Remedial Investigation of a VOC-Contaminated Aquifer

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Wisconsin Department of Natural Resources

Webster, Wisconsin

Task 1 Investigation Report

Wisconsin DNR Project Number 91SW409

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Prepared by **RREM, Inc. Engineering & Environmental Consultants** Superior, Wisconsin 
Duluth, Minnesota January 1992

# **Investigation Report**

**Remedial Investigation of a VOC-Contaminated Aquifer** Webster, Wisconsin

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## Certification

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of Wisconsin.

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JAN 1 | 1992

NORTHWEST ENSTRICT **HEADGAMATERS** 

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# **Investigation** Report

## Remedial Investigation of a VOC-Contaminated Aquifer Webster, Wisconsin

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# **Investigation Report**

## Remedial Investigation Wisconsin DNR Webster, Wisconsin

## EXECUTIVE SUMMARY

#### FINDINGS

- 1. The investigation was conducted in the Village of Webster, Wisconsin, which is located in Burnett County.
- 2. The site is located approximately halfway between the Yellow River (to the north) and the Clam River (to the south), within the St. Croix River drainage basin.
- 3. The topography of the area is dominated by an extensive, low relief outwash plain that contains scattered wetlands. The study area is flat, with a total variation in topography of less than five feet.
- 4. Nineteen soil borings, varying from 36 to 71 feet in depth, were drilled at various locations around the study area to determine the sedimentary stratigraphy, the depth to groundwater, and the lateral and vertical extent of soil contamination by volatile organic compounds (VOCs).
- 5. The sedimentary stratigraphy consists of silty to clayey sand, plus gravel fill, silty clay, and fine to coarse-grained, well rounded, well-sorted sand deposits that locally contain lenses of pebbly to gravelly sand and silt to silty sand.
- 6. Groundwater was encountered in all soil borings at depths ranging from 34 to 36 feet below the ground surface.
- 7. The groundwater is contained in an unconfined aquifer system. Mechanical analyses of soil samples from the saturated zone indicate that the aquifer varies from poorly graded sand (SP) to poorly graded sand with silt (SP-SM) to silty sand (SM).

#### 8. Thirty-eight soil samples were selected for chemical analysis. Findings, Twenty-eight samples were analyzed for VOCs, using EPA continued Method 8010/8020, total petroleum hydrocarbons (TPH) using the California Method, and lead via EPA Method 7421. Ten samples were analyzed only for VOC contamination via EPA Method 8010/8020. All analyses were performed by Enviroscan of Rothschild, Wisconsin. 9. Lead was detected in 17 of the 28 soil samples analyzed, with concentrations ranging from 1.82 to 9.47 $\mu$ g/g. These are considered to be background concentrations. 10. Toluene was detected only in soil boring SB-13, where a soil sample collected from 34 to 36 feet in depth had a concentration of 4.2 $\mu$ g/g. 11. Tetrachloroethylene (PCE) contaminated soil was detected at depths of 34 to 36 feet in soil borings SB-1 (34.9 $\mu$ g/g), SB-6 (2.4 $\mu$ g/g), and SB-18 (9.3 $\mu$ g/g). Tetrachloroethylene contamination was also detected at 69 to 71 feet in depth in soil boring SB-4 (5.8 $\mu$ g/g). 12. Methylene chloride contamination, detected in samples from soil borings SB-4, SB-7, SB-9, and SB-14, is believed to be the result of laboratory contamination during the analysis of the samples. 13. Ten monitoring wells were installed to evaluate the hydrogeological characteristics of the aquifer, as well as to allow groundwater sampling. 14. The aquifer was found to have a geometric mean hydraulic conductivity of $1.77 \times 10^{-2}$ cm/sec and an arithmetic mean hydraulic conductivity of $1.82 \times 10^{-2}$ cm/sec, based on analyses of data collected by a pressure transducer using the Hvorslev

15. Water table elevations were monitored from June through October, 1991, in the ten wells installed by RREM and in the nine wells installed during the previous study by Ayres (1987). Groundwater flows from east to west, with a gradient between  $8 \times 10^{-4}$  ft/ft and  $9 \times 10^{-4}$  ft/ft.

method.

## Findings, continued

- 16. The groundwater average linear velocity was calculated to be between 44 and 48 ft/year, assuming a porosity of 35 percent for the aquifer.
- 17. Groundwater samples were obtained during two rounds of sampling from the 19 wells discussed above and from a tap connected to Webster village well 2 (VW-2).
- 18. Low-level contamination of groundwater by the gasoline-related compounds benzene, toluene, and 1,2-dichloropropane was recognized during the first round of sampling. Benzene, ethylbenzene, 1,2-dichloropropane, toluene, and m- and p-xylene were detected in the second round of sampling.
- 19. Only the concentrations reported for benzene exceeded the preventive action limit (PAL). None of the concentrations reported for the gasoline-related contaminants exceeded its respective enforcement standard (ES).
- 20. Contamination by organic compounds used primarily as solvents was also recognized during the two rounds of groundwater sampling. During the first round of sampling, the halogenated compounds 1,2-dichlorobenzene, 1,2-dichloroethane, tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected. The second round water samples contained the previous compounds as well as 1,2-dichloroethylene.
- 21. The concentrations of 1,2-dichlorobenzene and 1,2dichloroethylene did not exceed the PAL or the ES.
- 22. Trichloroethylene was detected in wells 91-2B, 91-3,91-4, and 91-6. All concentrations detected exceeded the PAL of 0.18 ug/l, and the concentration in well 91-2B consistently exceeded the ES of 5.0 ug/l.
- 23. Two halogenated VOCs (1,2-dichloroethane and tetrachloroethylene) had a widespread distribution in the groundwater at Webster.
- 24. Dichloroethane concentrations that exceeded the PAL of 0.05 ug/l were detected in wells 91-4, 91-5B, OW-2, and VW-2. The enforcement standard for 1,2-dichloroethane (5.0 ug/l) was exceeded in both rounds of water sampling by groundwater from well 91-3.

Findings, continued25. Tetrachloroethylene was detected in water from 11 wells during the first round of sampling, and 13 wells from the second round of sampling. In all locations where tetrachloroethylene was detected, the concentrations exceeded both the PAL and the ES.

- 26. Based on the mapped distribution of 1,2-dichloroethane and tetrachloroethylene, the contaminant concentration increases with depth as one moves away from the possible sources.
- 27. Contamination by 1,2-dichloroethane and tetrachloroethylene appears to have originated from separate sources.
- **CONCLUSIONS** 1. The results of this investigation indicate that volatile organic compound contamination of both soil and water is present at the Webster, Wisconsin, study site.
  - 2. Although petroleum-related contamination has been detected, for the most part, the concentrations of these compounds are below the preventive action limits (PAL) and do not appear to pose substantial threat to human health.
  - 3. The most widespread contamination at the site is related to VOCs that are primarily associated with solvents. These include 1,2-dichlorobenzene, 1,2-dichloroethane, 1,2-dichloroethylene, tetrachloroethylene, and trichloroethylene.
  - 4. Based on the groundwater quality standards enforced by the Wisconsin DNR, it appears that the most serious contamination is due to the presence of 1,2-dichloroethane and tetrachloroethylene.
  - 5. The plume of 1,2-dichloroethane appears to be restricted to the southwestern region of the study area.
  - 6. The plume related to tetrachloroethylene contamination appears to be concentrated in a northeast-southwest trending zone through the central region of the site in shallow portions of the aquifer. In deeper parts of the aquifer (down to 70 feet), this zone appears to be shifted northward relative to its position near the top of the aquifer.

## Conclusions, continued

- 7. The plumes related to 1,2-dichloroethane and tetrachloroethylene contamination appear to have different sources. The source for 1,2-dichloroethane appears to be located along Main Street on the west side of the village, probably between Pike and Sturgeon avenues, whereas the source for tetrachloroethylene may exist west of Lakeland Avenue (Highway #35) and east of Muskey Avenue, between Main and Elm streets.
- 8. Continued monitoring of groundwater quality from existing monitoring wells is recommended.
- 9. Drilling of several soil borings at potential source locations, with geochemical analysis of soil and water, is recommended to better define the distribution of the contamination.
- 10. The drilling of soil borings and the installation of monitoring wells is recommended to better define the lateral and vertical limits of the 1,2-dichloroethane and tetrachloroethylene plumes.
- 11. The drilling of at least four soil borings to the base of the sand aquifer underlying Webster is recommended to better define the slope of the surface of the confining layer.
- 12. Sampling of water from residences with private wells located immediately downgradient of the contaminant plumes is recommended.

# **Investigation Report**

## Remedial Investigation Wisconsin DNR Webster, Wisconsin

## INTRODUCTION

RREM, Inc., was retained by the Wisconsin Department of Natural Resources (DNR) to conduct a remedial investigation of a contaminated aquifer in the Village of Webster. The 1991 investigation was conducted to determine the scope, extent, source(s) and potential impacts of volatile organic compound (VOC) contamination in the aquifer underlying Webster. The contamination was first recognized in 1984 and 1985 in Webster Village Wells 1 and 2.

This Task 1 study examined background information about the site and previous investigations of the aquifer. In addition, the study area was expanded to evaluate possible sources of halogenated VOCs. Site work included soil boring completion, soil sample collection and analysis, monitoring well installation, groundwater sample collection and analysis, aquifer tests, and a site survey. Additional work is being conducted by RREM in a Task II investigation to evaluate the feasibility of various remedial options and future use of the aquifer.

#### PROJECT SCOPE

This remedial investigation encompassed:

- evaluation of the subsurface geological and hydrogeological characteristics of the study area;
- investigation of the vertical and horizontal distribution of VOC contamination in the soil and groundwater;
- evaluation of potential impacts related to the VOC contaminated soil and/or groundwater; and
- identification of several possible sources of VOC contamination in the study area.

## SITE LOCATION

The Village of Webster is located in Section 8, Township 39 North, Range 16 West, Burnett County, Wisconsin (Figure 1). The study area (Figures 2 and 3) is bounded by Fir Street to the north, Cedar Street to the south, Wisconsin State Highway 35 to the east, and the less developed area immediately west of the abandoned Soo Line Railroad right-of-way to the west. The study area includes most of Webster's downtown business district.

## SITE CHARACTERISTICS

#### TOPOGRAPHY

The topography in the Webster area (Figure 4) is dominated by an extensive, low relief outwash plain, containing scattered wetlands. The Yellow River to the north and the Clam River to the south occupy east-west trending river valleys and lowlands, which lie approximately 30-50 feet below the elevation of the outwash plain. The study area is flat, with a total variation in topography of less than 5 feet.

#### **BEDROCK GEOLOGY** Bedrock in the vicinity of Webster (Figure 5) is composed of subaerially deposited amygdaloidal to massive basalt lava flows and associated sedimentary rocks (Mudrey, Brown, and Greenberg, 1982; Ojakangas and Matsch, 1982). These rocks comprise part of the Chengwatana Volcanic Group, a series of 1100-million-year-old volcanic and sedimentary rocks, which are up to 25,000 feet in thickness (Young and Hindall, 1973).

The Chengwatana Volcanic Group has been mapped, primarily by geophysical means, from east-central Minnesota through northeastern Wisconsin. This group of rocks comprises a portion of the larger Keweenawan Super Group, which is composed of Middle Proterozoic volcanic and sedimentary rocks, formed within a failed continental rift system that extends from eastern Lake Superior to Kansas.

No lithified strata of Paleozoic, Mesozoic, or Cenozoic age have been recognized in the immediate Webster area. However, Cambrian age rock, consisting dominantly of quartzose and glauconitic sandstone and siltstone with lesser amounts of carbonate rocks, are believed to underlie the unconsolidated Pleistocene glacial sediments two to three miles west of Webster (Morey, Sims, Cannon, Mudrey, and Southwick, 1982; Mudrey et al., 1982).

#### GLACIAL GEOLOGY

The quaternary geologic history of the Webster area includes a period of continental glaciation, which extended over a large region in Wisconsin. Sediments deposited during this glaciation range from 5,000 to 70,000 years in age (Paull and Paull, 1977).

Glacial sediments present in the Webster area (Figure 6) are believed to have been deposited during the Woodfordian Advance of the Wisconsinian glaciation. This advance occurred between 22,000 and 12,500 years ago. At its maximum limit, ice from the Woodfordian Advance covered regions of Minnesota, Wisconsin, Iowa, and central Illinois. Over northwestern Wisconsin, ice flowed out of the Lake Superior Basin in a southwesterly direction. During periods of glacial stagnation, sediment-laden streams, produced from glacial meltwaters, deposited stratified sand and gravel deposits. This resulted in the formation of an extensive, pitted outwash plain. In the vicinity of Webster, these sedimentary deposits are more than 150 feet thick (Young and Hindall, 1973).

## **PREVIOUS INVESTIGATIONS**

WISCONSIN DNR (1984 AND 1985)

Wisconsin DNR Northwest Water Supply Staff first recognized the presence of volatile organic compound (VOC) contamination in water samples from the Webster village well 1 (VW-1) in December, 1984. The concentration of the contamination was not quantifiable at that time. Analysis of water samples taken from village well 1 (VW-1) in December 1984 indicated the presence of 1,2-dichloroethane and tetrachloroethylene (perchloroethylene [PCE]) in concentrations of 26 and 18  $\mu$ g/l, respectively. A summary of the chemical analyses performed on village well 1 by the Wisconsin DNR is contained in Appendix A.

Water samples from village well 2 (VW-2) were also collected and analyzed. Although no contamination was detected initially, both 1,2-dichloroethane and tetrachloroethylene were recognized in samples from this well in November 1985. Again, the concentrations of these contaminants was not quantifiable at that time. Analyses of water from VW-2 in December 1985 detected 1,2-dichloroethane and tetrachloroethylene in concentrations of 14 and 6.9  $\mu$ g/l, respectively. A summary of the chemical analyses performed on water samples from village well 2 is contained in Appendix A.

The locations of village well 1 and village well 2 are shown in Figure 7.

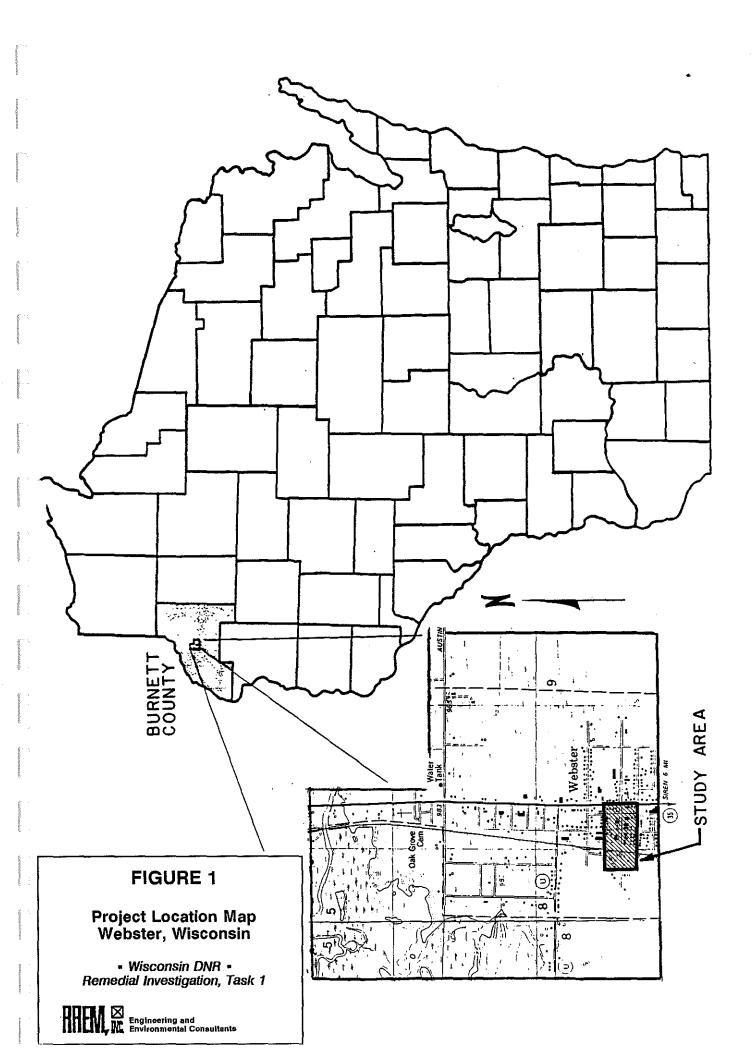
Tetrachloroethylene is considered an irritant to eyes and skin and a carcinogen; 1,2-dichloroethane is a strong eye irritant and a carcinogen (Sax & Lewis, 1987; U.S. Department of Health and Human Services, 1990).

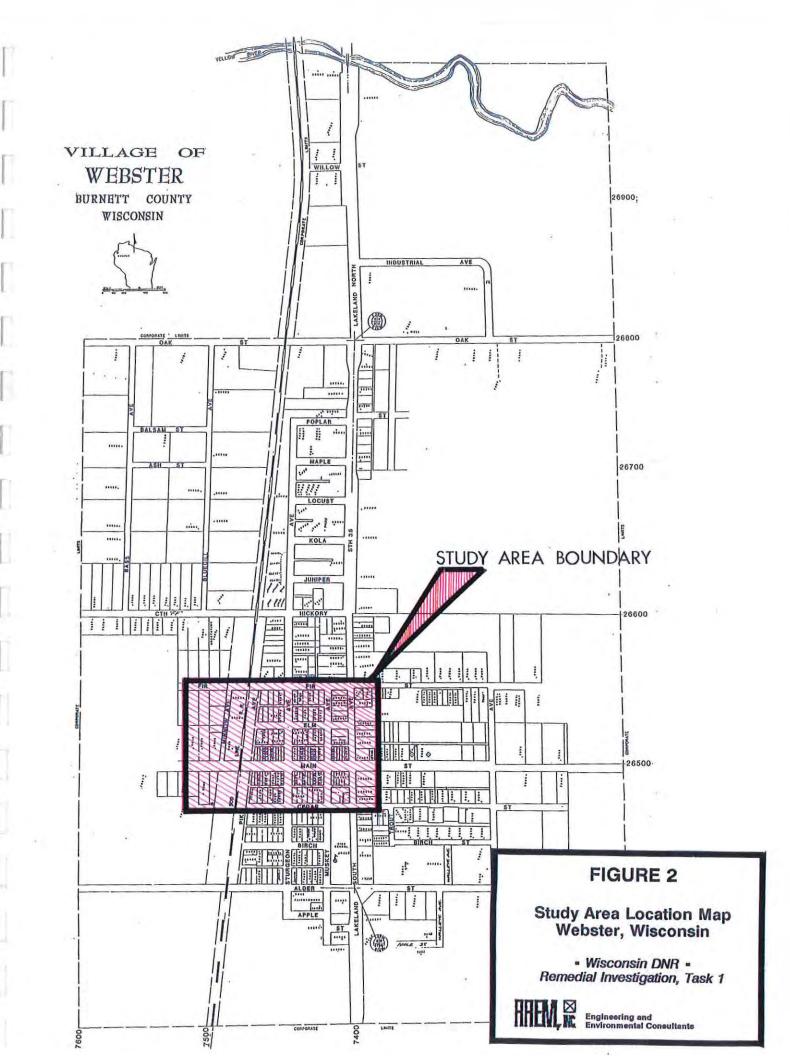
Several attempts were made to locate the source of contamination. In May 1985, field work conducted by Wisconsin DNR Northwest District personnel included several shallow auger borings in an area just north and northeast of VW-1. Petroleum product odors and petroleum hydrocarbon contamination were detected at locations between VW-1 and the site of the former Hoffman's Corner Bulk Oil Facility.

AYRES ASSOCIATES (1986-87)	<ul> <li>In May 1986, Ayres Associates of Eau Claire, Wisconsin, was retained by the Wisconsin DNR to:</li> <li>investigate the extent and degree of contamination in the groundwater and soil near the contaminated wells;</li> <li>determine the sources of the contamination;</li> </ul>
	evaluate the contamination with respect to relevant

- evaluate the contamination with respect to relevant environmental criteria;
- and summarize the data collected and formulate opinions for remedial action.

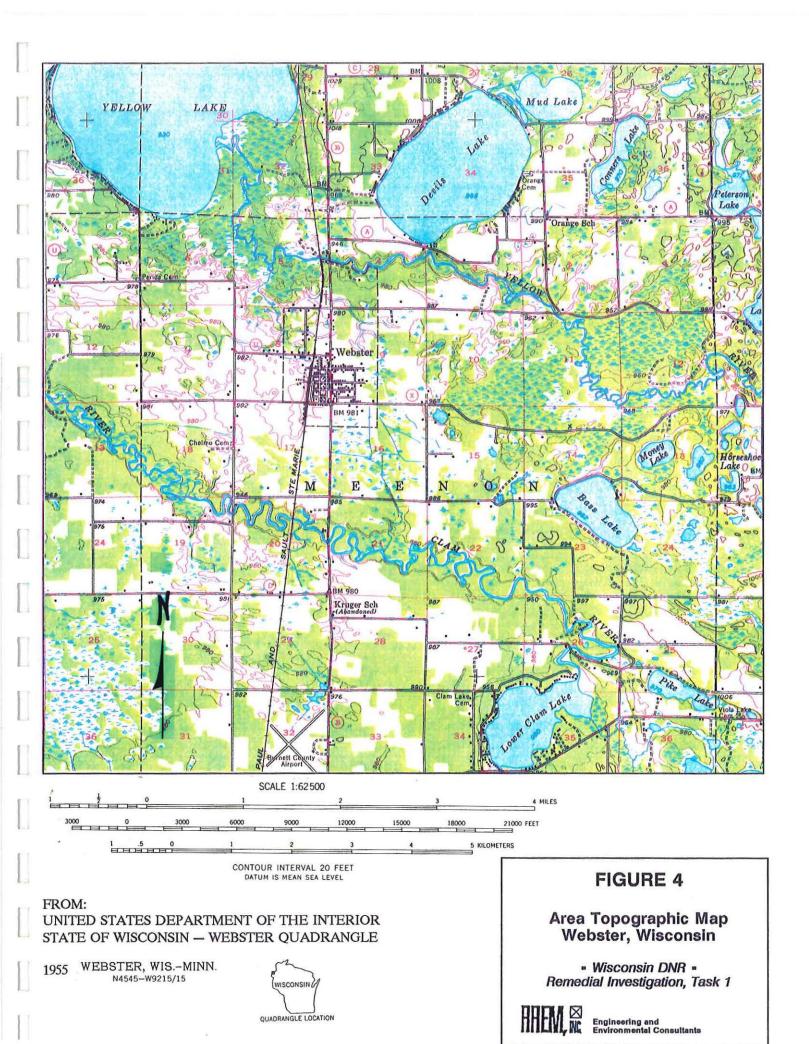
The Ayres investigation included drilling of nine soil borings and installation of nine groundwater monitoring wells, laboratory analysis of soil samples, two rounds of groundwater sampling and laboratory analysis for selected VOCs, a site survey, and a pump test of VW-2 to assess the hydraulic characteristics of the aquifer. A summary of the chemical analyses performed for this study is contained in Appendix A.

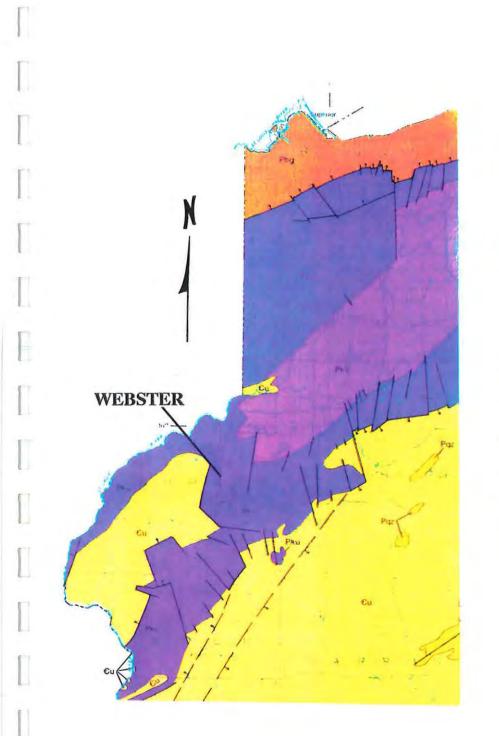






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#### **EXPLANATION OF UNITS**

#### Cambrian System

Sandstone with some dolomite and EU shale, undivided; includes Trempealeau, Tunnel City and Elk Mound Groups.

#### Sedimentary Rocks of Paleozoic or **Proterozoic** Age

Cambrian (?) or Upper Proterozoic System



Pbg Bayfield Group-feldspathic quartzose sandstone with some orthoquartzitic sandstone; includes Chequamegon, Devils Island and Orienta Formations.

#### PRECAMBRIAN ROCKS

- Sedimentary, Igneous and Metamorphic **Rocks of Proterozoic Age** Middle Proterozoic System **KEWEENAWAN SUPERGROUP** Pko Oronto Group-feldspathic sandstone, siltstone, shale and conglomerate;
  - includes Freda and Nonesuch Formations and Copper Harbor Conglomerate.
- Pku Upper volcanic sequence-basalt flows and minor interbedded sedimentary rocks; includes Chengwatana Volcanic Group in west.
- Lower Proterozoic System
  - Pqz Quartzite and associated slate, dolomite, ferruginous slate, conglomerate and chert; includes Barron Quartzite in northwest, metasedimentary inclusions in Wolf River rocks including Rib Mountain, Mosinee Hill and McCaslin Quartzites and other metasedimentary rocks of uncertain stratigraphic position which occur as inliers and outliers in central Wisconsin.

SCALE 1:1,000,000

#### FROM

BEDROCK GEOLOGIC MAP OF WISCONSIN By M.G. Mudrey, B.A. Brown and J.K. Greenberg

(University of Wisconsin-Extension Geological and Natural History Survey Meredith E. Ostrom, Director and State Geologist)

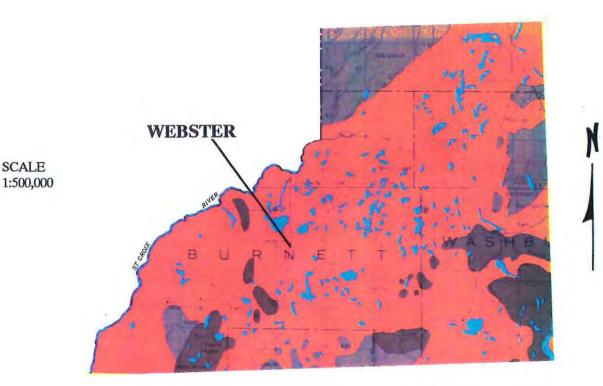
1982

## **FIGURE 5**

#### Bedrock Geologic Map Webster, Wisconsin

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#### **EXPLANATION**



#### PITTED OUTWASH AND OTHER ICE CONTACT DEPOSITS

Pitted outwash plains, kames, eskers, crevasse fillings and related features. Mainly sand and gravel with sorting and stratification locally poor. Pitted outwash and other ice contact deposits have a high potential for containing commercial sand and gravel. These deposits tend to be smaller and often less uniform than those found in outwash. However, as most ice contact deposits are steep-sided, the sand and gravel is often exposed by erosion and thus more readily found than are flat-lying outwash plains and alluvial fans. In addition, the sand and gravel is usually well-drained, making apecial mining methods necessary.



#### GROUND MORAINE

Till plains. Thin drift, mostly till of relatively uniform thickness but discontinuous in some areas of older drift. Includes drumlins. Till plains have a low potential for containing deposits of commercial sand and gravel. Production is limited to gravel-cored drumlins and to isolated kames, eskers and similar features which are often superimposed on the ground moraine.



#### END MORAINES Terminal, recessional and interlobate moraines.

Mostly till and associated local ice contact deposits.

End moraines have a low potential for containing large deposits of commercial sand and gravel. Outwash plains as well as kames and other local ice contact deposits are often found in association with end moraines. These associated deposits have a high potential to contain moderate to small deposits of sand and gravel.



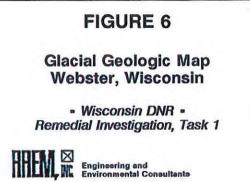
#### FROM

GLACIAL DEPOSITS OF WISCONSIN SAND AND GRAVEL RESOURCE POTENTIAL

(Land Resources Analysis Program

Wisconsin Geological and Natural History Survey University of Wisconsin-Extension and State Planning Office Wisconsin Department of Administration)

1976



The Ayres study made the following findings:

- Soil samples from the borings completed for OW-1 and OW-2 (Figure 7) contained contamination by petroleum-related aromatic hydrocarbons. Samples from OW-1 were found to contain BTEX (benzene, toluene, ethylbenzene, xylene).
   Contamination occurred at several depths within the hole. Soil from OW-2, located approximately 75 feet southwest of OW-1, contained contamination only by toluene. This contamination was found in samples ranging from 15 to 35 feet in depth.
- 2) Soil samples from the borings completed for OW-3, OW-6, and OW-7 contained contamination by halogenated hydrocarbons. Dichloromethane was detected at a depth of 10 feet in a soil sample from OW-3. Trichlorofluoromethane was detected in samples from depths of 10 and 45 feet in OW-6, and in a sample from a depth of 45 feet in OW-7.
- 3) With the exception of monitoring well OW-3 and OW-4, water sample analyses during one or both of the sampling rounds indicated the presence of one or more halogenated compounds. At several locations, groundwater contamination occurred where the corresponding soil samples contained no contamination.
- 4) Water samples from OW-1 and OW-5 contained the aromatic hydrocarbon toluene.
- 5) Water samples obtained during two periods in a 20.5 hour long pump test of VW-2 were contaminated. The sample taken 0.88 hours into the pump test revealed the presence of 1,2-dichloroethane, tetrachloroethylene, benzene, and trichloroethylene. In the sample taken 20 hours into the test, only 1,2-dichloroethane and tetrachloroethylene were detected. These contaminants were present at significantly lower concentrations than those observed in the sample from 0.88 hours into the test. This trend was attributed to dilution of contaminants during the pump test.

Based on the above findings, Ayres Associates drew the following conclusions:

- The contaminants detected in soil samples are most likely derived from various surface spills of petroleum fuels (aromatic hydrocarbons) and degreasing solvents (halogenated compounds), which occurred over time within the 1986-87 study area. A possible source for this contamination is the former Hoffman's Corner bulk fuel storage facility.
- ➤ The data suggest that aromatic hydrocarbons are essentially limited to soil in the area just south of Main Street and west of the Soo Line Railroad right-of-way. An area 30-50 feet north of VW-1 contains soil and possibly groundwater contamination. The source of this contamination was not located.
- ► There may be more than one source of halogenated hydrocarbon contamination present in the region. The location of these sources may be east of the Ayres study area, upgradient of the village wells. Based on available information, the source of the halogenated compounds could not be determined, although the data suggest a source upgradient of VW-2.
- ► The principal contaminants in water samples from VW-2 are constituents of degreasing solvents, which may have originated from a source different from that responsible for the aromatic compounds.
- WISCONSIN<br/>DNR (1990)Chemical analyses of water samples taken by the Wisconsin DNR in<br/>March 1990 from village well 2 (VW-2) detected 1,2-dichloroethane<br/>and tetrachloroethylene. The concentrations detected exceeded the<br/>Preventive Action Limits (PAL) for these compounds (0.05  $\mu$ g/l and<br/>0.1  $\mu$ g/l, respectively) but remained below the Enforcement<br/>Standard (ES) of 5  $\mu$ g/l and 1  $\mu$ g/l, respectively. A summary of<br/>these analyses is contained in Appendix A.

#### MID-STATE ASSOCIATES, INC. (1991)

As part of the construction of Webster village well 4, Mid-State Associates, Inc., Baraboo, Wisconsin, has performed several analyses of water obtained from VW-2. A summary of the results is contained in Appendix A (Table A5).

Samples obtained during February and early June detected 1,2-dichloroethane, tetrachloroethylene, and toluene. The concentrations of 1,2-dichloroethane and tetrachloroethylene exceeded their Preventive Action Limits (PALs) but were below the Enforcement Standards (ESs) established by the Wisconsin DNR for these compounds. The concentration of toluene detected in the water remained below both the PAL and the ES.

Village well 2 was pumped constantly from June 20, 1991, to July 23, 1991, at a rate of approximately 110 gallons per minute. Samples obtained June 27 and July 3 also detected 1,2-dichloroethane, tetrachloroethylene, and toluene. The concentrations of 1-2-dichloroethane and tetrachloroethylene in these samples were above both the PALs and the ESs. The concentration of toluene remained below both the PAL and the ES.

## **1991 SUBSURFACE EXPLORATION**

The 1991 remedial investigation was conducted by RREM, Inc. The work included:

- drilling of soil borings, and collection of soil samples;
- field screening of soil samples;
- mechanical analysis of soil samples;
- geochemical analysis of soil samples;
- installation of groundwater monitoring wells in the study area, and collection of groundwater samples;
- laboratory geochemical analyses of groundwater samples;
- examination of subsurface characteristics related to groundwater flow direction and velocity;
- examination of vertical distribution of contamination.

SOIL Nineteen soil borings, varying from 36 to 71 feet in depth, were completed between June 17 and August 7, 1991, by GME Consultants, Duluth, under the supervision of a RREM geologist. Soil boring locations are shown in Figure 8. All soil borings were logged by a RREM geologist. Figure 9 summarizes the information gathered from the soil borings; detailed boring logs are contained in Appendix B.

#### **Soil Boring Procedures**

The soil borings were drilled with a CME 550 All-Terrain drill rig, using 4<sup>\*</sup>/<sub>4</sub>-inch inside diameter, hollow-stem augers. Because wet, heaving sands were encountered below the water table, mud-rotary drilling techniques were employed below a depth of 40 feet in deep borings.

A moderately thick, clay-water slurry (typically composed of 6-12 pounds of quick-gel bentonite mixed with 50 gallons of water), mixed within a jetting tank, was pumped through the center of a tri-cone bit during drilling. The excess slurry was then pumped up through the hollow-stem auger back into the jetting tank, where it was recirculated for further drilling. The boring progressed in 2-5 foot intervals, as determined by the sampling interval requirements.

Soil borings not converted to monitoring wells were abandoned in accordance with Wisconsin Administrative Code NR 141.25 with neat cement grout. The grout extended to grade in borings located on city streets. The remainder of the borings were filled to within 6 inches of grade with grout, then filled with native material.

#### **Soil Sample Collection**

A total of 218 soil samples were collected for field screening. Twelve samples were selected for mechanical tests, and 36 were selected for chemical analysis.

Soil samples were collected from each boring using a split-spoon sampler following ASTM Standards D1586 and D1587 at 5-foot intervals in all but two of the 71-foot deep borings, which were sampled continuously. As each split-spoon was retrieved from the boring and opened, a 4-ounce glass laboratory jar (supplied by Enviroscan, Rothschild, Wisconsin) was packed completely with soil (to prevent volatile loss into the headspace) and sealed. A second soil sample was collected in an 8-ounce glass jar, filled approximately two-thirds to three-quarters, for use in the soil vapor screening analysis.

The spatula used to transfer sediment from the split-spoon into the jars was cleaned prior to collecting each sample. Samples were packed into the jars manually. Single-use vinyl gloves were worn by the field crew at all times and were discarded and replaced with new gloves after each sample was obtained. Sample jars were sealed, labelled, and refrigerated immediately in a cooler chest.

Following collection of soil samples, each split-spoon sampler was cleaned with a solution of water and Red Devil phosphate-free TSP/90 heavy-duty cleaner. Split-spoon samplers were rinsed with fresh water prior to re-use. All water used in the drilling process was obtained from municipal taps located on the Webster Municipal building or at the Webster Sanitary Dumping station.

At the end of each day, soil samples were transferred from the cooler to a refrigerator in the Webster Municipal Building.

#### Soil Classification

Soil samples were classified in the field by a RREM geologist, in accordance with the Unified Soil Classification System (USCS) and ASTM 2487. Munsell Soil Color Charts (1988 edition) were used to classify the color of each sample. Samples were submitted for laboratory analyses to verify field classifications. These analyses are discussed in the following section.

#### **Mechanical Analyses of Soil**

During subsurface exploration, twelve soil samples were selected by a RREM geologist for mechanical analysis. Ten grain size distribution analyses (sieve analyses) were performed on representative samples of the native material around the screened interval of each well. The purpose of these analyses was to characterize the samples by grain size. In addition, one undisturbed hydraulic conductivity test and one recompacted hydraulic conductivity test were also performed. The results of these analyses are contained in Table 1. The results confirm the field observations that the aquifer underlying the Webster study area is composed of poorly graded sand (SP) to poorly graded sand with silt (SP-SM) to silty sand (SM).

# Table 1Sieve Analysis ResultsVillage of Webster, Wisconsin

Soil Boring Number	Sample Depth (in feet)	Description	ASTM Classification <sup>(1)</sup>
SB-2	34 - 36	Poorly graded sand	SP
SB-4	34 - 36	Poorly graded sand	SP
SB-4	69 - 71	Poorly graded sand with silt	SP-SM
SB-7	34 - 36	Poorly graded sand	SP
SB-7	66 - 68	Poorly graded sand with silt	SP-SM
SB-8	34 - 36	Poorly graded sand	SP
SB-9	66 - 68	Silty sand	SM
SB-14	34 - 36	Poorly graded sand	SP
SB-16	64 - 66	Poorly graded sand	SP
SB-17	64 - 66	Poorly graded sand	SP

<sup>(1)</sup> Samples were classified by GME Consultants per Unified Soil Classification System (USCS) classifications, in accordance with American Society of Testing and Materials (ASTM) Standard D:2487

#### Site Stratigraphy

The stratigraphy in the Webster area, as indicated by the soil samples collected, is composed dominantly of flat-lying unconsolidated sediments, which were deposited primarily as glacial outwash. This stratigraphy can be divided into four laterally continuous, field-recognizable units. Presented in order of occurrence with increasing depth, these units are:

- A) Blacktop, which composes the uppermost 0.5 feet of the stratigraphic succession in soil borings located on city streets.
- B) Black-brown to red-brown sand plus gravel fill which contains silt and clay. This unit varies from 0.5 to 5.0 feet in thickness, and has an average thickness of 3.1 feet. This material is present in all soil borings, except SB-14. Locally, topsoil up to 0.25 feet in thickness is present above this fill layer.
- C) Light, brownish grey to pale red, mottled clay is present in all borings, except SB-12. This unit typically has a massive appearance and varies from 0.5 to 5.0 feet thick. Locally, thin lenses ( $\leq 1$  mm thick) of very fine-grained to medium-grained, black sand are present. Decayed rootlets are also occasionally observed, and may comprise up to two percent of the unit. In some borings, this clay unit is underlaid by 0.25 feet to 1.5 feet of silty to clayey, fine- to medium-grained sand. This material appears to represent a mixture of the clay deposits described above and the underlying sand deposits.
- D) Brown, very fine to coarse-grained, interbedded sand and pebbly to gravelly sand deposits. These deposits are typically massive in appearance, but the fine-grained sand deposits occasionally contain laminations (1-5 mm thick), interpreted to be bedding.

The sand present in these deposits is typically well-rounded and well-sorted and varies from very fine-grained to coarse-grained. Although quartz and feldspar are the predominant components of the sand, grains composed of calcite, biotite, basalt, rhyolite, and mudstone have also been observed. Pebbles are typically moderately to well-rounded and vary from 0.6 to 4.0 cm in diameter. They are composed of quartz, chert, basalt, rhyolite, and mudstone fragments. Gravel is similar in size and composition to the pebbles but is subangular to angular in shape.

Individual sandy deposits may reach up to 17 feet in thickness. Pebbly and gravelly sand deposits attain thicknesses up to 24 feet in the soil borings.

Deposits of brown silty sand (up to 8 feet thick) and silt (up to 6 feet thick) are interbedded with the sand and pebbly to gravelly sand deposits. These deposits cannot be correlated between adjacent soil borings, and appear to be lenses that are very limited in areal extent.

Detailed soil boring logs are contained in Appendix B. Geological cross-section are shown in Figures 10 through 12. The geology of the OW-series borings is based on the soil boring logs present in Ayres (1987). The locations of the cross-sections are shown in Figure 8.

#### Soil Vapor Screening

Soil samples were screened in the field by a RREM geologist for volatile organic compounds, using a flame ionization detector and following the standard jarheadspace method described at right.

Field vapor screening readings ranged from 0.0 ppm to 20.0 ppm organic vapors. No significant trends in the distribution of these readings were observed.

Table 2 contains the results of the soil vapor analyses. These

#### Soil Vapor Screening Method

Soil samples collected with the split-spoon sampler were placed in 8-ounce glass jars. When each jar was approximately 2/3 full, it was covered with aluminum foil and sealed with a screw-on lid. The jars were then agitated to aid in releasing volatile organic compounds from the soil. The samples were then allowed to stand for ten minutes to allow headspace development.

At the end of this time period, the lid was removed and the foil seal penetrated with the probe of a flame ionization detector (FID). The highest reading shown on the instrument was then recorded.

The FID used was a Foxboro OVA 128. This instrument was calibrated each day prior to use on the site, using ambient air as zero gas and either 50 ppm or 100 ppm isobutylene in air as the calibration gas. Instrument calibration was checked periodically during each day.

results are also listed on the soil boring logs in Appendix B.

#### GROUND WATER

Ten monitoring wells were installed during the 1991 subsurface exploration (91- series wells). The new wells were used in conjunction with wells installed during the previous investigation (OW- series wells; Ayres, 1987) and village well 2 (VW-2) to:

- evaluate groundwater quality and the hydrogeologic characteristics of the aquifer.
- further assess the distribution and extent of groundwater contamination.

Groundwater was encountered in all soil borings at depths ranging from 34 to 36 feet below the ground surface. The physical properties of the organic contaminants detected in previous studies were considered in establishing the new monitoring system. Two groups of contaminants were known to be present: those with densities less than water (benzene, toluene, etc.) and those

Table 2				
<b>Results of Soil Vapor Screening</b>				
Village of Webster, Wisconsin				

		Soil Boring Number															
Footage	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-8	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19
0-2	0.0 <sup>(1)</sup>	1.3		2.1	0.3		3.9	0.9	2.0		0.0				1.1	0.2	1.2
4-6	7.0	0.4	0.0	0.1	0.0	0.3	4.3	0.0	0.0	0.0	0.0	1.3	<b>-</b>	0.8	1.1	0.1	1.2
9-11	0.0	0.3	0.4	0.2	0.2	1.0	4.6	0.8	0.1	1.5	0.0	0.5	0.8	1.2	0.2	2.0	0.4
14-16	0,0	0.8	1.0	0.2	0.1	0.3	4.7	0.4	0.0	0.0	0.4	0.5	0.9	0.5	0.2	0.7	3.6
19-21	0.0	1.6	0.4	0.1	0.1	0.3	4.7	0.0	0.1	0.3	0.2	0.7	0.3	0.8	0.4	0.3	3.3
24-26	0.0	2.9	0.2	0.3	0.2	1.8	4.1	0.0	0.0	0.0	1.2	0.0	0.6	0.2	0.9	0.5	0.7
29-31	5.0	0.6	0.2	0.6	0.0	1.8	3.5	0.4	0.0	0.0	0.4	2.5	0.3	0.3	0.7	0.3	0.7
34-36	4.5	0.3	4.3	0.4	0.0	2.7	3.2	0.1	0.3	0.0	1.0	3.5		0.4	2.5	6.8	1.2
39-41				1.0								2.9		1.2	3.0	0.3	<u> </u>
44-46				3.2									i	3.2	9.2		
49-51				0.8										1.6	0.5		
54-56				0.6										4.5	4.2		
59-61				0.3										2.4	1.0		
64-66				0.3										4.0	1.0		
69-71				0.0										0.9	2.7		

(1) Concentrations in parts per million (instrument units as isobutylene).

Results of soil vapor screening at borings SB-7 and SB-9 are shown below:

Footage	SB-7	SB-9	Footage	SB-7	SB-9
0-2	0.5	1.0	36-38	1.4	0.1
2-4	0.0	0.3	38.40	2.6	0.4
4-0	0.0	1.7	40-42	7.0	9.6
6-8	0.4	8.5	42-44	1.0	1.6
8-10	0.2	2.0	44-46	1.7	0.3
16-12	0.2	0.7	46-48	6.5	5.0
12-14	0.3	1.1	48-50	8.4	1.6
14-16	0.2	0.2	\$0-52	4.1	8.8
16-18	0.3	0.3	52-54	1.6	1.2
18-20	0.1	0.1	54-56	5.6	11.0
20-22	0.3	0.3	56-58	3.2	4.0
22-24	0.4	0.2	58-60	9.7	2.8
24-26	0.0	0.1	60-62	10,5	2.2
26-28	0.1	0.4	62-64	15.0	1.2
28-30	0.2	0.0	64-66	20.0	0.2
30-32	0.3	0.2	66-68	19.0	1.6
32-34	0.1	0.0	68-70	5.0	0.8
34-36	0.9	0.0			

•

with densities greater than water (tetrachloroethylene, 1,2-dichloroethane). For this reason, wells were installed at several levels—near the top of the aquifer for lighter compounds and deep in the aquifer for heavier compounds.

Prior to initiating the subsurface exploration, several potential contaminant sources were identified through interviews with village officials and residents. These potential sources included:

- an existing laundromat/dry cleaner near Highway 35,
- the site of a former dry cleaner on Main Street, near the site of the present post office, and
- a former print shop site, approximately one block west of the post office.

Several other potential sources were mentioned during the interviews. These sites were located near the Hoffman's Corner site and along the abandoned railroad right-of-way. Since the area near Hoffman's Corner was investigated by Ayres and Associates, monitoring wells and borings were concentrated upgradient of that study area.

Monitoring well locations are shown in Figure 13.

#### **Monitoring Well Installation**

Five 40-foot-deep wells were installed. The wells were constructed of 2-inch, inside diameter, Schedule 80 PVC pipe flush threaded with No. 10 slot, 10-foot-long, Schedule 80 PVC well screens.

Five deep monitoring wells were installed: one at 60 feet and four at 71 feet. The monitoring wells were constructed of materials similar to those in the 40-foot wells, with the exception of the well screens, which were 5 feet long.

A filter pack, composed of a mixture of native fine- to mediumgrained sand and red flint sand, filled the annulus around each well screen. In some wells, all of the filter pack consisted of red flint sand. The filter pack extended a minimum of 2 feet above the top of the well screen. A bentonite seal, at least 2 feet thick, was placed directly on top of the filter pack. During construction of this seal, a thick slurry of bentonite and water was pumped down a tremie pipe into position in the deeper wells. Dry powdered bentonite was dropped slowly through the auger into position in the 40-foot-deep wells. The thickness of the bentonite filter pack seal was measured during installation with a fiberglass measuring tape. The annular space seal consisted of neat cement grout which, in turn, was covered by a surface seal consisting of concrete. Typical well construction diagrams are illustrated in Figure 14.

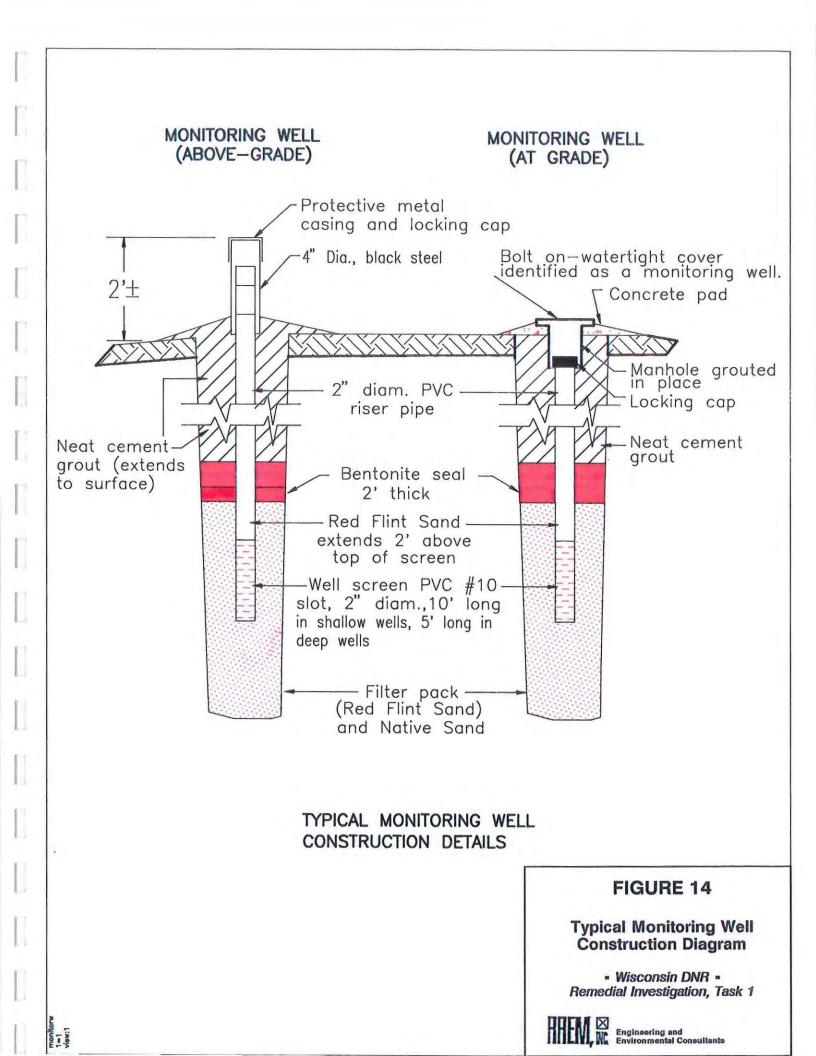
Monitoring wells 91-1, 91-2A, 91-2B, and 91-3 were completed by extending a 2-inch inside diameter PVC riser pipe to approximately two feet above grade. A lockable expanding well cap sealed the top of this pipe. A 4-inch diameter black steel protective casing, with locking cap, was placed around each PVC riser pipe and cemented into place. Three 4-inch diameter steel guard posts, filled with cement, were placed around each well to prevent damage to the well. Both the protective casing and the guard posts were painted orange for visibility.

Because of their location in high traffic areas, wells 91-4, 91-5A, 91-5B, 91-6, 91-7 and 91-8 were completed using at-grade well covers. The top of the PVC riser pipe was cut approximately 2-3 inches below grade and was sealed with a lockable, expanding well cap. The wells were covered with a water-tight manhole with a bolted O-ring cover, which was cemented into place. The manhole cover was clearly marked as a monitoring well.

Well construction diagrams (form 4400-113A) for each well are included in the subsurface exploration report (GME Consultants), contained in Appendix C of this report. All wells constructed for this study conform to Wisconsin Administrative Code NR-141.

#### **Hydraulic Conductivity**

In situ hydraulic conductivity tests of the aquifer underlying the Webster study area were conducted between October 28 and October 31, 1991, on 14 monitoring wells.



During these tests, a volume of water was pumped from each well, resulting in a drop in the water level. Because of the extremely fast rate at which the water returned to its original elevation, a pressure transducer was used to record water levels every second during the recovery period of the test.

The data generated by these tests were graphed and analyzed, using the Hvorslev Method of determining hydraulic conductivity.

## HYDRAULIC

**CONDUCTIVITY** is the measure of the ability of an aquifer or water-bearing formation to transmit fluids. The hydraulic conductivity of a geologic unit is dependent on the characteristics of both the fluid and the unit. As an example—in saturated, unconsolidated sediments—sand transmits water more easily than clay does; therefore, the hydraulic conductivity of sand is greater than that of clay.

#### The Hvorslev Method

The Hvorslev Method plots  $H/H_0$  on a logarithmic scale  $[H_0 =$  the height of the water level (head) above or below the static water level at time zero; H = the head at time t ] versus time on a linear scale. Data plots in a straight or nearly straight line. The following equation is used to calculate the hydraulic conductivity (K):

$$K = \frac{r_c^2 \ln\left(\frac{L}{R}\right)}{2LT_o}$$

where

K = hydraulic conductivity (cm/sec)

 $r_c$  = radius of the well casing (cm)

 $\ln = natural \log natural$ 

L =length of well screen of screened saturated interval (cm)

R = radius of the well screen (cm)

 $T_0 = basic time lag (seconds)$ 

The basic time lag, as defined by Hvorslev (1951) is the time required for the equalization of head at the original inflow rate. Basic time lag is determined from the plot at  $H/H_o = 0.37$  (ln  $H/H_o = -1$ ).

Table 3 lists the hydraulic conductivity values calculated for the Webster study area, using the Hvorslev Method, based on the well recovery graphs contained in Appendix D. These values range from  $1.23 \times 10^{-2}$  cm/sec to  $2.9 \times 10^{-2}$  cm/sec. The arithmetic mean of the hydraulic conductivity values is  $1.82 \times 10^{-2}$  cm/sec; the geometric mean of these values is  $1.77 \times 10^{-2}$  cm/sec. These values are within the range for hydraulic conductivities of well-sorted sands and glacial outwash (Table 4), which vary from  $10^{-3}$  cm/sec to  $10^{-1}$ cm/sec (Fetter, 1988). The hydraulic conductivities determined in this study are of the same order of magnitude as the horizontal hydraulic conductivities determined by Ayres Associates (1987) for wells OW-5 and OW-6 (7.41  $\times 10^{-2}$  cm/sec and  $2.12 \times 10^{-2}$  cm/sec, respectively).

Laboratory permeability (hydraulic conductivity) analyses were performed on two samples by GME Consultants, Inc. A Shelby Tube sample of the silty clay, located from 3.5 to 6.5 feet in soil boring SB-15, was found to have a hydraulic conductivity of  $1.5 \times 10^{-6}$  cm/sec. A recompacted sample of fine- to mediumgrained, well-rounded, well-sorted sand—from 34 to 36 feet in soil boring SB-7—had a hydraulic conductivity of  $7.1 \times 10^{-3}$  cm/sec.

#### **Groundwater Flow Direction**

During the summer and fall of 1991, the groundwater level elevations were measured on the ten new wells installed and on the nine Ayres observations wells in Webster. The data collected are shown in Table 5. Contour maps of the water table elevations for each sampling date were constructed from the data using the CONTOUR PLUS software package (CIVILSOFT, 1989). Because of the similarity of the geometry of the contour diagrams constructed between August 7 and October 28. Average groundwater elevations were calculated (Table 6), and an average groundwater elevation contour map was constructed (Figure 15). This figure indicates that over this time period, groundwater flowed generally from east to west in the study area.

Table 3
In Situ Hydraulic Conductivities
Calculated Using the Hvorslev Method
Village of Webster, Wisconsin

Monitoring Well No.	Hydraulic Conductivity (cm/sec)
91-1	$1.35 \times 10^2$
91-2A	$1.70 \times 10^{-2}$
91-4	$2.42 \times 10^{-2}$
91-5A	$1.23 \times 10^2$
91-6	$1.57 \times 10^{-2}$
OW-1	$2.25 \times 10^{-2}$
OW-2	$1.63 \times 10^2$
OW-3	$1.65 \times 10^2$
OW-4	$1.83 \times 10^2$
OW-5	$1.93 \times 10^{-2}$
OW-6	1.74 × 10 <sup>-2</sup>
OW-7	$2.90 \times 10^{-2}$
OW-8	$1.33 \times 10^{2}$
OW-9	$1.97 \times 10^2$
Arithmetic Mean	$1.82 \times 10^{-2}$
Geometric Mean	$1.77 \times 10^{-2}$

# Table 4Ranges of Hydraulic ConductivitiesFor Unconsolidated Sediments(Fetter, 1988)

Material	Hydraulic Conductivity (cm/sec)
Clay	10 <sup>9</sup> - 10 <sup>6</sup>
Silt, sandy silt, clayey sand, till	10 <sup>-6</sup> - 10 <sup>-4</sup>
Silty sand, fine sand	$10^{-5} - 10^{-3}$
Well-sorted sand, glacial outwash	10 <sup>-3</sup> - 10 <sup>-1</sup>
Well-sorted gravel	10 <sup>-2</sup> - 1

### Table 5Water Table ElevationsVillage of Webster, Wisconsin

	(Wells Installed During RREM, Inc., Investigation)									
			Date of Elevation Measurement (measured in feet)							
RREM Well No.	Wisconsin Unique Well No.	Top of Riser Elevation	7/24/91	8/7/91	8/26/91	9/10/91	10/16/91	10/28/91		
91-1	DL-001	983.22	946.70	947.00	947.20	947.23	947.39	947.40		
91-2A	DL-002	984.28	946.97	947.25	947.37	947.44	947.56	947.56		
91-2B	DL-003	983.69	946.69	947.21	947.37	947.42	947.55	947.56		
91-3	DL-004	982.27	946.77	947.25	947.35	947.43	947.52	947.63		
91-4	DL-005	980.13	947.18	947.43	947.60	947.66	947.78	947.78		
91-5A	DL-006	980.49	947.52	947.63	947.76	947.82	947.93	947.94		
91-5B	DL-007	980.48	947.53	947.62	947.75	947.81	947.93	947.93		
91-6	DL-008	982.01	947.85	947.94	948.04	948.09	948.20	948.24		
91-7	DL-571	980.99	(1)	947.89	947.96	948.05	948.08	948.24		
91-8	DL-572	980.50		948.34	948.17	948.30	948.40	948.46		

### Table 5, continued Water Table Elevations Village of Webster, Wisconsin

	(Wells Installed During Ayres Associates Investigation)										
	Top of Riser Date of Elevation Measurement (measurement (						d in feet)				
Ayres Well No.	Elevation <sup>(1)</sup>	6/20/91	7/23/91	8/7/91	8/9/91	9/26/91	9/10/91	10/16/91	10/28/91		
OW-1	983.36	947.00	946.43	946.97		947.21	947.25	947.43	947.46		
OW-2	983.48	946.99	946.30	946.97		947.21	947.25	947.40	947.43		
OW-3	982.65	947.03	946.04	946.98		947.21	947.19	947.42	947.44		
OW-4	981.80	946.81	945.03	946.72		946.97	946.92	947.19	947.24		
OW-5	982.46	945.80	945.44	946.81		947.00	946.94	947.21	947.24		
OW-6	982.59	946.87	945.92	946.84		947.05	947.06	947.29	947.31		
OW-7	981.25	946.95	946.50	946.97		947.16	947.20	947.37	947.40		
OW-8	983.11	947.14	946.78	947.18		947.38	947.45	947.57	947.57		
OW-9	981.00				947.19	947.36	947.41	947.56	947.56		

<sup>(1)</sup> Top of riser elevation figure taken from Ayres and Associates report (1987).

### Table 6 Average Water Table Elevations Village of Webster, Wisconsin (Based on Data Collected August 7, 1991, through October 28, 1991)

Monitoring Well Number	Average Water Table Elevation
91-1	947.24
91-2A	947.44
91-2B	947.42
91-3	947.44
91-4	947.65
91-5A	947.82
91-5B	947.81
91-6	948.10
91-7	948.05
91-8	948.33
OW-1	947.26
OW-2	947.25
OW-3	947.25
OW-4	947.01
OW-5	947.04
OW-6	947.11
OW-7	947.22
OW-8	947.43
OW-9	947.42

### **Groundwater Gradient**

As shown in Figure 15, groundwater surface is relatively flat. Groundwater gradients were determined between three pairs of wells at various locations in the study area. The groundwater gradient was calculated by measuring the difference in water table elevations between the two wells, and dividing by the horizontal distance between them. Between wells 91-8 and 91-1, the groundwater gradient was determined to be 0.0009 ft/ft. Between wells 91-6 and OW-7, the gradient was calculated to be 0.0008 ft/ft. Between wells 91-3 and OW-5, the gradient was determined to be 0.0008 ft/ft. Between wells 91-3 and OW-5, the gradient was determined to be 0.0009 ft/ft. These groundwater gradients are slightly higher than the 0.0006 and 0.0007 ft/ft calculated by Ayres (1987).

