Perfluorocarbon (PFC) Containing Firefighting Foams and Their Use in Minnesota:

Sampling at the Lake Superior College Emergency Response Training Center, Duluth

Antea Group Project No. 45618DEL02

February 25, 2011

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PERFLUOROCARBON (PFC)-CONTAINING FIREFIGHTING FOAMS
AND THEIR USE IN MINNESOTA:
SAMPLING at the LAKE SUPERIOR COLLEGE EMERGENCY RESPONSE TRAINING CENTER,
DULUTH

1.0 INTRODUCTION

1.1 Purpose
Antea™ Group (formerly Delta Consultants) has worked under contract with the Minnesota Pollution Control Agency (MPCA) investigating perfluorochemicals in Class B firefighting foams and the use of Class B firefighting foams in Minnesota. Previous information regarding this investigation was presented in the following reports:

- Perfluorocarbon (PFC)-Containing Firefighting Foams and Their Use In Firefighting Training in Minnesota, dated June 30, 2008 (the June 2008 Report);
- Addendum to PFC-Containing Firefighting Foams and Their Use In Firefighting Training in Minnesota, dated October 22, 2008 (the October 2008 Addendum Report);
- Firefighting Training Area Site Reconnaissance, Pine Bend Flint Hills Refinery, Marathon Refinery, Burnsville Fire Training Center, and Site Access for 21 Fire Departments, dated April 3, 2009 (the April 2009 Report);
- Report of Site Reconnaissance and Sampling at Select Firefighting Foam Training Areas in Minnesota, dated June 30, 2009 (the June 2009 Report);
- Report of Investigation Activities at Select Firefighting Foam Training Areas and Foam Discharge Sites in Minnesota, dated February 10, 2010 (the February 2010 Report); and,
- Perfluorocarbon (PFC)-Containing Firefighting Foams and Their Use In Firefighting Training in Minnesota, dated June 30, 2010 (the June 2010 Report).

Perfluorocarbon (PFC)-Containing Firefighting Foams and Their Use in Minnesota: Well Receptor Surveys and Follow-Up Sampling at Select Sites, dated November 15, 2010 (the November 2010 Report).

This report presents additional data and information specific to PFC impacts previously identified in soil, sediment and surface waters at the Lake Superior College Emergency Response Training Center (ERTC) located in Duluth, Minnesota.

1.2 Background
As a part of an overall investigation of PFCs in Minnesota, the MPCA and Minnesota Department of Health (MDH) are investigating firefighting foams as a possible source of PFCs in the environment. The investigation has found that Class B foams, or aqueous film-forming foam (AFFF), are made with PFCs; Class A foam and foams made for training exercises (training foams) are not made with PFCs. PFCs have been identified in soil, sediment, surface water and groundwater samples collected from a number of
locations where various brands of Class B firefighting foams have been used repeatedly in training exercises or in large quantity to extinguish fires in Minnesota, including at the Lake Superior College ERTC.

The Lake Superior College ERTC was built in 1994 and includes a firefighter training area where firefighters can practice extinguishing aircraft fires. The ERTC is located in Duluth at 11501 Highway 23, as shown in on Figure 1, Site Location Map, Lake Superior College ERTC.

Communications with a former ERTC Program Supervisor in 2008 and 2009 indicated the possible historic use of 3M-brand Class B firefighting foam in training exercises from approximately 1994 through 1996. The former ERTC Program Supervisor stated that training foam has been used for training purposes since 1996 under his tenure. The current use of training foam for training exercises at the ERTC was confirmed by the ERTC Interim Director Paula Castleman in February 2010.

The firefighter training area includes a 600-foot diameter circular area with a 125-foot diameter concrete burn pit in the center, which is surrounded by a gravel surface vehicle operation area with storage around the outer-most portion of the circular area. A mock airplane sits in the center of the concrete burn pit. Numerous LP-gas lines with jets around and inside the mock airplane can repeatedly be fired to create a burning aircraft for training exercises. Water and spent foam discharged within the 125-foot diameter burn area around the mock airplane is collected into the concrete pit and routed to an on-site wastewater treatment plant specifically designed to treat wastewater and foam from this area, and from there it is routed to the municipal sanitary sewer system. The surrounding gravel vehicle operation area has several layers: 4” of Class V gravel over 8” of crushed rock over 36” of non-frost susceptible granular material over Type 1 fabric. A 6-inch perforated PVC pipe in a trench lined with crushed rock lies below these layers, which may carry infiltrated spent water/foam away from the area. This pipe also carries excess groundwater away from the training area. The pipe extends to a wooded area northeast of the training area to a small ravine with a creek at the bottom. Water flows from this drain pipe year-around. Surface water runoff from the training area may also flow to a wetland located on the southeast side of the training area. The layout of the training area is shown in Figure 2, Site Map, Lake Superior College ERTC.

