles: 2, 2, 2, 2, 5		<b>Number of preserved Bottles</b> BORE MECH NRSQA NONE HOS HOS HOS	
<b>Retransmitted by Sampler:</b> 1 [Signature]		<b>Received by:</b> 1 [Signature]		<b>Relinquished by:</b> 2 [Signature]	
<b>Retransmitted by:</b> 3 [Blank]		<b>Date Time:</b> 9-19-03		<b>Date Time:</b> 9/23/03	
<b>Retransmitted by:</b> 5 [Blank]		<b>Date Time:</b> [Blank]		<b>Date Time:</b> [Blank]	
<b>Emergency &amp; Rush T/A data available VIA LabLink</b>		<b>Sample Custody must be documented below each time samples change possession, including courier delivery.</b>		<b>On 10/16/03</b> Cooler Temp: 16.0, 17.0	

FOR N49578



January 29, 2004

FEB 06 2004

REV EA

Mr. Mike Ciarlo  
EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

Dear Mr. Ciarlo:

During a recent review of the calculations used for determining particle size data, Accutest concluded that the definition used for the method did not match the specifications of the ASTM method, necessitating changes to the Accutest approach. These changes have impacted data previously delivered to your organization.

Accutest had previously defined gravel as particles passing through the 3-inch sieve and retained on the 3/8-inch sieve. Sand was defined as particles passing through the No. 4 sieve and retained on the No. 100 sieve. Silt, clay, and colloids were defined as particles retained and passing through the No. 200 sieve.

These definitions vary slightly from the definitions found in method ASTM D422. The definitions from ASTM-D422 are as follows:

- Gravel is defined as particles passing through the 3-inch sieve and retained on the No. 4 sieve.
- Sand is defined as particles passing through the No. 4 sieve and retained on the No. 200 sieve.
- Silt, clay, and colloids are defined as particles passing through the 200 sieve.

Accutest has edited the particle size reporting procedures to reflect the ASTM particle size definitions to assure that the data is reported to the ASTM specification. The % gravel, % sand, and % silt, clay, and colloids values for the enclosed jobs have been recalculated using the ASTM definitions. The updated results have been appended to the Accutest database.

We apologize for any inconvenience this may have caused you. If you have any additional questions, please feel free to contact me or your Accutest client services representative.

Sincerely,

Accutest Laboratories



David N. Speis

Director, Corporate Quality Assurance

Technical Report for

EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49598

Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 15



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.

## Sample Summary

EA Engineering

Job No: N49598

Soap and Detergent Association (SDA), Sediment Sampling  
Project No: 1407401.0001

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
N49598-1	10/01/03	08:45 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-U
N49598-2	09/30/03	11:30 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-D
N49598-3	09/30/03	13:30 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-M
N49598-4	09/30/03	08:45 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-F
N49598-5	10/01/03	08:45 SS	10/02/03	AQ	Water	WILMINGTON-PORE-U
N49598-6	09/30/03	11:30 SS	10/02/03	AQ	Water	WILMINGTON-PORE-D
N49598-7	09/30/03	13:30 SS	10/02/03	AQ	Water	WILMINGTON-PORE-M
N49598-8	09/30/03	08:45 SS	10/02/03	AQ	Water	WILMINGTON-PORE-F
N49598-9	09/30/03	13:30 SS	10/02/03	SO	Soil	WILMINGTON-SED-M
N49598-10	09/30/03	08:45 SS	10/02/03	SO	Soil	WILMINGTON-SED-F
N49598-11	09/30/03	11:30 SS	10/02/03	SO	Soil	WILMINGTON-SED-D
N49598-12	10/01/03	08:45 SS	10/02/03	SO	Soil	WILMINGTON-SED-U

---

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-1	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	344	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	476	10	mg/l	1	10/06/03	NR	EPA 160.1
Total Organic Carbon	3.0	1.0	mg/l	1	10/06/03 14:03	MW	415.1/9060 M/5310B M

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RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-STREAM-D	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-2	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Surface Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	326	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	479	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.4	1.0	mg/l	1	10/06/03 14:10	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-M	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-3	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	314	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	504	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.6	1.0	mg/l	1	10/06/03 14:16	MW	415.1/9060 M/5310B M

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RL = Reporting Limit



## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-F	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-4	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	8.2	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	292	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	428	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.9	1.0	mg/l	1	10/06/03 14:23	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-PORE-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-5	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	21.2	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	143	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	650	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	440	10	mg/l	1	10/06/03	NR	EPA 160.1
Total Organic Carbon	52.4	3.0	mg/l	3	10/10/03 14:50	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-PORE-D	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-6	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	18.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	125	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	868	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	337	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	11.4	1.0	mg/l	1	10/06/03 15:38	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-PORE-M	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-7	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	12.5	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	270	40	mg/l	2	10/21/03	ST	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	1670	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	338	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	5.9	1.0	mg/l	1	10/06/03 15:44	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-PORE-F	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-8	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	18.1	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	190	20	mg/l	1	10/14/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	664	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	227	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	126	6.0	mg/l	6	10/06/03 17:54	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-SED-M	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-9	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 79.9
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	98.1		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	87.6		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	84.4		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	66.0		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	37.0		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	14.4		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	9.8		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	9.5		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.5		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	1.5		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.5		%	1	10/15/03	ST	ASTM D422-63
% Gravel	1.9		%	1	10/15/03	ST	ASTM D422-63
% Sand	88.6		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	9.5		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1870	390	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	20.1		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	167	24	mg/kg	1	10/09/03 10:10	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	5120	1300	mg/kg	1	10/22/03 15:31	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	18.9	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-F	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-10	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	81.4
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	95.7		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	76.4		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	70.3		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	50.0		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	20.4		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.2		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.3		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	5.1		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.0		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	1.2		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.2		%	1	10/15/03	ST	ASTM D422-63
% Gravel	4.3		%	1	10/15/03	ST	ASTM D422-63
% Sand	90.6		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	5.1		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.8		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1180	380	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	18.6		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	113	24	mg/kg	1	10/09/03 10:11	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon	5700	1200	mg/kg	1	10/22/03 13:06	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	19.7	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-D	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-11	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	82.7
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	96.7		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	81.3		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	76.6		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	59.8		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	32.7		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	12.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	7.0		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	6.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.9		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.5		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.4		%	1	10/15/03	ST	ASTM D422-63
% Gravel	3.3		%	1	10/15/03	ST	ASTM D422-63
% Sand	90.4		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	6.3		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.9		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	685	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	17.3		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	116	23	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	8560	1200	mg/kg	1	10/22/03 14:32	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	17.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.



## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-12	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	78.8
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	97.4		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	91.6		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	89.5		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	76.9		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	47.1		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	14.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	8.8		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	8.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	3.5		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.8		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.6		%	1	10/15/03	ST	ASTM D422-63
% Gravel	2.6		%	1	10/15/03	ST	ASTM D422-63
% Sand	89.1		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	8.3		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	882	390	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	21.2		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	220	24	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	6510	1300	mg/kg	1	10/22/03 14:59	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	15.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.





11/21/03



Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N48765

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Report to:

EA Engineering

mciarlo@eaest.com

ATTN: Mike Ciarlo

Total number of pages in report: 19



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

A handwritten signature in black ink, appearing to read 'Vincent J. Pugliese'.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

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## Sample Summary

EA Engineering

Job No: N48765

Soap and Detergent Association (SDA), Sediment Sampling  
Project No: 1407401.0001

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
N48765-1	09/19/03	07:30 MC	09/22/03	AQ	Water	LOWELL-STREAM-U
N48765-2	09/18/03	15:30 MC	09/22/03	AQ	Water	LOWELL-STREAM-M
N48765-3	09/19/03	08:10 MC	09/22/03	AQ	Water	LOWELL-STREAM-D
N48765-4	09/18/03	09:40 MC	09/22/03	AQ	Water	LOWELL-STREAM-F
N48765-5	09/19/03	12:00 MC	09/22/03	AQ	Water	LOWELL-PORE-U
N48765-6	09/18/03	17:00 MC	09/22/03	AQ	Water	LOWELL-PORE-M
N48765-7	09/19/03	09:45 MC	09/22/03	AQ	Water	LOWELL-PORE-D
N48765-8	09/18/03	12:10 MC	09/22/03	AQ	Water	LOWELL-PORE-F
N48765-9	09/19/03	11:30 MC	09/22/03	SO	Solid	LOWELL-SED-U
N48765-10	09/18/03	17:00 MC	09/22/03	SO	Solid	LOWELL-SED-M
N48765-11	09/19/03	08:10 MC	09/22/03	SO	Solid	LOWELL-SED-D
N48765-12	09/18/03	09:40 MC	09/22/03	SO	Solid	LOWELL-SED-F
N48765-13	09/19/03	08:10 MC	09/22/03	AQ	Water	LOWELL-STREAM-D-DUP

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

Client Sample ID: LOWELL-STREAM-U	Date Sampled: 09/19/03
Lab Sample ID: N48765-1	Date Received: 09/22/03
Matrix: AQ - Water	Percent Solids: n/a
Project: Soap and Detergent Association (SDA), Sediment Sampling	

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	< 3.3	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	< 20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	416	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	624	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.5	1.0	mg/l	1	09/24/03 19:47	LE	415.1/9060 M/5310B M

(a) Sample received and analyzed out of the holding time.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-STREAM-M	Date Sampled:	09/18/03
Lab Sample ID:	N48765-2	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	8.5	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	< 20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	430	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	1000	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.2	1.0	mg/l	1	09/24/03 19:54	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

RL = Reporting Limit



## Report of Analysis

Client Sample ID:	LOWELL-STREAM-D	Date Sampled:	09/19/03
Lab Sample ID:	N48765-3	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	416	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	919	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	4.1	1.0	mg/l	1	09/24/03 20:00	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-STREAM-F	Date Sampled:	09/18/03
Lab Sample ID:	N48765-4	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	< 3.3	3.3	mg/l	1	09/22/03 15:50	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	< 20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	436	4.0	mg/l	1	09/30/03	JA	SM19 2340C
Solids, Total Dissolved	989	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	3.6	1.0	mg/l	1	09/24/03 20:06	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

RL = Reporting Limit

## Report of Analysis

Client Sample ID: LOWELL-PORE-U	Date Sampled: 09/19/03
Lab Sample ID: N48765-5	Date Received: 09/22/03
Matrix: AQ - Water	Percent Solids: n/a
Project: Soap and Detergent Association (SDA), Sediment Sampling	

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	< 3.3	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	52.5	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	728	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	794	10	mg/l	1	09/26/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	7.1	1.0	mg/l	1	09/30/03 12:32	MW	415.1/9060 M/5310B M

- (a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.
- (b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-PORE-M	Date Sampled:	09/18/03
Lab Sample ID:	N48765-6	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	10.2	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	170	80	mg/l	4	10/13/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	12.0	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	1120	10	mg/l	1	09/25/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	13.3	1.0	mg/l	1	09/30/03 12:39	MW	415.1/9060 M/5310B M

- (a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.
- (b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

RL = Reporting Limit

## Report of Analysis

Client Sample ID: LOWELL-PORE-D	Date Sampled: 09/19/03
Lab Sample ID: N48765-7	Date Received: 09/22/03
Matrix: AQ - Water	Percent Solids: n/a
Project: Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	8.0	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	1320	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	823	10	mg/l	1	09/26/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	8.8	1.0	mg/l	1	09/30/03 12:45	MW	415.1/9060 M/5310B M

- (a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.
- (b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-PORE-F	Date Sampled:	09/18/03
Lab Sample ID:	N48765-8	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/26/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	32.5	20	mg/l	1	10/01/03	JN	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub> <sup>b</sup>	524	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved <sup>b</sup>	910	10	mg/l	1	09/25/03	NR	EPA 160.1
Total Organic Carbon <sup>b</sup>	9.4	1.0	mg/l	1	09/30/03 12:52	MW	415.1/9060 M/5310B M

- (a) Sample received and analyzed out of the holding time. Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.
- (b) Sample centrifuged before analysis. Aqueous portion from centrifugation analyzed.

RL = Reporting Limit

## Report of Analysis

Page 1 of 1

Client Sample ID:	LOWELL-SED-U	Date Sampled:	09/19/03
Lab Sample ID:	N48765-9	Date Received:	09/22/03
Matrix:	SO - Solid	Percent Solids:	64.5
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	98.5		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	92.5		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	89.6		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	89.2		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	87.1		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	80.4		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	44.3		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	28.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	27.0		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	10		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	8		%	1	10/13/03	ST	ASTM D422-63
% Gravel	1.6		%	1	10/13/03	ST	ASTM D422-63
% Sand	70		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	29		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.2		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4970	480	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	35.5		%	1	09/25/03	TC	EPA 160.3 M
Nitrogen, Total Kjeldahl	922	92	mg/kg	3	09/30/03 14:43	VLP	EPA 351.2 M
Phosphorus, Total	144	36	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<6.2	6.2	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	12200	1600	mg/kg	1	10/03/03 11:11	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	3.2	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-SED-M	Date Sampled:	09/18/03
Lab Sample ID:	N48765-10	Date Received:	09/22/03
Matrix:	SO - Solid	Percent Solids:	61.3
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	98.7		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	92.1		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	80.7		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	79.6		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	75.6		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	69.7		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	48.0		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	30.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	27.7		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	10		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	7		%	1	10/13/03	ST	ASTM D422-63
% Gravel	1.3		%	1	10/13/03	ST	ASTM D422-63
% Sand	68		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	31		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.1		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4880	510	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	38.7		%	1	09/25/03	TC	EPA 160.3 M
Nitrogen, Total Kjeldahl	1130	95	mg/kg	3	09/30/03 14:44	VLP	EPA 351.2 M
Phosphorus, Total	149	37	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<6.5	6.5	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	19500	1600	mg/kg	1	10/03/03 11:22	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	5.4	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