### **Seepage Velocity**

The average linear seepage velocity can be calculated using the following formula:

1Z	_	(K)	(dl)
V <sub>s</sub>	Ŧ	$\left(\frac{1}{n}\right)$	$\left(\frac{dl}{dh}\right)$

where

 $V_s$  = seepage velocity K = hydraulic conductivity dh/dl = groundwater gradient n = porosity

The range of porosities determined for various sediment types is shown in Table 7. As illustrated in Figure 9, the wells used for the hydraulic conductivity tests are screened primarily in fine- to medium-grained, well-sorted, well-rounded sand deposits, which contain lenses of coarse sand and gravel.

### Table 7Porosity Ranges for Unconsolidated Sediments(Fetter, 1988)

Material	Porosity
Clay	33% - 60%
Silt	35% - 50%
Glacial till	10% - 20%
Well-sorted sand or gravel	25% - 50%
Sand and gravel, mixed	20% - 35%

Using the geometric mean hydraulic conductivity of  $1.77 \times 10^{-2}$  cm/sec, and intermediate groundwater gradient of  $8.5 \times 10^{-4}$  cm/sec, and assuming a porosity of 35 percent for the deposits located in the screened intervals of the wells, the average linear velocity for the Webster study area is:

$$V_s = \frac{1.77 \times 10^{-2} \text{ cm/sec } (0.00085)}{0.35}$$
  
= 4.3 × 10<sup>-5</sup> cm/sec  
= 1.4 × 10<sup>-6</sup> ft/sec  
= 1.2 × 10<sup>-1</sup> ft/day  
= 43.8 ft/year.

In the area just west of village well VW-2, the hydraulic gradient is slightly higher:

$$V_s = \frac{1.77 \times 10^{-2} \text{ cm/sec } (0.0009)}{0.35}$$
  
= 4.6 × 10<sup>-5</sup> cm/sec  
= 1.5 × 10<sup>-6</sup> ft/sec  
= 1.3 × 10<sup>-1</sup> ft/day  
= 47.5 ft/year.

Assuming that the groundwater elevations, groundwater gradients, and sediment porosities used in the above calculations are representative, a water particle in the saturated zone is expected to travel horizontally between 44 and 48 feet per year. These values are much lower than those calculated by Ayres (1987), which imply seepage velocities ranging from 2070 to 2250 feet per year. SOIL

### CHEMICAL ANALYSIS OF SOIL AND GROUNDWATER

In order to determine the composition and distribution of subsurface contamination in the Webster study area, both soil and groundwater samples collected during this investigation were chemically analyzed. Laboratory analyses of both soil and groundwater were performed by Enviroscan, Rothschild, Wisconsin (Wisconsin Lab Certification Number 737053130). Chain-of-custody documents and laboratory reports of the analyses are included in Appendix E (soil) and Appendix F (groundwater).

#### Soil Sample Collection

During the drilling of the soil borings, 218 soil samples were collected by a RREM geologist for possible geochemical analyses. Thirty-eight of these samples were analyzed; the samples were selected from the intervals shown in Table 8. Soil samples were collected in 4-ounce glass laboratory jars, using procedures described on page 8. Following collection, the sample jars were immediately placed in insulated containers and kept cool with ice packs. At the end of each day, the samples were transferred to the Webster Municipal Building and stored overnight in a refrigerator. The following day, the jars containing samples chosen for chemical analysis were packed into insulated shipping containers with ice packs and shipped via overnight carrier to Enviroscan.

#### Laboratory Analysis

A total of 38 samples were analyzed, including a minimum of one sample per boring. Up to five samples per boring were analyzed where jar-headspace results suggested VOC contamination. Two duplicate samples were analyzed.

Twenty-eight samples from early in the drilling program were analyzed in accordance with the following methods:

- Volatile Organic Compounds: EPA Method 8010/8020.
- Total Petroleum Hydrocarbons (TPH): California Method, with a capillary GC/FID.
- Lead: EPA Method 7421.

Table 8
Depths of Soil Samples Collected for Chemical Analysis
Village of Webster, Wisconsin

Soil Boring Number	Collection Date	Depth of Sample (in feet below ground surface)	Soil Boring Number	Collection Date	Depth of Sample (in feet below ground surface)
SB-1	6/17/91 6/17/91	9 - 11 34 - 36	SB-11	6/25/91	34 - 36
SB-2	7/09/91 7/09/91	24 - 26 34 - 36	SB-12	6/19/91 6/19/91	9 - 11 34 - 36
SB-3	6/18/91	34 - 36	SB-13	6/24/91	34 - 36
SB-4	7/11/91 7/11/91 7/11/91	34 - 36 44 - 46 69 - 71	SB-14	6/19/91	34 - 36
SB-5	6/26/91	34 - 36	SB-15	6/18/91	34 - 36
SB-6	6/26/91	34 - 36	SB-16	8/05/91 8/05/91 8/05/91	4 - 6 44 - 46 64 - 66
SB-7	7/16/91 7/17/91 7/17/91 7/17/91	8 - 10 38 - 40 60 - 62 64 - 66	SB-17	8/06/91 8/06/91 8/06/91	4 - 6 44 - 46 69 - 71
SB-8	7/08/91	34 - 36	SB-18	8/06/91 8/06/91	9 - 11 34 - 36
SB-9	7/22/91 7/23/91 7/23/91 7/23/91	8 - 10 40 - 42 60 - 62 68 - 70	SB-19	8/06/91 8/06/91	14 - 16 34 - 36
SB-10	6/25/91	34 - 36			

Since the lead and TPH results suggested no contamination from these substances, the final ten samples were analyzed for VOCs only, by EPA Method 8010/8020.

### **Results of Chemical Analyses of Soil**

The results of the chemical analyses of the soil samples from Webster are summarized in Table 9. Lead, tetrachloroethylene, toluene and methylene chloride were detected in these samples. Figure 16 illustrates the distribution and composition of soil contamination detected in soil borings completed by RREM (1991) and by Ayres (1987).

Lead was detected in 17 of the 28 samples analyzed. The values reported ranged from 1.82 to 9.47  $\mu$ g/g. These are considered to be background concentrations.

Tetrachloroethylene (PCE) was detected in soil samples collected from depths of 34 to 36 feet in soil borings SB-1 (34.9  $\mu g/g$ ), SB-6 (2.4  $\mu g/g$ ), and SB-18 (9.3  $\mu g/g$ ), and at 69 to 71 feet in boring SB-4 (5.8  $\mu g/g$ ). These results appear to limit the PCE contamination to an area north of Main Street that is approximately 800 feet long and 200 feet wide.

Soil contaminated with toluene was found only at soil boring SB-13, at a depth of 34 to 36 feet, where a concentration of 4.2  $\mu$ g/g was detected.

Methylene chloride (dichloromethane) contamination was detected in samples from soil borings SB-4, SB-7, SB-9 and SB-14. Enviroscan reported that the methylene chloride concentrations may be the result of laboratory contamination. According to an Enviroscan chemist, methylene chloride is used in the preparation of samples for semi-volatile compound analysis. Each day, Enviroscan runs a test blank through its analytical equipment; if methylene chloride concentrations are detected, each subsequent analysis that detects this compound is footnoted as containing possible lab contamination.

## Table 9Summary of Laboratory Analyses of Soil SamplesSamples Collected June 17, 1991 through August 6, 1991Village of Webster, Wisconsin

Sample Location	Compound Concentration (all units ug/g)								
(Soil Boring / Depth)	Lead	Methylene Chloride <sup>(1)</sup>	Tetrachloroethylene	Toluene	TPH as Gas/Diesel				
Detection Limit <sup>(2)</sup>	1.8	9,8	20	20	63				
SB-1 9-11 ft. 34-36 ft.	2.5 ND	ND <sup>(3)</sup> ND	ND 34.9	ND ND	ND ND				
SB-2 24-26 ft. 34-36 ft.	ND ND	ND ND	ND ND	ND ND	ND ND				
SB-3 34-36 ft.	2.0	ND	ND						
SB-4 34-36 ft. 34-36 ft. <sup>(4)</sup> 44-46 ft. 69-71 ft.	5.34 5.29 9.47 ND	42.9 46.0 49.2 43.1	ND ND ND 5.8	ND ND ND ND	ND ND ND ND				
SB-5 34-36 ft.	3.49	ND	ND	ND	ND				
SB-6 34-36 ft.	ND	ND	2.4	ND	ND				
SB-7 8-11 ft. 38-40 ft. 60-62 ft. 60-62 ft. <sup>(4)</sup> 64-66 ft.	2.06 2.31 3.9 3.52 2.34	ND ND 13.7 35.7 22.4	ND ND ND ND ND	ND ND ND ND ND	ND ND ND ND ND				
SB-8 34-36 ft.	2.27	ND	ND	ND	ND				

# Table 9, continuedSummary of Laboratory Analyses of Soil SamplesSamples Collected June 17, 1991 through August 6, 1991Village of Webster, Wisconsin

Sample Location		Compo	und Concentration (all unit	ts ug/g)	
(Soil Boring / Depth)	Lead	Methylene Chloride <sup>(1)</sup>	Tetrachloroethylene	Toluene	TPH as Gas/Diesel
Detection Limit <sup>23</sup>	LS	9.8	20	20	63
SB-9 8-10 ft. 40-42 ft. 60-62 ft. 68-70 ft.	ND 4.62 ND 1.82	ND ND 14.6 ND	ND ND ND ND	ND ND ND ND	ND ND ND ND
SB-10 34-36 ft.	2.26	ND	ND	ND	ND
SB-11 34-36 ft.	3.34	ND	ND	ND	ND
SB-12 9-11 ft. 34-36 ft.	ND ND	ND ND	ND ND	ND ND	ND ND
SB-13 34-36 ft.	ND	ND	ND	4.2	ND
SB-14 34-36 ft.	3.7	13.5	ND	ND	ND
SB-15 34-36 ft.	ND	ND	ND	ND	ND
SB-16 4- 6 ft. 44-46 ft. 64-66 ft.	(5)	ND ND ND	ND ND ND	ND ND ND	

### Table 9, continued **Summary of Laboratory Analyses of Soil Samples** Samples Collected June 17, 1991 through August 6, 1991 Village of Webster, Wisconsin

Sample Location	Compound Concentration (all units ug/g)								
(Soil Boring / Depth)	Lead	Methylene Chloride <sup>(1)</sup>	Tetrachloroethylene	Toluene	TPH as Gas/Diesel				
Detection Limit <sup>(2)</sup>	1.8	9.8	20	20	63				
SB-17 4- 6 ft. 44-46 ft. 69-71 ft.	·	ND ND ND	ND ND ND	ND ND ND					
SB-18 9-11 ft. 34-36 ft.		ND ND	ND 9.3	ND ND					
SB-19 14-16 ft. 34-36 ft.		ND ND	ND ND	ND ND					

(1) May be a laboratory contaminant.

<sup>(2)</sup> Detection limits in accordance with methods discussed on page 25. Detection limits may vary slightly between analyses.
 <sup>(3)</sup> ND - Not detected; compound concentration is below detection limit.

Duplicate sample. (4)

- - Not analyzed. (5)

### GROUND WATER

Earlier studies by the Wisconsin DNR (1984), and Ayres Associates (1987), along with several rounds of water sampling by the Wisconsin DNR between 1984 and 1991 have indicated that groundwater in the Webster area is contaminated by volatile organic compounds.

As part of the 1991 subsurface investigation by RREM, Inc., chemical analysis of groundwater samples was conducted.

### **Groundwater Sample Collection**

Groundwater samples were collected during two sampling periods: September 17-19, 1991, and October 14-16, 1991. Samples were collected from wells installed for this investigation (1991) and from wells installed by Ayres Associates in 1986. Groundwater sample collection was supervised by a RREM geologist.

Prior to sampling, each well was purged of at least four well volumes of water to ensure that representative samples of groundwater were obtained, as suggested in the Wisconsin DNR *Groundwater Sampling Procedures Guidelines* (1987). Groundwater samples were then collected from each well, using teflon bailers.

One field blank and two duplicate samples were collected during the first round of sampling. Two field blanks and two duplicate samples were collected during the second round of sampling.

Following collection, groundwater samples were placed in insulated containers with ice packs and/or ice and shipped via overnight carrier to Enviroscan Laboratories, Rothschild, Wisconsin. Samples were analyzed for volatile organic compounds (VOCs), by EPA Method 8010/8020.

### **Results of Chemical Analyses of Groundwater**

The results of both rounds of 1991 groundwater sampling are summarized in Tables 10 and 11. Wisconsin DNR Enforcement Standards (ES) and Preventive Action Limits (PAL) are presented in Table 12.

## Table 10Summary of Laboratory Analysis of Groundwater SamplesRound One Sampling (samples collected September 17-19, 1991)Village of Webster, Wisconsin

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			Compound	Concentration (all	units µg/l)		
Monitoring Well	Benzene	1,2-Dichloro- benzene	1,2-Dichloro- ethane	1,2-Dichloro- propane	Tetrachloro- ethylene	Toluene	Trichloro- ethylene
Detection Limit <sup>(1)</sup>	0.2	1.0	0.5	0.5	0.5	8.5	02
91-1	ND <sup>(2)</sup>	ND	ND	ND	ND	ND	ND
91-2A	ND	ND	ND	ND	ND	ND	ND
91-2B	0.5	1.4	ND	0.7	112.0	ND	6.1
91-3	1.6	ND	83.6	ND	ND	ND	ND
91-4	ND	ND	2.9	ND	15.3	ND	0.2
91-5A	ND	ND	ND	ND	8.0	ND	ND
91-5A <sup>(3)</sup>	ND	ND	ND	ND	7.7	ND	ND
91-5B	0.3	ND	0.8	ND	ND	ND	ND
91-6	ND	ND	ND	ND	31.8	ND	0.4
91-7	ND	ND	ND	ND	ND	ND	ND
91-8	ND	ND	ND	ND	ND	0.6	ND
OW-1	ND	ND	ND	ND	13.8	ND	ND
OW-2	ND	ND	4.3	ND	2.3	ND	ND
OW-3	ND	ND	ND	ND	ND	ND	ND
OW-4	ND	ND	ND	ND	ND	ND	ND
OW-5	ND	ND	ND	ND	3.5	ND	ND
OW-6	ND	ND	ND	ND	1.3	ND	ND

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## Table 10, continuedSummary of Laboratory Analysis of Groundwater SamplesRound One Sampling (samples collected September 17-19, 1991)Village of Webster, Wisconsin

Monitoring Well	Compound Concentration (all units µg/l)								
	Benzene	1,2-Dichloro- benzene	1,2-Dichloro- ethane	1,2-Dichloro- propane	Tetrachloro- ethylene	Toluene	Trichloro- ethylene		
Detection Limit <sup>(1)</sup>	0.2	1.0	0.5	0.5	0.5	0.5	0.2		
OW-7	ND	ND	ND	ND	1.3	ND	ND		
OW-8	ND	ND	ND	ND	13.2	ND	ND		
OW-9	ND	ND	ND	ND	ND	ND	ND		
OW-9 <sup>(3)</sup>	ND	ND	ND	ND	ND	ND	ND		
VW-2	ND	ND	2.8	ND	ND	ND	ND		

<sup>(1)</sup> Detection limits in accordance with methods discussed on page 31.

<sup>(2)</sup> ND – Not Detected.

<sup>(3)</sup> Duplicate sample.

# Table 11Summary of Laboratory Analysis of Groundwater SamplesRound Two Sampling (samples collected October 14-16, 1991)Village of Webster, Wisconsin

Monitoring Well		Compound Concentration (all units µg/l)											
	Benzene	1,2- Dichloro- benzene	1,2- Dichloro- ethane	1,2- Dichloro- ethylene	1,2- Dichloro- propane	Ethyl- benzene	Tetra- chloro- ethylene	Toluene	Trichloro- ethylene	M and P Xylene			
Detection Limit <sup>(1)</sup>	0.2	1.0	0.5	1.0	0.5	1.0	05	0.5	0.2	1.0			
91-1	0.6	ND	ND	ND	ND	ND	ND	1.0	ND	ND			
91-2A	0.5	ND	ND	ND	ND	ND	ND	0.9	ND	ND			
91-2B	ND	1.4	ND	2.2	0.6	ND	105.0	ND	7.2	ND			
91-3	0.7	ND	90.2	ND	ND	ND	ND	ND	0.3	ND			
91-4	0.5	ND	1.5	ND	ND	ND	11.5	0.7	ND	ND			
91-5A	0.4	ND	ND	ND	ND	ND	5.1	0.8	ND	ND			
91-5B	0.4	ND	0.8	ND	ND	ND	ND	ND	ND	ND			
91-6	0.3	ND	ND	ND	ND	ND	32.0	ND	0.7	ND			
91-6 <sup>(3)</sup>	0.2	ND	ND	ND	ND	ND	52.5	ND	0.6	ND			
91-7	ND	ND	ND	ND	ND	ND	0.6	ND	ND	ND			
91-8	0.4	ND	ND	ND	ND	ND	ND	5.6	ND	ND			
OW-1	1.1	ND	ND	ND	ND	3.3	9.4	0.5	ND	1.1			
OW-2	0.2	ND ·	2.5	ND	ND	ND	1.2	ND	ND	ND			
OW-3	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND			
OW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
OW-5	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND			

### Table 11, continuedSummary of Laboratory Analysis of Groundwater SamplesRound Two Sampling (samples collected October 14-16, 1991)Village of Webster, Wisconsin

Monitoring Well	Compound Concentration (all units $\mu$ g/l)										
	Benzene	1,2- Dichloro- benzene	1,2- Dichloro- ethane	1,2- Dichloro- ethylene	1,2- Dichloro- propane	Ethyl- benzene	Tetra- chloro- ethylene	Toluene	Trichloro- ethylene	M and P Xylene	
Detection Limit <sup>(1)</sup>	0.2	1.0	0.5	1.0	0,5	1.0	0.5	0.5	0.2	1.0	
OW-5 <sup>(3)</sup>	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	
OW-6	ND	ND	ND	ND	ND	ND	0.9	ND	ND	ND	
OW-7	0.3	ND	ND	ND	ND	ND	1.6	0.5	ND	ND	
OW-8	0.2	ND	ND	ND	ND	ND	12.9	ND	ND	ND	
OW-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
VW-2	ND	ND	2.7	ND	ND	ND	ND	ND	ND	ND	
Trip Blank	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

<sup>(1)</sup> Detection limits in accordance with methods discussed on page 31.

(2) ND — Not Detected.

<sup>(3)</sup> Duplicate sample.

### Table 12Wisconsin Department of Natural ResourcesPublic Health Groundwater Quality Standards<sup>(1)</sup>October 1990

Compound	Enforcement Standard (µg/l)	Preventive Action Limit (µg/l)		
Benzene	5	0.067		
1,2-Dichlorobenzene	1250	125		
1,2-Dichloroethane	5	0.05		
1,2-Dichloroethylene	100	10 <sup>(2)</sup> or 20 <sup>(3)</sup>		
1,2-Dichloropropane	NA <sup>(4)</sup>	NA		
Ethylbenzene	1360	272		
Tetrachloroethylene	1	0.1		
Toluene	343	68.6		
Trichloroethylene	5	0.18		
(M & P) Xylene	620	124		

<sup>(1)</sup> Per Wisconsin Administrative Code NR 140.

<sup>(2)</sup> cis-1,2-dichloroethylene.

<sup>(3)</sup> trans-1,2-dichloroethylene.

<sup>(4)</sup> NA – Standards not established.

#### First Round Sampling

First-round results indicate the presence of gasoline-related contaminants:

- Benzene was detected in three of the wells samples (91-2B, 91-3 and 91-5B), with concentrations ranging from 0.3-1.6 μg/l. These concentrations exceed the PAL but do not exceed the ES.
- Toluene was detected only in well 91-8 at a concentration of 0.6  $\mu g/l$ . This concentration does not exceed the PAL or the ES.
- ▶ 1,2-dichloropropane was detected only in well 91-2B (0.7 µg/l).
   No PAL or ES has been established for 1,2-dichloropropane.

The distribution of these contaminants is illustrated in Figure 17. Although present, contamination by these gasoline-related compounds is not the focus of this study.

Other contaminants detected during the first round of sampling were the following halogenated compounds:

- 1,2-dichlorobenzene was detected only in well 91-2B (1.4  $\mu g/l$ ). This concentration does not exceed the PAL or the ES.
- 1,2-dichloroethane was detected in wells 91-3 (83.6 μg/l), 91-4 (2.9 μg/l), 91-5B (0.8 μg/l) OW-2 (4.3 μg/l) and village well VW-2 (2.8 μg/l). These concentrations exceed the PAL established for this compound, but the ES is exceeded only in well 91-3.
- Tetrachloroethylene was detected in eleven of the wells tested, with concentrations ranging from 1.3  $\mu$ g/l to 112  $\mu$ g/l. These concentrations exceed both the PAL and the ES.
- Trichloroethylene was detected in wells 91-2B (6.1 μg/l), 91-4 (0.2 μg/l), and 91-6 (0.4 μg/l). These concentrations exceed the PAL, but the ES is exceeded only in well 91-2B.

The distribution of these compounds is shown in Figure 18.

### Second Round Sampling

Gasoline-related contaminants were again detected during the second-round chemical analyses of groundwater samples.

- Benzene concentrations ranging from 0.2 µg/l to 1.1 µg/l were detected in 14 of the wells sampled. These values again exceed the PAL but are below the ES.
- Ethylbenzene was detected only in well OW-1, where a concentration of 3.3 µg/l was found. This concentration is well below both the PAL and the ES.
- 1,2-dichloropropane was detected only in well 91-2B (0.6 μg/l).
   Again, no PAL or ES has been established for this compound.
- Toluene was detected in seven of the wells sampled, with concentrations ranging from 0.5 µg/l to 5.6 µg/l. These values are below both the PAL and the ES.
- ► M-xylene and p-xylene were detected only in well OW-1, where the concentration of 1.1 µg/l is not greater than either the PAL or the ES.

The distribution of these contaminants is illustrated in Figure 19.

Also detected during second round sampling were compounds primarily associated with solvents. These include:

- ▶ 1,2-dichlorobenzene was detected only in well 91-2B. The reported concentration of 1.4 µg/l at this location is well below the PAL and ES.
- 1,2-dichloroethane was detected in wells 91-3 (90.2 μg/l), 91-4 (1.5 μg/l), 91-5B (0.8 μg/l), OW-2 (2.5 μg/l), and VW-2 (2.7 μg/l). As in the first round of sampling, these concentrations exceed the PAL, but the ES of 0.5 μg/l is exceeded only in well 91-3.
- ► 1,2-dichloroethylene was detected only in well 91-2B, at a concentration of 2.2 µg/l, is below the PAL and the ES.
- Tetrachloroethylene was again found to be the most widespread of the halogenated contaminants. This compound was detected in 13 of the wells tested, at concentrations ranging from 0.6  $\mu$ g/1 to 105  $\mu$ g/l. These values exceed both the PAL and the ES.
- Trichloroethylene concentrations were detected in shallow well 91-6 (0.6 and 0.7 μg/l) in the eastern part of the study area, and in deep wells 91-2B (7.2 μg/l) and 91-3 (0.3 μg/l) in the western part of the study area. These values are above the PAL of 0.18 μg/l. Only the concentration reported in well 91-2B exceeds the ES of 5 μg/l.

The distribution of these compounds is shown in Figure 20.

### DISCUSSION OF FINDINGS

Based on the results of laboratory analysis of groundwater, the halogenated compounds 1,2-dichloroethane and tetrachloroethylene appear to have a well-defined distribution in the groundwater in the Webster area.

Uses for 1,2-dichloroethane include degreaser, solvent, wetting and penetrating agent, and lead scavenger in anti-knock gasolines (Sax and Lewis, 1987). Uses for tetrachloroethylene include dry cleaning solvent, vapor degreasing solvent, drying agent for metals and certain other solids, vermifuge, heat transfer medium, and the manufacture of fluorocarbons (Sax and Lewis, 1987). **DNAPLs** Both 1,2-dichloroethane and tetrachloroethylene have densities greater than that of water (Table 13). These compounds have been classified as Dense Non-Aqueous Phase Liquids (DNAPLs) (Huling and Weaver, 1991). Chlorinated solvents are the most frequently encountered contaminants within this classification.

Within the vadose zone, the DNAPL contamination may exist in up to four simultaneous phases. These include:

- 1. The air phase, where the contaminants are present as vapor;
- 2. The solid phase, where the contaminants may adsorb or partition onto the soil or aquifer material;
- 3. The water phase, in which the contaminants dissolve into the water according to their relative solubility;
- 4. The immiscible phase, where the contaminants are present as dense non-aqueous phase liquids (Huling and Weaver, 1991).

### Table 13Densities of Contaminants Detected in Webster<br/>(Sax and Lewis, 1987)

Contaminant	Density <sup>(1)</sup>	Reference Temperature	
Benzene	0.8790	20° C	
Dichloromethane (methylene chloride)	1.335	15°C	
1,2-Dichlorobenzene	1.284	20° C	
1,2-Dichloroethane	1.2554	20° C	
1,2-Dichloroethylene	1.27 <sup>(2)</sup>	25° C	
Ethylbenzene	0.867	20° C	
Tetrachloroethylene	1.160 <sup>(3)</sup>	20° C	
Toluene	0.866	20° C	
Trichloroethylene	1.452 - 1.458 <sup>(3)</sup>	25° C	
Trichlorofluoromethane	1.494	17.2°C	
M-xylene	0.8684	15°C	
P-xylene	0.8611	20° C	

<sup>(1)</sup> Measured in grams/cubic centimeter  $(g/cm^3)$ .

<sup>(2)</sup> According to Weiss (1986).

<sup>(3)</sup> Calculated using reference water densities from Perry et al. (1969).

### **Potential Migration of DNAPLs**

DNAPLs are considered mobile in three of the four phases. Under saturated, subsurface conditions, DNAPLs can migrate in water according to their solubility, and in the gas phase, according to their DNAPL-air partition coefficients. DNAPLs as a continuous immiscible phase also have potential to be mobile. The relative distribution of DNAPLs within these three phases is complex and is poorly understood at this time.

In the solid phase, DNAPLs which have adsorbed onto the soil are considered immobile.

Often, pore spaces within permeable sediments—such as sands or fracture networks within low permeability units such as clays—provide the most efficient locations for movement of the contaminant. Soil capillarity is also important when considering the lateral movement of DNAPLs. Because of the surface tension within the pores within the sediment, a fraction of the DNAPLs will be retained within the porous media. This fraction is referred to as residual saturation.

DNAPL contaminants tend to sink within the saturated zone, rather than float on top of the water table as many petroleum-related contaminants do. According to Cherry (1991), when DNAPLs sink in the groundwater zone, their movements (i.e., their immiscible phase) are influenced more by gravity than by natural groundwater movement. The contaminants will continue to sink until a stratigraphic unit of lower permeability is encountered. At this point, the transport of the DNAPLS will depend greatly on the gradient of the lower permeability stratigraphic unit. If the directional gradient of the stratigraphic unit is different than the groundwater gradient, the continuous (immiscible) phase DNAPL contamination may migrate in a different direction than the flow of groundwater, while the dissolved (water, gas) phase contaminants will continue to migrate in the direction of groundwater flow (Huling and Weaver, 1991). Eventually, continuous-phase DNAPLS are expected to pool within topographic depressions on the relatively impermeable stratigraphic unit. Several possible scenarios for DNAPL migration are illustrated in Figure 21.

### Distribution and Concentration of DNAPLs in Webster Study Area

In an attempt to determine the distribution and concentration gradients of 1,2-dichloroethane and tetrachloroethylene, contour diagrams of the first and second round groundwater chemistry for these contaminants have been constructed.

#### 1,2-Dichloroethane

Figures 22 and 23 are contour diagrams, presenting the results of 1,2-dichloroethane concentrations detected in the first and second rounds of groundwater analysis, respectively. These two-dimensional diagrams present a simplistic view of the contaminant distribution, since the groundwater quality data has a three-dimensional component. Based on these diagrams, 1,2-dichloroethane appears to be restricted to the south-central and southwestern portions of the study area.

The vertical distribution of 1,2-dichloroethane can be approximated based on the groundwater quality data available from the two rounds of analyses. Two of the five wells (91-4 and OW-2) in which 1,2-dichloroethane is present are screened at the top of the aquifer, whereas the remaining wells (91-5B, 91-3, and VW-2) are screened deeper in the formation. Conceptual drawings of the vertical distribution of 1,2-dichloroethane are shown in Figure 24. These conceptual cross-sections were constructed by projecting the concentrations of 1,2-dichloroethane from the first round of groundwater sampling onto the cross-section planes X-X' and Y-Y'.

The highest concentration of this contaminant was found at well 91-3, during both rounds of groundwater analysis (83.6  $\mu$ g/l in round 1, and 90.2  $\mu$ g/l in round 2). The concentration of 1,2-dichloroethane appears to decrease upgradient and downgradient (northeast and southwest, respectively) of well 91-3. The concentration also decreases in directions perpendicular to groundwater flow (northwest and southeast) but appears to increase with depth.

The contaminant distribution is well-constrained near the top of the aquifer, with nearby wells OW-4, OW-5, OW-6, OW-1, 91-5A, OW-9, and OW-3 showing no impact from this contaminant.

Information is limited at depth, with well 91-2B to the north being the nearest available deep aquifer sampling point. Well 91-2B constrains the northernmost possible margin of 1,2-dichloroethane contamination. However, no wells exist south-southeast of well 91-3, nor further west than VW-2. Therefore, the extent of contamination in these directions cannot be adequately determined.

The source for 1,2-dichloroethane appears to occur along Main Street on the west side of town, probably between Pike and Sturgeon avenues. Information collected prior to the start of this investigation indicated a printing shop had once operated in the vicinity of the current Community Center; the former printing shop may represent a source for the 1,2-dichloroethane contamination.

Although the source of the 1,2-dichloroethane is not known with certainty, RREM believes the majority of the original compound has passed through the unsaturated zone. The apparent lack of widespread soil contamination by 1,2-dichloroethane lends support to this theory, although it should be noted that direct encounters of DNAPLs in boreholes are rare (Cherry, 1991). Once in the saturated zone, 1,2-dichloroethane may have travelled to the bottom of the aquifer, pooled on top of a relatively impermeable stratigraphic layer, or migrated according to the slope of an impermeable surface encountered at depth.

#### **Tetrachloroethylene**

Contour drawings of the concentrations of tetrachloroethylene (PCE) from the first and second rounds of groundwater sampling are illustrated in Figures 25 and 26.

These drawings were constructed based on tetrachloroethylene concentrations detected in wells screened in the shallow sections of the aquifer, between depths of 34 and 45 feet. The locations of contaminated soil samples at depths of 34 to 36 feet were also considered in constructing the contours, but no contaminant concentrations other than those detected in the groundwater have been implied. Therefore, the maps shown in Figures 25 and 26 represent the concentrations of PCE that might be expected to occur in groundwater present only in the upper sections of the aquifer. Based on comparison of the chemical analyses of soil and groundwater, it appears that contaminated groundwater occurs where there is contaminated soil, but contaminated soil is not always present where groundwater contamination exists. It is likely that soil contamination will be found only near the source of contamination, and only where high levels of water contamination exist away from the source.

In the upper sections of the aquifer, tetrachloroethylenecontaminated groundwater occurs within a northeast-southwest trending plume, approximately 1600 feet in length and up to 450 feet in width, which occurs west of Lakeland Avenue (Highway 35) between Elm and Cedar streets (Figures 25 and 26). The highest concentration of tetrachloroethylene in groundwater within this portion of the aquifer was found at well 91-6 (31.8  $\mu$ g/l, 32  $\mu$ g/l, and 52.5  $\mu$ g/l), while the highest concentration of soil contamination was detected at SB-1 (34.9  $\mu$ g/g). The concentration of PCE appears to decrease upgradient and downgradient of these two locations. Concentrations also appear to decrease perpendicular to groundwater flow.

The lateral distribution of the tetrachloroethylene contamination is well-defined in the southwestern region of the study area by wells 91-3, OW-9, OW-3, and OW-4. In the northwestern portion of the area, the extent of the plume is delimited by data from wells 91-1 and 91-2A. In the east, the extent of contamination is restricted by data from well 91-8. It is difficult to ascertain the lateral extent of contamination in the eastern portion of the study area and the longitudinal extent of contamination in the western portion of the area, because of a lack of sampling points.

In addition to lateral and longitudinal concentration gradients, it also appears that vertical concentration gradients of PCE contamination are present in Webster. The highest concentrations of tetrachloroethylene detected in both rounds of groundwater sampling occurred in well 91-2B (112 and 105  $\mu$ g/l), which is screened between a depth of 65 and 70 feet near the intersection of Elm Street and Pike Avenue. Chemical analyses of groundwater samples taken from well 91-7, which is also screened between 65 and 70 feet deep, failed to detect tetrachloroethylene during round 1 sampling and detected only 0.6  $\mu$ g/l PCE during round 2 sampling. It appears, therefore, that the tetrachloroethylene plume is sinking as it moves from east to west. At depth, the plume also appears to be centered more northward than it is near the top of the aquifer. This apparent northward shift in the location of the plume may be a result of the plume encountering a relatively impermeable soil unit, such as the silt horizon that was encountered at depths of 60 to 66 feet in soil boring SB-9.

Conceptual illustrations of the possible geometry of the tetrachloroethylene-contaminated groundwater plume, based solely on the results of the first round groundwater analyses, are illustrated in Figure 27. These conceptual cross-sections were constructed by projecting the concentrations of tetrachloroethylene from the first round of groundwater sampling onto the cross-section planes X-X' and Y-Y'. These diagrams illustrate the sinking nature of the plume as it moves from its source in the east-central region of the study area to the west, via transportation by flowing groundwater.

Based on current data, it is not possible to determine the nature of the plume below a depth of 70 feet. However, based on the relative differences in density between water and tetrachloroethylene, it is likely that the plume will continue to sink until it encounters an impermeable boundary, where it is likely to pool within topographic depressions.

Based on information collection to date, it appears that a source of tetrachloroethylene contamination may exist west of Lakeland Avenue and east of Muskey Avenue, between Main and Elm streets. It is RREM's interpretation that this source is separate from the source of 1,2-dichloroethane. Research early in this investigation indicated that dry cleaning businesses were operating at the location of the present laundromat, as well as in the vicinity of the post office. These two locations may represent possible sources of the tetrachloroethylene contamination.

### IMPACT TO RECEPTORS

The distribution of soil and groundwater contamination by halogenated volatile organic compounds in the Webster study area has been examined within this report. The potential impacts to receptors are discussed below.

SOIL CONTAMIN-ATION Based on the analyses performed for this study, tetrachloroethylenecontaminated soil appears to be confined to depths between 34 and 71 feet in the Webster area. Although this soil does not have any direct contact with humans, the contaminated soil may represent, in part, a source for tetrachloroethylene to further contaminate the groundwater. Groundwater quality will continue to be affected, as long as this contaminated soil is present. Well 91-8, which is located upgradient of the potential source of PCE contamination, contains groundwater that does not appear to be affected by the PCE contamination. Therefore, it appears that PCE-contaminated groundwater is restricted to receptors downgradient of well 91-8.

### GROUND WATER CONTAMIN-ATION

Contaminated groundwater appears to have the potential to affect a widespread area within and to the west of the Village of Webster. The following receptors have been or may be affected by contaminated groundwater:

- 1. Village well 2 (VW-2) continues to be impacted by contamination from 1,2-dichloroethane and, periodically, by tetrachloroethylene. During the course of this study, concentrations of 2.8 and 2.7  $\mu$ g/l of 1,2-dichloroethane were detected in water samples from this well. Tetrachloroethylene has periodically been detected in water samples analyzed by the Wisconsin DNR and Mid-State Associates from this well since 1984. The concentrations detected for this study are relatively low and do not exceed the Enforcement Standard of the Wisconsin DNR. However, a potential for impacts to human health does exist.
- 2. Potential exists for contamination of private wells located downgradient (to the west) of the study area. The residence of Vernon and Connie Bushey, which is located approximately 500 feet west of the boundary of the study area, is supplied by a private well. Attempts were made during the course of this

study to contact the Busheys and to sample water from their well. These attempts were unsuccessful. During the next phase of this investigation (Task II), samples will be collected and analyzed from this site. No further wells have been identified immediately downgradient of the study area.

- 3. The Yellow River, located approximately 1.25 miles north of Village Well 2, and the Clam River, located approximately 1.25 miles south of Village Well 2, represent potential downgradient receptors of contamination from the groundwater passing beneath Webster. A small stream located approximately one-quarter to one-half mile north of Village Well 2 represents the closest surface water to the presently defined plumes. It is speculated that, due to dilution from uncontaminated groundwater, levels of contamination will be greatly reduced by the time groundwater has reached these receptors. In addition, since the contaminants appear to be sinking with increasing distances from their probable sources, it is unlikely that surface water will be greatly impacted by the contamination.
- 4. It appears that until the source(s) of contamination are eliminated, either by remedial action or dilution of the contamination via solution by groundwater, the potential exists for the continuation of widespread contamination.

### SUMMARY AND CONCLUSIONS

Volatile organic compound (VOC) contamination has been documented in the Village of Webster, Wisconsin municipal water wells 1 and 2 since 1984 and 1985, respectively. RREM, Inc., was retained by the Wisconsin Department of Natural Resources (DNR) to conduct a remedial investigation of the contaminated aquifer in the Village of Webster. The purpose of this investigation was to determine the scope, extent, source(s), and potential impacts of VOC contamination in the Village.

As part of the investigation, a subsurface exploration program was conducted. Nineteen soil borings, varying from 36 to 71 feet in depth, were drilled at various locations within the site to evaluate the subsurface stratigraphy and to determine the lateral and vertical extent of the contamination. Based on these borings, the generalized stratigraphy in the Webster area, as logged with increasing depth, consists of:

- blacktop (on city streets only),
- silty to clayey sand plus gravel fill,
- ▶ silty clay,

▶ fine to coarse, well rounded, well sorted sand deposits, which locally contain lenses of pebbly to gravelly sand and silt to silty sand.

Ten soil samples from the aquifer beneath Webster that were selected by RREM geologists were subjected to sieve analysis tests by GME Consultants, Duluth, Minnesota. The results of these analyses indicate that the aquifer varies from poorly graded sand (SP) to poorly graded sand with silt (SP-SM) to silty sand (SM).

A Foxboro OVA-128 Flame Ionization Detector (FID) was used to screen soil samples in the field for volatile organic compound contamination using the standard jar-headspace method. Based on the chemical analyses of the soil from Webster (see below), there appears to be little correlation between the magnitude of the readings on the FID and actual soil contamination. This may suggest:

► the concentration of VOC contamination in the soil was not high enough to cause a significant FID reading;

► the vapor phase of contamination was not migrating into the headspace of the apparatus because of its relatively high

density with respect to air. It is speculated that the vapor phase of contamination remained in the pore space of the soil sample during these tests.

Thirty-eight soil samples were selected for chemical analysis. The samples were analyzed by Enviroscan in Rothschild, Wisconsin. The first 28 samples were analyzed for volatile organic compounds (VOCs), using EPA Method 8010/8020, total petroleum hydrocarbons (TPH) using the California Method, and lead via EPA Method 7421. The final ten samples were analyzed only for VOC contamination by EPA Method 8010/8020.

Lead was detected in 17 of the 28 samples analyzed, with concentrations ranging from 1.82 to 9.47  $\mu$ g/g.

Toluene was detected only in soil boring SB-13, where a sample from 34 to 36 feet had a concentration of 4.2  $\mu$ g/g.

Tetrachloroethylene (PCE) contaminated soil was detected at depths of 34 to 36 feet in soil borings SB-1 (34.9  $\mu$ g/g), SB-6 (2.4  $\mu$ g/g), and SB-18 (9.3  $\mu$ g/g). Tetrachloroethylene contamination was also detected at 69 to 71 feet in soil boring SB-4 (5.8  $\mu$ g/g).

Methylene chloride was detected in soil samples from borings SB-4, SB-7, SB-9, and SB-14. However, it is believed that the methylene chloride detects resulted from lab contamination during the analysis of the samples.

Ten monitoring wells were installed to evaluate the hydrogeological characteristics of the aquifer, as well as to allow groundwater sampling. Based on data collected from a pressure transducer during in situ hydraulic conductivity tests, the sediments beneath the study site were found to have a geometric mean hydraulic conductivity of  $1.77 \times 10^{-2}$  cm/sec and an arithmetic mean hydraulic conductivity of  $1.82 \times 10^{-2}$  cm/sec. This compares favorably with the hydraulic conductivity determined by GME Consultants on a recompacted sample of fine to medium sand ( $7.1 \times 10^{-3}$  cm/sec). A Shelby tube sample of silty clay was determined to have a hydraulic conductivity of  $1.5 \times 10^{-6}$  cm/sec.

Water table elevations were monitored from June through October in the ten wells installed by RREM and in the nine wells from the previous study by Ayres (1987). Groundwater flows from east to west, with a gradient between  $8 \times 10^{-4}$  ft/ft and  $9 \times 10^{-4}$  ft/ft.

The groundwater flow velocity was calculated to be between 44 and 48 ft/year, assuming a porosity of 35 percent for the fine- to medium-grained, well-sorted, well-rounded sand aquifer.

Groundwater samples were obtained during two rounds of sampling from the 19 wells discussed above and from a tap connected to Webster village well 2. Contamination of groundwater by the gasoline-related compounds benzene, toluene, and 1,2-dichloropropane was recognized during the first round of sampling. Benzene, ethylbenzene, 1,2-dichloropropane, toluene, and m- and p-xylene were also detected in the second round of sampling. However, only the concentrations reported for benzene exceed the Preventive Action Limits (PAL). None of the concentrations reported for these contaminants exceeded its respective Enforcement Standard (ES).

Contamination by organic compounds used primarily as solvents was also recognized during the two rounds of groundwater sampling. During the first round of sampling, the halogenated compounds 1,2-dichlorobenzene, 1,2-dichloroethane, tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected. Second-round water samples detected the previous compounds, as well as 1,2-dichloroethylene. Neither the PAL nor ES was exceeded by the concentrations of 1,2-dichlorobenzene, or 1,2-dichloroethylene.

Dichloroethane concentrations that exceeded the PAL of 0.05  $\mu$ g/l were detected in wells 91-4, 91-5B, OW-2, and VW-2. The Enforcement Standard for 1,2-dichloroethane was exceeded in both rounds of sampling by groundwater from well 91-3.

Tetrachloroethylene was detected in water from 11 wells during the first round of sampling, and 13 wells from the second round of sampling. In all locations where tetrachloroethylene was detected, the concentrations exceeded both the PAL and the ES established by the Wisconsin DNR.

Trichloroethylene was detected in wells 91-2B, 91-3, 91-4, and 91-6. All concentrations detected exceeded the PAL of 0.18  $\mu$ g/l, and the

concentration in well 91-2B consistently exceeded the Enforcement Standard of 5.0  $\mu$ g/l.

The potential for high concentrations of contamination deep in the groundwater downgradient from the source appears to exist. Based on the distribution of 1,2-dichloroethane and tetrachloroethylene, the contamination by these substances appears to increase with depth as one moves further from the possible sources. The contaminants are expected to eventually pool within topographic depressions in the surface of a relatively impermeable unit. The likelihood of detecting these pools by conventional drilling is small, and any breaching of the confining layer may only lead to increasing the area contaminated by the substances.

Based on this evaluation, it appears that a source of tetrachloroethylene contamination may exist west of Lakeland Avenue and east of Muskey Avenue between Main and Elm streets. It is RREM's interpretation that this source is separate from the source of 1,2-dichloroethane, which appears to be located along Main Street on the west side of the Village, probably between Pike and Sturgeon avenues.

Based on the information collected to date, it appears that the most likely locations to be impacted by the contamination are located in the western portion of the study area and to the immediate west of the study area. Village well 2 (VW-2) continues to be impacted by the presence of 1,2-dichloroethane and tetrachloroethylene contamination, at levels that exceed the PAL. Because VW-2 is no longer being used as a municipal water supply, this contamination is presently not affecting the village water supply. However, such contamination will continue to preclude the use of VW-2 as a municipal water source. The Vernon Bushey residence, located approximately 500 feet west of the study area, is supplied by a private water well. At the present time, this well is the most likely downgradient receptor to be affected by the contamination.

The Yellow and Clam rivers also are potential downgradient receptors of the contamination. However, due to their distances from the presently outlined contamination plumes, and due to the apparent sinking nature of the plumes, these rivers are not likely to be greatly affected by the contamination.

### RECOMMENDATIONS

Based upon the findings of this report, RREM recommends the following:

- 1. The drilling of several soil borings at potential source locations, with soil sampling and geochemical analysis. This will better define the distribution of contamination. Groundwater samples should be collected from each soil boring to define the distribution of contaminants.
- 2. The installation of monitoring wells and soil borings to better define the lateral and vertical limits of the 1,2-dichloroethane and tetrachloroethylene plumes. At the present time, the western and southeastern margins of the 1,2-dichloroethane plume is poorly defined, and the western, northern, and southeastern margins of the tetrachloroethylene plume, especially at depth, are not well defined.
- 3. The drilling of at least four soil borings to the base of the sand aquifer underlying Webster. This will serve to better define the slope of the surface of the confining layer, which may be influencing the direction of migration of immiscible DNAPL phases at depth. It should also help to refine the present interpretations about the vertical distribution of the contamination.
- 4. Continuation of groundwater sampling in the present wells and from Village Well 2 (VW-2). This will monitor the migration as well as the concentrations of any contaminants present in the groundwater.
- 5. Sampling of water from residences with private wells located downgradient of the contaminant plumes should be undertaken. The Vernon Bushey residence, which has a private well approximately 500 feet west of Village Well 2, is the most likely location for future impacts from the present contamination.

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### **Appendix A**

**Results of Chemical Analyses of Soil and Groundwater from Previous Studies** 

• Summary of Soil Geochemistry, Ayres Associates

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- Summary of Groundwater Geochemistry, Ayres Associates, September 1986 (Round One Sampling)
- Summary of Groundwater Chemistry, Ayres Associates, October 1986 (Round Two Sampling)
- Summary of Water Chemistry, Webster Village Wells 1 and 2

### Appendix A

# Table A1Summary of Soil ChemistryAyres Associates (July 1986)Village of Webster, Wisconsin

Compound Concentration (all units µg/g)									
Benzene	Dichloromethane	Ethylbenzene	Toluene	Trichloro- fluoromethane	M-xylene	P-xylene			
0.4	0.4	0.4	0.2	0.4	0.1	1.0			
ND	ND	29.6	45.7	ND	51.0	60.7			
ND	ND	ND	ND	ND	ND	ND			
ND	ND	ND	0.3	ND .	ND	ND			
ND		ND	1			ND			
						ND			
0.6	ND	ND	1.2	ND	3.8	5.1			
ND	ND	ND	ND	ND	ND	NĎ			
ND	ND	ND	0.2	ND	ND	ND			
ND	ND	ND	0.4	ND	ND	ND			
ND	ND	ND		ND	ND	ND			
						ND			
ND	ND	ND	ND	ND	ND	ND			
ND	ND	ND	ND	ND	ND	ND			
ND	2.0	ND	ND	ND	ND	ND			
ND	ND	ND	ND	ND	ND	ND			
						{			
ND	ND	ND	ND	ND	ND	ND			
ND	ND	ND	ND	ND	ND	ND			
	0.4       ND       ND	0.40.4ND	BenzeneDichloromethaneEthylbenzene0.40.40.4NDND0.4ND	BenzeneDichloromethaneEthylbenzeneToluene0404040402NDNDNDNDNDNDNDNDNDNDNDNDNDNDND0.3ND </td <td>BenzeneDichloromethaneEthylbenzeneTolueneTrichloro-fluoromethane040404020404040204NDND29.645.7NDNDNDNDNDNDNDNDND0.3NDNDNDND0.3NDNDNDND0.3NDNDNDND0.3NDNDNDND0.4NDNDNDND0.3NDNDNDND0.4NDNDNDND0.4NDNDNDND0.4ND</td> <td>BenzeneDichloromethaneEthylbenzeneTolueneTrichloro- fluoromethaneM-xylene0.40.40.40.20.40.1NDND0.40.20.40.1NDND29.645.7ND0.3NDNDND0.3NDNDND0.8NDNDND1.2NDNDNDND3.8NDNDND0.2ND</td>	BenzeneDichloromethaneEthylbenzeneTolueneTrichloro-fluoromethane040404020404040204NDND29.645.7NDNDNDNDNDNDNDNDND0.3NDNDNDND0.3NDNDNDND0.3NDNDNDND0.3NDNDNDND0.4NDNDNDND0.3NDNDNDND0.4NDNDNDND0.4NDNDNDND0.4ND	BenzeneDichloromethaneEthylbenzeneTolueneTrichloro- fluoromethaneM-xylene0.40.40.40.20.40.1NDND0.40.20.40.1NDND29.645.7ND0.3NDNDND0.3NDNDND0.8NDNDND1.2NDNDNDND3.8NDNDND0.2ND			

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### Table A1, continued Summary of Soil Chemistry Ayres Associates (July 1986) Village of Webster, Wisconsin

	Compound Concentration (all units µg/g)									
Soil Boring /Sample Depth	Benzene	Dichloromethane	Ethylbenzene	Toluene	Trichloro- fluoromethane	M-xylene	P-xylene			
Detection Limit	0.4	0.4	0.4	0.2	0.4	0.1	1.0			
OW-5 5 ft. 45 ft.	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND			
OW-6 5 ft. 10 ft. 45 ft.	ND ND ND	ND ND ND	ND ND ND	ND ND ND	ND 9.8 3.3	ND ND ND	ND ND ND			
OW-7 5 ft. 10 ft. 45 ft.	ND ND ND	ND ND ND	ND ND ND	ND ND ND	ND ND 11.3	ND ND ND	ND ND ND			
OW-8 5 ft. 10 ft. 45 ft.	ND ND ND	ND ND ND	ND ND ND	ND ND ND	ND ND ND	ND ND ND	ND ND ND			
OW-9 5 ft. 40 ft.	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND			

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#### Appendix A

#### Table A2 Summary of Groundwater Chemistry Ayres Associates, Sept. 1986 (Round One Sampling) Village of Webster, Wisconsin

		Com	pound Concentration (all	l units ug/l)	
Monitoring Well	Chloroform	Dichloromethane	Tetrachloroethylene	Toluene	1,1,2-Trichloroethane
Detection Limit <sup>(1)</sup>	0.1	0.2	0.1	0.1	0.1
OW-1	ND <sup>(2)</sup>	ND	0.6	0.5	ND
OW-2	ND	ND	ND	ND	ND
OW-3	ND	ND	ND	ND	ND
OW-4	ND	ND	ND	ND	ND
OW-5	0.4	0.2	0.1	0.1	ND
OW-6	0.5	ND	ND	ND	ND
OW-7	ND	0.9	ND	ND	1.2
OW-8	ND	0.9	0.9	ND	ND
OW-9	ND	0.2	ND	ND	ND

 $^{(1)}$  Analyzed using EPA Method 601, with photoionization detector (10.2 eV).  $^{(2)}$  ND - Not Detected.

#### Appendix A

#### Table A3 **Summary of Groundwater Chemistry** Ayres Associates, October 1986 (Round Two Sampling) Village of Webster, Wisconsin

Monitoring Well	Benzene	Chloroform	1,2-Dichloro- ethane	Tetrachloro- ethylene	1,1,1-Trichloro- ethane	Trichloro- ethylene
Detection Limit <sup>(1)</sup>	0.2	0.1	0.3	0.1	0.1	0.1
OW-1	ND	ND	ND	3.3	ND	ND
OW-2	ND	ND	ND	0.7	ND	ND
OW-3	ND	ND	ND	ND	ND	ND
OW-4	ND ·	ND	ND	ND	ND	ND
OW-5	ND	ND	ND	3.3	ND	ND
OW-6	ND	0.3	ND	0.1	ND	ND
OW-7	ND	ND	ND	ND	0.4	ND
OW-8	ND	ND	ND	3.0	ND	ND
OW-9	ND	ND	ND	0.2	ND	ND
VW-2 <sup>(3)</sup> (0.88 hours into pump test)	0.3	ND	69.3	12.5	ND	0.2
VW-2 <sup>(3)</sup> (20 hours into pump test)	ND	ND	9.9	5.5	ND	ND

 $^{(1)}$  Analyzed using EPA Method 601, with photoionization detector (10.2 eV).  $^{(2)}$  ND - Not Detected.

<sup>(3)</sup> Samples collected during a 20.5-hour pump test of Village Well 2 (October 1986).

#### Appendix A

#### Table A4 Summary of Water Chemistry Village Well 1 🗆 Webster, Wisconsin

		Compound Conce	ntration (all units ug/l)	
Sampling Date	1,2-Dichloroethane	Tetrachloroethylene	Trichloroethylene	Source
November 1984	D <sup>(1)</sup>	D	ND <sup>(2)</sup>	А
December 1984	26	18	ND	А
January 1985	22	17	ND	А
May 1985	16	11	ND	А
October 1986	4	58	2.3	А
February 1987	100	18	ND	А
February 1988	16	23	1.2	А
May 1988	24	18	ND	А
October 1988	18	19	ND	А
August 1989	27	9	0.34	А

<sup>(1)</sup> D - Compound detected but not quantified.
 <sup>(2)</sup> ND - Not Detected.

Sources:

A - Wisconsin Department of Natural Resources

# Table A5Summary of Water ChemistryVillage Well 2 I Webster, Wisconsin

<u>i – mensi – medi – mudi – m</u>			Compound Concentration	n (all units ug/l)		
Sampling Date	Benzene	1,2-Dichloroethane	Tetrachloroethylene	Trichloroethylene	Toluene	Source
November 1984	ND <sup>(1)</sup>	ND	ND	ND	ND	A
November 1985	ND	D <sup>(2)</sup>	D	ND	ND	А
December 1985	ND	14	6.9	ND	ND	А
February 1987	ND	D	D	D	ND	A
February 1988	2.3	120	2.2	ND	ND	A
May 1988	ND	6.7	5	ND	ND	A
October 1988	ND	2.8	2.6	ND	ND	A
August 1989	0.36	5.8	. 4.1	, ND	ND	A
March 1990	ND	3.2	0.37	ND	ND	А
September 1986	ND	9.9	5.5	ND	ND	В
September 1986	0.3	69.3	12.5	0.2	ND	В
February 1991	ND	4.4	0.65	ND	2.3	С
June 1991	ND	3.5	0.9	ND	1.2	С
June 1991	ND	7.2	1.4	ND	<0.5	С
July 1991	ND	7.6	2.0	ND	<0.5	С
September 1991	ND	2.8	ND	ND	ND	D
October 1991	ND	2.7	ND	ND	ND	D

<sup>(1)</sup> ND — Not Detected.

<sup>(2)</sup> D – Compound detected but not quantified.

Sources:

A – Wisconsin DNR Public Water Sample Results

B – Ayres (1987)

C — Mid-State Associates (1991) D — RREM (1991)

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Appendix **B** 

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Soil Boring Logs

PROJECT	Rer	nedi			gatio	n	CLIENT: WISCONSIN	N DNF	२		91			
DRILLING HOLE DV			4 1,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin		SI	HEET 1	<b>No.</b> of 2		
BORING	NUMBE	R-LC	CATIO	N:	SB-	1: MUSKEY AVE	& ELM			DA	TE:	6-16-	91	
рертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	(M dd) Sdno Sdno Sdno Sund Sund Sund Sund Sund Sund Sund Sund				8) STAN 10	STANDARD PENETRATION (BLOWS/FT)				
-					CL	0.2" BLACK TOP, 0.6" 1.2" OLIVE (5YR5/2) SIL	sand fill. Ty clay					1		
	1	2	2	0.0	SP	BROWN (7.5YR4/4) MED SORTED AND WELL ROUN	TO FINE GRAINED WELL DED SAND DAMP			⊗24	-			
						BROWN (7.5YR4/4) MED	TO FINE GRAINED WELL SORTED							
D <b></b>	2	2	2	7.0	SP	AND WELL ROUNDED SAN	ID DAMP LAB SAMPLE			⊗23				
5-	3	2	2	0.0	SP	BROWN (7.5YR4/4) MED SORTED AND WELL ROUN	TO FINE GRAINED WELL IDED SAND DAMP	80	1					
-														
-					 	BROWN (7.5YR4/4) MEDI			N.	ç.				
0 <u> </u> ::::::::::::::::::::::::::::::::::	4	2	2	0.0	SP	SORTED AND WELL ROUN	IDED SAND DAMP		811					
									$\left  \right\rangle$					
5 <b></b>	5	2	2	0.0	SP	BROWN (7.5YR4/4) MED SORTED AND WELL ROUN			168			ł		
_					<b>_</b> ,	CONTED WILD HELL NUUM								
0								<b>_</b>		⊗22	<u></u>			
VATER L	EVEL:				RTED	BY:	BORING COMPLETED: 6-16	-91	REM/	RKS:				
IATER L	EVEL:				1.11.10	Brian Hayden								
				DRIL	LING	GME/Jamie			SIGNED:					

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#### RRFM Inc. 🖾 FIELD EXPLORATORY BORING LOG consulting engineers CLIENT: PROJECT: Wisconsin DNR PROJECT No. WISCONSIN DNR 9114 Remedial Investigation SITE LOCATION: SHEET No. DRILLING METHOD: 1/4" HSA 4 Webster Wisconsin HOLE DIAMETER: 2 of 2 BORING NUMBER-LOCATION: DATE: SB-16-16-91 SAMPLE DISTANCE SOIL GROUPS SYMBOL (USCS) F I D Reading (PPM) ŝ SAMPLE RECOVERED & STANDARD PENETRATION E DESCRIPTION OF MATERIAL (BLOWS/FT) SAMPLE DEPTH SURFACE ELEVATION 10 30 80 30 40 BROWN (7.5YR4/4) MEDIUM TO FINE GRAINED WELL SORTED WELL ROUNDED SAND DAMP 2 6 2 ⊗22 0.0 SP 1 BROWN (7.5YR4/4) MED TO FINE GRAINED WELL SORTED SP AND WELL ROUNDED SAND DAMP LAB SAMPLE 35-..... 7 2 2 5.0 GW 6" LAYER COARSE GRAINED ROUNDED SAND-FINE GRAVEL `⊗4€ SP 6" LAYER FINE GRAINED SAND BROWN (7.5YR4/4) MED-FINE GRAINED WELL SORTED 40-Ø22 8 2 SP 2 4.5 AND WELL ROUNDED QUARTZ SAND SATURATED END OF BORING 45-50-55-60-**REMARKS:** BORING WATER LEVEL: 6-16-91 6-16-91 STARTED: LOGGED BY: Brian Hayden/RREM,Inc.

 WATER LEVEL:
 Brian Hayden/RREM,Inc.