Sampling of the surface soil beneath the 6-inch pipe outlet, the sediment from the creek below the pipe, and sediment and surface water in November 2009 identified PFCs in all of the media. The November 2009 sampling event at the ERTC was detailed in the February 2010 Report. The PFC concentrations in the surface water sample were the impetus to conduct a groundwater receptor survey in the area of the ERTC. The groundwater receptor survey identified five water supply wells that serve six houses near the ERTC. The groundwater receptor survey was described in the November 2010 Report. The locations of the six houses are shown on Figure 3, Surrounding Area Map, Lake Superior College ERTC.
1.3 Scope of Work

Based on the results of the groundwater receptor survey and previous sampling results at the ERTC, the following scope of work was conducted under MPCA Work Order SFDE1111:

1. An access agreement was implemented between the MPCA and Lake Superior College for additional PFC sampling of surface waters and sediments at the ERTC.
2. Access agreements were implemented between nearby well owners and the MPCA for PFC sampling of their water wells.
3. Surface water and sediment samples were collected at the ERTC from the wetland and the creek located adjacent to the ERTC fire training area for PFC analysis.
4. Water samples were collected from two of the private water wells located within one-half mile of the ERTC for analysis of PFCs.
5. Sediment, surface water and well water samples were analyzed by a State-contracted laboratory for analysis of PFCs.
6. The report was prepared summarizing the work performed as part of the scope of work.

Details of the work performed as part of the contracted scope of work is described in Sections 2.0 through 3.0.

2.0 PFC SAMPLING AT AND NEAR LAKE SUPERIOR COLLEGE ERTC

Previous sampling in November 2009 of surface water and sediments from a wetland at the ERTC, as well as sampling of soil and creek sediment below the 6-inch perforated pipe outfall, identified PFC concentrations present. The laboratory analytical results are included on Table 1, PFC Analytical Results, Lake Superior College ERTC. The concentrations of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) detected in the surface water sample (SW-1) were higher than the State drinking water Health Risk Limits (HRLs). Although the HRLs are not necessarily applicable to surface waters of the State, there was a concern that elevated concentrations of PFOA and PFOS could reach groundwater or a drinking water aquifer that is utilized by water supply wells in the area.

2.1 Follow-Up Sampling at ERTC

A second set of surface water and sediment samples were collected from the wetland and creek at the ERTC in order to confirm the presence of PFCs. An access agreement was signed by the Vice President of Finances and Administration of Lake Superior College and the MPCA, allowing access for sampling at the ERTC. A copy of the access agreement is included in Appendix A.

Sediment and surface water samples were collected by Antea Group on November 18, 2010, from at or near the locations of previous sediment and surface water samples Sed-1, Sed-2 and SW-1. Sample locations are shown on Figure 2. In addition, a surface water sample was collected from the creek. Sediment and surface water samples collected from the wetland were labeled “Sed-3” and “SW-2”. The
sediment and surface water samples collected from the creek were labeled “Sed-4” and SW-3.” Sampling methodologies are included as Appendix B. Surface water samples were collected prior to disturbing the sediments for sediment sample collection. Antea Group personnel was accompanied by Ms. Paula Castleman during sampling activities. Samples were submitted to Axys Analytical Services LTD under standard chain-of-custody records for analysis of PFCs.

2.2 Private Well Sampling
The groundwater receptor survey conducted in September and October 2010 identified six residences within one-half mile of the ERTC that utilized drinking water from five private wells; two of the houses shared one well. The City of Duluth Public Works Department confirmed that the houses within the receptor survey area are not connected to the municipal water supply, but that a water main is available to one of the properties, at 11825 Highway 23.

Access agreements were sent to the owners of the identified residences with private wells, requesting access to their residences to collect water samples from private wells for analysis of PFCs. Three of the well owners provided access to the MPCA and Antea Group as their contractor to sample their wells. However, a sampling appointment for one of the residences was cancelled and was not rescheduled.

On November 19, 2010, water samples were collected from private wells at two residences located within one-half mile of the Lake Superior College ERTC, at 10801 and 11601 Highway 23 in Duluth. Access agreements signed by the homeowners and the MPCA are included in Appendix A. The homeowners were present during sample collection. Water samples were collected from kitchen faucets in both homes. Sampling methodologies are included in Appendix B. The sample collected from the residence at 10801 Highway 23 was labeled “ERTC-10801,” and the sample collected at 11601 Highway 23 was labeled “ERTC-11601.” Samples were submitted to Axys Analytical Services LTD under standard chain-of-custody record for analysis of PFCs.

