

Health Consultation

CONTAMINATION OF SUMP WITHIN RESIDENTIAL PROPERTY

CARROLL COUNTY, IOWA

SEPTEMBER 24, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

CONTAMINATION OF SUMP WITHIN RESIDENTIAL PROPERTY

CARROLL COUNTY, IOWA

Prepared By:

Iowa Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Purpose

The Iowa Department of Natural Resources (IDNR) has been involved in an investigation surrounding the appearance of an unknown oil within the sump in the basement of a residence in Carroll, Iowa. The IDNR has requested the Iowa Department of Public Health (IDPH) to prepare a health consultation regarding their investigation. The IDPH, in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared this health consultation to review the current status of the IDNR investigation and to provide an evaluation of the public health implications of exposure to the unknown oil within the sump. The information in this health consultation was current at the time of writing. Data that emerges later could alter this document's conclusions and recommendations.

Background

Discovery of Oil-Like Substance within Sump and Water Sampling

In April 2006 the IDNR was notified a resident of Carroll, Iowa that an oil-like substance was present in the water within the sump in the basement of the residence. The presence of this oil-like substance was visually observed by IDNR staff on April 29, 2006. On May 1, 2006, a sample of the water within the sump was collected by IDNR and sent to an analytical laboratory for analysis. The water sample was analyzed for volatile petroleum hydrocarbons and for total extractable hydrocarbons. Laboratory analysis indicated the presence of a oil-like low-volatile substance resembling fuel oil or motor oil at a concentration of 890,000 micrograms per liter ($\mu\text{g/L}$) or 890,000 parts per billion (ppb). A copy of the laboratory report is included in Appendix A.

Subsequent sampling of water from within the sump was completed on November 15, 2006, and again on June 7, 2007. Laboratory analysis indicated the presence of a similar oil-like substance within the sump at the November 15, 2006 sampling event, but at a lower concentration of 57,000 $\mu\text{g/L}$. Laboratory analysis of water within the sump on June 7, 2007, did not detect the presence of any oil-like substance. A copy of the laboratory reports for these two samples is also included in Appendix A.

IDPH personnel were present at the residence during the June 7, 2007 sampling event. The sump was covered with a plastic tarp which was removed to observe the sump and sample the water within the sump. An oil sheen was not observed to be present on the surface of the water during this sampling event. A petroleum or oil odor was not detected within the sump during this sampling event.

Investigation of Source of Oil-Like Substance

Additional soil and groundwater sampling were collected by the IDNR within the residential property and the adjacent property to the north (a convenience store/gas station). These samples were collected in an effort to determine a potential source of the oil-like substance. According to information within the IDNR files, the oil-like substance detected within the sump is not chemically similar to the contaminants detected within soil and groundwater at the neighboring

convenience store/gas station site (1). Groundwater and soil samples collected on the residential property also did not provide any information that would point to a source of contamination of the sump (1). The IDNR has not been able to determine the source of the contamination found within the sump (1).

Contaminant of Concern

The contaminant of concern at the site is the oil-like substance that was discovered in the water within the sump in the basement of the residence. The laboratory analysis of this substance indicated that the substance was a petroleum-based substance with the consistency of a heavy fuel oil or motor oil. The specific chemical species were not identified by the laboratory analysis, only that the substance had the consistency of a heavy fuel oil or motor oil. As stated before, laboratory results of the analysis of the water within the sump are included in Appendix A.

Discussion

Exposure to Contaminant of Concern

Exposure to the contaminant of concern is determined by examining human exposure pathways. An exposure pathway has five parts:

1. a source of contamination,
2. an environmental medium such as air, water, or soil that can hold or move the contamination,
3. a point at which people come in contact with a contaminated medium, such as in drinking water or in surface soil,
4. an exposure route, such as drinking water from a well or eating contaminated soil on homegrown vegetables, and
5. a population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one on the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur.

An exposure pathway exists for individuals living in the residence. Although it is believed that there is no direct exposure to the water within the sump through ingestion, there is exposure to contaminants that may volatilize from the water into the air within the home. Exposure to the oil-like substance would be from inhalation of any volatilized amounts within the air. The largest exposure would be to any individuals who spent the most time in the basement of the residence during the period when the oil-like substance was present in the sump.

The substance or substances identified in the water within the sump did not include detectable amounts of the more volatile chemicals found in petroleum-based products such as benzene or toluene (Appendix A). The chemical that was found within the sump was similar to fuel oil or motor oil, which has a lower volatility to the surrounding air when dissolved within water. As a

result, it would be reasonable to expect that large amounts of this chemical would not volatilize from the sump into the basement air.