 DRILLING COMPANY/DRILLER:
 SIGNED:

 GME/Jamie Tuura
 SIGNED:

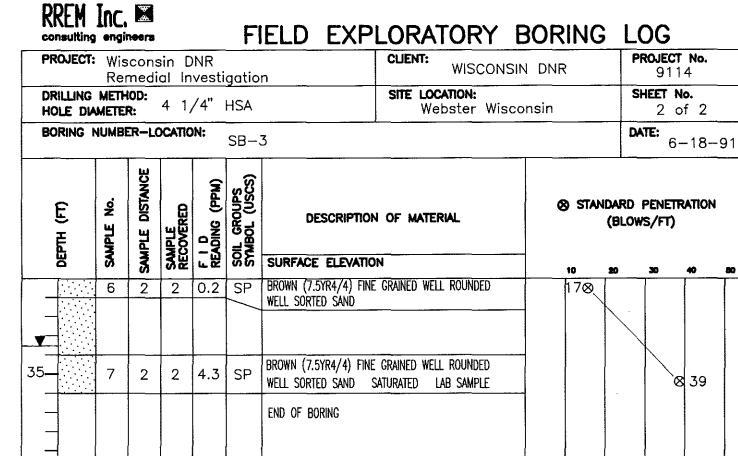
# RREM Inc.

consultin								DUIVING	LUG
PROJECT					gatio	n	CLIENT: WISCONS	IN DNR	PROJECT No. 9114
DRILLING HOLE DI	METH	IOD:	4 1,				SITE LOCATION: Webster Wisc	onsin	SHEET No. 1 of 2
BORING						•	20' SE OF FIRE HY -35 & MUSKEY (T		DATE: 7-09-91
DЕРТН (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)		N OF MATERIAL	-	ARD PENETRATION BLOWS/FT)
	_──	SA	RESA	ᄕᄦ	એંબ	SURFACE ELEVATIO		10 20	30 40 50
	1		[   	1.3		BLACK BROWN SANDY C SURFACE	CLAY AND SILT FILL, GRAVEL AT		
					SP	RED BROWN FINE TO M WELL SORTED SAND, TR	EDIUM GRAINED WELL ROUNDED ACE SILT, FILL		
5 - 7	1	2	2	0.4	CL	LIGHT BROWNISH GREY WEAK RED (10YR4/4)	(10YR6/2) CLAY WITH 5-10%	₿11	
					SP	Brown (7.5yr4/4) Fini Rounded Well Sorted (transition-like Mater	e to medium grained well Sand with 5—10% clay Rial)		
10	2	2	2	0.3	SP		IO MEDIUM GRAINED WELL ROUNDED RACE 0.25-0.5MM ROUNDED PEBBL		
-									
15	3	2	1.8	0.8	SP	BROWN (7.5YR4/4) FIN WELL SORTED SAND	e to medium well rounded		
		   		 		BROWN (7.5YR4/4) FINI	e to medium well rounded		
20	4	2	1.8	1.6	SP	Well Sorted Sand Brown (7.5yr4/4) Co/ Rounded Well Sorted	ARSE TO MEDIUM WELL SAND	- ⊗β -	
	·		 		 		RSE TO MED WELL ROUNDED		
25	5	2	1.8	2.9	SP	Well Sorted Sand 5 <u>3–5% Coarse Sand Pf</u>	-10% ORANGE MOTTLING RESENT LAB SAMPLE		
30	6	2	1.8	0.6	SP		) TO COARSE WELL ROUNDED		
L I · · · ·	l			L	L	WELL SORTED SAND			<u>8</u> 29
WATER LEVEL: STARTED: LOGGED E							COMPLETED:		EN @ 30-40'
WATER L	EVEL	:	<u></u>			COMPANY/DRIL	·	SIGNED	):
						GME/Jamie			•

Consulting				F١	ELD EXP	LORATORY E	BOR	RING	LC	C		
PROJECT:	Wiscon: Remedi					CLIENT: WISCONSIN				ROJECT 9114		
DRILLING HOLE DIAM	METHOD:	4 1/				SITE LOCATION: Webster Wisco	nsin		SH	SHEET No. 2 of 2		
BORING N	UMBER-L	OCATIO	N: S	B-2					DA	<sup>TE:</sup> 7–	10-9	) 1
DEPTH (FT)	DEPTH (FT) SAMPLE No. SAMPLE DISTANCE SAMPLE DISTANCE SAMPLE RECOVERED F   D				DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	(	STANDARD PENETRATION (BLOWS/FT)				50
	7 2 8 2	2 RECOVERD TROM		TED:	BROWN (7.5YR4.4) FINE WELL ROUNDED SAND BROWN (7.5YR4/4) FINI SORTED WELL ROUNDED END OF BORING 7-09-91 BY:	E TO MEDIUM GRAINED WELL SAND SATURATED BORING COMPLETED: 7-10-	-91	REMA		83	5	≥67
WATER LE	VEL:		DRILI	LING	George Hudak COMPANY/DRIL GME/Jamie	LER:		SIGNI	ED:			

PROJECT	Rei	medi			gatio		I DNF	२		91	<b>T No.</b> 14	
DRILLING HOLE DV			41,	/4"	HSA	<b>SITE LOCATION:</b> Webster Wisco	nsin		S	HEET 1	No. of 2	
BORING	UMB	ER-LO	DCATIC	)N:	SB-	3: SE CORNER OF STURGEON & E	LM		D	ATE: (	5-18-	-91
оертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM) SOIL GROUPS SYMBOL (USCS)	DESCRIPTION OF MATERIAL SURFACE ELEVATION		-	STANDARD PENETRATION (BLOWS/FT)				
-77		0			CL	.2" BLACK TOP .6" SAND FILL SILTY CLAY	······	10	20	30	40	
5	1	2	2	0.0	SP	BROWN (7.5YR4/4) MED-FINE GRAINED WELL ROUNDED WELL SORTED SAND			288			
0	2	2	2	0.4	SP	BROWN (7.5YR4/4) MED-FINE GRAINED WELL ROUNDED WELL SORTED SAND		20	\$			
5	3	2	2	1.0	SP	BROWN (7.5YR4/4) MED-FINE GRAINED WELL ROUNDED WELL SORTED SAND		168				
20	4	2	2	0.4	SP	BROWN (7.5YR4/4) MED-FINE GRAINED WELL ROUNDED WELL SORTED SAND WITH 2CM META-VOLCANIC ROUNDED PEBBLE		168		i I		
25-	5	2	2	0.2	SP	BROWN (7.5YR4/4) MED-FINE GRAINED WELL ROUNDED WELL SORTED SAND, LOWER 1 FT FINER GRAINED			⊗2	5		
30-							 					
WATER L	.:		BOR	RING	6-18-91 <b>BORING</b> COMPLETED: 6-18	-91	REM	ARKS:				
			<b>_</b>	LOGGED BY: Brian Hayden/RREM,Inc.								
WATER L	EVËL	:		DRILLING COMPANY/DRILLER:					SIGNED:			

elan yang



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2 of 2

40-								
45_								
 50								
  55								
60-								

WATER LEVEL:	BORING STARTED: 6-18-91	BORING COMPLETED: 6-18-91	REMARKS:
	LOGGED BY: Brian Hayden/		
WATER LEVEL:	<b>DRILLING COMPANY/DRIL</b> GME/Jamie T		SIGNED:

# RREN Inc.

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consulting engineers		FLUKAIUKI BUF	
PROJECT: Wisconsir Remedial	DNR Investigation	CLIENT: WISCONSIN DN	R PROJECT No. 9114
DOILLING METHOD	1/4" HSA	SITE LOCATION: Webster Wisconsin	SHEET No. 1 of 3
BORING NUMBER-LOC	TION: SB-4: NESTED WE CORNER OF PIKE &		DATE: 7-11-91
DEPTH (FT) SAMPLE No. SAMPLE DISTANCE		ION OF MATERIAL	⊗ STANDARD PENETRATION (BLOWS/FT)
SA S E	ーとして、 と 一 と で の の ら SURFACE ELEV/	TION	10 20 30 40 50
		Y SILT & CLAY FILL ROOTLETS SY VEGETATION AT SURFACE	
	CL WEAK RED (10YR5/4 BROWN (7.5YR4/4) TO MED GRAINED WE	CLAYEY—SAND TRANSITION ZONE, FINE LL ROUNDED WELL SORTED SAND WELL ROUNDED WELL SORTED FINE	829
	BROWN (7.5YR4/4)	VELL SORTED WELL ROUNDED FINE SAND WITH LOCAL 1-2" LENSES OF ND MEDIUM SAND TRACE PEBBLES,	⊗30
		Vell Sorted Well Rounded Fine Sand no Pebbles	⊗42
20-42	.8 0.1 SP SORTED WELL ROUND	ine to medium grained well. Ed Sand. Fine grained sand, Sorted From 20'8"—21'0"	827
25_522	2.01 0.31 SP (ROUNDED SAND ORANG	TO MED GRAINED WELL SORTED WELL E-RED MOTILING 5% AT 25' GRADES DOWN D STAINING FROM 25'-26' NO ODOR	⊗24
	ROUNDED SAND; ORANGE INTO SLIGHT ORANGE-R	RSE SAND & CRAVEL; PEBBLES HORE VOLCANICS 15-20%:	⊗32
WATER LEVEL:	BORING STARTED: 7-11-91 LOGGED BY: George Hud	BORING COMPLETED: 7-11-91 lak/RREM,Inc.	REMARKS: 91-2A SCREEN @ 30-40' 91-2B SCREEN @ 65-70'
WATER LEVEL:	DRILLING COMPANY/D GME/Jami		SIGNED:

PROJECT					gatio	n	CLIENT: WISCONSIN	DNR			CT No. 114	
DRILLING HOLE DI	METH	IOD:		/4"	<u></u>		SITE LOCATION: SHEET No. Webster Wisconsin 2 of 3					
BORING			CATIO	<sup>N:</sup> SE	3-4	<u> </u>				DATE:	7-11-	-91
DЕРТН (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	STANDARD PENETRATIC (BLOWS/FT) 10 20 30 40				50
▼ 35 	7/8	2	1.8	0.4	SP /	GRAINED SAND WITH 5-	TO MEDIUM GRAINED WELL		⊗(19	9		
+0	9	2	2	1.0	SP	BROWN (7.5YR4/4) VERY F WELL ROUNDED SAND, SOM FINE TO MEDIUM GRAINED	ine to med grained well sorted lewhat finer grained than other sands excavated			824		
H5	10	2	2	3.2	SP	BROWN (7.5YR4/4) SILT WELL SORTED SAND SAT BROWN, WATER SATURAT	y fine to medium grained Urated with water Ed silt lab sample saturated	\$5				
50	11	2	1.8	0.8	SP	BROWN (7.5YR4/4) SILT WELL SORTED SAND WITI SILT 20–30% WHEN WITI WATER SATURATED	Y VERY FINE TO FINE GRAINED H 1—2CM THICK SILT LENSES H SANDS 80—90% IN LENSES	<b>8</b> 9				
55	. 12	2	1.0	0.6	SP	BROWN (7.5YR4/4) FINE Sorted Well Rounded To Grey Basalt Pebbli	TO MEDIUM GRAINED WELL SAND 1–2% 0.25–0.5 BLACK ES, ANGULAR TO SUB-ROUND	81	0			
60	13	2	1.4	0.3	SP	BROWN (7.5YR4/4) FINE SORTED WELL ROUNDED	TO MEDIUM GRAINED WELL SAND					\⊗5
WATER L	EVEL	•			RING RTED: GED		BORING COMPLETED: 7-11- /RREM,Inc.	.91	MARK	(S: Tary drill	NG FROM	50'-70'
WATER L	EVEL:			-  			LER:		MUD RO		ING FROM	50'-

PROJECT					gatio	n	CLIENT: WISCONSIN	DNR	PROJECT No. 9114
DRILLING HOLE DIA	METH	0D: R:	4 1,	/4"	HSA		SITE LOCATION: Webster Wiscor	nsin	SHEET No. 3 of 3
BORING	NUMB	ER-LO	OCATIO	<sup>N:</sup> S	B-4			·····	DATE: 10-11-9
DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	=	ARD PENETRATION BLOWS/FT) 0 30 40 5
65-	14	2	1.8	0.3	SP	BROWN (7.5YR4/4) FIN	IE TO MEDIUM GRAINED WELL		
  70	15	2	1.8	0.0	20	brown (7.5yr4/4) very fin	) SAND SATURATED WITH WATER E TO FINE GRAINED WELL D LAB SAMPLE SATURATED WITH WATER		54
  75						END OF BORING AT 71'			
  80									
85  									
90									
WATER L					ING RTED GED		BORING COMPLETED: 7-11- /RREM,Inc.	-91 REMAR	KS:
WATER L	EVEL	:		DRIL	LING	COMPANY/DRIL GME/Jamie		SIGNE	D:



	ROJECT:											PROJEC	TNo	
		Re	medi			gatio	n	WISCONSIN	N DNF	२		91	14	
	RILLING			41,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin			SHEET 1	<b>No.</b> of 2	
B	DRING I	NUMBI	ER-LO	DCATIC	DN: SI	3–5: MFC	15' NORTH S G. GARAGE BETW	IDE OF ALLEY BEHIN VEEN PIKE & STURG	D HO EON /	RTON	1	ATE: e	5-16-	91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D Reading (PPM)	soil groups Symbol (USCS)	DESCRIPTION SURFACE ELEVATION	N OF MATERIAL	Q	B) STA	(8L0	WS/FT)		
				-	0.3		BROWN SANDY SILT AND AND ORGANIC MATERIAL	CLAY TOPSOIL WITH ROOTLETS			20	30	40	<b>50</b>
							MOTTLED CLAY WITH 1- GRAINED BLACK SAND.	(10YR6/2) TO BROWN (7.5YR5/4) 2% LOCAL FINE TO MEDIUM LOCAL WEAK RED (10YR5/4) OTLETS, 1–2% DECAYED						
_		1	2	1.5	0.0	CL SP	STREAKS PRESENT. RO BROWN (7.5YR4/4) FINE	OTLETS, 1-2% DECAYED	6⊗					
-				†			Sorted and Well Rou Transition Zone From	TO MEDIUM GRAINED WELL NDED SAND. SANDY CLAY 5'6" TO 5'9"						
o_		2	2	1.5	0.2	SP		o medium grained well sorted, -3% coarse sand grains present			27 8			
_				<u>†</u>	1		THE RUDINED SPIND, 2	ON CONTRE SHITE CIVILIA FREEDEN				N		
												$\land$		
 5		3	2	1.7	0.1	SP	BROWN (7.5YR4/4) FINI	e to medium grained well					34	
	·				0.1		Sorted, Well Rounded	) SAND					ļ	
 0							BROWN (7.5YR4/4) FINE TO	) MED GRAINED WELL SORTED SAND						
		4	2	1.7	0.1	SP	SORTED MODERATELY TO W	I TO COARSE GRAINED WELL ELL ROUNDED SAND		<b>⊗</b> 14				
_				 			BROWN (7.5YR4/4) FINE							
5		5	2	1.8	0.2	SP	WELL SORTED WELL ROU						`⊗4	6
-						1								
<u> </u>														
A	TER LI	EVEL	:		BOR	ING RTED:	6-26-91	BORING COMPLETED: 6-26	-91	REM/	RKS			
						GED	•							
/ <b>A</b> 1	ER LE		•		-		George Hudak	RREM,Inc.						
1		_ + L_L	•		DRIL	LING	COMPANY/DRIL			SIGN	ED:			
							GME/Jamie	Tuura						

PROJECT:					gatio	n	CLIENT: WISCONSII	1 DNF	2			<b>CT No.</b> 14	
DRILLING HOLE DIA			41,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin			SHEET 2	No. of 2	
BORING N	UMBE	R-LO	CATIO	N: SE	3-5		, 100,00, 100,00, 100,000,0	<del></del>			ATE:	6-16-	-91
оертн (гт)	SMIPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	OF MATERIAL		-	(BL.0	WS/FT	-	
	6	2	1.8	·		BROWN (7.57R4/4) MEDIUM TO	COARSE GRAINED SAND DIUM GRAINED WELL SORTED WELL	· · ·	10 1 6 ⊗	20	30		
						ROUNDED SAND; TRACE <0.5CM	PEBBLES						
5	7	2	1.8	0.0	SP	WELL ROUNDED SAND; TR WATER AT 34' LAB SAMPI	to med grained well sorted, Ace 0.3–0.5cm pebbles e wet	90	S				
						end of Boring							
o					:								
5					i								
0  													
											1		
5													
VATER L	VEL:	1	<u></u>	BOR STA		6-26-91	BORING COMPLETED: 6-26	-91	REM	ARKS		t	<u>_</u>
					GED								
VATER LE	1/51 •			L									

# RREM Inc.

DRI HOL	LLING E DIA	Rei METH METE	medi IOD: R:	<u>ial In</u> 4 1,	vesti /4"	gatio HSA	n	WISCONSIN SITE LOCATION: Webster Wisco		9114 SHEET No. 1 of 2
BOł	RING M	NOWR	LK-L(		SB-6	6: B	EHIND POST OF	FICE ON SOUTH SID	E OF ALLEY	<b>DATE:</b> 6-26-91
AEBTU (ET)		SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D READING (PPM)	soil groups Symbol (USCS)	DESCRIPTION SURFACE ELEVATIO	OF MATERIAL	-	RD PENETRATION DLOWS/FT)
		(7)	5	50	u. 02	мн	RED BROWN SILTY-CLAY BLACK SANDY SILT AND	-sand with gravel	10 20	30 40 80
5 -	$\square$	1	2	1.3	0.3	CL	RED-BROWN SANDY SILT LIGHT BROWNISH GREY (1	AND CLAY FILL OVR6/2) TO DARK GREYISH	13⊗	
							BROWN (10YR4/2) MOTTL GRAINED BLACK SAND, W	0YR6/2) TO DARK GREYISH ED CLAY WITH 1–2% LOCAL FINE AK RED STREAKS PRESENT		
10 <u>-</u>		2	2	1.5	1.0	SP	BROWN (7.5YR4/4) FINE	TO MEDIUM GRAINED WELL		
							Sorted Well Rounded	JANAT		88
		-						· · · · · · · · · · · · · · · · · · ·		
15		3	2	1.5	0.3	SP	BROWN (7.5YR4/4) FINE Sorted Well Rounded	TO MEDIUM GRAINED WELL SAND	26	∞
· · · · ·										
20	• • •	4	2	1.6	0.3	SP	BROWN (7.5YR4/4) FINE WELL SORTED WELL ROU 1% 0.5-1.0CM ROUNDED	to medium grained Inded Sand; ) pebbles	178	
25	•	5	2	1.8	1.8	SP	BROWN(7.5YR4/4) MED- Well Sorted Sand With BROWN (7.5YR4/4) FINF	COARSE GRAINED WELL ROUNDED 1 2% 1–2CM PEBBLES AT BASE MED GRAINED	16 ⊗	
							WELL SORTED WELL ROL	NDED SAND		
30-	• •					 SP	BROWN(7.5YR4/4) MED-CO	ARSE GRAINED WELL ROUNDED 3–5% 0.5–1.0CM PEBBLES AT BASE		
WATE	R LE	EVEL		I	BOR STA	L	6 26 01	BORING COMPLETED: 6-26-	178  -91 <b>REMARH</b>	<pre></pre>
					LOG	GED	<b>BY:</b> George Hudak	/RREM,Inc.		
WATE	R LE	VEL:				LING	COMPANY/DRIL		SIGNED	•

<b>L_1</b> 44	OJECT:					gatio	n	CLIENT: WISCONSIN	N DNR	PROJECT No. 9114
	lling Le dia	METH	OD:	4 1,		E		SITE LOCATION: Webster Wisco	onsin	SHEET No. 2 of 2
BO	RING N	IUMBE	R-LC	OCATIO		SB-6	5	Language	<u> </u>	DATE: 6-26-91
	UEPIH (F1)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D Reading (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	-	ARD PENETRATION BLOWS/FT) 0 30 40 80
-		6	2	1.8	0.1	SP	BROWN (7.5YR4/4) MED-COARS Sand With 3-5% 0.5-1.0CM w	e grained well sorted well rounded Ell rounded pebbles	178	
		7	2	1.8	2.7	SP	BROWN (7.5YR4/4) FINE T Well Rounded Sand With Saturated Lab Sam	0 med grained well sorted Trace 0,5—1,0 cm pebbles ple		⊗ 32
							end of Boring			
5-										
00 										
		l								
 5										
-						_				
;o										
NATI	ER LI	EVEL	:		BOR	ING RTED:	6-26-91	BORING COMPLETED: 6-26	-91 REMAR	KS:
					L	GED				

# RREM Inc. FIELD EXPLORATORY BORING LOG

BC		UMB	ER-LO	DCATIC		B-7:		Webster Wisco S 91-5A & 91-5E DN IN FRONT OF AN	ON			1 0 .TE: 7-	-16-9	91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	PM)	JUPS (USCS)		N OF MATERIAL		⊗ STAN	<b></b> _		ATION	50
-		1	2	18	0.5	SP	6" Blacktop Dark Reddish Brown	(5YR3/4) FINE TO MED GRAINED				- 1188		
_		,	2		0.0	SP	SAND WITH GRAVEL FILL LIGHT BROWN (7.5YR6/	<u>GRAVEL 5-15%, 0.5-2CM DI</u> 4) FINE TO MED GRAINED SAND	A	⊗11				
- 5 -		2	2	2.0		CL	FILL WITH TRACE CLAY GREYISH BROWN (2.5YF				_ ⊗2	6		
		2				SP	REDDISH BROWN (5YR4 Well sorted well ro	/4) FINE TO MEDIUM GRAINED UNDED SAND TRACE 2% CLAY	-					
_			2	1.8	0.4							28		
 10_		3	2	1.8	0.2		ROUNDED WELL SORTED	e to medium grained well ) Sand Lab Sample		8	18			
_			2	1.7	0.2					81	6			
			2	1.8	0.3					8	19			
15	-	4	2	1.7	0.2	SP				8	18			
<u> </u>			2	1.8	0.3					8	19			
 20	• • •	5	2	2	0.1		BROWN (7.5YR4/4) FINE WELL SORTED SAND WITH	TO MED GRAINED WELL ROUNDED TRACE 1% 0.2–0.4 CM PEBBLES			824			
20— —			2	1.8	0.3	SP	ROUNDED SAND GRADAT	E TO COARSE GRAINED WELL IONAL CONTACT WITH ABOVE			\$22			
			2	1.7	0.4	SP	COARSE SAND GRAINS BROWN (7.5YR4/4) FIN ROUNDED WELL SORTED	e to med grained well	-	Ø	/ 920			
 25		6	2	1.8	0.0		brown (7.5yr4/4) fine	GRAINED WELL ROUNDED WELL		ø13				
_			2	1.8	0.1	SP	Sorted Sand Brown (7.5yr4/4) Fin Rounded Well Sorted	e to medium grained well	-	\$10				
		7	2	1.8		SP			- &	/  				
30_	• • •	,		1.0	0.2	SP	ROUNDED WELL SORTED SAN MODERATELY WELL ROUNDED	ded fine to med grained well ) with med to coarse grained Sand and gravel, beds 6° thick						
TAW	ER LE	EVEL	:			RTED:		BORING COMPLETED: 7-18	-91	REMA 91–5A 91–5B	SCREE	N 69 30- N 69 65-		

	OJECT:	_Rer	<u>medi</u>			gatio	n	CLIENT: WISCONSIN	N DNF	2	P		<b>T No.</b> 14	
	ILLING LE DIA			4 1	/4"	HSA		<b>SITE LOCATION:</b> Webster Wisco	nsin		S	HEET 2	No. of 3	
BO	RING I	UMB	ER-LO	OCATIC	)N:	SB-7	7				D/	TE:	7-16-	91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	Q	9 STA1	IDARD (BLOW		TRATION	50
	•		2	2	0.3	SP	BROWN (7.5YR4/4) INTE WELL ROUNDED WELL SO	RBEDDED FINE TO MED GRAINED ORTED SAND WITH MED TO	86					
▼		8	2	1.8	0.1		COARSE GRAINED MODEL AND GRAVEL INDIVIDUA	RATELY WELL ROUNDED SAND	85					
35 <b>—</b>			2	1.4	0.9		BROWN (7.5YR4/4) FINE	to medium grained well Sand Lab Sample 38'-40'	  ⊗3					
			2	1.8	1.4									
									8&		_			
10-		9	2	2	2.6					× X	17			
_			2	1.3	7.0								838	
		10	2	1.0	1.0	SP	ROUNDED WELL SORTED BROWN TO BLACK SAND	TO MEDIUM GRAINED WELL Sand With Trace 1% Dark Patches 0.2–0.5cm diameter						3 4 9
45 <u>-</u>		11	2	1.8	1.7						82	5		
-		12	2	1.9	6.5		BROWN (7.5yr4/4) Fine T Well sorted sand with 1	0 Med grained well rounded [race –1% black to white						3 49
50_			2	1.5	8.4		COARSE SAND / SM PEBB	LES 0.1-0.2CM DIA Grained Well Rounded Well Sorted -0.3CM PEBBLES; 1-2% COARSE SAND			33	5 8		
_		13	2	1.6	4.1		BROWN (7.5YR4/4) FINE	TO MEDIUM GRAINED WELL SAND WITH TRACE COARSE			ø	28		
_		14	2	1.5	1.6		SAND. NU PEDDLES				\$21			
55-			2	1.2	5.6		BROWN (7.5YR4/4) FINE WELL SORTED SAND WIT	-MED GRAINED WELL ROUNDED H 1–3% COARSE SAND				×	34	
		15	2	1.8	3.2	SP		iedium sand with 3-5% 0.5-0.7Cm						45
			2	1.6	9.7	SP	BROWN (7.5YR4/4) FINE ROUNDED WELL SORTED	TO MEDIUM GRAINED ROUNDED				-		\$ 6
50 <u></u>										DEM	DVC:			
	ATER LEVEL:					RTED:		BORING COMPLETED: 7-18 /RREM,Inc.	-91		<b>ARKS:</b> ) Rotary	' Drilli	NG BELOW	40'0
WATI	ATER LEVEL:													

PROJECT					gatio	<u> </u>	CLIENT: WISCONSI		10		PROJEC	<b>T No.</b> 14	<del></del>
DRILLING HOLE DV	METH	OD:		/4"			SITE LOCATION: Webster Wisco	onsin			SHEET 3	No. of 3	
BORING	NUMBI	ER-LO	OCATIO	)N:		7	· · · · · · · · · · · · · · · · · · ·				DATE:	7—16—	91
DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	I OF MATERIAL		-	<b>(</b> BL(	ows/ft)		
	16,17	2		10.5			TO MEDIUM GRAINED WELL		10	20	30	40	<b>90</b> (* 66
-							SAND LAB SAMPLE 60'-62'						
	17	2	1.7	15.0									\$69
65 <b></b>	18	2	1.7	20.0	SP	LAB SAMPLE 64'-6	66'						\$76
		2	1.6	19.0									\$ 69
70	19	2	1.8	5.0							34⊗		
_						END OF BORING							
_													
 75													
		5											
30													
35													
 90 <b></b>													
WATER L	EVEL		<u> </u>	BOR		7-16-91	BORING COMPLETED: 7-18		REM	ARKS	<u> </u>		-L
					GED								
WATER L	EVEL	:		DRII	LING	COMPANY/DRIL			SIGN	IED:			
						GME/Jamie							

PR	OJECT:					gatio	······································	CLIENT: WISCONSIN			PROJEC 91		
	ILLING LE DIA	METH	IOD:		/4"			<b>SITE LOCATION:</b> Webster Wiscor	nsin		SHEET 1	<b>No.</b> of 2	
BO	RING N							ON SOUTH SIDE OF EON IN FRONT OF B	KE_SHC		DATE: 7	/-08-	-91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	soil groups Symbol (USCS)		OF MATERIAL	85	TANDARD (BLO	) penet WS/FT)		N
		<i>v</i>	S	35		00 	SURFACE ELEVATIO	N	10	20	30	40	80
			ļ	ļ	3.9	SP		ND GRAVEL FILL TRACE SILT					
	$\overset{\vartriangle}{\longrightarrow}$					CL	LIGHT BROWNISH GREY (10YR5/4) MOTTLED CL	(10YR6/2) TO WEAK RED Y & SILT			i i i		
5 <b>—</b>		1	2	1.8	4.3	SP	· · · · · · · · · · · · · · · · · · ·	TO MEDIUM GRAINED WELL			34⊗		
							BROWN (7.5YR4/4) FINE	TO MEDIUM GRAINED WELL				1997	
10 <u>-</u> 		2	2	1.8	4.6	SP	Sorted Well Rounded ODD 0.5-1.0cm Pebble	SAND, TRACE COARSE SAND			\$ 3:	2	
15 <u>-</u>		3	2	1.8	4.7	SP		TO MEDIUM GRAINED WELL SAND, TRACE COARSE SAND S		24 🛇			
  20		4	2	1.7	4.7	SP		dium to coarse grained Sorted Sand With 5–10%		⊗2	2		
								to medium grained well rounded					
25 <b>—</b> — —		5	2	1.8	4.1	SP	WELL SORTED SAND				× 	35	
30-		6	2	1.8	3.5	SP	BROWN (7.5YR4/4) ME ROUNDED WELL SORTE(	DIUM TO COARSE GRAINED WELL ) SAND			8	35	
WAT	ER LI	EVEL	•	<b></b>	L	RTED		BORING COMPLETED: 7-09-	-91 RE	MARKS	PID USE		
						GED	<b>BY:</b> George Hudak	/RREM,Inc.		SAMPLES OVA WOU WELL 91-	ld not c	alibrate	<u> </u>
WAI	ER LE	YEL			DRI	LING	COMPANY/DRIL	I FR:	SI	GNED:			

PROJECT:					gatio	n	CLIENT: WISCONSIN		2		<b>PROJE</b> 91	<b>T No.</b> 14	
DRILLING HOLE DI	METH	10D:	4 1,			<u></u>	SITE LOCATION: Webster Wisco	nsin			SHEET 2	No. of 2	
BORING	NUMB	ER-LO	OCATIO	N: s	SB-8						DATE:	7-08-	91
оертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	Soil Groups Symbol (USCS)	DESCRIPTION	I OF MATERIAL	Q	3 stat		) PENE WS/FT	TRATION )	
<b>ö</b>	2	3	25	ᄕᄚ	30	SURFACE ELEVATIO	N		10	20	30	40	80
				7.0		Brown (7.5yr4/4) Medium	to coarse grained well rounded						
	7	2	0.9	3.2	SP	WELL SORTED SAND	LAB SAMPLE SATURATED		8	16			
	8				SP	BROWN (7.5YR4/4) FINE WELL SORTED SAND TF	MED GRAINED WELL ROUNDED ACE 1% COARSE GRAINED SAND						
-						end of boring							
<u> </u>					 								
ATER L	EVEL	.:		<u> </u>	RING RTED: GED		RREM,Inc.	-91	REMA			REENED 30	)'—40
ATER LI	EVEL	;		DRII	LING	COMPANY/DRIL	·		SIGN	ED:			
						GME/Jamie							

## RREM Inc.

consultin					<u> </u>	LLD LAF		SURING	
PROJECT					gatio	n	CLIENT: WISCONSIN	DNR	PROJECT No. 9114
DRILLING HOLE DI	METH	IOD:		/4"	<u> </u>	,	SITE LOCATION: Webster Wisco	nsin	SHEET No. 1 of 3
BORING			DCATIO			WELL 91-3 AIN ST ON PIKE	APPROXIMATELY 300'		DATE: 7-22-91
		ш		[		AIN SI UN PIKE			
оертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D READING (PPM)	soil groups Symbol (USCS)	DESCRIPTION	N OF MATERIAL	-	RD PENETRATION BLOWS/FT)
		5	S.C.	1.0		BLACK SANDY SILT TOP	SOIL, TRACE CLAY; 3-5%	10 20	30 40 50
_					SM	NOUTEETS, DAmi			
	1 	2	1.8	0.3	SM CL	LIGHT BROWNISH GREY	8) SILTY SAND WITH TRACE CLAY (10YR6/2) SILT & CLAY WITH	⊗6	
5 - / /	2	2	1.8	1.7	SM	Yellowish Red (5yr5/ Yellowish Red (5yr5/ Well Sorted Well Ro	6) FINE TO MEDIUM GRAINED UNDED SAND WITH LOCAL		25
_		2	1.8	8.5		CONCENTRATIONS OF CI REDDISH BROWN (5YR4)	AY; CLAY 2-5% (4) FINE TO MEDIUM GRAINED		
	3	2	1.7	2.0	SP	SAND W/ 1% CLAY; MO	isf; gradational lower contact /4) fine to medium grained		836
10*	<u> </u>	2	1.8	0.7	SP		1-2%; 0.2-0.4CM PEBBLES;		34⊗
_					SP		/4) FINE TO MEDIUM GRAINED UNDED SAND NO CLAY; DRY		
	. 4	2	1.8	1.1		WELL SONIED WELL NO	UNDED SAND NO CEAT, DRI	240	
15 <b></b>	5	2	1.9	0.2	SP	REDDISH BROWN (5YR4,	/4) FINE GRAINED WELL SORTED	2	78
-	-	2	1.8	0.3	5		HARD SILTSTONE FRAGMENTS /4) FINE TO MEDIUM GRAINED		⊗33
	6	2	2.0	0.1	SP	WELL SORTED WELL RO	JNDED SAND; 18'-21' & FG SAND, TRACE PEBBLES	817	
20		2	1.8	0.3		0.2-0.4CM	4) medium to coarse grained tely sorted sand; 3–5%	S 1	9
	· <b> </b> _	2	2.0	0.2	SP	WELL ROUNDED MODERA Coarse Sand With 1% White to black pebbli	0.2-0.3CM WELL ROUNDED	244	
25-						REDDISH BROWN (5YR4/	(4) FINE TO MEDIUM GRAINED INDED SAND; TRACE COARSE		
		2	1.9	0.1		SAND	MULU UNIU, INNUL UURIUL		⊗ 25
	·	2	1.8	0.4					\$ 30
 30	8	2	1.9	0.0				178	
WATER L	.EVEL	:	<u> </u>	BOF		6-26-91	BORING COMPLETED: 6-26		
					RTED:		COMPLETED: 6-26	j WELL	91-3 N @ 35-60'
WATER L	FVFI	•				George Hudak	/RREM,Inc.		
	.∟₹⊑	•		DRI	LING	COMPANY/DRIL		SIGNED	:
				1		GME/Jamie	luura		

PROJECT					gatio	n	UENT: WISCONSIN	I DNR		PROJEC 91	14	
drilling Hole Di	METER	र:		/4"		S	<b>TE LOCATION:</b> Webster Wisco	nsin		SHEET 2	No. of 3	
BORING	NUMBE	ER-LO	OCATIC	N: S	B-9					DATE: 7	7-22-	91
depth (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE Recovered	F I D Reading (PPM)	soil groups Symbol (USCS)	DESCRIPTION O	f material	Ø S	TANDARI (BLC	) penet DWS/FT)		
ð	ري ال	₹	25	ᇿᅏ	30	SURFACE ELEVATION		10	20	39	40	<b>80</b>
	•	2	1.8	0.2	SP	BROWN (7.5YR4/4) FINE TO SORTED WELL ROUNDED SAN			8	26		
	9	2	1.8	0.0		LAB SAMPLE SATURATED			Ø 19			
		2	0.6	0.0		BROWN (7.5YR4/4) FINE TO WITH 1-2% COARSE SAND.	WET, GRADATIONAL CONTACT	\$6				
	10	2	1.0	0.1	SP	with above. Sand well r	ounded, well sorted	<b>&amp;</b> 6				
									_			
		2	1.3	0.4	SP	BROWN (7.5YR4/4) WELL RC TO COARSE GRAINED SAND (	(5—10%); WET	17	×			
	11	2	1.8	9.6	SP	BROWN (7.5YR4/4) FINE TO ROUNDED WELL SORTED SAN SAND WITH 5% MEDIUM GRAI	MEDIUM GRAINED WELL ID MAINLY FINE GRAINED NED SANDY LAB SANDLE					<b>3</b> \$8 6
-		2	1.2	1.6		BROWN (7.5YR4/4) FINE TO 0.1-1CM REDDISH BROWN S	MEDIUM GRAINED SAND, ILITSTONE PEBBLE PRESENT	138				
	12	2	1.6	0.3		More medium grained san	d than above	(	\$ 16			
	1	2	1.2	5.0		46'-48' TRACE COARS	se sand			8 29		
	13	2	1.2	1.6	SP	48'-52' 1-2% 00489	e sand; matrix mainly				35	
		2	1.4				NED SAND TRACE 0.1-0.2CM		6			
			 							25		
	14	2	1.8	1.2		53'-53'6" 5% 0.1-0.1	2CM FLATTENED PEBBLES				<b>8</b> 40	
		2	1.6	11.0							Ø 42	2
	15 2 1.7		4.0		BROWN (7.5YR4/4) VERY FIN WELL ROUNDED WELL SORTED				829			
-	2 1.8				SP	59'-59'3" 3% 0.2-0 Black peb	3MM OVAL TO ROUNDED BLES			⊗ 3:	2	
TER L	EVEL			BOR	ING RTED:	7-22-91	BORING COMPLETED: 7-24-	-91 <b>RE</b>	MARKS MUD ROT	<b>s:</b> Tary drill	JNG BELO	W 38'
				LOG	GED	BY:	REM,Inc.					

GME/Jamie Tuura

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	NECT:	Rer	medi			gatio	n	CLIENT: WISCONSIN	DNR			14	
	LLING E DIA			41,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin		SHEET 3	<b>No.</b> of 3	
BOF	RING N	UMB	ER-LO	CATIO	N:	SB-9	9			ſ	DATE:	7-22-	91
ענפעה (כנן)		SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	(8) ST/		) PENE WS/FT) 30	TRATION	50
		16	2	†	2.2		BROWN (7.5YR5/2) SILT	WITH TRACE VERY FINE SAND			T		8 49
			2		1.2	МН	SATURATED 63'0"-63'3" TRACE RED LAB SAMPLE 60-'62'	dish brown clay in lenses				84	4
55		17	2		0.2						Ø		
_			2	<u> </u>						4	25		
				1.0		SP	SILT: SILT CONTENT DE	TO FINE SAND WITH TRACE 2% CREASES WITH DEPTH WET NIT; LAB SAMPLE 68'-70'			20	i i	
70-	· · · · · · · · · · · · · · · · · · ·	18	2	2.0	0.8	 			\$10				
							END OF BORING						
											1		
75 <u>-</u>													
30-													
_													
35-													
_													
90													
WATE	TER LEVEL:			1	ING RTED: GED		BORING COMPLETED: 7-24-	-91 <b>REN</b>	IARKS	•			



### FIELD EXPLORATORY BORING LOG

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	OJECT:	Re	medi	ial In	vesti	gatio	n	CLIENT: WISCONS	IN DNR		<b>JECT No</b> 9114 ET No.	ł <b>.</b>
но	LE DIA	METE	R:	•	/4"	HSA		Webster Wisc	onsin		<u>1</u> of	2
80	RING N Se	<b>10MB</b> 3 – 10	ER-L( ): (	OCATIC ON R	<b>)n:</b> Railr	OAD	GRADE APPROX	300' EAST OF MU	NICIPAL BLD	G	6-25	5-91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D Reading (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	& STAN	idard pe (Blows,		ON
			Ø		0.9	SM		ED FINE SANDY SILT AND	10	20 3	0 40	- 80
	$\sim \Delta - 2$							n				
		2	2	2	0.0	CL SP	BLACK SAND LOCAL WÉAK BROWN (7.5YR4/4) FINE T	YR4/2) MOTTLED CLAY WITH 2–3% ( RED (10YR5/4) STREAKS PRESED D MED GRAINED WELL SORTED	<u>v</u> ∎ ⊗12			
							Well Rounded Sánd					
 10			2	2	0.8	SP	BROWN (7.5YR4/4) FINE SORTED AND WELL ROU	TO MEDIUM GRAINED WELL		18		
_	· · · · · ·						SURIED AND WELL ROOM	10LD SAND, MUISI	-			
15		4	2	1.9	0.4	SP		) med grained well sorted wel Y coarser grained 14'0''-14'6'				
<b>.</b>												
	• • •				0.0		BROWN (7.5YR4/4) FINE T	O MED GRAINED WELL SORTED				
		5	2	1.5	0.0	SP	9 19'6 -20'6 TRACE 0.	TO COARSE GRAINED SAND LENS 5-1.0CM ROUNDED PEBBLES	- 188			
25 <u> </u>	•.•	6	2	1.5	0.0	SP	Well Rounded Sand T	) MEDIUM GRAINED WELL SORTED RACE 0.5–1.0CM WELL ROUNDED BBLES (PORPHYRITIC RHYOLITE)	200			
	· · · · · ·											
 30		7	2	1.6	0.4	SP	BROWN (7.5YR4/4) FINE GRAINEL WELL SORTED WELL ROUNDED SA	) to med grained No				846
WAT	ER LE	EVEL	*	-	BOR		<u> </u>		5-91 <b>REMA</b>	RKS:		
					LOG	GED	BY: George Hudak	/RREM,Inc.				
WATI	ER LE	VEL			DRII	LING	COMPANY/DRIL	· · · · · · · · · · · · · · · · · · ·	SIGNI	ED:		·
							GME/Jamie					

PROJECT:	Rer	nedi			gatio	<u>n</u>	CLIENT: WISCONSI	N DNI	R		911	4
DRILLING HOLE DIA			41,	/4"	HSA		SITE LOCATION: Webster Wisco	onsin		SH	i <b>eet n</b> 2	<b>o.</b> of 2
BORING N	IUMBE	R-LC	CATIO	N:	SB-	10	ler		<u> </u>	DA	<b>TE:</b> 6-	-25-91
DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D Reading (PPM)	SOIL GROUPS SYMBOL (USCS)	SURFACE ELEVATIO			8 STAN 10	IDARD (BLOW		40 50
	7	2	1.6	0.4	SP	BROWN (7.59R4/4) FINE GRAINE Well sorted well rounded s	) TO NED CRANED ND					<u></u>
<b></b>	8	2	1.5	0.1	SP	BROWN (7.5YR4/4) FINE-M ROUNDED SAND; 1-2% MET SAND-SIZED BLACK BASALT	EDIUM GRAINED WELL SORTED WELL NUM-COARSE GRAINED FRAGMENTS. LAB SAMPLE			298		
						end of Boring						
									нин, се е е е е е е е е е е е е е е е е е е			
									1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 - 1979 -			
									n an			
ATER LI	VEL	:			RTED:		BORING COMPLETED: 6-25	5-91	REMA	RKS:	<u></u>	
						George Hudak	/RREM,Inc.		[			

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Community Spectra

V-Vergers (-). Num



				4 1,		лол ———		Webster Wisco	nsin		<u> </u>		of 2	
 BO	RING N	олия 58—1				ST O	F LARGE STORA	GE TANK ON RAILRO	AD GF	RADE	D	ATE: 6	-25-	-91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	OF MATERIAL			(BLOV	WS/FT)		
		1			2.0	SM	VERY DARK GREY (10YR3/	1) To light brownish grey ) Clay Fill with gravel. Surface 0.5–5.0cm well rounded pebbles		10	20	30	40	50
5		2	2	1.4	0.0	CL SP	GREY (10YR6/2) MOTTLE GRAINED BLACK SAND 5'10"-6'0" BROWN (7.5	10yr4/2) to light brownish d clay with 1–2% fine (r4/4) fine to gorted well rounded sand		⊗13				
 10		3	2	1.5	0.1	SP	BROWN (7.5YR4/4) FINE Sorted Well Rounded	to medium grained well Sand				⊗ 31		
		4	2	1.3	0.0	SP	BROWN (7.5YR4/4) FINE Sorted Well Rounded	to medium grained well Sand			290	8		
20		5	2	1.5	0.1	SP	BROWN (7.5YR4/4) FINE Sorted Well Rounded Local Medium to coa	to medium grained well Sand RSE grained sand lenses			⊗22	2		
 25		6	2	1.5	0.0	SP	BROWN (7.5YR4/4) FINE SORTED WELL ROUNDED	to medium grained well. Sand			⊗23	3		
WAT	ER LE	EVEL:						BORING COMPLETED: 6-25	-91	REMA	RKS:			
WATI	ER LE	EVEL:				LING	COMPANY/DRIL GME/Jamie 1	LER:		SIGNE	ED:	2.2		

DRILLING ME	emedi		NR vestig	natio	n	CLIENT: WISCONSI	N DNR	PROJECT No. 9114	
HOLE DIAME	THOD:	4 1/			10	SITE LOCATION: Webster Wisc	onsin	SHEET No. 2 of 2	<b>_</b> _
BORING NUN	IBER-LC	OCATIO		SB-1	1	4 <u>466</u> , 1997, 199		DATE: 6-25-	91
DEPTH (FT) SAMPLE No.	1 [ ]	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	(	ARD PENETRATION BLOWS/FT)	50
	7 2	1.8	0.0	SP	BROWN (7.5YR4/4) FINE SORTED WELL ROUNDED GRAVEL CONSISTING OF SHORE VOLCANIC PEBBL	E TO MEDIUM GRAINED WELL SAND COARSE SAND WITH 0.5—2.0CM ROUNDED NORTH ES (RHYOLITE)	158		
36	3 2	1.5	0.3	SP	BROWN (7.5YR4/4) FINE T ROUNDED SAND SATURA END OF BORING	0 med grained well sorted wel Ted from 35'-36' lab sample	- \&13		
40									
  45									
  50									
			1999,	:					
55 									
WATER LEVE	EL:			ING RTED GED		BORING COMPLETED: 6-25 /RREM.Inc.	5-91 REMAR	KS:	

6

Pr	ROJECT:					gatio	n	CLIENT: WISCONSIN	I DNI	र	P	ROJECT 9114		
	RILLING DLE DIA	METH	IOD:	4 1,				SITE LOCATION: Webster Wisco	nsin		s	HEET No 1 of		
	RING N			OCATIO	N:	SB-	12: NW CORNE	ER MAIN & MINNOW			D,	ATE:	19-	- 91
	DЕРТН (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS	DESCRIPTION SURFACE ELEVATIO	I OF MATERIAL	(	8 STAP		PENETR/ VS/FT) 30	ATION 40	50
							sand (fill)							
   -		1	2	2	0.0	SP	BROWN (7.5YR4/4) MED- ROUNDED AND WELL SOR		58					
-  10		2	2	2	1.5	SP	BROWN (7.5YR4/4) MED WELL SORTED SAND, TRA	-FINE GRAINED WELL ROUNDED ICE FINE GRAVEL LAB SAMPLE				<b>\$</b> 30		
  15 		3	2	2	0.0	SP	BROWN (7.5YR4/4) MED ROUNDED AND WELL SO	-FINE GRAINED WELL RTED SAND		\$11				
_  20 		4	2	2	0.3	SP	BROWN (7.5YR5/5) FINE SORTED SAND WITH PAR GRAINED WELL ROUNDED	GRAINED WELL ROUNDED WELL ALLEL BEDDING. THIN 2" COARSE WELL SORTED SAND LENS				<b>⊗</b> 34		
 25 		5	2	2	0.0	SP	BROWN (7.5YR4/4) MED ROUNDED AND WELL SOF	-FINE GRAINED WELL RTED SAND		814				
 30														
WAT	WATER LEVEL: BORING STARTED: 6-19-91 LOGGED BY: Brian Hoyden							BORING COMPLETED: 6-19	-91	1 REMARKS:				

ATER LEVEL: DRILLING COMPANY/DRILLER: GME/Jamie Tuura

PR	OJECT:					gatio	n	CLIENT: WISCONSI	N DNF	2	F	PROJEC 91		
	ILLING ILE DIA	METH	IOD:		/4"		- <u></u>	SITE LOCATION: Webster Wisco	onsin			SHEET 2	No. of 2	
BC	RING	IUMBI	ER-L(	DCATIC	N:	SB-	12		· · · · · · · · · · · · · · · · · · ·			ATE: 6	5-19-	-91
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F 1 D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	I OF MATERIAL	6	3 STAN		PENET WS/FT) 30	RATION	50
		6	2	2	0.0	SP	BROWN (7.5YR4/4) MED ROUNDED AND SORTED	IUM GRAINED SAND WELL NITH 2" COARSE GRAINED LENS	-	168		1	1	
 35		7	2	2	0.0	SP	BROWN (7.5YR4/4) MED	GRAINED WELL ROUNDED WELL TED LAB SAMPLE	-	\$				
-	<u></u>						END OF BORING							
40														
45— 														
			i i			-								
-00														
 55														
														-
60_														
WAT	ER LI	EVEL	.:		BOR		. 6–19–91	BORING COMPLETED: 6-19	-91	REMA	ARKS			
					<u></u>	GED	BY:	COMPLETED.	{					
WAT	ER LE	EVEL	:		-	· <u></u>	Brian Hayden,						<u> </u>	
					DRIL	LING	COMPANY/DRIL GME/Jamie			SIGN	ED:			



# RREM Inc. FIELD EXPLORATORY BORING LOG

	LE DIA RING N			DCATIC				Webster Wisco BUILDING DRIVEWAY A INICIPAL WELLS 1 &	PPRO	X.	DATE	1 of 2 : 6–24	
	ОЕРТН (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F   D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	Ø	_	ARD PE BLOWS/	NETRATIC (FT)	DN
			/S	S R	0.0	мн		WAY FILL, RED-BROWN FINE TO		10 2	20 30	40	50
5		1	2	1.5	0.0	CL B/	BROWN (10YR4/2) MOT	TO MEDIUM GRAINED WELL		18⊗			
  10		2	2	1.5	0.0	SP	BROWN (7.5YR4/4) FINE SORTED WELL ROUNDED	e to medium grained well sand			⊗25		
  15		3	2	2	0.4	SP	BROWN (7.5YR4/4) FINE SORTED WELL ROUNDED	e to medium grained well Sand		ø12			
		4	2	1.3	0.2	SP	BROWN(7.5YR4/4)MED TO	COARSE GRAINED WELL SORTED WELL GRAINED SAND LENS @ 20'-20'2'		⊗12			
25		5	2	1.6	1.2	SP	SORTED WELL ROUNDED	. To medium grained well sand	100				
30	ER LI				BOR			BORING	T	REMAR			
VYA I		_VEL	•		STA	RTED:		COMPLETED: 6-24-	-91				

BORING NUMBER-LOCATIO	/4" HSA          N:       SB-13         (Mdd)       SSG025         Sd0025       JOS         SURFACE       ELEVATION         0.4       SP         BROWN       (7.5YR4/4) FIN         WELL       SOURTED         1-3CM       WELL	NE TO MEDIUM GRAINED DUNDED SAND WITH 1-2%	⊗ STANDAR	SHEET No. 2 of 2 DATE: 6-24-91 RD PENETRATION LOWS/FT) 30 40 50
DEPTH     Image: Figure F	(Wdd) ONUS U U U U U U U U U U U U U	ON VE TO MEDIUM GRAINED DUNDED SAND WITH 1-2%	(BL 10 20	6-24-91 RD PENETRATION LOWS/FT)
H BEATH H B	0.4 SP BROWN (7.5YR4/4) FIN WELL SORTED WELL ROUNDED	ON VE TO MEDIUM GRAINED DUNDED SAND WITH 1-2%	(BL 10 20	LOWS/FT)
6       2       1.6         35       7       2       1.6         40       1       1       1         40       1       1       1         40       1       1       1	1-SCM WELL ROUNDEL	VE TO MEDIUM GRAINED DUNDED SAND WITH 1-2% D PEBBLES		
	1.0 SP BROWN (7.5YR4/4) FIN			
	SURIED WELL ROUNDED	IE TO MED GRAINED WELL D SAND; SATURATED; LAB SAMPLE	108	
45	END OF BORING			
WATER LEVEL:	BORING STARTED: 6–24–91 LOGGED BY:	BORING COMPLETED: 6-24-9	91 REMARK	S:
WATER LEVEL:	George Hudal	·	SIGNED:	



consulting engineers

PR	ROJECT							CLIENT: WISCONSIN			ECT No.	
	RILLING			al In	vesti	gatio	n	SITE LOCATION:		9 SHEET	114	
	DLE DIA			41,	/4"	HSA		Webster Wisco	nsin		of 2	
BC	RING	NUMB	ER-L(							DATE:	6-19-	.01
		[	<b>I</b>	SE	<u>s - 14</u>	: wi	ELL 91-1 WEST	OF FERRELLGAS O	n minnuw T		0-19-	
	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION	I OF MATERIAL		BLOWS/F	Τ)	
	$\overline{V}$		S					····	10 2	0 30	40	50
		ļ	-			CL	DARK TELLUWISH DROWI	N (10YR4/4) SILTY CLAY				
	$\left\langle \right\rangle$											
		· 1	2	2	1.3	SP	BROWN (7.5YR4/4) MED	GRAINED WELL SORTED WELL	2	278		
					1.0		Rounded Sand					
10—		2	2	2	0.5	SP	BROWN (7.5YR4/4) MEL ROUNDED SAND	) grained well sorted well		\$29		
_								, , <u>, ,</u> , , , , , , , , , , , , , , ,				
—												Ì
 15		3	2	2	0.5	SP	BROWN (7.5YR4/4) COA	RSE GRAINED ROUNDED		27⊗		
			~	~	0.0		SORTED SAND					
			-				RROWN (7 AYRA /A) COA					
20—	•••	4	2	2	0.7	SP	BROWN (7.4YR4/4) COA SORTED SAND WITH TRA CLAST SANDSTONE & SI	CE (2CM) FINE GRAVEL	16⊗			
				1								
 25		5	2	2	0.0	SP		RSE GRAINED ROUNDED &		826		
							SORTED SAND					
_												
30												
WAT	ER L	evel	.:		BOR		6-19-91	BORING COMPLETED: 6-19-	-91 REMAR	KS:		
						RTED:		COMPLETED:		91-1 en @	30-40	,
							Brian Hayden/	RREM,Inc.			00 70	
WAT	'ER LI	EVEL			DRIL	LING	COMPANY/DRIL		SIGNED	):		
							GME/Jamie					

PR	OJECT:					gatio	n	CLIENT: WISCONSIN	N DNR		PR	OJECT 911		
	ILLING LE DIA	METH	10D:		/4"		10000 August 10000	SITE LOCATION: Webster Wisco			SH	EET N 2 o	lo. of 2	
	RING			OCATIC	N: S	SB-1	4				DAT		-19-	91
Į	DEPTH (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	DESCRIPTION SURFACE ELEVATIO	N OF MATERIAL	8		BLOWS		RATION	50
		6	2	2	2.5	SP	BROWN (7.5YR4/4) COARSE WITH 2° LENS OF FINE SAND	GRAINED ROUNDED AND SORTED SAND WITH THIN PARALLEL BEDDING		20 🕸				T
▼ 35		7	2	2	3.5	SP	BROWN (7.5YR4/4) FIN Sorted Sand Satur	e grained well rounded well. Ated Lab sample		20 &				
40		8	2	2	2.9	SP	BROWN (7.5YR4/4) MEI SORTED SAND SATU END OF BORING	) grained well rounded well Rated						84
45														
50     														
55 														
— 60—														
WAT	ER L	EVEL		•		ING RTED: GED		BORING COMPLETED: 6-19	R	EMAR	KS:			

GME/Jamie Tuura



## FIELD EXPLORATORY BORING LOG

consularia					+ +					LUG		
PROJECT					gatio	n	CLIENT: WISCONSIN	I DNF	२		CT No.  14	
DRILLING HOLE DIA			4 1,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin		SHEET 1	No. of 2	
BORING	NUMBI	ER-L(	OCATIC	DN:	SB-	15: MINNOW &	: ELM			DATE:	6-18-	91
<b>ДЕРТН (FT)</b>	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)		N OF MATERIAL	¢	⊗ STANDA (B	RD PENE LOWS/FT		
	S	ŝ	NE	<u>.</u>					10 20	30	40	50
	1				SP	SORTED WELL ROUNDED	(5YR3/3) MED GRAINED WELL SAND DAMP WITH TRACE SILT					
5 -	2	2	1.5		CL	Pushed shelby tube Cuttings silty clay						
	•											
10-	3	2	2	0.8	SP	BROWN (7.5YR4/4) MED ROUNDED WELL SORTED	ium to fine grained well sand		⊗15			
15	4	2	2	0.9	SP	BROWN (7.5YR4/4) MED Rounded Well Sorted	ium to fine grained well Sand		⊗13			
								/				
20	5	2	2	0.3	SP	BROWN (7.5YR4/4) MED ROUNDED WELL SORTED	ium to fine grained well Sand	58		-		
25	6	2	2	0.6	SP	BROWN (7.5YR4/4) COA WELL SORTED SAND	RSE GRAINED WELL ROUNDED		⊗ <sub>12</sub>			
 30												
WATER L	WATER LEVEL:					6-18-91	BORING COMPLETED: 6-18-	-91	REMARK	<s:< td=""><td></td><td></td></s:<>		
						BY: Brian Hayden/						
WATER LI			DRIL	LING	COMPANY/DRIL			SIGNED	•	<b></b>		
						GME/Jamie	luulu					

R	REM nsulting	Inc. engi	neers			FI	ELD EXP	LORATORY E	BORINO	3	LO	G		
PF	ROJECT:	Wis Rer	cons medi	sin D al In	NR vesti	gatio		CLIENT: WISCONSI			PRO	JECT 9114		
	RILLING DLE DIA	METH	IOD:		/4"		41	SITE LOCATION: Webster Wisco	onsin		SHEE	T No 2 of	5. f 2	<i></i>
BC	ORING 1	UMB	ER-L(	OCATIC	DN:	SB-	15				DATE	: 6-	-18-9	91
	DЕРТН (FT)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	SOIL GROUPS SYMBOL (USCS)	SURFACE ELEVATIO		⊗ STA		RD PE OWS/	ΈT)	ATION 40	50
-		7	2	2	0.3	SP	BROWN (7.5YR4/4) MED ROUNDED WELL SORTED	⊗14	•					
 35		8	2	2		SP	BROWN (7.5YR4/4) COA ROUNDED-SORTED SAND	rse grained sub ) saturated lab sample	⊗1	6				
-							END OF BORING						1	
40_														
												1		
												1		
45-													1	
-														
-														
50							, ,						:	
-	-													
55_														
-														
60-	60													
WAT	FER L	EVEL	:		BOF STA	RING RTED	6-18-91	BORING COMPLETED: 6-18	-91 REM	ARK	S:			
					LOG	GED	BY: Brian Hayden,							
WAT	ER LI	EVEL	:		DRI	LING	COMPANY/DRIL		SIGN	IED:			<u> </u>	<u> </u>
							GME/Jamie	Tuura						

