

**Appendix C**  
**WDNR Correspondence**

**C-1**

**WDNR Letter to Mr. Steven Dischler – June 1, 2006**



## State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor  
Scott Hassett, Secretary  
Gloria L. McCutcheon, Regional Director

Sturtevant Service Center  
9531 Rayne Road, Suite IV  
Sturtevant, WI 53177  
Telephone 262-884-2357  
FAX 262-884-2307

June 1<sup>st</sup>, 2006

Mr. Steven Dischler, P.E.  
Foth & Van Dyke  
2737 S. Ridge Road  
PO Box 19012  
Green Bay, WI 53407-9012

Subject: Sediment Sampling Protocols and Analysis for Proposed Nagawicka Lake Dredging Project

Dear Mr. Dischler:

In order to adequately characterize the sediments proposed for dredging as described in your NR 347 Preliminary Application, dated April 21<sup>st</sup>, 2006, please undertake sediment sampling within the following locations and according to the following directions:

### Mill Pond

Within the impoundment, two core samples shall be taken to a depth of two feet beyond project depth. The cores should be taken a minimum of 200 feet apart, and located in areas to be most representative of the Mill Pond sediment. The top half of each of the two core samples taken should be mixed, and a single grab composite sample should then be taken from the resulting mixture and analyzed for the parameters listed in the attached table. The bottom half of each of the two core samples taken should also be mixed, with single grab composite sample then taken from the resulting mixture and analyzed for the parameters in the attached table. Additionally, 4-5 random cores should be taken from within the whole impoundment. These cores should then be composited together, and a single grab sample taken from the resultant mixture and analyzed as previously discussed.

### Bark River Inlet

Within the Bark River Inlet proposed dredged area, three core samples shall be taken. The cores should be located in areas most representative of the Inlet sediment profile, and be taken two feet beyond dredge depth. Each of three core samples taken should be separated into sediment and "beyond dredge depth" portions. The sediment portions from each core should then be composited together, and a single grab composite sample should then be taken from the resulting mixture and analyzed for the parameters listed in the attached table. The "beyond dredge depth" portions of each of the three core samples taken should also be mixed, with single grab composite sample then taken from the resulting mixture and analyzed for the parameters in the attached table.

General

Core appearances for all cores taken should be documented with photos prior to separating. Sediment depths and core locations should be recorded. All sample analyses should follow the suggested analytical methods, and meet the required detection limits listed in the attached table. Additionally, sampling and analyses shall be done in accordance with ch. NR 347.06 Wis. Admin. Code, unless modified by specific methods described in this memo. All analyses submitted to the Department shall be done by a laboratory certified or registered under ch. NR 149, Wis. Admin. Code. Finally, I would suggest that the composite samples be saved and preserved until the Project Manager determines that extra testing will not be necessary.

Please don't hesitate to contact me at 262-884-2357 if you have any questions regarding the information above.

Sincerely,

Craig Helker  
Water Resources Biologist

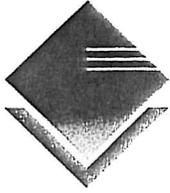
Cc: File  
Tom Hafner, City of Delafield  
Craig Webster, WDNR  
Jim D'Antuono, WDNR (electronic)  
Vic Pappas, WDNR (electronic)  
Bizhan Shiekholeslami, WDNR (electronic)  
Ken Denow, WDNR (electronic)

<b>Parameters for Testing (Nagawicka Lake - 6/01/06)</b>		
Parameter	Suggested Analytical Method	Required Detection Limit (ug/g dry)
<b>Inorganics-Metals</b>		
Arsenic	EPA 6010 or 7060	2.0
Cadmium	EPA 7131	0.02
Chromium (total)	EPA 6010 or 7191	5.0
Copper	EPA 6010 or 7211	2.0
Lead	EPA 6010 or 7421	5.0
Mercury	EPA 7471	0.02
Nickel	EPA 6010	5.0
Zinc	EPA 6010 or 7951	5.0
<b>Inorganics-Nutrients</b>		
Nitrate		
Nitrite		
Ammonia-Nitrogen		
Available Phosphorus		
Total Phosphorus		
Total K-Nitrogen		
Particle Size Analysis		
<b>Organics</b>		
Total Organic Carbon	SW 846 EPA 9060	
Polycyclic Aromatic Hydrocarbons (PAHs- 16 unsubstituted Parent Compounds)	EPA 8310	0.03
Chlordane	EPA 8081, 354440B, 3541	0.01
DDT	EPA 8081, 354440B, 3541	0.01
DDE	EPA 8081, 354440B, 3541	0.01
PCBs (total)*		0.05

\* Note: PCB analysis should be included on Mill Pond samples only, and not run on the Inlet samples

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**Foth Letter to Mr. Craig Helker – June 21, 2006**



# Foth & Van Dyke

June 21, 2006

Mr. Craig Helker  
WI Department of Natural Resources  
Sturtevant Service Center  
9531 Rayne Rd, Ste IV  
Sturtevant WI 53177

Dear Mr. Helker:

RE: Nagawicka Lake Sediment Sampling

On behalf of the city of Delafield, this letter is to acknowledge receipt of the Wisconsin Department of Natural Resources (WDNR) sediment sampling plan for Nagawicka Lake (WDNR letter dated June 1, 2006). This letter also summarizes minor adjustments to the sampling plans since the Preliminary Application was submitted in April 2006.

The city of Delafield has decided to put the Mill Pond dredging on hold at this time, and therefore, will not perform sediment sampling in this area. The city will perform the required Mill Pond sediment sampling in the future if and when they decide to pursue dredging of this area. The Bark River Inlet will be sampled and tested in accordance with the June 1, 2006 letter.

Although not listed in the June 1, 2006 letter, the city of Delafield is also planning to obtain one composite sediment sample for elutriate testing and two composite samples at each of the upland disposal sites for soil background characterization. These tests were proposed in the Preliminary Application.

The elutriate test will be used to characterize the chemistry of carriage return water generated during dredging operations. The elutriate sample will be a composite from three sediment samples obtained from the Bark River, Northwest Channels, and the West Channels. Chemical analyses will be performed as specified in Table 9-3 of the Preliminary Dredge Application. The test will be conducted by a qualified laboratory in accordance with U.S. Army Corps of Engineers testing procedures. In addition, physical testing of the composited samples from each area will be conducted as follows:

- ◆ Grain-size distribution (sieve and hydrometer), ASTM D422,
- ◆ Specific gravity (ASTM D5550),
- ◆ Percent moisture content and solids (ASTM D2216), and
- ◆ Organic content (ASTM D2974)

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Mr. Craig Helker  
WI Department of Natural Resources  
June 21, 2006  
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Soil samples will be obtained at the potential upland disposal sites. The purpose of these samples will be to establish background chemical concentration levels for soils from these properties, if they are selected for disposal. Sampling and analyses will be conducted as outlined in Section 9.3 of the Preliminary Application.

The city intends to conduct the sampling on Wednesday and Thursday, June 28 and 29, 2006. If desired, the WDNR is welcome to observe sample collection. We request written concurrence from the WDNR on the proposed additional sampling, as discussed in this letter. If you have any questions regarding the information contained herein or would like to be present during sampling, please contact Steve Dischler at (920) 496-6800.

Sincerely,

Foth & Van Dyke and Associates, Inc.