3.0 ANALYTICAL RESULTS FOR PFC SAMPLES
Laboratory analyses were performed by Axys Analytical Services LTD of British Columbia, Canada. Copies of the laboratory reports and chain-of-custody are included in Appendix C. PFC compound concentrations were detected in all of the sediment, surface water and water well samples collected as part of this scope of work. Laboratory results are summarized in Table 1.

3.1 State Sediment Quality Standards
The MPCA has not created general, State-wide sediment quality standards for PFCs to which to compare sediment analytical results. Sediment quality targets have been adopted for use in the St. Louis River Area of Concern nearby; however, there are no sediment quality targets for any of the PFC compounds.
The MPCA has defined soil Tier 1 Residential Soil Reference Values (SRVs), Tier 2 Recreational SRVs, and Tier 2 Industrial SRVs for only the PFC compounds listed below. Though the SRVs are not necessarily applicable to the creek or wetland sediments at the ERTC, they are presented here for comparison purposes only.

<table>
<thead>
<tr>
<th></th>
<th>Tier 1 Residential SRV</th>
<th>Tier 2 Recreational SRV</th>
<th>Tier 2 Industrial SRV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOS</td>
<td>2,100 ng/g</td>
<td>2,600 ng/g</td>
<td>14,000 ng/g</td>
</tr>
<tr>
<td>PFOA</td>
<td>2,100 ng/g</td>
<td>2,500 ng/g</td>
<td>13,000 ng/g</td>
</tr>
<tr>
<td>PFBA</td>
<td>77,000 ng/g</td>
<td>94,000 ng/g</td>
<td>500,000 ng/g</td>
</tr>
</tbody>
</table>

Note: ng/g is nanograms per gram, which is approximately equivalent to parts-per-billion.

3.2 State Surface Water and Drinking Water Quality Standards
The MPCA has developed site-specific ambient surface water quality criteria for PFOA and PFOS for the surface waters of the Mississippi River and Lake Calhoun only. No general surface water criteria or criteria specific to the Lake Superior College ERTC creek wetland have been developed.

The Minnesota Department of Health has defined drinking water values for PFOS, PFOA, PFBA and PFBS. The Health Risk Limit (HRL) for both PFOS and PFOA in drinking water is 300 nanograms per liter (ng/L), which is approximately equivalent to parts-per-trillion. The chronic exposure Health Based Value (HBV) for both PFBA and PFBS is 7000 ng/L. The HBVs are developed by the MDH as interim guidance until a HRL can be established. A Risk Assessment Advice (RAA) for PFHxS does not specify numerical values. While the HRLs and HBVs may not be applicable to surface waters and/or wetlands, they are discussed here for comparison purposes only.

3.3 Creek Sample Results
In comparing analytical results for sediment samples Sed-1 (collected in November 2009) and Sed-4 (collected in November 2010), the detected concentrations were slightly higher for the Sed-4 sample collected in November 2010, except for PFOS which was slightly lower (see Table 1). Sample Sed-4 also had a greater number of PFC compounds detected; Perfluoro-n-pentanoic acid (PFPeA), Perfluorohexanoic acid (PFHxA), and Perfluoroheptanoic acid (PFHpA) were detected in the Sed-4 sample but not in the Sed-1 sample.

Similar PFC compounds were detected in the SW-3 surface water sample collected from the creek as found in Sed-4, except that Perfluorobutanoic acid (PFBA) and Perfluorononanoic acid (PFNA) were detected in SW-3 but not in Sed-4.
None of the detected PFC concentrations in either of the sediment sample collected from the creek at the Lake Superior College ERTC met or exceeded any of the MPCA SRVs.

The PFOS concentration of 7,630 ng/L in the SW-3 surface water sample collected from the creek exceeded the PFOS HRL of 300 ng/L.

3.4 Wetland Sample Results
In comparing analytical results for sediment samples Sed-2, collected in November 2009, and Sed-3 collected in November 2010, the detected PFC concentrations were similar. None of the PFC concentrations in either sample collected from the wetland met or exceeded any of the MPCA SRVs.

While the longer-chain perfluorinated acids Perfluoroundecanoic acid (PFUnA) and Perfluorododecanoic acid (PFDoA) were detected in the wetland sediment, these compounds were not detected in the surface water. The PFC concentrations detected in the surface water sample SW-1, collected from the wetland in November 2009, were higher than the concentrations detected in SW-2, collected in November 2010. The PFOS concentrations detected in both surface water samples SW-1 and SW-2 exceeded the HRL, with concentrations of 11,300 ng/L and 7,640 ng/L, respectively. The PFOA concentration of 991 ng/L detected in the November 2009 SW-1 sample exceeded the HRL of 300 ng/L, but the PFOA concentration of 290 ng/L detected in SW-2 in November 2010 was below the HRL.

