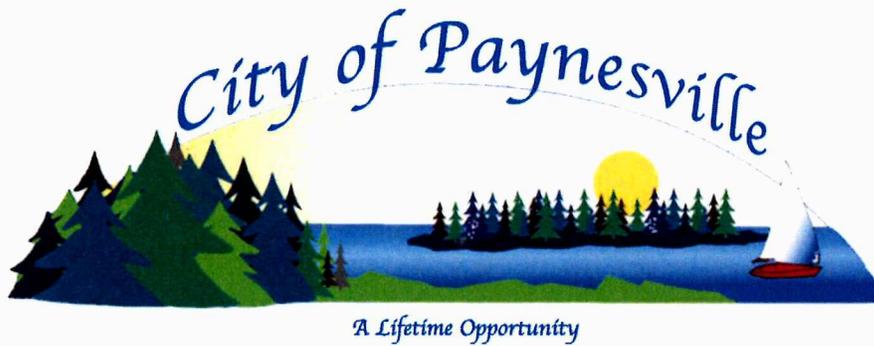


PILOT STUDY REPORT



Paynesville Water Treatment Facility Paynesville, MN

**Bolton & Menk Project No. R21.111286
March 2016**



DESIGNING FOR A BETTER TOMORROW

PAYNESVILLE, MINNESOTA

PILOT STUDY REPORT

MARCH 2016

PROJECT NO. R21.111286

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: 

Typed or Printed Name: Paul Saffert, P.E.

Date March 8, 2016

Lic. No. 43485

BOLTON & MENK, INC.
CONSULTING ENGINEERS & LAND SURVEYORS

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SECTION 1 INTRODUCTION

A. PURPOSE

This report provides the City of Paynesville, Minnesota with recommendations for removal of benzene from the source water and detail the results of the packed tower piloting plant implemented for VOC removal.

B. BACKGROUND

The Minnesota Pollution Control Agency (MPCA) has been monitoring the benzene levels in a groundwater plume since a leak was discovered in an underground gasoline storage tank. The leaking storage tank was owned by Midtown Station located in Paynesville near the intersection of Lake Avenue and Mill Street. The benzene plume has slowly migrated toward the municipal well field which is the source of the drinking water for the community of Paynesville. The City has four wells which supply water to the Water Treatment Facility. Currently, no benzene has been detected in the source water.

The City of Paynesville received a grant to add a VOC removal process to their Water Treatment Plant. The Best Available Technology (BAT) outlined for Volatile Organic Compounds (VOCs) by the Environmental Protection Agency (EPA) are packed tower aeration and granular activated carbon (GAC) adsorption. For the purpose of this report, only packed tower aeration will be discussed. GAC has been discounted due to the anticipated need to replace the filter bed for continued success of benzene removal.

SECTION 2 PILOT TESTING

A. BACKGROUND

Benzene levels in the ground water have been monitored as high as 20 parts per billion or (micrograms per liter). The MPCA is using Well 4 in an attempt to control the plume and Well 3 has been abandoned. The system will be designed based on a concentration of benzene of 20 parts per billion. Well 4 is current not being used as a drinking water supply well.

As outlined in the Terracon Midtown Station report from September 17, 2015, the benzene appears to continue to migrate towards the municipal water supply and imposes a future risk to the supply. The EPA Maximum Contaminant Level (MCL) is 5 micrograms per liter and the Maximum Contaminant Level Goal (MCLG) is zero due to the increased likelihood of anemia and cancer.

B. PACKED TOWER AERATION PILOT

The process for packed tower aeration consists of pumping water to the top of a tower and allowing it to flow by gravity through random pack of media. Air is drawn into the bottom of the tower and pulled upward. The air and water interaction causes the benzene to volatilize out of the water into the air. This is due to the air being continuously refreshed at a high rate. The benzene in the air is safely released into the atmosphere at extremely low doses.

The packed tower can be located anywhere in the existing process. It is recommended to locate this process following the gravity filter to prevent iron and manganese fouling of the packed tower. To simulate a packed tower benzene removal system, Bolton & Menk, Inc. operated a pilot plant which contained random pack media to evaluate the efficiency of the proposed system.