- 100

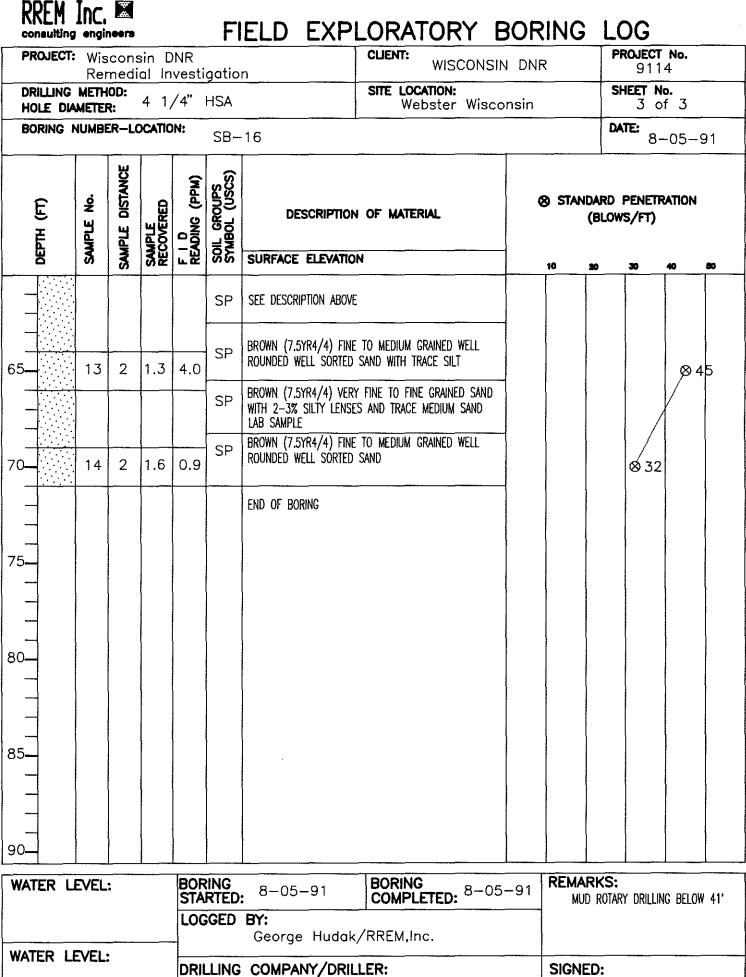
olisolay<sub>ba</sub>



## FIELD EXPLORATORY BORING LOG

PROJECT:	medi			gatio	n	CLIENT: WISCONSIN	I DNR	PROJECT No. 9114	
DRILLING HOLE DIA			4 1,	/4"	HSA		SITE LOCATION: Webster Wisco	nsin	SHEET No. 1 of 3
BORING I	NUMB	ER-L					ON MUSKEY AVE 20 EY & FIRE STATION [		<b>DATE:</b> 6-16-91
рертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	f i d Reading (PPM)	soil groups Symbol (USCS)		N OF MATERIAL	-	RD PENETRATION LOWS/FT)
	2	3	2 R	ᄕᅏ	លល	SURFACE ELEVATI	ON	10 20	39 40 50
		2	2.0	0.8		6" BLACKTOP BROWN (7.5YR4/2) SIL	TY SAND AND GRAVEL FILL		
						5% WEAK RED (10YR4	(10YR6/2) SILT & CLAY, /4) MOTTLING, TRACE BLACK		
	1	2	2.0	1.2		DECAYED ORGANICS			⊗ 33
					SP	Sorted Well Rounder	IE TO MEDIUM GRAINED WELL D SAND, TRACE COARSE SAND		
_					SP	BROWN (7.5YR4/4) FIN	IE TO MEDIUM GRAINED WELL D SAND, TRACE GRAVEL		
	2	2	1.7	0.5		PRIMARILY MEDIUM GRA			\$ 24
					SP		ie to medium grained well d Sand, primarily fine sand grained sand		
	3	2	2.0	0.8	SP	BROWN (7.5YR4/4) FIN ROUNDED WELL SORTE	IE TO MEDIUM GRAINED WELL D SAND; TRACE COARSE SAND	⊗ 15	
  	4	2	1.9	0.2	SP	brown (7.5yr4/4) fi Rounded well sorte	ne to medium grained well d sand	<b>∞</b> 16	
					SP		NE TO MEDIUM GRAINED SAND; OCM DIA) 2–3% COARSE SAND		
-					SP		NE TO MED GRAINED SAND WITH		
	5	2	1.9	0.3			ND FINE PEBBLES(0.2-0.3CM DIA)		55 0
			<u> </u>		SP	BROWN (7.5YR4/4) FIN 1MM WIDE LAMINATIONS	ne bedded sand black sub- 5 define bedding		
	6	2	1.8	0.4	SP	BROWN (7.5YR4/4) FI ROUNDED WELL SORTE	NE TO MEDIUM GRAINED WELL D SAND		⊗ 35
	(	L	· · · ·	BOR					
ATER L	•		STA	RTED		COMPLETED: 8-03	MUD F	ROTARY DRILLING BELOW 41' 91-7 SCREEN @ 65'-70'	
ATER L	:		DRIL	LING	COMPANY/DRI	LLER:	SIGNED	:	
						GME/Jamie	Tuura		

PROJECT	Rei	medi		NR vesti	gatio		ISIN DNR	PROJECT No. 9114
DRILLING HOLE DV			41,	/4"	HSA	<b>SITE LOCATION:</b> Webster Wi	sconsin	SHEET No. 2 of 3
BORING	NUMBI	ER-LO	OCATIC	)N:	SB-	16		DATE: 8-05-9
оертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	soil groups Symbol (USCS)	DESCRIPTION OF MATERIAL	8 8	STANDARD PENETRATION (BLOWS/FT)
<b>5</b>	5	3	35	F既	30	SURFACE ELEVATION	10	20 30 40 84
  	• • • • • • • • •				SP	brown (7.5yr4/4) fine to medium grained well Rounded well sorted sand		
35	7	2	1.9	1.2	SP	BROWN (7.5YR4/4) FINE GRAINED BEDDED WELL ROUNDED WELL SORTED SAND WITH TRACE 3% MED SAND. BLACK SUB 1-MM LAMINAE DEFINE BEDDING		78
	· · ·	 			SP	BROWN (7.5YR4/4) FINE TO MEDIUM GRAINED WELL ROUNDED WELL SORTED SAND: PRIMARILY FINE SAN	)	
40	. 8	2	1.9	3.2	SP	BROWN (7.5YR4/4) FINE GRAINED WELL ROUNDED V SORTED SAND WITH TRACE COARSE SAND AND FINE GRAVEL (0.2–0.3CM DIA)	FELL	
45-	9	2	1.4	1.6	SP	BROWN (7.5YR4/4) FINE TO MEDIUM GRAINED WELL ROUNDED WELL SORTED SAND LAB SAMPLE 44'-46'		
	•							
50	. 10	2	1.2	4.5	SP	BROWN (7.5YR4/4) COARSE GRAINED WELL ROUNDE WELL SORTED SAND, 6" DIA BOULDER	D	36⊗
55-	11	2	1.1	2.4	SP	brown (7.5yr4/4) fine to medium grained well rounded well sorted sand		288
	•							
60	. 12	2	1.2	0.4	SP	BROWN (7.5YR4/4) VERY FINE TO FINE WELL ROUN WELL SORTED SAND WITH UP TO 5% SILT LENSES	DED	⊗ 25
WATER L	WATER LEVEL:					8-05-91 BY: George Hudak/RREM,Inc.	05-91 <b>RE</b>	EMARKS: MUD ROTARY DRILLING BELOW 4
WATER L	EVEL			DRIL	LING	COMPANY/DRILLER:	SI	GNED:
						GME/Jamie Tuura		



GME/Jamie Tuura

SIGNED:

# RREM Inc. FIELD EXPLORATORY BORING LOG

consulting engineers					Г	ELU EAF	LURAIURI	OKING	LUG
	PROJECT: Wisconsin DNR Remedial Investi DRILLING METHOD:			gatio	<u>n</u>	CLIENT: WISCONSIN	I DNR	PROJECT No. 9114	
HOLE	DIAMETE	R:		/4"			SITE LOCATION: Webster Wisco		SHEET No. 1 of 3
BORING	NUMB	ER—L(					ON EAST END OF SH & CHRISTIANSON P		<b>DATE:</b> 8-06-91
оертн (гт)	SAMPLE No.	SAMPLE DISTANCE	SAMPLE RECOVERED	F I D READING (PPM)	soil groups Symbol (USCS)	DESCRIPTION SURFACE ELEVATION	N OF MATERIAL		ard penetration Blows/ft)
	<b>.</b>					2" TOPSOIL		t0 30	30 40 80
		2	2.0	1.1	SM	DARK BROWN (7.5YR3/: LAB SAMPLE 4'-6'	2) SILTY SAND WITH 2-3% CLAY		
		2	1.8	1.1	CL	LIGHT BROWNISH GREY(10)	(R6/2)MOTTLED SANDY SILT & CLAY		44 ⊗
					SP	STRONG BROWN (7.5YR GRAINED WELL ROUNDED	5/8) SILTY FINE TO MEDIUM ) WELL SORTED SAND		
10-	2	2	1.6	0.2	SP	brown (7.5yr5/5) fine Well sorted sand wit	e—med grained well rounded H up to 1% coarse sand		\$ 26
15	• 3	2	1.9	0.2	SP	BROWN (7.5YR4/4) COA PEBBLES; LOCALLY PEB	ARSE SAND WITH 2% 0.4–0.5CM BLES UP TO 1.0CM	8 11	
20-0-	4	2	1.8	0.4	SP	brown (7.5yr4/4) medium to coarse grained rounded well sorted sand, trace pebbles up 0.75cm in dia		Ø 16	
	•				SP		e to medium grained well.		
25	· · 5	2	1.8	0.9		ROUNDED WELL SORTED			222
		0	1 7	0.7	SP SP	WELL ROUNDED WELL S BROWN (7.5yr4/4) MEDIU ROUNDED WELL SORTED S	IY FINE TO MEDIUM GRAINED ORTED SAND M TO COARSE GRAINED WELL AND WITH LOCAL FINE GRAINED SAND FINE TO FINE GRAINED WELL		
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						BY: George Hudak	RREM,Inc.		
WATER	VATER LEVEL:					COMPANY/DRIL GME/Jamie		SIGNED	):



## FIELD EXPLORATORY BORING LOG

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B	ORING	NUMB	ER-LO	DCATIC	)N:	SB-1	7			DATE:	8-06	-91
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<b>V</b>							BROWN (7.5YR4/4) VERY FINE TO FINE GRAINED WE ROUNDED WELL SORTED SAND WITH 2–5% MEDIUM	ill				
		7	2	1.6	2.5		SAND WELL SORIED SAIND WITH 2-3% MEDIUM					\$ 67
		/		1.0	2.5	SP						
_												
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)		10	2	1.9	0.5	SP	BROWN (7.5YR4/4) FINE-MED GRAINED WELL ROUND WELL SORTED SAND WITH TRACES OF COARSE SAND					\$ 75
							THEE SURLEY SAME WITH HAVES OF COMAGE SAME					
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						<del>ا</del> ت	GRAVEL, TRACE-1% ROUNDED PEBBLES (RHYOLITE) UP TO 1.5CM ACROSS					
-							BROWN (7.5YR4/4) FINE TO COARSE GRAINED WELL					
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	2	2	1.8	2.0	SP	brown (7.5yr4/4) fine Rounded Well Sorted	e to medium grained well Sand Lab Sample 9'11'		368	
5	3	2	1.8	0.7				\$ 12		
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-0	8	2	1.6	0.3	SP	BROWN (7.5YR4/4) FINI ROUNDED WELL SORTED SAND	e to medium grained well sand with traces of coarse	811	
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ä	8	3	85 S	г. В	୰ୖ	SURFACE ELEVATION	N	10	20	30	40	<b>50</b>
		2		1.2		6" BLACKTOP BROWN (7.5YR4/2) SILTY	r sand and gravel fill					
					CL	LIGHT BROWNISH GREY (	10YR6/2) MOTTLED SILT & CLAY					
	1	2	1.9	1.2	SP	BROWN (7.5YR4/4) FINE WELL SORTED SAND WITH	-MED GRAINED WELL ROUNDED I TRACE-1% BLACK ORGANICS			⊗32		
	2	2	1.9	0.4	SP	BROWN (7.5YR4/4) FINE ROUNDED WELL SORTED SAND AND LOCAL 0.2-0.	TO MEDIUM GRAINED WELL SAND WITH TRACE-1% COARSE 3CM PERBLES			⊗3	5	
5-	3	2	1.9	3.6	SP		To medium grained well Sand Lab Sample 14'-16'				Ø43	
	4	2	1.9	77	SP	BROWN (7.5YR4/4) MEDI WITH 1% 0.5-1.0CM ROU	um to coarse grained sand Inded Pebbles		286			
		۷	1.3	5.5	SP		TO MED GRAINED SAND WITH D TRACE 0.2-0.5CM PEBBLES					
5 <b></b>	5	2	1.9	0.7	SP	BROWN (7.5YR4/4) MEDI ROUNDED WELL SORTED	um to coarse grained well Sand		824			
		-			SP	BROWN (7.5YR4/4) FINE ROUNDED WELL SORTED	to medium grained well Sand					
0-	6	2	2.0	0.7	SP		To medium grained well Sand with 1–2% coarse 7MM rounded pebbles	8	17			
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GME/Jamie Tuura

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•					<u>-</u>	SAND AND 1-2% 0.2-0.	7MM ROUNDED PEBBLES			
5-	7	2	1.9	1.2	SP		MED GRAINED WELL ROUNDED 1 TRACE1% COARSE SAND		⊗21	
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				UKIL	LING	GME/Jamie		SIG	NEU:	

## Appendix C

Subsurface Exploration and Monitoring Well Installation Program, Village of Webster Water Supply (Prepared by GME Consultants, October 1991) **GME CONSULTANTS, INC.** 



CONSULTING ENGINEERS 314 Garfield Avenue / Duluth, MN 55802 (218) 722-4323 / Fax (218) 722-9722

November 13, 1991

Mr. Colin Reichhoff RRem Engineers & Architects 408 Board of Trade Building 301 West First Street Duluth, Minnesota 55802

Report of: Recompacted Permeability Test

GME Project No. 30-232-01

Project: Subsurface Exploration & Monitoring Well Installation

Location: Village of Webster Webster, Wisconsin Soil Boring No. B-7, 34 to 36 Feet

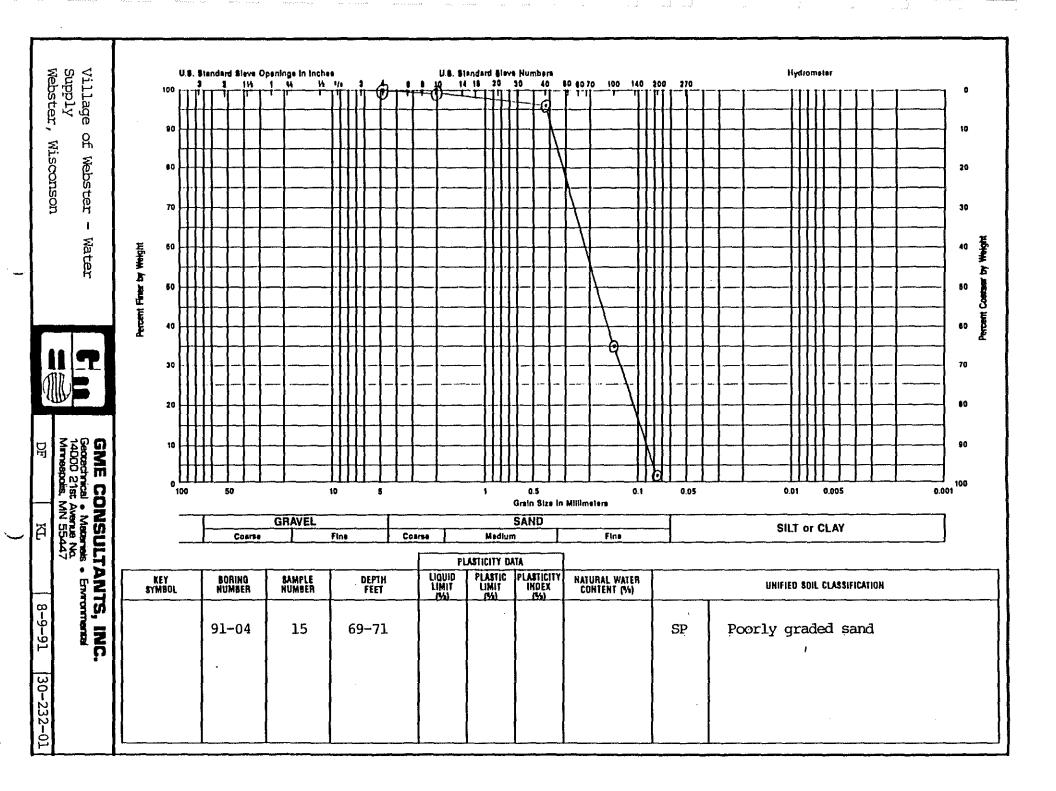
Date of Test: 8-22-91

Moisture Content (air dried) Dry Unit Weight (lbs/FT ) Void Ratio (e) 16.7% 101.7 0.393

HYDRAULIC CONDUCTIVITY

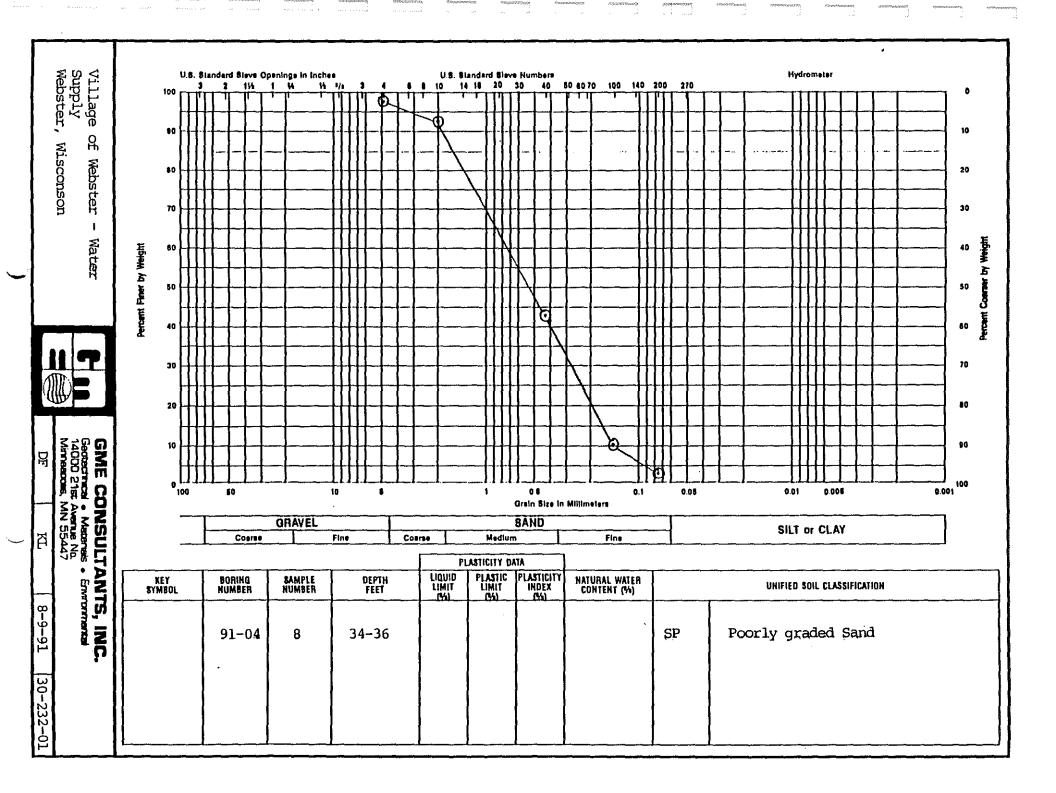
 $7.086 \times 10^{-3}$  cm/sec

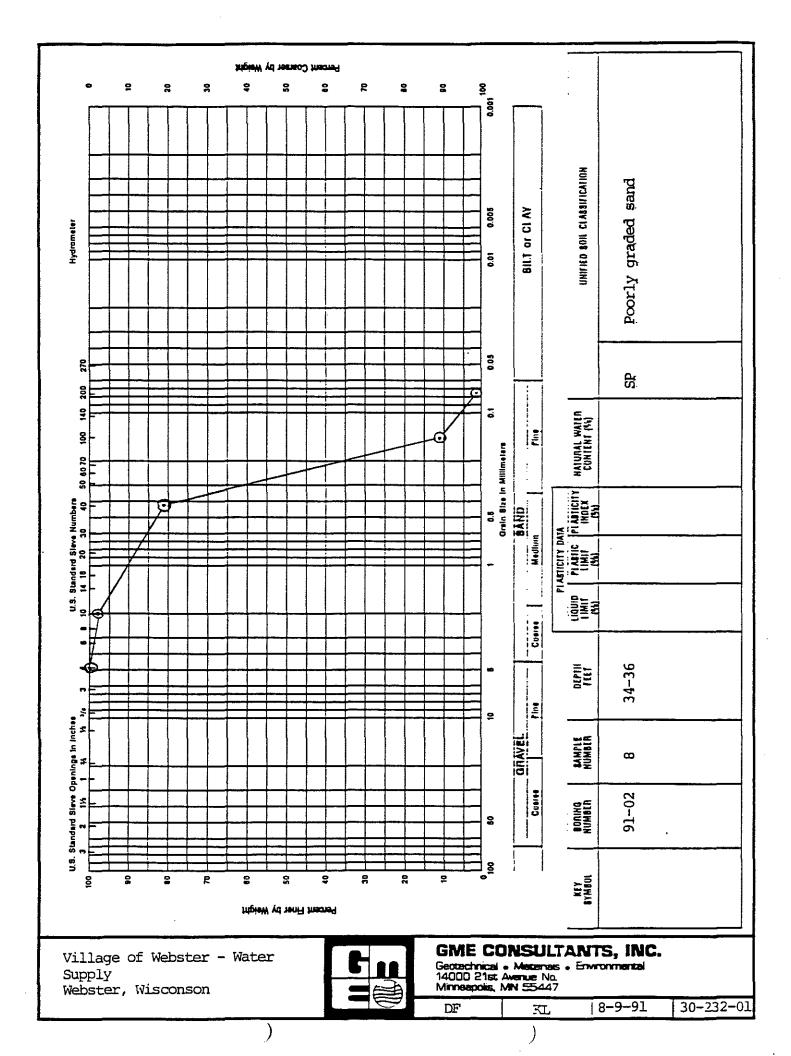
GME Consultants, Inc.

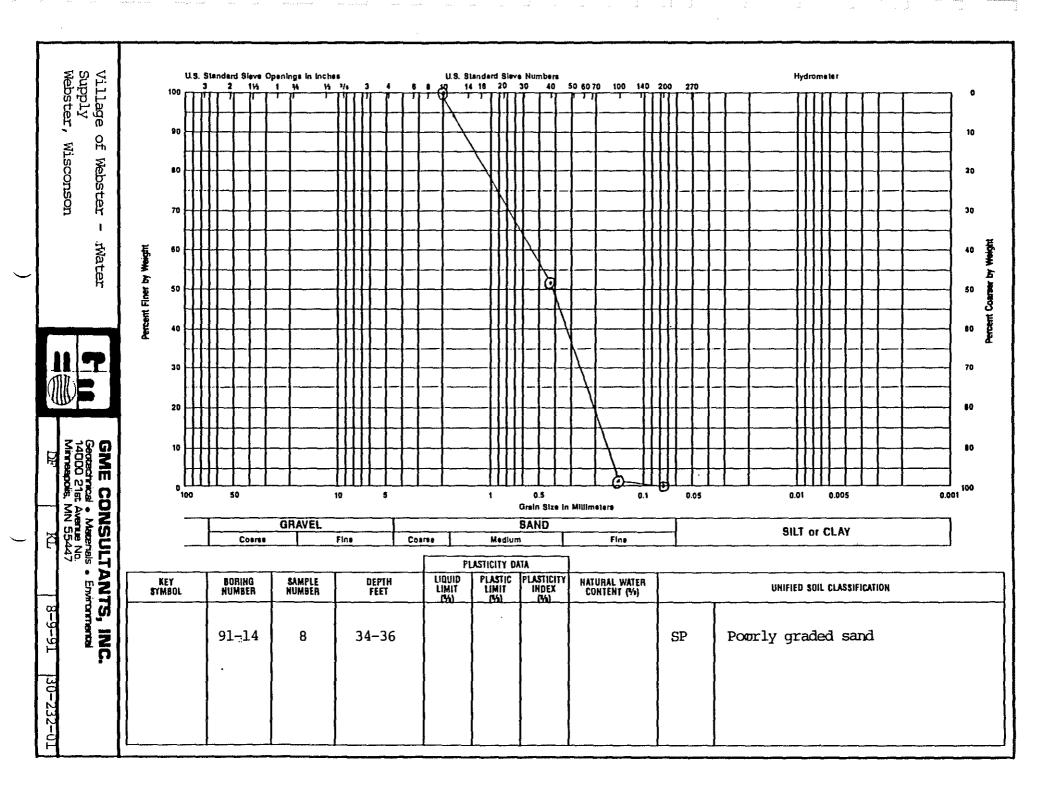


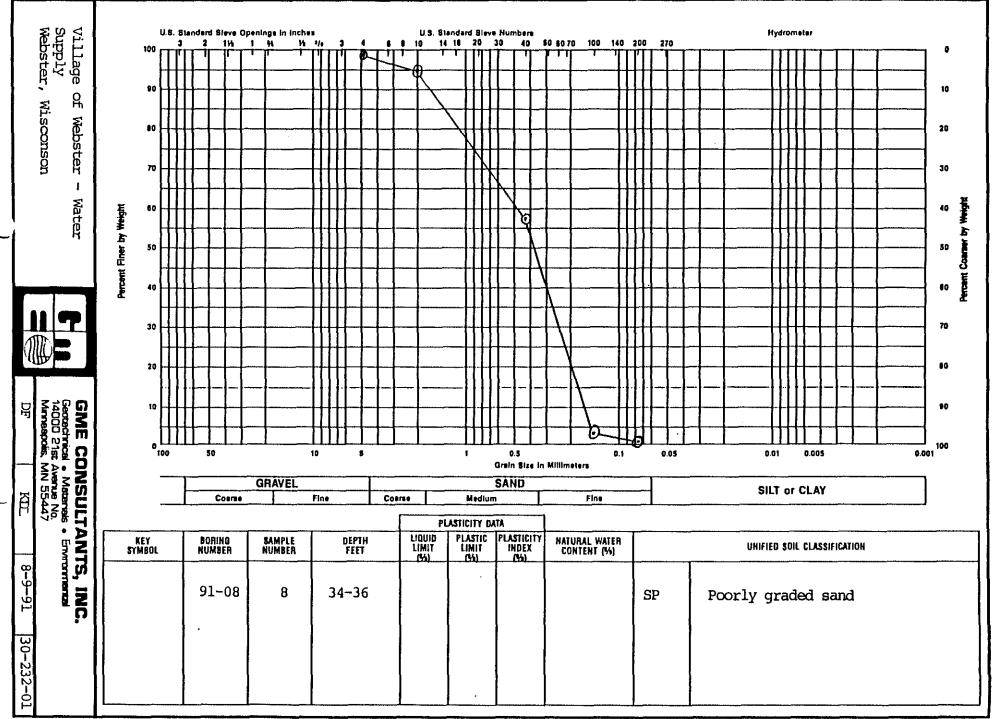
U.B. Standard Slave Numbers 10 14 16 20 30 40 17 17 17 14 17 17 17 Village of Webster Supply Webster, Wisconson U.B. Standard Bleve Openings in Inches Hydrometer 1 111 94 - 94 -4 1 1 19 40 50 60 70 100 140 200 270 1 1 11 2 100 0 ন 90 10 80 20 70 30 Ĭ Water 60 40 Percent Finer by Weight Б Commer 50 50 Finant 40 40 Θ 30 70 80 20 GME CONSULTANTS, Georgennical - Materials - Environ 14000 21st Avenue No. Manaepolis, MN 55447 łŌ 80 P ----------Ð 100 100 50 10 5 0.5 0.01 0.005 . 1 0.1 0.05 0.001 Grein Size in Millmeters GRAVEL SAND SILT or CLAY A  $\sim$ Coaree Fine Coarse Medlum Fine PLASTICITY DATA PLASTIC LIMIT PLASTICITY INDEX LIQUID SAMPLE NUMBER DEPTH FEET NATURAL WATER CONTENT (%) KEY SYMBOL BORING NUMBER UNIFIED SOIL CLASSIFICATION .\_ Chi \_ \_ 61)\_\_ ហ -<del>9-</del>91 a S 91-16 14 64-66 SP - Poorly graded sand 30<u>-</u> -232 - 01

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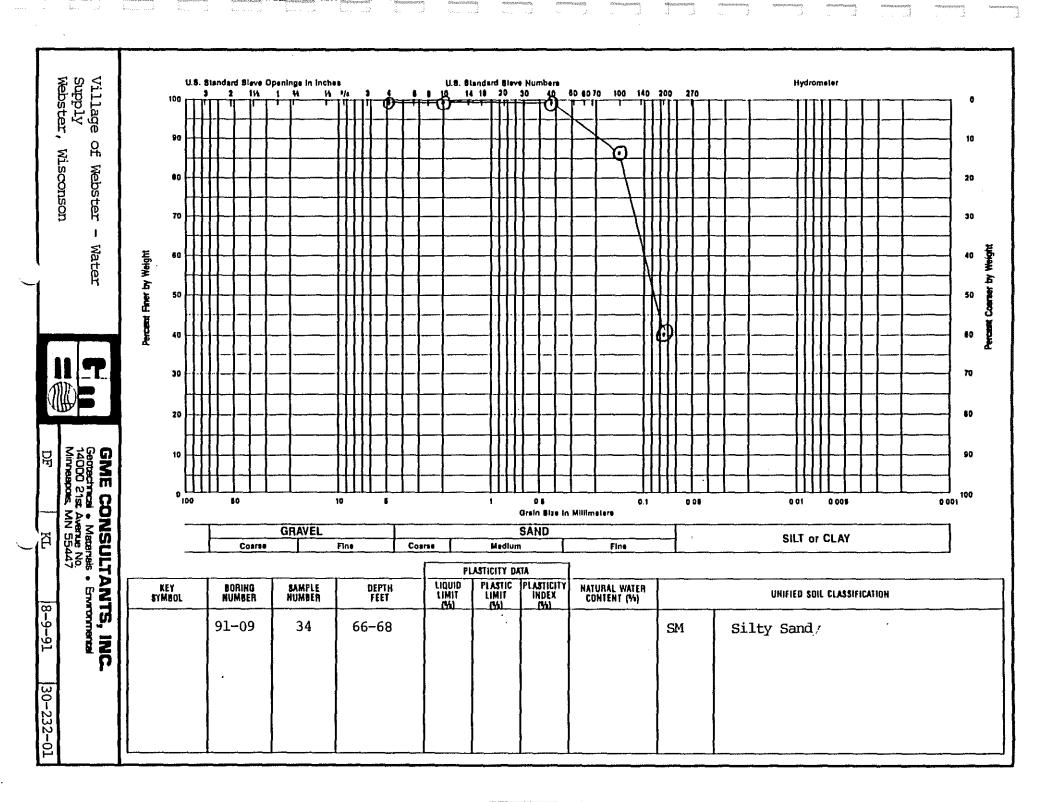


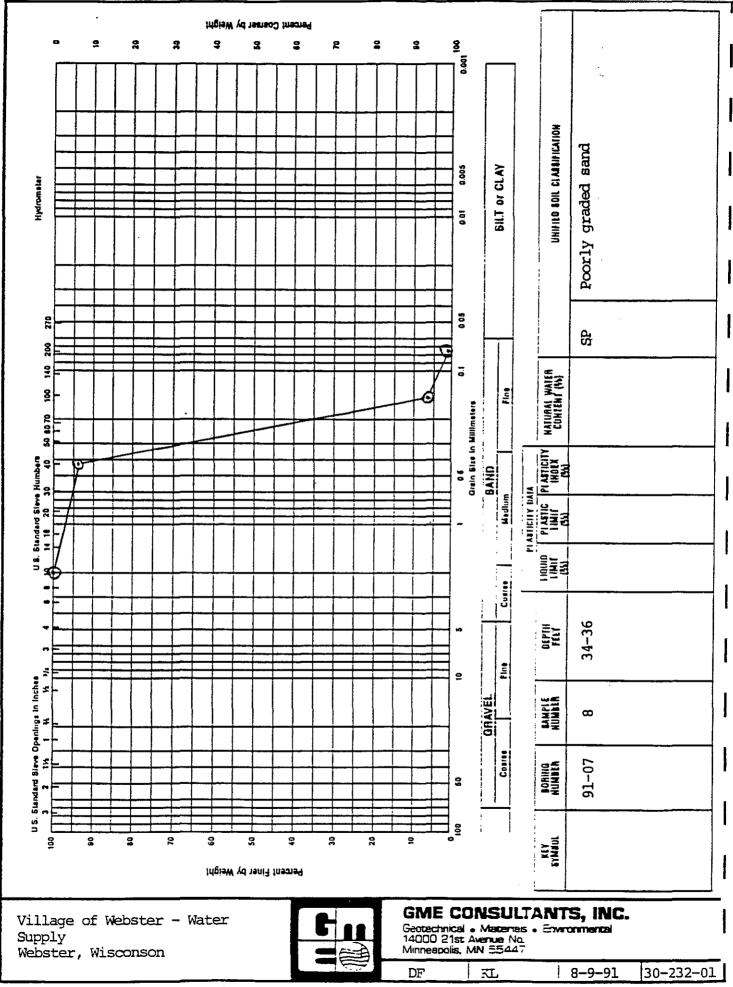


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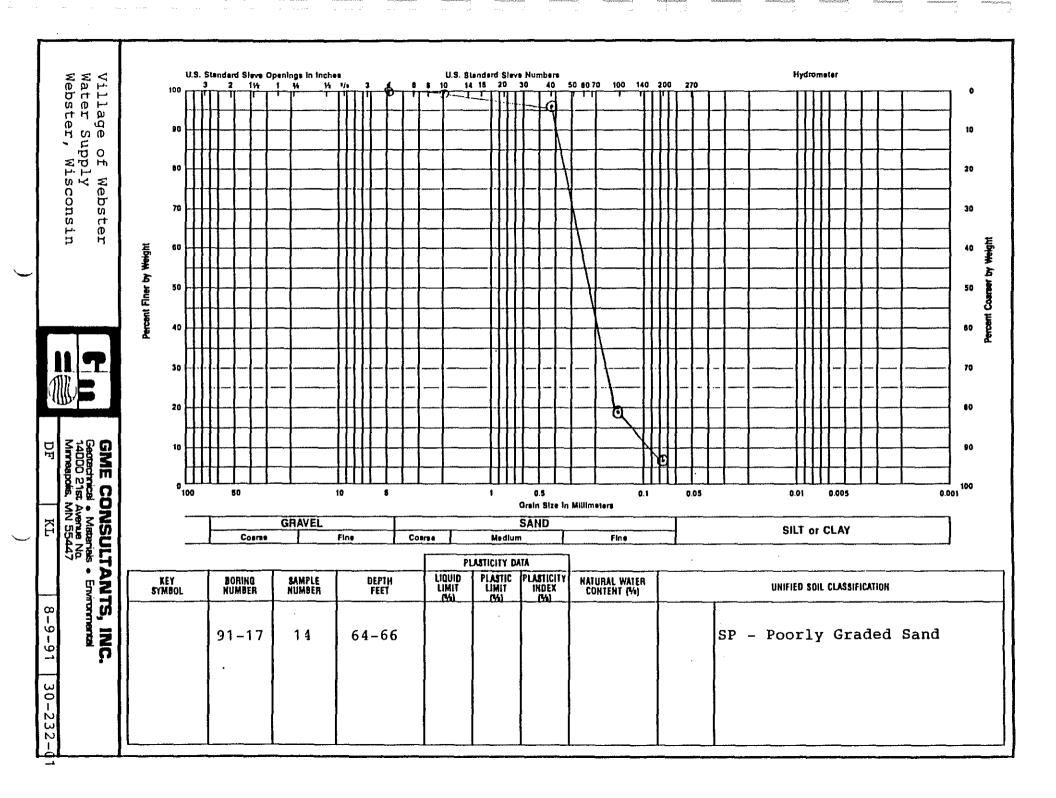
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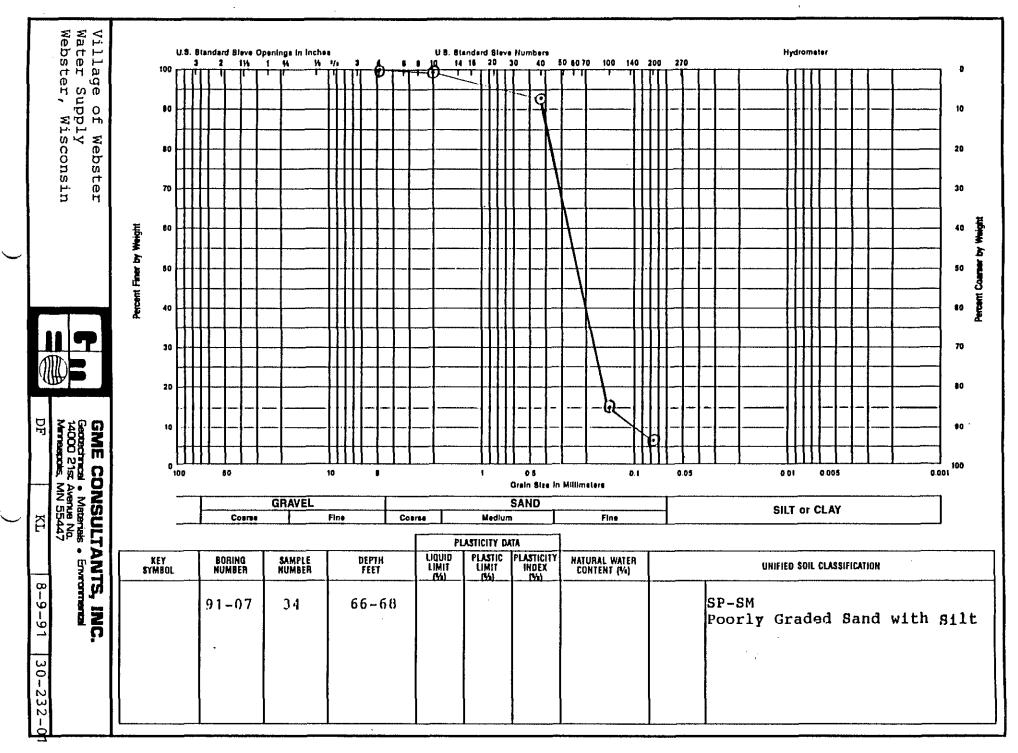




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SUBSURFACE EXPLORATION AND MONITORING WELL INSTALLATION PROGRAM VILLAGE OF WEBSTER-WATER SUPPLY WEBSTER, WISCONSIN GME PROJECT NUMBER D1368 OCTOBER 8, 1991 **GME CONSULTANTS, INC.** 



CONSULTING ENGINEERS 14000 21 st Ave. No. / Minneapolis, MN 55447 Phone (612) 559-1859 / Fax (612) 559-0720

October 8, 1991

Mr. Colin L. Reichhoff RREM, Inc. 408 Board of Trade Building 301 West First Street Duluth, Minnesota 55802

GME Project No. D1368

RE: Report of subsurface exploration an monitoring well installation program for the Village of Webster water supply in Webster, Wisconsin.

Dear Mr. Reichhoff:

We are pleased to submit the results of our environmental exploration program for the above referenced project. Submittal of this report concludes the scope of work for this project as discussed in our May 29, 1991 proposal.

We appreciate having had the opportunity to work with you on this project. If you have any questions regarding this material, please feel free to contact us at your convenience.

Sincerely,

GME Consultants, Inc.

une

Kristopher A. Lyytinen, EIT Geotechnical Engineer

WILLIAM C. Kwasny, P/E. Principal Engineer/President

KAL/WCK:ljn

WILLIAM C. KWASNY, P.E. GREGORY R. REUTER, P.E. MARK D. MILLSOP Thomas Paul Venema, p.e. Wyatt A. Gutzke, p.e. Sandra J. Forrest

WILLIAM E. BLOEMENDAL, P.E. MERVYN MINDESS, P.E. JOEL D. ULRING, P.E.

An Equal Opportunity Employer

#### SUBSURFACE EXPLORATION AND MONITORING WELL INSTALLATION PROGRAM VILLAGE OF WEBSTER-WATER SUPPLY WEBSTER, WISCONSIN GME PROJECT NUMBER D1368 OCTOBER 8, 1991

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#### APPENDIX

ASFE Notes Regarding Geotechnical Engineering Reports General Notes Soil Boring Logs Sketch Unified Soil Classification Chart Special Notes Regarding Placement of Compacted Fill Soils

#### INTRODUCTION

The subsurface exploration and monitoring well installation program performed in Webster, Wisconsin, was performed to evaluate the potential for contamination of the Village's water supply. The program explored the area to obtain subsurface information relative to the soil and groundwater conditions and potential contamination and to install permanent wells to allow groundwater sampling and monitoring.

In accordance with your acceptance of our May 29, 1991 proposal for the project, we have conducted a subsurface exploration and monitoring well installation program. The purpose of this report is to present the results of our field exploration program.

#### EXPLORATION PROGRAM RESULTS

#### Scope of Exploration

The field exploration consisted of drilling 19 soil borings around the City of Webster. The soil borings ranged in depth from 36 to 71 feet, and monitoring wells were installed in 10 of the borings.

The borings were drilled with our CME 550 rig all-terrain. The borings were drilled at locations and to depths specified by the RREM site representative. The elevations of the ground surface and the top of monitoring well casings were also determined by RREM. GME Project No. D1368

#### Surface Conditions

The explored area is located on the southern end of the Village of Webster, bordered on the east by Lakeland South Avenue, on the south by Cedar Avenue, on the north by Elm Street, to the west of Minnow Avenue and the Soo Line Railroad. The area is relatively flat, consisting of developed areas. The borings were drilled on streets and avenues.

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#### Subsurface Conditions

The subsurface conditions encountered in each boring are illustrated on logs included in the Appendix. We wish to point out that the subsurface conditions at other times and locations at this site may differ from those found at our test locations.

The logs show that the soil conditions are relatively uniform. The borings encountered 3 to 5 feet of brown sand or sand with silt, fill overlying the naturally occurring soils, which consisted of a thin layer of gray silty lean clay extending to depths of 5 to 6 feet. Below this silty lean clay, we encountered brown fine to medium sand which extended to the termination depths in all of the borings. The N-values indicate that the sand is medium dense.

#### Monitoring Wells

Ten monitoring wells were installed within the project area, as directed by RREM. The wells were installed in accordance with the

GME Project No. D1368 3 October 8, 1991 current State of Wisconsin Well Regulations. Five of the wells were installed to an approximate depth of 40 feet, one was installed to an approximate depth of 60 feet, and four of the monitoring wells were installed to an approximate depth of 70 feet below existing grade.

The holes for the wells were drilled using 4-1/4 inch hollow stem auger (HSA). The screens consisted of 2 inch by 5 feet, and 2 inch by 10 feet, No. 10 slot, Johnson SCH 80 PVC. The screens were attached to SCH 80 PVC riser which extended approximately 2 feet above the ground surface for the wells with protective casings and to the ground surface for wells installed in at grade gateboxes. The screens were then backfilled with Red Flint sand to a level approximately 2 feet above the top of the screen. The annulus was sealed with a approximately 2 feet of bentonite, and the remainder of the boreholes were grouted to the surface with neat cement grout. Four foot long, 4 inch diameter locking low carbon steel protective casing surrounded by three, 4 inch steel guard posts or at grade gateboxes were then installed to protect the wells.

#### Groundwater Levels

Groundwater level measurements were made in the borings and monitoring wells. The data obtained from these measurements are included on the boring and well logs. A study of these readings indicates that water was encountered in all of the borings and wells at an approximated depth of 33 to 34 feet below the ground GME Project No. D1368 4 October 8, 1991 surface. The consistency of the depths of the readings and the relatively permeable soils found in the borings lead us to believe that this is the static groundwater table. The groundwater levels can be expected to vary seasonally and annually, and with variations in precipitation and infiltration.

#### Laboratory Testing

A laboratory testing program to determine the grain size and permeability of the various soil strata was completed. The results of the testing program are included on the appended data sheets. Ten mechanical analysis tests and two permeability tests were performed on recovered samples.

#### FIELD EXPLORATION PROCEDURES

#### Soil Sampling

Soil sampling was performed in accordance with ASTM:D1586. Using this procedure, a 2 inch O.D., split-barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler an additional 12 inches is known as the Standard Penetration resistance or N-value. The N-value is an index of the relative density of cohesionless soils and the consistency of cohesive soils. The recovered samples were screened in the field by a representative of RREM using a Hnu meter. GME Project No. D1368

October 8, 1991

#### Soil Classification

As the samples were obtained in the field, they were preliminarily classified by our driller. Representative portions of all samples were then sealed in moisture tight jars and returned to our laboratory for final examination and classification by a Geotechnical Engineer. The samples obtained during the soil boring program will be held for a period of one month at which time they will be discarded unless we are notified further as to their disposition.

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The boring logs in the Appendix indicate the depth and identification of various soil strata, the N-value, groundwater level information, and pertinent information regarding the method of maintaining and advancing the drill holes. Charts illustrating the soil classification and the descriptive terminology and symbols used on the boring logs are also attached. GME Project No. D1368

#### STANDARD OF CARE

6

The factual data contained in this report are based on our interpretation of the subsurface conditions and represent our professional opinions. These opinions were arrived at in accordance with currently accepted geotechnical practices at this time and location. Other than this, no warranty is implied or intended.

1/1 ines

Prepared by:

Kristopher A. Lyytinen, EIT Geotechnical Engineer

Reviewed by:

/ WEAliam C. Kwasny, D.E. Principal Engineer/President Registered Profession Engineer, Wisconsin

KAL/WCK:ljn

## APPENDIX

## IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, thanks to the Association of Soil and Foundation Engineers (ASFE).

When ASFE was founded in 1969, subsurface problems were frequently being resolved through lawsuits. In fact, the situation had grown to such alarming proportions that consulting geotechnical engineers had the worst professional liability record of all design professionals. By 1980, ASFE-member consulting soil and foundation engineers had the best professional liability record. This dramatic turn-about can be attributed directly to client acceptance of problem-solving programs and materials developed by ASFE for its members' application. This acceptance was gained because clients perceived the ASFE approach to be in their own best interests Disputes benefit only those who earn their living from others' disagreements

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project

#### A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of his report may affect his recommendations.

Unless your consulting geotechnical engineer indicates otherwise, your geotechnical engineering report should not be used:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

A geotechnical engineer cannot accept responsibility for problems which may develop if he is not consulted after factors considered in his reports develop ment have changed

#### MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by the geotechnical engineer who then renders an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those opined to exist, because no geotechnical engineer, no matter how gualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. For example, the actual interface between materials may be far more gradual or abrupt than the report indicates, and actual conditions in areas not sampled may differ from predictions Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact. For this reason, most experienced owners retain their acotechnical consultant through the construction staac, to identify variances, conduct additional tests which may be needed, and to recommend solutions. to problems encountered on site

### SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantlychanging natural forces Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time. Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

#### A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy

## **GENERAL NOTES**

#### DRILLING & SAMPLING SYMBOLS:

- SS with Liner
- Split Spoon 1%" I.D., 2" O.D., unless SS
- otherwise noted
- Shelby Tube 2" O.D., unless otherwise noted ST
- Power Auger ΡA
- DB Diamond Bit - NX: BX: AX
- AS Auger Sample
- JS Jar Sample
- vs Vane Shear

- OS Osterberg Sampler - 3" Shelby Tube Hollow Stem Auger
- HS WS Wash Sample
- FT Fish Trail
- RB Rock Bit
- BS Bulk Sample
- PM Pressuremeter test - in situ
- Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

#### WATER LEVEL MEASUREMENT SYMBOLS:

WL :	Water Level
WCI:	Wet Cave In
DCI :	Dry Cave In
WS :	While Sampling
WD :	While Drilling
BCR:	Before Casing Remvoal
ACR:	After Casing Removal
AB :	Atter Boring

After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In previous soils, the indicated elevations are considered reliable ground water levels. In impervious soits, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence of ground water elevations must be sought.

#### **GRADATION DESCRIPTION & TERMINOLOGY**

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as; boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive, and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and line grained soils on the basis of their strength or consistency, and their plasticity.

Major Component Of Sample	Size Range	Descriptive Term(s) (Of Components Also Present in Sample)	Percent of Dry Weight
Boulders	Over 8 in. (200mm)	Trace	9 — F
Cobbles	8 in. to 3 in. (200mm to 75mm)	Little	10 — 19
Gravel	3 in. to #4 sieve (75mm to 2mm)	Some	20 — 34
Sand	#4 to #200 sieve (2mm to .074mm)	And	35 — 50
Sitt	Passing #200 sieve (0.074mm to 0.005mm)		

Smaller than 0.005mm Clav

#### CONSISTENCY OF COHESIVE SOILS:

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#### RELATIVE DENSITY OF GRANULAR SOILS:

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ā	A Sr	Š	ST	SURFACE ELEVAT				2 H	ż		10	20		40	50
	1AS			Reddish-brown f	ine to m	edium	SAND,					ļ			
			4	fill, moist			P)							ļ	<u> </u>
	2SS		<u>, 5° 5</u>	Gray SILTY LEAN	CLAY, m	OIST (C	STIT		10	4	<u> </u>				
				Brown fine to m	edium SA	ND, mo	ist to				$\left[ \right]$		1		{
10-	3SS			waterbearing, m					20						1
	500								20			ĸ			
						(5	SP)				ļ	$  \rangle$			
	4SS								26						
												P		Í	
20	555								13		ø				
							!				-				
													$ \land$		
	<u>6SS</u>								40		}		>	Þ	
													T I		
30	7SS						•		11		0			1	
											ſ				
		$\mathbf{M}$							_			ļ	Ì		
36	8SS								7	Ø	<u> </u>	<u> </u>			
				End of boring	at 36 fe	et									
40												[	(	{	ļ
				$4\frac{1}{4}$ inch hollow	stem au	ger us	ed full					ł			
				depth								ļ	1		
				Borehole backf	illed wi	th san	a/					ļ			
				cement grou	t						}	}		ļ	Į
50													[		[
			ļ								[	[	1	Ì	ĺ
											}	]	1	}	1
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60															
												[		1	
															ł
	WAT	ER	LEVEL (	OBSERVATIONS				L	L	BORI	NG STA		6-26-	1 91	L
W.L.				ile sampling				NTS, I	NC.					6-91	
<u>N.L.</u>				<u></u>		P.O. Box 16				RIG		550			. Tuu
W.L.						(218) 722-4				DRAV	VN KA 30-2	L 37_01		ROVED	
					The strati	fication li	nes repres	ent en	nrovi				ISHE	ET/ C	f 26
		- <u></u>					; insitu the								

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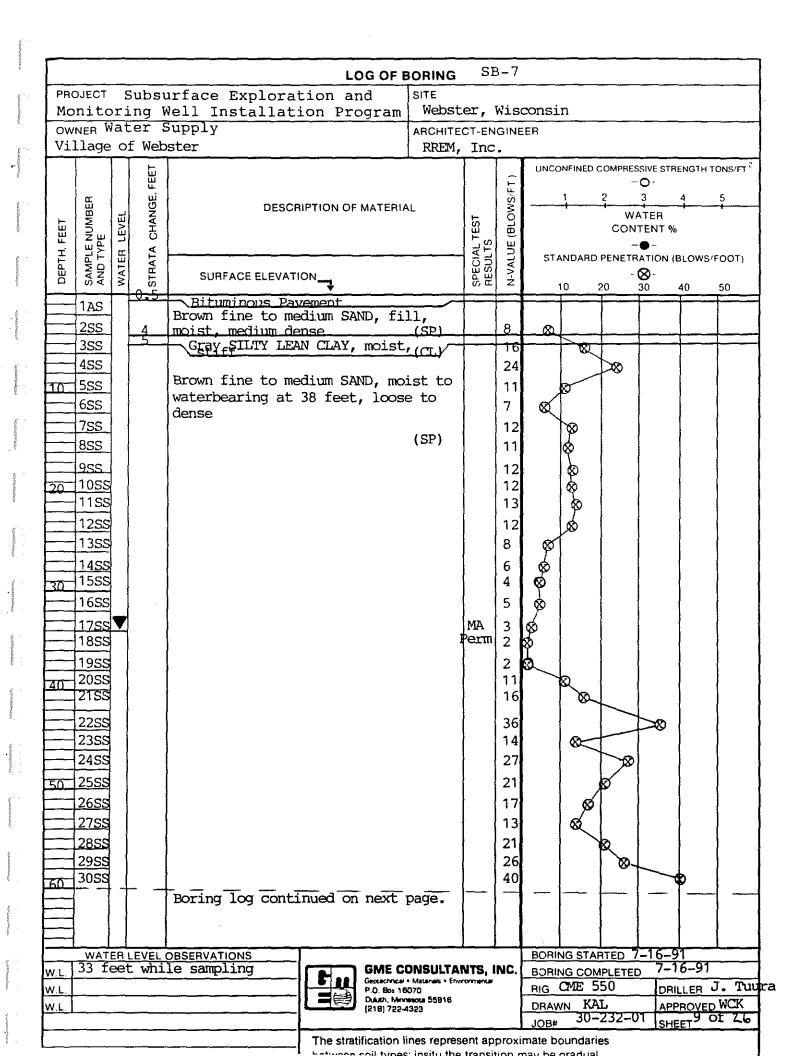
<b></b>					LOG	OF BORING	SB	- 6						
•	JECT			urface Explorati	on and	SITE A	ley	Nea			venue			
		in	goWel	1 Installation F					Wisco	nsin				
	NER 1age	0	f Web	Water Supp	лу	ARCHITE	ECT-EN EM,							
		r -	1								COMPRESS	SIVE STRE		DNS/FT <sup>2</sup>
			FEET					Ê	onot			0-		JANG/TT
	ЯЕН		U U U U	DESC	RIPTION OF MAT	ERIAL		MS,1	[	1	2	3	4	5
L.	UMB	EVEI EVEI	HAN				EST	BLO				TER ENT %		
DEPTH, FEE1	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA CHANGE.				SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)			-(	•-		-0.07
EPT	AMP ND 1	ATE	L BA	SURFACE ELEVA	TION		ESUI	- AI	51,	ANDARD	PENETR/	810N (8 8)-	scows/i	001)
		-					5	Ż		10			40	50
	1AS	{	2	Dark brown fine						<u> </u>				
	200		5	Brown fine to m moist	edium SAND,	fill (SP)'		2						
	2SS		6.5	Gray SILTY LEAN	CLAY, mois	t, soft		2	8			·····		
-10					<u></u>					$\backslash$				
	3 <u>SS</u>		}	Brown fine to m				22						
				to waterbearing dense	at 34 Ieet	(SP)					/ /		[	
	4SS	[						19		ø				
20	5SS							13		6				
	0							1.5		18				
	<u>6SS</u>							14		♥				
-30-	7SS							14		1 &				
36	8SS							29			8			
	_			End of boring a	t 36 feet									
40				4111 heller -		£								
				4¼" hollow stem depth	auger used	TATT								
				-										
				Borehole backfi cement gro		and/								
				ceneric gro										
-50														
										ļ				
60														
	WAT	ER	LEVEL	OBSERVATIONS	J		<u> </u>		BORI	NG STA			<u>6-</u> 91	
W.L.				while sampling				NC.	BORI	NG CON	PLETED		6 <u>-91</u> 6-26-	
W.L.						Box 16070 1, Minneette 55816				CME 5				Tuur
W.L.		<u> </u>		·····	(218)	722-4323				<u>vn KAL</u> 30-2			ROVED	
				- <u></u>		ion lines repres			mate b	oundari	es			
					I between soil t	ypes; insitu the	transit	ion r	nay be	gradual				

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			<u></u>	<u></u>	LOG OF I	BORING	SB-7	7 Co	nt'd			<u> </u>		
	JECT			rface Exploration		SITE		<b>7.7</b> 2						
<u> </u>	NER	ng	well	Installation Pro Water Sup		ARCHITE			scons	1n		·		
		of	Webs		£~1	RREM			ER					
ОЕРТН. FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	LA CHANGE. FEET	DESCF	RIPTION OF MATERIA	۹L	SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT)		1	2 WA CON	SIVE STRE O- 3 ATER TENT %	4	5
DEPTI	SAMP AND 1	WATE	STRATA	SURFACE ELEVAT			SPECI RESUL	N-VAL			- (	ATION (B <b>8</b> - 30 4		50
70	3155 3255 3355 3455 3555			Brown fine t waterbearing	, dense	·	МА	49 43 48 46 34				8	<b>BBBBBBBBBBBBB</b>	
				End of boring a										
				$4\frac{1}{4}$ inch hollow full depth	stem auger us	sed								
80				Monitoring wel installed i	l MW-91-5B was n this boring	5								
90														
100														
110														
120					2									
												7-16		
<u>W.L</u> . W.L. W.L.	33 f	ee'	t whi.	DESERVATIONS le sampling	Geotachisca P.O. Box 18	1000ta 55816	VTS, I	INC.		IG STAF IG COM ME 55 N KA 30-23	PLETEC 0 L	7-16 DRIL	-91	Tuura ICK of 26
					The stratification I				mate bo		s			ļ

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					BORING	SB-	7A						
PROJECT Monitor	Sul ina	osurf: Well	ace Exploration Installation P	and rogram -	SITE	Vebst	er,	Wisc	onsin	L			
OWNER			Water Supply		ARCHITE	CT-EN	GINE	ER	<u></u>				
Village	of	Webs			I	RREM,	Ind	c.					
		ET						UNCO	NFINED C		SIVE STRE	NGTH TO	ONS
		FEET					FT.				0-		٣
3ER		U U U U U U	DESC	CRIPTION OF MATER	IAL	1.	ŴŚ		+	2	3 ATER	4	5
UME	LEVEL	CHANGE.				EST	(BLOWS/FT.)	1			TENT %		
DEPTH. FEET SAMPLE NUMBER AND TYPF						SPECIAL TE RESULTS	лЕ (				•-		
	WATER	STRATA				SUL SUL	N-VALUE	STA	NDARD		ATION (B	LOWS/F	00
AN SA	Š	STI	SURFACE ELEVA	<b>•</b>		S ₩	ź	-	10 :		⊗- 30 4	40	50
		2.5	Bituminous P Brown SAND WIT	avement			F						;—
		3.5	Black organ	ic clay (OH		<u> </u>							
		6.5	Gravish-brown	SILTY LEAN CL	ΑY,	1				ļ			
			moist	(CL)	<u></u>		<b> </b>			<u> </u>			
10			Brown fine to a		noist								Í
			to waterbearing	g at 33 feet									[
					(SP)								
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20									ļ				
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30													
	V	ĺ									i I		
40													
		• -	na ana ana ana ana ana ana ana ana ana	0 feet									
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		]	and and present	n auger i	ısed				1				
			A TIMAN	M									}
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			U percetters	is boring						]			
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			No sampling w	as performed									
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60													
									1				
													[
		.EVEL (	DBSERVATIONS			<u> </u>	<b>—</b>	BORI		RTED	7-16	-91	L
			le sampling	GME	CONSULTA	NTS, I	NC.	BORI		PLETE		16-91	
		<u>wni</u>	<u></u>		war a hansamain - F -								
				P.0 Box		n unmenun			CME 5			LER J.	
v.L. 33				P.0 Box	16070 Annual 55816	n un nenuñ		DRAW	СМЕ 5 /N КА 30-2	T		<u>ler</u> J. ROVED ET_11	WC

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					G OF BORING	SB	-8					<b>_</b>	
PROJECT			rface Exploration l Installation P.		SITE	bste	r. V	Viscons:	in				
OWNER			Water Supply										-
Village	e o:	f Web	ster		1	EM,							
	Ţ					1		UNCONFI	NED C			ENGTH	т
		EET					ΥFT.	1		2 -	0 · 3	4	
BER	یے	NGE	DESC	RIPTION OF I	MATERIAL		SNO	<del>`</del>		<del>i</del> w	ATER		
DEPTH, FEET SAMPLE NUMBER AND TYPE	WATER LEVEL	CHANGE.				SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)				TENT %	ı	
DEPTH, FEET	E E	TA I			- <u></u>	ILTS	LUE	STAND	ARD		- 🗭 RATION (	BLOWS	2
ND	ATE	STRATA	SURFACE ELEVAT	ION		PEC	A - 1			-	⊗-		
	5	0.5		÷		01	<u> </u>	10		20	30	40	=
1AS	4	3	Brown fine to m	edium SAN	D with (SP)					<u> </u>		<u> </u>	_
	-	4.5	Gray SILTY LÉAN	CLAY, mo	ist_stiff_		-			<u> </u>	┟───		_
255	-	]					21			ø			
 			Brown fine to m		•					1			
<u>355</u>		]	waterbearing at dense	33 feet,	medium		18		ø				
			dense		(SP)				/				
					(SP)		12	Q	\$				
	1												
20-5-22	-												
<u>5ss</u>	4						13	1	ବ	l.		1	
	1						18		୍ଡ ବ				
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										]	ļ		
<u>36 855</u>	ļ	<u> </u>			<u></u>	MA	11	<u>ø</u>				<u> </u>	
			End of boring a	t 36 feet	:	1				Ì	{	1	
40			$4\frac{1}{4}$ inch hollow	stom auge	besu re								
			full depth										
				MT-7 0-1 4									
			Monitoring well installed in							ĺ	[		
			an at grade										
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						(					1		
60										ļ	]		
<u> </u>												1	
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											l	<u> </u>	_
			OBSERVATIONS			NTE		BORING			7-8-		_
<u>W.L. 33</u> W.L	тe	sr Mu	ile sampling		GME CONSULTA Geotechnical • Materials • Env P.O. Box 18070	rronmenta		BORING RIG		<u>IPLETEI</u> 550	<u>-0-/ u</u>  09	- <u>91</u> ILLER 1	
WY.L			<u></u>		Duith, Ministe 55816			DRAWN		AL		PROVE	
W.L					(218) 722-4323						10, 1		4