RL = Reporting Limit



## Report of Analysis

Page 1 of 1

Client Sample ID: LOWELL-SED-D	Date Sampled: 09/19/03
Lab Sample ID: N48765-11	Date Received: 09/22/03
Matrix: SO - Solid	Percent Solids: 73.4
Project: Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Particle Size Analysis (Sieve and Hydrometer Testing)							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	100		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	99.8		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	99.7		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	98.9		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	96.0		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	64.2		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	13.7		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	11.9		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/13/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/13/03	ST	ASTM D422-63
% Sand	86		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	14		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	708	430	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	26.6		%	1	09/25/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	150	26	mg/kg	1	09/30/03 12:36	VLP	EPA 351.2 M
Phosphorus, Total	155	31	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	<5.5	5.5	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	5400	1400	mg/kg	1	10/03/03 13:17	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	3.0	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-SED-F	Date Sampled:	09/18/03
Lab Sample ID:	N48765-12	Date Received:	09/22/03
Matrix:	SO - Solid	Percent Solids:	76.6
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/13/03	ST	ASTM D422-63
0.375 Inch Sieve	96.9		%	1	10/13/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	78.4		%	1	10/13/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	64.9		%	1	10/13/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	63.1		%	1	10/13/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	57.4		%	1	10/13/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	52.7		%	1	10/13/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	32.4		%	1	10/13/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	9.6		%	1	10/13/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	8.3		%	1	10/13/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/13/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/13/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1		%	1	10/13/03	ST	ASTM D422-63
% Gravel	3.1		%	1	10/13/03	ST	ASTM D422-63
% Sand	87		%	1	10/13/03	ST	ASTM D422-63
% Silt, Clay, Colloids	9.6		%	1	10/13/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.6		g/ml	1	09/30/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1760	400	mg/kg	1	10/13/03	LH	SW846 9081
Moisture, Percent	23.4		%	1	09/25/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	177	26	mg/kg	1	09/30/03 12:37	VLP	EPA 351.2 M
Phosphorus, Total	391	29	mg/kg	10	10/07/03	MLC	EPA 365.3 M
Sulfide	< 5.3	5.3	mg/kg	1	09/25/03	ST	EPA 376.1 M
Total Organic Carbon	5330	1300	mg/kg	1	10/03/03 15:41	MW	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	7.9	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

RL = Reporting Limit

## Report of Analysis

Client Sample ID:	LOWELL-STREAM-D-DUP	Date Sampled:	09/19/03
Lab Sample ID:	N48765-13	Date Received:	09/22/03
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day <sup>a</sup>	<3.3	3.3	mg/l	1	09/24/03 10:00	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	09/26/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	412	4.0	mg/l	1	10/01/03	MD	SM19 2340C
Solids, Total Dissolved	781	10	mg/l	1	09/24/03	NR	EPA 160.1
Total Organic Carbon	5.1	1.0	mg/l	1	09/24/03 20:13	LE	415.1/9060 M/5310B M

(a) Sample received outside the holding time.

RL = Reporting Limit

Misc. Forms

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Custody Documents and Other Forms

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Includes the following where applicable:

- Chain of Custody





# CHAIN OF CUSTODY

2235 Route 130, Dayton NJ 08810  
 TEL: 732-329-0200 FAX: 732-329-3499/3480  
 www.accutest.com

FED-EX Tracking #  
 Accutest Quote #  
 Bottle Order Control # **N48765 +X**  
 Accutest Job #

Client / Reporting Information		Project Information		Requested Analysis		Matrix Codes	
Company Name <b>PA Engineers &amp; Architects</b>		Project Name <b>SDA sediment Sampling</b>		City <b>Sparks</b>		State <b>MD</b>	
Address <b>15 Lovell Circle</b>		Street		City		State	
City <b>Sparks</b>		State <b>MD</b>		Zip <b>21093</b>			
Project Contact <b>Mike Corbett</b>		E-mail <b>mcorbett@paest.com</b>		Project # <b>14074010001</b>		Fax #	
Phone # <b>410-771-4950</b>		Client Purchase Order # <b>TBA</b>					
Sampler's Name <b>Michael Corbett, Leadway, J&amp;H</b>							
Accutest Sample #	Field ID / Point of Collection	SUMMA #	Collection Date	Time	Sampled By	Matrix	# of bottles
-9	LOWELL - SED - U		9-19-03	1130	MCB	SED	2
-10	LOWELL - SED - M		9-18-03	1700			2
-11	LOWELL - SED - D		9-18-03	0910			2
-12	LOWELL - SED - F		9-18-03	0940			2
-13	Lowell - stream - D - Dup.		9/19/03	~1710			5

Turnaround Time (Business Days)		Data Deliverable Information		Comments/Remarks	
<input type="checkbox"/> Std. 16 Business Days	Approved By: / Date:	<input type="checkbox"/> Commercial 'A'	<input type="checkbox"/> FULL CLP		
<input type="checkbox"/> 10 Day RUSH		<input type="checkbox"/> Commercial 'B'	<input type="checkbox"/> NYASP Category A		
<input type="checkbox"/> 5 Day RUSH		<input type="checkbox"/> NJ Reduced	<input type="checkbox"/> NYASP Category B		
<input type="checkbox"/> 3 Day EMERGENCY		<input type="checkbox"/> NJ Full	<input type="checkbox"/> State Forms		
<input type="checkbox"/> 2 Day EMERGENCY		<input type="checkbox"/> Other	<input type="checkbox"/> EDD Format		
<input type="checkbox"/> 1 Day EMERGENCY		Commercial 'A' = Results Only			
<input type="checkbox"/> Other					

Emergency & Rush T/A data available VIA LabLink

Sample Custody must be documented below each time samples change possession, including counter delivery.

Relinquished by: <b>Michael Corbett</b>	Date Time: <b>9-19-03</b>	Received by: <b>FEDEX</b>	Date Time: <b>9/19/03</b>	Received by: <b>[Signature]</b>	Date Time: <b>9/19/03</b>
Relinquished by:	Date Time:	Received by:	Date Time:	Received by:	Date Time:
Relinquished by:	Date Time:	Received by:	Date Time:	Received by:	Date Time:
Relinquished by:	Date Time:	Received by:	Date Time:	Received by:	Date Time:

Preserved where applicable  On Ice  Cooler Temp **16.0, 17.0**

N48765: Chain of Custody  
 Page 2 of 2



NOV 10 2003  
BP/SA

Technical Report for

EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N48765X

Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report:



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.

### Sample Summary

EA Engineering

Job No: N48765X

Soap and Detergent Association (SDA), Sediment Sampling  
 Project No: 1407401.0001

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
N48765-9X	09/19/03	11:30 MC	09/22/03	SO	Solid	LOWELL-SED-U
N48765-10X	09/18/03	17:00 MC	09/22/03	SO	Solid	LOWELL-SED-M
N48765-11X	09/19/03	08:10 MC	09/22/03	SO	Solid	LOWELL-SED-D
N48765-12X	09/18/03	09:40 MC	09/22/03	SO	Solid	LOWELL-SED-F





# CHAIN OF CUSTODY

2235 Route 130, Dayton NJ 08810  
 TEL. 732-329-0200 FAX: 732-329-3499/3480  
 www.accutest.com



<b>Client / Reporting Information</b> Company Name: EA Engineering Address: 15 Loretan Circle City: Sparks, State: MD, Zip: 21093 Project Contact: Mike Clark, E-mail: mclark@eaest.com Phone #: 410-771-4950 Sampler's Name: Mike Clark, Lead by: Self		<b>Project Information</b> Project Name: SDA solvent sampling Street: [blank] City: [blank], State: [blank] Project #: 14079010001 Fax #: [blank] Client Purchase Order #: TBA		<b>FED-EX Tracking #</b> Bottle Order Control #: N487652X <b>Accustest Quote #</b> Accustest Job #: [blank]		<b>Requested Analysis</b> Matrix Codes: DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY	
<b>Turnaround Time (Business Days)</b> Approved By / Date: [blank]		<b>Data Deliverable Information</b> <input type="checkbox"/> Full CLP <input type="checkbox"/> NYASP Category A <input type="checkbox"/> NYASP Category B <input type="checkbox"/> NJ Reduced <input type="checkbox"/> NJ Full <input type="checkbox"/> Other		<b>Comments</b> [blank]		<b>Matrix Codes</b> DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY	
<b>Emergency &amp; Rush T/A data available VIA LabLink</b> <input type="checkbox"/> Std. 15 Business Days <input type="checkbox"/> 10 Day RUSH <input type="checkbox"/> 5 Day RUSH <input type="checkbox"/> 3 Day EMERGENCY <input type="checkbox"/> 2 Day EMERGENCY <input type="checkbox"/> 1 Day EMERGENCY <input type="checkbox"/> Other		<b>Commercial 'A'</b> <input type="checkbox"/> Commercial 'A' <input type="checkbox"/> Commercial 'B' <input type="checkbox"/> NJ Reduced <input type="checkbox"/> NJ Full <input type="checkbox"/> Other		<b>Commercial 'A' = Results Only</b>		<b>LAB USE ONLY</b>	
<b>Field ID / Point of Collection</b> SUMMA # MECH Vel # -9 LOWELL - SED - U -10 LOWELL - SED - M -11 LOWELL - SED - D -12 LOWELL - SED - F -13 Lowell - stream - D - Dip.		<b>Collection</b> Date Time Matrix # of bottles 9-19-03 1130 MCP 2 9-18-03 1700 2 9-18-03 0940 2 9-18-03 0940 2 9/19/03 0810 5		<b>Number of preserved Bottles</b> B260 B264 B270 B275 B276 B277 B278 B279 B280 B281 B282 B283 B284 B285 B286 B287 B288 B289 B290 B291 B292 B293 B294 B295 B296 B297 B298 B299 B300 B301 B302 B303 B304 B305 B306 B307 B308 B309 B310 B311 B312 B313 B314 B315 B316 B317 B318 B319 B320 B321 B322 B323 B324 B325 B326 B327 B328 B329 B330 B331 B332 B333 B334 B335 B336 B337 B338 B339 B340 B341 B342 B343 B344 B345 B346 B347 B348 B349 B350 B351 B352 B353 B354 B355 B356 B357 B358 B359 B360 B361 B362 B363 B364 B365 B366 B367 B368 B369 B370 B371 B372 B373 B374 B375 B376 B377 B378 B379 B380 B381 B382 B383 B384 B385 B386 B387 B388 B389 B390 B391 B392 B393 B394 B395 B396 B397 B398 B399 B400 B401 B402 B403 B404 B405 B406 B407 B408 B409 B410 B411 B412 B413 B414 B415 B416 B417 B418 B419 B420 B421 B422 B423 B424 B425 B426 B427 B428 B429 B430 B431 B432 B433 B434 B435 B436 B437 B438 B439 B440 B441 B442 B443 B444 B445 B446 B447 B448 B449 B450 B451 B452 B453 B454 B455 B456 B457 B458 B459 B460 B461 B462 B463 B464 B465 B466 B467 B468 B469 B470 B471 B472 B473 B474 B475 B476 B477 B478 B479 B480 B481 B482 B483 B484 B485 B486 B487 B488 B489 B490 B491 B492 B493 B494 B495 B496 B497 B498 B499 B500 B501 B502 B503 B504 B505 B506 B507 B508 B509 B510 B511 B512 B513 B514 B515 B516 B517 B518 B519 B520 B521 B522 B523 B524 B525 B526 B527 B528 B529 B530 B531 B532 B533 B534 B535 B536 B537 B538 B539 B540 B541 B542 B543 B544 B545 B546 B547 B548 B549 B550 B551 B552 B553 B554 B555 B556 B557 B558 B559 B560 B561 B562 B563 B564 B565 B566 B567 B568 B569 B570 B571 B572 B573 B574 B575 B576 B577 B578 B579 B580 B581 B582 B583 B584 B585 B586 B587 B588 B589 B590 B591 B592 B593 B594 B595 B596 B597 B598 B599 B600 B601 B602 B603 B604 B605 B606 B607 B608 B609 B610 B611 B612 B613 B614 B615 B616 B617 B618 B619 B620 B621 B622 B623 B624 B625 B626 B627 B628 B629 B630 B631 B632 B633 B634 B635 B636 B637 B638 B639 B640 B641 B642 B643 B644 B645 B646 B647 B648 B649 B650 B651 B652 B653 B654 B655 B656 B657 B658 B659 B660 B661 B662 B663 B664 B665 B666 B667 B668 B669 B670 B671 B672 B673 B674 B675 B676 B677 B678 B679 B680 B681 B682 B683 B684 B685 B686 B687 B688 B689 B690 B691 B692 B693 B694 B695 B696 B697 B698 B699 B700 B701 B702 B703 B704 B705 B706 B707 B708 B709 B710 B711 B712 B713 B714 B715 B716 B717 B718 B719 B720 B721 B722 B723 B724 B725 B726 B727 B728 B729 B730 B731 B732 B733 B734 B735 B736 B737 B738 B739 B740 B741 B742 B743 B744 B745 B746 B747 B748 B749 B750 B751 B752 B753 B754 B755 B756 B757 B758 B759 B760 B761 B762 B763 B764 B765 B766 B767 B768 B769 B770 B771 B772 B773 B774 B775 B776 B777 B778 B779 B780 B781 B782 B783 B784 B785 B786 B787 B788 B789 B790 B791 B792 B793 B794 B795 B796 B797 B798 B799 B800 B801 B802 B803 B804 B805 B806 B807 B808 B809 B810 B811 B812 B813 B814 B815 B816 B817 B818 B819 B820 B821 B822 B823 B824 B825 B826 B827 B828 B829 B830 B831 B832 B833 B834 B835 B836 B837 B838 B839 B840 B841 B842 B843 B844 B845 B846 B847 B848 B849 B850 B851 B852 B853 B854 B855 B856 B857 B858 B859 B860 B861 B862 B863 B864 B865 B866 B867 B868 B869 B870 B871 B872 B873 B874 B875 B876 B877 B878 B879 B880 B881 B882 B883 B884 B885 B886 B887 B888 B889 B890 B891 B892 B893 B894 B895 B896 B897 B898 B899 B900 B901 B902 B903 B904 B905 B906 B907 B908 B909 B910 B911 B912 B913 B914 B915 B916 B917 B918 B919 B920 B921 B922 B923 B924 B925 B926 B927 B928 B929 B930 B931 B932 B933 B934 B935 B936 B937 B938 B939 B940 B941 B942 B943 B944 B945 B946 B947 B948 B949 B950 B951 B952 B953 B954 B955 B956 B957 B958 B959 B960 B961 B962 B963 B964 B965 B966 B967 B968 B969 B970 B971 B972 B973 B974 B975 B976 B977 B978 B979 B980 B981 B982 B983 B984 B985 B986 B987 B988 B989 B990 B991 B992 B993 B994 B995 B996 B997 B998 B999 B1000		<b>Matrix Codes</b> DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY	
<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03		<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03	
<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03		<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03	
<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03		<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03	
<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03		<b>Requisitioned by:</b> [Signature] Date Time: 9-19-03		<b>Received by:</b> [Signature] Date Time: 9-19-03	





# **SUBCONTRACT DATA**

**Golder Associates Inc.**

1951 Old Culihbert Road, Suite 301  
Cherry Hill, NJ 08034  
Telephone (856) 616-8166  
Fax (856) 616-1874



November 4, 2003

993-6504-002

Nadine Yakes  
AccuTest  
Fresh Ponds Corporate Village  
Building B  
2235 Route 130  
Dayton, NJ 08810

RE: GEOTECHNICAL SOIL TEST DATA

Dear Ms. Yakes:

Please find attached zipped Excel spreadsheet containing geotechnical laboratory test results for projects N48765 and N49598.