1. Purpose and Objective

The purpose of the pilot was to run a column test to simulate an air stripping tower utilizing random pack media. The influent water was spiked with diesel fuel to an

approximate concentration of 40 parts per billion (micrograms per liter) for test number one, and 20 parts per billion for test number two, of benzene, respectively. The objective was to quantify how effective the random pack media is at removing VOC's from the water and to develop curves to observe the efficiency of benzene removal at different points within the system to ensure conservative and effective design.

2. Materials

The pilot trailer was provided by Bolton & Menk, Inc. Inside the pilot trailer are two columns that were packed with random pack media (see Figure 2-1) The random pack media that was provided is made from plastic and is octagonal in shape (see Figure 2-2). There are four hexagonal layers that make up one piece of media. Submersible pumps were used to pump the water out of 30 gallon containers into the columns. An air compressor supplied the required air flow into the columns. A list of materials is as follows:

- Random pack media
- 2 submersible pumps
- Miscellaneous hoses
- Diesel fuel (1 gallon)
- Six 3 mL syringes
- Six 6 mL syringes
- Two 35 mL syringes
- Six 1L amber bottles
- Eighteen 43 mL TOC vials
- Air compressor with air lines

Column A

Column B

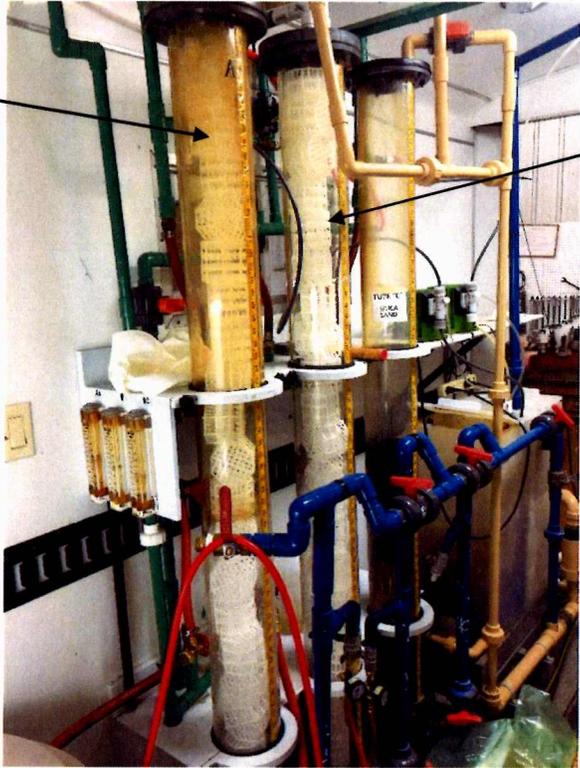


Figure 2-1: Two Column Design with Random Pack Media

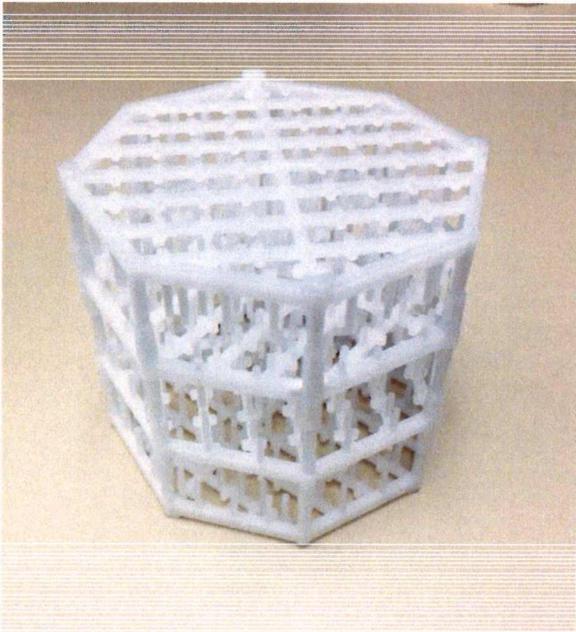


Figure 2-2: Sample of Random Pack Media

3. Procedure

Random pack media was placed inside two 6 foot tall columns with an inside diameter of 8 inches each. The media was dropped in from the top of each column with no direction or order as it is random pack media. Two tests were conducted with two different concentrations of diesel fuel and water. The first test mixed diesel fuel with water to obtain a concentration of 0.040 mg/L aromatic hydrocarbons (benzene). To obtain this concentration, 1 mL of diesel fuel was mixed with 5.5 gallons of water. The second test mixed 0.5 mL of diesel fuel with 5.5 gallons of water to obtain a concentration of 0.020 mg/L aromatic hydrocarbons.