					LOG O	FBORING	SB	-9						
				ace Exploration a		SITE	oste	r, V	Visco	nsin			<u></u>	
	NER	ing	Water	Installation Pro	gram -	ARCHITE		· · · · · · · · · · · · · · · · · · ·						
-			Webs	. =			EM, 2							
ET	ЛМВЕЯ	VEL	HANGE, FEET	DESCRIP	TION OF MATE	RIAL	ST	(BLOWS/FT.)			2 WA	SIVE STAI O- 3 VTER FENT %	ENGTH TO	5
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA CHANGE.				SPECIAL TEST RESULTS	N-VALUE (B	STA	NDARD	 PENETR	● ATION (E	BLOWS/F	OOT)
BO	AN AN	Š	ST	SURFACE ELEVATIO	¥		SP RE	ż		10 2		8- 30	40	50
	1AS		3.5	Brown SILTY SAND	, moist, l	oose (SM)				}				
	<u>255</u>		 5	Gray SILTY LEAN	CLAY, mois			-4	8					
	3SS	ł						12		8				
	4SS			Brown fine to me	dium SAND,	moist to	- -	27			P			
10	<u>5SS</u> 6SS	ļ		waterbearing at 3				22 20			80			
	75S			to medium dense		(SP)		14		ø	ŕ			
	855					<b>\-</b> - <i>\</i>		17		l &				
	955	ł						23			8		ļ	
20	10SS							12		8				
	115S							13						
	12SS						-	14		<b>B</b>				
	13SS	ł						14					ł	
	14SS	ĺ					n,	20					j	
	15 <u>SS</u>							12		0	ſ			
	16SS							16		6			÷	
	17SS	T						13		æ				
	18SS						1	ROD	0		1		ĺ	
	19SS							4	Ø				}	
40	20SS							6	0	L		6	1	
	21SS							52						<b>⊨⊗</b>
	22SS						i	9	8					
	23SS		{					10	6	R.				1
	24 <u>SS</u>							18					l	
50	25 <u>55</u>							24						ł
	26 <u>SS</u>		1					15		$\ll$	ſ		{	
	27 <u>55</u>							28			8		{	Į
	28SS		ļ					26		1	ø		]	j
	29SS							19		8	Y		]	Į
60	30SS							19		6				
		T		Boring log contin	nued on ne	xt page.								
	. [	ĺ											[	{
	أحبب						l							
<u></u> Т				DBSERVATIONS			NTS	INC.		NG STAI		7-22	<u>-91</u> 3-91	
<u>W.L.</u> W.L.	<u> </u>	<u>,,</u>	5 100	C WITTE Sampting	Geotec	nical + Materials + Envi ox 18070	ronmenual		RIG	OME !				. Tuu
W.L.			·····			Minimota 55816 722-4323			DRAV		AL	APF	ROVED	WCK
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PRC				rface Explorat	cion and	đ	SITE			Wisco		<u>.</u>			
		<u>11</u> t	oring	Well Installati	on Progr	:am	ARCHITE								
		la	ige of	Webster				EM,							
		<b></b>	FEET		<u></u>	· · · · ·	L	,			NFINED			ENGTH T	ONS/FT 2
	~								/FT.)		1	- 2	О- З	4	5
	1BEP		CHANGE.	DESC	RIPTION OF	MATERIA	λL.	<b>⊷</b>	ows		<b>.</b>	+	¥ 	-i	-i
FEET	NUN	LEV	CH/					TES 2	BL.			CON	TENT %	ı	
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA						N-VALUE (BLOWS/FT.)	ST/	NDARD	PENETR	ATION (	BLOWS/	FOOT)
DEF	SAN	WAI	STR	SURFACE ELEVAT	ION_ Der	pth = (	60 <b>'</b>	SPECIAL TEST RESULTS	N-N		10		⊗- 30	40	50
	3155			Brown SILT, wat					30			l ø	þ	T	
	32SS			dense					26			ø			
	3355		66			•	正)		20			×			
	34SS	ł –		Brown fine grai bearing, medium	ned SANL dense t	), wate to loos	e	MA	16		Ø				
70	3555	<u> </u>					( <u>S</u> P)		7	8				1	
				End of boring a	t 70 fee	et.									
				$4\frac{1}{4}$ inch hollow	stem aug	ler use	d								
				full depth											
80				Monitoring Well	. MW-91-3	was									
				installed in	this bo	ring									
90															
100															
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סדד	ł														
120		ĺ	Í											1	
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	WAT	ER		DESERVATIONS	1					BORIN	G STAP		-7-22	2-91	L
W.L.				while sampling				NTS, I	NC.			IPLETED	7-7	3-91	
<u>W.L.</u>						P.O. Box 16					OME 5				J.Tuur WCK
W.L.				<u></u>		[218] 722-4				DRAW	30-23	2-01		ROVED	of 26
							nes represe			mate bo	oundari	es			]
					between s	soil types	; insitu the	transit	tion n	nay be	oradual				1

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PROJE				urface Explorati Installation Pr								h of	Main	Stree	≥t
OWNER				r Supply	<u>ogram –                                    </u>					Wisco ER	nsin			<u> </u>	
Villac		of	Webs	ter				EM,							
DEPTH, FEET SAMPLE NUMBER	3		CHANGE. FEET	DESCF	RIPTION OF M	IATERIA	L	TEST	N-VALUE (BLOWS/FT.)		NFINED (	2 WA	SIVE STRE O - 3 ATER TENT %		5
DEPTH, FEET	AND TYP	WAIEH LEVEL	STRATA	SURFACE ELEVAT	ION	<b></b>	<b></b>	SPECIAL TEST RESULTS	N-VALUE			- (	● ~ ATION (E ⊗- 30		=00т) 50
17	AS		4	Black to brown moist	SAND with	n SILT (SP-									
- 29	SS		<u>4</u> 5.5	Gray SILTY LEAN	CLAY, MC	oist, (	CL)		-7	Q	 				
0 35	SS			Brown fine to m to waterbearing dense					15		8				
45	<u>ss</u>					(	SP)		12						
0 59	SS						1		15	1					
- 65	SS								15						
0 75	SS N								26			D			
85	SS	-+-				·····			16		Ø			<b> </b>	<b> </b>
				End of boring a 4 <sup>1</sup> / <sub>4</sub> inch hollow full depth			đ								
				Borehole backfi cement grout		n sand	l/			-					
										-					
														; ;	
							:								
				OBSERVATIONS le sampling		Geotechnical 4 P.D. Box 16	eota 55816	NTS, I	NC.	BORI RIG	OME ! VN KAI	IPLETED	6-2 DRI	5-91 5-91 LLER J PROVED	WCK
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<b>[</b>				<u> </u>	LOG OF E	BORING	SB-	11						
	JECT			urface Exploratio	on and	SITE RA	ilro	ad (			h of	Main	Stree	et
		in	g Wel	l Installation Pr Water Supply	rogram -	<u>+</u>			Wisco	nsin				
1	NER 11age	. 0	f Web				CI-EN EM,							
						, <u> </u>				NFINED C	OMPRES	SIVE STRE	NGTH TO	DNS/FT <sup>2</sup>
			. FEET					N-VALUE (BLOWS/FT.)		1	-	0- 3	л	5
	BEA	ر ا	NGE	DESCR	IPTION OF MATERIA	AL.	Έ	SMO		<b></b>	+			¥
EET	NUN	EVE	CHANGE.				TES	(BL			CONT	ENT %		
DEPTH, FEET	PLE	EB	STRATA					ILUE	STA	NDARD I	PENETR	ATION (B)	LOWS/F	тоот)
DEP	SAMPLE NUMBER AND TYPE	WATER LEVEL	STR/	SURFACE ELEVATI	0N		SPECIAL TEST RESULTS	//-N		10 2		<b>8</b> - 30 4	40	50
	1AS			Black to brown										
		1	3.5	with organics,	moist (	SP-SM)								
$\vdash$	2SS	1	6	Gray SILTY LEAN	I CLAY, MOISE,	CL)	ļ	4	8					
				Brown fine to m	edium SAND, m	oist								
10	3SS			to waterbearing	, medium dens	е		26			8			
					(	SP)								
	4SS							23			6			
	400	1									$\mathcal{P}$			
20	555							18						
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<u> </u>	6SS							20		9	Ø			
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30	7 <u>5</u> 5						Ì	16		ø				
36	8SS							10		6				
				End of boring a	at 36 feet									
40				$4\frac{1}{4}$ inch hollow	stem auger us	ed								
				full depth										
				Borehole was ba	obfilled with	cond/								
				cement grout		( Sand/	ļ		1					
50				-										
60							Į							
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				OBSERVATIONS	GME C	ONSULTA	NTE		BORI		RTED 6	-25-9	91	
W.L. W.L.	54	re	et wn	ile sampling		• Materials • Envi			BIG	NGCOM CME 5	<u>PLE (EC</u> 50			.Tuura
W.L.						menta 55916				VN KAL				WCK
						·			_	30-2		SHE	ETIO	of 26
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1	DJECT			face Exploration	and Monitor-	T				and onsin	Main	Stree	t	
ling	We NER		Ins	tallation Program	n - Water Supply									
		of	: Web	ster	1	ARCHITE	REM,							
			FEET		<u></u>	<u>^</u>				ONFINED (	COMPRES	SIVE STRI	ENGTH T	ONS/FT
	~							;/FT.)		1	-	O- 3	۸	5
	ABEP		CHANGE.	DESCF	RIPTION OF MATERIA	AL	H	SMO		- <del>i</del>	<del>7</del> WA		<b></b>	¥
	ΝΩμ	LEVI	Đ				LES 0	BL			CONT	FENT %		
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA				SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)	ST/	ANDARD			BLOWS/F	00T)
DEF	SAN	WA	STR	SURFACE ELEVAT			SPE	N-V		10 ;		<b>8</b> - 30 · ·	40	50
	1AS			Brown SAND with							[		[	
	<u> </u>		4	organics at 3 f	.eet, moist (S	P-SM)					 		<u> </u>	
<u> </u>	2SS			Brown fine to m				4	Q					
				to waterbearing to medium dense		loose				$\square$		i		
	3SS				~			25					]	
<u> </u>					()	SP)								
	4SS							10	6					
<u> </u>										$\left  \right\rangle$				
20	5SS							22			8			
<u> </u>	6SS							13		ø				
<u> </u>			1					.5		٦				
30	7SS							17				1		
	100							17		ø				
	0.0.0	$\mathbf{M}$						_						
36	855				+ <u>)</u>				Ø					
40				End of boring a	IT 30 IEET									
				$4\frac{1}{4}$ inch hollow	stem auger use	ed								
				full depth								:		
				Borehole backfi	lled with sand	d/								
				cement grout	:							1		
50														
60														
	WAT	ER I		OBSERVATIONS		<u> </u>			BORI	NG STAF		6-19	1 9-91	
W.L.				le sampling		ONSULTAI		NC.	BORI		PLETED			
W.L. W.L.					P.O. Box 18 Dukch, Mey	5070 neesta 55816				CME 5	······		<u>LLER J</u> ROVED	<u>, Tuur</u> WCK
<u> </u>					(218) 722-	4323				30-23				of 26
					The stratification I									
I					between soil types	s, insitu the	transi		nay be	gradual				

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<b></b>					LOG OF	BORING		S	B–13				
	JECT	_		face Exploration		SITE							
	itori NER	.ng	Well	Installation Pr Water Supply		ARCHITE			consin			·	
		of	Webs			RREM,			.En				}
			FEET						UNCONFINED	- (	SIVE STREE	ибтн то	NS /FT <sup>2</sup> 5
DEPTH, FEET	SAMPLE NUMBER AND TYPE	R LEVEL	LA CHANGE.	DESCI	RIPTION OF MATER		SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)	STANDARI	CONT -	TER ENT %	014/5/5/	
DEPT	SAMP AND 1	WATER	STRATA	SURFACE ELEVAT	<u> </u>		SPEC RESU	N-VAI	10	- 0	8-		50
	1AS		3.5	Brown fine to m SILT, fill, moi Gray SILTY LEAN medium									]
	2SS		5.5	Brown fine to m				6		++			
10	3SS			to waterbearing dense				20		⋗			
	4SS							9	8				
20	555							11	8				
	6SS							10	€.				
30	755							16					
	855							10					
36	000			End of boring a	t 36 feet								
40				$4\frac{1}{4}$ inch hollow full depth	stem auger u:	sed							
				Borehole backfi cement grout		nd/							
50													
60													
					<b>.</b>	<u></u>					<u> </u>		
W.L.	<u>wат</u> 34	ER fe	LEVEL ( et wh	DBSERVATIONS ile sampling	GME GME		NTS, II	NC.	BORING ST	MPLETED		-91	
W.L. W.L					P.D. Bos DAuch, H	16070 Arresota 55816 22-4323	<b></b>		RIG CME	L	APPF	OVED	•Tuur WCK
		<u> </u>			The stratification				mate bounda		<u>ISHEI</u>	<u>ET 18</u>	of 26

<u> </u>				an 1991 - Anna Anna Anna Anna Anna Anna Anna An	LOG OF E	BORING	SB	-14			······································		
PRC	JECT	S	ıbsur	face Exploration		SITE Min	nnow	Av	enue				
Mon	itori	ng	Well	Installation Pr		We	bste	r, '	Wisconsin				
(	NER	~		water supply	У	ARCHITEC							
V11_	Lage	ot	Webs	ter			EM,	Inc					
ĺ			FEET					ĉ	UNCONFINED		SIVE STRE	NGTH TO	)NS/FT '
ļ	œ		ш ці					S/F]	1	2	3	4	5
	ABE	ᆸ	ANG	DESC	RIPTION OF MATERIA	L I	3T	ΝO			TER	- <b>f</b>	<b>*</b>
EE	ΠΩμ	LEVEL	СН				TEST	(BI			TENT %		
DEPTH, FEET	SAMPLE NUMBER AND TYPE	臣	STRATA CHANGE.				SPECIAL T RESULTS	N-VALUE (BLOWS/FT.)	STANDAR		ATION (B)	BLOWS/F	00T)
DEP	AND	WATER	STR,	SURFACE ELEVAT			SPE(	77-N	10		8-		
			0.5	Black sandy s	ILI, topsoil,	ML) /			10	20	30 4	40	50
	1AS		3	Gray SILTY LEAN									
	2SS			Brown fine to m	odium CAND mo	i et		26		8			
	200			to waterbearing				20		ľΫ́			
				dense to dense									
10	3SS					(07)	-	22		Ø			ĺ
						(SP)							
	4SS							21					
	455						l	21		P			
20	5SS					ļ		12	Ø				
	6SS		1					21					
	005							21		۶°			
													-
30	7SS							14	Ø	Î I			
	8SS						MA	18		3			
	035						1*144	10		$\mathbf{k}$			
40	9SS			:				38			<b>N</b>		
42	555	$\vdash$		End of boring a	t 42 foot						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
				and or writing a	L 72 ICCL								
				$4\frac{1}{4}$ inch hollow	stem auger use	d (							
50				full depth									
				Monitoring well	MW_91_1 wae								
				installed in									
					<b>---</b>								
						}							
60													
						Í							
				OBSERVATIONS					BORING STA	RTED	6-19		
W.L.	33	fe	et wh	ile sampling	GME C Geotactrical	Materials + Envir	<b>UTS, I</b> ormentai	NC.	BORING CO			9-91	
W.L.					P.O. Box 10 Dutch, Mrr	3070 1000ta 55916			RIG CME	550 AL			VCK
W.L.					(218) 722-					232-01		ROVED	of 26
					The stratification I	ines represe	ent an	proxi				<u></u>	
					between soil types								

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PRC	JECT	Su	bsurf	ace Exploration					enue and	Elm Str	eet	
				allation Program	- water				Wisconsin			
owi	NER V	/il	lage	of Webster	supply		EM,	GINE	ER •			
			FEET			_I		ΈT.)	UNCONFINED	-0		
	VIBER	EL	CHANGE.	DESCF	RIPTION OF MATERIA	AL	31	(BLOWS/FT.)	<del></del>	2 3 WAT		5
FEE	N N N N N	LEV	HO V				L TES	JE (B(	ł	CONTE	NT %	
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEI	STRATA	SURFACE ELEVAT	ION		SPECIAL TEST RESULTS	N-VALUE		- 🛇		
	1AS	5	S	Brown SAND with	÷	,	0.0	2	10	20 30	40	50
			3.5	moist	CLAY with	(SP)						
	255			Gray SILTY LEAN Organics			erm	3T				
10				Brown fine to m medium dense	edium SAND, m	oist,						
	3SS					(SP)		11	Ø			
	4ss							11				
	400							, ,				
20	5SS							6	ø			
									N			
	6SS							11	ବ			
30												
	7 <u>5</u> 5							13				
	8SS	•						14				
36	033		. <u></u>	End of boring a	t 36 feet				~			
40				$4\frac{1}{4}$ inch hollow								
				used full de								
				Borehole backfi		a/						
				cement grout	-							
50												
60										ÍÍ		
									1			
	WAT	EЯ	LEVEL	OBSERVATIONS			NTE		BORING STA		-18-91	
W.L.	33.	j W	nite	sampling	Geotechnica	CONSULTA			BORING CO RIG CME	MPLETED 550	0-10-31	J.Tuura
W.L. W.L.						veeota 55815			DRAWN KA	L	APPROVE	DWCK
<u></u>					[218] 722	-060			JOB# 30-2	32-01		of 26
					The stratification between soil type							

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					OF BORING	SB-	16	
				face Exploration and 1 Installation Program -	SITE	bste	r, '	Wisconsin
	NER			er Supply	ARCHITE		· ·	
		2 0		oster		EM,		
						1		UNCONFINED COMPRESSIVE STRENGTH TON
			Ē				/FΤ.)	-0-
	IBER	<u>ر</u> ا	NGE	DESCRIPTION OF MAT	ERIAL		(BLOWS/	1 2 3 4 5 WATER
FEET	NUNUN	LEVEL	СНА			TES	(BL	CONTENT %
DEPTH, FEET	SAMPLE NUMBER AND TYPE	EB	STRATA CHANGE, FEET			SPECIAL TEST RESULTS	N-VALUE	
DEP	SAM	WATER	STR,	SURFACE ELEVATION		SPE(	//-N	-⊗- 10 20 30 40 50
	1AS	$\square$	<del>:0.5</del> -	Bituminous pavement			<u> </u>	
			3.5	Brown fine to medium SAND Fill, moist	with grave	₽ ↓		
	2SS		4.8	Gray SILTY LEAN CLAY, m	oist,		21	
				Brown fine to medium SAND,	moist			
10	3SS			to waterbearing at 33.5 fe		ų ·	14	Ø
				dense	1 mm 1			
					(SP)			
	<u>4SS</u>					(	14	
-70								
	<u>555</u>						9	
	6SS						30	
30	7SS						24	
	855						9	
							-	
40	9SS						44	
	955					[	41	
	1055						38	
50	11SS					]	22	Ø
	12SS					[ ·	17	
60	177	_				I		
	<u>135</u> 5		-	Boring log continued on n	ext page.		17	
				<u> </u>				
	WAT		EVEL	OBSERVATIONS				BORING STARTED 8-6-91
/.L.				hile sampling GM			NC.	BORING COMPLETED 8-6-91
/.L.				P.D.1	chncel + Matenals + Envi Box 18070 h, Minnesota 55816	ronmental		RIG CME 550 DRILLER J.T
/.					722-4323			DRAWN KAL APPROVED W JOB# 30-232-01 SHEET 21 O
				The stratificat	· · · · · · · · · · · · · · · · · · ·			

	<u> </u>			<u></u>	LOG	OF BORING	 G	SB-1	6 0	ont'd		
	JECT			face Exploration	and	SITE						
		ng	Well	Installation Pr	ogram -				onsin			
	NER	~f		later Supply		ł	TECT-EN		EER			
Vil.	Lage		Webs	ster			, Inc	Τ	UNCON	VFINED COMPRE	SSIVE STREN	GTH TONS/FT 2
			. FEET					/FT.)	<b>.</b>	-	-0-	F
ĺ	BER		CHANGE.	DESCI	RIPTION OF MA	TERIAL	.	MS		1 2 +	3 4 ATER	5
EET	MON	EVE	HA				LES1	ВГО			ITENT %	
н	Le N	Ч					r_s	H ۲		- NDARD PENETI		
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA	SURFACE ELEVAT	ION Depth	n = 60'	SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)	51AI 11	-	· 🚫 - 30 40	
	1355			Brown fine to	medium SAM	<u></u>		17		Q		
				waterbearing,								
	1455					(SP)	MA	28				
							1.41.7					
70												
70 71	<u>1555</u>							20		¢	┦	
					,							
				End of boring	at 71 feet	L						
				$4\frac{1}{4}$ inch hollow	stem auge	er used						
80				full depth								
					1 151 04 7							
				Monitoring wel installed i								
				Instarieu I		1119						
90												
100												
<u>110</u>												
										(		
120			1									
1	WAT		EVELO	DESERVATIONS	1			Į	BOBIN	G STARTED	<u>   </u> 8-6-9	1
V.L.				hile sampling	G C C C C C C C C C C C C C C C C C C C	ME CONSULT	ANTS,	INC.		G COMPLETE		
V.L.						otechnical * Mateinais * I D. Box 16070	invironmental		RiG (	ME 550	DRILL	ER J. Tuura
V.L.						AAh, Minnesota 55816 18) 722-4323				KAL		OVED WCK
					<b></b>				JOB#	30-232-0	ISHEET	22 of 26
						ation lines repr I types; insitu tl						

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	JECT	C,	ואפייי	LOG OF	SITE		3–17		
				l Installation Program -	Web	ster	:, W	isconsin	
1WO				Water Supply	ARCHITE	CT-EN	GINE	ER	
Vi	Llage	0	f Web	oster	RRE	M, i	.nc.		
			FEET				-	UNCONFINED COMPRESSIVE STRENGTH T	ON
	œ		цí Цí				S/FT	1 2 3 4	5
⊢	MBE	Ē	ANG	DESCRIPTION OF MATER	IAL	ST	(BLOWS/FT.)	WATER	
FEET	SAMPLE NUMBER AND TYPE	LEVEL	STRATA CHANGE.			SPECIAL TEST RESULTS	JE (B	CONTENT %	
DEPTH,	MPLI D TY	WATER	AT/			SULT	N-VALUE	STANDARD PENETRATION (BLOWS/	FO
DE	SA AN	AN V	STI			S H	ź	- 🚫 - 10 20 30 40	5(
	1AS		2_	Black to brown SANDY SILT wi organics, topsoil, moist (M					L
			4 <u>.5</u>	Dark brown SILTY SAND, fill,		1)			
	2SS	F	5.5	Gray SILTY LEAN CLAY, Moist, stiff			23-		┢
				Light brown fine to medium S					
	3SS		-	moist to waterbearing at 33.	5 feet,		15	ø	
				medium dense to loose					
	4SS			(	SP)		7	Ø I I I	
[									
20_	555						10		
					:				
	6SS				1		13		
	000						1.5		
30	700						33		
	7 <u>5</u> 5	_					33	8	
		<b>•</b>							
	8SS					ļ	43		
40	9SS						39		
	1055	;					46		
50	11S	;					45		
	1255	;					6	8	ĺ
60_	1355	-				<b>↓</b> −	-3	-☆	1
				Boring log continued on next	c page.				
1				OBSERVATIONS	. <u> </u>			BORING STARTED 8-6-91	<u> </u>
W.L.	33.	5	feet	Geotectra	CONSULTA	NTS,	INC.	BORING COMPLETED 8-6-91 RIG CME 550 DRILLER J	
<u>W.L.</u> W.L.				P.O. Box DARD, N (218) 72	Anneetta 55916			DRAWN KAL APPROVED	<u>,</u>
<u></u>				(210) / 2				JOB# 30-232-01 SHEET 23	0

			<u></u>	<u></u>		OF BORING	 }	SB	–17 C	ont'd				]
	JECT			rface Exploration	n and	SITE								
		in	g Wel	l Installation Pr Water Supply			oster,			in				· ·
1WO		_	f Web				ECT-EN EM, Ir		ER					
	.1age		_	ster	<u></u>				UNCO	NFINED CO	MPRESS	IVE STRE	NGTH TO	NS/FT <sup>2</sup>
			FEET					FT.)	¢e		- 0	)-		
	ЯËR		JOE NGE	DESCR	IPTION OF M	ATERIAL		NS.		$\frac{1}{1}$			4	5
	IUME	LEVEL	AHA				rest	(BLC			CONT			
Η	LEN		TA C					ПШ	STA	NDARD P		-	LOWS/F	
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER	STRATA CHANGE.	SURFACE ELEVATI	0N		SPECIAL TEST RESULTS	N-VALUE (BLOWS/FT.)			- 6	<u>م</u>		
	1355	1	~~~	ا مت <u>من من م</u>		$oth = 60^{1}$		4	8	10 20	3	<u>0</u>	40	50
				Brown fine to me bearing, loose t										
	14SS			bearing, toose (			MA	7	6					
	1300					(SP)		,	, a					
70	4500							21						
71	1555	$\left  - \right $				<u></u>		21		<u>├</u>	<del>~  </del>			
				End of boring at 4 <sup>1</sup> / <sub>4</sub> " hollow stem		ed full de	oth				[			
	l			Monitoring well	MW-91-8 v	was								
				installed in	this bor:	ing								
80	l													
90			ļ											
	:													
100														
											ĺ			Í
											ļ			
110												-		
											Ì	1		
								1						
120														
											Ĭ			
T				OBSERVATIONS			ANTS	INC		NG START		8-6-		]
W.L. W.L.	33	5.5	reet	while sampling	▋▋▕▋▋▋▋□	eouchrical + Matenals + .D. Box 16070	Environmenta	4 <b>5 10 14</b> 9 4 1		CME 55			····.	Tuura
W.L.						AAth, Minneente 5581( 218) 722-4323	5		DRAV	VN KAI	,	APP	ROVED	WCK
									JOB#			SHE	Ет 24	of 26
						cation lines replayed					5			[

<b></b>	<u></u>		<u> </u>	·	LOG OF I	BORING	<u></u>	SI	3 – 1	8				
				face Exploration		SITE	ebst	er,	Wisc	onsin				
	NER	inc	j ins	tallation Program	m - Water Supply	ļ								
		of	Web	ster	ocherl	ARCHITE	REM,							
ET	UMBER	LEVEL	STRATA CHANGE, FEET	DESCI	RIPTION OF MATERIA	AL	EST	BLOWS/FT.)	UNCC		2 WA	SIVE STRE 	мбтн тс 4 4	5 1
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LE	STRATA C	SURFACE ELEVAT		<u> </u>	SPECIAL TEST RESULTS	N-VALUE (BLOWS)			– ( PENETR/ - <b>(</b>	●- \TION (B <b>8</b> -		OOT) 50
	1AS		4	Brown SAND with moist	gravel, fill,	(SP)								
	2SS		6	Gray SILTY LEAN	CLAY, moist,	(CI')		<u>ه</u>	Q					· · · · · · · · · · · · · · · · · · ·
	35 <u>5</u>			Brown fine to ma waterbearing at dense to loose	edium SAND, mo 33.5 feet, me	ist to dium (SP)		19			•			
	4SS							6	ø					
20	<u>588</u>							10	ð	8				
30	6 <u>SS</u>							10	(					
	7 <u>SS</u>	V						17		8				
	855 955							19 3	~	8				
41	555	-		End of boring at	 t 41 feet	<u></u>		<u> </u>	Ø					
				$4\frac{1}{4}$ inch hollow s full depth	stem auger use	đ								
50				Borehole backfi cement grout	lled with ŝand	/								
60														
				DBSERVATIONS while sampling	GME C	ONSULTAI		NC				8-7- 8-7-		
W.L. W.L.						• Matenals • Envi			RIG	CME !	IPLETED			Tuur
W.L						neecsa 55816			DRAV	VN KZ	AL 232-01	APP	ROVED	wСК
			7	·	The stratification I		ent en	nrovi	JOB#			<u>ISHE</u>	ETZO (	of 26
	<u> </u>			<u></u>	between soil type			-						ļ

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<b></b>	LOG OF BORING SB- 19													
PRC	PROJECT Subsurface Exploration and							SITE						
Monitoring Well Installation Program - OWNER Water Supply						Webster, Wisconsin								
Village of Webster						RREM			EH					
						İ.		UNCO	DNFINED (	COMPRES	SIVE STR	ENGTH T	ONS/FT 2	
			: FEET					/FT.)		4	- -	0~ 3	4	5
	IBEA		CHANGE.	DESC	RIPTION OF MATERI	AL		SWC		·+	- <del>1</del>	ATER	-+ 	+
EET	NUN	LEVE	CHA				TES	B			CON	TENT %		
DEPTH, FEET	SAMPLE NUMBER AND TYPE	WATER LEVEL	STRATA		<u></u>			N-VALUE (BLOWS/FT.)	ST	ANDARD	PENETF	•●- ATION (E	BLOWS/	F00T)
DEP	SAM	WAT	STR/	SURFACE ELEVAT			SPECIAL TEST RESULTS	17-N		10 :		⊗- 30	40	50
	1AS		-0.5	Bituminous Pa	vement Ith gravel, 11						<u> </u>	ř <del>–</del>		
		]	<u>3.5</u>					ļ			<u> </u>	 		
	<u>2SS</u>		<u> </u>		EAN CLAY, mois	<u>Ľ) /-</u>		18		Ø		<u> </u>		
					fine to medium					$  \rangle$				
10	3SS		ļ	moist to wate medium dense	erbearing at 3 (S			20			5			
					(3.	E)					$\left  \right\rangle$			
	4SS							25						
											V			
20	5SS							15			1			
	222							15		<b>S</b>				
	6SS							13		ø				
30										Y				
	7 <u>5</u> 5							8	ø					
36	8SS							8	&					
				End of boring	g at 36 feet									
40				4 <del>1</del> inch holle	w stem auger i	used					[	:		
	í			full depth										
				Borehole back	filled with s	and/								
				cement gro										
50														
		ļ							:					
60											Í			
													0.5	
W.L.				DBSERVATIONS		ONSULTA	NTS. I	NC.		NG STAP		8-6- 8-6-		
W.L.			<u></u>		Geotechnica P.O. Box 1	* Matenais + Envi 6070				CME 5	50		LER J	Tuura
W.L.					(218) 722	neota 55816 4323			DRAV		(AL 232-0		ROVED	
					The stratification	lines rennes	ent an		JOB#	·,		SHE	ET70	of 26
The stratification lines represent approximate boundaries between soil types; insitu the transition may be gradual.														

SIEVE ANALYSIS TESTS Village of Webster-Water Supply DATE 8-9-91 PROJECT Webster, Wisconsin JOB NO. 30-232-01 REPORTED TO RREM, Inc. 91-02 BORING NO. 91-04 91-07 91 - 04SAMPLE NO. 8 15 8 8 DEPTH (ft) 34-36 69-71 34-36 34-36 TYPE OF SAMPLE SS SS SS SS CLASSIFICATION (ASTM: D2487) SP SP SP-SM SP Symbol Poorly Description Poorly Poorly Poorly graded graded graded graded sand sand sand with sand silt MECHANICAL ANALYSIS: 168.4 108.2 135.7 168.6 Dry Weight of Total Sample (grams) Based on Total Sample -0--0-2.6 -0-Gravel-% (on #4) Based on Total Sample Sand-% (#4-#10) 4.9 0.1 -0-2.2 48.8 3.8 5.5 (#10-#40)16.6 61.1 87.8 (#40 - #100)33.6 70.9 (#100-#200)7.5 33.1 6.1 9.0 Fines-% (#200 Down) 9.3 0.6 1.3 2.6

> GME CONSULTANTS, INC. GEOTECHNICAL \* MATERIAL \* ENVIRONMENTAL

SII	EVE ANALYSI	IS TESTS					
PROJECT Village of Webster	- Water Supply DATE 8-9-91						
Webster, Wisconsin							
REPORTED TO RREM, Inc.		JOB NO. <u>30-232-01</u>					
	<u>- 10 - 100 </u>	a <sup>n -</sup> ettavistan, fr					
BORING NO.	91–07	91-08	91–09	91–14			
SAMPLE NO.	34	8	34	8			
DEPTH (ft)	66-68	34-36	66–68	34-36			
TYPE OF SAMPLE	SS	SS	SS	SS			
CLASSIFICATION (ASTM:D2487) Symbol	SP-SM	SP	SM	SP			
Description	Poorly graded sand with silt	Poorly graded sand	Silty sand	Poorly graded sand			
MECHANICAL ANALYSIS: Dry Weight of Total Sample (grams)	143.6	103.6	165.5	104.8			
Based on Total Sample Gravel-% (on #4)	-0-	1.9	0.1	-0-			
Based on Total Sample	0.1	3.3	-0-	_0_			
Sand-% (#4-#10)			Ť	-			
(#10-#40)	6.9	37.5	0.5	48.7			
(#40-#100)	78.1	53.5	12.7	50.3			
(#100-#200)	8.3	2.9	47.0	1.0			
Fines-% (#200 Down)	6.6	0.8	39.6	0.1			

I

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SIE	VE ANALYSI	s tests	
PROJECT Village of Webster -	Water Suppl	Y I	DATE 8-9-91
Webster, Wisconsin			
REPORTED TO RREM, Inc.			JOB NO. <u>30–232–01</u>
BORING NO.	91-16	91–17	
SAMPLE NO.	14	14	
DEPTH (ft)	64–66	6466	
TYPE OF SAMPLE	SS	SS	
CLASSIFICATION (ASTM:D2487) Symbol	SP	SP	
Description	Poorly graded sand	Poorly graded sand	
MECHANICAL ANALYSIS: Dry Weight of Total Sample (grams)	115,2	161.6	
Based on Total Sample Gravel-% (on #4)	-0-	-0-	
Based on Total Sample	-0-	0.1	
Sand-% (#4-#10)			
(#10-#40)	1.8	3.2	
(#40-#100)	60.0	78.2	
(#100-#200)	31.9	11.8	
Fines-% (#200 Down)	6.4	6.7	

ondagaadi.

-

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# SPECIAL NOTES ON PLACEMENT OF COMPACTED FILL SOIL

# GENERAL

The placement of compacted fill for support of foundations, floor slabs, pavements, or earth structures should be carried out by an experienced excavator with the proper equipment. The excavator must be prepared to adapt his procedures, equipment, and materials to the type of project, to weather conditions, and the structural requirements of the architect and engineer. Methods and materials used in summer may not be applicable in winter; fill used in dry excavations may not be suitable in wet excavations or during periods of precipitation; proposed fill soil may require wetting or drying for proper placement and compaction. Conditions may also vary during the course of a project or in different areas of the site. These needs should be addressed in the project drawings and specifications.

### EXCAVATION/BACKFILL BELOW THE WATER TABLE

It is common to have to excavate and replace unsuitable soils below the water table for site correction. As a general rule of prudent construction technique, we recommend that excavation/backfill below the water table not be permitted, unless the excavation is dewatered. Numerous problems can develop when this procedure is attempted without dewatering.

- Inability of the equipment operators and soil technicians to observe that all unsuitable soil/materials have been removed from the base of the excavation.
- Inability to observe and measure that proper lateral oversizing is provided.
- Inability to prevent or correct sloughing of excavation sidewalls, which can result in unsuitable soils trapped within the select backfill.
- Inability of the contractor to adequately and uniformly compact the backfill.
- Possibility of disturbance of the suitable soils at the base of the excavation.

The dewatering methods, normally chosen at the contractor's option, should follow prudent construction practice. Excavations in clay can often be dewatered with sump pits and pumps; this technique would not be applicable for excavation extending into permeable granular soil, especially for depths significantly below the water table. Dewatering granular soils should normally be done with well points or wells. When dewatering is needed, we strongly recommend that the procedures be discussed at pre-bid or pre-construction meetings. The dewatering technique chosen by the contractor should be reviewed by the architect and engineer before construction starts; it should not be left until excavation is under way.

The selection of proper backfill materials is important when working in dewatered excavations. Even with dewatering, the base is usually wet and the contractor must be careful not to disturb the base. We recommend that the first lifts of backfill be a clean medium to course grain sand with less than 5% passing the #200 sieve. The use of silty sand, clayey sand, or cohesive/semi-cohesive soils is not recommended for such situations. The excavator should be required to submit samples of the proposed material(s) he plans to use as backfill before the fill is hauled to the site, so that it can be tested for suitability.

#### WINTER EARTHWORK CONSTRUCTION

Winter earthwork presents its own range of problems which must be overcome; the situation may be complicated by the need for dewatering discussed above.

During freezing conditions, the fill used must not be frozen when delivered to the site. It also must not be allowed to freeze during or after compaction. Since the ability to work the soil while keeping it from freezing depends in part on the soil type, the specifications should require the contractor to submit a sample of his proposed fill before construction starts, for laboratory testing. If the soil engineer and structural engineer determine that it is not suitable, it should be rejected. In general, silty sand, clayey sand, and cohesive/semi-cohesive soils should not be used as fill under freezing conditions. All frozen soil of any type should be rejected for use as compacted fill.

It is important that compacted fill be protected from freezing after it is placed. The excavator should be required to submit a plan for protecting the soil. The plan should include details on the type and amount of material (straw, blankets, extra loose fill, topsoil, etc.) proposed for use as frost protection. The need to protect the soil from freezing is ongoing throughout construction and applies both before and after concrete is placed, until backfilling for final trost protection is completed. Foundations placed on frozen soil can experience heaving and significant settlement, rotation, or other movement as the soil thaws. Such movement can also occur if the soil is allowed to freeze after the concrete is placed and then allowed to thaw. The higher the percentage of fines (clay and silt, P-200 material) in the fill, the more critical is the need for protection from freezing.

# MOISTURE CONTROL OF FILL

The contractor should be required to adjust the moisture content of the soil to within a narrow range near the optimum moisture content (as defined by the applicable Proctor or AASHTO Test). In general, fill should be placed within about 2% of optimum. The need for moisture control is more critical as the percentage of fines increases. Naturally-occurring clayey sand or cohesive/semi-cohesive soil are often much wetter than the optimum. Placing and attempting to compact such soils to the specified density may be difficult, or not possible. Even if compacted to the specified density, excessively wet soils may not be suitable as floor slab or pavement subgrades due to pumping under applied load. This is especially true when wet cohesive/semi-cohesive soil is used as backfill in utility trenches under streets. Excessively wet soil in thick fill sections may cause post-construction settlement beyond that estimated for fill placed at or near (±2%) the optimum moisture content.

An exception to this would be low permeability soil placed as a pond liner or for a dam. Such soil should usually be placed at 2% to 4% above the optimum moisture content, to provide for a lower insitu permeability. Also, shrinking/ swelling soils (expansive clay) should be placed at about 2% to 4% above optimum moisture to reduce the possibility of soil expansion. Clayey silt, silt, or very silty fine sand should be placed excessively dry. Such soils can undergo post-construction consolidation upon being wetted, even if the specified density had been achieved. This is caused by the collapse of flocculant soil particle arrangement, and can result in settlement of buildings or slabs constructed over the soil.

Proper control of fill soil moisture is the responsibility of the excavator. The excavator should evaluate the need for wetting or drying the soils, based either on the data in the soil report, or his own site testing. If the excavator is bringing in off-site fill, it is also his responsibility to evaluate the moisture content of the soil, and the need for wetting or drying. We recommend that this matter be addressed in the project specifications.

#### CONSTRUCTION ON COMPACTED SOIL

After the select fill has been placed, compacted, and tested, it must be maintained and protected in order to properly support structures. The suitability of compacted fill soil can be greatly diminished if it is allowed to freeze, become saturated while unconfined (such as in footing excavations or at the surface of slab/placement subgrade), or disturbed by construction equipment.

The responsibility for protecting the soil, or for correcting any disturbance, should be clearly defined in the specifications. Soils which become wet and soft after compaction testing do not necessarily reflect inaccurate field density tests. Especially with non-expansive cohesive/semi-cohesive soils, saturation when unconfined can severely reduce the shear strength while the density remains adequate. The reduced shear strength can cause footings, floor slabs, or pavements to settle or fail under load. We strongly recommend that all pavement subgrade be test rolled (MN/DOT Specification 2111) immediately before paving to determine if the subgrade has not been protected and soft spots have developed.

#### FLOOR SLAB SUBGRADE AND UTILITY TRENCHES

This facet of construction presents special problems, especially if the slab subgrade is allowed to freeze. When the soil thaws, it undergoes a period of temporarily lower shear strength. Floor slabs should not be cast over soil in such a weakened or frozen condition (reference pertinent PCA and ACI publications). To do so can result in cracked and failing slabs. The time period to heat and thaw a building may place the construction schedule and/or costs in jeopardy. We strongly recommend that this matter be reviewed in pre-bid and pre-construction meetings.

Backfilling of utility trenches in the floor slab subgrade can be difficult. If the soil is wet, compaction to the specified density may be difficult, or not possible. The narrowly cut trenches may preclude the use of proper compaction equipment. With the use of small equipment in confined areas, the contractor must place the soil in thin lifts (4 to 6 inches), with the soil at the proper moisture content. This work is typically carried out by contractors other than the mass grading or earthwork contractor. We strongly recommend that the responsibility to carry out the compaction be clearly detailed in the applicable section of the specifications, and reviewed with the appropriate contractor and subcontractor.

# CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

(ASTM: D 2487 and 2488)

Major divisions			Group symbols	Typical names	Laboratory classification criteria	
	noli	Clean gravels (Little or no lines)	GW Well-graded gravels, gravel-sand i mixtures, little or no fines		$ \begin{array}{c} D_{60} & (D_{30})^2 \\ C_{\mu} = -\frac{D_{60}}{2} & greater than 4: C_{c} = -\frac{D_{60}}{2} & between 1 and 3 \\ D_{10} & D_{10} & XD_{60} \\ \end{array} $	
o. 200 sleve slze)	Gravels all of corase fract n No. 4 sleve size	Clean (Little or	GP	Poorly graded gravels, gravel- sand mixtures, little or no fines	D 10 D 10 XD 50	
	Gravels (More than half of corase fraction larger than No. 4 sleve size	Gravels with fines (Appreciable amount of fines)	GM U	Silty gravels, gravel-sand-sill mixtures	Atterberg limits below "A" S & S & S & S & S & S & S & S & S & S &	
Coarse-grained solls material is larger than No.	¥.	Gravels (Apprecial of II	GC	Clayey gravels, gravel-sand-clay mixtures	0 o     0 o       N Z     Ine cases requiring us       N Z     Atterberg limits below "A"       0 dual symbols       Ine or P.I. greater than 7	
Coarse-gri	llan (e)	Clean sands (Litte or no fines)	sw	Well-graded sands, gravelly sands, little or no fines	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
(More Uhan half of	Sands III of coarse fract In No. 4 sleve siz	Clean (Little or	SP	Poorly graded sands, gravely sands, little or no lines	Not meeting all gradation requirements for SW set o so the so th	
N)	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Sands with fines (Appreclable smount of fines)	SM U	Slity sends, send-silt mixtures	Not meeting all gradation requirements for SW Not set of the	
	52	Sands v (Apprecial of I	SC Clayey sands, sand-clay mix tures		Atterberg limits below "A" requiring use of dual sym bols. inte or Ri, greater than 7	
	Silts and clays (Liquid Ilmit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clay- ey fine sands or clayey silts with slight plasticity	60 <sub>1</sub>	
sleve)			CL	Inorganic clays of low to me- dium plasticity, gravelly clays, sandy clays, slity clays, lean clays	For classification of fine-grained solis and fine traction of coarse- grained solis. Atterberg Limits plotting in hatched area are borderline classi-	
200		(Llqui	OL	Organic silts and organic silty clays of low plasticity	fications requiring use of dual       40       symbols       Equation of A-line:       PI=0.73 (LL - 20)	
Fine-grained soils material is smaller than No.		han 50)	MH	inorganic silts, micaceous or diatomaceous fine sandy or silty solis, elastic silts	20	
Fine than hall of mate	Sills and clays (Liquid limit greater than 50)		СН	Inorganic clays of high plas- ticity, lat clays	The second secon	
More tha		(Llquid	он	Organic clays of medium to high plasticity, organic silts	4 0 0 0 10 20 30 40 50 60 70 80 90 10 Liguid Limit	
-	High! organic solis		Pt	Peat and other highly organic soll	Plasticity Chart	

	id Waste 🛛 Haz. Waste 🗆 & Repair 🖾 Undergroup		MONITORING WELL CONSTRUCTION Form 4400-113A Rev. 4-90
'acility/Project Name	Local Grid Location of W	cil	Well Name
VILLAGE OF WEBSTER - WATER SUPPLY	ſı. ⊟N.	ft_ <b>E</b> .	Mw-91-1
acility License, Permit or Monitoring Number	CLASSIC MALLAN W	ELL LOCATION	Wis Unique Wall Number DNR Well Number
iype of Well Water Table Observation Well 211	4		Date Well Installed
Piezometer 112	St. Plane <u>268 547.297</u> Section Location of Wasu		$\frac{c_{\rm m}}{m} \frac{c_{\rm m}}{d} \frac{c_{\rm m}}{d} \frac{c_{\rm m}}{v} \frac{c_{\rm m}}{v}$
Distance Well Is From Waste/Source Boundary	]		Well installed By: (Person's Name and Firm)
fL		, T N. R 🗄 👯	Jamie Tuura
is Well A Point of Enforcement Std. Application?	Location of Well Relative u Dpgradient	s 🔲 Sidegradient	
		n 🔲 Not Known	GME Consultants, Inc.
A Protective pipe, top elevation _ 923.421	ft. MSL	1. Cap and lock? 2. Protective cov	<i>–</i> –
B. Well casing, top elevation _ 963.2.2.1		a. Inside diam	
C. Land surface elevation $-980.24$		b. Length:	_4.9.ft. Steel 125 04
D. Surface seal, bottom fL MSL or 2	7 5 ft		Other D
12. USCS classification of soil near screen:		d. Additional	
	SP 🛛 🔪	If yes, desc	ribe: 3-4"x7' STEEL GUARD DOSTS
	сн 🗆 🛛 👔		Bentonite 🗖 30
Bedrock		3. Surface seal:	
13. Sieve analysis attached? 🖾 Yes 🗖 1	No		Ouher 🔲 🔅
14. Drilling method used: Rotary 🗖	50 📓	4. Material betwe	en well casing and protective pipe:
Hollow Stem Auger 💆			Bentonite 🗖 30
Other 🖸 .	8		Annular space seal
	o. 1		CONCRETE Other D'
15. Drilling fluid used: Water □ 02 Air □ Drilling Mud □ 03 None Ø	1000	5. Armular space	
			al mud weight Bentonite-sand slurry 🔲 35
16. Drilling additives used? 🔲 Yes 🔯 P	vo 🕅		al mud weight Bentonite slurry 🔲 31
		100 million	tonite Bentonite-cement grout $\mathbf{D} = 50$
Describe	X	c f. How install	Ft volume added for any of the above ed: Tremie 🔲 01
17. Source of water (attach analysis):		I. NOW UISTALL	$\frac{1}{\text{Tremie pumped } \square 02}$
1 NEDSTER CITY GARAGE or County Fairge	rounds		Gravity 🖸 08
		6. Bentonite seal:	
E Bentonite seal, top 25 5 ft. MSL or	ft		$\square 3/8$ in. $\square 1/2$ in. Bentonite pellets $\square 32$
		C	Other 🛛 🧾
F. Fine sand, top ft. MSL or	ft.	2. Fine sand mate	rial: Manufacturer, product name & mesh size
3. Filter pack, top 5 ft. MSL or	ft.	b. Volume adk	
H. Screen joint, top 30 0 ft. MSL or	ft_		terial: Manufacturer, product name and mesh size
H. Screen joint, top <u>30</u> ft. MSL or			LINT SAND 45-55
I. Well bottom4 o _o ft. MSL or	fr.	b. Volume adı 9. Well casing:	
		. wen casing:	Flush threaded PVC schedule 40 🖸 23 Flush threaded PVC schedule 80 🗵 24
I. Filter pack, bottom 4 2 p ft. MSL or	ft_		
		10. Screen materia	
K. Borehole, bottom 4 2 . 2 ft. MSL or	fts	a. Screen type	
			Continuous slot 🔲 01
-Borchole, diameter 20 in.			
		b. Manufacture	
M. O.D. well casing <u>239</u> in.		c. Slot size:	0. <u>♀ ℓ</u> Ųin.
· · · · · · · · · · · · · · · · · · ·		d. Slotted leng	
N. L.D. well casing <u>2/09</u> in.		11. Backfill materi	al (below filter pack): None 🖬 14
Lalla 11			Other 🛛 👻
hereby certain that the information on this		rect to the best of my k	nowledge.
JURANON LYDON 11E	FIMGME	CONSULTAN.	$\overline{M}$ $1\overline{M}$ .
	· -	· · · · · · · · · · · · · · · · · · ·	

**.** .

Olerse complete both sides of this form and feturn to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., ind ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10,000 for each \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each

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State of Wisconsin Department of Natural Resources MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

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Route 10: Solid Waste 🗆 Haz. Waste 🔲 Wastewater 🗇

Facility/Project Name			unty Name		Well Name	
WEBSTER			Bur	NETT	MW-91	-1
Facility License, Permit or Monitoring Number		C	ounty Code	Wis: Unique Wall N	Umber DNR W	ell Number
1. Can this well be purged dry?		œ	No No	11. Depth to Water	Before Development	After Development
2. Well development method				(from top of	<u>36.02ft</u>	<u>36.03</u> fL
surged with bailer and bailed		41		well casing)		
surged with bailer and pumped	_	41 61		-		
' surged with block and bailed	_	42		Date	1910591	69105191
surged with block and pumped	_	62			$\frac{bOQ}{mm} \frac{1051}{d} \frac{51}{v} \frac{91}{v}$	$\frac{\partial f}{\partial d} \frac{\partial f}{\partial f} \frac{\partial f}{\partial d} \partial $
surged with block, bailed and pumped		70				
compressed air	_	20		Time	с <u>7:50</u> пр. т.	<u><u>9</u>:20 <u>p.m.</u></u>
bailed only		10				
pumped only		51		12. Sediment in well	<u>0</u> .4 inches	$\_$ <u>O</u> . $\_$ inches
pumped slowly		50		bottom		
Other				13. Water clarity		Clear 🖸 20
					Turbid 🖂 15	Turbid 🛛 25
3. Time spent developing well	4	<u> </u>	min.		(Describe)	(Describe)
	1 3	2	•		LIGHT BROWN	CLEAR WATER
4. Depth of well (from top of well casisng)	_43	<u> </u>	<u>⊇</u> ft.		Due TO	AFTER 3
	٦	~ /	<b>~</b> .		SUSPENDED	MINUTES OF
5. Inside diameter of well	<u>_2</u> .	<u> </u>	<u>_</u> nr	]	FINE TO YERY	PUMPING
6. Volume of water in filter pack and well					FINE SILT	
casing	(	4	51			I
	<u> </u>	<u>e</u> • :	<u> </u>	Fill in if drilling fluid	is were used and well is a	it solid waste facility:
7. Volume of water removed from well	<u>_2</u>	5.0	) val			
•••••••••••••••••••••••••••••••••••••••			- 0	14. Total suspended	mg/l	mg/l
8. Volume of water added (if any)		<u></u> . <u></u>	⊇gal.	solids		
9. Source of water added			· <u></u>	15. COD	mg/l	mg/l
10. Analysis performed on water added? (If yes, attach results)	□ Ye	5	⊠ No			1

16. Additional comments on development:

	Arri Al
Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge
Name: GEORGE J. HUDAL	Signature: JANNE Wasy 1E
Firm: RREM Tic.	Print Initials: $\underline{WC}K$
	Firm: GME CONSULTANTINC.

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NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

	lid Waste 🔲 Haz. Waste & Renair M Underw	U Wastewater U ound Tanks U Other U	MONITORING WELL CONS Form 4400-113A	TRUCTIC Rev. 4-9
acility/Project Name	Local Grid Location of	Weil	Well Name	
LILLAGE OF WEIDSTER- WATER SUPPLY	fr. 🗄		MW-91-2A	
acility License, Permit or Monitoring Number	BAL Roy Hatter	WELL LOCATION	Wis, Unique Well Number DNR W	ellNumb
		Long or	<u>D1-001</u>	
ype of Well Water Table Observation Well [11]	St. Plane 268 538. 63	5 ft. N. 1396897.47 ft. E.	Date Well Installed	<u> </u>
Piezometer 12	Section Location of Wa		$\frac{o b}{m m} \frac{1}{d d}$	
Distance Well Is From Waste/Source Boundary	1/4 of 1/4 of S	ec, T N. R 😽	Well Installed By: (Person's Name a	nd Firm)
ft	Location of Well Relati	ve to Waste/Source	JAMIE Tuura	
Well A Point of Enforcement Std. Application?	u 🔲 Upgradient 🛀	s 🔲 Sidegradient	GME Consultant	
	d Downgradient			
Protective pipe, top elevation _ 96.3.79	ft. MSL	1. Cap and lock		es 🔲 Nic
. Well casing, top elevation _ 983.69	ft. MSL	2. Protective co a. Inside diam	••	_4.ei
		b. Length;		4.01
Land surface elevation $-989.7$	ft. MSL	c. Material:	Stee	
. Surface seal, bottom ft. MSL or 2	7.0 ft.			
2. USCS classification of soil near screen:	X	d. Additional		= = [] No
	SP Z		TIDE: 3 - 4 STEEL GUARD P	
	сн 🗆 📔 🖊 🕅		Bentoni	
Bedrock		3. Surface seal:	Concret	
3. Sieve analysis attached? 🖾 Yes 🔲	100			r 🛛
4. Drilling method used: Rotary	1 200	4. Material berw	een well casing and protective pipe:	
Hollow Stem Auger			Bentoni	
Other 🗖	88		Annular space see	
5. Drilling fluid used: Water 02 Air 0	01		Concre k Othe	_
Drilling Mud 🖸 0.3 None 🔂		5. Armular space		
			al mud weight Bentonite-sand slurr	
6. Drilling additives used? 🔲 Yes 🛛 🕅	No 👹		al mud weight Bentonite slurry ntonite Bentonite-cement grou	
			Ft <sup>3</sup> volume added for any of the above	
Describe	I 🕅	f. How instal	-	
7. Source of water (attach analysis):			Tremie pumped	0
WEBSTER CITY GARAGE or Count	y tairg punds		Gravin	0 🖾 🛛
		6. Bentonite sea	: a. Bentonite granule	s <u>1</u> 22 3
Bentonite seal, top $240$ ft. MSL or	ft 📈 👹	b. □1/4 in.	□3/8 in. □1/2 in. Bentonite peller	s 🗖 3
-	. 🔪 📓	<u> </u>		
Fine sand, top ft. MSL or	ft.		erial: Manufacturer, product name & :	mesh size
Filter pack, top			one Used	
. Filter pack, top ft. MSL or	"丶丶 丶\		ded ft <sup>3</sup>	
. Screen joint, top ft. MSL or			uerial: Manufacturer, product name an Nin F Sawo 45-55	a mesh s
		b. Volume ad		
Well bottom 39 5 ft. MSL or	ft.	9. Well casing:	Flush threaded PVC schedule 40	<b>E</b> 2
	\		Flush threaded PVC schedule 80	_
Filter pack, bottom 40 0 ft. MSL or	ft		Other	
		10. Screen materi		_ š
Borehole, bottom e ft. MSL or	ft 🔪 📗	L Screen typ	e: Factory cu	ਿਡ ਹਿੱ
			Continuous slo	
Borehole, diameter $\underline{\vartheta}, \underline{\vartheta}$ in.			Other	r 🗖 🚊
_			er Johnson	
. O.D. well casing <u>Z_3</u> 1 in.		c. Slot size:		0. <u>e 1 e</u> i
		d. Sloued len		10.01
I.D. wellicasing $229$ in.		11. Backfill mater		
berefy/ settly that the information on this	s form is true and c	correct to the best of my l		
			ANTI INC.	