If you have any questions, please contact us at (856) 616-8166.

Very truly yours,

GOLDER ASSOCIATES INC.

A handwritten signature in black ink, appearing to read "Robert M. Wilkinson", is written over the printed name.

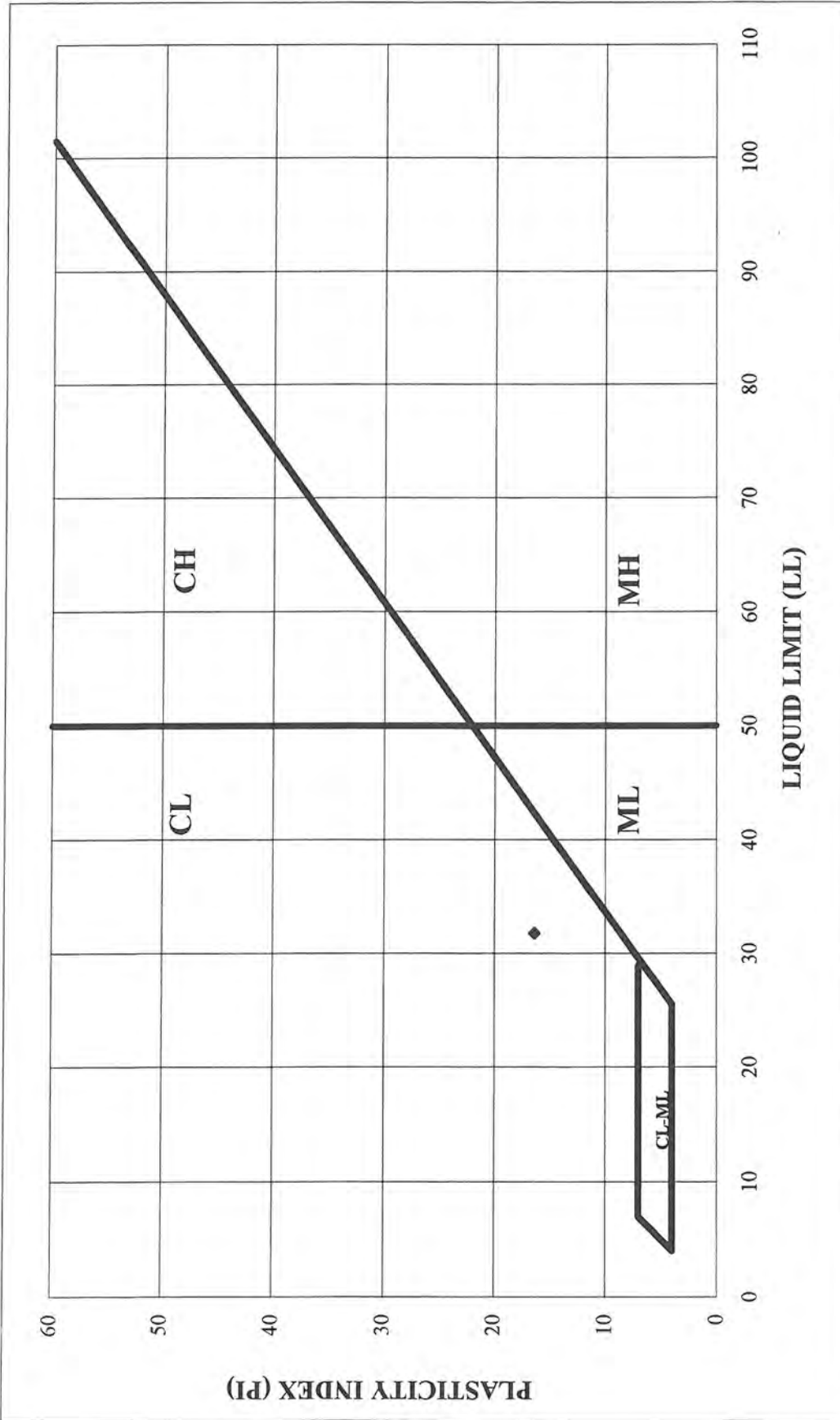
Robert M. Wilkinson  
Laboratory Manager and Associate

Enclosures

**ATTERBERG LIMITS  
ASTM D 4318**

<b>ACCUTEST/LAB GEOTECH/NJ 993-6504-002</b>			<b>SAMPLE #:</b> N48765-9		
<b>SAMPLE PREPARATION</b>					
Wet or Dry <input type="checkbox"/> Wet <input checked="" type="checkbox"/>					
<b>PLASTIC LIMIT</b>			<b>DELIVERED MOISTURE CONTENT</b>		
tare #	M2	18			
wt soil&tare,moist (g)	27.84	26.01	tare # N-40		
wt soil&tare,dry (g)	27.08	25.13	wt soil&tare,moist (g) 42.28		
wt tare (g)	22.00	19.54	wt soil&tare,dry (g) 39.76		
wt moisture (g)	0.76	0.88	wt tare (g) 30.44		
wt dry soil (g)	5.08	5.59	wt moisture (g) 2.52		
% moisture	<b>14.96</b>	<b>15.74</b>	wt dry soil (g) 9.32		
<b>AVERAGE</b>			% moisture <b>27.04</b>		
<b>15</b>					
<b>LIQUID LIMIT</b>					
Number of Blows	23	22	<b>LIQUID LIMIT: 32</b>		
tare #	M12	N100	<b>PLASTIC LIMIT: 15</b>		
wt soil&tare,moist (g)	36.49	37.50	<b>PLASTICITY INDEX: 16</b>		
wt soil&tare,dry (g)	32.96	33.77	<b>DELIVERED MOISTURE: 27.04</b>		
wt tare (g)	21.99	22.16	<b>WET COLOR: Olive</b>		
wt moisture (g)	3.53	3.73			
wt dry soil (g)	10.97	11.61	<b>USCS: CL</b>		
% moisture	32.18	32.13			
LL	<b>31.86</b>	<b>31.63</b>	<b>AVERAGE 32</b>		
<b>USCS Classification is based upon material passing the #40 sieve ONLY.</b>					
<b>LL CALCULATION: % moisture*((Number of Blows/25)^0.121)</b>					
			DATE	09/30/03	
			TECH	AD	
			REVIEW	RDD	

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**

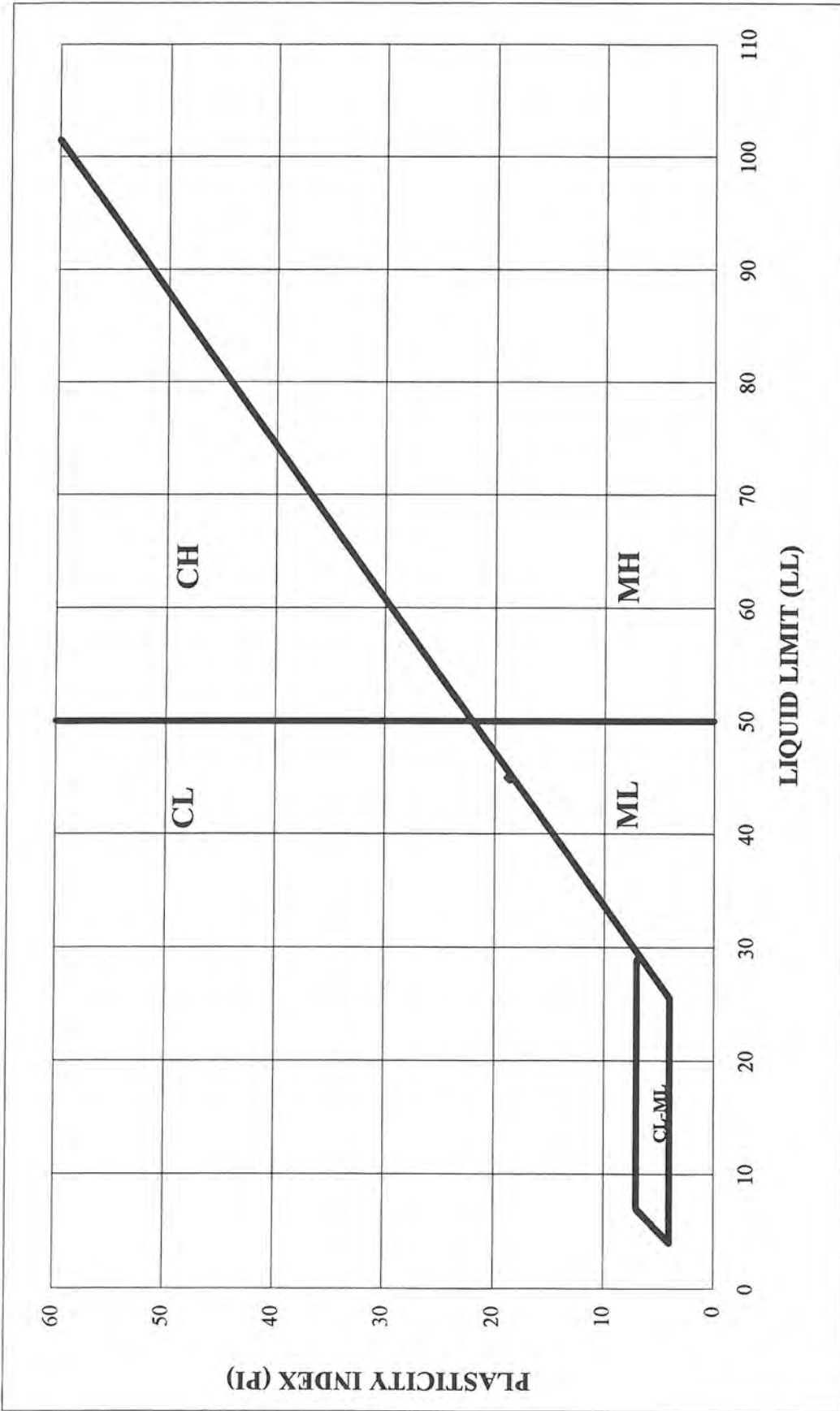




**ATTERBERG LIMITS  
ASTM D 4318**

<b>ACCUTEST/LAB GEOTECH/NJ 993-6504-002</b>			<b>SAMPLE #:</b> N48765-10		
<b>SAMPLE PREPARATION</b>					
Wet or Dry <input type="checkbox"/> Wet <input checked="" type="checkbox"/>					
<b>PLASTIC LIMIT</b>			<b>DELIVERED MOISTURE CONTENT</b>		
tare #	M8	29C			
wt soil&tare,moist (g)	27.78	26.33	tare # CH32		
wt soil&tare,dry (g)	26.45	25.05	wt soil&tare,moist (g) 66.15		
wt tare (g)	21.62	19.96	wt soil&tare,dry (g) 48.85		
wt moisture (g)	1.33	1.28	wt tare (g) 30.86		
wt dry soil (g)	4.83	5.09	wt moisture (g) 17.30		
% moisture	27.54	25.15	wt dry soil (g) 17.99		
<b>AVERAGE</b>			% moisture 96.16		
<b>LIQUID LIMIT</b>					
Number of Blows	21	25	<b>LIQUID LIMIT:</b> 45		
tare #	I-43	45	<b>PLASTIC LIMIT:</b> 26		
wt soil&tare,moist (g)	37.67	36.85	<b>PLASTICITY INDEX:</b> 19		
wt soil&tare,dry (g)	32.49	31.90	<b>DELIVERED MOISTURE:</b> 96.16		
wt tare (g)	21.09	21.02	<b>WET COLOR:</b> Dark olive brown		
wt moisture (g)	5.18	4.95			
wt dry soil (g)	11.40	10.88	<b>USCS:</b> CL		
% moisture	45.44	45.50			
LL	44.49	45.50	<b>AVERAGE</b> 45		
<b>USCS Classification is based upon material passing the #40 sieve ONLY.</b>					
<b>LL CALCULATION:</b> % moisture*((Number of Blows/25)^0.121)					
			<b>DATE:</b> 09/30/03		
			<b>TECH:</b> AC		
			<b>REVIEW:</b> RDD		

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



**ATTERBERG LIMITS  
ASTM D 4318**

**ACCUTEST/LAB GEOTECH/NJ  
993-6504-002**

**SAMPLE #: N48765-11**

**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	M6	M4	
wt soil&tare,moist (g)	32.08	31.42	
wt soil&tare,dry (g)	30.54	29.75	
wt tare (g)	22.12	22.09	
wt moisture (g)	1.54	1.67	
wt dry soil (g)	8.42	7.66	<b>AVERAGE</b>
% moisture	<b>18.29</b>	<b>21.80</b>	<b>20</b>

**DELIVERED MOISTURE CONTENT**

tare #	N-5
wt soil&tare,moist (g)	92.05
wt soil&tare,dry (g)	80.55
wt tare (g)	31.35
wt moisture (g)	11.50
wt dry soil (g)	49.20
% moisture	<b>23.37</b>

**LIQUID LIMIT**

Number of Blows	20	21	
tare #	CT-1	AB-2	
wt soil&tare,moist (g)	42.65	43.23	
wt soil&tare,dry (g)	39.33	39.62	
wt tare (g)	21.76	19.75	
wt moisture (g)	3.32	3.61	
wt dry soil (g)	17.57	19.87	
% moisture	18.90	18.17	<b>AVERAGE</b>
LL	<b>18.39</b>	<b>17.79</b>	<b>18</b>

<b>LIQUID LIMIT:</b>	<b>18</b>
<b>PLASTIC LIMIT:</b>	<b>20</b>
<b>PLASTICITY INDEX:</b>	<b>NP</b>
<b>DELIVERED MOISTURE:</b>	<b>23.37</b>