3.5 Well Water Sample Results
The only PFC compounds detected in the water well samples collected from the private water wells at 10801 and 11601 Highway 23 were PFOS and Perfluorohexane sulfonate (PFHxS). The PFOS concentrations of 6.49 ng/L and 7.26 ng/L were below the HRL of 300 ng/L. The concentrations of PFHxS detected in the well water samples were 11.2 ng/L and 9.63 ng/L; the RAA for PFHxS does not include a numerical standard. All of the other PFC compounds were not detected above laboratory detection limits in either well water sample.

All sample results have been furnished to the home owners.

4.0 CONCLUSIONS
It appears that the only potential use of Class B firefighting foam at the Lake Superior College ERTC occurred in approximately 1994 through 1996. Training foam has reportedly been utilized for training purposes at the ERTC since 1996. Thus, barring another unidentified source of the PFCs detected in the creek and wetland sediment and surface water samples, the detected PFC concentrations are most likely from the use of Class B foam in the mid-1990s.
Additional sampling of sediments and surface water from a wetland located adjacent to the fire training area at the Lake Superior College ERTC has confirmed the presence of PFCs in both media. Additional sampling of sediments from a nearby creek at the ERTC, and initial sampling of surface water from the creek, has identified PFC concentration in both media there as well. The concentrations of PFOS in surface water samples collected from the creek and wetland exceed the State HRL for drinking water. The PFOA HRL was exceeded in the surface water sample collected in November 2009 from the wetland, but the PFOA concentrations detected in both the creek and wetland surface water samples collected in November 2010 were below the HRL. While drinking water standards do not necessarily apply to the surface waters of the creek and wetland, there was concern regarding the PFOS and PFOA concentrations due to nearby water supply wells and the potential for surface waters to reach the drinking water aquifer.

Sampling of two nearby private water supply wells located within approximately 800 feet or less of the ERTC fire training area identified PFOS and PFHxS in the water samples. The PFOS concentrations of 11.2 ng/L and 9.63 ng/L were below the PFOS HRL of 300 ng/L. The PFHxS detections were similarly low, but there is no numerical State drinking water standard for PFHxS for comparison purposes.

Based on the sediment and water samples collecting during this assessment, the elevated levels of PFCs detected in the creek and wetland sediment and surface water samples do not appear to be impacting the nearby drinking water supply wells at or above drinking water standards.
5.0 REMARKS

The recommendations contained in this report represent Antea Group's professional opinions based upon the currently available information and are arrived at in accordance with currently accepted professional standards. This report is based upon a specific scope of work requested by the client. The contract between Antea Group and its client outlines the scope of work, and only those tasks specifically authorized by that contract or outlined in this report were performed. This report is intended only for the use of Antea Group's client. Antea Group will not and cannot be liable for unauthorized reliance by any other third party. Other than as contained in this paragraph, Antea Group makes no express or implied warranty as to the contents of this report.

Nancy Rodning
Project Geologist

Date: February 25, 2011

Reviewed by:

John Estes
Project Manager

Date: February 25, 2011
Tables

Table 1  PFC Analytical Results, Lake Superior College ERTC
**TABLE 1**
PFC Analytical Results
Lake Superior College ERTC
Delta Project No. 45618DEL0

<table>
<thead>
<tr>
<th>Perfluorinated Carbon Chains</th>
<th>Tier 1 Residential SRV, ng/g</th>
<th>Tier 2 Recreational SRV, ng/g</th>
<th>Tier 2 Industrial SRV, ng/g</th>
<th>Drinking Water Health-Based Limits, ng/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>#Perfluorinated Carbon Chains:</td>
<td>4 5 6 7 8 9 10 11 12</td>
<td>4 6</td>
<td>8 8</td>
<td></td>
</tr>
<tr>
<td>Perfluorobutanoic acid (PFBA)</td>
<td>77000</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluoro-pentanoic acid (PFPeA)</td>
<td>94000</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluorohexanoic acid (PFHxA)</td>
<td>50000</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluoroheptanoic acid (PFHpA)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluorooctanoic acid (PFOA)</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluorononanoic acid (PFNA)</td>
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</tr>
<tr>
<td>Perfluorodecanoic acid (PFDA)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluoroundecanoic acid (PFUnA)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Perfluorododecanoic acid (PFDoA)</td>
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<tr>
<td>Perfluorobutanoic sulfonate (PFBS)</td>
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<tr>
<td>Perfluorohexane sulfonate (PFHxS)</td>
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<tr>
<td>Perflourooctane sulfonate (PFOS)</td>
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<tr>
<td>Perfluorooctane sulfonylamide (PFOSA)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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</tr>
</tbody>
</table>