After mixing the diesel fuel and water, the mixture was then poured into a 30 gallon container where a submersible pump was used to pump the water to the top of the first column (Column A) of random pack media at 1 gallon per minute (gpm). As the water flowed through the media, air was forced in the bottom of the column and exited out the top at a flow of approximately 3 cfm.

As the water left column A, it was collected in an intermediate 30 gallon container. A second submersible pump immediately pumped the water into the top of the second column (Column B) at a flow of 1 gpm. Air was also forced through the second column at approximately 3 cfm. Once the water reached the end of the second column, it was collected in a final effluent 30 gallon container.

Samples of water were collected from the influent, intermediate, and final effluent containers. Throttling valves were used to control the flow from the submersible pumps to obtain 1 gpm. The air compressor maintained a pressure of 50-60 psi, yielding a total air flow of 6 cfm (3 cfm/column). The air to water ratio was 22:1. The desired air to water ratio was 20:1. When completed, the columns were allowed to drain and they remained open to the atmosphere to dry.

4. Sample Collection

Samples were collected on February 18, 2016. Prior to sample collection, a diesel fuel and water mixture (1 mL diesel/5.5 gallons water) was run through the entire system for 6

hours the previous day. The purpose of this was to equilibrate the columns and to ensure the system would work properly during the actual testing phase.

On sampling day, test number one began at 9:30 am. The water and diesel fuel mixture was pumped through the columns for two hours. At 11:30 am, two hours after start-up, samples were collected. The sample collection procedure included collecting 1 Liter samples of the influent, intermediate, and final effluent stages of the system. The samples were placed in acidified 1 L amber bottles, capped, and stored until analysis.

After the first set of samples was collected the diesel fuel and water mixture dosing was reduced to 0.5 mL of diesel into 5.5 gallons of water. Test number two began at 11:55 am. The columns were run with the new mixture for two hours before samples were collected. Two hours was sufficient to ensure the system was equilibrated with the new concentration of diesel fuel and water. After two hours, at 2:00 pm, samples were collected from the influent, intermediate, and final effluent stages of the system in the same manner as test number one.

Once samples were collected, they were placed in a cooler with ice and brought to Minnesota Valley Testing Laboratories in New Ulm, MN for analysis of VOC's.

5. Results and Discussion

Test No. 1 involved dosing the columns with 1 mL of diesel fuel into 5.5 gallons of water. The results are shown in Table 2-1.

Table 2-1: Test Number One Results				
1 mL Diesel / 5.5 gallons of water				
Compound	Influent #1 Concentration (µg/L)	Intermediate #1 Concentration (µg/L)	Final Effluent #1 Concentration (µg/L)	Total Reduction (%)
n-Butylbenzene	11.1	4.2	2.4	78.4%
Cumene	3.9	0	0	100.0%
Ethyl Benzene	12.6	2.7	1	92.1%
Naphlanene	9.8	2.9	0	100.0%
n-Propylbenzene	15.6	3.7	1.4	91.0%
Toluene	11.4	5.8	4.4	61.4%
1,2,4-Trimethylbenzene	71.0	0	0	100.0%
1,3,5-Trimethylbenzene	2.4	0	0	100.0%
m-Xylene and p-Xylene	39.1	3.9	0	100.0%
o-Xylene	30.2	6.7	2.6	91.4%

Most of the major compounds experienced greater than 90% removal by the random pack media system, with several compounds experiencing 100% removal. As the water entered the top of the column, it would trickle down through the random pack media as designed. When the system was running, a strong odor of diesel fuel could be smelled exiting the top of the columns, which was expected. This indicates the system performed as designed and the benzene compounds were being volatilized and released into the air.

One observation made during testing, was each container had a reduction in the “oily sheen” on the water surface. The influent container had a strong odor of diesel fuel with a very noticeable “oily sheen” as seen in Figure 2-3. After passing through the first column, there was a significantly noticeable reduction in odor and sheen within the intermediate container (Figure 2-4). Finally, after passing through the second column, there was no odor and sheen in the final effluent container. Figure 2-5 represents the final water quality. The water clarity was very good and there is little to no trace of an oily residue on the water surface. The results reflect the observations made during testing. There was a significant reduction of harmful compounds through the system indicating removal of volatile compounds.