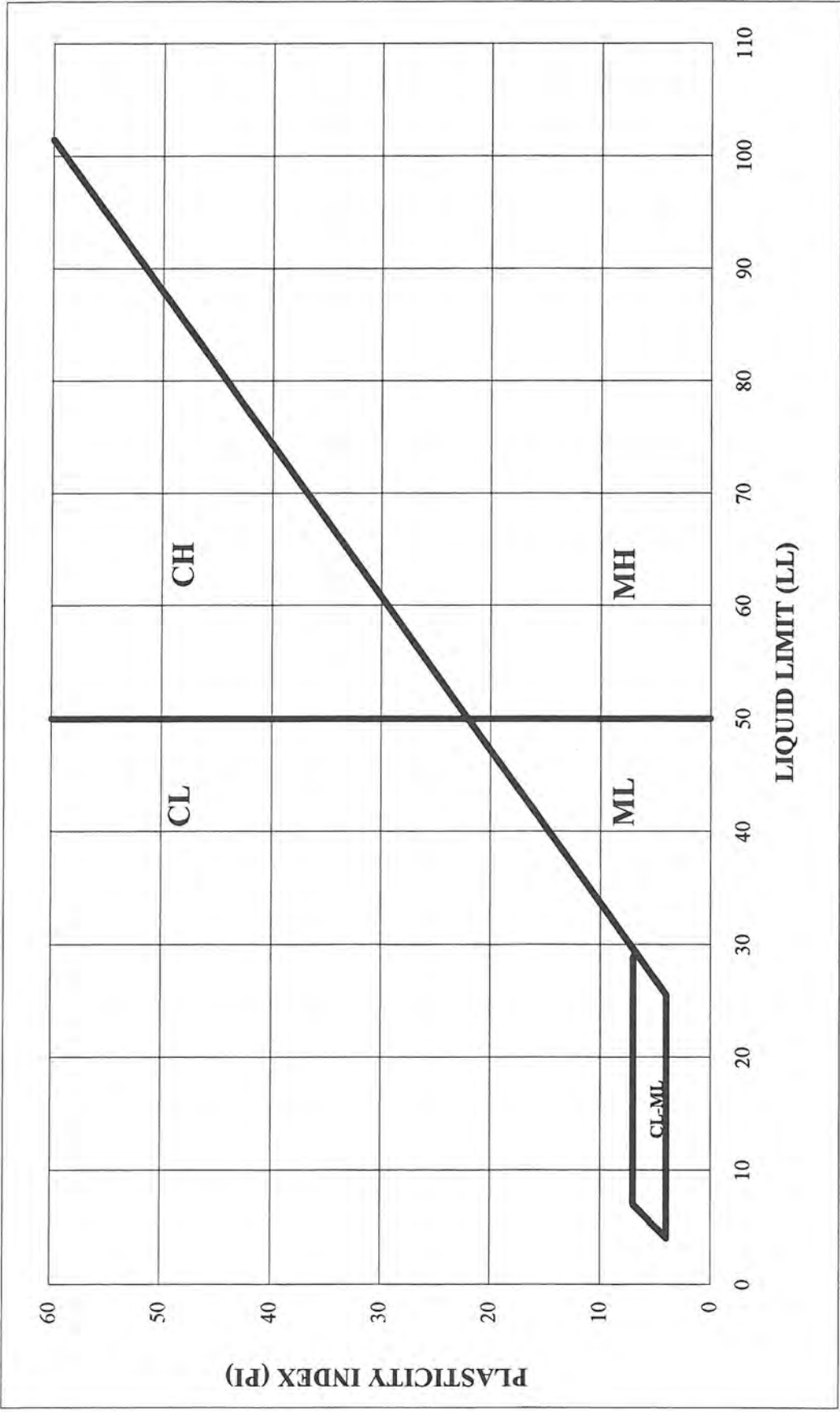
<b>WET COLOR:</b>	<b>Pale brown</b>
	<b>NP = NON-PLASTIC</b>
<b>USCS:</b>	<b>NP</b>

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION: % moisture\*((Number of Blows/25)^0.121)**

DATE	09/30/03
TECH	AC
REVIEW	RDD

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



**ATTERBERG LIMITS  
ASTM D 4318**

**ACCUTEST/LAB GEOTECH/NJ  
993-6504-002**

**SAMPLE #: N48765-12**

**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	150	47	
wt soil&tare,moist (g)	27.72	29.45	
wt soil&tare,dry (g)	26.55	28.16	
wt tare (g)	20.48	20.84	
wt moisture (g)	1.17	1.29	
wt dry soil (g)	6.07	7.32	<b>AVERAGE</b>
% moisture	<b>19.28</b>	<b>17.62</b>	<b>18</b>

**DELIVERED MOISTURE CONTENT**

tare #	N-1
wt soil&tare,moist (g)	87.98
wt soil&tare,dry (g)	76.79
wt tare (g)	31.16
wt moisture (g)	11.19
wt dry soil (g)	45.63
% moisture	<b>24.52</b>

**LIQUID LIMIT**

Number of Blows	24	20	
tare #	M9	26C	
wt soil&tare,moist (g)	40.79	44.52	
wt soil&tare,dry (g)	37.77	40.78	
wt tare (g)	21.63	20.62	
wt moisture (g)	3.02	3.74	
wt dry soil (g)	16.14	20.16	
% moisture	18.71	18.55	<b>AVERAGE</b>
LL	<b>18.62</b>	<b>18.06</b>	<b>18</b>

<b>LIQUID LIMIT:</b>	<b>18</b>
<b>PLASTIC LIMIT:</b>	<b>18</b>
<b>PLASTICITY INDEX:</b>	<b>NP</b>
<b>DELIVERED MOISTURE:</b>	<b>24.52</b>

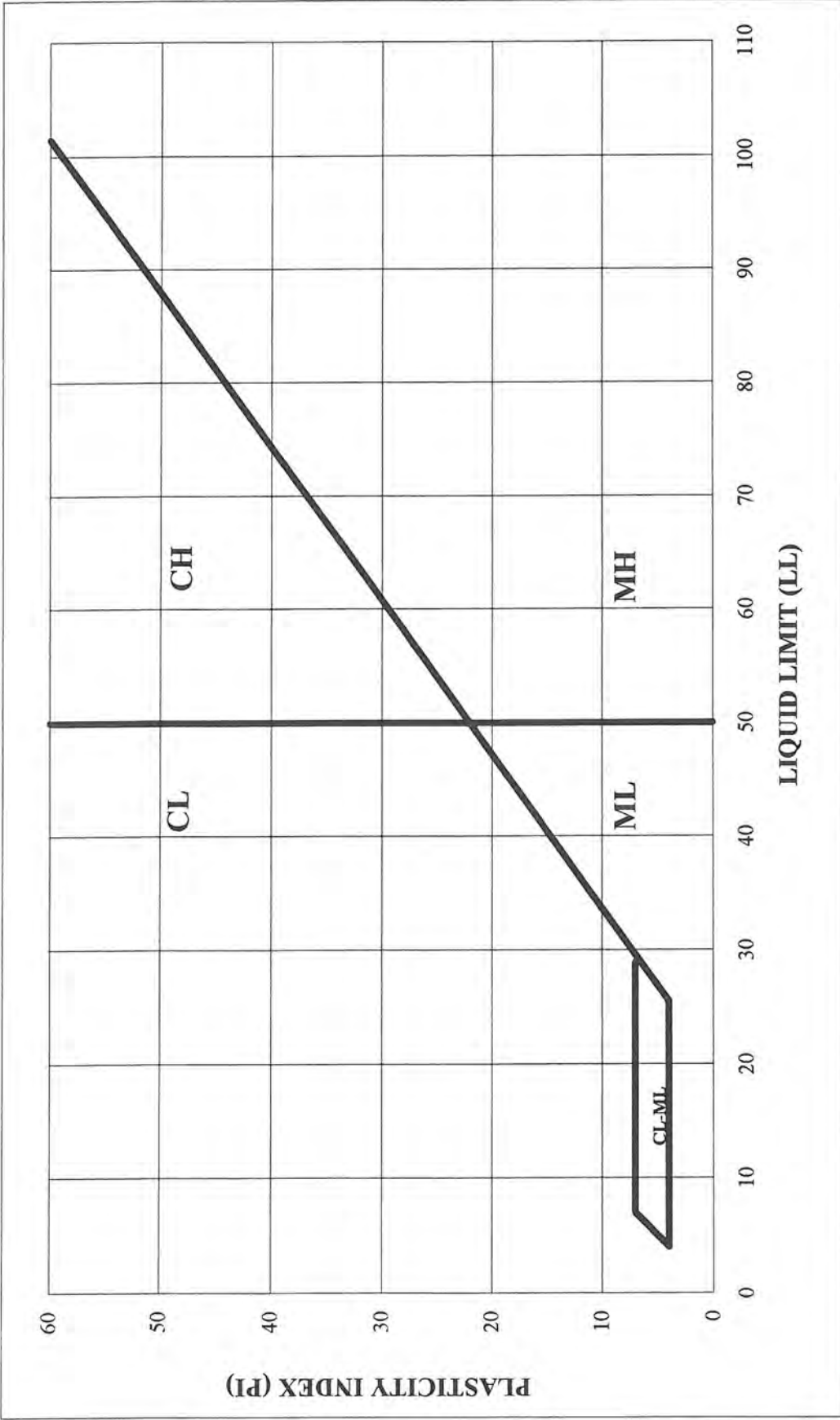
<b>WET COLOR:</b>	Pale olive
	<b>NP = NON-PLASTIC</b>
<b>USCS:</b>	<b>NP</b>

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION: % moisture\*((Number of Blows/25)^0.121)**

DATE	09/30/03
TECH	AC
REVIEW	RDD

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**





10/29/03

OCT 31 2003

*RJP/EA*

Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49876

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Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 11



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.

### Sample Summary

EA Engineering

Job No: N49876

Soap and Detergent Association (SDA), Sediment Sampling  
 Project No: 1407401.0001

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
N49876-1	10/03/03	09:30 LD	10/04/03	AQ	Surface Water	BRYAN-STREAM-U
N49876-2	10/02/03	12:30 LD	10/04/03	AQ	Surface Water	BRYAN-STREAM-D
N49876-3	10/02/03	15:15 LD	10/04/03	AQ	Surface Water	BRYAN-STREAM-M
N49876-4	10/02/03	09:30 LD	10/04/03	AQ	Surface Water	BRYAN-STREAM-F
N49876-5	10/03/03	11:15 LD	10/04/03	AQ	Water	BRYAN-PORE-U
N49876-6	10/02/03	12:30 LD	10/04/03	AQ	Water	BRYAN-PORE-D
N49876-7	10/02/03	15:15 LD	10/04/03	AQ	Water	BRYAN-PORE-M
N49876-8	10/02/03	09:30 LD	10/04/03	AQ	Water	BRYAN-PORE-F



## Report of Analysis

<b>Client Sample ID:</b>	BRYAN-STREAM-U	<b>Date Sampled:</b>	10/03/03
<b>Lab Sample ID:</b>	N49876-1	<b>Date Received:</b>	10/04/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	218	3.3	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	180	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	312	4.0	mg/l	1	10/09/03	MAZ	SM19 2340C
Solids, Total Dissolved	465	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	78.0	4.0	mg/l	4	10/10/03 14:57	MW	415.1/9060 M/5310B M
Total Organic Content	100	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	BRYAN-STREAM-D	<b>Date Sampled:</b>	10/02/03
<b>Lab Sample ID:</b>	N49876-2	<b>Date Received:</b>	10/04/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	324	4.0	mg/l	1	10/09/03	MAZ	SM19 2340C
Solids, Total Dissolved	595	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	4.1	1.0	mg/l	1	10/10/03 14:20	MW	415.1/9060 M/5310B M
Total Organic Content	100	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-STREAM-M	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49876-3	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Surface Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	352	4.0	mg/l	1	10/09/03	MAZ	SM19 2340C
Solids, Total Dissolved	589	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	4.3	1.0	mg/l	1	10/10/03 14:27	MW	415.1/9060 M/5310B M
Total Organic Content	100	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-STREAM-F	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49876-4	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Surface Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	332	4.0	mg/l	1	10/09/03	MAZ	SM19 2340C
Solids, Total Dissolved	581	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	4.3	1.0	mg/l	1	10/10/03 14:34	MW	415.1/9060 M/5310B M
Total Organic Content	100	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-PORE-U	<b>Date Sampled:</b> 10/03/03
<b>Lab Sample ID:</b> N49876-5	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	158	20	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	90.0	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	4900	20	mg/l	5	10/27/03	ST	SM19 2340C
Solids, Total Dissolved	360	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	1100	100	mg/l	1	10/27/03 12:37	HY	415.1/9060 M/5310B M
Total Organic Content	93.9	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-PORE-D	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49876-6	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	73.8	10	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	165	20	mg/l	1	10/28/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	2840	20	mg/l	5	10/27/03	ST	SM19 2340C
Solids, Total Dissolved	530	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	220	100	mg/l	1	10/27/03 12:01	HY	415.1/9060 M/5310B M
Total Organic Content	99.4	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-PORE-M	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49876-7	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	50.1	10	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	120	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	3100	20	mg/l	5	10/27/03	ST	SM19 2340C
Solids, Total Dissolved	520	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	480	100	mg/l	1	10/27/03 12:12	HY	415.1/9060 M/5310B M
Total Organic Content	98.7	0.010	%	1	10/24/03	MW	ASTM D2974-87

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-PORE-F	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49876-8	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	35.9	10	mg/l	1	10/04/03 14:10	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	85.0	20	mg/l	1	10/16/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	6870	40	mg/l	5	10/27/03	ST	SM19 2340C
Solids, Total Dissolved	410	10	mg/l	1	10/08/03	NR	EPA 160.1
Total Organic Carbon	2400	500	mg/l	1	10/27/03 12:24	HY	415.1/9060 M/5310B M
Total Organic Content	89.4	0.010	%	1	10/24/03	MW	ASTM D2974-87

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RL = Reporting Limit





NOV 04 2003

*BLP/EA*

Technical Report for

EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49894

Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 8



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

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## Sample Summary

EA Engineering

Job No: N49894

Soap and Detergent Association (SDA), Sediment Sampling  
 Project No: 1407401.0001

