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**Superior Water Light & Power Company**

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February 7, 2003

Mr. Jamie Dunn  
Hydrogeologist, Northern Division  
WI Department of Natural Resources  
810 W Maple Street  
Spooner, WI 54801

RE: Gas Technology Institute Chemical Fingerprinting Report for SWL&P

Dear Mr. Dunn:

Enclosed for your review is a copy of the Gas Technology Institute's report on the results of the chemical fingerprinting testing on samples that were gathered at the site of the former manufactured gas plant in Superior, WI.

This report will be included as Appendix F in the Phase II, Part II report that is currently being prepared by ENSR Intl. I expect the ENSR report to be completed in about two weeks.

If you have any questions or need any additional information regarding this report, please contact me at (715) 395-6288.

Thank you,

*William S. Bombich*  
William S. Bombich  
General Manager

## INTRODUCTION

Superior Water, Light and Power Company (SWL&P) has contracted Gas Technology Institute (GTI) to determine whether the organic residues found in soil samples from and sediment samples near their Superior, Wisconsin former manufactured gas plant (MGP) site are chemically similar or dissimilar to petrogenic, pyrogenic, or other organic materials specifically associated with MGP operations. GTI has performed a series of highly definitive, defensible tests designed to: (1) determine the generic source of the organic materials, (2) determine the chemical similarity or dissimilarity among all the samples, and (3) determine the exact composition of the samples.

Recent trends in environmental investigation, particularly of sites containing former MGP materials, have increasingly employed the use of environmental forensic techniques to identify specific wastes. Environmental forensic methodologies have been especially effective in discerning MGP-type tars from other tars and waste mixtures. Former MGP wastes possess distinct "chemical fingerprints," based upon the gas production process used and other factors. This attribute is also true of other tar wastes, such as asphalt/roofing tar and creosotes. Chemical fingerprinting has the capability to identify compounds associated with the tars, either tars from distinctly separate sources or tar purposely co-mingled with other compounds. Therefore, the analysis and comparison of specific fingerprints with known standards may elucidate the sources of the contamination.

Chemical fingerprinting has also been applied to site investigations to determine the extent of organic residues that may be attributable to specific sources. The chemical fingerprints of site samples can be compared to each other and to the fingerprints of off-site samples to determine if off-site impacts are caused by on-site sources. As a result, environmental forensic methods have been increasingly applied to a variety of site investigation efforts. Chemical fingerprinting and comparison of data generated from the chemical fingerprinting analysis have more recently been applied to the identification of background contamination, as part of general urban and industrial activities.

Hydrocarbons, such as those found on former MGP sites, can be divided into three classes: (1) petrogenic substances, (2) pyrogenic substances, and (3) diagenetic substances. Petrogenic substances are defined as the substances that originate from petroleum, including crude oil, fuels, lubricants and the derivatives of those materials. Aliphatic and aromatic hydrocarbons constitute the vast majority of these compounds. Two features most clearly represent fresh crude oil include: (1) a regular series of normal alkanes peaks (the "picket fence") on the chromatogram and (2) the "hump" in the baseline of the chromatogram (unresolved complex mixture or UCM). The fraction of crude oil contained in the sample (e.g., gasoline, diesel fuel, and kerosene) can be determined by the examination of the elution time of the cluster of peaks and the presence of particular compounds.

Pyrogenic substances are defined as the organic substances that originate from oxygen-depleted, high temperature processes, which include incomplete combustion, pyrolysis, cracking, and destructive distillation. Pyrogenic materials consist primarily of aromatic hydrocarbons. By definition, tar is a pyrogenic material. MGP-type tars are distinct because of the conditions

under which they were formed; therefore, their chromatograms possess a particular pattern. Furthermore, the examination of the ratios of specific polycyclic aromatic hydrocarbons (PAHs) and alkylated PAHs can be used as indicator of the source of the tarry material. Typically, the ratios of fluoranthene to pyrene and dibenzofuran to fluorene are most often examined. Comparison of these ratios can differentiate MGP tars from non-MGP tars as well as within the grouping of MGP tars (e.g., carburetted water gas (CWG) tar from oil gas or coal carbonization tar). In addition, the identification of tars may also be based upon the relative abundance of certain PAHs, such as naphthalene and anthracene.