The level of exposure cannot be accurately quantified with the information available. Indoor air measurements of any petroleum-based substances were not completed during the time the sump contained detectable levels of the oil-like substance. In addition, since individual chemical species were not identified with the analytical results, it is not possible to estimate a concentration of specific chemicals within the indoor air based upon known chemical properties of any detected substance.

The length of exposure to any oil-like substances is also not completely known. The oil-like substance was initially noticed in April of 2006. Analytical testing in November 2006 showed that the concentration of oil-like chemicals in the sump had been reduced, and analytical testing in June 2007 showed non-detectable concentrations of oil-like chemicals. It is suspected that exposure to detectable levels of oil-like chemicals within the indoor air was less than one year.

Toxicological Evaluation

A toxicological evaluation of exposure to the oil-like substance within the sump can be attempted by reviewing published toxicological studies on chemicals similar to the substance found within the sump. There will be some uncertainty in completing this toxicological evaluation since the specific chemicals within the indoor air have not been measured, and there is some uncertainty as to the time of exposure.

ATSDR Toxicological Profiles

ATSDR publishes toxicological profiles of specific chemicals and mixtures of chemicals. These toxicological profiles identify and review the key literature that describes a hazardous substance's toxicological properties. It includes information concerning levels of significant human exposure and, when known, significant health effects. Several ATSDR toxicological profiles have been completed on substances that may be similar to the oil-like substance found within the sump. ATSDR toxicological profiles are available for fuel oils, hydraulic fluids, and used mineral-based crankcase oil. A review of these toxicological profiles has been made, and the following is a discussion of some of the known health effects from inhalation exposures to these substances.

ATSDR Toxicological Profile for Fuel Oils (2)

The ATSDR toxicological profile for fuel oils included a discussion of the following health effects that have been observed in human studies. An epidemiological study examined the chronic exposure to jet fuel in factory workers. This study found an increase in a feeling of heaviness in the chests of exposed workers. Two studies reported mild hypertension in humans who had acute inhalation exposures to fuel oil. Nausea and other gastrointestinal discomfort has been observed in humans after inhalation exposures to fuel oil. Kidney damage has been observed in individuals who had inhalation exposure to diesel fuel oil at high levels. Eye irritation has been reported in individuals who have been exposed to jet fuel vapor. Headaches, fatigue, depressed mood, dizziness, and sleep disturbances have been observed in individuals who were exposed through inhalation of fuel oil vapors.

ATSDR Toxicological Profile for Hydraulic Fluids and Used Mineral-Based Crankcase Oil (3,4)

There are no humans studies identified in the ATSDR toxicological profile for hydraulic fluids regarding inhalation exposure. Some of the animal studies indicate that breathing high levels of some hydraulic fluid vapor can cause drowsiness, congested lungs, and trouble breathing. Studies on volunteers who breathed mists of used mineral-bases crankcase oil for short time periods had slightly irritated noses and throats. In addition, the mists were irritating to the eyes of some people.

Summary of Potential Health Effects and Conclusions

The following is a summary of the potential human health effects from inhalation exposure to fuel oils, hydraulic oil, and used mineral-based crankcase oil:

- Heaviness in the chest
- Hypertension
- Nausea and other gastrointestinal discomfort
- Kidney damage (high levels of exposure)
- Eye irritation
- Nose and throat irritation
- Headaches, fatigue, depressed mood, dizziness, drowsiness, and sleep disturbances

It should be noted that the health effects listed above were experienced in individuals who were exposed to mists or vapors from a direct exposure to the oil-like substance. There were no studies identifying individuals who were exposed to indoor air that may have contained an oil-like substance that had volatilized from water that was contaminated with an oil-like substance.

Community Health Concerns

The owner of the home has expressed concerns of being exposed to the substance found within the sump. The owner of the home and her children have indicated that they have experienced nausea, headaches, flem in the throat, and respiratory problems during the time period that the oil-like substance was noticed in the sump. The owner indicated that her daughter experienced a large number of absences from school during the last academic year. The owner of the home is concerned about long-lasting health effects from their exposure to the oil-like substance within the sump. The owner of the home is also concerned about the safety of the water coming from the tap within their home.