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
N49894-1	10/03/03	10:50 LD	10/04/03	SO	Soil	BRYAN-SED-U
N49894-2	10/02/03	12:30 LD	10/04/03	SO	Soil	BRYAN-SED-D
N49894-3	10/02/03	15:15 LD	10/04/03	SO	Soil	BRYAN-SED-M
N49894-4	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F
N49894-5	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F-DUP

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Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-U	<b>Date Sampled:</b> 10/03/03
<b>Lab Sample ID:</b> N49894-1	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 82.5
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	77.0		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	54.5		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	35.4		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	31.6		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	22.4		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	13.2		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.8		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.1		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	4.7		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	4		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	3		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	23.0		%	1	10/27/03	ST	ASTM D422-63
% Sand	71.9		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	5.1		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	<370	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	17.5		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	173	24	mg/kg	1	10/09/03 10:13	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	9610	1200	mg/kg	1	10/23/03 12:53	SJG	CORP ENG 81M/SW9060M
Total Organic Content	4.9	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-D	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49894-2	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 77.8
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	96.7		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	87.7		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	62.7		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	55.3		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	34.2		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	15.8		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.7		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.5		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	5.3		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	3		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	3.3		%	1	10/27/03	ST	ASTM D422-63
% Sand	91.2		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	5.5		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.6		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1230	400	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	22.2		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	212	25	mg/kg	1	10/09/03 10:14	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	11400	1300	mg/kg	1	10/23/03 13:05	SJG	CORP ENG 81M/SW9060M
Total Organic Content	1.7	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> BRYAN-SED-M	<b>Date Sampled:</b> 10/02/03
<b>Lab Sample ID:</b> N49894-3	<b>Date Received:</b> 10/04/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 81.8
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	93.0		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	64.2		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	40.5		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	36.4		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	26.4		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	15.1		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	4.5		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	2.9		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	2.6		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	2		%	1	10/27/03	ST	ASTM D422-63
% Gravel	7.1		%	1	10/27/03	ST	ASTM D422-63
% Sand	90.1		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	2.9		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.8		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1030	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	18.2		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	184	24	mg/kg	1	10/09/03 10:15	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon	5480	1200	mg/kg	1	10/23/03 13:24	SJG	CORP ENG 81M/SW9060M
Total Organic Content	2.1	0.010	%	1	10/24/03	MW	ASTM D2974-87

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	BRYAN-SED-F	<b>Date Sampled:</b>	10/02/03
<b>Lab Sample ID:</b>	N49894-4	<b>Date Received:</b>	10/04/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	73.7
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	99.5		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	94.7		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	83.4		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	81.4		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	75.5		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	66.4		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	47.7		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	22.8		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	22.0		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	10		%	1	10/27/03	ST	ASTM D422-63
% Gravel	0.47		%	1	10/27/03	ST	ASTM D422-63
% Sand	76.7		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	22.8		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.5		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4360	420	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	26.3		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	482	26	mg/kg	1	10/09/03 10:16	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon <sup>b</sup>	9570	1400	mg/kg	1	10/23/03 13:48	SJG	CORP ENG 81M/SW9060M
Total Organic Content	1.5	0.010	%	1	10/27/03	MW	ASTM D2974-87

(a) Data extrapolated from higher and lower data points due to possible analytical problem with hydrometer analysis at short analysis times.

(b) Multiple injections indicate possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	BRYAN-SED-F-DUP	<b>Date Sampled:</b>	10/02/03
<b>Lab Sample ID:</b>	N49894-5	<b>Date Received:</b>	10/04/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	81.0
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/27/03	ST	ASTM D422-63
0.375 Inch Sieve	98.1		%	1	10/27/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	93.5		%	1	10/27/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	82.9		%	1	10/27/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	80.8		%	1	10/27/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	74.3		%	1	10/27/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	65.2		%	1	10/27/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	47.4		%	1	10/27/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	24.9		%	1	10/27/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	23.7		%	1	10/27/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	20		%	1	10/27/03	ST	ASTM D422-63
% Gravel	1.9		%	1	10/27/03	ST	ASTM D422-63
% Sand	73.3		%	1	10/27/03	ST	ASTM D422-63
% Silt, Clay, Colloids	24.9		%	1	10/27/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/09/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	4300	380	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	19		%	1	10/16/03	TC	ASTM 4643-00
Nitrogen, Total Kjeldahl	385	24	mg/kg	1	10/09/03 10:18	VLP	EPA 351.2 M
Sulfide	<4.0	4.0	mg/kg	1	10/09/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	6440	1200	mg/kg	1	10/23/03 14:13	SJG	CORP ENG 81M/SW9060M
Total Organic Content	6.2	0.010	%	1	10/24/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

RL = Reporting Limit





# ACCU-TEST Laboratories

2235 Route ayton NJ 08810  
 TEL: 732-329-0200 FAX: 732-329-3499/3480  
 www.acctest.com

# CHAIN OF CUSTODY

50

<b>Client / Reporting Information</b> Company Name: EA Address: 15 Loveton Cir City: Spinks MD Zip: 21152 Project Contact: Mike Ciarfo Phone: 410-771-4950 Sampler's Name:		<b>Project Information</b> Project Name: SDA Street: State City: State Project #: Fax # Client Purchase Order #:		<b>FED-EX Tracking #</b> Bottle Order Control # Accutest Job # Accutest Quote #		<b>Requested Analysis</b> Matrix Codes: DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SD - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY HZ												
Accutest Sample #	Field ID / Point of Collection	SUMMA #	Collection		# of bottles	Number of preserved Bottles							Matrix	Samp'd By	Date	Time	Comments / Remarks	
			MECH	Vol #		IS	HS04	HS04	HS04	HS04	HS04	HS04						HS04
-1	BRYAN - SED - U				2									LO	10/3/03	10:50	ATTCBUREAU	
-2	BRYAN - SED - B				2										10/2/03	12:30	S, TKM, TOC, TOC/T, MOIST, BOMS, CCC, GRMS	
-3	BRYAN - SED - M				2										10/1/03	15:15		
-4	BRYAN - SED - F				2											09:30		
-5	BRYAN - SED - B dup				4											09:30		

Approved By: / Date:  
 Std. 15 Business Days  
 10 Day RUSH  
 5 Day RUSH  
 3 Day EMERGENCY  
 2 Day EMERGENCY  
 1 Day EMERGENCY  
 Other \_\_\_\_\_

Commercial "A" = Results Only

Turnaround Time (Business Days)  
 FULL CLP  
 NYASP Category A  
 NYASP Category B  
 State Forms  
 EDD Format \_\_\_\_\_

Relinquished by Sampler: demondone  
 Date Time: 10/2/03 1400  
 Relinquished by: FedEx  
 Date Time: 10/1/03 02:15  
 Relinquished by: FedEx  
 Date Time: 10/1/03 02:15  
 Relinquished by: FedEx  
 Date Time: 10/1/03 02:15

Sample Custody must be documented below each time samples change possession, including counter delivery.

Relinquished by: FedEx  
 Date Time: 10/1/03 02:15  
 Relinquished by: FedEx  
 Date Time: 10/1/03 02:15  
 Relinquished by: FedEx  
 Date Time: 10/1/03 02:15

Emergency & Rush TIA data available VIA LabLink

On Ice  Cooler Temp. 4.4



New Jersey

**ACCUTEST.**

Laboratories

11/05/03

NOV 10 2003

*BS/EA*

Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49894X

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Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report:



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

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### Sample Summary

EA Engineering

Job No: N49894X

Soap and Detergent Association (SDA), Sediment Sampling  
Project No: 1407401.0001

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
N49894-1X	10/03/03	10:50 LD	10/04/03	SO	Soil	BRYAN-SED-U
N49894-2X	10/02/03	12:30 LD	10/04/03	SO	Soil	BRYAN-SED-D
N49894-3X	10/02/03	15:15 LD	10/04/03	SO	Soil	BRYAN-SED-M
N49894-4X	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F
N49894-5X	10/02/03	09:30 LD	10/04/03	SO	Soil	BRYAN-SED-F-DUP



**ACCUTEST.**  
Laboratories

**CHAIN OF CUSTODY**

2235 Route 1ayton NJ 08810  
TEL. 732-329-0200 FAX: 732-329-3499/3480  
www.accutest.com

50

<b>Company Name</b> EA		<b>Client / Reporting Information</b> Project Name: SDA Street: [blank] City: [blank] State: [blank] Project #: [blank] Fax #: [blank]		<b>Project Information</b> Project Name: SDA Street: [blank] City: [blank] State: [blank] Project #: [blank] Fax #: [blank]		<b>Requested Analysis</b> Matrix Codes: DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY H2	
<b>Company Name</b> EA		<b>Client / Reporting Information</b> Project Name: SDA Street: [blank] City: [blank] State: [blank] Project #: [blank] Fax #: [blank]		<b>Project Information</b> Project Name: SDA Street: [blank] City: [blank] State: [blank] Project #: [blank] Fax #: [blank]		<b>Requested Analysis</b> Matrix Codes: DW - Drinking Water GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid WP - Wipe LAB USE ONLY H2	
<b>Field ID / Point of Collection</b> 1 BRYAN - SED - U 2 BRYAN - SED - D 3 BRYAN - SED - M 4 BRYAN - SED - F 5 BRYAN - SED - dup		<b>Collection</b> Date: 10/3/03 10:30 10/2/03 1230 10/2/03 1515 0830 0830		<b>Number of preserved Bottles</b> MECH: [blank] H2SO4: [blank] HNO3: [blank] HNO2: [blank] H2O2: [blank] H2O: [blank]		<b>Matrix</b> Matrix: [blank] SAMPLED BY: [blank]	
<b>Accutest Sample #</b> -1 -2 -3 -4 -5		<b>SUMMA #</b> MECH Val # [blank]		<b>Turnaround Time (Business Days)</b> Approved By / Date: [blank]		<b>Data Deliverable Information</b> <input type="checkbox"/> FULL CLP <input type="checkbox"/> NYASP Category A <input type="checkbox"/> NYASP Category B <input type="checkbox"/> State Forms <input type="checkbox"/> EDD Formal Commercial *A* <input type="checkbox"/> Commercial *B* <input type="checkbox"/> NJ Reduced <input type="checkbox"/> NJ Full <input type="checkbox"/> Other	
<b>Sampler's Name</b> [blank]		<b>Client Purchase Order #</b> [blank]		<b>Emergency &amp; Rush TIA data available VIA LabLink</b> <input type="checkbox"/> Std. 15 Business Days <input type="checkbox"/> 10 Day RUSH <input type="checkbox"/> 5 Day RUSH <input type="checkbox"/> 3 Day EMERGENCY <input type="checkbox"/> 2 Day EMERGENCY <input type="checkbox"/> 1 Day EMERGENCY <input type="checkbox"/> Other		<b>Comments / Remarks</b> * Samples filled in on per DK. BUB 10-7-03	
<b>Relinquished by:</b> [Signature]		<b>Relinquished by:</b> [Signature]		<b>Relinquished by:</b> [Signature]		<b>Relinquished by:</b> [Signature]	
<b>Date Time:</b> 10/3/03 1100		<b>Date Time:</b> 10/1/03 0725		<b>Date Time:</b> 10/1/03 0725		<b>Date Time:</b> 10/1/03 0725	
<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]	
<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]	
<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]		<b>Received by:</b> [Signature]	



**ACCUTEST®**

# CHAIN OF CUSTODY

Fresh Ponds Corporate Village, Building B  
2235 Route 130, Dayton, NJ 08810  
908-329-0200 FAX: 908-329-3499/3480

Accutest Job #:  
Accutest Quote #:

Client Information		Facility Information		Analytical Information	
<b>Accutest</b> Name: 2235 Route 130 Address: Dayton NJ 08810 City: Diane Komar State: NJ Zip: 08810 Project Name: SDA Location: Dayton NJ 08810 Project No.: N49894 Send Report to: (732) 329-0200 x212 Phone #: (732) 329-0200 FAX #: (732) 329-3499		Analytical Information		Analytical Information	
Field ID / Point of Collection N49894 -1 -2 -3 -4 -5 - - - - -		Date 10/3 10/2 10/2 10/2 10/2 - - - - -		Matrix Soil Soil Soil Soil Soil - - - - -	
Turnaround Information <input type="checkbox"/> 21 Day Standard <input type="checkbox"/> 14 Day <input type="checkbox"/> 7 Days EMERGENCY <input checked="" type="checkbox"/> Other 21 (Days)		Data Deliverable Information <input type="checkbox"/> NJ Reduced <input type="checkbox"/> NJ Full <input type="checkbox"/> FULL CLP <input type="checkbox"/> Disk Deliverable <input type="checkbox"/> Other (Specify)		Preservation H 254 H 203 H 103 H 102 H 101 None	
Approved By: _____ Date Time: _____		Relinquished By: _____ Date Time: _____		Comments / Remarks	
Relinquished by Sampler: _____ Date Time: 10/8/03 1700		Relinquished By: _____ Date Time: _____		Received By: _____ Date Time: _____	
Relinquished by Sampler: _____ Date Time: _____		Relinquished By: _____ Date Time: _____		Received By: _____ Date Time: _____	
Relinquished by Sampler: _____ Date Time: _____		Relinquished By: _____ Date Time: _____		Received By: _____ Date Time: _____	
Relinquished by Sampler: _____ Date Time: _____		Relinquished By: _____ Date Time: _____		Received By: _____ Date Time: _____	

Atterburg Limits

X  
X  
X  
X  
X

Commercial "A"  
Commercial "B"  
State Forms

Approved By:  
Date Time: \_\_\_\_\_

Relinquished By:  
Date Time: \_\_\_\_\_

Relinquished By:  
Date Time: \_\_\_\_\_

Relinquished By:  
Date Time: \_\_\_\_\_

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler	Date Time	Relinquished By	Date Time	Received By	Date Time
1	10/8/03 1700	1	10/8/03 1700	2	10/8/03 1700
3		3		4	
5		5			

On Ice

Preserved where applicable



# **SUBCONTRACT DATA**

**Golder Associates Inc.**

1951 Old Cuthbert Road, Suite 301  
Cherry Hill, NJ 08034  
Telephone (856) 616-8166  
Fax (856) 616-1874



November 4, 2003

993-6504-002

Nadine Yakes  
AccuTest  
Fresh Ponds Corporate Village  
Building B  
2235 Route 130  
Dayton, NJ 08810

RE: GEOTECHNICAL SOIL TEST DATA

Dear Ms. Yakes:

Please find attached zipped Excel spreadsheet containing geotechnical laboratory test results for projects N48765 and ~~N49598~~ *N49894* *ny 11/5*

If you have any questions, please contact us at (856) 616-8166.