5000 for each day of violation. In accordance with ch. 147, Wis, Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each

State of Wisconsin Department of Natural Resources MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🔲 Haz. Waste 🔲 Wastewater 🗋

Env. Response & Repair 🔂 Underground Tanks 🗖 Other 🗖 . County Name Well Name Facility/Project Name 91-ZA BURNE NEBSTER DNR Wall Number County Code Wis Unique Wall Number Facility License, Permit or Monitoring Number 07 DL<u>-002</u> 🗖 Yes M No After Development 1. Can this well be purged dry? Before Development 11. Depth to Water  $_{36.93m}$  $36.94_{ft}$ (from top of 2. Well development method well casing) surged with bailer and bailed 41 surged with bailer and pumped 61 5 surged with block and bailed 42 Date b<u>O</u>9/05/91 mm d d y y  $\frac{09}{mm} \frac{05}{d}$ surged with block and pumped 62 surged with block, bailed and pumped 70 c. 10: 27 pm. ⊥⊥:<u>45</u> **¤.m.** compressed air Time 20 bailed only 10  $\underline{0}$ ,  $\underline{2}$  inches  $\_$ <u> $\bigcirc$ </u>. ] inches 12. Sediment in well pumped only **D** 51 bottom pumped slowly 50 -86 13. Water clarity Other Clear Z 10 Clear DI 20 Turbid 🗖 25 Turbid 🗖 15  $45_{min.}$ 3. Time spent developing well (Describe) (Describe) CLEAR - SEDIMENT CLEAR - W 42.9 ft MINOR FINE FREE AFTER 4. Depth of well (from top of well casisng) GRAINED SAND ZMINUTES 2 0 0 in. 5. Inside diameter of well OF FUMPING 6. Volume of water in filter pack and well 6.3 gal. casing Fill in if drilling fluids were used and well is at solid waste facility: \_<u>20</u>.0gal. 7. Volume of water removed from well 14. Total suspended mg/l \_\_\_\_ . \_\_\_ mg/l \_\_\_\_O . <u>O</u> gal. 8. Volume of water added (if any) solids 15. COD 9. Source of water added mg/l \_\_ mg/l 🗖 Yes 10. Analysis performed on water added? ΔΥ No (If yes, attach results)

16. Additional comments on development:

	Ana 1
Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge.
Name: GEORGE J. HUDAK	Signature: The Mill Mon PE
Firm: RREM, INC.	Print Initials: $\frac{W C R}{C}$
	Firm: <u>GMG CANSMJJ/MC</u>

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

Department of Natural Resources Env. Response		and Tanks D. Other D	MONITORING WELL CONSTRUCTION Form 4400-113A Rev. 4-90
	Local Grid Location of W		Well Name
VILLAGE OF WEBSTER - WATER SUPPLY	fi. S		MW-91-2B Wis. Unique Woll Number DNR Well Number
Facility License, Permit or Monitoring Number			
ype of Well Water Table Observation Well 11			Date Well Installed
		ft. N. 1396893.78 ft. E.	$\frac{\rho_{\rm m}^2}{m_{\rm m}^2} / \frac{1}{d_{\rm m}^2} / \frac{1}{v_{\rm m}^2} / \frac{1}{v_{\rm m}^2}$
Distance Well Is From Waste/Source Boundary	Section Location of Wass		Well installed By: (Person's Name and Firm)
fL	Location of Well Relative		JAMIE Tuura
Is Well A Point of Enforcement Std. Application?	u DUpgradient	s Sidegradient	
⊠ Yes ⊡ No	d Downgradient		GME_Consultants, Inc.
L Protective pipe, top elevation _98449 ft	MSL	1. Cap and lock?	⊠ Yes 🖸 No
		2. Protective cov	
B. Well casing, top elevation _ 184.22		a. Inside diame	
Land surface elevation $9920$ ft	MSL	b. Length:	_ <u>4</u> .9fL
D. Surface seal, bonom ft. MSL or 51	O ft.	c. Material:	Steel D 04
			Other 🛛
12. USCS classification of soil near screen:	D 22	d. Additional	
GP GM GC GW G SW G S SM G SC G ML G MH G CL G C		If yes, desc	
Bedrock		3. Surface seal:	Bentonite 🖬 30 Concrete 🖼 01
13. Sieve analysis attached? 🗹 Yes 🔲 N	ío 👹		Concrete be 01 Other
14. Drilling method used: Rotary 🖸 5	0	4. Material betwe	en well casing and protective pipe:
Hollow Stem Auger 2 4			Bentonite 🔲 30
Other 🗖 🗕			Annular space scal
			Concrete Other D
15. Drilling fluid used: Water 02 Air 0		5. Annular space	seal: a. Granular Bentonite 🛛 33
Drilling Mud 🗖 03 None 🕮 9	9		al mud weight Bentonite-sand slurry 🔲 35
16 Dulling additions used? D May 19 by	. 🔊		al mud weight Bentonite slurry 🔲 31
16. Drilling additives used? 🔲 Yes 🔯 N		d % Ben	tonite Bentonite-cement grout 🖾 50
Describe		е	Ft volume added for any of the above
17. Source of water (attach analysis):		f. How install	<b>—</b> · · <b>—</b>
•			Tremie pumped 🔲 02
WEBSTER City GARAGE or County Fairgrow			Gravity 🖾 08
Aft DE MEL		6. Bentonite seal:	· · ·
E. Bentonite seal, top ft. MSL or	<sup>II</sup> 🔨 🕅	b. $\Box 1/4$ m.	$\square 3/8$ in. $\square 1/2$ in. Bentonite pellets $\square 32$
F. Fine sand, top1.0 <sup>ft. MSL or</sup>	_ · - ft.		erial: Manufacturer, product name & mesh size
G. Filter pack, top ft. MSL or	ft.		
G. Filter pack, top590 ft. MSL or	** \	b. Volume add	terial: Manufacturer, product name and mesh size
H. Screen joint, top64 .0 ft. MSL or	ft_		Vint Sand - 45-55
		b. Volume add	
Well bottom 69 ft. MSL or	fr.	9. Well casing:	Flush threaded PVC schedule 40 🔲 23
	\ [編		Flush threaded PVC schedule 80 24
. Filter pack, bottom ft. MSL or	ft		Other 🗖 📜
K. Borchole, bottom ft. MSL or	fL	10. Screen materia a. Screen type	E Factory cut SI 11
		3	Continuous slot 💻 01
Borchole, diameter <u><u>B</u>O in.</u>			Other 🛛 📋
		b. Manufacture c. Slot size:	T Johnson 0.91 pin.
M. O.D. well casing $2.31$ in.		c. Slot size: d. Slotted leng	
N. I.D. well sting 209 in.		\	al (below filter pack): None 14
hereby certify that the information on this	form is true and co	rrect to the best of my k	nowledge.
spranne ///// Wan DE	Firm G ME	(1)	TANJT INC.
lease complete both sides of this form and return to the	ne appropriate DNR offic	e listed at the top of this form a	s required by chr. 144, 147 and 160, Wis. Stats.,
nd ch. NR 141, Wis. Ad. Code. In accordance with c 5000 for each day of violation. In accordance with ch	h.144, Wis Stats., failure h. 147, Wis, Stats., failure	to file this form may result in a to file this form may result in	a forfeiture of not less than \$10, nor more than

State of Wisconsin Department of Natural Resources

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🗆 Haz. Waste 🖾 Wastewater 🗖

Facility/Project Name		County Name		Well Name	
WEBSTER		Ι Βυ	RNETT	91-ZR	
Facility License, Permit or Monitoring Numb	ar 	County Code	Wis. Unique Well N	Umber DNR.Wo	all Number
1. Can this well be purged dry?	🗆 Ye	s JEL No	11. Depth to Water	Before Development	After Development
2. Well development method surged with bailer and bailed surged with bailer and pumped surged with block and bailed surged with block and pumped surged with block, bailed and pumped compressed air bailed only pumped only pumped slowly Other		1 2 2 0 0 0 1	<ul> <li>11. Deput to water (from top of well casing)</li> <li>Date</li> <li>Time</li> <li>12. Sediment in well bottom</li> <li>13. Water clarity</li> </ul>	$\frac{36.33}{mm} \frac{36}{d} \frac{3}{y} \frac{3}{y}$ b $\frac{09}{mm} \frac{35}{d} \frac{91}{y} \frac{1}{y}$ c. $11:57$ p.m. $\underline{0.5}$ inches Clear $\underline{5}$ 10	! : <u>40 \_</u> a.m.
3. Time spent developing well		<u>2</u> min.	,	Turbid 🔲 15 (Describe)	Turbid 🔲 25 (Describe)
4. Depth of well (from top of well casisng)	_71	. <u>8</u> fr.		CLEAR WATER BUT 0.5-1.0	<u>CLEAR - LITTLE</u> <u>OR NO SAND</u>
5. Inside diameter of well	_2.9	<u>0</u> in.		INCHES OF SAND CONSIST- ENTLY ON	OBSERVEN
<ol> <li>Volume of water in filter pack and well casing</li> </ol>	_10	. <u>7</u> gal.		BOTTOM OF BAILER	
7. Volume of water removed from well	_ <u>bo</u>	. <u>O</u> gal.		is were used and well is a	
8. Volume of water added (if any)	0	. <u>Ogal</u> .	14. Total suspended solids	mg/l	mg/l
9. Source of water added			15. COD	mg/l	mg/l
10. Analysis performed on water added? (If yes, attach results)	□ Yes	ÇY №			l

16. Additional comments on development:

٩,

Well developed by: Person's Name and Firm I hereby certify that the ab of my knowledge ve information is true and correct to the best 0 Signature: Name: **Print Initials** Firm: 1WS Firm:

	Solid Waste 🔲 Haz. Wastel 1se & Repair 🖬 Undergro		MONTTORING WELL CONSTRUCT Form 4400-113A Rev.	
Facility/Project Name	Local Grid Locauon of	Weil	Well Name	-
VILLAGE OF WEBSTER - WATER JUDPU	۲ <u></u> ۴. ج	$f_{L}$ fr. $\Box E_{L}$	MW-91-3	
Facility License, Permit or Monitoring Number	Contraction in the second s	WELL LOCATION	Wis. Unique Well Number DNR Well Nur DL - 004	лb <del>с</del>
Type of Well Water Table Observation Well	St. Plane 267988.90	ft. N. 1396 804.6/ ft. E.	Date Well Installed 07/23/91	
Piezometer Z L Distance Well Is From Waste/Source Boundary			Well Installed By: (Person's Name and Firm	<b>n</b> )
ft.		±c, T N. R 🗄 🖗	Jamie Tuura	•• /
is Well A Point of Enforcement Std. Application?	<ul> <li>Location of Well Relative</li> <li>U Upgradient</li> <li>Downgradient</li> </ul>	s 🔲 Sidegradient	GME Consultante, In	L
A. Protective pipe, top elevation _ 182.5		1. Cap and lock	? <u>1</u> 2 Yes 🗆	No
Ron at		2. Protective co	ver pipe:	
	1	a Inside diam		⊆ in.
C. Land surface elevation $-992.3$		b. Length:	_44 Steel 123	≌f∟ 04
D. Surface seal, bottom fL MSL or	<u>21.0 ft.</u>		Other 🖬	
12. USCS classification of soil near screen:	and the second second	d. Additional	protection?	No
GP GM GC GW SW G SM SC ML MH CL G Bedrock G		If yes, desc 3. Surface seal:		30
				01
14. Drilling method used: Rotary			een well casing and protective pipe:	
Hollow Stem Auger			Bentonite	30
Other D			Annular space seal	
			Concrete Other D	
15. Drilling fluid used: Water 02 Air	000	5. Annular space		33
Drilling Mud 🔲 03 None 🗴	3 9 9			35
16 Deilling additives word?	No			31
16. Drilling additives used? 🔲 Yes 🗅	5 NO		2	50
Describe		e	Ft volume added for any of the above	
17. Source of water (attach analysis):		f. How instal	<b>—</b> · · · · · ·	01
· · · · · · · · · · · · · · · · · · ·				02
HEBSTER CITY GARAGE or County Fair	TOURIS			08
F Det MSI at	<u>.</u>	6. Bentonite sea		33
E. Bentonite seal, top 42 . 2 ft. MSL or	··- <sup>II</sup>		• —	32
F. Fine sand, top ft. MSL or	ft.		erial: Manufacturer, product name & mesh si None Used	ize
G. Filter pack, top51_0 ft. MSL or	fL	b. Volume ad		<del>.</del>
	/ 道		tterial: Manufacturer, product name and mesh	size
H. Screen joint, top f. MSL or	fr.		NATIVE SAND	
		b. Volume ad		-
I. Well bonom $\underline{60}$ $\underline{60}$ ft. MSL or $\underline{60}$	ft.	9. Well casing:		23 24
I. Filter pack, bottom ? o ft. MSL or	ft.		Other	
K. Borehole, bottom ft. MSL or	ft.	10. Screen materi Screen typ		11
				01
L. Borehole, diameter <u><u>2</u> <u>2</u> in.</u>				
M. O.D. well casing _ <u>2</u> <u>3</u> <u>9</u> in.		b. Manufactur c. Slot size:	0. <u>e</u> t	_
NID Mill and		d Sloned len		
N. I.D. well desing 2.01 in.			ial (below filter pack): None D	
I hereby identity that the information on the		orrect to the best of my l	nowledge.	
Signaphre	DE Fim 6 M	E CAShi	TANT, INC.	
Please complete both sides of this form and return	to the appropriate DNR offi	ice listed at the top of this form	as required by chs. 144, 147 and 160. Wis. Su	MS.,

ويعجرون والعاهة

and bh. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each State of Wisconsin Department of Namral Resources

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🗋 Haz. Waste 🗖 Wastewater 🗖 D. 6 D. T 7\_\_\_--I \_\_

	sponse & R		rground Tanks 🔲 Ot		
acility/Project Name		County Name		Well Name	
WEBSTER			NETT	MW-9	
acility License, Permit or Monitoring Numb	xer 	County Code			all Number
. Can this well be purged dry?	🖸 Ye	s )⊈ №	11. Depth to Water	Before Development	After Development
. Well development method surged with bailer and bailed surged with bailer and pumped	口 4 区 6		(from top of well casing)	<u>∎ _34.82</u> fL	<u>_34.90</u> ft
surged with block and bailed surged with block and pumped surged with block, bailed and pumped		2 2	Date	b <u>D9/04/91</u> mm d d y y	
compressed air bailed only		0	Time	с. <u>3:05 р</u> п.	<u>4:50 pr.m.</u>
pumped only pumped slowly		0	12. Sediment in well bottom	$\underline{0}$ , $\underline{3}$ inches	<u> </u>
Other	_ 🗖 🗒	<u> </u>	13. Water clarity	Clear □ 10 Turbid 20 15	Clear 22 20 Turbid 12 25
Time spent developing well	6			(Describe) PALE TAN DUE	(Describe) CLERR WATER
Depth of well (from top of well casisng)	_62	_		TO MUX OF SUSPENDED	AFTER APPROXIMA 5 MINUTES
Inside diameter of well	<u>_2.0</u>	<u>) ()</u> in.		BENTONITE & EINE SAND	DF PUMPING
Volume of water in filter pack and well casing	8	. <u>5</u> gal.			
Volume of water removed from well	<u> </u>	. Ogal.		is were used and well is a	
Volume of water added (if any)		. <u> </u>	14. Total suspended solids	mg/l	,, mg/l
Source of water added			15. COD	mg/l	mg/l
Analysis performed on water added? (If yes, attach results)	🛛 Yes	Z №			

16. Additional comments on development:

		AMAIL /
Well deve	loped by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge ///////////////////////////////////
Name:	GEORGE J. HUDAK	Signature: All Von NE
Firm:	REM, INC.	Print Initials: UUCK
		Firm: <u>GME GUSULTITUTI</u>

à

An By the set of the s		lid Waste 🗋 Haz. Waste 🗅 Waste & Repair 🗋 Underground Tanks		MONITORING WELL CONSTRUCTION Form 4400-113A Rev. 4-90
Veckey or Merger Unress Durble       Checkey or Unress Durble       Checkey			We	ll Name
Faching License. Ferminal Producting Number       Operating License. Ferminal Productions Number       Data Number <td< td=""><td></td><td>fr. 🕂 📉</td><td>ft. 🖥 🖳</td><td></td></td<>		fr. 🕂 📉	ft. 🖥 🖳	
Long.       Long. <thlong.< th=""> <thlong.< th=""> <thlo< td=""><td>Facility License, Permit or Monitoring Number</td><td></td><td>LOCATION WE</td><td></td></thlo<></thlong.<></thlong.<>	Facility License, Permit or Monitoring Number		LOCATION WE	
Syme 20 Kell Weat Table Observation Weil/2011 St. Prems 2001254 ed. f. N. UN1044-69 f. E.       Data and the second of Weat Kalawa Source		Lat Long	or 🚿	<u>DL-005</u>
PercenterIIIDurance Will is from WaterSourceIII of 1 / 4 / 4 / 4 / 4 / 5 Sc. T. N. R. HornowWill is fulle store with them can firm.Jumer Will Schwarz StoreIII of 1 / 4 / 4 / 4 / 4 / 5 Sc. T. N. R. HornowWill is fulle storeJumer Will Schwarz StoreIII of 1 / 4 / 4 / 4 / 4 / 5 Sc. T. N. R. HornowWill is fulle storeJumer Will Schwarz StoreIII of 1 / 4 / 4 / 4 / 4 / 5 / 4 / 5 / 4 / 5 / 4 / 5 / 4 / 5 / 4 / 5 / 4 / 5 / 4 / 5 / 5	Type of Well Water Table Observation Well 11	St. Plane 266/54, 02 fr. N. 13		well Installed
Dumme WaterSource Source Source WaterSource Source WaterSource Source WaterSource Source WaterSource Source WaterSource Source WaterSource Source Source WaterSource Source Sour	Piezometer 12			
If Well A Four of Enforcement Sut. Application?       1: Decision of Well Resurve to Weir/Source       Image: Decision       1: Decision of Weir/Source       Image: Decision       1: Decision of Weir/Source       Image: Decision       1: Decision of Weir/Source       Image: Decision       I	Distance Well Is From Waste/Source Boundary			Il Installed By: (Person's Name and Firm)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				Jamie Tuura
A. Protective prop. top clevation       A. Protective prop. top clevation       A. Protective prop. top clevation       A. B. D. C. D. C. D. N. MSL         B. Well casing, top elevation       -1.2.6.4.1.5.1. MSL       C. Lavid surface clevation       -2.8.6.1. MSL         D. Surface scal. bosom       -1.0.6.7.1. MSL       -2.7.1. MSL       -2.7.1. MSL         D. Surface scal. bosom       -1.0.6.7.1. MSL       -2.6.7.1. MSL       -2.6.7.1. MSL         D. Surface scal. bosom       -1.0.6.7.1. MSL       -2.6.7.1. MSL       -2.6.7.1. MSL         D. Surface scal. bosom       -1.0.6.7.1. MSL       -2.6.7.1. MSL       -2.6.7.1. MSL         D. Surface scal. bosom       -1.0.6.7.1. MSL       -2.6.7.1. MSL       -2.6.7.1. MSL         J. Siver analysis anched?       D. West       No       -2.6.7.1. MSL       -2.6.7.1. MSL         J. Siver analysis anched?       D. Vest       No       -2.6.7.1. MSL or       -0.6.7.1. MSL or         J. Source of water (attach analysis):       -2.7.2.6. MSL or       -0.6.7.1. MSL or       -0.6.7.1. MSL or         J. Source of water (attach analysis):       -2.7.2.6. MSL or       -0.6.7.1. MSL or       -0.6.7.1. MSL or         J. F. Fine sand. top       -2.7.2.6. MSL or       -0.6.7.1. MSL or       -0.6.7.1. MSL or       -0.6.7.1. MSL or         J. F. Fine sand it top       -2.6.7.1. MSL or       <	is Well A Point of Enforcement Std. Application?	u 🗖 Upgradient s 🗖 S	idegradient	
B. Well exing, top elevation       -1.5 2. 1.2 ft. MSL       1. Protective cover pipe:         B. Well exing, top elevation       -1.2 2. 2 ft. MSL		d 🗖 Downgradient n 🗖 N		GME Consultants, Inc.
9. Well exists, top elevation       12 0 0.1 ft. MSL       1.6 edit diagneter       1.6 edit diagneter         1. Surface seal: bottom       1.6 MSL or 22.0 ft.       1.6 mSL       0.7 mSR b         1. USCS classification of soil near screen:       0.7 mSR b       0.7 mSR b       0.7 mSR b         1. USCS classification of soil near screen:       0.7 mSR b       0.7 mSR b       0.7 mSR b         1. Store analysis statched?       DI Yes       0.7 mSR b       0.7 mSR b         1. Store analysis statched?       DI Yes       0.7 mSR b       0.7 mSR b         1. Store analysis statched?       DI Yes       0.7 mSR b       0.7 mSR b         1. Store analysis statched?       DI Yes       0.7 mSR b       0.7 mSR b         1. Store analysis statched?       DI Yes       0.7 mSR b       0.7 mSR b         1. Sourd out weldt       Reary 0.5 0       0.7 mSR b       0.7 mSR b       0.7 mSR b         1. Sourd out weldt       Reary 0.2 A       0.7 mSR b       0.7 mSR b       0.7 mSR b       0.7 mSR b         1. Sourd out weldt       Reary 0.2 A       0.7 mSR b       0.7 mSR b <td>A. Protective pipe, top elevation AT GRADE</td> <td>ft. MSL</td> <td>· ·</td> <td>• – –</td>	A. Protective pipe, top elevation AT GRADE	ft. MSL	· ·	• – –
C. Land surface elevation <sup>1</sup> / <sub>2</sub> <u>D</u> <u>L</u> ft. MSL <sup>1</sup> / <sub>2</sub> ft. M	D Well envire ten elevation 98013	ft. MSL	· ·	
C. Material: Stress and, bottom C. Milestandi C. Markelle C. Material: Stress and, bottom C. Milestandi C.	en			
D. Surface seal, boutom	C. Land surface elevation $\underline{-189.1}$	fL MSL	-	
12. USCS classification of roll new terms:       Yes GP No         Yes       GP II GM GC GC GW GW GW GW GP P         Store analysis anached?       GP Yes       No         13. Sive analysis anached?       GP Yes       No         14. Defiling method used:       Roary GS II       GW G	D. Surface seal, bottom fr. MSL or $2^{\circ}$	Z. O ft.	110	· · · · · · · · · · · · · · · · · · ·
GP				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1	SP DF	•	
Berrore C       13. Sirve snalysis anached       24 region       14. Drilling method used:       Retury C       50         14. Drilling method used:       Retury C       24 1       Other C		Сн 🖬 🛛 💾 💾 🔪		
13. Sieve analysis anached?       2 Yes       No         14. Drilling method used:       Rotary       50         14. Drilling method used:       Water   02       Arm   01         15. Drilling fluid used:       Water   02       Arm   01         16. Drilling additives used?       Yes       27 No         16. Drilling additives used?       Yes       27 No         17. Source of water (attach analysis):       Image: Image			3. Surface seal:	
14. Drilling method used:       Rotary □ 50 Hollow Stem Auger ⊠ 41 Other □       4. Material between well casing and protective pipe: Bentonic □ 33 Annular space scal □       30         15. Drilling fluid used:       Water □ 02       Air □ 01 Drilling Mud □ 03       None ☑ 99       33         16. Drilling additives used?       Yes       Ø None ☑ 99       35         16. Drilling additives used?       Yes       Ø None ☑ 99         17. Source of water (attach analysis):       Tremic □ 01         17. Source of water (attach analysis):       Tremic pages scal: □       Bentonice granue grants         17. Source of water (attach analysis):       Tremic pages scal: □       Bentonice granue grants         17. Source of water (attach analysis):       Tremic pages scal: □       Bentonice granue grants       Gravity ☑ 08         18. Bentonice scal: cop	13. Sieve analysis attached? 🛛 Yes 🗖	No 🕅 🕅	$\mathbf{X}$	
Hollow Stem Auger 12 41       Other 11	14. Drilling method used: Rotary	50 📓 👹	4. Material between v	
Armular space seal15. Drilling fluid used:Warr0.2Air0.1Drilling fluid used:Warr0.2Air0.1Drilling fluid used:Warr0.2Air0.1Drilling fluid used:Warr0.3None9.916. Drilling additives used?YesEX No3.1DescribeTremic granular space seal:a. Cornular space seal:b.Lbs/gal mud weight17. Source of water (attach analysis):Bentonite seal;c.17. Source of water (attach analysis):Tremic granules0.117. Source of water (attach analysis):17. Source of water (attach analysis):18. Bentonite seal; top2.5ft. MSL orft.19. Child in, DJR in, DI2 in, Bentonite parallels3.210. Streen joint, topft.11. Well bonomft.12. Well conomft.13. Well conomft.14. Koreen joint, topft.15. Drille size16. Well casing:17. Source of water18. Koreen joint, top19. Volume added pVC schedule 4010. Screen material:11. Backbolon	<b>u t</b>			
F. Fine sand, top $27 \pm 6$ . MSL or $6$ $127 \pm 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $127 \pm 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $110$ . Screen material: $5 - 6$ . MSL or $6$ $110$ . Screen material: $100$		🕅 🕅 👹		Annular space seal
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G. Filter pack, top	E Bentonite seal, top $\underline{-25}$ , $\underline{\nu}$ ft. MSL of $\underline{-25}$		b. $\Box 1/4$ in. $\Box 3$	
G. Filter pack, top			7 Eine and a statist	
G. Filter pack, top	$-\frac{27}{2}$ is in the same, top $-\frac{27}{2}$ is in the same of $-$			
H. Screen joint, top       30:0       ft. MSL or       ft.         H. Screen joint, top       40:0       ft. MSL or       ft.         I. Well bottom       40:0       ft. MSL or       ft.         I. Well bottom       41:0       ft. MSL or       ft.         I. Filter pack, bottom       41:0       ft. MSL or       ft.         K. Borehole, bottom       41:0       ft. MSL or       ft.         K. Borehole, bottom       6:0       ft.       0         K. Borehole, diameter       8:0       ft.       0         M. O.D. well casing       2:3       9       in.       0         M. O.D. well casing       2:3       9       in.       0       0         M. O.D. well casing       2:3       9       in.       0       0       0         M. O.D. well casing       2:3       9       in.       0       0       0       0       0         M. O.D. well casing       2:3       9       in.       0 <td< td=""><td>G Filter neck ton 7.7 () ft. MSL or</td><td></td><td>/</td><td></td></td<>	G Filter neck ton 7.7 () ft. MSL or		/	
H. Screen joint, top $-\frac{3}{2} e 2$ ft. MSL or ft. I. Well bottom $-\frac{4}{2} e e$ ft. MSL or ft. I. Well bottom $-\frac{4}{2} e e$ ft. MSL or ft. I. Well bottom $-\frac{4}{2} e e$ ft. MSL or ft. I. Filter pack, bottom $-\frac{4}{2} e e$ ft. MSL or ft. K. Borehole, bottom $-\frac{4}{2} e e e$ ft. MSL or ft. K. Borehole, diameter $-\frac{8}{2} e e$ in. M. O.D. well casing $-\frac{2}{2} e e e$ in. M. O.D. well casing $-\frac{2}{2} e e e e$ in. M. O.D. well casing $-\frac{2}{2} e e e e e$ in. M. O.D. well casing $-\frac{2}{2} e e e e e$ in. M. D. well/casing $-\frac{2}{2} e e e e e$ in. M. D. well/casing $-\frac{2}{2} e e e e e$ in. M. D.D. well/casing $-\frac{2}{2} e e e e e$ in. M. D.D. well/casing $-\frac{2}{2} e e e e e e$ in. M. D.D. well/casing $-\frac{2}{2} e e e e e e$ in. M. D.D. well/casing $-\frac{2}{2} e e e e e e$ in. M. D.D. well/casing $-\frac{2}{2} e e e e e e e e e e e e e e e e e e e$			-	
I. Well bottom $40 \cdot 2$ ft. MSL or       ft.         I. Well bottom $41 \cdot 2$ ft. MSL or       ft.         J. Filter pack, bottom $41 \cdot 2$ ft. MSL or       ft.         K. Borehole, bottom $-41 \cdot 2$ ft. MSL or       ft.         K. Borehole, bottom $-41 \cdot 2$ ft. MSL or       ft.         M. O.D. well casing $2 \cdot 3$ ft.         M. O.D. well casing $2 \cdot 2$ ft.         M. D. well casing $2 \cdot 2$ ft.         M. D. Well casing	H. Screen joint top 30 0 ft. MSL or			•
I. Well bottom      4 ooft. MSL orft.       9. Well casing:       Flush threaded PVC schedule 40 □ 23         J. Filter pack, bottom      ft. MSL orft.       0ther      ft.         K. Borehole, bottom      ft. MSL orft.       0ther      ft.         I. Filter pack, bottom      ft. MSL orft.       0ther      ft.         K. Borehole, bottom      ft. MSL orft.       0ther      ft.         L. Borehole, diameter      foft.       Screen nype:       Factory cut 25 11         M. O.D. well casing      f.o.      ft.      ft.         M. O.D. well casing      f.o.      ft.      ft.         N. I.D. well/casing      ft.      ft.				5 ft <sup>3</sup>
Filter pack, bottom	I. Well bottom 40 oft. MSL or	fr.		Flush threaded PVC schedule 40 🔟 23
K. Borehole, bottom			-	Flush threaded PVC schedule 80 🖬 24
K. Borehole, bottom	J. Filter pack, bottom ft. MSL or			Other 🖬 🖉
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			10. Screen material:	Schedule BO PVC.
L. Borehole, diameter $\underline{0}$ , $\underline{0}$ in. M. O.D. well casing $\underline{2}$ , $\underline{3}$ , $\underline{9}$ in. M. I.D. well casing $\underline{-2}$ , $\underline{2}$ , $\underline{9}$ in. N. I.D. well casing $\underline{-2}$ , $\underline{2}$ , $\underline{4}$ in. N. I.D. well casing $\underline{-2}$ , $\underline{2}$ , $\underline{4}$ in. I. Backfill material (below filter pack): I hereby/certify/that the information on this form is true and correct to the best of my knowledge. Signature $\underline{0}$ , $\underline{0}$	K. Borehole, bottom $-41.0$ ft. MSL or	fL	<ol> <li>Screen type:</li> </ol>	Factory cut 😂 11
M. O.D. well casing _2 39 in.       b. Manufacturer				
M. O.D. well casing <u>2</u> . <u>3</u> <u>9</u> in. N. I.D. well/casing <u>2</u> . <u>2</u> <u>4</u> in. I hereby/cettify/that the information on this form is true and correct to the best of my knowledge. Signative M. C. Slot size: d. Slotted length: II. Backfill material (below filter pack): None <u>2</u> 14 Other <u>1</u> Please domplete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than	L. Borehole, diameter $\underline{\beta} \underline{\rho}$ in.	- Carlos		Other 🛛 🚊
d Slotted length: N. I.D. well/casing in. 1 hereby/cettify/that the information on this form is true and correct to the best of my knowledge. Signative ////////////////////////////////////	·	$\sim$		
N. I.D. well(rasing	M. O.D. well casing $239$ in.			
Intereby/certify/that the information on this form is true and correct to the best of my knowledge.         Signature         Signature         Wissed of this form and return to the appropriate DNR office listed at the top of this form as required by chr. 144, 147 and 160, Wis. Stats., rand ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than	in the second seco		<b>`</b>	
hereby certify that the information on this form is true and correct to the best of my knowledge. Signather when the information on this form is true and correct to the best of my knowledge. Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chr. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than	N. I.D. well/casing $\frac{2}{2} = \frac{2}{2}$ in.		11. Backfill material (b	• • • • • • • • • • • • • • • • • • •
Signature Wisses of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than				
Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than			the pest of my know	vieoge
Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than	- WING / Whom _ M	E OME	CONSLIT	ANTT INC,
and/ch, NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than	Please complete both sides of this form and return to	the appropriate DNR office listed at	the top of this form as re	
	and ch. NR 141, Wis. Ad. Code. In accordance with	ch.144, Wis Stats., failure to file this	is form may result in a for	feiture of not less than \$10, nor more than

and a second second

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

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Route to: Solid Waste 🗇 Haz. Waste 🗇 Wastewater 🗇

Facility License, Permit or Monitoring Number       County Code       Wis. Unique Wall Number       DNR Well Number         1. Can this well be purged dry? $\Box$ Yes $\Delta$ No       1. Depth to Water       Before Development       After Develop         2. Well development method       1. Depth to Water $\Box$ $\Box$ $\Box$ $\Box$ $\Box$ $\Box$ $\Box$ $\Delta$ $\Box$ $\Box$ $\Box$ $\Box$ $\Box$ $\Box$ $\Delta$ $\Delta$ $Error Development       After Develop         2. Well development method       1. Depth to Water       \Box \Box \Box \Box \Box \Box \Delta \Box \Box \Box \Box \Box \Delta \Box \Box \Box \Box \Box \Delta \Delta \Box \Box \Box \Box \Delta \Delta \Box \Box \Box \Box \Delta \Delta \Box \Box \Box \Delta \Delta \Box \Box \Box \Delta \Delta \Box \Box \Box \Box \Box \Delta \Delta \Box \Box \Box \Box \Delta \Delta \Box \Box \Box \Box \Box \Box \Box \Box \Box \Box$	Facility/Project Name		County Name		Well Name	
1. Can this well be purged dry?       □ Yes       Yes       Ø No         1. Can this well be purged dry?       □ Yes       Ø No         2. Well development method surged with bailer and pumped       □ 41       Before Development       After Develop         1. Depth to Water (from top of well casing)       □ 41       □ 32.4       Before Development       After Develop         2. Well development method surged with block and pumped       □ 41       □ 32.4       □ 32.4       □ 32.4         surged with block and pumped       □ 62       □ 0       □ 3       □ 32.4       □ 32.4         surged with block, bailed and pumped       □ 62       □ 3       □ 0       □ 3<	WEBSTER					
2. Well development method surged with bailer and pumped $\Box$ 61 surged with bailer and pumped $\Box$ 61 surged with block and pumped $\Box$ 62 surged with block and pumped $\Box$ 62 surged with block, bailed and pumped $\Box$ 62 surged with block and pumped $\Box$ 50 bailed only $\Box$ 10 pumped slowly $\Box$ 51 pumped slowly $\Box$ 50 3. Time spent developing well $-\underline{50}$ min. 4. Depth of well (from top of well casisng) $\underline{40}$ , $\underline{2}$ ft. 5. Inside diameter of well $-\underline{2}$ , $\underline{00}$ in. 6. Volume of water in filter pack and well casisng $-\underline{7}$ , $\underline{1}$ gai. 7. Volume of water removed from well $-\underline{20}$ , $\underline{D}$ gal. 7. Volume of water removed from well $-\underline{20}$ , $\underline{D}$ gal.	Facility License, Permit or Monitoring Number		•	<ul> <li>An Article and Antiparticipation of the Article Management of the Article and Arti Article and Article and Articl</li></ul>	andar an	ell Number
<ul> <li>2. Well development method surged with bailer and bailed</li> <li>41</li> <li>surged with bailer and pumped</li> <li>41</li> <li>surged with block and bailed</li> <li>42</li> <li>surged with block and pumped</li> <li>62</li> <li>surged with block, bailed and pumped</li> <li>62</li> <li>surged with block, bailed and pumped</li> <li>62</li> <li>surged with block, bailed and pumped</li> <li>70</li> <li>compressed air</li> <li>20</li> <li>bailed only</li> <li>10</li> <li>pumped only</li> <li>51</li> <li>pumped slowly</li> <li>50</li> <li>3. Time spent developing well</li> <li></li></ul>	1. Can this well be purged dry?	🗆 Yes	i p⊠i No	11 Depth to Water	Before Development	After Development
Other       Image: Second	surged with bailer and bailed surged with bailer and pumped surged with block and bailed surged with block, and pumped surged with block, bailed and pumped compressed air bailed only pumped only		1 2 2 0 0 0 1	(from top of well casing) Date Time 12. Sediment in well	b. <u>09</u> / <u>06</u> / <u>9</u> / mmddyy c	<u>3:20</u> p.m.
5. Inside diameter of well       _2_0_0 in.         6. Volume of water in filter pack and well casing      7. 1 gal.         7. Volume of water removed from well      20. D gal.	3. Time spent developing well	• •	<u></u> min.	13. Water clarity	Turbid 172 15 (Describe) <u>LIGHT BROWN</u>	Turbid 25 (Describe) <u>CLEAR</u> SEDIMEN
7. Volume of water removed from well $\underline{20}, \underline{20}$ gal. Fill in if drilling fluids were used and well is at solid waste facility	6. Volume of water in filter pack and well				FINE GRAINED SUSPENDED	AFTER APPROX- IMATELY 3 MINUTES
	, , , , , , , , , , , , , , , , , , ,			Fill in if drilling fluid		t solid waste facility:
8. Volume of water added (if any) gal. solids	8. Volume of water added (if any)		. <u> </u>	-		
9. Source of water added 15. COD mg/l	9. Source of water added			15. COD	mg/l	mg/l

16. Additional comments on development:

		MAG 1
Well deve	loped by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge
Name:	GEORGE J. HUDAK	Signature: IMA Wen DE
Firm:	RREM , INC	Print Initials: $\underline{W} \underline{U} \underline{V}$
		Firm: GMU ANSUWARID INC

£.

	Local Grid Locanon of W	nd Tanics 🔲 Other 🔲 💷	Well Name	
	ft. 0.N.		MW-91-5A	
cility License, Permit or Monitoring Number	Orid Origin Location Wi	ELL LOCATION	Wis Unique Wall Number DNR Well	Nur
-	Lat		a DL-OD6	
		ft. N, 1397276.52 ft.	E Date Well Installed	<u> </u>
	Section Location of Waste		$\frac{c}{m}\frac{7}{m}\frac{1}{d}\frac{6}{d}\frac{9}{v}$	<u>'</u>
stance Well Is From Waste/Source Boundary		T N. R		
fL	Location of Well Relative		JAMIE TUURA	
Well A Point of Enforcement Std. Application?		s Sidegradient		
	d Downgradient	n 🔲 Not Known	GME Consultants,	
Protective pipe, top elevation AT GRADE fi	MSL	1. Cap and lo		
Well casing, top elevation _982.49 ft	_ MSL	2. Protective		
	-   [	a. Inside di		2.5
Land surface elevation _ 980.5 ft	MSL	b. Length:		<u>e</u> .3
Surface seal, bottom ft. MSL or 2/2	O fL STERT	c. Material		
2. USCS classification of soil near screen:		1.1.1.1.1.2.2.2.2.2.2.	ITEEL C Grade Manhole Other   1al protection?	
			,	25
GP GM GC GC GW SW S SM SC G ML MH CL G			escribe:Bentonite	-
Bedrock 🗖		3. Surface sea	i: Benumite i Concrete l	
). Sieve analysis attached? 🖉 Yes 🛛 🗆 N	b 👹		Other [	
, Drilling method used: Rotary 🗖 5	0	4. Material be	tween well casing and protective pipe:	
Hollow Stem Auger 12 4	1 1554		Bentonite I	п
Other 🖸 🗕			Annular space seal [	
			concrete Other	_
5. Drilling fluid used: Water 🗖 0 2 Air 🗖 0	)1	5. Annular sp		
Drilling Mud 🗖 03 None 💆 9	9 👹		s/gal mud weight Benionite-sand slurry I	_
, ,			s/gal mud weight Bentonite shury	
5. Drilling additives used? 🔲 Yes 🛛 🖾 N	• 员		Bentonite Bentonite-cement grout	
			Ft <sup>3</sup> volume added for any of the above	
Describe	👹	f. How ins	·	
. Source of water (attach analysis):		•••••	Tremie pumped	
WEBSTER CITY HALL or County Fair	g rounds		Gravity	Ø
		6. Bentonite s	eal: a. Bentonite granules	Ø
Bentonite seal, top ft. MSL or	fi_ 👹	В / ъ. □1/4	in. 3/8 in. 1/2 in. Bentonite pellets	
•		≝ / c	Other [	
Fine sand, top 2 6 0 ft. MSL or	- :- ft.	7. Fine sand r	naterial; Manufacturer, product name & met	sh si
		· / L	None Used	
Filter pack, top ft. MSL or	fr \\`	b. Volume	added ft <sup>3</sup>	
		8. Filter pack	material: Manufacturer, product name and m	nesh
Screen joint, top 30 of fL MSL or	ft	R / 1 R	ED Flint SAND 45-55	
		b, Volume		
Well bottom ft. MSL or	<sup>fr</sup> 、	9. Well casing	-	
			Flush threaded PVC schedule 80 🔎	₫
Filter pack, bottom 40 _ ft. MSL or	ft		Other [	ב
Borehole, bottom 40, D ft. MSL or		10. Screen mat		
Borehole, bottom 42 . D ft. MSL or	"丶 🎼			
		<u>s</u>	Continuous slot	
Borehole, diameter <u><u>g</u> <u>g</u> in.</u>			Other D	
		b. Manufac c. Slot size		21.0
O.D. well casing $\underline{Z}, \underline{3}, \underline{1}$ in.		d. Slotted 1		<u>o</u> .
ID Willield Jalage				
I.D. wettersing $2.29$ in.		ii. Dickiii ma	terial (below filter pack): None S	
// HIII / /	form in true and an	root to the best of		<u> </u>
pereby certify that the information on this	Firm (Q //			<del>_</del>
THR/RINA DE			Mould 1411	

5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeinure of not more than \$10,000 for each

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State of Wisconsin Department of Natural Resources

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🔲 Haz. Waste 🔲 Wastewater 🗇

$blesster$ $BURDETT$ $M \oplus -9I - 5A$ Facility License, Permit or Monitoring NumberCounty CodeWis. Unique Wall NumberDNR Wall Number $27$ $27$ $27$ $21$ $27$ $21$ 1. Can this well be purged dry? $27$ $27$ $21$ $27$ $21$ 1. Can this well be purged dry? $27$ $27$ $21$ $27$ $21$ 2. Well development method $31$ $27$ $31$ $21$ $22$ $21$ 3. Surged with bailer and pumped $61$ $31$ $22$ $27$ $61$ $32$ $27$ $61$ $31$ surged with block and pumped $62$ $31$ $20$ $31$ $32$ $27$ $61$ $32$ $27$ $61$ $31$ surged with block and pumped $62$ $31$ $32$ $27$ $61$ $32$ $27$ $61$ $31$ surged with block and pumped $62$ $31$ $32$ $27$ $61$ $32$ $27$ $61$ $31$ surged with block and pumped $62$ $31$ $32$ $27$ $91$ $10$ $10$ $10$ $10$ $10$ $10$ $10$ $10$ $10$ $10$ $22$ $92$ $31$ $12$ $92$ $91$ $10$ <th>Facility/Project Name</th> <th></th> <th>County Name</th> <th></th> <th>Well Name</th> <th></th>	Facility/Project Name		County Name		Well Name	
0.7 $b t = 0.06$ 1. Can this well be purged dry?YrsYrsYrsYrsBefore DevelopmentAfter Development2. Well development method11. Depth to Water (from top of surged with black and pumped14.1 $a = 32.70$ ft. $-32.71$ ft.2. Well development method14.1Date $b 0.9/10.6/9.1$ m m d d y y $32.71$ ft. $-32.70$ ft. $-32.70$ ft.3. surged with block and pumped16.216.2Date $b 0.9/10.6/9.1$ m m d d y y $59.00.70$ m m d d y y $59.00.70$ m m d d y y $59.00.70$ m m d d y y9. Durped only pumped only 0 Other1010 $20.20.70$ m m d d y y $10.20.90.70$ m m d d y y1. Time contrasted air bottom2010 $10.20.90.70$ m m d d y y $10.20.90.7000$ m m d d y y3. Time spent developing well $-4.9$ min. $10.20.90.70000$ m d d 2.5 $10.20.90.700000$ m m d d 2.5 $10.20.90.70000000$ m m d d 2.53. Time spent developing well $-4.9$ min. m. $10.20.90.70000000000000000000000000000000$	WEBSTER		BURN	JETT	Mw-91	-5A
<ul> <li>2. Well development method surged with bailer and bailed surged with bailer and bailed surged with block and bailed surged with block and pumped compressed air bailed only pumped only pumped only pumped slowly Other</li></ul>	Facility License, Permit or Monitoring Number					all Number
<ul> <li>2. Well development method surged with bailer and pumped surged with bailer and pumped surged with block and pumped compressed air bailed only pumped only Other</li> <li>3. Time spent developing well</li> <li>4. Depth of well (from top of well casing)</li> <li>4. Depth of well (from top of well casing)</li> <li>4. Depth of well</li> <li>5. Inside diameter of well</li> <li>2. O O in.</li> <li>6. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O in</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O in</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O in</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>2. O O gal.</li> <li>7. Volume of water removed from well</li> <li>3. O O O O O O O O O O O O O O O O O O O</li></ul>	1. Can this well be purged dry?	🗆 Yes	Ø №	11. Depth to Water	Before Development	After Development
3. Time spent developing well      49_min.        (Describe)	surged with bailer and bailed surged with bailer and pumped surged with block and bailed surged with block and pumped surged with block, bailed and pumped compressed air bailed only pumped only pumped slowly		L 2 2 3 3 2	(from top of well casing) Date Time 12. Sediment in well bottom	$b \underbrace{O}_{m} \underbrace{Q}_{m} \underbrace{O}_{d} \underbrace{O}_{d} \underbrace{O}_{j}	$\frac{69}{m}, \frac{06}{d}, \frac{91}{y}, \frac{91}{y}$ $\frac{10}{2}; \frac{09}{2}; \frac{95}{2}; \frac{1}{2}; \frac{99}{2}; \frac{1}{2}; \frac{99}{2}; \frac{1}{2}; \frac{99}{2}; \frac{99}{2}; \frac{1}{2}; \frac{1}{2}$
8. Volume of water added (if any) gal. solids	<ul> <li>4. Depth of well (from top of well casisng)</li> <li>5. Inside diameter of well</li> <li>6. Volume of water in filter pack and well casing</li> </ul>	_ <u>40</u> 2_0 7	. <u>S</u> fr. 2 <u>O</u> in. . <u>3</u> gal.		(Describe) IN ITTALLY PALE BROWN W/SILT AND FIDE SAND CLEAR AFTER 5-10 MINUTES OF BAILING is were used and well is a	(Describe) <u>CUEAR SEDIMENT</u> <u>FREE WATER</u>  t solid waste facility:
9. Source of water added 15. COD mg/l	_		gal.	solids		

16. Additional comments on development:

	AMAN (
Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge // ///
Name: GEORGE JHUDAK	Signature: Multi Work 116
Firm: RREM, INC.	Print Initials: WOLC
	Firm: 4000 000 3000 010 5111 4

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Statement and			
State of Wisconsin Route to: Sol	id Waste 🛛 Haz. Waste 🖾 W	/astewater	MONITORING WELL CONSTRUCTION
	& Repair 💋 Underground T		Form 4400-113A Rev. 4-90
Facility/Project Name	Local Grid Location of Well	ft. 🛛 🖳	Well Name Mw - 91-5B
VILLAGE OF WEBSTER - WATER SUPPLY	ft. IS		Wis Unique Wall Number DNR Well Number
	Lat Long	g or	<u>DL-007</u>
Type of Well Water Table Observation Well 11 Piezometer 212	St. Plane 268 186.63 ft. N Section Location of Waste/Sou	, <u>тэттетэ. ст</u> п. Е.	Date Well installed $\frac{\rho}{m}\frac{7}{m}\frac{1}{d}\frac{9}{d}\frac{9}{v}\frac{1}{v}$
Distance Well Is From Waste/Source Boundary	1/4 of 1/4 of Sec	<b></b>	Well Installed By: (Person's Name and Firm)
fL Is Well A Point of Enforcement Std. Application?	Locanon of Well Relative to V		Jamie Tuura
	d Downgradient n	Not Known	<u>GME Consultants, Inc.</u>
A. Protective pipe, top elevation AT 6149E 1	L MSL	1. Cap and lock?	
B. Well casing, top elevation $-\frac{980.48}{1000}$	r MSL	2. Protective cov a. Inside diame	••
C. Land surface elevation _ 980.5 f	r. MSL	b. Length:	_ <u>e.</u> 51L
D. Surface seal, bottom ft. MSL or $\underline{\Sigma}$		c. Material:	
12. USCS classification of soil near screen:		d. Additional y	EEL @ Grade Manhole Other B roucction? DYes BY No
· · · · · · · · · · · · · · · · · · ·	SP ME		ibe:
	сн 🗆 🔪 💾	3. Surface seal:	Bentonite 🔲 30
13. Sieve analysis attached? 24 Yes 2	<b>vo</b>		Concrete 201 Other 2
14. Drilling method used: Rotary	50	4. Material betwe	en well casing and protective pipe:
Hollow Stem Auger			Bentonite 🔲 30
Other 🗆 .	🕺 👹		Annular space seal
15. Drilling fluid used: Water 02 Air	01		seal: a Granular Bentonite 🛛 33
Drilling Mud 🗆 03 None 😡		5. Annular space	a Granuar Bentomite D 55 d mud weight Bentonite-sand slurry D 35
	.   🕺 👹		al mud weight Bentonite slurry 🔲 31
16. Drilling additives used? 🖸 Yes 💆 N	*°		tonite Bentonite-cement grout 🖬 50
Describe	📓 📓	cl	Ft volume added for any of the above
17. Source of water (attach analysis):		I. HOW UISTALI	Tremie pumped  0 2
NEBSTER CITY GARAGE or County Fair	- a rouads		Gravity 🖵 08
		6. Bentonite seal:	
E. Bentonite seal, top e ft. MSL or	<sup>n</sup>	b. $\Box 1/4$ in.	□3/8 in. □ 1/2 in. Bentonite pellets □ 32
F. Fine sand, top ft_ MSL or	ft.		rial: Manufacturer, product name & mesh size
G. Filter pack, top58 oft. MSL or	ft	b. Volume add	led ft <sup>3</sup>
H. Screen joint, top6 5.0 ft. MSL or	ft		ierial: Manufacturer, product name and mesh size
		b. Volume adr	ied ft <sup>3</sup>
I. Well bottom ft. MSL or	ft 🔪	9. Well casing:	Flush threaded PVC schedule 40 23 Flush threaded PVC schedule 80 22 24
J. Filter pack, bottom? <u>i</u> <u>o</u> ft. MSL or	ft		Other 🗖 🔄
K. Borehole, bottom7/ of ft. MSL or	ft.	10. Screen materia a. Screen type	: Factory cut 🗹 11
L. Borehole, diameter _ D in.		· · · · · · · · · · · · · · · · · · ·	Continuous slot 🛛 01
			T-Johnson
M. O.D. well casing $\underline{2}, \underline{3}, \underline{9}$ in.		c. Slot size: d. Slotted leng	. <u>0.21</u> 2 in. h: <u>י</u> <u>5.2</u> ft.
N. I.D. well rasing 12.0/1 in.		\	al (below filter pack): None 2 14 Other 1
I hereby/certity that/the information on this	form is true and correct	to the best of my ki	
Signature Million John John John John John John John Jo	E Fam QME	Chosuc.	TONIS INC,
Rease complete both sides of this form and return to t and ch. NR 141, Wis. Ad. Code. In accordance with	he appropriate DNR office list ch.144. Wis Stats., failure to fi	ed at the top of this form a le this form may result in a	s required by chs. 144, 147 and 160, Wis. Stats., a forfeiture of not less than \$10, nor more than

\$5000 for each day of violation. In secondance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each

State of Wisconsin Department of Natural Resources MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route\_to: Solid Waste 🗋 Haz. Waste 🗋 Wastewater 🗋 Env. Response & Repair 🗋 Underground Tanks 📄 Other 🛄 .

Facility/Project Name		County			Well Name	
WEBSTER				ETT	MW-91	
Facility License, Permit or Monitoring Number	-	County O		Wis: Unique Wall N		ll Number
1. Can this well be purged dry?	🗆 Yes	埬	No	11. Depth to Water	Before Development	After Development
2. Well development method				(from top of	<u>_ 32.71</u> ft	$3z.\dot{7}(ft)$
surged with bailer and bailed	□ 4	1		well casing)		
surged with bailer and pumped		-				
surged with block and bailed				Date	109106191	DAIDRIAI
surged with block and pumped		_			$b \underbrace{Oq}_{m m} \underbrace{Ob}_{d d} \underbrace{Oq}_{y y}$	
surged with block, bailed and pumped	<b>D</b> 7	0			<b>17</b> 8.m.	<b>п</b> а.п.
compressed air		D ·		Time	c⊥0:19 ₽ p.m.	<u>  Z:0 o z p.m.</u>
bailed only		D				
pumped only	<b>D</b> 5	1		12. Sediment in well	$\underline{0}$ . $\underline{4}$ inches	<u>0</u> . <u>2</u> inches
pumped slowly	5	2		bottom		
Other		÷		13. Water clarity	Clear 🗂 10 Turbid 🖵 15	Clear Z 20 Turbid Z 25
3. Time spent developing well	6	<u>Z</u> min.	•		(Describe) PALE BROON-	(Describe) CLEAR WATER
4. Depth of well (from top of well casisng)	_69	. <u>6</u> fL			LITTLE VERY	AFTER 5 MINUTES
5. Inside diameter of well	_2.9	<u>0</u> in.			FINE SAND W/ BENTONITE SUSPENSION	DE PORTING
6. Volume of water in filter pack and well					000702-010	· · · · · · · · · · · · · · · · · · ·
casing		.8 ga	1.			
7. Volume of water removed from well	60			Fill in if drilling fluid	is were used and well is a	t solid waste facility:
				14. Total suspended	mg/l	
8. Volume of water added (if any)		. <u> </u>	•	solids		
9. Source of water added				15. COD	mg/l	mg/l
10. Analysis performed on water added? (If yes, attach results)	🛛 Yes	অ	_ No			

16. Additional comments on development:

	d'AAI /
Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge.
Name: GEORGE J, HUDAL	Signature: Million AE
Firm: RREM, INC.	Print Initials: WCL
	Firm: COME ON JULTON/ 1/1

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	I Waste 🛛 Haz. Waste 🖾 🛛 W		MONTTORING WELL CC Form 4400-113A	DNSTRUCTIO Rev. 4-9
Eliv. Restolise d	Repair Underground To	anks 🛛 Other 🖸	· · · · · · · · · · · · · · · · · · ·	NCV, 4-9
	Local Grid Location of Well	, DE	Well Name	
	ft. <u>Cis</u>	ft_ DE		
	WELL WELL	Loc Attan	Wis Linque Wall Number DN	R Well Numb
	at Long	3 or	<u>DL-008</u>	
ype of Well Water Table Observation Well 211 S	St. Plane 2683/1. 75 ft. N		DANS AND A VIEW AND A DATE OF A	
	ection Location of Waste/Sou		Date well installed $\frac{D}{m}\frac{7}{m}\frac{1}{d}\frac{1}{d}$	국/극분
Istance Well Is From Waste/Source Boundary			Well Installed By: (Person's Nat	
·	1/4 of 1/4 of Sec	<u>, T N, R 🗖 W.</u>	·	
	ocation of Well Relative to W	vaste/Source	JAMIE TUURA	<u></u>
	- 10 -	Sidegradient	GME Consulta	a ste In
Yes DNo	d Downgradient n D	<u>Not Known</u>	GIVE DASUIR	1115,41
Protective pipe, top elevation AT GRADE ft.	MSL-	1. Cap and lock	·	Yes 🛛 No
	T	2. Protective cov	ver pipe:	
. Well casing, top elevation _ <u><u><u>1</u></u><u>8</u><u>2</u>.<u>e</u><u>1</u> ft.</u>		a. Inside diam		<u>10</u> .0i
Land surface elevation $\frac{7820}{100}$ ft.		b. Length:		_0.5f
Land surface elevation $\frac{782.0}{100}$ ft.	MSL	c. Material:		
). Surface seal, bottom fL MSL or $\ge 7$ .	o ft. starter i i i			
				Other 🛛 🚊
12. USCS classification of soil near screen:	N Charles I N	d. Additional	protection?	]Yes ⊡ No
GP GM GM GC GW G SW G SP SM G SC G ML G MH G CL G CI	<u>(昭一 / 日 1</u> 70	Lf yes, desc	ribe:	
			Ben	tonite 🗖 3
Bedrock D		3. Surface seal:	Ca	narcie 📈 0
13. Sieve analysis attached? 🛛 Yes 🛛 🗖 No				Other 🛛
	n 🛛 🗱 🗱	A Material berry	een well casing and protective pipe	
5		-, Malerial Delwi	<b>e</b>	
Hollow Stem Auger 💆 4 1				ntonite 🛛 3
Other 🛛 🖆	-   🕅 🕅		Annular spac	e seal 🔲 🔤
		<u> </u>	oncrete	Other 🗹 🔔
5. Drilling fluid used: Water 02 Air 0		5. Annular space	seal: a. Granular Ben	tonite 🛛 3
Drilling Mud 🗖 03 None 🔀 99	9 8 8		al mud weight Bentonite-sand	slurry 🛛 3
			al mud weight Bentonite s	
16. Drilling additives used? 🔲 Yes 🛛 🗖 No				
			nonite Bentonite-coment	
Describe		-	Ft volume added for any of the a	
17. Source of water (attach analysis):		f. How instal		remie 🔲 0
			Tremie pur	mped 🗂 0;
WEBSTER CITY GARAGE or County Fui	ic grown 5 8 8		Gi	navity 🖾 🛛 🕅
		6. Bentonite seal	a. Bentorute gra	anules 🗹 3
Bentonite seal, top24 Oft. MSL or	a 🔯 👹	,	$\square$ 3/8 in. $\square$ 1/2 in. Bentonite p	
		<b>9. 2</b> 77 <b>5</b> 1.	•	
				Other 🔲 🔄
Fine sand, top ft. MSL or	ft.		enal: Manufacurer, product nam	e & mesh size
	N N N NV	/ / •	Vone used	
. Filter pack, top 6L MSL or		b. Volume ad	ied ft <sup>3</sup>	
		8. Filter pack me	terial: Manufacturer, product nam	ie and mesh si
Screen joint, top 20 ft. MSL or		RED	flint Samo - addler 4	15-55
		b. Volume ad		
Well bottom $400$ ft. MSL or	ft.			- 40 17 21
Well bottom $-40.0$ ft. MSL or		9. Well casing:	Flush threaded PVC schedul	_
			Flush threaded PVC schedule	e80 j⊠ 2.
Filter pack, bottom ft. MSL or	fr	<hr/>	0	Duber 🗖 🗒
		10. Screen materia	1: Set 80 TVC	
Borehole, bottom4 [ .0 ft. MSL or	fL	L Screen typ		ry cut 🗹 1
		a Subertyp	Continuous	· · ·
				=
Borehole, diameter $\underline{\mathcal{B}} \underbrace{\mathcal{O}}$ in.		· · · · · · · · · · · · · · · · · · ·		Other 🗖 🚊
		b. Manufacom	= Johnson	
. O.D. well casing _ 2 3 9 in.		c. Slot size;		0. <u>©⊥</u> ⊘i
Λ/		d Sioned leng	gth:	10.01
I.D. well essing 2 0 9 in.		11. Backfill materi	al (below filter pack):	None Z 14
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	fa ia A			
hereby perting that the information on this f		to the pest of my h	nowleage.	
grature ////////////////////////////////////	E Form 6/1/1-	- (n)/mi	mail INI	-
1 yuu I wu fic			ININ PIUC	•
case complete both sides of this form and return to the				
dat ND 141 Wie Ad Cade In accordance with ch	a 144 Wie State - failure to fil	in this forms make mouth in	a forfairum of noi loss than \$10 -	or more then

contraction of the second 
and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis, Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each State of Wisconsin Department of Natural Resources MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

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Route to: Solid Waste 🗇 Haz. Waste 🗇 Wastewater 🗇

Facility/Project Name County Name			Well Name		
WEBSTER		Bur	NETT	Mw-91	-6
Facility License, Permit or Monitoring Number	-	County Code	Wis: Unique Wellin		all Number
1. Can this well be purged dry?	🗆 Yes	⊠ No	11. Depth to Water	Before Development	After Development
2. Well development method surged with bailer and bailed surged with bailer and pumped surged with block and bailed surged with block, and pumped surged with block, bailed and pumped compressed air bailed only pumped only pumped slowly		1 2 2 0 0 0 1	(from top of well casing) Date Time 12. Sediment in well bottom	<u>0</u> . <u>3</u> inches	$\frac{O q}{m m} \frac{1}{d} \frac{O}{d} \frac{q}{y} \frac{q}{y}$ $\frac{1}{2} : O O p.m.$ $\underline{O} \cdot \underline{I} \text{ inches}$
4. Depth of well (from top of well casisng)	<u>5</u> 39 39	<u>5</u> min. . <u>7</u> ft.	13. Water clarity	Clear [] 10 Turbid [] 15 (Describe) LIGHT BROWN DRBID WATER W/ 0.5-1.0 INCHES OF FINE SAND, CONSISTENTLY IN BAILER	Clear 22 20 Turbid 25 (Describe) WATER CLEAR AFTER 1-2 MINUTES DE DUMANG
casing 7. Volume of water removed from well	20	. <u>7 gal.</u> . <u>O</u> gal. . <u>O gal.</u>	Fill in if drilling fluid 14. Total suspended solids	ls were used and well is a	t solid waste facility:
9. Source of water added			15. COD	mg/l	mg/l
10. Analysis performed on water added? (If yes, attach results)	🖸 Yes	XI No	Ι .		I

16. Additional comments on development:

	MII 1
Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge,
Name: GEORGE J. HUDAK	Signature: //// KUMPE
Firm: RREM, INC.	Print Initials: $\frac{WCIC}{CHO} = COCHORDON IT MI$
	Firm: <u>GMF CONSWITTEN</u> ML.