Steve A. Dischler, P.E.  
*Senior Project Manager*

cc: Tom Hafner, City of Delafield  
Jerry Bills, Lake Welfare Committee  
John Starke, Foth & Van Dyke

**C-3**

**Foth Letter to Ms. Geri Radermacher – November 19, 2007**



November 19, 2007

Ms. Geri Radermacher  
Wisconsin Department of Natural Resources  
141 NW Barstow St, Rm 180  
Waukesha WI 53188

Dear Ms. Radermacher:

RE: Results of Elutriate Tests Conducted for Nagawicka Lake

This letter presents the results for the elutriate testing conducted from Nagawicka Lake sediment samples. The testing and analysis was conducted pursuant to the WDNR requirements outlined in the WDNR March 8, 2007 letter to Mr. Tom Hafner, Appendix 5.

Presented in this letter is a summary of the sampling conducted by Foth on October 10, 2007, laboratory testing and interpretation of the results. Based upon the test results, it is our opinion that water quality at a 40 mg/L total suspended solid will meet water quality discharge standards issued under a WPDES General Permit.

### **Sample Collection**

Sediment samples for elutriate testing were retrieved from Nagawicka Lake as per instructions in the March 8, 2007 letter to Mr. Tom Hafner. Specific instructions were:

- ◆ Collect Nagawicka Lake sediment and conduct elutriate tests.
  - ▶ Sediment must be collected at four specific Nagawicka Lake locations. These are Bark River Inlet, Northeast Channels, Northwest Channels, and West Channels (the four locations).
- ◆ Measure concentrations in the elutriate supernatant of Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN), ammonia, arsenic (total and dissolved), and total copper (the main analytes).
- ◆ Measure concentration of mercury in the elutriate supernatant using ultra-trace methodology, such that limit of detection is equal to or less than 1 ng/L (trace mercury).
- ◆ Concentrations of the main analytes must be measured in each of four elutriate tests, with each test conducted using sediment from one of the four locations in Nagawicka Lake.
  - ▶ At each of the four locations, collect three discrete sediment samples and composite equal portions of these to create one sample representing that location.
- ◆ Concentration of trace mercury is to be measured in supernatant from one elutriate test representing Nagawicka Lake sediment.
  - ▶ At each of the four locations, collect one discrete sediment sample. Composite equal portions these four samples to create one sample representing Nagawicka Lake.

Foth personnel conducted field sampling on Nagawicka Lake on October 10, 2007. Sediment was successfully obtained from each of the four locations and was collected and composited in accordance with instructions above. Three specific sample points at each of the four locations were selected by field personnel to be representative of a given location. Sampled sediment was representative of proposed dredge material. Sampling was done from a moored boat. Sampling location (GPS coordinates), water depth, and sediment depth were recorded when sediment was collected. Sampling locations are shown on Figure 1. The sediment core logs are provided in Attachment 1.

Sediment samples used to create elutriate tests for the main analytes were retrieved using four-inch Lexan™ coring tubes. Cores tubes were placed manually. Once brought onboard, the sediment in a single core tube was placed in a stainless steel bowl and homogenized. If core tubes contained material other than soft sediment, this material was removed and discarded. To obtain sufficient sediment quantity, two cores were collected at each specific sample point. After each core was individually homogenized, a glass measuring container was used to transfer equal portions to a plastic transport bucket. This process was repeated at each of the other two sample points within a particular location, and the transport bucket with sediment from that location was sealed and returned to Foth. This process was repeated at each of the four locations. Approximately eight liters of sediment from each of the four locations was returned to Foth.

Sediment to be used in the trace mercury elutriate test was collected using two-inch coring tubes, placed with a T-bar push rod. Equipment preparation and field procedures conformed to methods appropriate for environmental trace mercury sampling. Cores were retrieved from each of the four locations. After retrieval, cores tubes were sealed and returned intact to Foth. Once secured in the Foth laboratory, equal portions of the cores were combined and blended in a non-metallic container to create a single composite sample representative of the four Nagawicka Lake locations.

All elutriate testing was done using lake water. Lake water was collected at each of the four locations as follows: At each location, approximately twenty liters of water was placed in a single plastic container, and the container was sealed. Water in this container was later used with sediment from the same location to create an elutriate test for the main analytes from that location. Water for the single trace mercury elutriate test was obtained by combining five liters of lake water from each of the four locations in a single container.

In summary, field sampling collected five unique sample pairs of sediment and water: one sample pair from each of the four locations in Nagawicka Lake (to create elutriate tests for the main analytes, and specific to each location); and one composite sample pair (to create a single elutriate test for trace mercury, and representative of all four locations).

### Elutriate Testing

The WDNR letter stated that elutriate testing be done on sediment collected from the four locations in Nagawicka Lake and that supernatant have a TSS concentration of less than 40 mg/L. The letter further stated that the elutriate test be treated so as to ensure TSS concentrations did not exceed 40 mg/L. An effluent elutriate test with chemical addition was chosen to meet these specifications.

Effluent elutriate testing is designed to simulate settling conditions in a confined disposal facility. Effluent elutriate test methodology suggests an initial solids concentration in the test vessel of 150,000 mg/L, simulating influent dredge slurry containing about 14% solids by weight for solids of typical density (2.65 g/cm<sup>3</sup>). The initial solids concentration may be adjusted to more accurately reflect actual dredge slurry solids concentrations, or to compensate for atypical sediment particles.

Preparation of an effluent elutriate test begins by placing an appropriate volume of wet sediment in the test vessel. The following two equations are used to determine appropriate wet sediment volume for a selected initial solids concentration:

$$\gamma_D = \frac{\gamma_W}{\frac{1}{G_s} + \frac{100}{\%S} - 1} \quad (1)$$

where

$\gamma_D$  = solids concentration (or dry bulk density)

$\gamma_W$  = density of water

$G_s$  = specific gravity of sediment particle

$\%S$  = weight percent of solids

$$V_{Sample} = \frac{\gamma_{D,Test}}{\gamma_{D,Sample}} \times V_{Test} \quad (2)$$

where

$V_{Sample}$  = sediment sample volume

$V_{Test}$  = elutriate test volume

$\gamma_{D,Test}$  = test solids concentration

$\gamma_{D,Sample}$  = sample solids concentration

Equation 1 requires the weight percent of solids in the wet sediment samples. This was determined gravimetrically for the five samples from Nagawicka Lake. Results from these measurements, and sediment solids concentrations (often referred to as dry bulk density for in-place sediments) calculated from Equation 1, are shown in Table 1.

Effluent elutriate tests were conducted in four-liter glass beakers, using a typical test volume of 3.75 L. Although the design is not final, the proposed Nagawicka Lake dredging is expected to produce an 8% by weight dredge slurry, which has an equivalent solids concentration of 84,000

mg/L. Appropriate sediment volumes to create initial solids concentrations equivalent to the proposed dredge slurry were calculated from the above values and the sample solids concentrations shown in Table 1. Results are shown in Table 2.

Effluent elutriate tests were conducted using established methodology (US Environmental Protection Agency, 1998; U.S. Army Corps of Engineers (USACE), 2003). Briefly, after preparing all glassware for trace-level metal analysis, sediment was placed in the test vessel and made to volume using paired lake water. After preparation, test vessels were covered at all times with plastic film to prevent contamination. Also, the single trace mercury elutriate test was shrouded as a further precaution against mercury contamination. Sediment slurries were mixed vigorously, and then allowed to settle. After chemical treatment (described below), supernatant samples were collected and placed in analytical laboratory-supplied containers. A filtered sample was also prepared by passing supernatant through a 0.45  $\mu\text{m}$  pre-cleaned filter.