Figure 2-3: Influent Container with “Oily Sheen” visible

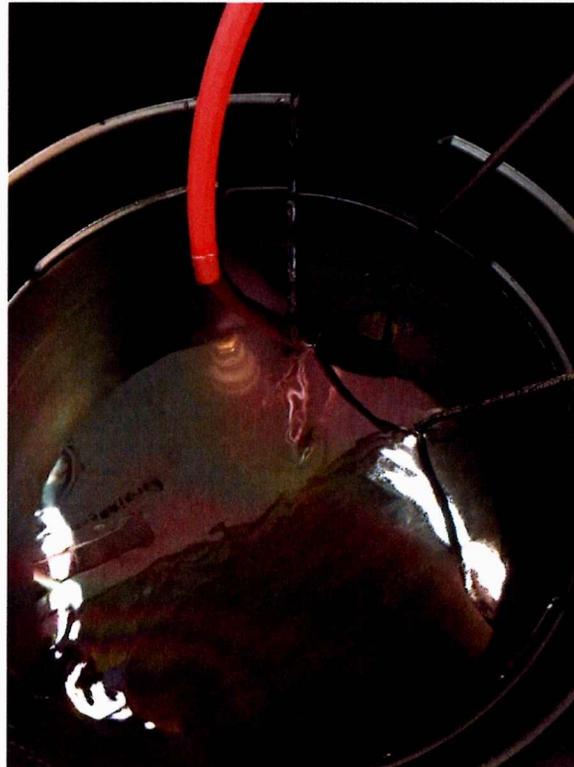


Figure 2-4: Intermediate Container with slight “Oily Sheen” visible

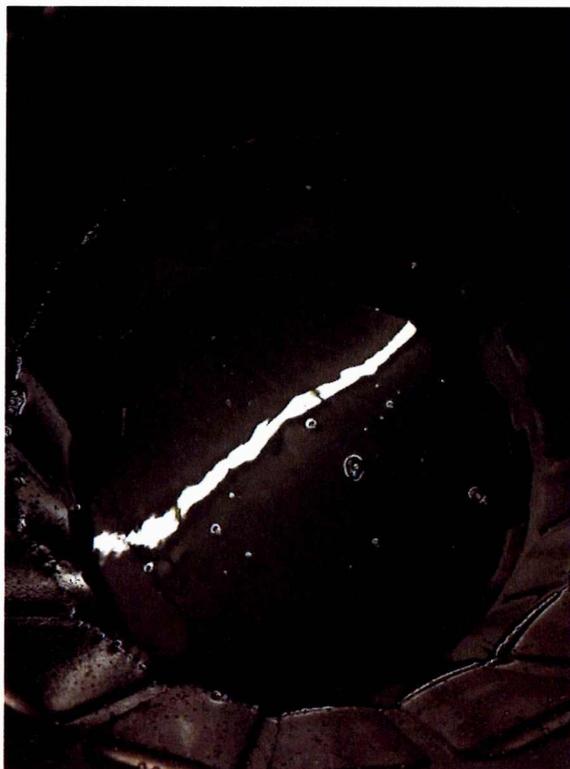


Figure 2-5: Final Effluent Container with no “Oily Sheen” visible

Table 2-1 shows that all of the benzene products are reduced to below the National Primary Drinking Water Standard for benzene of 5 µg/L within the final effluent water stream. n-Butylbenzen was reduced from 11.1 µg/L to 2.4 µg/L, a reduction of 78.4%. Another compound, n-Propylbenzene, was reduced from 15.6 µg/L to 1.4 µg/L, a reduction of 91%. Another compound regulated by the EPA and the National Primary Drinking Water Standard, is Toluene. Toluene has a MCL of 1 mg/L. From Table 2-1, Toluene is reduced from 11.4 µg/L to 4.4 µg/L, a reduction of 61.4%. Overall, the system removed harmful compounds from the water supply.

The results from test number one indicate that the random pack media system can effectively remove benzene and other compounds at high concentration in water supplies.