Very truly yours,

GOLDER ASSOCIATES INC.

A handwritten signature in black ink, appearing to read "Robert M. Wilkinson", is written over the printed name.

Robert M. Wilkinson  
Laboratory Manager and Associate

Enclosures



**ATTERBERG LIMITS  
ASTM D 4318**

**ACCUTEST/LAB GEOTECH/NJ  
993-6504-002**

**SAMPLE #: N49894-1**

**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	M-9	M-6	
wt soil&tare,moist (g)	31.50	35.59	
wt soil&tare,dry (g)	29.82	33.31	
wt tare (g)	21.62	22.12	
wt moisture (g)	1.68	2.28	
wt dry soil (g)	8.20	11.19	<b>AVERAGE</b>
% moisture	<b>20.49</b>	<b>20.38</b>	<b>20</b>

**DELIVERED MOISTURE CONTENT**

tare #	RD-4
wt soil&tare,moist (g)	203.46
wt soil&tare,dry (g)	181.03
wt tare (g)	37.72
wt moisture (g)	22.43
wt dry soil (g)	143.31
% moisture	<b>15.65</b>

**LIQUID LIMIT**

Number of Blows	20	22	
tare #	N100	45	
wt soil&tare,moist (g)	33.02	32.09	
wt soil&tare,dry (g)	29.85	28.97	
wt tare (g)	22.15	21.03	
wt moisture (g)	3.17	3.12	
wt dry soil (g)	7.70	7.94	
% moisture	41.17	39.29	<b>AVERAGE</b>
LL	<b>40.07</b>	<b>38.69</b>	<b>39</b>

<b>LIQUID LIMIT:</b>	<b>39</b>
<b>PLASTIC LIMIT:</b>	<b>20</b>
<b>PLASTICITY INDEX:</b>	<b>19</b>
<b>DELIVERED MOISTURE:</b>	<b>15.65</b>

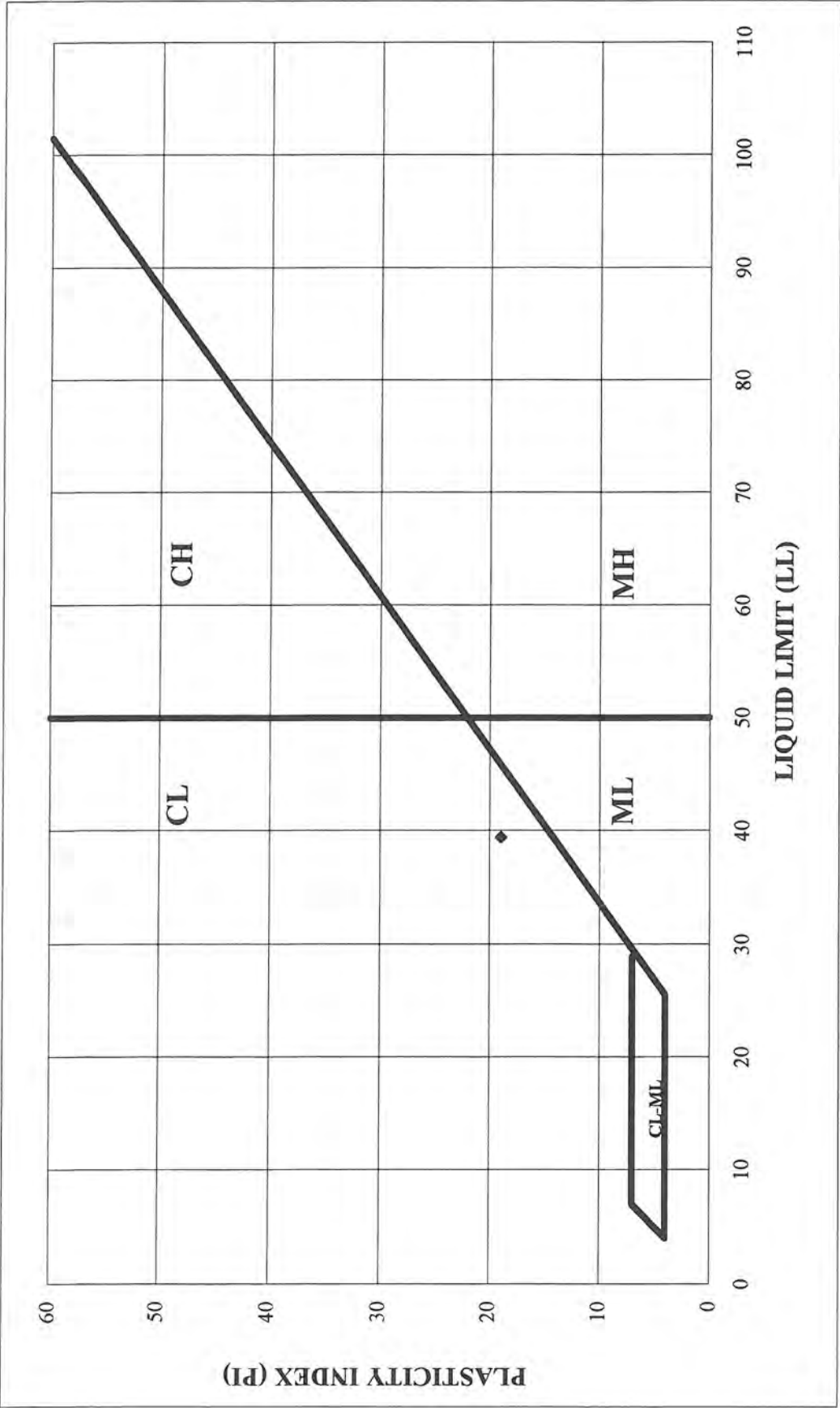
<b>WET COLOR:</b>	Olive gray
<b>USCS:</b>	<b>CL</b>

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION: % moisture\*((Number of Blows/25)^0.121)**

DATE	10/16/03
TECH	WWC
REVIEW	RMW

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



**ATTERBERG LIMITS  
ASTM D 4318**

<b>ACCUTEST/LAB GEOTECH/NJ 993-6504-002</b>	<b>SAMPLE #:</b> N49894-2
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**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	98	CP-2	
wt soil&tare,moist (g)	26.97	32.37	
wt soil&tare,dry (g)	26.00	30.99	
wt tare (g)	19.54	21.71	
wt moisture (g)	0.97	1.38	
wt dry soil (g)	6.46	9.28	<b>AVERAGE</b>
% moisture	<b>15.02</b>	<b>14.87</b>	<b>15</b>

**DELIVERED MOISTURE CONTENT**

tare #	E036
wt soil&tare,moist (g)	137.63
wt soil&tare,dry (g)	119.43
wt tare (g)	31.73
wt moisture (g)	18.20
wt dry soil (g)	87.70
% moisture	<b>20.75</b>

**LIQUID LIMIT**

Number of Blows	20	20	
tare #	M-2	I-43	
wt soil&tare,moist (g)	30.68	28.92	
wt soil&tare,dry (g)	28.73	27.18	
wt tare (g)	21.98	21.09	
wt moisture (g)	1.95	1.74	
wt dry soil (g)	6.75	6.09	
% moisture	28.89	28.57	<b>AVERAGE</b>
LL	<b>28.12</b>	<b>27.81</b>	<b>28</b>

<b>LIQUID LIMIT:</b>	<b>28</b>
<b>PLASTIC LIMIT:</b>	<b>15</b>
<b>PLASTICITY INDEX:</b>	<b>13</b>
<b>DELIVERED MOISTURE:</b>	<b>20.75</b>

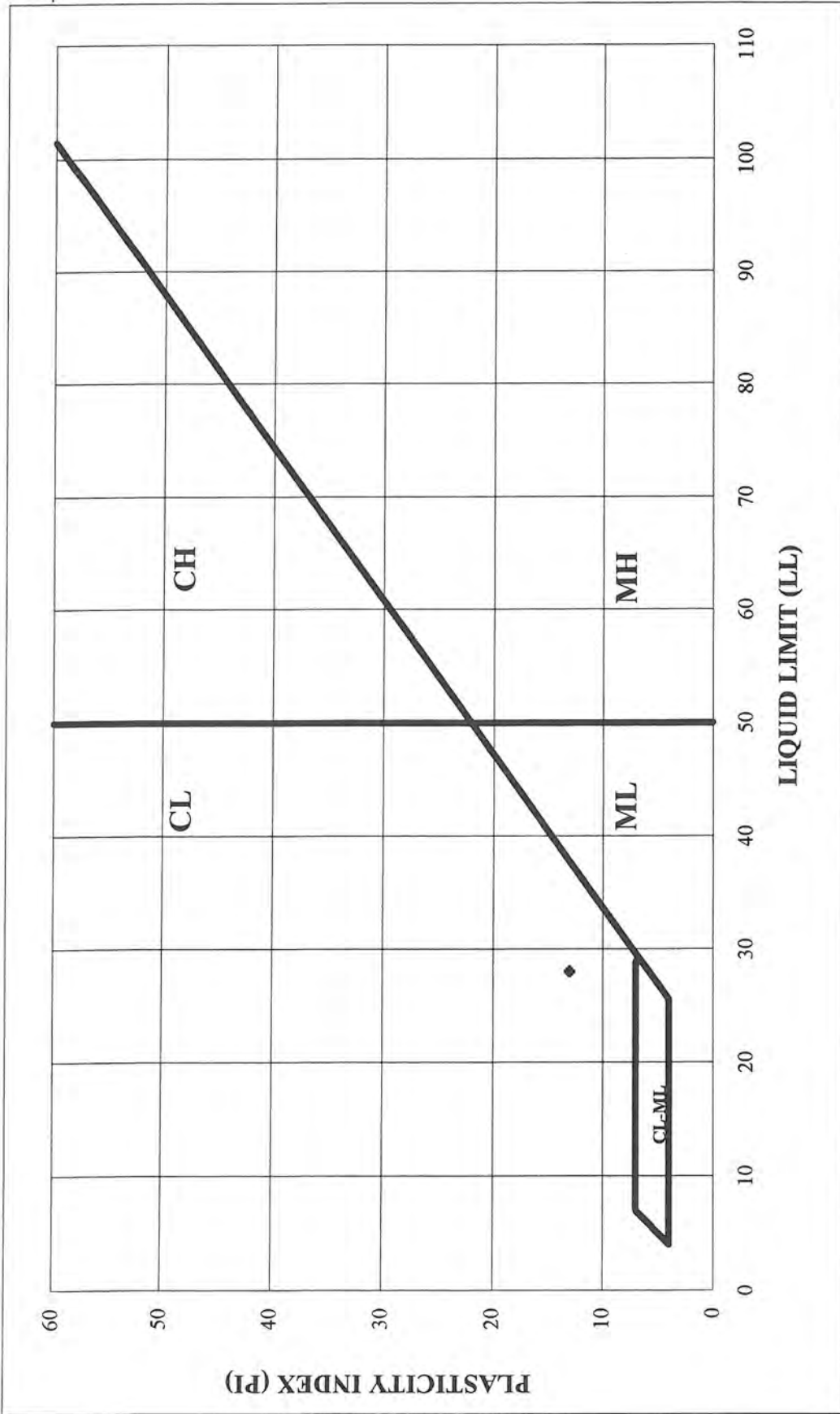
<b>WET COLOR:</b>	Light olive brown
<b>USCS:</b>	<b>CL</b>

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION: % moisture\*((Number of Blows/25)^0.121)**

DATE	10/20/03
TECH	WWC
REVIEW	RMW

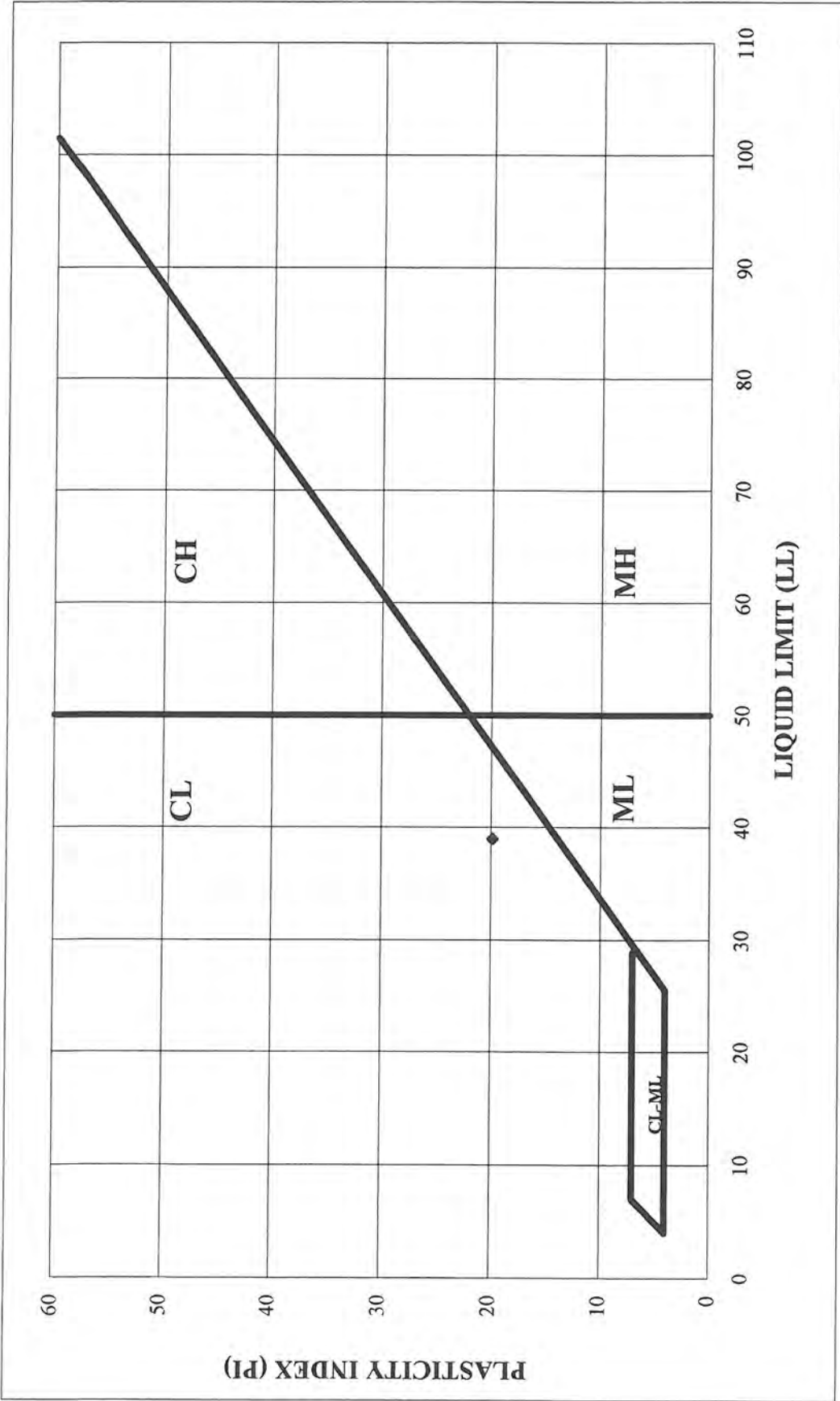
**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