A matrix blank for the main analytes was created by combining equal portions of lake water from each of the four locations. The blank was handled in a manner identical to the elutriate tests, including chemical addition. A matrix blank for trace mercury was prepared by directly sampling the composite lake water used in the trace mercury elutriate test; chemicals were not added to this blank. Two trace mercury laboratory blanks were also created by pouring mercury-free water (supplied by the analytical laboratory) into sample containers. Samples and blanks were delivered to Pace Analytical Services, Inc., Green Bay, Wisconsin for quantitation of main analytes and trace mercury.

#### **Chemical Addition to Effluent Elutriate Test**

The WDNR request that TSS be brought below 40 mg/L through treatment before collection of elutriate supernatant water samples implies a modification of normal elutriate testing procedures. Elutriate test procedures were modified by the addition of a coagulant and a flocculating agent to reduce the TSS concentration of the test supernatant. Selection of chemical agents for TSS reduction was guided by an understanding that use of such agents in the field would be monitored, and chemical agents were chosen based on published WDNR guidelines.

A general discussion of the use of sediment control agents is available in a WDNR document entitled "Interim Sediment Control Water Application of Polymers—1051." This document indicates that approval of specific products is done by the Wisconsin Department of Transportation (WDOT). WDOT produces a Product Acceptability List (PAL) of approved products for erosion control, including sediment control; this list is contained within a document entitled "Erosion Control Product Acceptability List for Multi-Modal Applications." Vendors of approved products are listed in Table 3.

A number of vendors listed in Table 3 were contacted. After consideration of several products, a product (the TSS control agent) from Soil-net (Soil Net LLC, Madison, Wisconsin) (the vendor) designed specifically for TSS control during dredging was selected. The vendor has several approved products on the WDOT PAL (Table 3), and the selected product has recently

been used successfully in the field on a Dane County, Wisconsin dredging project monitored by the WDNR.

The TSS control agent consists of two chemical solutions: a coagulant (SRH-100) and a flocculant (Liquid TriPAM). These solutions are added in sequence, beginning with the coagulant and followed immediately with the flocculant. The TSS control agent was added to the elutriate tests in this manner, and the tests were stirred for several minutes to distribute the agent. Final concentration of the TSS control agent was approximately 300 PPM in each elutriate test. While this concentration is appropriate for the application described here, use in the field will require a refinement of dosing strategy.

### **Results**

Elutriate tests successfully produced results for the main analytes in sediment from each of the four locations, as well as a trace mercury value for the composite sediment sample. Elutriate tests were documented with digital photographs; four photographs, shown in Figures 2 and 3, are presented herein. Four elutriate tests, representing the four locations and each contained in a separate beaker, are shown in three photographs. The tests are arranged in the same order in each photograph; from left to right, the tests contain sediment from Bark River Inlet, Northeast Channels, Northwest Channels, and West Channels.

Photograph A, Figure 2, shows the tests approximately sixty minutes after mixing ended, but before TSS control agent was added. In each case, an interface has formed between large sediment particles and supernatant. However, also in each case, the supernatant contains a high concentration of TSS. Although it would not be possible to measure the TSS concentration at this point and still have sufficient sample for the required tests, a visual assessment would estimate the TSS concentrations at many hundreds of milligrams per liter.

Photograph B, Figure 2 shows the tests approximately 100 minutes after the TSS control agent was added. Supernatant in all four tests began to clear immediately after TSS control agent addition, and the tests reached the condition shown in the photograph within about ten minutes. The TSS control agent was very effective in all four tests; close examination of the photograph shows a clear supernatant above all four sediments.

Photograph B, Figure 2 also shows another important result. A comparison of the initial sediment volumes listed in Table 2 with those visible in the photograph shows that all four sediments increased in volume. A sediment volume increase is not unexpected when TSS control agents are used. However, the magnitude of the volume increase, particularly for the sediment from the three channel locations, suggests that these sediments are different from those taken from Bark River Inlet. Several differences are apparent. The channel sediments have lower solids than the Bark River Inlet sediments (Table 1). Also, physical examination of the sediments shows that the channel sediments have high fiber content typical of decaying aquatic plant material, while the river sediment contains a large fraction of terrestrial particulate matter. These observations have important implications for management of sediment taken from these different locations.

While very low TSS concentrations (based on visual observation) were achieved in all four initial elutriate tests, the three channel sediments did not produce sufficient supernatant volume for the required analytical tests. Therefore, elutriate tests for the three channel sediments were rerun with approximately half the sediment sample volume used in the initial tests. The results of this second round of testing, as well as the original Bark River Inlet test, are shown in Photograph A, Figure 3 (this photograph was taken approximately thirty minutes after TSS control agent addition). As before, clear supernatant is present above all four sediments, and now sufficient supernatant is available for required analytical testing. Supernatant from each of the beakers shown in this photograph was collected and submitted for analytical testing to determine the concentrations of the main analytes resulting from elutriate testing of sediments from the four Nagawicka Lake locations.

Photograph B, Figure 3 shows the elutriate test based on the composite sediment sample approximately fifty minutes after TSS control agent addition. Sediment sample volume was approximately half that shown in Table 2. As with the other elutriate tests, a clear supernatant is present, although sediment volume is greater than the original sediment sample volume. The supernatant shown in this photograph was submitted for trace mercury analysis.

All of the main analytes were successfully quantified in supernatant from each of the four elutriate tests representing the four Nagawicka Lake locations. Concentrations of the main analytes in these tests are shown in Table 4.

Total suspended solids concentrations are all below the recommended target of 40 mg/L by a factor of three or more. Three of the four tests have TSS concentrations below the lake water matrix blank. These results demonstrate the effectiveness of the TSS control agent.

Target concentrations for the other main analytes were not provided in the WDNR letter, and an assessment of these values is not presented here, although it is noted that all values are relatively low. Also, total and dissolved concentrations for arsenic are similar, and in some cases the reported value for the dissolved concentration is greater than the total concentration. This apparent anomaly is the result of generally low arsenic concentrations and indicates that essentially all of the arsenic in the elutriate supernatant is dissolved. The two sets of measurements may then be seen as representing replicate analyses that differ due to sampling and analytical artifacts. All of these measurements will be most useful when considering proper handling of dredge spoils and carriage water from the proposed dredging project.

The concentration of mercury in the supernatant of the composite sediment elutriate test, as well as mercury concentrations in lake water and laboratory blanks, are shown in Table 5. Two aliquots of elutriate supernatant were collected from the composite sediment test, and both were submitted for mercury analysis (Elutriate Supernatant and Elutriate Supernatant duplicate in Table 5). The average of these two measurements is 1.26 ng/L (parts per trillion), a concentration that is less than the strictest environmental standard for mercury in water. The mercury supernatant concentration is also only twice the concentration of mercury in

Ms. Geri Radermacher  
Wisconsin Department of Natural Resources  
November 19, 2007  
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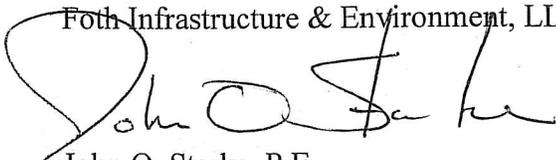
Nagawicka Lake water. Mercury in natural systems is often associated with particulate matter. The results in Table 5 indicate that reducing TSS concentration also reduces mercury levels. Results of the laboratory tests conducted by Pace Analytical are provided in Attachment 1.