The second test was conducted after the samples on test number one were completed. The goal of this test was to run the system at lower concentrations to observe how the system would respond. Here, the columns were dosed with a mixture of 0.5 mL of diesel fuel with 5.5 gallons of water (the concentration was reduced by 50%). The results are shown in Table 2-2:

Table 2-2: Test Number Two Results				
0.5 mL Diesel / 5.5 gallons of water				
Compound	Influent #1 Concentration (µg/L)	Intermediate #1 Concentration (µg/L)	Final Effluent #1 Concentration (µg/L)	Total Reduction (%)
n-Butylbenzene	4.0	0	0	100.0%
Cumene	0.0	0	0	NA
Ethyl Benzene	2.2	0	0	100.0%
Naphthalene	0.0	0	0	NA
n-Propylbenzene	3.6	0	0	100.0%
Toluene	1.5	2.5	1	33.3%
1,2,4-Trimethylbenzene	0.0	0	0	NA
1,3,5-Trimethylbenzene	0.0	0	0	NA
m-Xylene and p-Xylene	2.3	0	0	100.0%
o-Xylene	5.4	1.3	0	100.0%

The results from test number two show that all the compounds were reduced by 100% through the system. Toluene was the only compound not completely reduced, but it remained under the EPA standard MCL of 1 mg/L. The high intermediate level of toluene is likely an anomaly of testing at parts per billion levels as nothing in the pilot would add toluene to the water. Again, the final effluent concentrations are below the National Primary Drinking Water Standard for benzene of 5 µg/L within the final effluent water stream.

Similar to test number one, a strong odor of diesel fuel could be smelled leaving the top of the columns in the airflow. There was a noticeable reduction in odor between test number one and test number two in the influent container. Test number two had a strong odor to it, but there was a light “oily sheen” on the surface of the water. The intermediate and final effluent containers for test number two had almost no odor or sheen present.

The results from test number two indicate that under low concentrations, the system can efficiently remove benzene and other compounds. It is important to note that the system was run in series. That is, where the water was pumped into the first column, treated and then pumped into the second column. The effluent from test 1 was approximately the influent from test 2 and serves as an estimate of the system operating as one continuous tower.

6. Conclusion/Recommendation

Both test number one and two indicated that the random pack media can be used to removed benzene and other compounds from water. Aromatic hydrocarbon removal was greater than 90% for test one, and 100% for test number two. There was an observable reduction in odor and “oily sheen” between the influent, intermediate, and final effluent containers for both test number one and two. To optimize the efficiency of the system, the columns should be relatively tall to ensure proper time for the compounds to volatilize.

Based on the discussed results and observations, it is recommended that the City of Paynesville proceed with constructing a packed tower aeration system for the removal of benzene and other VOCs that may be in the water supply in the future. Published values for benzene removal will be utilized in combination with pilot plant results on the final design.

APPENDIX A

MINNESOTA VALLEY TESTING LABORATORIES, INC.

MVTL

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890

2616 E. Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5310
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:30
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Temp at Receipt: 3.5 C

Sample Description: INFLUENT #1

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	3.092	ppm	0.035	WI DRO (95)	26 Feb 16	TMP

DRO Sample pH < 2

Approved by:



Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix

= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5310
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:30
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INFLUENT #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
1,1-Dichloroethene	75-35-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
cis-1,2-Dichloroethene	156-59-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
trans-1,2-Dichloroethene	156-60-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloropropane	78-87-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichloropropane	142-28-9	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2,2-Dichloropropane	594-20-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloropropene	563-58-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Ethyl Benzene	100-41-4	12.6	ug/L	1.0	EPA 624	22 Feb 16	SKV
Hexachlorobutadiene	87-68-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
p-Isopropyltoluene	99-87-6	4.2	ug/L	1.0	EPA 624	22 Feb 16	SKV
Methylene Chloride	75-09-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Naphthalene	91-20-3	9.8	ug/L	2.0	EPA 624	22 Feb 16	SKV
n-Propylbenzene	103-65-1	15.6	ug/L	1.0	EPA 624	22 Feb 16	SKV
Styrene	100-42-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1,2-Tetrachloroethane	630-20-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2,2-Tetrachloroethane	79-34-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Tetrachloroethene	127-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Toluene	108-88-3	11.4	ug/L	1.0	EPA 624	22 Feb 16	SKV
1,2,3-Trichlorobenzene	87-61-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trichlorobenzene	120-82-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1-Trichloroethane	71-55-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2-Trichloroethane	79-00-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichloroethene	79-01-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichlorofluoromethane	75-69-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichloropropane	96-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trimethylbenzene	95-63-6	71.0	ug/L	1.0	EPA 624	22 Feb 16	SKV
1,3,5-Trimethylbenzene	108-67-8	2.4	ug/L	1.0	EPA 624	22 Feb 16	SKV