Finally, diagenetic substances include PAHs from natural sources. These sources include vascular plant debris (e.g., leaf waxes, resins and lipids), microbial biomass, and buried organic material, including municipal waste.

In general, the application of chemical fingerprinting for source identification has been particularly effective in source identification for "gross" contamination situations. However, the chemical identification techniques become less reliable and rigorous at low-levels of contamination (less than 50 ppm). Therefore, an alternate identification technique is needed. Recently developed instruments are capable of measuring the ratio of the two natural stable isotopes of carbon for individual PAHs in a sample. This method is called compound-specific carbon isotope ratio (CSIR) determination and is done with a GC/IRMS (gas chromatograph with an isotope ratio mass spectrometer). Researchers have noted that the carbon isotope ratios of PAHs from different hydrocarbon sources (e.g., coal, oil, and biomass) are often different. Because CSIR values are not dependent on chemical concentrations in the sample, CSIRs can provide a method for separating PAH sources when the PAH concentration profiles cannot.

## METHODOLOGY

GTI has completed chemical forensic analysis of eight soil samples from and five sediment samples near a former MGP site in Superior, Wisconsin. The soil samples included samples T10-1, T10-2, T10-3, B-11-12-13, B-12-11-12, B-13-12-13, B-23-6-8, and B-23-10-12. The sediment samples included samples SD1-0-1, SD2-0-1, SD3-0-1, SS-Upstream, and SS-Outfall. Analyses of these samples included identification and/or quantification of: (1) monocyclic hydrocarbons (MAHs), (2) polycyclic aromatic hydrocarbons (PAHs), and (3) aliphatic and polar hydrocarbons. Analyses and hydrocarbon fingerprinting were performed using gas chromatography with flame ionization detection (GC/FID) and gas chromatography with mass spectrometry (GC/MS). The soil and sediment samples were prepared by solvent extraction (EPA 3570) using dichloromethane (DCM). The extracts were spiked with internal standards and analyzed by GC/FID (EPA 8100 mod.) and GC/MS (EPA 8270 mod.).

The GC/FID method of analysis is routinely used to identify specific compounds present in a sample, which can then be compared with a "standard" sample of known origin or composition. The GC/FID analysis does not quantify the compounds found in the mixture. Result obtained from a single GC/FID scan shows the FID detector response versus residence time of each compound in the chromatographic column. The pattern of peaks versus residence time that is generated in the GC/FID scan is sometimes referred to as the "fingerprint" of the sample. In this way, an investigator may "fingerprint" the sample by comparing scan features of the test sample with scan features of control samples. For instance, particular relative ratios of one compound to another, the relatively high concentration of a compound or the absence of particular compounds may be indicative of a CWG tar, a high temperature coal tar or a mixture of alternate origins. Generally, several identified reference samples are used when conducting the GC/FID analysis, so that the test sample may be compared with accuracy.

In order to quantify the compounds or classes of compounds contained in the sample mixture, the sample is subjected to a second set of analyses through GC/MS. In GC/MS, chromatograms are produced containing peaks that are similar to the chromatograms obtained in GC/FID analysis. In addition, a mass spectrum is produced for every compound detected. When performed in a controlled and reproducible manner, the GC/MS method produces multiple "fingerprints" for each sample (i.e., chromatogram and compound-specific mass spectra). Interpretation of the specific ions distribution can be highly useful for the identification of compounds in a sample. Additionally, compounds of certain target classes, such as biomarker compounds, can be selectively measured using their characteristic ion masses.