Although not requested in the WDNR letter, a final test was performed on Nagawicka Lake sediments. The increase in sediment volume that occurred during the elutriate tests after treatment with the TSS control agent raised the possibility that dredged sediments in the field might retain water and so present challenges with respect to disposal. An initial assessment of this possibility was made by collecting treated sediments from the completed elutriate tests and placing them in a container that allowed water in the sediments to drain. Untreated sediments were placed in similar containers. While water drained from both treated and untreated sediments, treated sediments dewatered more quickly and more thoroughly than untreated sediments, indicating that treatment with a TSS control agent may provide benefits when disposing of dredged sediment.

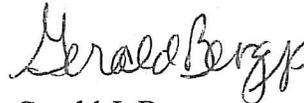
We look forward to discussing the results of these tests with the department to establish appropriate surface water protection standards for the Nagawicka Lake dredging project. If you need additional information, please contact either John Starke or Jerry Berg, at Foth, (920) 497-2500.

Sincerely,

Foth Infrastructure & Environment, LLC



John O. Starke, P.E.  
*Senior Geotechnical Engineer*



Gerald J. Berg  
*Associate*



Jon B. Manchester, P.E., Ph.D.  
*Lead Environmental Scientist*

Attachments

Laboratory Test Results  
Figures

cc: Tom Hafner, City of Delafield

## References

US Environmental Protection Agency, 1998. "Evaluation of Dredged Material Proposed for Discharge in the Waters of the U.S.—The Inland Testing Manual"

<http://www.epa.gov/waterscience/itm/>

DiGiano, FA, Miller, CT, Yoon, J, (1995). "Dredging elutriate test (DRET) development," Contract Report D-95-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS

U.S. Army Corps of Engineers (USACE), 2003. Evaluation of dredge material proposed for disposal at island, nearshore, or upland confined disposal facilities—Testing Manual. Technical Report ERDC/EL TR-03-1. Vicksburg, MS. U.S. Army Engineer Research and Development Center.

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Wisconsin Department of Transportation ECSW Committee, 2007. Erosion Control Product Acceptability List for Multi-Modal Applications.

<http://www.dot.wisconsin.gov/business/engrserv/docs/pal.pdf>

# Tables

**Table 1**  
**Nagawicka Lake Sediment Weight Percent Solids and Solids Concentrations**

<b>Sediment Sample</b>	<b>Weight Percent Solids</b>	<b>Solids Concentrations (mg/L)</b>
Bark River Inlet	39.7	528,000
Northeast Channels	12.3	133,000
Northwest Channels	14.4	158,000
West Channels	15.4	170,000
Mercury Composite	22.2	257,000

**Table 2**  
**Nagawicka Lake Effluent Elutriate Test Wet Sediment Volumes**

<b>Sediment Sample</b>	<b>Test Volume (L)</b>
Bark River Inlet	0.598
Northeast Channels	2.366
Northwest Channels	2.003
West Channels	1.855
Mercury Composite	1.228

**Table 3**  
**WDOT Approved Soil Stabilizers**

<b>Product Name</b>	<b>Manufacturer</b>
CF 2000	Construction Fabrics and Materials
Natural Earth PolyStable Plus	Earth & Road
PAM 12	ENCAP
PolyPlus	Polymer Plus , LLC
TRIPAM	Soil Net
35	Soil Net
50	Soil Net
B100	Agrecol

**Table 4**  
**Nagawicka Lake Elutriate Test Results—Concentrations of Main Analytes**

Analyte	Units	BRI <sup>1</sup>	Location of Sample			
			NEC <sup>2</sup>	NWC <sup>3</sup> mg/L	WC <sup>4</sup>	LW <sup>5</sup>
Total Suspended Solids		14	6.1	2.8	5.6	8.0
Total Kjeldahl Nitrogen		9.8	7.2	4.7	3.4	0.69
Ammonia		9.1	6.3	4.2	3.2	<0.50
	Units			µg/L		
Arsenic-Total <sup>6</sup>		1.3	9.8	18	4.3	0.18
Arsenic-Dissolved <sup>6</sup>		1.6	9.2	18	3.4	0.43
Copper-Total		0.25	0.21	0.33	0.21	0.26
Copper-Dissolved <sup>7</sup>		0.28	0.53	0.49	2.4	0.58

<sup>1</sup> Bark River Inlet

<sup>2</sup> Northeast Channels

<sup>3</sup> Northwest Channels

<sup>4</sup> West Channels

<sup>5</sup> Lake Water-composite of water from above locations

<sup>6</sup> Data shown for dissolved and total arsenic presents an anomaly, with some dissolved fractions having higher concentrations than the total. This may be reflective of sampling and analytical method variation. It also reflects minimal difference between the dissolved fraction and the total.

<sup>7</sup> WDNR did not request dissolved copper. Data shown for dissolved and total copper presents an anomaly, with dissolved fractions having higher concentrations than the total. This may be reflective of sampling and analytical method variation. The dissolved copper value for the West Channels sample is an outlier; the analytical laboratory is repeating the analysis of this sample.

**Table 5**  
**Nagawicka Lake Elutriate Test Results—Concentration of Mercury**

Sample	Mercury Concentration (ng/L)
Elutriate Supernatant	1.19
Elutriate Supernatant (duplicate)	1.32
Nagawicka Lake Water	0.654
Elutriate Field Blank	0.299
Lake Water Field Blank	0.303

Prepared by: JBM  
Checked by: GLB1

**Attachment 1**

**Sediment Core Logs**



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

### Sediment Core Collection Log

Sample Location ID: BRI-1

Date: 10/10/07

Time: 15:20

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, light rain, winds (7-10 mph) and waves (0-0.25')

**Actual Sampling Location**  
 Northing: 43° 05' 12.5"  
 Westing: 088° 23' 05.9"

Water Depth: 1.7'

Probed Depth: 5.4'

Sediment Thickness: 3.7'

Sediment Recovered: 2.05', 1.85'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were placed in each bucket.  
 Collected 3 - 2" core tubes for low-level mercury analysis. Caps were placed on the top and bottom of the core tube, which were secured with duct tape. The top was labelled with the sample location ID.  
 2" core recoveries - 1.2', 1.3', 1.2'  
 2 Liters of lake water were collected and placed in a bucket for the composite low-level mercury sample.  
 1 - 5-gallon bucket of lake water was collected for elutriate testing.

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: BRI-2

Date: 10/10/07

Time : 15:40

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, light rain, winds (7-10 mph) and waves (0-0.25')

**Actual Sampling Location**  
 Northing: 43° 05' 13.5"  
 Westing: 088° 23' 03.2"

Water Depth: 1.8'

Probed Depth: 5.65'

Sediment Thickness: 3.85'

Sediment Recovered: 1.95', 2.3'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was  
then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets  
for the bulk samples. Three liters were placed in each bucket.  
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Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: BRI-3

Date: 10/10/07

Time : 15:55

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, light rain, winds (7-10 mph) and waves (0-0.25')

**Actual Sampling Location**  
 Northing: 43° 05' 14.1"  
 Westing: 088° 23' 01.2"

Water Depth: 1.65'

Probed Depth: 4.90'

Sediment Thickness: 3.25'

Sediment Recovered: 2.05', 2.15'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were added to each bucket containing the material already added from BRI-1 and BRI-2. The sediment in the buckets was then homogenized.