**ATTERBERG LIMITS  
ASTM D 4318**

<b>ACCUTEST/LAB GEOTECH/NJ 993-6504-002</b>			<b>SAMPLE #: N49894-3</b>		
<b>SAMPLE PREPARATION</b>					
Wet or Dry <input type="checkbox"/> Wet <input checked="" type="checkbox"/>					
<b>PLASTIC LIMIT</b>			<b>DELIVERED MOISTURE CONTENT</b>		
tare #	M-9	18			
wt soil&tare,moist (g)	27.49	25.81	tare # <span style="float: right;">RD-3</span>		
wt soil&tare,dry (g)	26.52	24.83	wt soil&tare,moist (g) <span style="float: right;">181.66</span>		
wt tare (g)	21.62	19.53	wt soil&tare,dry (g) <span style="float: right;">160.19</span>		
wt moisture (g)	0.97	0.98	wt tare (g) <span style="float: right;">37.74</span>		
wt dry soil (g)	4.90	5.30	wt moisture (g) <span style="float: right;">21.47</span>		
% moisture	<b>19.80</b>	<b>18.49</b>	wt dry soil (g) <span style="float: right;">122.45</span>		
			% moisture <span style="float: right;"><b>17.53</b></span>		
			<b>AVERAGE</b>		
			<b>19</b>		
<b>LIQUID LIMIT</b>					
Number of Blows	20	20	<b>LIQUID LIMIT: 39</b>		
tare #	27C	26C	<b>PLASTIC LIMIT: 19</b>		
wt soil&tare,moist (g)	29.38	31.97	<b>PLASTICITY INDEX: 20</b>		
wt soil&tare,dry (g)	26.88	28.73	<b>DELIVERED MOISTURE: 17.53</b>		
wt tare (g)	20.66	20.61	<b>WET COLOR: Light olive brown</b>		
wt moisture (g)	2.50	3.24			
wt dry soil (g)	6.22	8.12	<b>USCS: CL</b>		
% moisture	40.19	39.90			
LL	<b>39.12</b>	<b>38.84</b>			
			<b>AVERAGE</b>		
			<b>39</b>		
<b>USCS Classification is based upon material passing the #40 sieve ONLY.</b>					
<b>LL CALCULATION: % moisture*((Number of Blows/25)^0.121)</b>					
			DATE	10/21/03	
			TECH	WWC	
			REVIEW	RMW	

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



**ATTERBERG LIMITS  
ASTM D 4318**

**ACCUTEST/LAB GEOTECH/NJ  
993-6504-002**

**SAMPLE #:** N49894-4

**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	Z-1	47	
wt soil&tare,moist (g)	30.19	28.17	
wt soil&tare,dry (g)	28.70	26.85	
wt tare (g)	21.81	20.83	
wt moisture (g)	1.49	1.32	
wt dry soil (g)	6.89	6.02	<b>AVERAGE</b>
% moisture	<b>21.63</b>	<b>21.93</b>	<b>22</b>

**DELIVERED MOISTURE CONTENT**

tare #	RRD-2
wt soil&tare,moist (g)	139.37
wt soil&tare,dry (g)	119.54
wt tare (g)	37.93
wt moisture (g)	19.83
wt dry soil (g)	81.61
% moisture	<b>24.30</b>

**LIQUID LIMIT**

Number of Blows	27	25	
tare #	10B	M-4	
wt soil&tare,moist (g)	28.42	31.99	
wt soil&tare,dry (g)	25.78	28.77	
wt tare (g)	20.15	22.09	
wt moisture (g)	2.64	3.22	
wt dry soil (g)	5.63	6.68	
% moisture	46.89	48.20	<b>AVERAGE</b>
LL	<b>47.33</b>	<b>48.20</b>	<b>48</b>

<b>LIQUID LIMIT:</b>	<b>48</b>
<b>PLASTIC LIMIT:</b>	<b>22</b>
<b>PLASTICITY INDEX:</b>	<b>26</b>
<b>DELIVERED MOISTURE:</b>	<b>24.30</b>

**WET COLOR:** Olive gray

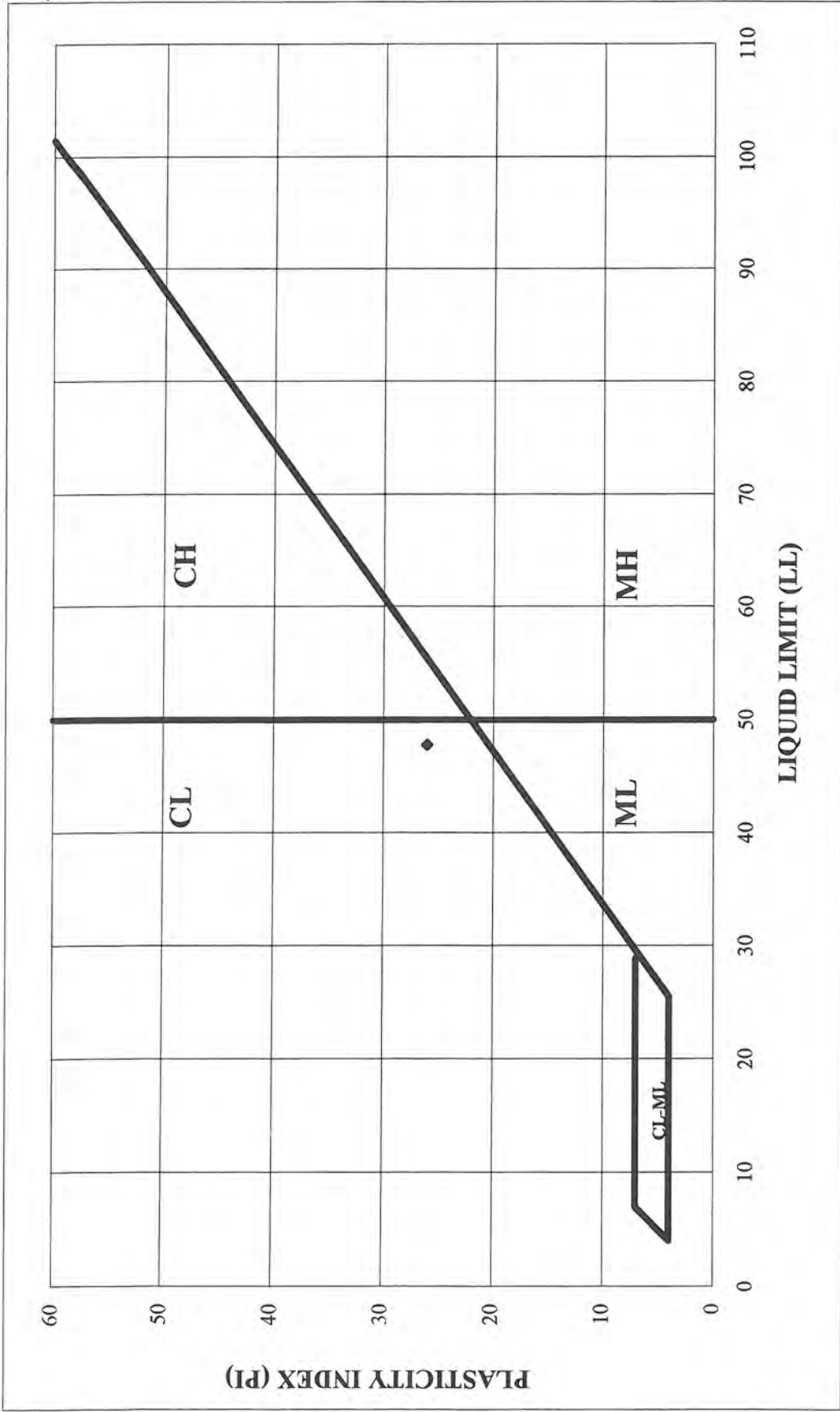
**USCS:** CL

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION:** % moisture\*((Number of Blows/25)^0.121)

DATE	10/20/03
TECH	WWC
REVIEW	RMW

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**





**ATTERBERG LIMITS  
ASTM D 4318**

**ACCUTEST/LAB GEOTECH/NJ  
993-6504-002**

**SAMPLE #: N49894-5**

**SAMPLE PREPARATION**

Wet or Dry  Wet

**PLASTIC LIMIT**

tare #	18B	AB-2	
wt soil&tare,moist (g)	27.44	29.09	
wt soil&tare,dry (g)	26.42	27.93	
wt tare (g)	19.84	19.75	
wt moisture (g)	1.02	1.16	
wt dry soil (g)	6.58	8.18	<b>AVERAGE</b>
% moisture	15.50	14.18	<b>15</b>

**DELIVERED MOISTURE CONTENT**

tare #	0
wt soil&tare,moist (g)	92.38
wt soil&tare,dry (g)	81.92
wt tare (g)	37.95
wt moisture (g)	10.46
wt dry soil (g)	43.97
% moisture	<b>23.79</b>

**LIQUID LIMIT**

Number of Blows	24	26	
tare #	34C	19-B	
wt soil&tare,moist (g)	31.47	30.65	
wt soil&tare,dry (g)	29.03	28.33	
wt tare (g)	20.04	19.80	
wt moisture (g)	2.44	2.32	
wt dry soil (g)	8.99	8.53	
% moisture	27.14	27.20	<b>AVERAGE</b>
LL	<b>27.01</b>	<b>27.33</b>	<b>27</b>

<b>LIQUID LIMIT:</b>	<b>27</b>
<b>PLASTIC LIMIT:</b>	<b>15</b>
<b>PLASTICITY INDEX:</b>	<b>12</b>
<b>DELIVERED MOISTURE:</b>	<b>23.79</b>

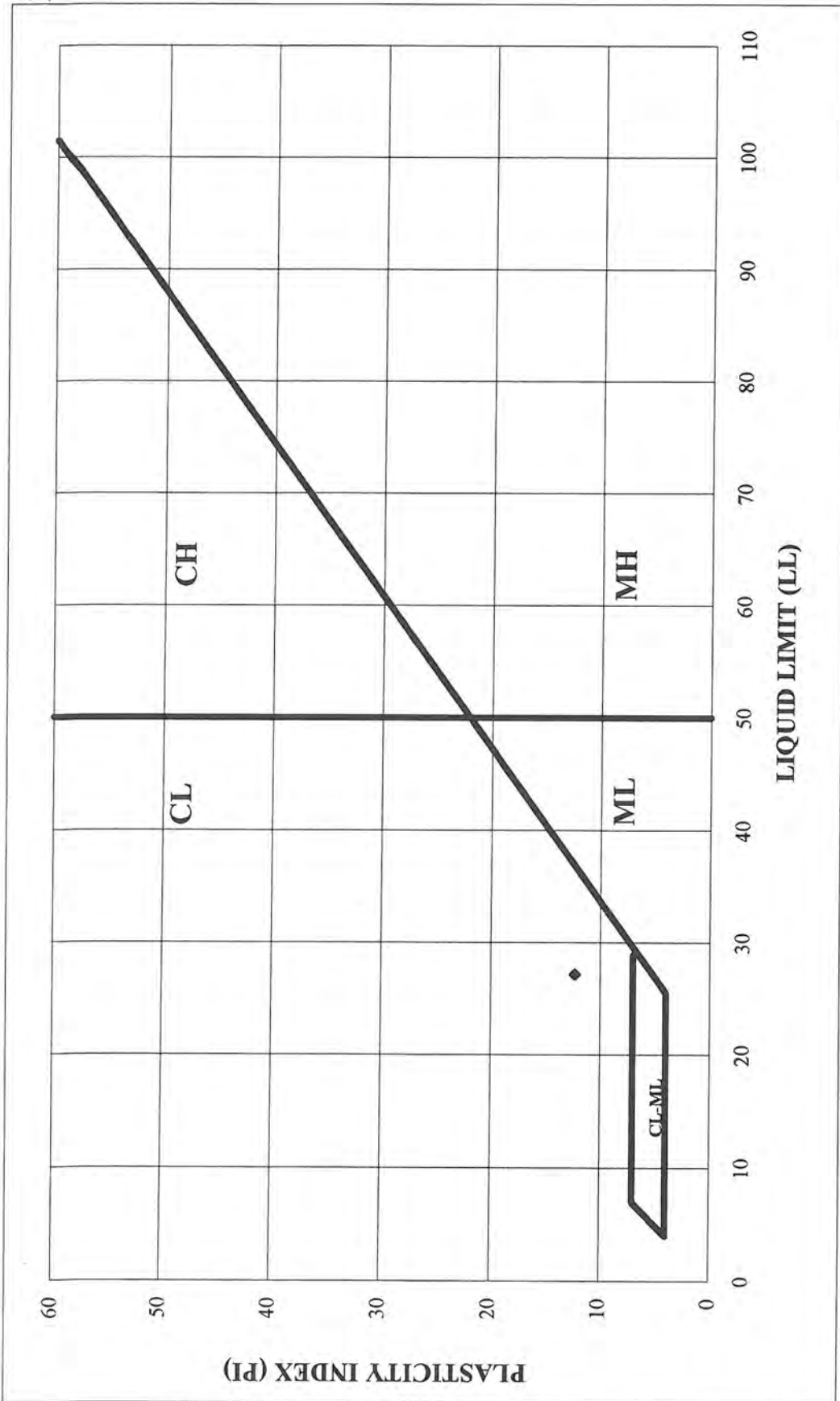
<b>WET COLOR:</b>	Olive gray
<b>USCS:</b>	<b>CL</b>