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7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5310
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:30
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INFLUENT #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	39.1	ug/L	2.0	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	30.2	ug/L	1.0	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 101 %
TOLUENE-d8 (SURROGATE) RECOVERY: 101 %
4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 85 %

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

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BOLTON & MENK INC/RAMSEY
 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5311
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016 11:38
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #1

Temp at Receipt: 3.5 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	4.621 ppm		0.035	WI DRO (95)	26 Feb 16	TMP

DRO Sample pH < 2

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards. The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
 ! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5311
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016 11:38
 Sampled By:
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
1,1-Dichloroethene	75-35-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
cis-1,2-Dichloroethene	156-59-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
trans-1,2-Dichloroethene	156-60-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloropropane	78-87-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichloropropane	142-28-9	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2,2-Dichloropropane	594-20-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloropropene	563-58-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Ethyl Benzene	100-41-4	2.7	ug/L	1.0	EPA 624	22 Feb 16	SKV
Hexachlorobutadiene	87-68-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
p-Isopropyltoluene	99-87-6	1.3	ug/L	1.0	EPA 624	22 Feb 16	SKV
Methylene Chloride	75-09-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Naphthalene	91-20-3	2.9	ug/L	2.0	EPA 624	22 Feb 16	SKV
n-Propylbenzene	103-65-1	3.7	ug/L	1.0	EPA 624	22 Feb 16	SKV
Styrene	100-42-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1,2-Tetrachloroethane	630-20-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2,2-Tetrachloroethane	79-34-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Tetrachloroethene	127-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Toluene	108-88-3	5.8	ug/L	1.0	EPA 624	22 Feb 16	SKV
1,2,3-Trichlorobenzene	87-61-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trichlorobenzene	120-82-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1-Trichloroethane	71-55-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2-Trichloroethane	79-00-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichloroethene	79-01-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichlorofluoromethane	75-69-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichloropropane	96-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trimethylbenzene	95-63-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3,5-Trimethylbenzene	108-67-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
 The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
 ! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5311
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:38
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result	Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1 ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	3.9 ug/L	2.0	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	6.7 ug/L	1.0	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 98 %

TOLUENE-d8 (SURROGATE) RECOVERY: 99 %

4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 88 %

Approved by:



Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards. The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix

= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040



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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

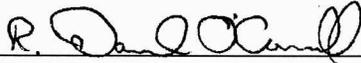
Report Date: 26 Feb 2016
Lab Number: 16-A5312
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:46
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #1

Temp at Receipt: 3.5 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	2.394	ppm	0.035	WI DRO (95)	26 Feb 16	TMP

DRO Sample pH < 2

Approved by: 

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.

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@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5312
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:46
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
1,1-Dichloroethene	75-35-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
cis-1,2-Dichloroethene	156-59-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
trans-1,2-Dichloroethene	156-60-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloropropane	78-87-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichloropropane	142-28-9	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2,2-Dichloropropane	594-20-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloropropene	563-58-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Ethyl Benzene	100-41-4	1.0	ug/L	1.0	EPA 624	22 Feb 16	SKV
Hexachlorobutadiene	87-68-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
p-Isopropyltoluene	99-87-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Methylene Chloride	75-09-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Naphthalene	91-20-3	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Propylbenzene	103-65-1	1.4	ug/L	1.0	EPA 624	22 Feb 16	SKV
Styrene	100-42-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1,2-Tetrachloroethane	630-20-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2,2-Tetrachloroethane	79-34-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Tetrachloroethene	127-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Toluene	108-88-3	4.4	ug/L	1.0	EPA 624	22 Feb 16	SKV
1,2,3-Trichlorobenzene	87-61-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trichlorobenzene	120-82-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1-Trichloroethane	71-55-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2-Trichloroethane	79-00-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichloroethene	79-01-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichlorofluoromethane	75-69-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichloropropane	96-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trimethylbenzene	95-63-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3,5-Trimethylbenzene	108-67-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix

= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5312
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 11:46
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #1

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	2.6	ug/L	1.0	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 97 %

TOLUENE-d8 (SURROGATE) RECOVERY: 100 %

4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 89 %

Approved by:



Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix

= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5313
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:00
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INFLUENT #2