Sample ID | Sample Date | Wetland Samples | Creek Samples | Private Well Water Samples |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTC Sed-2</td>
<td>11/25/2009</td>
<td>0.218 0.536 1.72 0.269 1.26 0.184 0.101 0.174 &lt; 0.0933 1.47 19.6 538 181</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERTC Sed-3</td>
<td>11/18/2010</td>
<td>0.118 0.202 1.04 0.171 0.75 0.149 &lt; 0.0955 0.174 0.156 0.318 7.1 478 267</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERTC SW-1</td>
<td>11/25/2009</td>
<td>257 537 1790 348 991 31.8 3.45 &lt; 2.51 2.51 1870 9390 11300 360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERTC SW-2</td>
<td>11/18/2010</td>
<td>76.8 144 476 66.2 290 22.4 &lt; 2.49 &lt; 2.49 &lt; 2.49 &gt; 315 2630 7640 134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERTC-10801</td>
<td>11/19/2010</td>
<td>&lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 2.50 &lt; 5.00 11.2 6.49 &lt; 2.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERTC-11601</td>
<td>11/19/2010</td>
<td>&lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 2.47 &lt; 4.95 9.63 7.26 &lt; 2.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- All samples were analyzed by Axys Analytical Services LTD of British Columbia, Canada.
- Surface water and well water results and water standards are in nanograms per liter (ng/L), which is approximately equivalent to parts-per-billion.
- Non-detect results are expressed as "less than" the laboratory detection limit.
- Bolded type indicates detection above the laboratory method detection limit.
- Tier 1 Residential SRV: Minnesota soil reference value for chronic human exposure in a residential setting.
- Tier 2 Recreational SRV: Minnesota soil reference value for exposure in a recreational setting.
- Tier 2 Industrial SRV: Minnesota soil reference value for exposure in an industrial setting.
- PFC compounds soil results reported on a dry weight basis.
- (1) Health-Based Value (HBV) for chronic exposure defined by the Minnesota Department of Health.
- (2) Health Risk Limit (HRL) for drinking water defined by the Minnesota Department of Health.
- (3) Risk Assessment Advise (RAA) set by the Minnesota Department of Health for PFHxS does not specify numeric values.
- ND: No State or Federal values or limits defined.
- (D) Dilution performed on sample by laboratory.

Antea Group
Figures

Figure 1  Site Location Map
Figure 2  Site Map
Figure 3  Surrounding Area Map
Appendix A

Access Agreements
Minnesota Pollution Control Agency

ACCESS AGREEMENT BETWEEN
THE MINNESOTA POLLUTION CONTROL AGENCY
AND LAKE SUPERIOR COLLEGE

The Minnesota Pollution Control Agency (MPCA) is investigating firefighting training sites where Class B foams may have been or are being utilized. The investigation will be conducted at the following firefighting training site owned by the Lake Superior College (Property Owner):

Lake Superior College Emergency Response Training Center (the Property)
11501 Highway 23
Duluth, Minnesota

The Property Owner hereby consents and authorizes the MPCA, its employees, agents and contractors (collectively, hereafter the “MPCA”), to enter the Property to conduct sediment and surface water sampling for perfluorocarbons (PFCs) as specified in the attached Scope of Work. The sampling is being conducted in response to PFCs previously detected in sediment and surface water samples collected at the Property. The MPCA is authorized to take these actions under Minn. Stat. § 115C.03, subd. 7 (2002).

The MPCA will notify the Property Owner at least 48 hours before entering the property. Work will be conducted during regular business hours (8:00 a.m. to 5:00 p.m.) unless the MPCA receives permission to and arrangements are made to conduct work during different hours. The MPCA will conduct its activities so as to minimize interference with the use of the property. If any portion of the Property must be disturbed as a result of the MPCA's activities, the MPCA will restore the disturbed Property as close to its original condition as is reasonably possible under the circumstances. The Property Owner will take reasonable precautions to ensure that the equipment of the MPCA and its contractors on the property is not damaged, and that the work being conducted by the MPCA, its employees, agents and contractors is not disrupted.

The Property Owner reserves the right to have Lake Superior College personnel or its representatives present during sampling activities. Results of all testing conducted on the Property will be provided to the Property Owner.