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	ite 🛛 Haz. Waste 🗔 🛛 W	<b>n</b>	MONITORING WELL CONSTRUCTION
	air 🖾 Underground Ta		Form 4400-113A Rev. 4-90
Facility/Project Name	Gind Locauon of Well		Well Name
VILLAGE OF WEBSTER. WATER JUPPLY	fr. HS	ft. <b>H</b> E.	Mw-91-7 Wis, Unique Wall Number DNR Well Number
Facility License, Permit or Monitoring Number	Long		DL - 57
Type of Well Water Table Observation Well 11 St. Ph.	me 268313. 61 ft. N.		
Piezometer 12 Sectio	n Location of Waste/Sour	rce	$\frac{O B / O 5 / 9 I}{m m d d y y}$
	4 of 1/4 of Sec,	.TN, RW	Well Installed By: (Person's Name and Firm)
	ion of Well Relative to W Upgradient s	aste/Source Sidegradient	Jamie Tuura
	= =	Not Known	GME Consultants, Inc.
A. Protective pipe, top elevation AT GRADE ft. MSI	,	1. Cap and lock?	·
B. Well casing, top elevation _ 982.99 ft. MSI		2. Protective cov a. Inside diame	••
C. Land surface elevation $-921.0$ ft. MSL		b. Length:	
		c. Material:	Steel 🗹 04
D. Surface seal, bottom ft. MSL or $\leq \beta_{1} \geq 1$		1. M. W.	reel @ Grade Manhole Other DI
12. USCS classification of soil near screen:         GP GM GC GW SW SP		d. Additional p If yes, descr	
		3. Surface seal:	Bentonite 🛛 30
Bedrock I 13. Sieve analysis attached? I Yes I No		J. SUITACE SERI:	Concrete 🛛 01
		A Material barrie	en well casing and protective pipe:
14. Drilling method used: Rotary 50 Hollow Stem Auger 24 1		4. Material Detwo	en weit casing and protective pipe: Bentonite
Other D			Annular space seal
15. Drilling fluid used: Water 02 Air 01		<	Convete Other 12
Drilling Mud 03 None 299		5. Annular space	seal: a Granular Bentonite 33 I mud weight Bentonite-sand slurry 35
			I mud weight Bentonite slurry [] 31
16. Drilling additives used?  Yes  No		d % Ben	tonite Bentonite-cement grout 🔎 50
Describe			volume added for any of the above
17. Source of water (attach analysis):		f. How installe	zd: Tremie 🗆 01 Tremie pumped 🔲 02
HEBSTER CITY GARAGE OF COUNTY FRIEGROUND	> 🐰 🔛		Gravity 🖬 0.8
		6. Bentonite seal:	a. Bentonite granules 🗾 33
E Bentonite seal, top54.0 ft. MSL or		b. $\Box 1/4$ in.	$\square 3/8$ in. $\square 1/2$ in. Bentonite pellets $\square 32$
F. Fine sand, top 58 p ft. MSL or	ft_	.7. Fine sand mate	rial: Manufacturer, product name & mesh size
		/ a	None USED
G. Filter pack, top ft. MSL or		b. Volume add	
H. Screen joint, top64 .0 ft_ MSL or	ft.		erial: Manufacturer, product name and mesh size
		b. Volume add	
I. Well bouom ft. MSL or		9. Well casing:	Flush threaded PVC schedule 40 📋 23
J. Filter pack, bottom ft. MSL or			Flush threaded PVC schedule 80 P 24
J. Filter pack, bollom		10. Screen materia	i: Schedule BO PVC
K. Borehole, bottom ft. MSL or	fL	a. Screen type	
			Continuous slot 🔲 01
L. Borehole, diameter <u><u>B</u></u> in.		b. Manufacture	Other D
M. O.D. well casing $2237$ in.		c. Slot size:	0. <u><u>01</u><u>0</u> in.</u>
21, M/		d. Slotted leng	····· <b>·</b> ···
N. I.D. well casing 7.09 in.		11. Backfill materia	l (below filter pack): None SI 14
heretogy deplify that the information on this form	is true and correct	/to the best of my k	
	Fim MKC	W/ULT	NT INC.
Pleby complete both sides of this form and return to the app	TODTIALE DNR office liste	d at the top of this form a	s required by chs. 144, 147 and 160. Wis. Stats.
and Sh NR 141 Wie Ad Code in accordance with ch 144	Win State failure to file	this form more morely in a	Forfainty of not loss than \$10 and more than

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and th. NR 141, Wis, Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than \$10,000 for each day of violation. In accordance with ch. 147, Wis, Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each

State of Wisconsin Department of Namral Resources

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🗋 Haz. Waste 🔲 Wastewater 🗖 Env. Response & Repair 🖸 Underground Tanks 🗖 Other 🗖

Facility/Project Name		Соц	nry Name		Well Name	
WEBSTER			BURNE		Mw-91-	•
Facility License, Permit or Monitoring Number		Cou	nty Code	Wis: Unique Well N	umber DNR W	sll Number
1. Can this well be purged dry?	□ Ye	æ	⊠ No	11. Depth to Water	Before Development	After Development
2. Well development method				(from top of	<u>32.92ft</u>	<u>32.93ft</u>
surged with bailer and bailed		41		well casing)		
surged with bailer and pumped		61				
surged with block and bailed	,	42		Date	109110191	09110191
surged with block and pumped		62			$b \underline{O} \underline{q} / \underline{l} \underline{O} / \underline{q} \underline{l}$ m m d d y y	mm d d y y
surged with block, bailed and pumped		70			b≓fa.m.	fram.
compressed air		20 ·		Time	c 8 : <u>0</u> 7 ☐ p.m.	<u>Lo:15</u> p.m.
bailed only		10				
pumped only		51		12. Sediment in well	<u><math>0.4</math></u> inches	$\underline{0}$ . $\underline{1}$ inches
pumped slowly		50		bottom	<b>-</b>	-
Other		<u></u>		13. Water clarity	Clear □ 10 Turbid 201 15	Clear DZ 20 Turbid 🛛 25
3. Time spent developing well	k	<u>c D</u> r	nin.		(Describe) WATER BROWN	(Describe) WATER CLEAR
4. Depth of well (from top of well casisng)	<u>_68</u>	<u>8</u> . <u>b</u>	fL		TURBID, WITH	AFTER 3-5 MINUTES
5. Inside diameter of well	_2.	<u>o o</u>	in.		SUSPENDED BENTONITE AND	
6. Volume of water in filter pack and well					FINE SAND	
casing	_ [ {	12	-08]			
-				Fill in if drilling fluid	is were used and well is a	t solid waste facility;
7. Volume of water removed from well	<u>_6c</u>	<u>2.0</u>	gal.			1
	_			14. Total suspended	mg/l	mg/l
8. Volume of water added (if any)	<u>c</u>	2.0	gal.	solids		
9. Source of water added		<u>~</u>	<u> </u>	15. COD	mg/l	mg/l
10. Analysis performed on water added? (If yes, attach results)	□ Ye	= )	Z No			[

16. Additional comments on development:

		MIL 11
Well develo	oped by: Person's Name and Firm	I hereby certify that the sbove information is true and correct to the best of my knowledge
·Name:	GEORGE J. HUDAK	Signature:
Firm:	RREM INC.	Print Initials:
-		Firm: GME GWJULTIN T, INC

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State of Wisconsin Department of Natural Resources

MONITORING WELL DEVELOPMENT Form 4400-113B Rev. 4-90

Route to: Solid Waste 🗆 Har. Waste 🖂 Wastewater 🗖

v.	Response &	Repair 🖾	Underground Tanks 🗖	Other 🗖 🗕

Facility/Project Name	County Name		Well Name	
WERSTER	BURN		· Mw-91-	
Facility License, Permit or Monitoring Number	County Code	Wis, Unique Well N DL +	umber DNR We	all Number
1. Can this well be purged dry?	ίes ⊠No	11. Depth to Water	Before Development	After Development
2. Well development method surged with bailer and bailed		(from top of well casing)	∎ <u>32.11</u> ft	<u>32.15</u> ft
,	42 ÷ 62		b <u>09/04/91</u> mmddyyy	
	20 · 10	Time 12. Sediment in well	c. $\underline{11}$ : $\underline{23}$ pm.	$-\underline{1}: \underline{15} \boxtimes p.m.$
pumped slowly		bottom 13. Water clarity	Clear [] 10 Turbid [2] 15	Clear 12 20 Turbid D 25
	<u>60</u> min.		(Describe) MILLY WHITE	(Describe)
	<u>8.6</u> fr. . <u>00</u> in.		NEAR BOTTOM TWE TO ABUNDANT	5-10 GALLONS PUMPED
6. Volume of water in filter pack and well casing	<u>/</u> . <u>3 gal</u> .		BENTONITE	
	<u> c</u> <u> _ c</u> gal,		ls were used and well is a	
8. Volume of water added (if any)	<u>0</u> . <u>0</u> gal.	14. Total suspended solids	ing/1	
9. Source of water added	ies <u>P</u> No	15. COD	mg/l	mg/l
(If yes, attach results)				
16. Additional comments on development:		······································		
				\$
Well developed by: Person's Name and Firm	. <u></u>	II have be any if the short		rue and correct to the best
ней автабрей бу, тезоліз Маше ана гиш		of my knowledge?//	AL X JAN	
Name: <u>GEORGE J. HUDAK</u>		Print Initials:	CVC	
Firm: <u>RREM INC</u>		Firm: G	me chur	ulton 11 10

	Haz. Waste 🛛 Wastewate		MONITORING WELL CC Form 4400-113A	NSTRUCTION Rev. 4-90
	Underground Tanks		- · · · · · · · · · · · · · · · · · · ·	
			Name Mw-91-8	
VILLAGE OF WEBSTER - WATER SUPPLY	TOBERON WELL LOCA		Unique Well Number DN	
	Long		$\frac{D L - S 1 2}{2}$	K WELLINGIDE
			Well Installed	
	268 416. 32 ft. N. 13474:	<u>54.75</u> ft. E.		e1 <u>91</u>
Diverse Wall Is From Waste/Source Roundary	ocation of Waste/Source		Installed By: (Person s Nar	
	f 1/4 of Sec, T 1	N. K W.	Jamie Tuura	
Locadon	of Well Relative to Waste/Sou ogradient s 🖾 Sidegr			
	owngradient n 🗆 Not K		GME Consultant	s, Inc.
A. Protective pipe, top elevation AT GRADE ft. MSL-		1. Cap and lock?		Yes 🗆 No
A DA TA A MOL		2. Protective cover pi	pe:	
B. Well casing, top elevation _ <u>18555</u> R. MSL =		a. Inside diameter:		<u>[ in</u>
C. Land surface elevation _ 980 5 ft. MSL .		b. Length:		fr
D. Surface seal, bottom ft. MSL or 57.0 ft.		c. Material:		Steel 🗹 04
12. USCS classification of soil near screen:				Other 🛛
$ \begin{array}{c} GP \square GM \square GC \square GW \square SW \square SP \blacksquare  \end{array} $	N N	d. Additional protect		IYes DE™No
		If yes, describe:		<b></b> ? 0
Bedrock		3. Surface seal:		$\begin{array}{c} \text{conice} \Box & 30 \\ \Box & 0 \end{array}$
13. Sieve analysis anached? 💆 Yes 🗖 No				nçrete 😡 01 Other 🔲 🦈
14. Drilling method used: Rotary 🗖 50		4 Material between w	ell casing and protective pipe	
Hollow Stern Auger 41				 
Other 🗆 💶			Annular space	
			Concrete	
15. Drilling fluid used: Water 🗆 02 Air 🗔 01		5. Annular space seal:		
Drilling Mud 🗖 03 None 🗹 99			d weight Bentonite-sand	
		c. Lbs/gal mu	d weight Bentonite s	slurry 🛛 3 I
16. Drilling additives used? 🖸 Yes 🔯 No			e Bentonite-coment	
			olume added for any of the a	
Describe 17. Source of water (attach analysis):		f. How installed:		remie 🔲 01
			Tremie pur	mped 🗖 02
HEBSTER CITY GARAGE OF COUNTY FAIRGROUNDS			Gr	navity 🖾 08
		6. Bentonite scal:	a. Bentonite gra	-
E Bentonite seal, top ft. MSL or ft.		b. 🗆 1/4 in. 🗆 3/	8 in. 🖾 1/2 in. Bentonite p	
		C	(	
F. Fine sand, top $-57.0$ ft. MSL or ft.			Manufacturer, product nam	e & mesh size
G. Filter pack, top ft. MSL or ft.			e User	
G. Filter pack. top $\underline{57.0}$ ft. MSL or $\underline{1.6}$ ft.		b. Volume added		
H. Screen joint, top ft. MSL or ft.			: Manufacturer, product nam NATT VE SAND	e and mesn size
		a b. Volume added	ft <sup>3</sup>	
I. Well bonom 69 .0 ft. MSL or ft.		9. Well casing:	Flush threaded PVC schedule	e 40 🗖 23
		i i on onding.	Flush threaded PVC schedule	
J. Filter pack, bottom7 l_ D ft. MSL or ft.				Diher 🗖 👘
		0. Screen material:	Schedule BO PUC	····
K. Borehole, bottom $-21.0$ ft. MSL or ft.		a. Screen type:		ry cut <b>1</b>
			Continuous	
L. Borchole, diameter <u>B</u> . <u>C</u> in.				Other 🖬 🔡
	$\backslash$	b. Manufacturer		
M. O.D. well casing <u>239</u> in.	$\backslash$	c. Slot size:		0. <u>0 1 0</u> in
AVIIII	$\backslash$	d. Slotted length:		_ <u></u> ft
N. I.D. well crassing <u>Z o 9</u> in.	1	1. Backfill material (be	elow filter pack):	None 2 14
				Other 🔲 🔡
I hereby certify that the information on this form is		best of my know	ledge.	
Semanare ////////////////////////////////////	$10 M \in 12$		HATI INI	-

MONITORING WELL CONSTRUCTION

Please complete both sides of this form/and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141. Wis. Ad. Code. In accordance with ch.144. Wis Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each

the states

## Appendix D

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## Well Recovery Graphs with Hydraulic Conductivity Calculations

### **RREM ENGINEERING**

JOB 9114 WEBSTER

SHEET NO. CALCULATED BY G. HUDAK

OF\_\_\_\_\_ DATE 11-8-91

$\begin{array}{c c c c c c c c c c c c c c c c c c c $		DULUTH, MN.		CHECKED	вү			<u></u>
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				SCALE H	YORAULI	C CONDI	UCTIVITY CAL	CULATIONS
WELL #       Velt berry       STRTIC H.O       LENGTH       THE CTO $K (CM)$ 91-1       43.00       35.82       7.18 (26.83)       4.00 $1.35/10^{12}$ 91-4       40.15       32.42       7.73 (25.64)       2.10 $2.42/10^{-2}$ 91-4       40.15       32.42       7.73 (25.64)       2.10 $2.42/10^{-2}$ 91-4       40.15       32.42       7.73 (25.64)       4.01 $1.57/10^{-2}$ 91-4       40.16       32.55       7.11 (20110)       4.05 $1.22/10^{-2}$ 91-4       40.16       32.55       7.11 (20110)       4.05 $1.25/10^{-2}$ 91-6       39.71       33.87       5.640 (78.60)       4.01 $1.57/10^{-2}$ 0W-1       46.75       36.04 $0.71/1$ (20.44) $1.75/10^{-2}$ $0.63/10^{-2}$ 0W-2       45.47       36.19 $9.28/20^{-2}$ $2.70/1.63/10^{-2}$ $1.63/10^{-2}$ 0W-3       45.45       34.83 $0.62/2370^{-2}$ $2.77/1.73/10^{-2}$ $1.63/10^{-2}$ 0W-4       45.45       33.92 $1.54/25/14^{-2}$ $1.83/10^{-2}$ $2.90/10^{-2}$ 0W-6       46.52								
P1 2A       42 90       36 72       6.8 (166 57)       3.55       1.70 / 10^{-2}         P1 4       40 15       32 42       7.73 (25 6)       2.19       2.42 / 0.72         P1 5A       40 46       32.55       7.91 (24) (0)       4.05       1.25 / 0.72         P1 6       39.71       33.97       5.86 (78.6)       4.01       1.57 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.75       2.25 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.75       2.25 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.65 / 10.72         000-2       45.47       36.19       2.43       1.65 / 10.72         000-3       45.80       35.33       10.62 (323.0)       2.17       1.83 / 10.72         000-4       45.45       34.83       10.62 (323.0)       2.17       1.74 / 10.72         000-5       47.77       35.34       12.43 (378.60)       1.81 (1.91 / 10.72       2.90 / 1.97 / 1.74 / 1.072         000-6       44.01       33.92       11.54 / 55.23       2.77       1.74 / 1.072         000-7       45.46       33.92       11.54 / 55.23       2.90 / 1.97 / 1.70^2       0.97 / 1	WELL #	WELL DEPTH	STATIC H20	Wł			(SECONDS) TIME (To)	K (CM/S
P1 2A       42 90       36 72       6.8 (166 57)       3.55       1.70 / 10^{-2}         P1 4       40 15       32 42       7.73 (25 6)       2.19       2.42 / 0.72         P1 5A       40 46       32.55       7.91 (24) (0)       4.05       1.25 / 0.72         P1 6       39.71       33.97       5.86 (78.6)       4.01       1.57 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.75       2.25 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.75       2.25 / 0.72         000-1       46.75       36.04       10.71 (32,44)       1.65 / 10.72         000-2       45.47       36.19       2.43       1.65 / 10.72         000-3       45.80       35.33       10.62 (323.0)       2.17       1.83 / 10.72         000-4       45.45       34.83       10.62 (323.0)       2.17       1.74 / 10.72         000-5       47.77       35.34       12.43 (378.60)       1.81 (1.91 / 10.72       2.90 / 1.97 / 1.74 / 1.072         000-6       44.01       33.92       11.54 / 55.23       2.77       1.74 / 1.072         000-7       45.46       33.92       11.54 / 55.23       2.90 / 1.97 / 1.70^2       0.97 / 1		12 00	2-02				1 ~~~	10/10/2
91       4       40,15       32,42       7.73 (255,61)       2.10       2.42 ( $n^{-2}$ 91       40       40       32,55       7.11 ( $2n_{110}$ )       4.05       1.23 ( $n^{-2}$ 91       6       31,71       33,87       5.866 ( $n^{28}60$ )       4.01       1.57 ( $n^{-2}$ 000-1       46,15       36,04       ( $n^{-71}$ )       32,44       1.75       2.25 ( $n^{-2}$ 001-2       45,471       36,19       9.28 ( $222s^{-2}$ )       2.70       1.63 ( $n^{-2}$ 001-2       45,471       36,19       9.28 ( $223s^{-2}$ )       2.70       1.63 ( $n^{-2}$ 001-3       45,30       35,33       10.47 ( $3n_{12}$ )       2.43       1.65 ( $n^{-2}$ 001-5       47.77       35,34       12.45 ( $n^{2}$ 1.81       1.93 ( $n^{-2}$ 001-5       47.77       35,34       12.45 ( $n^{2}$ 1.82       1.92       2.07       1.48 ( $n^{17}$ 001-6       46,07       3.93       3.92       1.94 ( $n^{-2}$ 2.90 ( $n^{-2}$ 2.90 ( $n^{-2}$ 2.90 ( $n^{-2}$ 001-6       46,52       35.59       10.71 ( $n^{22}$ ( $a^{2}$ )       2.90 ( $n^{-2}$ $n^{-2}$ 001-71       42.4 ( $n^{-2}$					1 1 1			
91-5A       40       40       32.55       7.91 (24.10)       4.05       1.23.10 <sup>-2</sup> 91-6       39.71       33.97       5.86 (178.6)       4.01       1.57.x10 <sup>-2</sup> 000-1       46.75       36.04       10.71 (32.44)       1.75       2.25.x10 <sup>-2</sup> 000-2       45.47       36.19       9.28 (22.85)       2.70       1.65 x10 <sup>-2</sup> 001-3       45.80       35.33       10.47 (39.13)       2.43       1.65 x10 <sup>-2</sup> 001-4       45.45       34.83       10.42 (32.30)       2.17       1.83 x10 <sup>-2</sup> 001-5       47.77       35.34       12.43 (37.65)       1.93 x10 <sup>-2</sup> 001-6       46.07       35.39       10.66 (32.55)       2.27       1.74 x10 <sup>-2</sup> 001-7       45.46       33.92       11.54 (35.74)       1.28       2.90 x10 <sup>-2</sup> 001-7       45.46       33.85       10.71 (32.44)       1.28       2.90 x10 <sup>-2</sup> 001-7       45.46       33.85       10.93 (333.15)       2.92       1.73 x10 <sup>-2</sup> 001-7       45.46       33.55       10.71 (32.44)       2.00       1.97 x10 <sup>-2</sup> 001-8       46.52       35.59       10.71 (32.44)       2.00       1.9					1 1 1			
91-6       39,71       33,87       5,860,7860)       4.01       1,57x,10-2         000-1       46,75       36,04       10.71 (32,44)       1,75       2,25x,10-2         010-2       45,47       36,19       9,28 (20285)       2,70       1,63 x,10-2         010-3       45,80       35,33       10.47 (30,18)       2,43       1,65 x,10-2         010-4       45,45       34,83       10.62 (223,10)       2,17       1,83 x,10-2         010-5       47,77       35,34       12,43 (33,85)       2,27       1,14 x,10-2         010-5       47,77       35,34       12,43 (33,85)       2,27       1,14 x,10-2         010-6       46,07       35,59       0.96 (35,55)       2,27       1,14 x,10-2         010-7       45,46       33,92       11.94 (35,14)       1,28       2,90 x,10-2         010-8       46,52       35,59       10.71 (32,44)       1,28       2,90 x,10-2         010-8       44,26       33,55       10.71 (32,44)       1,28       2,90 x,10-2         010-9       44,26       33,55       10.71 (32,44)       2,00       1,97 x,10-2         010-9       44,26       33,55       10.71 (32,44)       2,00       1,97 x,10-2<				-				1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							1 1 7 1	• • • •
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	91-6	39,71	<u>33.8</u> 7		5,866	178.61)	4.0	1.57×10-2
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0w-1	46 75	36.04		10.71	37. 44	1.75	2.75×10-2
$0ul-3$ 45.80       35,33 $10.47$ (39,13)       2.43 $1.65 \times 10^{-2}$ $0ul-4$ 45.45       34.83 $10.62$ (323,70)       2.17 $1.83 \times 10^{-2}$ $0ul-5$ 47.77       35,34 $12.43$ (378,87) $1.81$ $1.93 \times 10^{-2}$ $0ul-5$ 47.77       35,34 $12.43$ (378,87) $1.81$ $1.93 \times 10^{-2}$ $0ul-6$ 46.07       35,39 $0.68$ (325,53) $2.27$ $1.74 \times 10^{-2}$ $0ul-7$ 45,46       33,92 $11.54$ (351,74) $1.28$ $2.90 \times 10^{-2}$ $0ul-8$ 46,52       35,59 $10.93$ (333,15) $2.92$ $1.33 \times 10^{-2}$ $0ul-9$ 44.26       33.55 $10.71$ (326,44) $2.00$ $1.971 \times 10^{-2}$ $0ul-9$ 44.26       33.55 $10.71$ (326,44) $2.00$ $1.971 \times 10^{-2}$ $0ul-9$ $44.26$ $33.55$ $10.71$ (326,44) $2.00$ $1.971 \times 10^{-2}$ $0ul-9$ $44.26$ $32.55$ $10.71$ (326,44) $2.00$ $1.971 \times 10^{-2}$ $10.71$ $2.54 \text{ cm} = 1^{\circ0}$ $2.52 \text{ cm}^2$ $2.52 \text{ cm}^2$ $2.52 \text{ cm}^2$					1 1 1			
$0w-4$ 45,45       34.83 $10.62(323,10)$ 2.17 $1.83 \times 10^{-2}$ $0w-5$ 47.77       35,34 $12.43(378,87)$ $1.81$ $1.93 \times 10^{-2}$ $0w-6$ 46.07       35,39 $0.68(325,53)$ $2.27$ $1.74 \times 10^{-2}$ $0w-7$ 45,46       33,92 $11.54(351.74)$ $1.28$ $2.90 \times 10^{-2}$ $0w-7$ 45,46       33,92 $11.54(351.74)$ $1.28$ $2.90 \times 10^{-2}$ $0w-9$ 44.76       33,55 $10.711(326.46)$ $2.00$ $1.971 \times 10^{-2}$ $0w-9$ 44.76       33,55 $10.711(326.46)$ $2.00$ $1.971 \times 10^{-2}$ $0w-9$ 44.76       33,55 $10.711(326.46)$ $2.00$ $1.971 \times 10^{-2}$ $0w-9$ $44.76$ $32.55$ $10.711(326.46)$ $2.00$ $1.971 \times 10^{-2}$ $0w-9$ $44.76$ $32.55$ $10.711(326.46)$ $2.00$ $1.971 \times 10^{-2}$ $0w-9$ $44.76$ $2.50 \times 12$ $2.00$ $1.971 \times 10^{-2}$ $w-9$ $2.50 \times 12$ $2.50 \times 12$ $2.50 \times 12$ $2.50 \times 12$ $w-9$ $2.5$					1 1		*****	
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$\frac{11.54}{52.57} (551.74) \frac{1.28}{2.90 \times 10^{-2}}$ $\frac{11.54}{52.579} \frac{10.93}{3.55} \frac{2.92}{2.92} \frac{1.33}{3.56} \frac{33.75}{2.92}$ $\frac{10.71}{32.44} \frac{2.00}{2.00} \frac{1.97}{3.70^{-2}}$ $\frac{10.71}{3.70^{-2}} \frac{1.9}{3.70^{-2}} \frac{1.9}{3.$							**************************************	
$\frac{1}{12} \frac{1}{33.55} \frac{10.93}{33.55} \frac{2.92}{1.33.10} \frac{1.33.10^{-2}}{2.00} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}}$ $\frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.33.10^{-2}}{1.97.10^{-2}} \frac{1.37.10^{-2}}{1.97.10^{-2}} 1.$				her of harded 40.000 and 40.000 and				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $								
$L \in T  2.54 \text{ cm} = 1"$ $K = \frac{1}{C^2} \frac{\ln (L/E)}{2L}  \text{where } r_{\Xi} = effective readius$ $L \in T  2.54 \text{ cm} = 1"  2L \text{ To}$ $R \in A \text{ of } \text{ well} = 20.27 \text{ cm}^2$ $R \in A \text{ of } \text{ Hose} = 2.85 \text{ cm}^2$ $R \in A \text{ of } \text{ Hose} = 2.85 \text{ cm}^2$ $R \in A \text{ of } \text{ Hose} = 0.50 \text{ cm}^2$ $R \in A \text{ of } \text{ Pling Coed} = 0.50 \text{ cm}^2$ $R \in A \text{ of } \text{ Pling Coed} = 0.3 \text{ cm}^2$ $R \in A \text{ of } \text{ Pling Coed} = 0.3 \text{ cm}^2$ $R \in A \text{ of } \text{ Transduced condown}$ $R \in A \text{ of } \text{ Transduced condown}$ $= 20.27 - (2.85 + 5 + 3) = 16.62 \text{ cm}^2$								
LET 2.54 cm = 1" THEN 30.48 cm = 1' 30.48 cm = 1' $AREA OF WELL = 20.27 cm^{2}$ $AREA OF HOSE = 2.85 cm^{2}$ $AREA OF TRANS CORD = 0.50 cm^{2}$ $AREA OF TRANS CORD = 0.50 cm^{2}$ $AREA OF RUMP CORD = 0.50 cm^{2}$ AREA OF WELL = AREA OF WELL (AREA OF DUELL = AREA OF WELL (AREA OF TRANSDUCED COND - AREA OF TRANSDUCED COND $-AREA OF TRANSDUCED COND -AREA OF TRANSDUCED COND= 20.27 - (2.85 + 5 + 3) = 16.62 cm^{2}$								
AREA OF HOSE = 2.85 cm²AREA OF TRANSCORD = 0.50 cm²AREA OF TRANSCORD = 0.50 cm²AREA OF PUMP CUED = 0.3 cm²AREA OF WELL = AREA OF WELL(AREA OF PUMP HOSE) - (AREA OF PUMP HOSE) - (AREA OF PUMP HOSE) - (AREA OF PUMP CUED)- AREA OF TRANSDUCER COAD- AREA OF TRANSDUCER COAD- 20.27 - (2.85+5+3+3) = 16.62 cm²	LET 2.54	cm = 1"			where	E= ef	Fective radius	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	THEN 30	$.48_{cm} = 1'$				AREA	OF WELL = 2	20.27 cm <sup>2</sup>
$\begin{array}{c c c c c c c c c c c c c c c c c c c $								
$\frac{A e e A o F}{A R e A o F} \frac{P u m P C u e D}{V e U} = 0, 3 c m^{2}}$ $\frac{A R e A o F}{A R e A o F} \frac{V e e U}{V e U} = \frac{A e e A o F}{V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{A e e A o F} \frac{V m P H o s e}{V e U} - \frac{A e e A o F}{V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$ $\frac{A e e A o F}{V e V e U} \frac{V e U}{V} = \frac{1}{2}$								
AREAOF WELL = AREA OF WELL - (AREA OF WELL - (AREA OF PUMP HOSE) - (AREA OF PUMP HOSE) - (AREA OF PUMP HOSE) - (AREA OF TRANSDUCER COAD)- AREA OF TRANSDUCER COAD= 20.27 - (2.85 + 5 + 3) = 16.62 cm2								
(AREA OF PUMP HOSE) - (AREA OF PUMP HOSE)					ARSA			
- AREA OF TRANSDUCER COLD= 20.27 - (2.85+5+,3) = 16.62 cm2								
$= 20.27 - (2.85 + 5 + 3) = 16.62 \text{ cm}^{3}$				1				1
				600				

### HYDRAULIC CONDUCTIVITY DATA AND CALCULATIONS WEBSTER. WISCONSIN

WBLC #	WBLL Depth	STATIC Water Level	WELL SCRBEN LENGTH (FT)	TINE (To) SECONDS	HYD. COND. K x 100	ln HYD.COND.
91-1	43.00	35.82	7.18	4,00	1.35	-4.31
91-2A	42.90	36,72	6.18	3.55	1.70	-4.07
91-4	40.15	32.42	7.73	2.10	2.42	-3.72
91-5A	40.46	32.55	7.91	4.05	1,23	-4.40
91-6	39.71	33.85	5,86	4.01	1.57	-4.15
OW-1	46.75	35.04	10.71	1.75	2.25	-3.79
OW-2	45.47	36.19	9.28	2.70	1.63	-4.12
0₩-3	45.80	35.33	10.47	2.43	1.65	-4.10
0W-4	45.45	34.83	10.62	2.17	1.83	-4.00
OW-5	47.77	35.34	12.43	1.81	1.93	-3.95
0W-6	46.07	35.39	10.68	2.27	1.74	-4.05
08-7	45.46	33.92	11.54	1.28	2.90	-3.54
0¥-8	46.52	35,59	10.93	2.92	1.33	-4.32
014-9	44.26	33.55	10.71	2.00	1.97	-3,93
				d	25.5	-56,45

ARITHMETIC MBAN GBOMBTRIC MEAN

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(25.5 x 10-2) / 14 = 1.82 x 10-2 cm/s -56.45 / 14 = -4.032 e -4.032 = 1.27 x 10-2 cm/s

RREM	ENGINEERING	ì
DI	JLUTH, MN.	

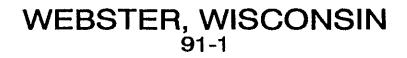
<sub>ЈОВ</sub> 9/14

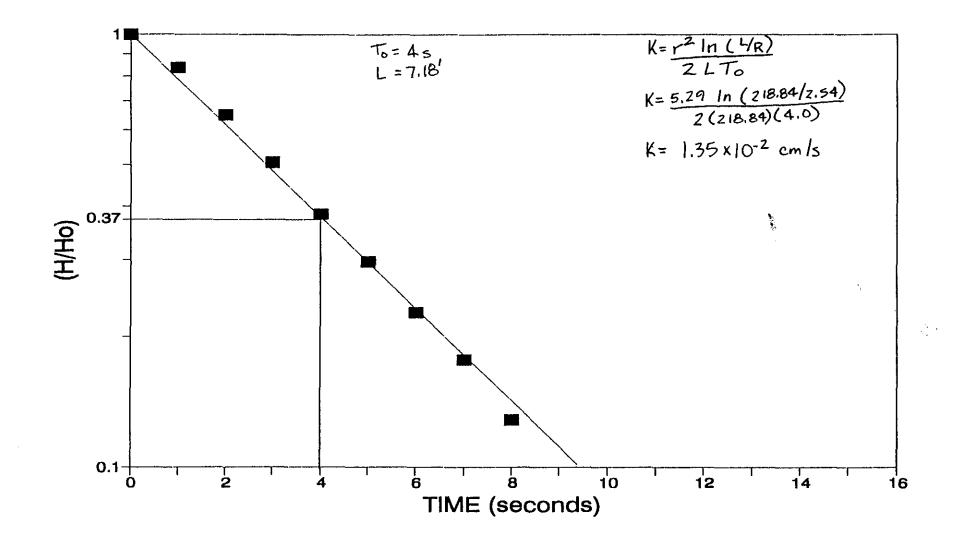
SHEET NO. \_\_\_\_\_\_

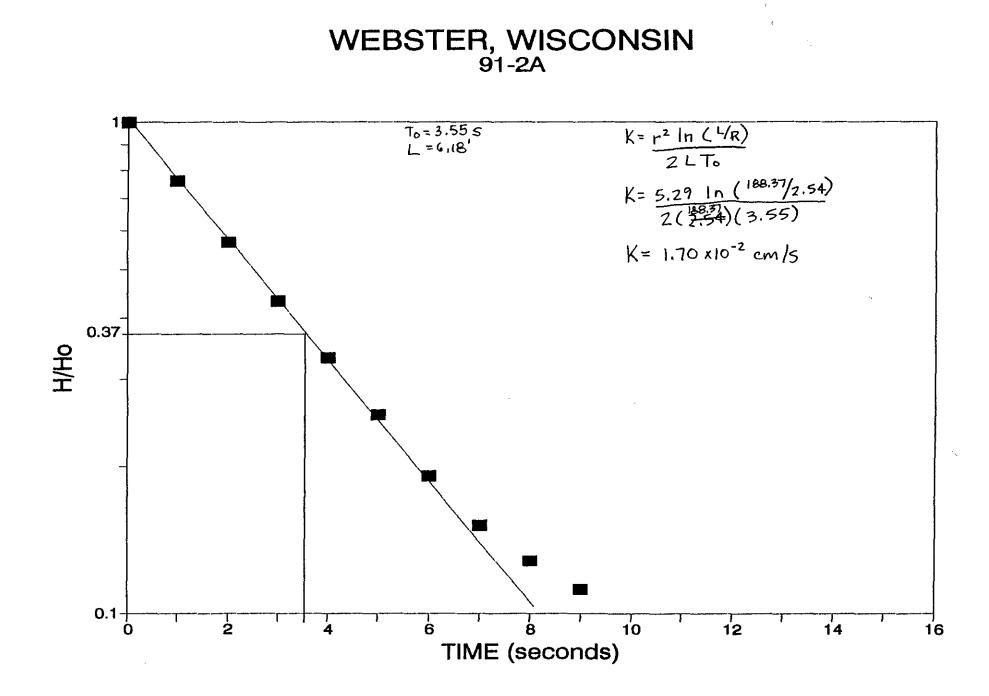
4m/ 0F\_\_\_\_\_

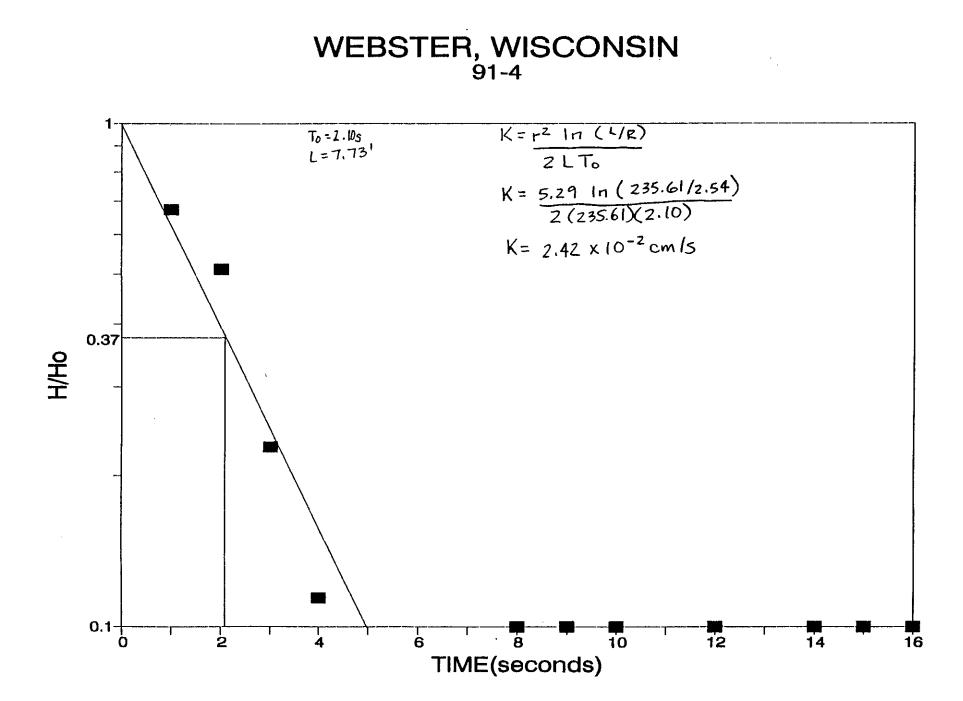
DATE	-1	3	-9	/

$E = E = \frac{1}{1000} = \frac{1000}{1000} = \frac{1000}$		
$ \frac{1}{24} = \frac{1}{1.70 \times 10^{-2}} = -\frac{4.31}{4.07} $ $ \frac{1}{24} = \frac{2.42 \times 10^{-2}}{2.42 \times 10^{-2}} = -\frac{4.07}{3.72} $ $ \frac{1}{24} = \frac{2.42 \times 10^{-2}}{2.42 \times 10^{-2}} = -\frac{4.40}{4.40} $ $ \frac{1}{6} = \frac{1.23 \times 10^{-2}}{1.63 \times 10^{-2}} = -\frac{4.15}{4.15} $ $ \frac{1}{2.25 \times 10^{-2}} = -\frac{4.12}{4.12} $ $ \frac{1}{65 \times 10^{-2}} = -\frac{4.12}{4.12} $ $ \frac{1}{65 \times 10^{-2}} = -\frac{4.10}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.00}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.00}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.05}{4.05} $ $ \frac{1.74 \times 10^{-2}}{2.10 \times 10^{-2}} = -\frac{3.95}{4.32} $ $ \frac{5}{1.74 \times 10^{-2}} = -\frac{3.93}{4.32} $ $ \frac{5}{1.91 \times 10^{-2}} = -\frac{3.93}{4.32} $		
$ \frac{1}{24} = \frac{1}{1.70 \times 10^{-2}} = -\frac{4.31}{4.07} $ $ \frac{1}{24} = \frac{2.42 \times 10^{-2}}{2.42 \times 10^{-2}} = -\frac{4.07}{3.72} $ $ \frac{1}{24} = \frac{2.42 \times 10^{-2}}{2.42 \times 10^{-2}} = -\frac{4.40}{4.40} $ $ \frac{1}{6} = \frac{1.23 \times 10^{-2}}{1.63 \times 10^{-2}} = -\frac{4.15}{4.15} $ $ \frac{1}{2.25 \times 10^{-2}} = -\frac{4.12}{4.12} $ $ \frac{1}{65 \times 10^{-2}} = -\frac{4.12}{4.12} $ $ \frac{1}{65 \times 10^{-2}} = -\frac{4.10}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.00}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.00}{4.12} $ $ \frac{1}{1.65 \times 10^{-2}} = -\frac{4.05}{4.05} $ $ \frac{1.74 \times 10^{-2}}{2.10 \times 10^{-2}} = -\frac{3.95}{4.32} $ $ \frac{5}{1.74 \times 10^{-2}} = -\frac{3.93}{4.32} $ $ \frac{5}{1.91 \times 10^{-2}} = -\frac{3.93}{4.32} $		
2A $1.70 \times 10^{-2}$ - 4,07 4 $2.42 \times 10^{-2}$ - 3,72 5A $1.23 \times 10^{-2}$ - 4,40 6 $1.57 \times 10^{-2}$ - 4,15 -1 $2.75 \times 10^{-2}$ - 4,15 -1 $2.75 \times 10^{-2}$ - 4,12 3 $1.65 \times 10^{-2}$ - 4,10 4 $1.83 \times 10^{-2}$ - 4,00 -3.95 -6 $1.93 \times 10^{-2}$ - 3.95 -6 $1.74 \times 10^{-2}$ - 4,05 -7 $2.90 \times 10^{-2}$ - 3.54 -8 $1.33 \times 10^{-2}$ - 4,32 -9 $1.97 \times 10^{-2}$ - 3,93 $\Sigma$ 2.5.5 cm/5 - 56.45		
2A $1.70 \times 10^{-2}$ - 4,07 4 $2.42 \times 10^{-2}$ - 3,72 5A $1.23 \times 10^{-2}$ - 4,40 6 $1.57 \times 10^{-2}$ - 4,15 -1 $2.75 \times 10^{-2}$ - 4,15 -1 $2.75 \times 10^{-2}$ - 4,12 3 $1.65 \times 10^{-2}$ - 4,10 4 $1.83 \times 10^{-2}$ - 4,00 -3.95 -6 $1.93 \times 10^{-2}$ - 3.95 -6 $1.74 \times 10^{-2}$ - 4,05 -7 $2.90 \times 10^{-2}$ - 3.54 -8 $1.33 \times 10^{-2}$ - 4,32 -9 $1.97 \times 10^{-2}$ - 3,93 $\Sigma$ 2.5.5 cm/5 - 56.45		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		
$5A = \frac{1.23 \times 10^{-2}}{1.57 \times 10^{-2}} - 4.40$ $6 = \frac{1.57 \times 10^{-2}}{1.57 \times 10^{-2}} - 4.15$ $2.25 \times 10^{-2} - 4.12$ $3 = \frac{1.65 \times 10^{-2}}{1.65 \times 10^{-2}} - 4.00$ $4 = \frac{1.83 \times 10^{-2}}{1.65 \times 10^{-2}} - 4.00$ $5 = \frac{1.74 \times 10^{-2}}{1.74 \times 10^{-2}} - 3.54$ $8 = \frac{1.33 \times 10^{-2}}{1.97 \times 10^{-2}} - 3.93$ $\Sigma = 2.5.5 \text{ cm/s} - 56.45$		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		
$\frac{1}{2} = \frac{2.25 \times 10^{-2}}{1.63 \times 10^{-2}} = \frac{-3.79}{-4.12}$ $\frac{1}{3} = \frac{1.65 \times 10^{-2}}{1.65 \times 10^{-2}} = \frac{-4.10}{-4.00}$ $\frac{4}{1.83 \times 10^{-2}} = -\frac{4.00}{-3.95}$ $\frac{1.93 \times 10^{-2}}{-3.54} = \frac{-3.54}{1.33 \times 10^{-2}} = -\frac{3.54}{-3.93}$ $\frac{5}{2} = \frac{2.5.5 \text{ cm}}{5} = -\frac{56.45}{-56.45}$		
$\frac{1.63 \times 10^{-2}}{4.12}$ $\frac{1.63 \times 10^{-2}}{4.00}$ $\frac{1.65 \times 10^{-2}}{4.00}$ $\frac{1.65 \times 10^{-2}}{4.00}$ $\frac{1.83 \times 10^{-2}}{5.5}$ $\frac{1.74 \times 10^{-2}}{5.5}$ $\frac{1.74 \times 10^{-2}}{5.5}$ $\frac{1.33 \times 10^{-2}}{5.5}$ $\frac{1.33 \times 10^{-2}}{5.5}$ $\frac{1.91 \times 10^{-2}}{5.5}$		
$\frac{1.63 \times 10^{-2}}{4.12}$ $\frac{1.63 \times 10^{-2}}{4.00}$ $\frac{1.65 \times 10^{-2}}{4.00}$ $\frac{1.65 \times 10^{-2}}{4.00}$ $\frac{1.83 \times 10^{-2}}{5.5}$ $\frac{1.74 \times 10^{-2}}{5.5}$ $\frac{1.74 \times 10^{-2}}{5.5}$ $\frac{1.33 \times 10^{-2}}{5.5}$ $\frac{1.33 \times 10^{-2}}{5.5}$ $\frac{1.91 \times 10^{-2}}{5.5}$		
$\frac{3}{4} = \frac{1.65 \times 10^{-2}}{1.83 \times 10^{-2}} = -4.10$ $\frac{4}{1.83 \times 10^{-2}} = -4.00$ $\frac{1.93 \times 10^{-2}}{1.74 \times 10^{-2}} = -4.05$ $\frac{1.74 \times 10^{-2}}{1.74 \times 10^{-2}} = -4.32$ $\frac{1.33 \times 10^{-2}}{1.91 \times 10^{-2}} = -3.93$ $\frac{5}{5} = 2.5.5 \text{ cm}/5 = -56.45$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		
$\frac{5}{1.93 \times 10^{-2}} - 3.95$ $\frac{1.93 \times 10^{-2}}{2.405} - 4.05$ $\frac{1.74 \times 10^{-2}}{2.405} - 3.54$ $\frac{1.33 \times 10^{-2}}{1.91 \times 10^{-2}} - 4.32$ $\frac{5}{2.5.5 \text{ cm}/5} - 56.45$		
$\frac{-6}{-7} = \frac{1.74 \times 10^{-2}}{2.90 \times 10^{-2}} = -4.05$ $\frac{-3.54}{-3.54}$ $\frac{1.33 \times 10^{-2}}{-3.93} = -4.32$ $\frac{1.97 \times 10^{-2}}{-3.93} = -3.93$ $\Sigma = 2.5.5 \text{ cm/s} = -56.45$		
$\frac{-6}{-7} = \frac{1.74 \times 10^{-2}}{2.90 \times 10^{-2}} = -4.05$ $\frac{-3.54}{-3.54}$ $\frac{1.33 \times 10^{-2}}{-3.93} = -4.32$ $\frac{1.97 \times 10^{-2}}{-3.93} = -3.93$ $\Sigma = 2.5.5 \text{ cm/s} = -56.45$		
$\frac{2.90 \times 10^{-2}}{1.33 \times 10^{-2}} - \frac{3.54}{-4.32}$ $\frac{1.33 \times 10^{-2}}{-3.93} - \frac{3.93}{-3.93}$ $\Sigma 2.5.5 \text{ cm/s} - 56.45$		· · · · · · · · · · · · · · · · · · ·
9 1.97×10 <sup>-2</sup> - 3.93 E 25.5cm/5 - 56.45		
9 1.97×10 <sup>-2</sup> - 3.93 E 25.5cm/5 - 56.45		 
Σ 2.5.5 cm/s -56.45		
1714 МЕТІС МЕЛО: 1.82×10-2 cm <sup>2</sup> /s		
174 METIC MEN): 1.82×10-2 cm <sup>2</sup> /s		
1714 METIC MEN): 1.82×10-2 cm <sup>2</sup> /5	**************************************	
174 METIC MEAN: 1.82×10-2 cm <sup>2</sup> /5	·····	
174 METIC MEN: 1.82×10-2 cm <sup>2</sup> /5		
anang nanang nanang kata sa katang nanang nanang kata sa katang nanang nanang nanang sa katang na katang nanang	· · · · · · · · · · · · · · · · · · ·	
	**************************************	
OMETRIC MEAN: -56.45/14 = -4.032		 
$e^{-4.032} = 1.77 \times$	$0^{-2} m/3$	
THOD FROM FETTER, 1988, pp. 82-83		







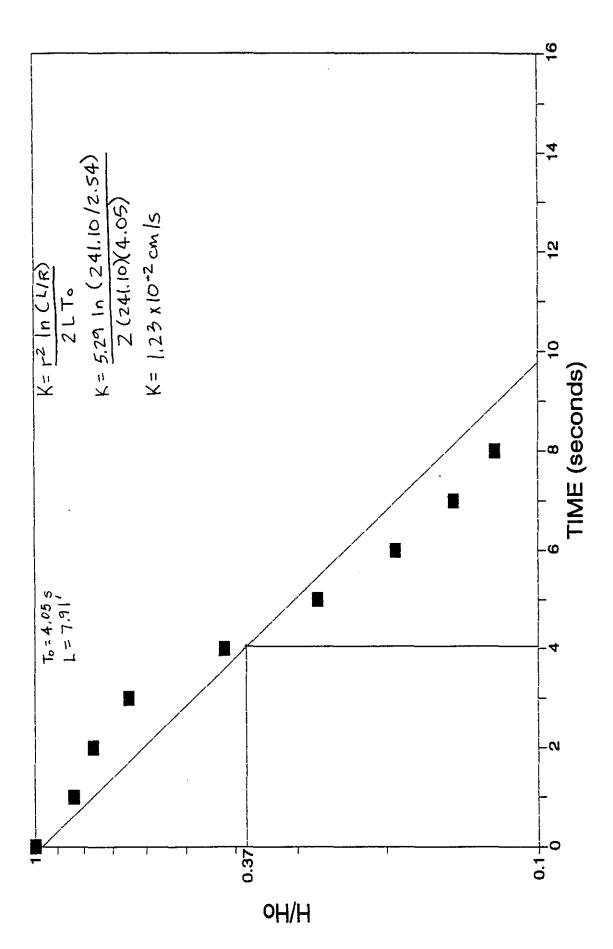


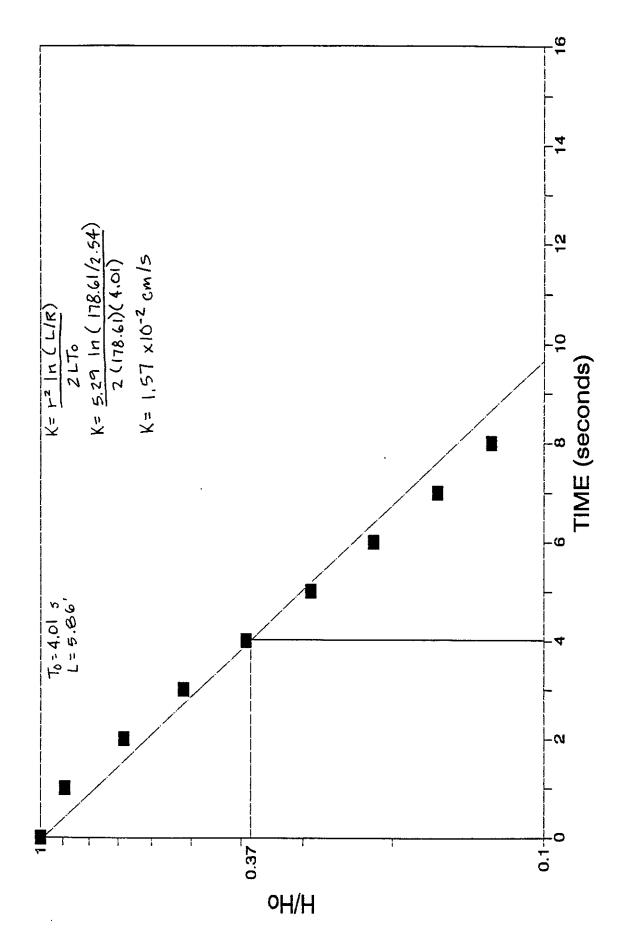
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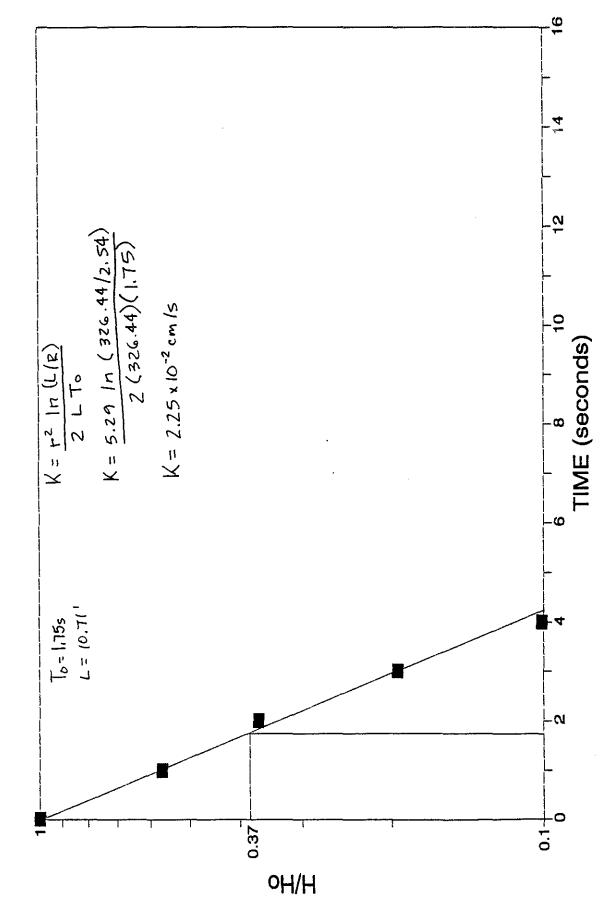


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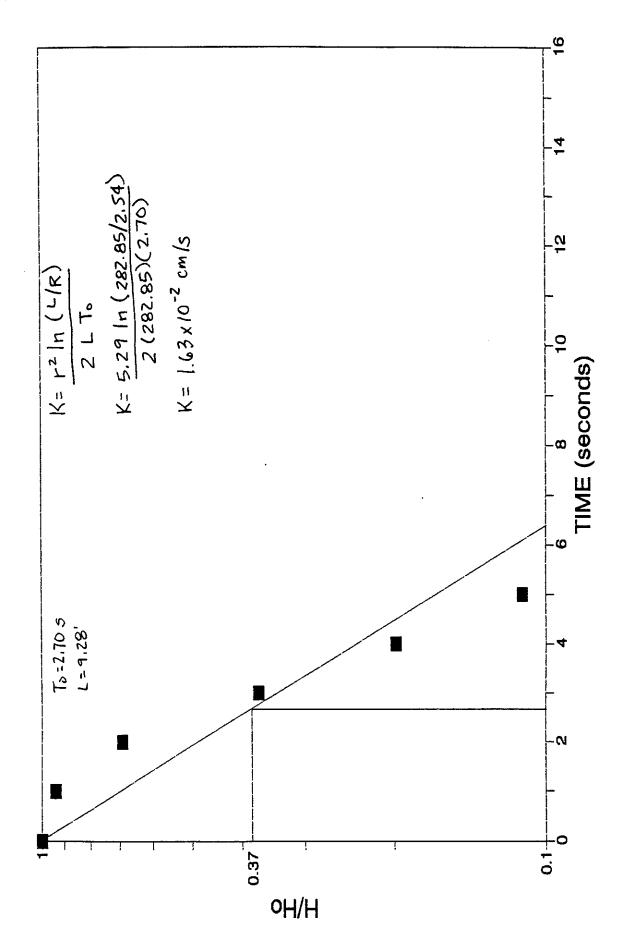


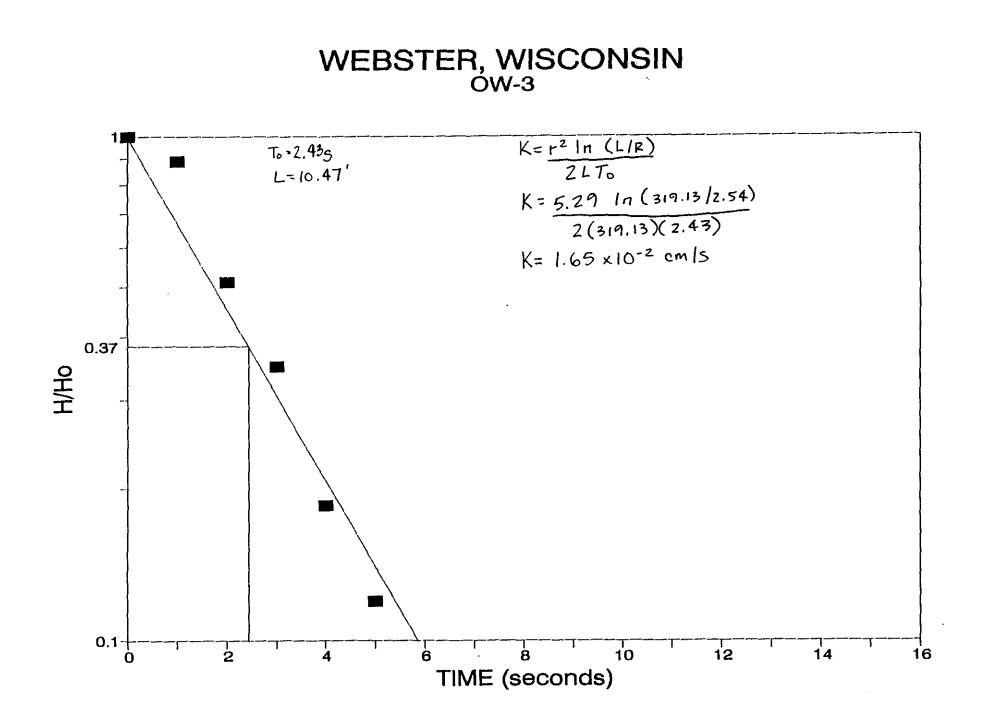
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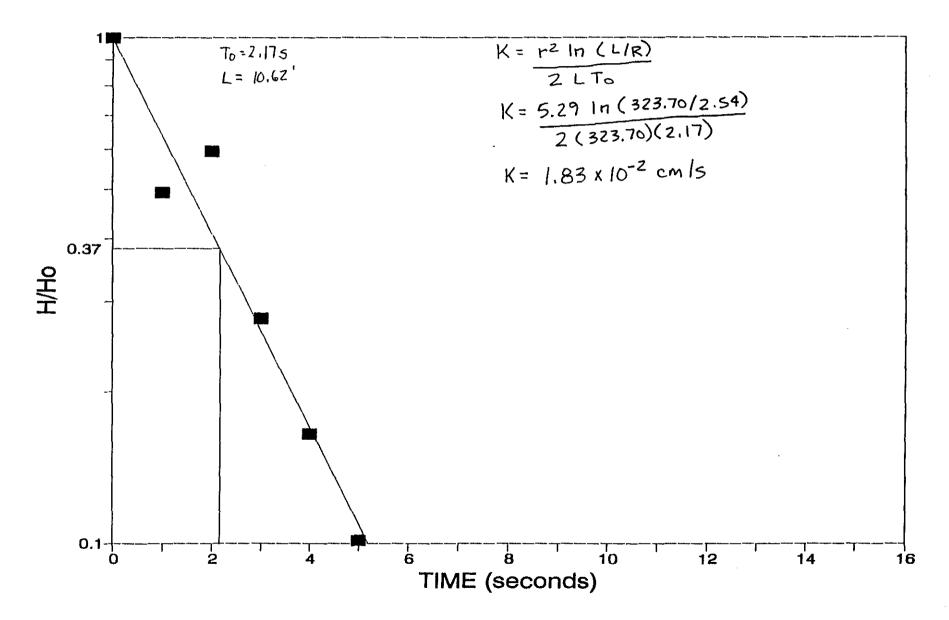
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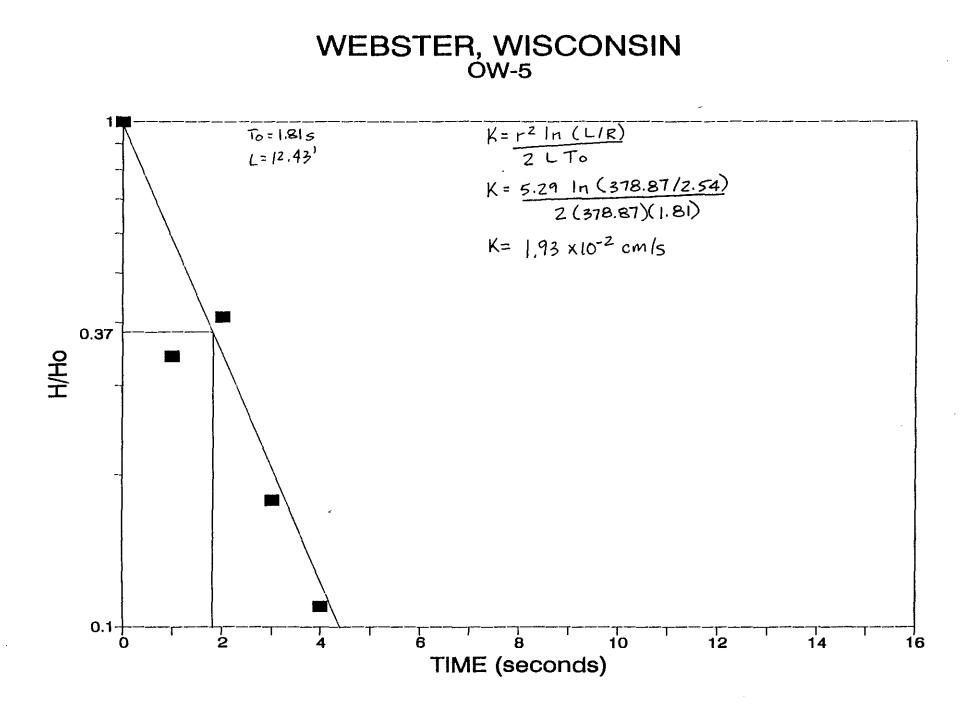
And and a second 
WEBSTER, WISCONSIN 0W-2