Conclusions

The IDPH cannot conclude whether the oil-like substance found within the sump could harm the health of residents of the home in Carroll, Iowa because the information needed to make a decision is not available. During the time of largest exposure to this substance there was no measurement of the indoor air concentration of chemical contaminants. It can be concluded that individuals within the home were exposed to fuel-oil like contaminants, but the degree of exposure cannot be determined. It cannot be conclusively determined if the health effects experienced by the residents of the home were caused by the presence of the oil-like substance found within the sump. Some of the health effects discussed in the toxicological profiles and

attributed to exposure to fuel oil, hydraulic oil, or used mineral-based crankcase oil were experienced by residents of the home, but other factors can also cause these health effects. If the indoor air would have been analyzed for chemical contaminants during the time of exposure (April through December 2006), more definitive conclusions may be possible since a comparison could be made to the levels of exposure documented in the toxicological profiles.

It is unlikely that the oil-like substance found within the sump could contaminate the residential tap water. The sump is not believed to be connected to the same water lines that supply potable water to the residence. Drinking water at the residence is supplied by public water, not by an on-site well. As a result there is no exposure pathway from the sump into the drinking water of the residence. The tap water at the residence has been tested and shows non-detectable levels of chemicals. These analytical results are included in Appendix A.

Recommendations

- It is recommended that analysis of the indoor air within the basement should be made if the oil-like substance is observed within the sump in the future to determine inhalation exposure levels. The IDPH should be consulted to determine which chemical parameters should be included in the analysis.
- It is recommended that a more permanent cover be installed over the opening of the sump to control any potential vapors within the basement if the oil-like substance returns within the sump.

Public Health Action Plan

- IDPH will consult with the home owner and the IDNR in determining the chemical parameters that will be included if any future indoor air sampling is completed.
- IDPH will provide an additional health consultation if any subsequent indoor air monitoring is completed.

References

1. Iowa Department of Natural Resources Field Office, Atlantic, Iowa.
2. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Fuel Oil. Atlanta: US Department of Health and Human Services; June 1995
3. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Hydraulic Fluids. Atlanta: US Department of Health and Human Services; September 1997
4. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Used Mineral-Based Crankcase Oil. Atlanta: US Department of Health and Human Services; September 1997

Preparers of the Report

Author

Stuart Schmitz, P.E. and Sara Colboth
Hazardous Waste Site Health Assessment Program
Iowa Department of Public Health

CERTIFICATION

The Iowa Department of Public Health, Hazardous Waste Site Health Assessment Program, has prepared this health consultation for a residential property in Carroll, Iowa under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The document is in accordance with approved methodology and procedures existing when the health consultation was being prepared. Editorial review was completed by the cooperative agreement partner.



Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.



Team Lead, CAT, CAPEB, DHAC, ATSDR

Appendix A

Sampling of Sump on May 1, 2006



Hygienic Laboratory

The University of Iowa

<p style="text-align: center;">Date of report: 05-17-2006</p> <p style="text-align: center;"> THAD NANFITO EPD 4 1401 SUNNYSIDE LANE ATLANTIC IA 50022 </p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Sample Number</td><td>200605140</td></tr> <tr><td>Date Received</td><td>05-02-2006</td></tr> <tr><td>Project</td><td>WQUST</td></tr> <tr><td>Date Collected</td><td>05-01-2006 09:40</td></tr> <tr><td>Collection Site</td><td>tina: major residence</td></tr> <tr><td>Collection Town</td><td></td></tr> <tr><td>Description</td><td>water</td></tr> <tr><td>Reference Collector</td><td>NANFITO THAD</td></tr> <tr><td>Phone</td><td>(712) 243-1934</td></tr> <tr><td>Purchase Order</td><td></td></tr> </table>	Sample Number	200605140	Date Received	05-02-2006	Project	WQUST	Date Collected	05-01-2006 09:40	Collection Site	tina: major residence	Collection Town		Description	water	Reference Collector	NANFITO THAD	Phone	(712) 243-1934	Purchase Order	
Sample Number	200605140																				
Date Received	05-02-2006																				
Project	WQUST																				
Date Collected	05-01-2006 09:40																				
Collection Site	tina: major residence																				
Collection Town																					
Description	water																				
Reference Collector	NANFITO THAD																				
Phone	(712) 243-1934																				
Purchase Order																					

Comments *Upon arrival, sample met container and preservation requirements for the analysis requested; EXCEPT: sample temperature exceeds 6 degrees celsius. Please review carefully your sample results for additional sample comments or method exceptions.*