The MPCA shall be liable for injury to or loss of property, or personal injury or death, caused by an act or omission of any employee of the state in the performance of the work described above, under the circumstances where the state, if a private person, would be liable to the claimant, in accordance with Minn. Stat. § 3.736.

MINNESOTA POLLUTION CONTROL AGENCY

[Signature]
[Title: SUPERFUND PROGRAM]
[Date: 11/8/10]

Lake Superior College

[Signature]
[Title: ]
[Date: 11/2/10]
SCOPE OF WORK: Surface Water and Sediment Sampling

SITE: Lake Superior College Emergency Response Training Center
11501 Highway 23
Duluth, Minnesota

Delta Consultants (Delta), as a contractor for the Minnesota Pollution Control Agency (MPCA), will conduct the Scope of Work detailed below at the above-referenced site (the Site). The work is being conducted as part of the MPCA’s PFCs in Firefighting Foam project.

1. Collect a sediment sample and a surface water sample from the creek located north of the fire training area. The samples will be collected below the outflow of the 6-inch drain pipe that extends from beneath the vehicle operation area around the fire training area burn pit. Samples will be collected by hand.

2. Collect a sediment sample and a surface water sample from the wetland located adjacent southeast of the fire training area. The samples will be collected from a readily accessible location near the western edge of the wetland. Samples will be collected by hand.

3. Collect latitude and longitude coordinates of all sample locations with a hand-held GPS unit.

4. Lake Superior College may request “split samples” for submittal to their own laboratory. Delta will split sediment and/or surface water samples as directed by Lake Superior College.

5. Submit all samples will be submitted to a State-contracted laboratory for analysis of PFCs only. The following PFC compounds will be included on the list of analytes:
   - Perfluorobutanoic acid (PFBA)
   - Perfluorobutane Sulfonate (PFBS)
   - Perfluoropentanoic acid (PFPeA)
   - Perfluorohexanoic acid (PFHxA)
   - Perfluoroheptanoic acid (PFHpA)
   - Perfluorohexane Sulfonate (PFHxS)
   - Perfluorooctanoic acid (PFOA)
   - Perfluorooctane Sulfonate (PFOS)
   - Perfluoroctane Sulfonamide (PFOSA)
   - Perfluorononanoic acid (PFNA)
   - Perfluorodecanoic acid (PFDA)
   - Perfluoroundecanoic acid (PFUDA)
   - Perfluorododecanoic acid (PFDoDA)

6. A copy of the laboratory chain-of-custody will be provided to Lake Superior College after sample collection if requested. A copy of the laboratory analytical report will be provided to Lake Superior College upon receipt.
ACCESS AGREEMENT BETWEEN
MINNESOTA POLLUTION CONTROL AGENCY
AND JOHN McINTOSH

Background

The Minnesota Pollution Control Agency ("MPCA") is investigating a release or threatened release of perfluorochemicals, or PFCs, in and around property owned by John McIntosh located at 10801 Highway 23, Duluth, MN (the "Property"). PFCs have been identified in sediments and surface water at the Lake Superior College Emergency Response Training Center (ERTC) located at 11501 Highway 23, Duluth, MN. The MPCA is authorized to enter the Property to take these actions under Minn. Stat. § 115B.17, subd. 4 and § 115.04, subd. 3.

Agreement

1. Parties. The Parties to this Agreement are:

   A. Minnesota Pollution Control Agency ("MPCA"); and

   B. John McIntosh (the "Property Owner").

2. Access. The Property Owner hereby consents and provides authorization to MPCA, its employees, agents, and contractors to enter the Property for the following purposes:

   A. Investigating as the MPCA deems necessary and reasonable to respond to release or threatened release of PFCs at the Property, including collecting a groundwater sample from the water well, and collecting sediment or surface water samples from creeks located on the Property, for the purpose of PFC analysis.

3. MPCA Obligations.

   MPCA will notify the Property Owner at least 48 hours before entering the Property. Work will be conducted during the hours of 8:00 a.m. to 5:00 p.m. unless MPCA receives permission to conduct work during different hours.

4. MPCA and Property Owner Precautions Regarding Work.

   A. MPCA will conduct its activities so as to avoid unreasonable interference with the use of the Property. If any portion of the Property must be disturbed as a result of MPCA's activities, MPCA will restore the property as close to its original condition as is reasonably possible under the circumstances.
B. The Property Owner will take reasonable precautions to ensure that the equipment of MPCA and its contractors on the property is not damaged, and that the work being conducted by MPCA, its employees, agents and contractors is not disrupted.