Samples were also analyzed by GC/IRMS at the University of Oklahoma using a Hewlett-Packard 6890 GC coupled with a Finnigan XL isotope ratio mass spectrometer via a combustion furnace heated at 940°C and a water trap. The isotopic composition was expressed relative to a reference standard that can be traced to the PDB standard of the University of Chicago (Belemnite Americana, Peedee Formation, Cretaceous, South Carolina). Results are expressed as:

$$\delta^{13}\text{C} = \frac{\left[ \left( \frac{^{13}\text{C}}{^{12}\text{C}} \right)_{\text{sample}} - \left( \frac{^{13}\text{C}}{^{12}\text{C}} \right)_{\text{standard}} \right]}{\left( \frac{^{13}\text{C}}{^{12}\text{C}} \right)_{\text{standard}}} \times 1000$$

The results are expressed in parts per thousand (‰). This commonly used convention was utilized for the data presented in this report.

Results of these analyses are included in this report, with expanded analytical data detailed in Appendices A-E.

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## 5.0 SUMMARY AND RECOMMENDATIONS

### 5.1 Summary

This report presents the results of the Sediment investigation performed at the Site in March and April 2003. Three sediment cores were advanced in the boat slip, SD1, SD2, and SD3, with a hand tools lowered through a hole in the ice. Sediment samples were collected from the cores for PAH and fingerprinting analysis. Two sediment samples were collected from the storm sewer that drains into the boat slip. One storm sewer sample was collected at a manhole access point upstream of the Site, and one sample was collected at the sewer outfall. The samples were collected with hand tools, and were analyzed for PAH and/or fingerprinting. The results of the fingerprinting indicated the PAH may have been derived from typical sources in urban runoff.

The concentrations of total PAH were up to an order of magnitude less than the comparable samples collected by the WDNR in September 2000. Further sampling would be necessary to determine if the levels of PAH discovered by WDNR are reproducible. However, the sampling done for this study indicates that PAH may be less of a problem in the boat slip than originally thought, and that the focus of the MGP investigation can shift back to the known areas of MGP-impact on land.

### 5.2 Recommendations

Based on the results of this sediment investigation, the most important part of the MGP investigation is to determine the extent of the previously discovered PAH and volatile organic compound (VOC) impacts. The extent of the soil and groundwater impacts has been delineated to the west and south of the Site. ENSR recommends conducting additional investigations to the north and east of the Site. A work plan was submitted to WDNR on November 21, 2003 to install up to eight Geoprobe® borings and five monitoring wells to further investigate the Site. Figure 5-1 illustrates the location of the proposed monitoring wells and Geoprobe soil borings.

The sampling methodologies outlined in the November 2001 and July 2002 Work Plans will be used during this proposed Phase II, Part III investigation. Soil samples will be collected from the Geoprobe borings and from the monitoring well borings for PAH and VOC analysis. Groundwater samples will be collected from temporary 1-inch wells installed in the Geoprobe borings. Groundwater samples will also be collected from the new monitoring wells after they are properly developed, and from existing wells MW-5, MW-6, and MW-7. The groundwater samples will be analyzed for PAH and VOC.

The placement of the borings and wells may be modified depending on whether access agreements can be obtained from the off-site property owners. The Phase II, Part III fieldwork will begin after receiving signed access agreements.

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## 4.0 INVESTIGATION RESULTS

### 4.1 Boat Slip Analytical Results

The boat slip sediment sampled for this study consisted of dark brown fine silty sand with an odor of decaying organic material. The ice was approximately 2.5 feet thick, with black particulate material observed throughout the ice. Coal piles immediately west of the boat slip on the CLM dock are believed to be the likely source of the black particulate.

The results of the En Chem PAH analyses are summarized in Table 4-1, and the total PAH concentrations are illustrated on Figure 4-1. The complete EnChem laboratory report is included as Appendix B. The sample IDs indicate the sample point followed by the sample depth (SD1-0-1 = Sample point SD1 sampled from 0 to 1 foot below the top of sediment).

As shown in Table 4-1, the total PAH concentrations ranged from 2.65 parts per million (ppm) in sample SD1-1-2 to 35.96 ppm in sample SD3-0-1. The sediment sample collected from the outfall contained 15 ppm total PAH.