Results of Analyses

Volatile Petroleum Hydrocarbons by GC/MS

Analyte	Concentration ug/L	Quantitation Limit ug/L
Methyl-t-butyl ether (MtBE)	<20	20
Benzene	<20	20
Toluene	<20	20
Ethylbenzene	<20	20
Total Xylenes	<50	50

Comments *Please note that the pH of this sample was less than or equal to 2. Please note quantitation limits were adjusted for dilution due to the sample matrix.*

Date Analyzed: 05-02-2006
Method: OA-1

Analyst: LL
Verified: TC

Total Extractable Hydrocarbons

Analyte	Concentration ug/L	Quantitation Limit ug/L
Gasoline	<56000	56000
Mineral spirits	<56000	56000
Kerosene	<56000	56000
Diesel Fuel	<56000	56000
Motor Oil	890000	56000
Total Extractable Hydrocarbons	890000	56000

Comments *The chromatographic profile of the sample extract did not match this laboratory's fuel or oil standards. Quantitation is based on this laboratory's motor oil standard. In addition to Method OA-2, this sample extract was injected into a GCMS system to check for PAHs. PAHs were not detected at a quantitation limit of 300 ug/L. This extract was also compared*

Page 1 - Continued on next page

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Hygienic Laboratory

The University of Iowa

Page 2
Sample Number 200605140

Comments to a hydraulic oil standard and did not match this laboratory's hydraulic oil standard.

Date Analyzed: 05-03-2006
Method: OA-2
Date Prepared: 05-02-2006
Preparation Method: EPA 3510

Analyst: CR
Verified: SM
Analyst: PM
Verified: KB

Description of units used within this report

ug/L - Micrograms per Liter

Quant Limit - Lowest concentration reliably measured

Iowa Laboratory Certification No. 027. AIHA, NELAP, USEPA, NVLAP #101288-0 and other credentials available upon request.

If you have any questions please call Sherri Marine at 500/421-IOWA (4692) or 319/335-4500. Thank you.

Page 2 - End of Report

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Hygienic Laboratory

The University of Iowa

Page 2
Sample Number 200620875

GC/MS S24.2 Volatiles

Analyte	Concentration ug/L	Quantitation Limit ug/L
1,1-Dichloroethane	<0.5	0.5
trans-1,2-Dichloroethylene	<0.5	0.5
cis-1,2-Dichloroethylene	<0.5	0.5
Chloroform	<0.5	0.5
1,2-Dichloroethane	<0.5	0.5
1,1,1-Trichloroethane	<0.5	0.5
Carbon tetrachloride	<0.5	0.5
Bromodichloromethane	<0.5	0.5
1,2-Dichloropropane	<0.5	0.5
trans-1,3-Dichloropropene	<0.5	0.5
Trichloroethene	<0.5	0.5
Dibromochloromethane	<0.5	0.5
Dibromomethane	<0.5	0.5
Dichlorodifluoromethane	<0.5	0.5
cis-1,3-Dichloropropene	<0.5	0.5
1,1,2-Trichloroethane	<0.5	0.5
Benzene	<0.5	0.5
Bromoform	<0.5	0.5
Tetrachloroethylene	<0.5	0.5
1,1,2,2-Tetrachloroethane	<0.5	0.5
1,1,1,2-Tetrachloroethane	<0.5	0.5
Toluene	<0.5	0.5
Chlorobenzene	<0.5	0.5
Ethylbenzene	<0.5	0.5
1,1-Dichloropropene	<0.5	0.5
Styrene	<0.5	0.5
1,2,3-Trichloropropane	<0.5	0.5
Total Xylenes	<0.5	0.5
m-Dichlorobenzene	<0.5	0.5
o-Dichlorobenzene	<0.5	0.5
p-Dichlorobenzene	<0.5	0.5
2,2-Dichloropropane	<0.5	0.5
Bromochloromethane	<0.5	0.5
1,3-Dichloropropane	<0.5	0.5
Isopropylbenzene	<0.5	0.5
Bromobenzene	<0.5	0.5
n-Propylbenzene	<0.5	0.5
2-Chlorotoluene	<0.5	0.5
1,3,5-Trimethylbenzene	<0.5	0.5
4-Chlorotoluene	<0.5	0.5