5. Notification. Unless otherwise specified, written requests or other documents sent to the Property Owner shall be addressed to:

Mr. John McIntosh  
10801 Highway 23  
Duluth, MN 55808

All reports or other documents sent to the MPCA shall be addressed to:

Nile Fellows  
MPCA  
520 Lafayette Road  
St. Paul, MN 55105

6. MPCA Liability. The MPCA shall be liable for injury to or loss of property, or personal injury or death, caused by an act or omission of any employee of the State in the performance of the work described above, under the circumstances where the State, if a private person, would be liable to the claimant, in accordance with Minn. Stat. § 3.736.

7. Effective Date. This Agreement shall be effective upon the date it is signed by MPCA.

8. Rights of MPCA Reserved. Nothing in this Agreement shall be construed to limit or diminish the right of the MPCA to take any action authorized by MERLA or other law with respect to any release or threatened release of a hazardous substance or pollutant or contaminant.

BY THEIR SIGNATURES BELOW, THE UNDERSIGNED REPRESENT THAT THEY HAVE AUTHORITY TO BIND THE PARTIES THEY REPRESENT, THEIR AGENTS, SUCCESSORS, AND ASSIGNS.

MINNESOTA POLLUTION CONTROL AGENCY 

[Signature]

PROPERTY OWNER 

[Signature]  
Mr. John McIntosh

Date 11/8/10  
Date 10/29/10
ACCESS AGREEMENT BETWEEN
MINNESOTA POLLUTION CONTROL AGENCY
AND DIXON BASTIE

Background

The Minnesota Pollution Control Agency ("MPCA") is investigating a release or threatened release of perfluorochemicals, or PFCs, in and around property owned by Dixon Bastie located at 11601 Highway 23, Duluth, MN (the "Property"). PFCs have been identified in sediments and surface water at the Lake Superior College Emergency Response Training Center (ERTC) located at 11501 Highway 23, Duluth, MN. The MPCA is authorized to enter the Property to take these actions under Minn. Stat. § 115B.17, subd. 4 and § 115.04, subd. 3.

Agreement

1. Parties. The Parties to this Agreement are:
   
   A. Minnesota Pollution Control Agency ("MPCA"); and
   
   B. Dixon Bastie (the "Property Owner").

2. Access. The Property Owner hereby consents and provides authorization to MPCA, its employees, agents, and contractors to enter the Property for the following purposes:
   
   A. Investigating as the MPCA deems necessary and reasonable to respond to release or threatened release of PFCs at the Property located at 11601 Highway 23, Duluth, MN, including collecting a groundwater sample from the water well located at the Property for the purpose of PFC analysis.

3. MPCA Obligations.

   MPCA will notify the Property Owner at least 48 hours before entering the Property. Work will be conducted during the hours of 8:00 a.m. to 5:00 p.m. unless MPCA receives permission to conduct work during different hours.

4. MPCA and Property Owner Precautions Regarding Work.

   A. MPCA will conduct its activities so as to avoid unreasonable interference with the use of the Property. If any portion of the Property must be disturbed as a result of MPCA's activities, MPCA will restore the property as close to its original condition as is reasonably possible under the circumstances.
B. The Property Owner will take reasonable precautions to ensure that the equipment of MPCA and its contractors on the property is not damaged, and that the work being conducted by MPCA, its employees, agents and contractors is not disrupted.

5. **Notification.** Unless otherwise specified, written requests or other documents sent to the Property Owner shall be addressed to:

   Mr. Dixon Bastie  
   11601 Highway 23  
   Duluth, MN 55808

   All reports or other documents sent to the MPCA shall be addressed to:

   Nile Fellows  
   MPCA  
   520 Lafayette Road  
   St. Paul, MN 55105

6. **MPCA Liability.** The MPCA shall be liable for injury to or loss of property, or personal injury or death, caused by an act or omission of any employee of the State in the performance of the work described above, under the circumstances where the State, if a private person, would be liable to the claimant, in accordance with Minn. Stat. § 3.736.

7. **Effective Date.** This Agreement shall be effective upon the date it is signed by MPCA.

8. **Rights of MPCA Reserved.** Nothing in this Agreement shall be construed to limit or diminish the right of the MPCA to take any action authorized by MERLA or other law with respect to any release or threatened release of a hazardous substance or pollutant or contaminant.