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: NEC-1

Date: 10/10/07

Time : 14:25

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased winds (5-7 mph) and waves (0-0.25') - more calm in bay/channel

**Actual Sampling Location**  
 Northing: 43° 05' 031.1"  
 Westing: 088° 23' 12.0"

Water Depth: 2.0'

Probed Depth: 5.5'

Sediment Thickness: 3.5'

Sediment Recovered: 7", 1.6', 1.25'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were placed in each bucket.  
 Collected 3 - 2" core tubes for low-level mercury analysis. Caps were placed on the top and bottom of the core tube, which were secured with duct tape. The top was labelled with the sample location ID.  
 2" core recoveries - 1.25', 1.55', 1.75'

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: NEC-2

Date: 10/10/07

Time : 14:50

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased winds (5-7 mph) and waves (0-0.25') - more calm in bay/channel

**Actual Sampling Location**  
 Northing: 43° 05' 26.8"  
 Westing: 088° 23' 11.3"

Water Depth: 1.9'

Probed Depth: 5.5'

Sediment Thickness: 3.6'

Sediment Recovered: 1.85', 1.35'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were placed in each bucket.  
 2 Liters of lake water were collected and placed in a bucket for the composite low-level mercury sample.  
 1 - 5-gallon bucket of lake water was collected for elutriate testing.

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: WC-1

Date: 10/10/07

Time : 11:05

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, sprinkles on and off, high winds (10-15 mph) and waves (1.5-2')

**Actual Sampling Location**  
 Northing: 43° 04' 16.3"  
 Westing: 088° 23' 48.0"

Water Depth: 2.9'

Probed Depth: 5.1'

Sediment Thickness: 2.2'

Sediment Recovered: 12", 15", 8", 14"

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 4 pushes to get sufficient sample.  
The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was  
then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets  
for the bulk samples. Three liters were placed in each bucket.  
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Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: WC-2

Date: 10/10/07

Time : 11:36

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, sprinkles on and off, high winds (10-15 mph) and waves (1.5-2')

**Actual Sampling Location**  
 Northing: 43° 04' 24.0"  
 Westing: 088° 23' 48.6"

Water Depth: 2.9'

Probed Depth: 5.4'

Sediment Thickness: 2.5'

Sediment Recovered: 13", 14", 13"

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 3 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were added to each bucket containing the material already added from WC-1.

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Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: WC-3

Date: 10/10/07

Time : 11:56

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased winds (5-7 mph) and waves (0.5-1') - more calm in bay/channel

**Actual Sampling Location**  
 Northing: 43° 04' 32.9"  
 Westing: 088° 23' 45.6"

Water Depth: 1.85'

Probed Depth: 4.8'

Sediment Thickness: 2.95'

Sediment Recovered: 26", 21.5"

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were added to each bucket containing the material already added from WC-1 and WC-2. The sediment in the buckets was then homogenized.  
 Collected 3 - 2" core tubes for low-level mercury analysis. Caps were placed on the top and bottom of the core tube, which were secured with duct tape. The top was labelled with the sample location ID.  
 2" core recoveries - 1.1', 1.25', 1.25'  
 2 Liters of lake water were collected and placed in a bucket for the composite low-level mercury sample.  
 1 - 5-gallon bucket of lake water was collected for elutriate testing.

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
Project Location: Delafield, WI  
Scope ID: 06D006

### Sediment Core Collection Log

Sample Location ID: NWC-1

Date: 10/10/07

Time : 12:52

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased winds (5-7 mph) and waves (0.5-1') - more calm in bay/channel

**Actual Sampling Location**  
Northing: 43° 05' 01.7"  
Westing: 088° 23' 45.7"

Water Depth: 3.15'

Probed Depth: 6.3'

Sediment Thickness: 3.15'

Sediment Recovered: 28", 15"

#### Field Observations

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were placed in each bucket.  
Collected 3 - 2" core tubes for low-level mercury analysis. Caps were placed on the top and bottom of the core tube, which were secured with duct tape. The top was labelled with the sample location ID.  
2" core recoveries - 1.53', 1.65', 2.25'  
2 Liters of lake water was collected and placed in a bucket for the composite low-level mercury sample.  
1 - 5-gallon bucket of lake water was collected for elutriate testing.

Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: NWC-2

Date: 10/10/07

Time : 13:30

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased wind (5-7 mph) and waves (0-0.25') in channel

**Actual Sampling Location**  
 Northing: 43° 05' 06.2"  
 Westing: 088° 23' 52.2"

Water Depth: 2.75'

Probed Depth: 5.5'

Sediment Thickness: 2.75'

Sediment Recovered: 10.5", 10.5", 18", 16.5"

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 4 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were placed in each bucket.

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Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: NWC-3

Date: 10/10/07  
 Time : 14:00

Sampling Personnel: TMK1, GJP  
 Weather Conditions: Cloudy, decreased wind (5-7 mph) and waves (0-0.25') in channel

**Actual Sampling Location**  
 Northing: 43° 05' 17.1"  
 Westing: 088° 23' 46.8"

Water Depth: 3.9'  
 Probed Depth: 6.5'  
 Sediment Thickness: 2.6'  
 Sediment Recovered: 23", 23"

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were added to each bucket containing the material already added from NWC-1 and NWC-2. The sediment in the buckets was then homogenized.

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Prepared by: TMK1



Project Name: Nagawicka Lake Restoration  
 Project Location: Delafield, WI  
 Scope ID: 06D006

**Sediment Core Collection Log**

Sample Location ID: NEC-3

Date: 10/10/07

Time : 15:05

Sampling Personnel: TMK1, GJP

Weather Conditions: Cloudy, decreased winds (5-7 mph) and waves (0-0.25') - more calm in bay/channel

**Actual Sampling Location**  
 Northing: 43° 05' 23.1"  
 Westing: 088° 23' 09.9"

Water Depth: 1.8'

Probed Depth: 5.4'

Sediment Thickness: 3.6'

Sediment Recovered: 1.0', 1.7'

**Field Observations**

Manually pushed a 4"-diam. vibracore to collect bulk samples. Took 2 pushes to get sufficient sample.  
 The sample collected in the vibracore tube from each push was emptied into a stainless steel bowl, which was then homogenized. An approximate 1 liter measuring device was used to place equal amounts into two buckets for the bulk samples. Three liters were added to each bucket containing the material already added from NEC-1 and NEC-2. The sediment in the buckets was then homogenized.

Prepared by: TMK1

## **Attachment 2**

### **Laboratory Test Results**

(Please Print Clearly)

Company Name: **FOTH I+E**  
 Branch/Location: **GREEN BAY**  
 Project Contact: **JON MANCHESTER**  
 Phone: **(920) 496-6983**  
 Project Number: **06D006**  
 Project Name: **LN - EMBREATE**  
 Project State: **WI**  
 Sampled By (Print): **JON MANCHESTER**  
 Sampled By (Sign): *[Signature]*  
 PO #:



UPPER MIDWEST REGION  
 MN: 612-607-1700 WI: 920-469-2436

Page 1 of 1  
 COC No. **030994**

### CHAIN OF CUSTODY

**Preservation Codes**  
 A=Flora B=HCL C=H2SO4 D=HNO3 E=D1 Water F=Methanol G=NaOH  
 H=Sodium Bicarbonate Solution I=Sodium Thiosulfate J=Other

FILTERED?  
(YES/NO)  
 PRESERVATION  
(CODE)

Analysis Requested	Y/N	Y/N	Y/N	Y/N				
TSS 16A.2	N	N	Y	N				
METALS ARSENIC CASER	A	D	D	C				
METALS ARSENIC CASER								
TKN								

Quote #: **JON MANCHESTER**  
 Mail To Contact: **FOTH I+E**  
 Mail To Company: **2727 RIDGE ROAD**  
 Mail To Address: **GREEN BAY, WI 54307**  
 Invoice To Contact:  
 Invoice To Company: **FOTH I+E**  
 Invoice To Address: **(SAA)**  
 Invoice To Phone:

**Data Package Options** (billable)  
 EPA Level III  
 EPA Level IV

**MS/MSD**  
 On your sample (billable)  
 NOT needed on your sample

**Matrix Codes**  
 A = Air W = Water  
 B = Biot D1W = Drinking Water  
 C = Charcoal GW = Ground Water  
 D = Oil SW = Surface Water  
 E = Soil WW = Waste Water  
 S = Sludge WP = Wipe

PAGE LAB #	CLIENT FIELD ID	COLLECTION		MATRIX	Analysis Requested	Y/N	Y/N	Y/N	Y/N
		DATE	TIME						
001	LN-BARK	10/12/07	12:00	W		X	X	X	X
002	LN-NORTHEAST					X	X	X	X
003	LN-NORTHWEST					X	X	X	X
004	LN-WEST					X	X	X	X
005	LN-BLANK					X	X	X	X

**CLIENT COMMENTS**  
 LAB COMMENTS (Lab Use Only)  
 Profile #  
 Reply, 3-250 ml

Rush Turnaround Time Requested - Prelims  
 (Rush TAT subject to approval/surcharge)  
 Date Needed:  
 Transit Prelim Results by (complete what you want):  
 Email #1: **JMANCHESTER@FOTH.COM**  
 Email #2: **FOTH.COM**  
 Telephone: **(920) 496-6983**  
 Fax:  
 Samples on HOLD are subject to special pricing and release of liability

Relinquished By: *[Signature]* Date/Time: **10/12/07 13:53**  
 Relinquished By: Date/Time:  
 Relinquished By: Date/Time:  
 Relinquished By: Date/Time:

Received By: *[Signature]* Date/Time: **10-12-07 13:53**  
 Received By: Date/Time:  
 Received By: Date/Time:  
 Received By: Date/Time:

FACE Project No. **889646**  
 Receipt Temp = **RT** °C  
 Sample Receipt pH **OK / Adjusted**  
 Cooler Custody Seal  
 Present /  Not Present  
 Intact /  Not Intact

OCT-15-2007 16:14

P.06/09

**Login Detail Report**

Batch: 889646      PM: Tod Noltemeyer      Date Received: 10/12/2007 13:53      Logged: 10/12/2007      Submitter: 40-000297

Sample No.	Sample Type	Sample ID	Date Sampled	Test Group ID	Test Group Description	Analytical Method	Preparation Method	Department	Due Date	Special Turn
889646-001	WATER	LN-BARK	10/12/07	M-AS-W	ARSENIC	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-AS-D	ARSENIC - DISSOLVED	SW846 6020	SW846 3020A	METALS	10/26/200	
				M-CU-W	COPPER	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-CU-D	COPPER - DISSOLVED	SW846 6010B	SW846 6010B	METALS	10/26/200	
				W-NH3-W	NITROGEN, AMMONIA	EPA 350.1	EPA 350.1	WETCHEM	10/26/200	
				W-TKN-W	NITROGEN, TOTAL KJELDAH	EPA 351.2	EPA 351.2	WETCHEM	10/26/200	
				W-TSS-W	SOLIDS, TOTAL SUSPENDED	SM 2540D	SM 2540D	WETCHEM	10/26/200	

Comments:

SampleRefID:

889646-002	WATER	LN-NORTH EAST	10/12/07	M-AS-W	ARSENIC	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-AS-D	ARSENIC - DISSOLVED	SW846 6020	SW846 3020A	METALS	10/26/200	
				M-CU-W	COPPER	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-CU-D	COPPER - DISSOLVED	SW846 6010B	SW846 6010B	METALS	10/26/200	
				W-NH3-W	NITROGEN, AMMONIA	EPA 350.1	EPA 350.1	WETCHEM	10/26/200	
				W-TKN-W	NITROGEN, TOTAL KJELDAH	EPA 351.2	EPA 351.2	WETCHEM	10/26/200	
				W-TSS-W	SOLIDS, TOTAL SUSPENDED	SM 2540D	SM 2540D	WETCHEM	10/26/200	

Comments:

SampleRefID:

889646-003	WATER	LN-NORTH WEST	10/12/07	M-AS-W	ARSENIC	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-AS-D	ARSENIC - DISSOLVED	SW846 6020	SW846 3020A	METALS	10/26/200	
				M-CU-W	COPPER	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-CU-D	COPPER - DISSOLVED	SW846 6010B	SW846 6010B	METALS	10/26/200	
				W-NH3-W	NITROGEN, AMMONIA	EPA 350.1	EPA 350.1	WETCHEM	10/26/200	
				W-TKN-W	NITROGEN, TOTAL KJELDAH	EPA 351.2	EPA 351.2	WETCHEM	10/26/200	
				W-TSS-W	SOLIDS, TOTAL SUSPENDED	SM 2540D	SM 2540D	WETCHEM	10/26/200	

Comments:

SampleRefID:

Sample No.	Sample Type	Sample ID	Date Sampled	Test Group ID	Test Group Description	Analytical Method	Preparation Method	Department	Due Date	Special Turn
889646-004	WATER	LN-WEST	10/12/07	M-AS-W	ARSENIC	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-AS-D	ARSENIC - DISSOLVED	SW846 6020	SW846 3020A	METALS	10/26/200	
				M-CU-W	COPPER	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-CU-D	COPPER - DISSOLVED	SW846 6010B	SW846 6010B	METALS	10/26/200	
				W-NH3-W	NITROGEN, AMMONIA	EPA 350.1	EPA 350.1	WETCHEM	10/26/200	
				W-TKN-W	NITROGEN, TOTAL KJELDAH	EPA 351.2	EPA 351.2	WETCHEM	10/26/200	
				W-TSS-W	SOLIDS, TOTAL SUSPENDED	SM 2540D	SM 2540D	WETCHEM	10/26/200	
<b>Comments:</b>								<b>SampleRefID:</b>		
889646-005	WATER	LN-BLANK	10/12/07	M-AS-W	ARSENIC	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-AS-D	ARSENIC - DISSOLVED	SW846 6020	SW846 3020A	METALS	10/26/200	
				M-CU-W	COPPER	SW846 6010B	SW846 3010A	METALS	10/26/200	
				M-CU-D	COPPER - DISSOLVED	SW846 6010B	SW846 6010B	METALS	10/26/200	
				W-NH3-W	NITROGEN, AMMONIA	EPA 350.1	EPA 350.1	WETCHEM	10/26/200	
				W-TKN-W	NITROGEN, TOTAL KJELDAH	EPA 351.2	EPA 351.2	WETCHEM	10/26/200	
				W-TSS-W	SOLIDS, TOTAL SUSPENDED	SM 2540D	SM 2540D	WETCHEM	10/26/200	
<b>Comments:</b>								<b>SampleRefID:</b>		

Client : FOTH INFRASTRUCTURE & ENVIRONMENT

Project Name : LN-ELUTRIATE

Project Number : 06D006

Report Date : 11/01/07

**Mercury - Low Level**

Prep Method : EPA 1631E

Analysis Method : EPA 1631E

Lab Number	Field ID	Matrix	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date	Collected
889934-001	LN-E-HG	WATER	1.19	0.325	1.08		2	ng/L		10/29/07	10/19/07
889934-002	LN-E-HG DUPLICATE	WATER	1.32	0.325	1.08		2	ng/L		10/29/07	10/19/07
889934-003	LN-E-HG BLANK	WATER	0.299	0.163	0.542		1	ng/L	Q	10/29/07	10/19/07
889934-004	LN-W-HG	WATER	0.654	0.163	0.542		1	ng/L		10/29/07	10/19/07
889934-005	LN-W-HG BLANK	WATER	0.303	0.163	0.542		1	ng/L	Q	10/29/07	10/19/07