Page 2 - Continued on next page

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Hygienic Laboratory

The University of Iowa

Page 3
Sample Number: 200620875

GC/MS 524.2 Volatiles

Analyte	Concentration ug/l.	Quantitation Limit ug/L
1,2,4-Trimethylbenzene	<0.5	0.5
tert-Butylbenzene	<0.5	0.5
sec-Butylbenzene	<0.5	0.5
p-Isopropyltoluene	<0.5	0.5
n-Butylbenzene	<0.5	0.5
1,2,4-Trichlorobenzene	<0.5	0.5
Hexachlorobutadiene	<0.5	0.5
Naphthalene	<0.5	0.5
1,2,3-Trichlorobenzene	<0.5	0.5
Total 1,3-Dichloropropene	<0.5	0.5

Comments: Please note that 2-ethyl-1-Hexanol was found at an estimated concentration of 2.8 ug/l in the analysis of this sample.

Date Analyzed: 11-20-2006
Method: EPA 524.2

Analyst: LL
Verified: JN

Description of units used within this report

ug/L - Micrograms per Liter

Quant Limit - Lowest concentration reliably measured

Iowa Laboratory Certification No. 027. AIHA, NELAP, USEPA, NVLAP #101288-0 and other credentials available upon request.

If you have any questions please call Sherri Marine at 800/421-IOWA (4692) or 319/335-4500. Thank you.

Page 3 - End of Report

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Hygienic Laboratory

The University of Iowa

Date of report: 06-20-2007


 KEITH WILKEN
 EPD 4
 1401 SUNNYSIDE LANE

 ATLANTIC IA 50022

Sample Number 2007019100
 Date Received 06-08-2007
 Project WQUST
 Date Collected 06-07-2007 09:30
 Collection Site majors sump pump
 Collection Town
 Description water
 Reference TINA MAJOR SITE
 Collector WILKEN KEITH
 Phone (712) 243-1934
 Purchase Order

Comments Upon arrival, sample not container and preservation requirements for the analysis requested;
 EXCEPT: sample temperature exceeds 6 degrees celsius.
 Please review carefully your sample results for additional analyte comments or method exceptions.

Results of Analyses

Total Extractable Hydrocarbons

Analyte	Concentration ug/L	Quantitation Limit ug/L
Gasoline	< 100	100
Mineral spirits	< 100	100
Kerosene	< 100	100
Diesel Fuel	< 100	100
Motor Oil	< 100	100
Total Extractable Hydrocarbons	< 100	100

Date Analyzed: 06-11-2007
 Method: QA-2
 Date Prepared: 06-11-2007
 Preparation Method: EPA 3510

Analyst: CR
 Verified: SM
 Analyst: MS
 Verified: GJ

Volatile Petroleum Hydrocarbons by GC/MS

Analyte	Concentration ug/L	Quantitation Limit ug/L
Methyl-t-butyl ether (MtBE)	< 2	2
Benzene	< 2	2
Toluene	< 2	2
Ethylbenzene	< 2	2
Total Xylenes	< 5	5

Comments Please note that the pH of this sample was less than or equal to 2.
 Date Analyzed: 06-08-2007
 Method: QA-1

Analyst: LL
 Verified: TC

Page 1 - Continued on next page

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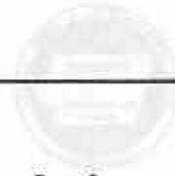
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Hygienic Laboratory

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Page 2

Sample Number 2007019100

Description of units used within this report
ug/L - Micrograms per Liter
Quant Limit - Lowest concentration reliably measured

The results of this report relate only to the items analyzed. This report shall not be reproduced except in full without the written approval of the laboratory.

Iowa Environmental Laboratory ID #027.

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(Table content is extremely faint and illegible)

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Hygienic Laboratory

The University of Iowa

Date of report: 11-22-2006


 DANIEL STIPE
 EPD 4
 1401 SUNNYSIDE LANE

 ATLANTIC IA 50022

Sample Number 200620874
Date Received 11-17-2006
Project 07WQER
Date Collected 11-15-2006 17:45
Collection Site kitchen sink-tina major reside
Collection Town Carroll
Description water
Reference Collector MAJOR STIPE DANIEL
Phone (712) 243-1934
Purchase Order

Comments Upon arrival, sample met container and preservation requirements for the analysis requested.
EXCEPT: sample temperature exceeds 6 degrees celsius. Please review carefully your sample results for additional analyte comments or method exceptions.