**BY THEIR SIGNATURES BELOW, THE UNDERSIGNED REPRESENT THAT THEY HAVE AUTHORITY TO BIND THE PARTIES THEY REPRESENT, THEIR AGENTS, SUCCESSORS, AND ASSIGNS.**

**MINNESOTA POLLUTION CONTROL AGENCY**  

**PROPERTY OWNER**

[Signatures]  

**Date:** 11/8/10  

**Date:** 10-30-10
Appendix B

Sampling Methodologies
**SAMPLING METHODOLOGIES AT**  
**FIREFIGHTING FOAM TRAINING AND DISCHARGE AREAS**

**Special PFC Sampling Consideration**

Since PFCs are also found in numerous everyday items, the following special precautions were taken during all sampling activities: no use of Teflon®-containing materials (i.e. Teflon® tubing, bailers, tape, plumbing paste); no Tyvek® clothing was worn; clothes treated with stain- or rain-resistant coatings were avoided or had gone through several washings; no Post-It® Notes were handled or brought on site; no fast food wrappers, disposable cups or microwave popcorn were brought on site during sampling, and hands were washed after handling such items and prior to any sampling activities; and no use of chemical (blue) ice packs was allowed.

Nitrile gloves were worn during all sample collection activities.

**Surface Water Sample Collection**

Surface water samples were collected near the edge of the water body; the water body was not entered for sample collection. Surface water samples were collected by dipping the (non-preserved) 1-liter High-Density Polyethylene (HDPE) sample jar supplied by the laboratory at the surface of the water and allowing the jar to slowly fill. Intermediary containers were not used. Water samples were labeled and stored in an iced, insulated cooler provided by the laboratory pending shipment to the laboratory.

Surface water samples were collected prior to sediment samples so sediments were not disturbed prior to sample collection.

**Sediment Sample Collection**

Sediment samples were collected by hand from the upper four inches of sediment, near the edge of the water body; the water body was not entered for sample collection. A shovel was utilized to loosen the sediment at the edge of the wetland; dense vegetation matted the sediment at the bottom of the wetland. Sediment samples were placed directly into non-preserved, 250-milliliter HDPE jars supplied by the laboratory, without the use of intermediary containers. Sediment samples were labeled and stored in an iced, insulated cooler provided by the laboratory pending shipment to the laboratory.

**Water Supply Well Sample Collection**

Water samples were collected from a faucet in the kitchen. The faucet was turned on and water allowed to flow for five minutes before sample collection. Water was collected directly into non-preserved, 1-liter HDPE jars provided by the laboratory. No intermediary containers were used. Water samples were labeled and stored in an iced, insulated cooler provided by the laboratory pending shipment to the laboratory.

**Chain of Custody**

A chain-of-custody record was prepared for the samples, including client (MPCA) name and address, project name, sample identification, sample matrix, sample date and time, type of analysis, and sampler name and signature. The chain-of-custody was kept with the samples until shipment of the samples to the laboratory.

**Sample Shipment**

Samples for PFC analysis were securely packed in an insulated cooler provided by the laboratory with ice and chain-of-custody record. The cooler was shipped Priority Overnight via FedEx to the following laboratory:

Axys Analytical Services, LTD  
2045 Mills Road West  
Sidney, British Columbia  V8L5X2  
Canada

Samples were shipped with required international shipping documents.
Appendix C

Laboratory Data and Chain-of-Custody
<table>
<thead>
<tr>
<th>CLIENT ID</th>
<th>ERTC SW-2</th>
<th>ERTC SW-3</th>
<th>ERTC-10801</th>
<th>ERTC-11601</th>
<th>Lab Blank</th>
<th>Spiked Matrix</th>
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<td>AXYS ID</td>
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<td>L15789-2</td>
<td>L15789-3</td>
<td>L15789-4</td>
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<td>0.502 L</td>
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<td>ng/L</td>
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<td>&lt; 2.50</td>
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See below for definitions of possible flags and labels in the database.

- `<=` less than the detection limit number following this symbol represents the detection limit.
- `D` dilution performed on sample.

Data are resubmitted with detection limits corrected to the CS1 level calibration detection qualifier raising the limits by a factor of 2.5. The reporting limit (RL) is defined as the concentration equivalent to the CS1 calibration standard or the sample specific detection limit, whichever was greater. All other data remain unchanged. KJC 10-Jan-11
<table>
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<tr>
<th>CLIENT ID</th>
<th>AXYS ID</th>
<th>AXYS ID</th>
<th>WORKGROUP</th>
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See below for definitions of possible flags and labels in the database.

- < = less than the detection limit number following this symbol represents the detection limit.
- D = dilution performed on sample.
# CHAIN OF CUSTODY

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**Project Name/Number:** Lake Superior Firefighting Forum - College ERTC

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- Relinquished by (Signature): Nancy Rocking 11-23-10 14:00
- Received by (Signature): Nancy Rocking 11-23-10 14:00

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- **Courier:** FedEx
- **Waybill No:** 8724 3523 8988

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