**Pace Analytical  
Services, Inc.**

**Analytical Report Number: 889646**

1241 Bellevue Street  
Green Bay, WI 54302  
920-469-2436

Client : FOTH INFRASTRUCTURE & ENVIRONMENT  
Project Name : LN - ELUTRIATE  
Project Number : 06D006  
Field ID : LN-BARK

Matrix Type : WATER  
Collection Date : 10/12/07  
Report Date : 11/12/07  
Lab Sample Number : 889646-001

**INORGANICS**

Test	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Arsenic	1.3	0.093	0.31		1	ug/L	A	11/07/07 10:14 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Arsenic - Dissolved	1.6	0.093	0.31		1	ug/L	A	11/07/07 09:32 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper	0.25	0.12	0.41		1	ug/L	Q	11/09/07 11:41 AM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper - Dissolved	0.28	0.12	0.41		1	ug/L	Q	11/07/07 09:32 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Nitrogen, Ammonia	9.1	0.50	1.7		1	mg/L		10/22/07 01:14 PM	EPA 350.1	EPA 350.1
								<b>Prep Date/Time:</b> 10/22/07 08:43 AM		<b>Anl By:</b> DAW
Nitrogen, Total Kjeldahl	9.8	0.42	1.4		1	mg/L		10/17/07 01:55 PM	EPA 351.2	EPA 351.2
								<b>Prep Date/Time:</b> 10/17/07 08:24 AM		<b>Anl By:</b> DAW
Total Suspended Solids	14	0.77	2.6		1	mg/L		10/18/07	SM 2540D	SM 2540D
								<b>Prep Date/Time:</b> 10/18/07		<b>Anl By:</b> DDY

**Pace Analytical  
Services, Inc.**

**Analytical Report Number: 889646**

1241 Bellevue Street  
Green Bay, WI 54302  
920-469-2436

**Client :** FOTH INFRASTRUCTURE & ENVIRONMENT  
**Project Name :** LN - ELUTRIATE  
**Project Number :** 06D006  
**Field ID :** LN-NORTH EAST

**Matrix Type :** WATER  
**Collection Date :** 10/12/07  
**Report Date :** 11/12/07  
**Lab Sample Number :** 889646-002

**INORGANICS**

Test	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Arsenic	9.8	0.093	0.31		1	ug/L	EA	11/07/07 10:44 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Arsenic - Dissolved	9.2	0.093	0.31		1	ug/L	A	11/07/07 09:38 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper	0.21	0.12	0.41		1	ug/L	Q	11/09/07 12:11 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper - Dissolved	0.53	0.12	0.41		1	ug/L		11/07/07 09:38 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Nitrogen, Ammonia	6.3	0.50	1.7		1	mg/L		10/22/07 01:15 PM	EPA 350.1	EPA 350.1
								<b>Prep Date/Time:</b> 10/22/07 08:43 AM		<b>Anl By:</b> DAW
Nitrogen, Total Kjeldahl	7.2	0.42	1.4		1	mg/L	A	10/17/07 01:56 PM	EPA 351.2	EPA 351.2
								<b>Prep Date/Time:</b> 10/17/07 08:24 AM		<b>Anl By:</b> DAW
Total Suspended Solids	6.1	0.44	1.5		1	mg/L		10/18/07	SM 2540D	SM 2540D
								<b>Prep Date/Time:</b> 10/18/07		<b>Anl By:</b> DDY

**Pace Analytical  
Services, Inc.**

**Analytical Report Number: 889646**

1241 Bellevue Street  
Green Bay, WI 54302  
920-469-2436

**Client :** FOTH INFRASTRUCTURE & ENVIRONMENT  
**Project Name :** LN - ELUTRIATE  
**Project Number :** 06D006  
**Field ID :** LN-NORTH WEST

**Matrix Type :** WATER  
**Collection Date :** 10/12/07  
**Report Date :** 11/12/07  
**Lab Sample Number :** 889646-003

**INORGANICS**

Test	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Arsenic	18	0.093	0.31		1	ug/L		11/07/07 10:57 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Arsenic - Dissolved	18	0.093	0.31		1	ug/L		11/07/07 09:44 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper	0.33	0.12	0.41		1	ug/L	Q	11/09/07 12:23 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper - Dissolved	0.49	0.12	0.41		1	ug/L		11/07/07 09:44 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Nitrogen, Ammonia	4.2	0.50	1.7		1	mg/L		10/22/07 01:16 PM	EPA 350.1	EPA 350.1
								<b>Prep Date/Time:</b> 10/22/07 08:43 AM		<b>Anl By:</b> DAW
Nitrogen, Total Kjeldahl	4.7	0.42	1.4		1	mg/L		10/24/07 09:35 AM	EPA 351.2	EPA 351.2
								<b>Prep Date/Time:</b> 10/24/07 04:00 AM		<b>Anl By:</b> DAW
Total Suspended Solids	2.8	0.61	2.0		1	mg/L		10/18/07	SM 2540D	SM 2540D
								<b>Prep Date/Time:</b> 10/18/07		<b>Anl By:</b> DDY

**Pace Analytical  
Services, Inc.**

**Analytical Report Number: 889646**

1241 Bellevue Street  
Green Bay, WI 54302  
920-469-2436

Client : FOTH INFRASTRUCTURE & ENVIRONMENT

Project Name : LN - ELUTRIATE

Project Number : 06D006

Field ID : LN-WEST

Matrix Type : WATER

Collection Date : 10/12/07

Report Date : 11/12/07

Lab Sample Number : 889646-004

**INORGANICS**

Test	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Arsenic	4.3	0.093	0.31		1	ug/L	A	11/07/07 11:03 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Arsenic - Dissolved	3.4	0.093	0.31		1	ug/L	A	11/07/07 09:50 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper	0.21	0.12	0.41		1	ug/L	Q	11/09/07 12:29 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper - Dissolved	2.4	0.12	0.41		1	ug/L	2	11/07/07 09:50 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Nitrogen, Ammonia	3.2	0.50	1.7		1	mg/L		10/22/07 01:17 PM	EPA 350.1	EPA 350.1
								<b>Prep Date/Time:</b> 10/22/07 08:43 AM		<b>Anl By:</b> DAW
Nitrogen, Total Kjeldahl	3.4	0.42	1.4		1	mg/L		10/24/07 09:36 AM	EPA 351.2	EPA 351.2
								<b>Prep Date/Time:</b> 10/24/07 04:00 AM		<b>Anl By:</b> DAW
Total Suspended Solids	5.6	0.61	2.0		1	mg/L		10/18/07	SM 2540D	SM 2540D
								<b>Prep Date/Time:</b> 10/18/07		<b>Anl By:</b> DDY