Results of Analyses

Total Extractable Hydrocarbons

Analyte	Concentration ug/L	Quantitation Limit ug/L
Gasoline	<100	100
Methyl spirits	<100	100
Kerosene	<100	100
Diesel Fuel	<100	100
Motor Oil	<100	100
Total Extractable Hydrocarbons	<100	100

Date Analyzed: 11-21-2006
 Method: OA-2
 Date Prepared: 11-17-2006
 Preparation Method: EPA 3510

Analyst: CR
 Verified: SM
 Analyst: RAD
 Verified: KB

GC/MS 524.2 Volatiles

Analyte	Concentration ug/L	Quantitation Limit ug/L
Chloromethane	<0.5	0.5
Bromomethane	<0.5	0.5
Vinyl chloride	<0.5	0.5
Chloroethane	<0.5	0.5
Trichlorofluoromethane	<0.5	0.5
Methylene chloride	<1.0	1.0
1,1-Dichloroethene	<0.5	0.5
1,1-Dichloroethane	<0.5	0.5
trans-1,2-Dichloroethylene	<0.5	0.5
cis-1,2-Dichloroethylene	<0.5	0.5

Page 1 - Continued on next page

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Hygienic Laboratory

The University of Iowa

Page 2
Sample Number 200620874

GC/MS 524.2 Volatiles

Analyte	Concentration ug/L	Quantitation Limit ug/L
Chloroform	0.8	0.5
1,2-Dichloroethane	<0.5	0.5
1,1,1-Trichloroethane	<0.5	0.5
Carbon tetrachloride	<0.5	0.5
Bromodichloromethane	<0.5	0.5
1,2-Dichloropropane	<0.5	0.5
trans-1,3-Dichloropropene	<0.5	0.5
Trichloroethene	<0.5	0.5
Dibromochloromethane	<0.5	0.5
Dibromomethane	<0.5	0.5
Dichlorodifluoromethane	<0.5	0.5
cis-1,3-Dichloropropene	<0.5	0.5
1,1,2-Trichloroethane	<0.5	0.5
Benzene	<0.5	0.5
Bromoform	<0.5	0.5
Tetrachloroethylene	<0.5	0.5
1,1,2,2-Tetrachloroethane	<0.5	0.5
1,1,1,2-Tetrachloroethane	<0.5	0.5
Toluene	<0.5	0.5
Chlorobenzene	<0.5	0.5
Ethylbenzene	<0.5	0.5
1,1-Dichloropropene	<0.5	0.5
Styrene	<0.5	0.5
1,2,3-Trichloropropane	<0.5	0.5
Total Xylenes	<0.5	0.5
m-Dichlorobenzene	<0.5	0.5
o-Dichlorobenzene	<0.5	0.5
p-Dichlorobenzene	<0.5	0.5
2,2-Dichloropropane	<0.5	0.5
Bromochloromethane	<0.5	0.5
1,3-Dichloropropane	<0.5	0.5
Isopropylbenzene	<0.5	0.5
Bromobenzene	<0.5	0.5
n-Propylbenzene	<0.5	0.5
2-Chlorotoluene	<0.5	0.5
1,3,5-Trimethylbenzene	<0.5	0.5
4-Chlorotoluene	<0.5	0.5
1,2,4-Trimethylbenzene	<0.5	0.5
tert-Butylbenzene	<0.5	0.5
sec-Butylbenzene	<0.5	0.5

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Hygienic Laboratory

The University of Iowa

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Sample Number 200620874

GC/MS 524.2 Volatiles

Analyte	Concentration ug/L	Quantitation Limit ug/L
p-Isopropyltoluene	<0.5	0.5
n-Butylbenzene	<0.5	0.5
1,2,4-Trichlorobenzene	<0.5	0.5
Hexachlorobutadiene	<0.5	0.5
Naphthalene	<0.5	0.5
1,2,3-Trichlorobenzene	<0.5	0.5
Total 1,3-Dichloropropene	<0.5	0.5

Comments: *I - Please note that this compound was observed below the quantitation limit in the analysis of this sample.
Please note that 2-ethyl-1-Hexanol was found at an estimated concentration of 5.1 ug/l in the analysis of this sample.*

Date Analyzed: 11-20-2006
Method: EPA 524.2

Analyst: LL
Verified: JN

Description of units used within this report

ng/L - Micrograms per Liter

Quant Limit - Lowest concentration reliably measured

Iowa Laboratory Certification No. 027. AHTA, NELAP, USEPA, NVLAP #101288-0 and other credentials available upon request.

If you have any questions please call Sherri Marine at 800/421-IOWA (4692) or 319/335-4500. Thank you.

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