### 4.2 Discussion

Results of fingerprinting analyses by GTI suggest that the PAH in the sediment samples collected for this investigation may have been derived from typical urban runoff. The storm sewer at the head of the boat slip conveys runoff from an area of Superior that includes industrial and other areas that may be sources of PAH. The coal particles observed in the ice may also contribute PAH.

The WDNR collected sediment samples at six locations in the boat slip near the Site in September 2000. The analytical results of WDNR's sampling indicated total PAH concentrations ranging from less than 10 parts per million to over 360 parts per million. The highest concentrations were found close to the four-foot diameter storm sewer outfall pipe located at the head of the boat slip (WDNR samples SPG-1, 2 and 3). The WDNR sample SPG-3 was collected near the storm sewer outfall. The total PAH in sample SPG-3 was 362.9 ppm from the shallow sample, and 197.1 ppm from the deep sample. The corresponding shallow sample collected by ENSR, SS-Outfall, contained 15.1 ppm total PAH. It is unclear why the two samples collected from the same area have such dissimilar results. However, the relatively low levels of PAH in the samples collected by ENSR were insufficient to definitively characterize the source of the PAH.

**- Analytical Report -**

Project Name : SWL&P MGP  
 Project Number : 09413-098 Client : ENSR-MN  
 Field ID : SD3-1-2 Report Date : 04/01/03  
 Lab Sample Number : 832159-006 Collection Date : 03/12/03  
 WI DNR LAB ID : 405132750 Matrix Type : SOIL

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	70.8				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

PAH/PNA - SEMIVOLATILES		Prep Method: SW846 3545				Prep Date: 03/20/03		Analyst: aro	
Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method	
Acenaphthene	1500	62	200		ug/kg		03/25/03	SW846 8270C	
Acenaphthylene	300	100	320		ug/kg	Q	03/25/03	SW846 8270C	
Anthracene	1100	62	200		ug/kg		03/25/03	SW846 8270C	
Benzo(a)anthracene	950	34	110		ug/kg		03/25/03	SW846 8270C	
Benzo(a)pyrene	890	34	110		ug/kg		03/25/03	SW846 8270C	
Benzo(b)fluoranthene	460	37	120		ug/kg		03/25/03	SW846 8270C	
Benzo(ghi)perylene	290	68	220		ug/kg		03/25/03	SW846 8270C	
Benzo(k)fluoranthene	600	51	160		ug/kg		03/25/03	SW846 8270C	
Chrysene	940	39	120		ug/kg		03/25/03	SW846 8270C	
Dibenzo(a,h)anthracene	68	42	130		ug/kg	Q	03/25/03	SW846 8270C	
Fluoranthene	2000	45	140		ug/kg		03/25/03	SW846 8270C	
Fluorene	730	34	110		ug/kg		03/25/03	SW846 8270C	
Indeno(1,2,3-cd)pyrene	280	62	200		ug/kg		03/25/03	SW846 8270C	
1-Methylnaphthalene	1200	40	130		ug/kg		03/25/03	SW846 8270C	
2-Methylnaphthalene	1600	42	130		ug/kg		03/25/03	SW846 8270C	
Naphthalene	3300	42	130		ug/kg		03/25/03	SW846 8270C	
Phenanthrene	3800	45	140		ug/kg		03/25/03	SW846 8270C	
Pyrene	2700	73	230		ug/kg		03/25/03	SW846 8270C	
Nitrobenzene-d5	36				%Recov		03/25/03	SW846 8270C	
2-Fluorobiphenyl	54				%Recov		03/25/03	SW846 8270C	
Terphenyl-d14	76				%Recov		03/25/03	SW846 8270C	

All soil results are reported on a dry weight basis unless otherwise noted.