Temp at Receipt: 3.5 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	1.729 ppm		0.035	WI DRO (95)	26 Feb 16	TMP

DRO Sample pH < 2

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards. The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5313
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:00
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INFLUENT #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	2.3	ug/L	2.0	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	5.4	ug/L	1.0	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 97 %
TOLUENE-d8 (SURROGATE) RECOVERY: 100 %
4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 90 %

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix

= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040



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BOLTON & MENK INC/RAMSEY
 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5314
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016 14:18
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #2

Temp at Receipt: 3.5 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	1.349	ppm	0.035	WI DRO (95)	25 Feb 16	TMP

DRO Sample pH < 2

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards. The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
 ! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
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Report Date: 26 Feb 2016
Lab Number: 16-A5314
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:18
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	71-43-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromobenzene	108-86-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromochloromethane	74-97-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromodichloromethane	75-27-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromoform	75-25-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Bromomethane	74-83-9	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Butylbenzene	104-51-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
sec-Butylbenzene	135-98-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
t-Butylbenzene	98-06-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Carbon Tetrachloride	56-23-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorobenzene	108-90-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorodibromomethane	124-48-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroethane	75-00-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroform	67-66-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloromethane	74-87-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2-Chlorotoluene	95-49-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
4-Chlorotoluene	106-43-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Cumene	98-82-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dibromo-3-chloropropane	96-12-8	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
1,2-Dibromoethane	106-93-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dibromomethane	74-95-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichlorobenzene	95-50-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichlorobenzene	541-73-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,4-Dichlorobenzene	106-46-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dichlorodifluoromethane	75-71-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloroethane	75-34-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloroethane	107-06-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards. The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5314
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016 14:18
 Sampled By:
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
1,1-Dichloroethene	75-35-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
cis-1,2-Dichloroethene	156-59-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
trans-1,2-Dichloroethene	156-60-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloropropane	78-87-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichloropropane	142-28-9	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2,2-Dichloropropane	594-20-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloropropene	563-58-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Ethyl Benzene	100-41-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Hexachlorobutadiene	87-68-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
p-Isopropyltoluene	99-87-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Methylene Chloride	75-09-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Naphthalene	91-20-3	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Propylbenzene	103-65-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Styrene	100-42-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1,2-Tetrachloroethane	630-20-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2,2-Tetrachloroethane	79-34-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Tetrachloroethene	127-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Toluene	108-88-3	2.5	ug/L	1.0	EPA 624	22 Feb 16	SKV
1,2,3-Trichlorobenzene	87-61-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trichlorobenzene	120-82-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1-Trichloroethane	71-55-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2-Trichloroethane	79-00-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichloroethene	79-01-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichlorofluoromethane	75-69-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichloropropane	96-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trimethylbenzene	95-63-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3,5-Trimethylbenzene	108-67-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

RL = Reporting Limit

Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.

The reporting limit was elevated for any analyte requiring a dilution as coded below:

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 ! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5314
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:18
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: INTERMEDIATE #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result	Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1 EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	< 2	ug/L	2 EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	1.3	ug/L	1.0 EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 97 %
TOLUENE-d8 (SURROGATE) RECOVERY: 99 %
4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 90 %

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

RL = Reporting Limit

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@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5315
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:30
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #2

Temp at Receipt: 3.5 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
DRO Extraction					23 Feb 16	KKG
Sample Concentration For DRO	1.181	ppm	0.035	WI DRO (95)	25 Feb 16	TMP

DRO Sample pH < 2

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

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CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5315
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016 14:30
 Sampled By:
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	71-43-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromobenzene	108-86-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromochloromethane	74-97-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromodichloromethane	75-27-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromoform	75-25-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Bromomethane	74-83-9	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Butylbenzene	104-51-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
sec-Butylbenzene	135-98-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
t-Butylbenzene	98-06-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Carbon Tetrachloride	56-23-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorobenzene	108-90-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorodibromomethane	124-48-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroethane	75-00-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroform	67-66-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloromethane	74-87-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2-Chlorotoluene	95-49-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
4-Chlorotoluene	106-43-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Cumene	98-82-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dibromo-3-chloropropane	96-12-8	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
1,2-Dibromoethane	106-93-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dibromomethane	74-95-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichlorobenzene	95-50-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichlorobenzene	541-73-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,4-Dichlorobenzene	106-46-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dichlorodifluoromethane	75-71-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloroethane	75-34-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloroethane	107-06-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