**Pace Analytical  
Services, Inc.**

**Analytical Report Number: 889646**

1241 Bellevue Street  
Green Bay, WI 54302  
920-469-2436

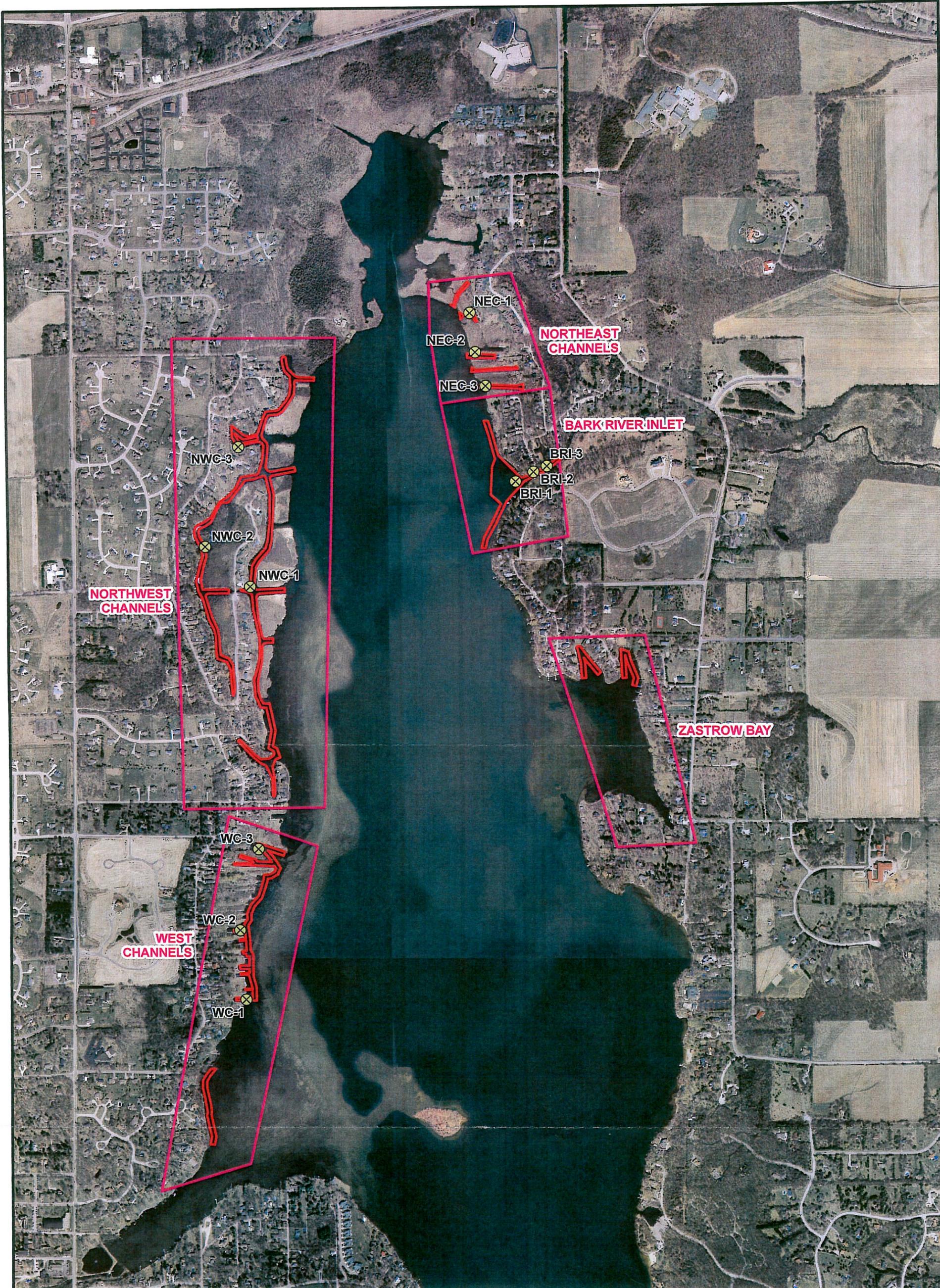
Client : FOTH INFRASTRUCTURE & ENVIRONMENT  
Project Name : LN - ELUTRIATE  
Project Number : 06D006  
Field ID : LN-BLANK

Matrix Type : WATER  
Collection Date : 10/12/07  
Report Date : 11/12/07  
Lab Sample Number : 889646-005

**INORGANICS**

Test	Result	LOD	LOQ	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Arsenic	0.18	0.093	0.31		1	ug/L	QA	11/07/07 11:09 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Arsenic - Dissolved	0.43	0.093	0.31		1	ug/L	A	11/07/07 09:56 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper	0.26	0.12	0.41		1	ug/L	Q	11/09/07 12:36 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Copper - Dissolved	0.58	0.12	0.41		1	ug/L		11/07/07 09:56 PM	SW846 3020A	SW846 6020
								<b>Prep Date/Time:</b> 11/02/07 10:00 AM		<b>Anl By:</b> MSB
Nitrogen, Ammonia	< 0.50	0.50	1.7		1	mg/L		10/22/07 01:17 PM	EPA 350.1	EPA 350.1
								<b>Prep Date/Time:</b> 10/22/07 08:43 AM		<b>Anl By:</b> DAW
Nitrogen, Total Kjeldahl	0.69	0.42	1.4		1	mg/L	Q	10/24/07 09:37 AM	EPA 351.2	EPA 351.2
								<b>Prep Date/Time:</b> 10/24/07 04:00 AM		<b>Anl By:</b> DAW
Total Suspended Solids	8.0	0.61	2.0		1	mg/L		10/18/07	SM 2540D	SM 2540D
								<b>Prep Date/Time:</b> 10/18/07		<b>Anl By:</b> DDY

## Figures



**Legend**

- Sediment Core Collection Location
- Project Areas
- Proposed Dredge Alignment

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.  
 Source: Waukesha County 2005 Digital Orthophotography, supplied by Southeast Wisconsin Regional Planning Commission, Flown in Spring of 2005.

Note: At some of the sampling sites multiple samples were tested.

0 500 1,000 Feet



**CITY OF DELAFIELD**

**FIGURE 1**

**2007 SUPPLEMENT SEDIMENT SAMPLING LOCATIONS NAGAWICKA LAKE**

Date: NOVEMBER 2007	Revised:
Drawn By: BJW1	Checked By: JOS1
Scope: 06D006	

A



First round elutriate testing. Photograph taken 60 minutes after mixing, but before chemical addition. Large sediment particles have settled, but total suspended solids (TSS) remain at high concentration in the supernatant of all four tests. Left to right, samples are Bark River Inlet, Northeast Channels, Northwest Channels, and West Channels.

B



First round elutriate testing. Photograph taken 100 minutes after addition of the TSS control agent. Clear supernatant is present in all four tests. However, sediment volume has increased, particularly in the channel sediment samples. Samples arranged as in Photograph A.



CITY OF DELAFIELD

FIGURE 2  
ELUTRIATE TEST 1  
NAGAWICKA LAKE

Scale: NOT TO SCALE | Date: NOVEMBER 2007

Drawn By: BJW1 | Checked By: JOS1 | Scope: 06D006

A

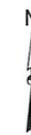


Second round elutriate testing. Left to right, samples are Bark River Inlet, Northeast Channels, Northwest Channels, and West Channels. The three channel sediments are tested a second time using approximately one-half the sediment volume used in the first round. Supernatant shown in this photograph was tested for total suspended solids (TSS), total kjeldahl nitrogen, ammonia, arsenic (total and dissolved), and total copper. Bark River Inlet sample is from first round test. Photograph taken 30 minutes after TSS control agent addition.

B



Elutriate test of Nakawicka Lake composite sediment sample, 50 minutes after TSS control agent addition. The clear supernatant was tested for ultra-trace level mercury.



CITY OF DELAFIELD		
FIGURE 3		
ELUTRIATE TEST 2		
NAGAWICKA LAKE		
Scale: NOT TO SCALE	Date: NOVEMBER 2007	
Drawn By: BJW1	Checked By: JOS1	Scope: 06D006