**- Analytical Report -**

Project Name : SWL&P MGP	Client : ENSR-MN
Project Number : 09413-098	Report Date : 04/01/03
Field ID : SD3-0-1	Collection Date : 03/12/03
Lab Sample Number : 832159-005	Matrix Type : SOIL
WI DNR LAB ID : 405132750	

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	70.7				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

**PAH/PNA - SEMIVOLATILES**

Prep Method: SW846 3545

Prep Date: 03/20/03

Analyst: aro

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Acenaphthene	2200	120	380		ug/kg		03/25/03	SW846 8270C
Acenaphthylene	520	200	640		ug/kg	Q	03/25/03	SW846 8270C
Anthracene	1400	120	380		ug/kg		03/25/03	SW846 8270C
Benzo(a)anthracene	2400	68	220		ug/kg		03/25/03	SW846 8270C
Benzo(a)pyrene	2400	68	220		ug/kg		03/25/03	SW846 8270C
Benzo(b)fluoranthene	1400	74	240		ug/kg		03/25/03	SW846 8270C
Benzo(ghi)perylene	780	140	450		ug/kg		03/25/03	SW846 8270C
Benzo(k)fluoranthene	1800	100	320		ug/kg		03/25/03	SW846 8270C
Chrysene	2400	78	250		ug/kg		03/25/03	SW846 8270C
Dibenzo(a,h)anthracene	250	84	270		ug/kg	Q	03/25/03	SW846 8270C
Fluoranthene	4200	91	290		ug/kg		03/25/03	SW846 8270C
Fluorene	1000	68	220		ug/kg		03/25/03	SW846 8270C
Indeno(1,2,3-cd)pyrene	840	120	380		ug/kg		03/25/03	SW846 8270C
1-Methylnaphthalene	1600	79	250		ug/kg		03/25/03	SW846 8270C
2-Methylnaphthalene	970	85	270		ug/kg		03/25/03	SW846 8270C
Naphthalene	1600	85	270		ug/kg		03/25/03	SW846 8270C
Phenanthrene	5300	91	290		ug/kg		03/25/03	SW846 8270C
Pyrene	4900	150	480		ug/kg		03/25/03	SW846 8270C
Nitrobenzene-d5	41				%Recov		03/25/03	SW846 8270C
2-Fluorobiphenyl	55				%Recov		03/25/03	SW846 8270C
Terphenyl-d14	71				%Recov		03/25/03	SW846 8270C

All soil results are reported on a dry weight basis unless otherwise noted.

**- Analytical Report -**

Project Name : SWL&P MGP  
 Project Number : 09413-098 Client : ENSR-MN  
 Field ID : SD2-1-2 Report Date : 04/01/03  
 Lab Sample Number : 832159-004 Collection Date : 03/12/03  
 WI DNR LAB ID : 405132750 Matrix Type : SOIL

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	67.9				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

PAH/PNA - SEMIVOLATILES Prep Method: SW846 3545 Prep Date: 03/20/03 Analyst: aro

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Acenaphthene	380	32	100		ug/kg		03/24/03	SW846 8270C
Acenaphthylene	77	53	170		ug/kg	Q	03/24/03	SW846 8270C
Anthracene	540	32	100		ug/kg		03/24/03	SW846 8270C
Benzo(a)anthracene	1100	18	57		ug/kg		03/24/03	SW846 8270C
Benzo(a)pyrene	1100	18	57		ug/kg		03/24/03	SW846 8270C
Benzo(b)fluoranthene	970	19	61		ug/kg		03/24/03	SW846 8270C
Benzo(ghi)perylene	330	35	110		ug/kg		03/24/03	SW846 8270C
Benzo(k)fluoranthene	910	27	86		ug/kg		03/24/03	SW846 8270C
Chrysene	1100	20	64		ug/kg		03/24/03	SW846 8270C
Dibenzo(a,h)anthracene	120	22	70		ug/kg		03/24/03	SW846 8270C
Fluoranthene	2600	24	76		ug/kg		03/24/03	SW846 8270C
Fluorene	350	18	57		ug/kg		03/24/03	SW846 8270C
Indeno(1,2,3-cd)pyrene	400	32	100		ug/kg		03/24/03	SW846 8270C
1-Methylnaphthalene	490	21	67		ug/kg		03/24/03	SW846 8270C
2-Methylnaphthalene	510	22	70		ug/kg		03/24/03	SW846 8270C
Naphthalene	870	22	70		ug/kg		03/24/03	SW846 8270C
Phenanthrene	2500	24	76		ug/kg		03/24/03	SW846 8270C
Pyrene	2300	38	120		ug/kg		03/24/03	SW846 8270C
Nitrobenzene-d5	48				%Recov		03/24/03	SW846 8270C
2-Fluorobiphenyl	67				%Recov		03/24/03	SW846 8270C
Terphenyl-d14	85				%Recov		03/24/03	SW846 8270C

All soil results are reported on a dry weight basis unless otherwise noted.