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CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5315
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016 14:30
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: FINAL EFFLUENT #2

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 98 %
TOLUENE-d8 (SURROGATE) RECOVERY: 100 %
4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 93 %

Approved by:



Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

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CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
 7333 SUNWOOD DR STE 206
 RAMSEY MN 55303

Report Date: 26 Feb 2016
 Lab Number: 16-A5316
 Work Order #: 22-2568
 Account #: 013307
 Sample Matrix: WASTEWATER
 Date Sampled: 18 Feb 2016
 Sampled By:
 Date Received: 19 Feb 2016
 PO #: PAUL SAFFERT

Sample Description: TRIP BLANK

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	71-43-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromobenzene	108-86-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromochloromethane	74-97-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromodichloromethane	75-27-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Bromoform	75-25-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Bromomethane	74-83-9	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Butylbenzene	104-51-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
sec-Butylbenzene	135-98-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
t-Butylbenzene	98-06-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Carbon Tetrachloride	56-23-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorobenzene	108-90-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chlorodibromomethane	124-48-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroethane	75-00-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloroform	67-66-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Chloromethane	74-87-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2-Chlorotoluene	95-49-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
4-Chlorotoluene	106-43-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Cumene	98-82-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dibromo-3-chloropropane	96-12-8	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
1,2-Dibromoethane	106-93-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dibromomethane	74-95-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichlorobenzene	95-50-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichlorobenzene	541-73-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,4-Dichlorobenzene	106-46-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Dichlorodifluoromethane	75-71-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloroethane	75-34-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloroethane	107-06-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

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CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5316
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: TRIP BLANK

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
1,1-Dichloroethene	75-35-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
cis-1,2-Dichloroethene	156-59-2	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
trans-1,2-Dichloroethene	156-60-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2-Dichloropropane	78-87-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3-Dichloropropane	142-28-9	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
2,2-Dichloropropane	594-20-7	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1-Dichloropropene	563-58-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Ethyl Benzene	100-41-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Hexachlorobutadiene	87-68-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
p-Isopropyltoluene	99-87-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Methylene Chloride	75-09-2	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
Naphthalene	91-20-3	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
n-Propylbenzene	103-65-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Styrene	100-42-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1,2-Tetrachloroethane	630-20-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2,2-Tetrachloroethane	79-34-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Tetrachloroethene	127-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Toluene	108-88-3	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichlorobenzene	87-61-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trichlorobenzene	120-82-1	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,1-Trichloroethane	71-55-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,1,2-Trichloroethane	79-00-5	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichloroethene	79-01-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
Trichlorofluoromethane	75-69-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,3-Trichloropropane	96-18-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,2,4-Trimethylbenzene	95-63-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
1,3,5-Trimethylbenzene	108-67-8	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

RL = Reporting Limit

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The reporting limit was elevated for any analyte requiring a dilution as coded below:

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= Due to concentration of other analytes

! = Due to sample quantity

+ = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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BOLTON & MENK INC/RAMSEY
7333 SUNWOOD DR STE 206
RAMSEY MN 55303

Report Date: 26 Feb 2016
Lab Number: 16-A5316
Work Order #: 22-2568
Account #: 013307
Sample Matrix: WASTEWATER
Date Sampled: 18 Feb 2016
Sampled By:
Date Received: 19 Feb 2016
PO #: PAUL SAFFERT

Sample Description: TRIP BLANK

Temp at Receipt: 3.5 C

	CAS #	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Vinyl Chloride	75-01-4	< 1	ug/L	1	EPA 624	22 Feb 16	SKV
m-Xylene and p-Xylene	179601-23-1	< 2	ug/L	2	EPA 624	22 Feb 16	SKV
o-Xylene	95-47-6	< 1	ug/L	1	EPA 624	22 Feb 16	SKV

Some of the SW 8260B matrix spike criteria were not met due to sample matrix.

GC/MS VOC Sample pH < 2

DIBROMOFLUOROMETHANE (SURROGATE) RECOVERY: 99 %
TOLUENE-d8 (SURROGATE) RECOVERY: 99 %
4-BROMOFLUOROBENZENE (SURROGATE) RECOVERY: 91 %

Approved by:

Dan O'Connell, Chemistry Laboratory Manager New Ulm, MN

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! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040