**USCS Classification is based upon material passing the #40 sieve ONLY.**

**LL CALCULATION: % moisture\*((Number of Blows/25)^0.121)**

DATE	10/20/03
TECH	WWC
REVIEW	RMW

**GOLDER ASSOCIATES INC.  
CHERRY HILL, NEW JERSEY**



Technical Report for

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EA Engineering

Soap and Detergent Association (SDA), Sediment Sampling

1407401.0001

Accutest Job Number: N49598

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Report to:

EA Engineering  
15 Loveton Circle  
Sparks, MD 21152

ATTN: Mike Ciarlo

Total number of pages in report: 16



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Vincent J. Pugliese  
President

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, MA, MD, NC, PA, RI, SC, VA

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## Sample Summary

EA Engineering

Job No: N49598

Soap and Detergent Association (SDA), Sediment Sampling  
Project No: 1407401.0001

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
N49598-1	10/01/03	08:45 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-U
N49598-2	09/30/03	11:30 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-D
N49598-3	09/30/03	13:30 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-M
N49598-4	09/30/03	08:45 SS	10/02/03	AQ	Surface Water	WILMINGTON-STREAM-F
N49598-5	10/01/03	08:45 SS	10/02/03	AQ	Water	WILMINGTON-PORE-U
N49598-6	09/30/03	11:30 SS	10/02/03	AQ	Water	WILMINGTON-PORE-D
N49598-7	09/30/03	13:30 SS	10/02/03	AQ	Water	WILMINGTON-PORE-M
N49598-8	09/30/03	08:45 SS	10/02/03	AQ	Water	WILMINGTON-PORE-F
N49598-9	09/30/03	13:30 SS	10/02/03	SO	Soil	WILMINGTON-SED-M
N49598-10	09/30/03	08:45 SS	10/02/03	SO	Soil	WILMINGTON-SED-F
N49598-11	09/30/03	11:30 SS	10/02/03	SO	Soil	WILMINGTON-SED-D
N49598-12	10/01/03	08:45 SS	10/02/03	SO	Soil	WILMINGTON-SED-U

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Soil samples reported on a dry weight basis unless otherwise indicated on result page.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-1	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

### General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO3	344	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	476	10	mg/l	1	10/06/03	NR	EPA 160.1
Total Organic Carbon	3.0	1.0	mg/l	1	10/06/03 14:03	MW	415.1/9060 M/5310B M

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RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-D	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-2	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	326	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	479	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.4	1.0	mg/l	1	10/06/03 14:10	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-STREAM-M	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-3	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Surface Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	<3.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	314	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	504	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.6	1.0	mg/l	1	10/06/03 14:16	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-STREAM-F	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-4	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Surface Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	8.2	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	<20	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	292	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	428	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	3.9	1.0	mg/l	1	10/06/03 14:23	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit



**Report of Analysis**

<b>Client Sample ID:</b>	WILMINGTON-PORE-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-5	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	21.2	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	143	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	650	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	440	10	mg/l	1	10/06/03	NR	EPA 160.1
Total Organic Carbon	52.4	3.0	mg/l	3	10/10/03 14:50	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-PORE-D	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-6	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	18.3	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	125	20	mg/l	1	10/09/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	868	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	337	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	11.4	1.0	mg/l	1	10/06/03 15:38	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-PORE-M	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-7	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	12.5	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	270	40	mg/l	2	10/21/03	ST	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	1670	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	338	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	5.9	1.0	mg/l	1	10/06/03 15:44	MW	415.1/9060 M/5310B M

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 RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-PORE-F	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-8	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
BOD, 5 Day	18.1	3.3	mg/l	1	10/02/03 09:35	MJC	EPA 405.1/SM19 5210B
Chemical Oxygen Demand	190	20	mg/l	1	10/14/03	JA	HACH 8000/EPA 410.1M
Hardness, Total as CaCO <sub>3</sub>	664	4.0	mg/l	1	10/06/03	JN	SM19 2340C
Solids, Total Dissolved	227	10	mg/l	1	10/04/03	JET	EPA 160.1
Total Organic Carbon	126	6.0	mg/l	6	10/06/03 17:54	MW	415.1/9060 M/5310B M

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-M	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-9	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	79.9
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	98.1		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	87.6		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	84.4		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	66.0		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	37.0		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	14.4		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	9.8		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	9.5		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.5		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	1.5		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.5		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	90.2		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	9.8		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1870	390	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	20.1		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	167	24	mg/kg	1	10/09/03 10:10	VLP	EPA 351.2 M
Sulfide	< 5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	5120	1300	mg/kg	1	10/22/03 15:31	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	18.9	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b> WILMINGTON-SED-F	<b>Date Sampled:</b> 09/30/03
<b>Lab Sample ID:</b> N49598-10	<b>Date Received:</b> 10/02/03
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> 81.4
<b>Project:</b> Soap and Detergent Association (SDA), Sediment Sampling	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	95.7		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	76.4		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	70.3		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	50.0		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	20.4		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	6.2		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	5.3		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	5.1		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.0		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	1.2		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.2		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	94.7		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	5.3		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.8		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	1180	380	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	18.6		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	113	24	mg/kg	1	10/09/03 10:11	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon	5700	1200	mg/kg	1	10/22/03 13:06	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>a</sup>	19.7	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-D	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-11	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	82.7
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

**General Chemistry**

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	96.7		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	81.3		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	76.6		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	59.8		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	32.7		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	12.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	7.0		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	6.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.9		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.5		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.4		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	93.0		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	7.0		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.9		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	685	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	17.3		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	116	23	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	8560	1200	mg/kg	1	10/22/03 14:32	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	17.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

- (a) Multiple injections indicate possible sample non-homogeneity.
- (b) Variable results on multiple analysis indicates possible sample non-homogeneity.

RL = Reporting Limit

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-12	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	78.8
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	97.4		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	91.6		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	89.5		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	76.9		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	47.1		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	14.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	8.8		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	8.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	3.5		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.8		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.6		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	91.2		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	8.8		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	882	390	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	21.2		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	220	24	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	6510	1300	mg/kg	1	10/22/03 14:59	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	15.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.





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FED-EX Tracking #  
AccuTest Quote #  
Boilie Order Control #  
AccuTest Job #  
M49558+X  
9/12/03

Client / Reporting Information

Company Name: EA Englehardt  
Address: 15 Lorston Circle  
City: Sparks MD Zip: 21152  
Project Name: SDA  
Street: SDA  
City: State: State:

Project Contact: Mike Ciało  
E-mail: Project #  
Phone #: 410-771-4950  
Fax #:  
Sampler's Name: Leonard Damp  
Client Purchase Order #:

Requested Analysis: TDS, TOC, BOD, COD, HARDNESS

Acquist Sample #	Field ID / Point of Collection	SUMMA #	MECH Val #	Collection			Matrix	# of bottles	Number of preserved Bottles										8260 BITEX	8260 TBA	8270 ASB	TDS	TOC	BOD	COD	HARDNESS	LAB USE ONLY
				Date	Time	Sampled By			NON	NOB	NR04	NON	NSH04	MEH	ENORE												
-1	WILMINGTON-STREAM-U			10/01/03	0845	SS	SW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-2	WILMINGTON-STREAM-D			9/30/03	1130	SS	SW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-3	WILMINGTON-STREAM-M			9/30/03	1330	SS	SW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-4	WILMINGTON-STREAM-F			9/30/03	0845	SS	SW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-5	WILMINGTON-POLE-U			10/10/03	0845	LD	WW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-6	WILMINGTON-POLE-D			9/30/03	1130	LD	WW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-7	WILMINGTON-POLE-M			9/30/03	1330	LD	WW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-8	WILMINGTON-POLE-F			9/30/03	0845	LD	WW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					
-9	WILMINGTON-SEB-D			10/10/03	0845	LD	WW	5	1	1	1	1	1	1	1	1	1	X	X	X	X	X					

Turnaround Time (Business Days) \_\_\_\_\_ Approved By: / Date: \_\_\_\_\_

Emergency & Rush T/A data available VIA LabLink

Requested by Sample: 1. *Samuel Bone* Date Time: 10/01/03  
 Requisitioned by: *Samuel Bone* Date Time: 10/01/03  
 Requisitioned by: \_\_\_\_\_ Date Time: \_\_\_\_\_  
 Requisitioned by: \_\_\_\_\_ Date Time: \_\_\_\_\_

Sample Custody must be documented below each time samples change possession, including courier delivery.

1. Received by: *FedEx* Date Time: 10/1/03  
 2. Requisitioned by: *FedEx* Date Time: 10/1/03  
 3. Received by: \_\_\_\_\_ Date Time: \_\_\_\_\_  
 4. Custody Seal # \_\_\_\_\_  
 5. Received by: \_\_\_\_\_ Date Time: \_\_\_\_\_

Preserved where applicable:  On Ice:  Cooler Temp: 3.1-3.5

Comments / Remarks: *we used 4x4.5s  
 @ Bob's and out of PLAD  
 shipped on pallet NBS 10-2-03*



ACCUTEST

Laboratories

CHAIN OF CUSTODY

2235 Route 130, Dayton NJ 08810  
TEL. 732-329-0200 FAX: 732-329-3499/3480  
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Client / Reporting Information

Company Name: EA Engineering

Address: 15 Loveton Circle

City: Sparks State: MD Zip: 21158

Project Contact: Mike Carls E-mail: Project #

Phone # 410-771-4950 Fax #

Sampler's Name: Leonard Dene Client Purchase Order #

Project Information

Project Name: SDA

Matrix Codes

DW - Drinking Water  
GW - Ground Water  
WW - Water  
SW - Surface Water  
SO - Soil  
SI - Sludge  
OI - Oil  
LI - Other Liquid  
AR - Air  
SOL - Other Solid  
WIP - Wipe

FED-EX Tracking #

Accutest Quote #

Accutest Job #

Boiler Order Control #

Requested Analysis: MOISTURE CONTENT, BULK DENSITY, TOC, ORG. MATTER, TOTAL SULFIDE, TOTAL KJELDAHL NITROGEN, ATTERBERG LIMITS, CATION EXCHANGE CAPACITY

Accutest Sample #	Field ID / Point of Collection	SUMMA #	MECH Val #	Date	Time	Sampled By	Matrix	# of bottles	ENCORE
-9	WILMINGTON - SED-M			9/30/03	1330	LD	50	2	
-10	WILMINGTON - SED-F			9/30/03	0845	LD	50	2	
-11	WILMINGTON - SED-D			9/30/03	1130	LD	50	2	
-12	WILMINGTON - SED-U			10/16/03	0845	LD	50	3	

Turnaround Time (Business Days):  
 Std. 15 Business Days  
 10 Day RUSH  
 Approved By: / Date:  
 Requisitioned by: / Date Time: / Received by: /

Data Deliverable Information:  
 Commercial 'A'  
 Commercial 'B'  
 NJ Reduced  
 FULL CLP  
 NYASP Category A  
 NYASP Category B  
 State Forms

Comments / Remarks

LAB USE ONLY

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-D	<b>Date Sampled:</b>	09/30/03
<b>Lab Sample ID:</b>	N49598-11	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	82.7
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	96.7		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	81.3		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	76.6		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	59.8		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	32.7		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	12.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	7.0		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	6.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	2.9		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.5		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.4		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	93.0		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	7.0		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.9		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	685	370	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	17.3		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	116	23	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	8560	1200	mg/kg	1	10/22/03 14:32	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	17.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.

## Report of Analysis

<b>Client Sample ID:</b>	WILMINGTON-SED-U	<b>Date Sampled:</b>	10/01/03
<b>Lab Sample ID:</b>	N49598-12	<b>Date Received:</b>	10/02/03
<b>Matrix:</b>	SO - Soil	<b>Percent Solids:</b>	78.8
<b>Project:</b>	Soap and Detergent Association (SDA), Sediment Sampling		

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
1.5 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.75 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
0.375 Inch Sieve	100		%	1	10/15/03	ST	ASTM D422-63
No.4 Sieve (4.75 mm)	97.4		%	1	10/15/03	ST	ASTM D422-63
No.8 Sieve (2.36 mm)	91.6		%	1	10/15/03	ST	ASTM D422-63
No.10 Sieve (2.00 mm)	89.5		%	1	10/15/03	ST	ASTM D422-63
No.16 Sieve (1.18 mm)	76.9		%	1	10/15/03	ST	ASTM D422-63
No.30 Sieve (0.60 mm)	47.1		%	1	10/15/03	ST	ASTM D422-63
No.50 Sieve (0.30 mm)	14.8		%	1	10/15/03	ST	ASTM D422-63
No.100 Sieve (0.15 mm)	8.8		%	1	10/15/03	ST	ASTM D422-63
No.200 Sieve (0.075 mm)	8.3		%	1	10/15/03	ST	ASTM D422-63
0.030 mm (Hydrometer)	3.5		%	1	10/15/03	ST	ASTM D422-63
0.005 mm (Hydrometer)	2.8		%	1	10/15/03	ST	ASTM D422-63
0.0015 mm (Hydrometer)	1.6		%	1	10/15/03	ST	ASTM D422-63
% Gravel	0.0		%	1	10/15/03	ST	ASTM D422-63
% Sand	91.2		%	1	10/15/03	ST	ASTM D422-63
% Silt, Clay, Colloids	8.8		%	1	10/15/03	ST	ASTM D422-63
Bulk Density (Dry Basis)	1.7		g/ml	1	10/14/03	LMM	ASTM D2937-94 M
Cation Exchange Capacity	882	390	mg/kg	1	10/30/03	LH	SW846 9081
Moisture, Percent	21.2		%	1	10/10/03	HBA	ASTM 4643-00
Nitrogen, Total Kjeldahl	220	24	mg/kg	1	10/09/03 10:12	VLP	EPA 351.2 M
Sulfide	<5.0	5.0	mg/kg	1	10/07/03	ST	EPA 376.1 M
Total Organic Carbon <sup>a</sup>	6510	1300	mg/kg	1	10/22/03 14:59	SJG	CORP ENG 81M/SW9060M
Total Organic Content <sup>b</sup>	15.6	0.010	%	1	10/15/03	MW	ASTM D2974-87

(a) Multiple injections indicate possible sample non-homogeneity.

(b) Variable results on multiple analysis indicates possible sample non-homogeneity.