**- Analytical Report -**

Project Name : SWL&P MGP  
 Project Number : 09413-098 Client : ENSR-MN  
 Field ID : SD2-0-1 Report Date : 04/01/03  
 Lab Sample Number : 832159-003 Collection Date : 03/12/03  
 WI DNR LAB ID : 405132750 Matrix Type : SOIL

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	69.9				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

**PAH/PNA - SEMIVOLATILES**

Prep Method: SW846 3545

Prep Date: 03/20/03

Analyst: aro

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Acenaphthene	300	31	99		ug/kg		03/24/03	SW846 8270C
Acenaphthylene	92	51	160		ug/kg	Q	03/24/03	SW846 8270C
Anthracene	290	31	99		ug/kg		03/24/03	SW846 8270C
Benzo(a)anthracene	530	17	54		ug/kg		03/24/03	SW846 8270C
Benzo(a)pyrene	530	17	54		ug/kg		03/24/03	SW846 8270C
Benzo(b)fluoranthene	410	19	61		ug/kg		03/24/03	SW846 8270C
Benzo(ghi)perylene	210	34	110		ug/kg		03/24/03	SW846 8270C
Benzo(k)fluoranthene	410	26	83		ug/kg		03/24/03	SW846 8270C
Chrysene	550	20	64		ug/kg		03/24/03	SW846 8270C
Dibenzo(a,h)anthracene	65	21	67		ug/kg	Q	03/24/03	SW846 8270C
Fluoranthene	1100	23	73		ug/kg		03/24/03	SW846 8270C
Fluorene	210	17	54		ug/kg		03/24/03	SW846 8270C
Indeno(1,2,3-cd)pyrene	230	31	99		ug/kg		03/24/03	SW846 8270C
1-Methylnaphthalene	270	20	64		ug/kg		03/24/03	SW846 8270C
2-Methylnaphthalene	260	21	67		ug/kg		03/24/03	SW846 8270C
Naphthalene	520	21	67		ug/kg		03/24/03	SW846 8270C
Phenanthrene	1300	23	73		ug/kg		03/24/03	SW846 8270C
Pyrene	1000	37	120		ug/kg		03/24/03	SW846 8270C
Nitrobenzene-d5	42				%Recov		03/24/03	SW846 8270C
2-Fluorobiphenyl	64				%Recov		03/24/03	SW846 8270C
Terphenyl-d14	82				%Recov		03/24/03	SW846 8270C

All soil results are reported on a dry weight basis unless otherwise noted.

**- Analytical Report -**

Project Name : SWL&P MGP  
 Project Number : 09413-098 Client : ENSR-MN  
 Field ID : SD1-1-2 Report Date : 04/01/03  
 Lab Sample Number : 832159-002 Collection Date : 03/12/03  
 WI DNR LAB ID : 405132750 Matrix Type : SOIL

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	78.6				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

**PAH/PNA - SEMIVOLATILES**

Prep Method: SW846 3545

Prep Date: 03/20/03

Analyst: aro

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Acenaphthene	120	28	89		ug/kg		03/24/03	SW846 8270C
Acenaphthylene	< 46	46	150		ug/kg		03/24/03	SW846 8270C
Anthracene	110	28	89		ug/kg		03/24/03	SW846 8270C
Benzo(a)anthracene	160	15	48		ug/kg		03/24/03	SW846 8270C
Benzo(a)pyrene	170	15	48		ug/kg		03/24/03	SW846 8270C
Benzo(b)fluoranthene	130	17	54		ug/kg		03/24/03	SW846 8270C
Benzo(ghi)perylene	70	31	99		ug/kg	Q	03/24/03	SW846 8270C
Benzo(k)fluoranthene	120	23	73		ug/kg		03/24/03	SW846 8270C
Chrysene	160	18	57		ug/kg		03/24/03	SW846 8270C
Dibenzo(a,h)anthracene	19	19	61		ug/kg	Q	03/24/03	SW846 8270C
Fluoranthene	320	20	64		ug/kg		03/24/03	SW846 8270C
Fluorene	68	15	48		ug/kg		03/24/03	SW846 8270C
Indeno(1,2,3-cd)pyrene	70	28	89		ug/kg	Q	03/24/03	SW846 8270C
1-Methylnaphthalene	90	18	57		ug/kg		03/24/03	SW846 8270C
2-Methylnaphthalene	95	19	61		ug/kg		03/24/03	SW846 8270C
Naphthalene	160	19	61		ug/kg		03/24/03	SW846 8270C
Phenanthrene	360	20	64		ug/kg		03/24/03	SW846 8270C
Pyrene	380	33	110		ug/kg		03/24/03	SW846 8270C
Nitrobenzene-d5	40				%Recov		03/24/03	SW846 8270C
2-Fluorobiphenyl	61				%Recov		03/24/03	SW846 8270C
Terphenyl-d14	78				%Recov		03/24/03	SW846 8270C

All soil results are reported on a dry weight basis unless otherwise noted.

**- Analytical Report -**

Project Name : SWL&P MGP  
 Project Number : 09413-098      Client : ENSR-MN  
 Field ID : SD1-0-1      Report Date : 04/01/03  
 Lab Sample Number : 832159-001      Collection Date : 03/12/03  
 WI DNR LAB ID : 405132750      Matrix Type : SOIL

**Inorganic Results**

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	75.6				%		03/15/03	SM 2540G M	SM 2540G M	KJP

**Organic Results**

**PAH/PNA - SEMIVOLATILES**

Prep Method: SW846 3545

Prep Date: 03/20/03

Analyst: aro

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Acenaphthene	550	58	180		ug/kg		03/24/03	SW846 8270C
Acenaphthylene	400	95	300		ug/kg		03/24/03	SW846 8270C
Anthracene	620	58	180		ug/kg		03/24/03	SW846 8270C
Benzo(a)anthracene	1400	32	100		ug/kg		03/24/03	SW846 8270C
Benzo(a)pyrene	1700	32	100		ug/kg		03/24/03	SW846 8270C
Benzo(b)fluoranthene	1000	34	110		ug/kg		03/24/03	SW846 8270C
Benzo(ghi)perylene	680	64	200		ug/kg		03/24/03	SW846 8270C
Benzo(k)fluoranthene	1200	48	150		ug/kg		03/24/03	SW846 8270C
Chrysene	1400	37	120		ug/kg		03/24/03	SW846 8270C
Dibenzo(a,h)anthracene	190	39	120		ug/kg		03/24/03	SW846 8270C
Fluoranthene	2200	42	130		ug/kg		03/24/03	SW846 8270C
Fluorene	320	32	100		ug/kg		03/24/03	SW846 8270C
Indeno(1,2,3-cd)pyrene	680	58	180		ug/kg		03/24/03	SW846 8270C
1-Methylnaphthalene	400	37	120		ug/kg		03/24/03	SW846 8270C
2-Methylnaphthalene	400	40	130		ug/kg		03/24/03	SW846 8270C
Naphthalene	740	40	130		ug/kg		03/24/03	SW846 8270C
Phenanthrene	2200	42	130		ug/kg		03/24/03	SW846 8270C
Pyrene	2600	69	220		ug/kg		03/24/03	SW846 8270C
Nitrobenzene-d5	50				%Recov		03/24/03	SW846 8270C
2-Fluorobiphenyl	50				%Recov		03/24/03	SW846 8270C
Terphenyl-d14	56				%Recov		03/24/03	SW846 8270C

All soil results are reported on a dry weight basis unless otherwise noted.