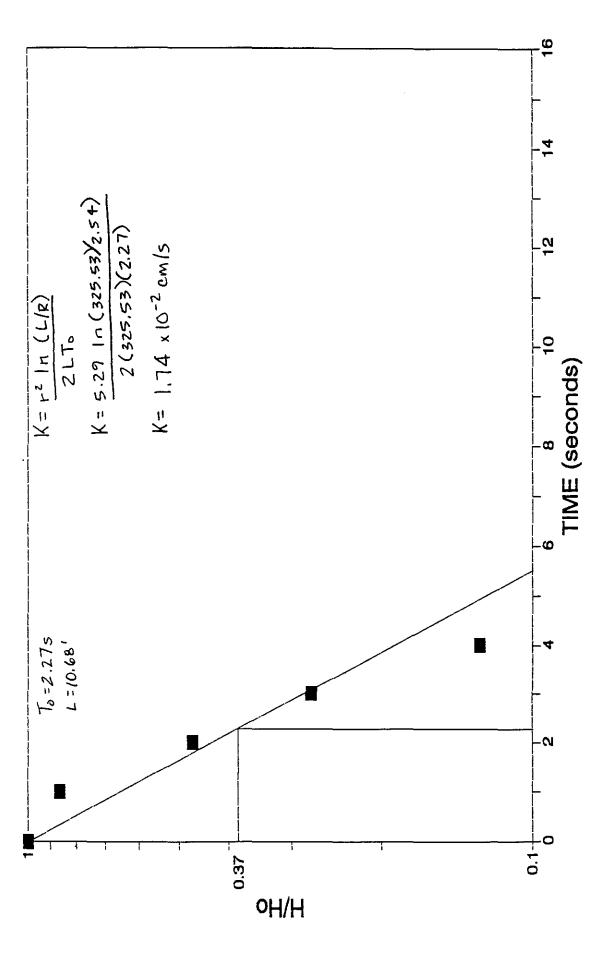


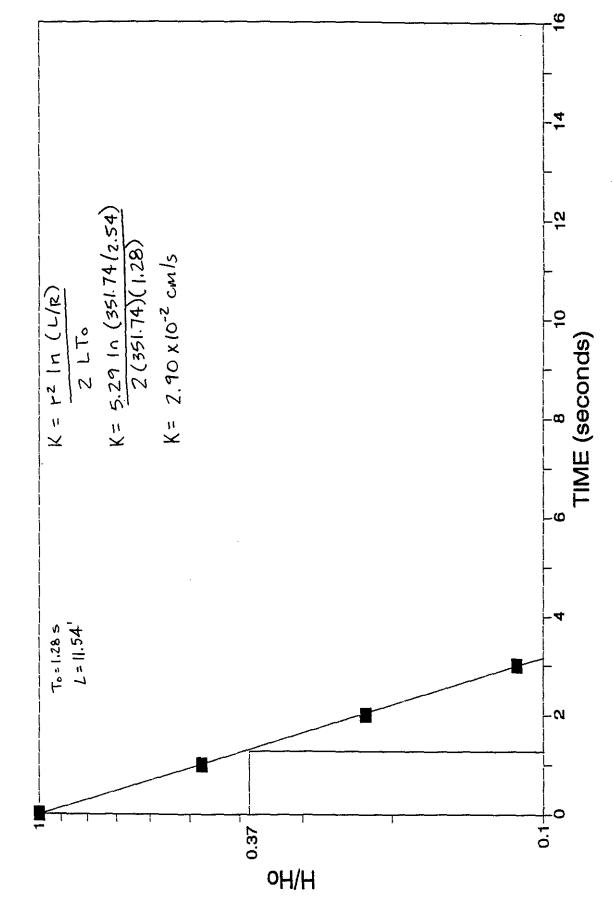
## WEBSTER, WISCONSIN OW-4





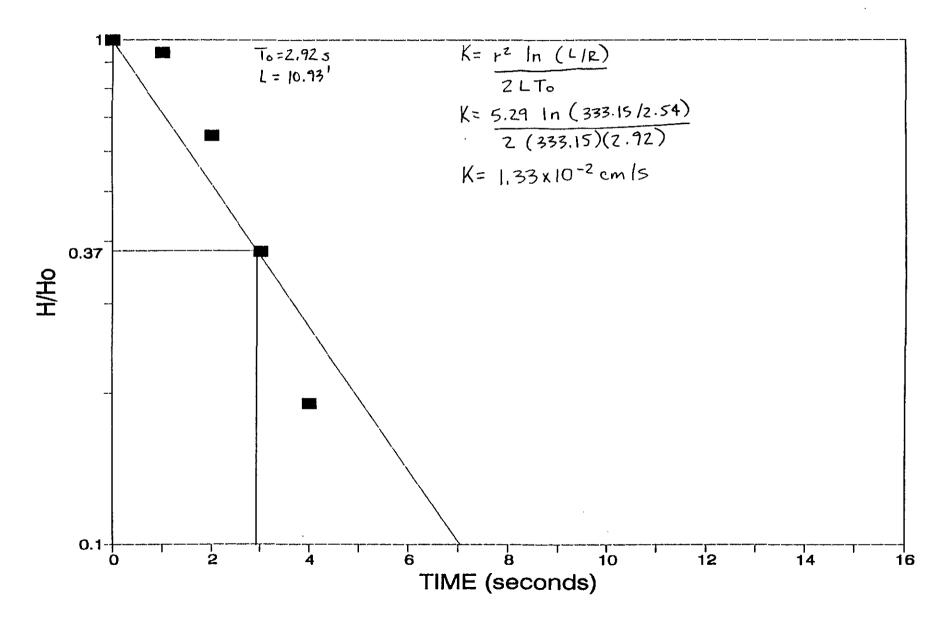
# WEBSTER, WISCONSIN 0W-6



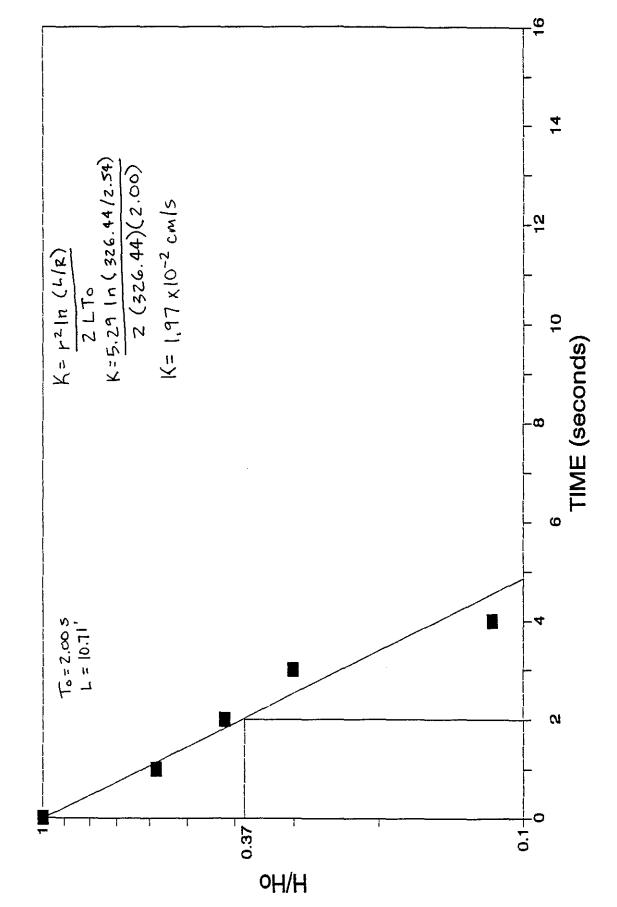


WEBSTER, WISCONSIN 0W-7

## WEBSTER, WISCONSIN



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# WEBSTER, WISCONSIN 0W-9

### Appendix E

Enviroscan 1991 Soil Geochemistry Results and Chain-of-Custody Documents July 15, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Brian Hayden

Re: Project No. 9114



Please find enclosed the analytical results for the samples received June 20, 1991.

The VOC and Lead analyses were done in accordance with EPA Methods (EPA-600/4-79-020, March, 1983 or SW-846, Third Edition). The Total Petroleum Hydrocarbons (TPH) analysis was completed using the California Method with a capillary GC/FID. The notes which follow the TPH results give an accurate description of any contamination. This was done to give you a better idea of the different types of petroleum contamination which could occur.

All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

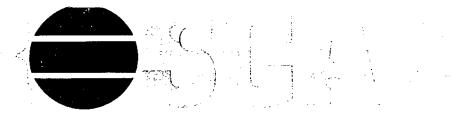
Sincerely,

Enviroscan Corp.

Victoria J Kakes

Victoria J. Kakes Analytical Chemist





CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/13/91 APPROVED BY: VJKU

Attn: Brian Hayden

	Detection				
	Units	Limit	SB-14	SB-12 34-36'	
Benzene	 ng/g	2.2	 x	x	
Bromoform	3/ 3 ng/g	8.6	x	x	
Bromomethane	ng/g	17.0	x	x	
Carbon Tetrachloride	ng/g	2.2	x	x	
Chlorobenzene	ng/g	8.6	x	x	
Chloroethane	ng/g	8.6	x	x	
2-Chloroethylvinyl Ether	ng/g	21.0	x	x	
Chloroform	ng/g	2.2	x	x	
Chloromethane	ng/g	8.6	x	x	
Chlorodibromomethane	ng/g	2.2	x -	x	
1,2-Dichlorobenzene	ng/g	4.2	x	x	
1,3-Dichlorobenzene	ng/g	4.2	x	x	
1,4-Dichlorobenzene	ng/g	2.2	x	х	
Bromodichloromethane	ng/g	2.2	x	x	
1,1-Dichloroethane	ng/g	2.2	x	х	
1,2-Dichloroethane	ng/g	2.2	х	x	
1,1-Dichloroethvlene	ng/g	4.2	x	х	
1,2-Dichloroethylene	ng/g	4.2	x	x	
Methylene Chloride(1)	ng/g	11.0	13.5	х	
1,2-Dichloropropane	ng/g	2.2	х	x	
cis-1,3-Dichloropropene	ng/g	8.6	х	x	
trans-1,3-Dichloropropene	ng/g	2.2	x	x	
Ethylbenzene	ng/g	4.2	x	x	
1,1,2,2-Tetrachloroethane	ng/g	4.2	x	X	
Tetrachloroethylene	ng/g	2.2	x	x	
Toluene	ng/g	2.2	x	х	
1,1,1-Trichloroethane	ng/g	2.2	x	x	
1,1,2-Trichloroethane	ng/g	2.2	x	x	
Trichloroethylene	ng/g	2.2	x	x	
Vinyl Chloride	ng/g	8.6	x	x	
Trichlorofluoromethane	ng/g	4.2	x	х	
Dichlorodifluoromethane	ng/g	8.6	x	x	
m-Xylene	ng/g	4.2	x	x	
o & p-Xylene	ng/g	4,2	х	x	
Analytical No.:			52508	52510	

X = Analyzed but not detected.
Results calculated on a dry weight basis.
(1) = May be due to lab contamination.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/13/91 APPROVED BY: VJK

Attn: Brian Hayden

	Detection		
	Units	Limit	SB-1
Benzene	ng/g	4.3	х
Bromoform	ng/g	17.0	х
Bromomethane	ng/g	34.0	х
Carbon Tetrachloride	ng/g	4.3	х
Chlorobenzene	ng/g	17.0	x
Chloroethane	ng/g	17.0	x
2-Chloroethylvinyl Ether	ng/g	43.0	x
Chloroform	ng/g	4.3	x
Chloromethane	ng/g	17.0	x
Chlorodibromomethane	ng/g	4.3	x
l,2-Dichlorobenzene	ng/g	8.5	x
1,3-Dichlorobenzene	ng/g	8.5	x
l,4-Dichlorobenzene	ng/g	4.3	x
Bromodichloromethane	ng/g	4.3	x
1,1-Dichloroethane	ng/g	4.3	x
1,2-Dichloroethane	ng/g	4.3	x
1,1-Dichloroethylene	ng/g	8.5	х
1,2-Dichloroethylene	ng/g	8.5	х
Methylene Chloride	ng/g	21.0	х
1,2-Dichloropropane	ng/g	4.3	x
cis-1,3-Dichloropropene	ng/g	17.0	х
trans-1,3-Dichloropropene	ng/g	4.3	x
Ethylbenzene	ng/g	8.5	х
1,1,2,2-Tetrachloroethane	ng/g	8.5	x
Tetrachloroethylene	ng/g	4.3	x
Toluene	ng/g	4.3	х
1,1,1-Trichloroethane	ng/g	4.3	x
1,1,2-Trichloroethane	ng/g	4.3	x
Trichloroethylene	ng/g	4.3	x
Vinyl Chloride	ng/g	17.0	x
Trichlorofluoromethane	ng/g	8.5	х
Dichlorodifluoromethane	ng/g	17.0	x
m-Xylene	ng/g	8.5	x
o & p-Xylene	ng/g	8,5	x
·	97 3		
Analytical No.:			5250

X = Analyzed but not detected.
Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

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**YIICAL REPO** 

CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/15/91 APPROVED BY: VJK

Attn: Brian Hayden

ł

		Detection	
	Units	Limit	SB-15
Benzene	ng/g	1.8	х
Bromoform	ng/g	7.4	x
Bromomethane	ng/g	15.0	x
Carbon Tetrachloride	ng/g	1.8	x
Chlorobenzene	ng/g	7.4	x
Chloroethane	ng/g	7.4	х
2-Chloroethylvinyl Ether	ng/g	19.0	х
Chloroform	ng/g	1.8	х
Chloromethane	ng/g	7.4	х
Chlorodibromomethane	ng/g	1.8	х
1,2-Dichlorobenzene	ng/g	3.8	х
1,3-Dichlorobenzene	ng/g	3.8	х
1,4-Dichlorobenzene	ng/g	1.8	х
Bromodichloromethane	ng/g	1.8	х
1,1-Dichloroethane	ng/g	1.8	x
1,2-Dichloroethane	ng/g	1.8	x
1,1-Dichloroethylene	ng/g	3.8	x
1,2-Dichloroethylene	ng/g	3.8	x
Methylene Chloride	ng/g	9.2	x
1,2-Dichloropropane	ng/g	1.8	x
cis-1,3-Dichloropropene	ng/g	7.4	х
trans-1,3-Dichloropropene	ng/g	1.8	x
Ethylbenzene	ng/g	3.8	x
1,1,2,2-Tetrachloroethane	ng/g	3.8	х
Tetrachloroethylene	ng/g	1.8	х
Toluene	ng/g	1.8	x
1,1,1-Trichloroethane	ng/g	1.8	x
1,1,2-Trichloroethane	ng/g	1.8	x
Trichloroethylene	ng/g	1.8	x
Vinyl Chloride	ng/g	7.4	x
Trichlorofluoromethane	ng/g	3.8	x
Dichlorodifluoromethane	ng/g	7.4	x
m-Xylene	ng/g	3.8	x
o & p-Xylene	ng/g	3.8	x

Analytical No.:

52511

X = Analyzed but not detected.
Results calculated on a dry weight basis.

### All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Environment Inc. 203 Wast Military Rd. Rothschild WI 54474 1/800/338-SCAN Wisconsin Lab Cartification No. 737053130

# ANALYTICAL REPORT

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802 CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/15/91 APPROVED BY: VJK

Attn: Brian Hayden

		Detection			
	Units	Limit	SB-3	SB-1 9-1	
Benzene	ng/g	2.1	 x	x	
Bromoform	ng/g	8.5	х	x	
Bromomethane	nq/q	17.0	x	x	
Carbon Tetrachloride	ng/g	2.1	х	х	
Chlorobenzene	ng/g	8.5	х	х	
Chloroethane	ng/g	8.5	x	x	
2-Chloroethylvinyl Ether	ng/g	21.0	x	x	
Chloroform	ng/g	2.1	х	х	
Chloromethane	ng/g	8.5	x	х	
Chlorodibromomethane	ng/g	2.1	x	x	
1,2-Dichlorobenzene	ng/g	4.3	x	x	
1,3-Dichlorobenzene	ng/g	4.3	х	x	
1,4-Dichlorobenzene	ng/g	2.1	x	x	
Bromodichloromethane	ng/g	2.1	x	x	
1,1-Dichloroethane	ng/g	2.1	x	x	
1,2-Dichloroethane	ng/g	2.1	x	x	
1,1-Dichloroethylene	ng/g	4.3	x	x	
1,2-Dichloroethylene	ng/g	4.3	x	x	
Methylene Chloride	ng/g	11.0	x	x	
1,2-Dichloropropane	ng/g	2.1	x	x	
cis-1,3-Dichloropropene	ng/g	8.5	x	x	
trans-1,3-Dichloropropene	ng/g	2.1	x	x	
Ethylbenzene	ng/g	4.3	x	x	
1,1,2,2-Tetrachloroethane	ng/g	4.3	x	x	
Tetrachloroethylene	ng/g	2.1	x	х	
Toluene	ng/g	2.1	x	х	
1,1,1-Trichloroethane	ng/g	2.1	x	х	
1,1,2-Trichloroethane	ng/g	2.1	x	x	
Trichloroethylene	ng/g	2.1	x	х	
Vinyl Chloride	ng/g	8.5	х	х	
Trichlorofluoromethane	ng/g	4.3	x	х	
Dichlorodifluoromethane	ng/g	8.5	x	x	
m-Xylene	ng/g	4.3	х	x	
o & p-Xylene	ng/g	4.3	x	x	
Analytical No.:			52512	52513	

X = Analyzed but not detected.

Results calculated on a dry weight basis.







RREM, Inc. 408 Board of Trade Building Duluth, MN 55802 CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/15/91 APPROVED BY: VJK

Attn: Brian Hayden

		Detection	
	Units	Limit	SB-1 34-36'
Benzene		2.2	x
Bromoform	ng/g	8.6	х
Bromomethane	ng/g	17.0	х
Carbon Tetrachloride	ng/g	2.2	х
Chlorobenzene	ng/g	8.6	x
Chloroethane	ng/g	8.6	x
2-Chloroethylvinyl Ether	ng/g	21.0	x
Chloroform	ng/g	2.2	x
Chloromethane	ng/g	8.6	x
Chlorodibromomethane	ng/g	2.2	х
1,2-Dichlorobenzene	ng/g	4.3	х
1,3-Dichlorobenzene	ng/g	4.3	x
1,4-Dichlorobenzene	ng/g	2.2	х
Bromodichloromethane	ng/g	2.2	х
1,1-Dichloroethane	ng/g	2.2	x
1,2-Dichloroethane	ng/g	2.2	x
1,1-Dichloroethylene	ng/g	4.3	х
1,2-Dichloroethylene	ng/g	4.3	x
Methylene Chloride	ng/g	11.0	x
1,2-Dichloropropane	ng/g	2.2	х
cis-1,3-Dichloropropene	ng/g	8.6	х
trans-1,3-Dichloropropene	ng/g	2.2	х
Ethylbenzene	ng/g	4.3	x
1,1,2,2-Tetrachloroethane	ng/g	4.3	х
Tetrachloroethylene	ng/g	2.2	34.9
Toluene	ng/g	2.2	x
1,1,1-Trichloroethane	ng/g	2.2	х
1,1,2-Trichloroethane	ng/g	2.2	x
Trichloroethylene	ng/g	2.2	х
Vinyl Chloride	ng/g	8.6	х
Trichlorofluoromethane	ng/g	4.3	х
Dichlorodifluoromethane	ng/g	8.6	х
m-Xylene	ng/g	4.3	x
o & p-Xylene	ng/g	4.3	x
Analytical No.:			52514

X = Analyzed but not detected.

Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.



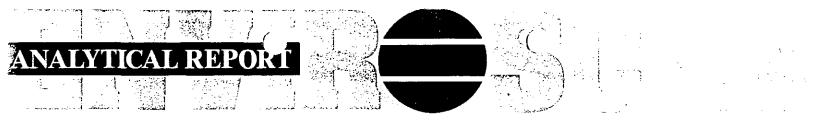
CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/15/91 APPROVED BY: VJK J

Attn: Brian Hayden

Customer Number	Lead	Analytical Number
		**
SB-14	3.7	52508
SB-12	х	52509
SB-12 34-36'	X	52510
SB-15	x	52511
SB-3	2.0	52512
SB-1 9-11'	2.5	52513
SB-1 34-36'	x	52514
Detection Limit	1.7	
Units	µg∕g	

X = Analyzed but not detected. Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/20/91 REPORT DATE: 07/11/91 APPROVED BY: DJB 079

Attn: Brian Hayden

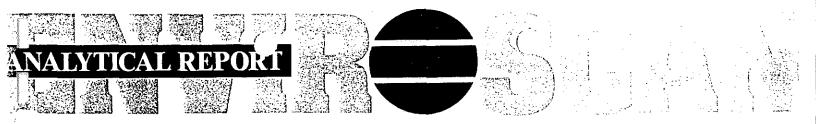
Total Petroleum Hydrocarbon (TPH) Analysis

			Analytical
	TPH Gasoline	TPH Diesel	No.
SB-14	x	х	52508
SB-12	х	x	52509
SB-12 34-36'	х	x	52510
SB-15	х	x	52511
S B – 3	x	x	52512
SB-1 9-11'	x	x	52513
SB-1 34-36'	x	x	52514
		•	
Detection Limit	6.1	6.1	
Units	ha∖a	₩ G \  G	

X = Analyzed but not detected.
Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

E. d. ---- Inc. 202 Mart Million Rd. Pathochild WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



Date Rec'd 6 / 20191

### SAMPLE RECEIPT REPORT

CLIENT: RREM Inc. Anal No: 52508 to 52514 20-

Reference Code Explanation

Sample(s) received at  $22 \cdot 1^{\circ}$ C which is above the EPA protocol of 4°C.

2.

1

Samples received without appropriate paperwork. Explain

З.

4.

VOC vial(s) received with headspace contrary to EPA protocol. Explain\_\_\_\_\_

- Sample(s) received in bottles not furnished by Enviroscan. Preservation method, if used, are unknown.
- 5. Sample(s) not properly preserved per EPA protocol for the following:
- Sample(s) not field filtered. Lab filtered upon receipt.

7. Sample(s) received beyond EPA holding time for:

- 8. Sample date/time not supplied by client. Actual holding time unknown.
- 9. Insufficient sample size to complete analysis or obtain required detection limit.

10. Other:\_\_\_\_\_

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc. 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

REQUEST FO	303 W. I	) MILITA			ILD, WI 544	74 1-8	300-338-	SCAN	- Criffine
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D	sluth	MA		802			Rush		
Phone: ( <u>2/8</u> ) P.O. # / Project #:	722-	<u>39/5</u> 74				Da	te Neede		
Quote / Reference #: _		1-9						roved by La	
Note: Terms and cond	litions prir	nted on I	back apply	<i>י</i> .					sheet if necessary)
<u>Sample Type</u> (Check all that apply)	🗍 Flan	hazardou Imable		igerate k in Hood		15/			Por Cu
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□ Other	-	•				1.8/	à s		
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20052509 /	6-19		1	5B-12	9'-11'				
20052510 🗸	16-19		1	SB-12	34'- 36'				
20052511	6-18		1	5B-15	34'- 36'		· ·		
20052512	6-1B		· · ·		34 - 36				
20052513 /	5-17		,	5B-1	9'-11'				
20052514	6-17		,	SB-)	34'-36	•			
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Deliarah				:55 400	r Hudak	RREM			-
RELINQUISHED B	(Signatu	re)	DATE/TIN		VED FOR LABOF gnature)	RATORY	DATE		

July 19, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Colin Reichhoff / George Hudak

Re: Project No. 9114

6 10 11 12 BY

Please find enclosed the analytical results for the samples received June 28, 1991.

The volatile organic compounds were determined in accordance with EPA method 8010/8020 (GC with Hall and PI detectors). The TPH analyses were completed in accordance with the California Method (GC-FID). The notes which follow the TPH results give an accurate description of any contamination observed. The lead was determined in accordance with EPA method 6010 (ICP-AES).

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

SEDWADS AMEZ

James B. Edwards Senior Analytical Chemist



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/28/91 REPORT DATE: 07/19/91 APPROVED BY: JBE 5

Attn: Colin Reichhoff / George Hudak

		Detection		
	Units	Limit	WEBSTER SB-6	WEBSTER SB-5
Benzehe	ng/g	2.0	x	x
Bromoform	ng/g	7.8	х	X
Bromomethane	ng/g	16.	Х	x
Carbon Tetrachloríde	ng/g	2.0	х	х
Chlorobenzene	ng/g	7.8	х	x
Chloroethane	ng/g	7.8	х	x
2-Chloroethylvinyl Ether	ng/g	20.	x	X
Chloroform	ng/g	2.0	x	X
Chloromethane	ng/g	7.8	х	X
Chlorodibromomethane	ng/g	2.0	x	x
1,2-Dichlorobenzene	ng/g	3.9	х	x
1,3-Dichlorobenzene	ng/g	3.9	x	x .
1,4-Dichlorobenzene	ng/g	2.0	x	x
Bromodichloromethane	ng/g	2.0	x	X
1,1-Dichloroethane	ng/g	2.0	x	x
1,2-Dichloroethane	ng/g	2.0	x	x
1,1-Dichloroethylene	ng/g	3.9	x	x
1,2-Dichloroethylene	ng/g	3.9	х	x
Methylene Chloride	ng/g	9.8	х	x
1,2-Dichloropropane	ng/g	2.0	x	x
cis-1,3-Dichloropropene	ng/g	7.8	x	x
trans-1,3-Dichloropropene	ng/g	2.0	х	x
Ethylbenzene	ng/g	3.9	х	x
1,1,2,2-Tetrachloroethane	ng/g	3.9	x	x
Tetrachloroethylene	ng/g	2.0	2.4	x
Toluene	ng/g	2.0	х	x
1,1,1-Trichloroethane	ng/g	2.0	x	x
1,1,2-Trichloroethane	ng/g	2.0	x	x
Trichloroethylene	ng/g	2.0	х	x
Vinyl Chloride	ng/g	7.8	x	x
Trichlorofluoromethane	ng/g	3.9	х	х
Dichlorodifluoromethane	ng/g	7.8	x	x
m-Xylene	ng/g	3.9	х	x
o- & p-Xylene	ng/g	3.9	x	x
Lead	ħå∖ā	1.8	x	3.47
Analytical No.:			52948	52947

X = Analyzed but not detected.

Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

**YTICAL REPOR** 

	*
APPROVED BY:	JBE
REPORT DATE:	07/19/91
DATE REC'D:	06/28/91
SAMPLED BY:	Client
CUST NUMBER:	9114

Attn: Colin Reichhoff / George Hudak

		Detection		
	Units	Limit	WEBSTER SB-10	WEBSTER SB-11
Benzene	ng/g	2.4	x	X
Bromoform	ng/g	9.7	x	x
Bromomethane	ng/g	19.	х	x
Carbon Tetrachloride	ng/g	2.4	x	x
Chlorobenzene	ng/g	9.7	x	х
Chloroethane	ng/g	9.7	х	x
2-Chloroethylvinyl Ether	ng/g	24.	х	x
Chloroform	ng/g	2.4	x	x
Chloromethane	ng/g	9.7	X	x
Chlorodibromomethane	ng/g	2.4	x	x
1,2-Dichlorobenzene	ng/g	4.8	x	x
1,3-Dichlorobenzene	ng/g	4.8	<b>x</b> .	x
1,4-Dichlorobenzene	ng/g	2.4	x	х
Bromodichloromethane	ng/g	2.4	x	x
1,1-Dichloroethane	ng/g	2.4	х	x
1,2-Dichloroethane	ng/g	2.4	x	х
1,1-Dichloroethylene	ng/g	4.8	x	x
1,2-Dichloroethylene	ng/g	4.8	x	x
Methylene Chloride	ng/g	12.	x	х
1,2-Dichloropropane	ng/g	2.4	x	x
cis-1,3-Dichloropropene	ng/g	9.7	x	x
trans-1,3-Dichloropropene	ng/g	2.4	x	х
Ethylbenzene	ng/g	4.8	х	x
1,1,2,2-Tetrachloroethane	ng/g	4.8	x	х
Tetrachloroethylene	ng/g	2.4	x	x
Toluene	ng/g	2.4	x	х
1,1,1-Trichloroethane	ng/g	2.4	x	х
1,1,2-Trichloroethane	ng/g	2.4	х	x
Trichloroethylene	ng/g	2.4	x	х
Vinyl Chloride	ng/g	9.7	x	x
Trichlorofluoromethane	ng/g	4.8	х	x
Dichlorodifluoromethane	ng/g	9.7	x	x
m-Xylene	ng/g	4.8	x	x
o- & p-Xylene	ng/g	4.8	x	x
Lead	ha∖a	1.7	2.26	3.34
Analytical No.:			52949	52950

X = Analyzed but not detected.
Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	06/28/91
REPORT DATE:	07/19/91
APPROVED BY:	JBE,

Attn: Colin Reichhoff / George Hudak

		Detection	
	Units	Limit	WEBSTER SB-13
Benzene			
	ng/g	2.3	x
Bromoform	ng/g	9.4	x
Bromomethane	ng/g	19.	X
Carbon Tetrachloride	ng/g	2.3	х
Chlorobenzene	ng/g	9.4	x
Chloroethane	ng/g	9.4	x
2-Chloroethylvinyl Ether	ng/g	24.	x
Chloroform	ng/g	2.3	X
Chloromethane	ng/g	9.4	x
Chlorodibromomethane	ng/g	2.3	x
1,2-Dichlorobenzene	ng/g	4.7	x
1,3-Dichlorobenzene	ng/g	4.7	. x
1,4-Dichlorobenzene	ng/g	2.3	X
Bromodichloromethane	ng/g	2.3	x
1,1-Dichlorcethane	ng/g	2.3	x
1,2-Dichloroethane	ng/g	2.3	X
1,1-Dichloroethylene	ng/g	4.7	x
1,2-Dichloroethylene	ng/g	4.7	x
Methylene Chloride	ng/g	12.	х
1,2-Dichloropropane	ng/g	2.3	x
cis-1,3-Dichloropropene	ng/g	9.4	x
trans-1,3-Dichloropropene	ng/g	2.3	х
Ethylbenzene	ng/g	4.7	x
1,1,2,2-Tetrachloroethane	ng/g	4.7	x
Tetrachloroethylene	ng/g	2.3	x
Toluene	ng/g	1.8	4.2
1,1,1-Trichloroethane	ng/g	2.3	x
1,1,2-Trichloroethane	ng/g	2.3	x
Trichloroethylene	ng/g	2.3	x
Vinyl Chloride	ng/g	9.4	x
- Trichlorofluoromethane	ng/g	4.7	х
Dichlorodifluoromethane	ng/g	9.4	x
m~Xylene	ng/g	4.7	x
o- & p-Xylene	ng/g	4.7	x
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		247	A
Lead	µg∕g	1.8	x
Analytical No.:			52951

X = Analyzed but not detected.

Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

.

CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 06/28/91 REPORT DATE: 07/15/91 APPROVED BY: DJB

Attn: Colin Reichhoff/george Hudak

BP

Total Petroleum Hydrocarbon (TPH) Analysis

		Analytical
TPH Gasoline	TPH Diesel	No.
x	x	52947
x	x	52948
x	x	52949
x	x	52950
x	x	52951
6.3	6.3	
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X = Analyzed but not detected.

Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Territorian Jane 202 Water Military Rd. Rothschild WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



Date Rec'd 6128191

### SAMPLE RECEIPT REPORT

CLIENT: _	RREM.
Anal. No	: 6052947 to 6052952

Reference Code Explanation Sample(s) received at  $WARM^{\circ}C$  which is above the EPA protocol of 4°C. Cold Packs NOT Cold Samples received without appropriate paperwork. 2. Explain \_\_\_\_\_ VOC vial(s) received with headspace contrary to EPA З. protocol. Explain\_\_\_\_\_ Sample(s) received in bottles not furnished by 4. Enviroscan. Preservation method, if used, are unknown. Sample(s) not properly preserved per EPA protocol for 5. the following:\_\_\_\_\_ 6. Sample(s) not field filtered. Lab filtered upon receipt. 7. Sample(s) received beyond EPA holding time for: Sample date/time not supplied by client. Actual 8. holding time unknown. 9. Insufficient sample size to complete analysis or obtain required detection limit. Other:\_\_\_\_\_ 10. 

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

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ENVIRESCAN

July 31, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802



Attn: Colin Reichhoff

Re: 9114

Please find enclosed the analytical results for the samples received July 11, 1991.

All analyses were done in accordance with EPA Methods (EPA-600/4-79-020, March, 1983 or SW-846, Third Edition). The Total Petroleum Hydrocarbon (TPH) analysis was completed using the California Method with a capillary GC/FID. All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed.

If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

- Bush

Dominic J. Bush Analytical Chemist



YTICAL REPORT

CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/11/91 REPORT DATE: 07/26/91 APPROVED BY: BMS

## Attn: Colin Reichhoff

~	Customer Number	Lead	Detection Limit	Units	Analytical Number
	SB-8,#7	2.27	1.7	hd\d	53499
	SB-2,#7	x	1.8	hd\d	53500
	SB-2,#5	x	1.6	hd\d	53501

X = Analyzed but not detected. Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program. Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/11/91 REPORT DATE: 07/26/91 APPROVED BY: JCH J.C.H.

Attn: Colin Reichhoff

	Units	Detection Limit	SB-8,#7 07/08/91
Benzene	ng/g	1.8	X
Bromoform	ng/g	7.4	Х
Bromomethane	ng/g	15.0	Х
Carbon Tetrachloride	ng/g	1.8	Х
Chlorobenzene	ng/g	7.4	Х
Chloroethane	ng/g	7.4	Х
2-Chloroethylvinyl Ether	ng/g	19.0	X
Chloroform	ng/g	1.8	Х
Chloromethane	ng/g	7.4	Х
Chlorodibromomethane	ng/g	1.8	Х
1,2-Dichlorobenzene	ng/g	3.7	Х
1,3-Dichlorobenzene	ng/g	3.7	Х
1,4-Dichlorobenzene	ng/g	1.8	Х
Bromodichloromethane	ng/g	1.8	Х
1,1-Dichloroethane	ng/g	1.8	Х
1,2-Dichloroethane	ng/g	1.8	Х
1,1-Dichloroethylene	ng/g	3.7	Х
1,2-Dichloroethylene	ng/g	3.7	Х
Methylene Chloride	ng/g	9.2	Х
1,2-Dichloropropane	ng/g	1.8	Х
cis-1,3-Dichloropropene	ng/g	7.4	Х
trans-1,3-Dichloropropene	ng/g	1.8	Х
Ethylbenzene	ng/g	3.7	Х
1,1,2,2-Tetrachloroethane	ng/g	3.7	Х
Tetrachloroethylene	ng/g	1.8	Х
Toluene	ng/g	1.8	Х
1,1,1-Trichloroethane	ng/g	1.8	Х
1,1,2-Trichloroethane	ng/g	1.8	Х
Trichloroethylene	ng/g	1.8	Х
Vinyl Chloride	ng/g	7.4	Х
Trichlorofluoromethane	ng/g	3.7	Х
Dichlorodifluoromethane	ng/g	7.4	X
m-Xylene	ng/g	3.7	X
o & p-Xylene	ng/g	3.7	x

Analytical No.:

53499

X = Analyzed but not detected. Results calculated on a dry weight basis.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/11/91 REPORT DATE: 07/26/91 APPROVED BY: JCH

Attn: Colin Reichhoff

	Units	Detection Limit	SB-2,#7 07/09/91
Benzene	ng/q	3.6	X
Bromoform	ng/g	14.0	X
Bromomethane	ng/g	28.0	x
Carbon Tetrachloride	ng/g	3.6	x
Chlorobenzene	ng/g	14.0	х
Chloroethane	ng/g	14.0	х
2-Chloroethylvinyl Ether	ng/g	35.0	Х
Chloroform	ng/g	3.6	х
Chloromethane	ng/g	14.0	x
Chlorodibromomethane	ng/g	3.6	Х
1,2-Dichlorobenzene	ng/g	7.1	х
1,3-Dichlorobenzene	ng/g	7.1	Х
1,4-Dichlorobenzene	ng/g	3.6	х
Bromodichloromethane	ng/g	3.6	Х
1,1-Dichloroethane	ng/g	3.6	х
1,2-Dichloroethane	ng/g	3.6	х
1,1-Dichloroethylene	ng/g	7.1	X
1,2-Dichloroethylene	ng/g	7.1	Х
Methylene Chloride	ng/g	18.0	х
1,2-Dichloropropane	ng/g	3.6	х
cis-1,3-Dichloropropene	ng/g	14.0	х
trans-1,3-Dichloropropene	ng/g	3.6	Х
Ethylbenzene	ng/g	7.1	Х
1,1,2,2-Tetrachloroethane	ng/g	7.1	Х
Tetrachloroethylene	ng/g	3.6	х
Toluene	ng/g	3.6	x
1,1,1-Trichloroethane	ng/g	3.6	х
1,1,2-Trichloroethane	ng/g	3.6	Х
Trichloroethylene	ng/g	3.6	х
Vinyl Chloride	ng/g	14.0	Х
Trichlorofluoromethane	ng/g	7.1	х
Dichlorodifluoromethane	ng/g	14.0	Х
m-Xylene	ng/g	7.1	Х
o & p-Xylene	ng/g	7.1	Х

Analytical No.:

53500

X = Analyzed but not detected. Results calculated on a dry weight basis.

Il analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CAL REPOR

9114
Client
07/11/91
07/26/91
07/26/91 JCH JC/H

Attn: Colin Reichhoff

	Units	Detection Limit	SB-2,#5 07/09/91
Benzene	ng/g	3.5	X
Bromoform	ng/q	14.0	Х
Bromomethane	ng/g	28.0	x
Carbon Tetrachloride	ng/g	3.5	Х
Chlorobenzene	ng/g	14.0	Х
Chloroethane	ng/g	14.0	X
2-Chloroethylvinyl Ether	ng/g	35.0	X
Chloroform	ng/q	3.5	Х
Chloromethane	ng/g	14.0	х
Chlorodibromomethane	ng/g	3.5	X
1,2-Dichlorobenzene	ng/g	6.9	Х
1,3-Dichlorobenzene	ng/g	6.9	X
1,4-Dichlorobenzene	ng/g	3.5	X
Bromodichloromethane	ng/g	3.5	Х
1,1-Dichloroethane	ng/g	3.5	Х
1,2-Dichloroethane	ng/g	3.5	х
1,1-Dichloroethylene	ng/g	6.9	Х
1,2-Dichloroethylene	ng/g	6.9	Х
Methylene Chloride	ng/g	17.0	Х
1,2-Dichloropropane	ng/g	3.5	Х
cis-1,3-Dichloropropene	ng/g	14.0	Х
trans-1,3-Dichloropropene	ng/g	3.5	X
Ethylbenzene	ng/g	6.9	Х
1,1,2,2-Tetrachloroethane	ng/g	6.9	Х
Tetrachloroethylene	ng/g	3.5	X
Toluene	ng/g	3.5	Х
1,1,1-Trichloroethane	ng/g	3.5	Х
1,1,2-Trichloroethane	ng/g	3.5	X
Trichloroethylene	ng/g	3.5	Х
Vinyl Chloride	ng/g	14.0	Х
Trichlorofluoromethane	ng/g	6.9	Х
Dichlorodifluoromethane	ng/g	14.0	Х
m-Xylene	ng/g	6.9	Х
o & p-Xylene	ng/g	6.9	x

Analytical No.:

53501

# X = Analyzed but not detected. Results calculated on a dry weight basis.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/11/91 REPORT DATE: 07/31/91 APPROVED BY: DJB **DSC** 

Attn: Colin Reichhoff

Total Petroleum Hydrocarbon (TPH) Analysis

				Analytical
		TPH Gasoline	TPH Diesel	Nº.
<u>,                                    </u>	SB-8,#7	х	х	53499
	SB-2,#7	x	x	53500
5	SB-2,#5	x	x	53501
	Detection Limit	6.1	6.1	
	Units	h dì∖ dì	h â∖ â	

X = Analyzed but not detected.

Results calculated on a dry weight basis.

Il analyses conducted in accordance with Enviroscan Quality Assurance Program.

Christopen Inc. 203 Weet Military Rd. Rothschild. WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

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Name: <u>COLIN KE</u> Company: <u>FREM</u>	<u>ICHHD</u> F INC,	F/G	<u>OKLE</u>	HOPK	K		<u></u>			ound	Time			
Address: <u>408 Bo</u>			ADE B	LD6.										
DULU7 Phone: (2(2) 72	H M	<u>N 55</u> , 115	BOZ							sh leede	a			
P.O. # / Project #:			3STER					U			oved by	/ Lab)		
Quote / Reference #: _			haak anal		<b></b>						-		REQUE	STS
Note: Terms and conc	ittions pr	inted on	раск арру	<i>.</i>				r		(use	sepata	te shee	et i necessa	<u>iry)</u>
Sample Type (Check all that apply) Groundwater Wastewater Soil Solid Waste Oil Other	□ Fla □ Ski □ Hig	nhazardo Immable n Irritant Ihly Toxic	🗆 Wea	igerate k in Hoo Ir Glove	od				20010	1 6020 S.F.	ZZ / ME S-02	H-AD H	Mon .	
LAB USE ONLY	DATE		No. of Containers COMP GRAB		SAMF	PLE ID		$/\xi$	× A		\$			EMARKS
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	INTICAL REI	RI
		Date Rec'd 7_11_191
		SAMPLE RECEIPT REPORT
		CLIENT: <u>RREM</u>
		Anal. No.: 13053499 to 53501
	Reference Code	Explanation Porm Time O
		$\begin{array}{r} \begin{array}{c} \text{Borm Temp} \\ \text{Sample(s) received at} \end{array} ^{\circ} C \text{ which is above the EPA} \\ \text{protocol of 4 °C} \end{array}$
s. Soostaanse	2.	Samples received without appropriate paperwork. Explain
and the second sec	З <sup>.</sup> .	VOC vial(s) received with headspace contrary to EPA protocol. Explain
n	4.	Sample(s) received in bottles not furnished by Enviroscan. Preservation method, if used, are unknown.
	5.	Sample(s) not properly preserved per EPA protocol for the following:
(1602/2000/2000/2000/2000/2000/2000/2000/	. 6.	Sample(s) not field filtered. Lab filtered upon '
	7.	Sample(s) received beyond EPA holding time for:
s; .	8.	Sample date/time not supplied by client. Actual holding time unknown.
	9.	Insufficient sample size to complete analysis or obtain required detection limit.
	10.	Other:
- 		

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

August 12, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802



Attn: Colin Reichhoff

Re: 9114

Please find enclosed the analytical results for the samples received July 16, 1991.

All analyses were done in accordance with EPA Methods (EPA-600/4-79-020, March, 1983 or SW-846, Third Edition). The Total Petroleum Hydrocarbon (TPH) analysis was completed using the California Method with a capillary GC/FID. All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed.

If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

in Bush

Dominic J. Bush Analytical Chemist



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/16/91 REPORT DATE: 08/09/91 APPROVED BY: BMS BMS

Attn: Colin Reichhoff

Customer Number	Lead	Detection Limit	Analytical Number
SB-4,7	5.34	1.9	53678
SB-4,8	5.29	1.8	53679
SB-4,10	9.47	2.0	53680
SB-4,15	x	1.9	53681
Units	µg∕g	µg∕g	

X = Analyzed but not detected. Results calculated on a dry weight basis.

Il analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/16/91 REPORT DATE: 08/12/91 APPROVED BY: JCH JL

Attn: Colin Reichhoff

		Detection		
	Units	Limit	SB-4,8	SB-4,7
Benzene	ng/g	2.5	x	x
Bromoform	ng/g	9.9	x	x
Bromomethane	ng/g	20.0	X	X
Carbon Tetrachloride	ng/g	2.5	x	х
Chlorobenzene	ng/g	9,9	x	x
Chloroethane	ng/g	9.9	x	x
2-Chloroethylvinyl Ether	ng/g	25.0	x	x
Chloroform	ng/g	2.5	x	x
Chloromethane	ng/g	9.9	x	x
Chlorodibromomethane	ng/g	2.5	х	x
1,2-Dichlorobenzene	ng/g	4.9	x	x
1,3-Dichlorobenzene	ng/g	4.9	x	x
1,4-Dichlorobenzene	ng/g	2.5	х	x
Bromodichloromethane	ng/g	2.5	x	x
1,1-Dichloroethane	ng/g	2.5	х	х
1,2-Dichloroethane	ng/g	2.5	x	x
1,1-Dichloroethylene	ng/g	4.9	x	x
1,2-Dichloroethylene	ng/g	4.9	x	х
Methylene Chloride(1)	ng/g	12.3	46.0	42.9
1,2-Dichloropropane	ng/g	2.5	x	x
cis-1,3-Dichloropropene	ng/g	9.9	x	х
trans-1,3-Dichloropropene	ng/g	2.5	x	х
Ethylbenzene	ng/g	4.9	x	x
1,1,2,2-Tetrachloroethane	ng/g	4.9	x	x
Tetrachloroethylene	ng/g	2.5	x	х
Toluene	ng/g	2.5	x	x
1,1,1-Trichloroethane	ng/g	2.5	x	х
1,1,2-Trichloroethane	ng/g	2.5	х	x
Trichloroethylene	ng/g	2.5	x	х
Vinyl Chloride	ng/g	9.9	x	х
Trichlorofluoromethane	ng/g	4.9	x	x
Dichlorodifluoromethane	ng/g	9.9	x	x
m-Xylene	ng/g	4.9	x	х
o & p-Xylene	ng/g	4.9	x	x
Analytical No.:			53679	53678

X = Analyzed but not detected.
Results calculated on a dry weight basis.
(1) = May be due lab contamination.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

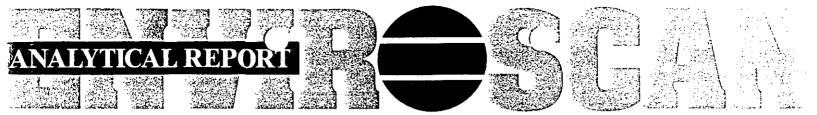
# ANALYTICAL REPORT

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802 CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/16/91 REPORT DATE: 08/12/91 APPROVED BY: JCH JCW

#### Attn: Colin Reichhoff

	Detection					
	Units	Limit	SB-4,15	SB-4,10		
Benzene	ng/g	2.9	x	x		
Bromoform	ng/g	12.0	x	x		
Bromomethane	ng/g	23.0	х	x		
Carbon Tetrachloride	ng/g	2.9	x	x		
Chlorobenzene	ng/g	12.0	x	x		
Chloroethane	ng/g	12.0	x	x		
2-Chloroethylvinyl Ether	ng/g	29.0	x	x		
Chloroform	ng/g	2.9	х	x		
Chloromethane	ng/g	12.0	х	x		
Chlorodibromomethane	ng/g	2.9	x	x		
1,2-Dichlorobenzene	ng/g	5.8	х	x		
1,3-Dichlorobenzene	ng/g	5.8	x	x		
1,4-Dichlorobenzene	ng/g	2.9	x	x		
Bromodichloromethane	ng/g	2.9	x	x		
1,1-Dichloroethane	ng/g	2.9	x	x		
1,2-Dichloroethane	ng/g	2.9	x	x		
1,1-Dichloroethylene	ng/g	5.8	x	x		
1,2-Dichloroethylene	ng/g	5.8	x	x		
Methylene Chloride(1)	ng/g	14.5	43.1	49.2		
1,2-Dichloropropane	ng/g	2.9	x	x		
cis-1,3-Dichloropropene	ng/g	12.0	x	x		
trans-1,3-Dichloropropene	ng/g	2.9	x	х		
Ethylbenzene	ng/g	5.8	x	х		
1,1,2,2-Tetrachloroethane	ng/g	5.8	x	x		
Tetrachloroethylene	ng/g	2.9	x	5.8		
Toluene	ng/g	2.9	x	x		
1,1,1-Trichloroethane	ng/g	2.9	x	х		
1,1,2-Trichloroethane	ng/g	2.9	x	х		
Trichloroethylene	ng/g	2.9	x	х		
Vinyl Chloride	ng/g	12.0	x	х		
Trichlorofluoromethane	ng/g	5.8	х	х		
Dichlorodifluoromethane	ng/g	12.0	x	x		
m-Xylene	ng/g	5.8	x	х		
o & p-Xylene	ng/g	5.8	x	x		
Analytical No.:			53681	53680		

X = Analyzed but not detected.
Results calculated on a dry weight basis.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/16/91 REPORT DATE: 08/12/91 APPROVED BY: DJB058

Attn: Colin Reichhoff

#### Total Petroleum Hydrocarbon (TPH) Analysis

			Analytical
	TPH Gasoline	TPH Diesel	No.
SB-4,7	х	x	53678
SB-4,8	х	x	53679
SB-4,10	x	x	53680
SB-4,15	x	x	53681
Detection Limit	6.5	6.5	
Units	µā∕ā	ħå∖ā	

X = Analyzed but not detected.
Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

n 1 1/2017 Ten 202 Most Military Rd Rothschild WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

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nin Germaniaaysuurs	Address: <u>408</u> <u>Duut</u> Phone: ( <u>218</u> ) 77 P.O. # / Project #: <u>7</u>	30 Aei + MN 12	55	TEAD 907	E BU	ILDING		Ć	(Nor Rus Rus ate N	h eede	d oved b	y Lab)		
1' <sup>1</sup> 'an failman las <sup>6</sup> 133 24	Quote / Reference #: _ Note: Terms and cond		inted on	back app	oly.	<u></u>	<u></u>	ſ		ANA (use			REQUE	STS ary)
r	Sample Type (Check all that apply) Groundwater Wastewater Soli Solid Waste Oil Other	□ Fla □ Ski □ Hig	nhazardo immable n Irritant jhly Toxic	ωw	efrigerate ork in He ear Glov	bod			2005	640.0020 5	Z47, WE SOO.	mo EAD	CZ)	
	LAB USE ONLY	DATE	TIME	No. of Containe	rs	SAM	PLE ID			Ţ	*		В	EMARKS
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	16053679	7/11/91	10:59	X	5B-	4, #8	, WEBSTER	X	X	X	/			
		7/11/91	11:28	<u>x</u>	SB-9	+ #P	WEBSTER	X	X	X	/		<u> </u>	• 
	16053680	7/11/9/	6,02	X	5B-4	<del>1, #15,</del>	WEBSTER	X	X	X	/	 		. <u></u>
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Date Rec'd 7,16,91

# SAMPLE RECEIPT REPORT

CLIENT: <u>RREM</u> Anal. No.: 53678 to 53681

<u>Reference Code</u>	Explanation
Ð	Sample(s) received at $20.0$ °C which is above the EPA protocol of 4 °C.
2.	Samples received without appropriate paperwork. Explain
З.	VOC vial(s) received with headspace contrary to EPA protocol. Explain
4.	Sample(s) received in bottles not furnished by Enviroscan. Preservation method, if used, are unknown.
5.	Sample(s) not properly preserved per EPA protocol for the following:
6.	Sample(s) not field filtered. Lab filtered upon receipt.
7.	Sample(s) received beyond EPA holding time for:
8.	Sample date/time not supplied by client. Actual holding time unknown.
9.	Insufficient sample size to complete analysis or obtain required detection limit.
10.	Other:

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

# ENVIRESCAN

August 13, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Colin Reichhoff/George Hudak

Re: 9114

Please find enclosed the analytical results for the samples received July 19, 1991.

All analyses were done in accordance with EPA Methods (EPA-600/4-79-020, March, 1983 or SW-846, Third Edition). The Total Petroleum Hydrocarbon (TPH) analysis was completed using the California Method with a capillary GC/FID. All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed.

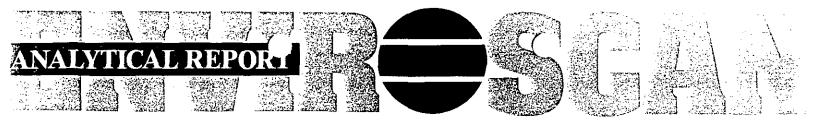
If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

renie Bush

Dominic J. Bush Analytical Chemist



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/19/91 REPORT DATE: 08/09/91 APPROVED BY: BMS D<sup>NS</sup>

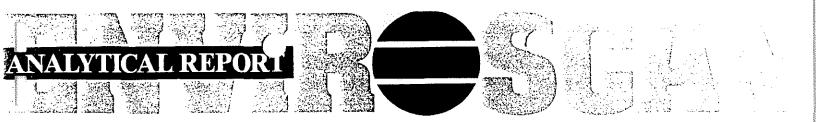
Attn: Colin Reichhoff/George Hudak

Sample # (Webster)	Lead	Total Solids	Analytical No.
# 3	2.66	89.2	54044
# 9	2.31	85.2	54045
#16	3.90	85.2	54046
#17	3.52	86.0	54047
#18	2.34	84.3	54048
Detection Limit	1.8	-	
Units	hā∖ā	8	

Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc. 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	07/19/91
REPORT DATE:	08/12/91
APPROVED BY:	JCH JCH

5

Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	# 3	# 9
Benzene	ng/g	2.0	x	x
Bromoform	ng/g	7.9	x	x
Bromomethane	ng/g	16.0	х	x
Carbon Tetrachloride	ng/g	2.0	х	x
Chlorobenzene	ng/g	7.9	х	х
Chloroethane	ng/g	7.9	х	x
2-Chloroethylvinyl Ether	ng/g	20.0	х	x
Chloroform	ng/g	2.0	х	x
Chloromethane	ng/g	7.9	x	х
Chlorodibromomethane	ng/g	2.0	х	x
1,2-Dichlorobenzene	ng/g	3.9	x	х
1,3-Dichlorobenzene	ng/g	3.9	х	х ·
1,4-Dichlorobenzene	ng/g	2.0	x	x
Bromodichloromethane	ng/g	2.0	x	x
1,1-Dichloroethane	ng/g	2.0	x	x
1,2-Dichloroethane	ng/g	2.0	x	x
1,1-Dichloroethylene	ng/g	3.9	х	x
1,2-Dichloroethylene	ng/g	3.9	x	х
Methylene Chloride	ng/g	9.9	x	х
1,2-Dichloropropane	ng/g	2.0	x	x
cis-1,3-Dichloropropene	ng/g	7.9	х	x
trans-1,3-Dichloropropene	ng/g	2.0	x	x
Ethylbenzene	ng/g	3.9	x	х
1,1,2,2-Tetrachloroethane	ng/g	3.9	x	x
Tetrachloroethylene	ng/g	2.0	x	x
Toluene	ng/g	2.0	x	х
1,1,1-Trichloroethane	ng/g	2.0	x	x
1,1,2-Trichloroethane	ng/g	2.0	x	x
Trichloroethylene	ng/g	2.0	x	x
Vinyl Chloride	ng/g	7.9	x	x
Trichlorofluoromethane	ng/g	3.9	x	x
Dichlorodifluoromethane	ng/g	7.9	x	x
m-Xylene	ng/g	3.9	x	x
o & p-Xylene	ng/g	3.9	x	x
Analytical No.:			54044	54045
NA = Not Analyzed.				
X = Analyzed but not detecte	ed.			
-				

Results calculated on a dry weight basis.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/19/91 REPORT DATE: 08/12/91 APPROVED BY: JCH JCH

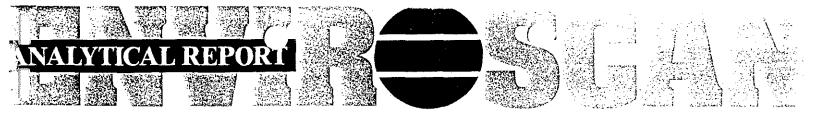
Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	#18	#16
Benzene	ng/g	2.5	х	х
Bromoform	ng/g	10.0	х	x
Bromomethane	ng/g	20.0	x	x
Carbon Tetrachloride	ng/g	2.5	x	х
Chlorobenzene	ng/g	10.0	x	x
Chloroethane	ng/g	10.0	х	х
2-Chloroethylvinyl Ether	ng/g	25.0	х	х
Chloroform	ng/g	2.5	<b>X</b> -	х
Chloromethane	ng/g	10.0	x	x
Chlorodibromomethane	ng/g	2.5	х	x
1,2-Dichlorobenzene	ng/g	4.9	x	x
1,3-Dichlorobenzene	ng/g	4.9	х .	х
1,4-Dichlorobenzene	ng/g	2.5	x	х
Bromodichloromethane	ng/g	2.5	x	x
1,1-Dichloroethane	ng/g	2.5	х	х
1,2-Dichloroethane	ng/g	2.5	x	х
1,1-Dichloroethylene	ng/g	4.9	X	x
1,2-Dichloroethylene	ng/g	4.9	x	х
Methylene Chloride(1)	ng/g	12.4	22.4	13.7
1,2-Dichloropropane	ng/g	2.5	х	х
cis-1,3-Dichloropropene	ng/g	10.0	x	x
trans-1,3-Dichloropropene	ng/g	2.5	х	х
Ethylbenzene	ng/g	4.9	х	х
1,1,2,2-Tetrachloroethane	ng/g	4.9	x	x
Tetrachloroethylene	ng/g	2.5	х	x
Toluene	ng/g	2.5	X	х
1,1,1-Trichloroethane	ng/g	2.5	x	x
1,1,2-Trichloroethane	ng/g	2.5	x	x
Trichloroethylene	ng/g	2.5	x	х
Vinyl Chloride	ng/g	10.0	х	х
Trichlorofluoromethane	ng/g	4.9	x	х
Dichlorodifluoromethane	ng/g	10.0	x	х
m-Xylene	ng/g	4.9	x	х
o & p-Xylene	ng/g	4.9	x	x
Analytical No.:			54048	54046

- ----

X = Analyzed but not detected.
Results calculated on a dry weight basis.
(1) = May be due to lab contamination.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.



CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/19/91 REPORT DATE: 08/12/91 APPROVED BY: JCH JCH

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	#17	
Benzene	ng/g	4.9	x	
Bromoform	ng/g	19.0	х	
Bromomethane	ng/g	39.0	x	
Carbon Tetrachloride	ng/g	4.9	x	
Chlorobenzene	ng/g	19.0	x	
Chloroethane	ng/g	19.0	x	
2-Chloroethylvinyl Ether	ng/g	48.0	x	
Chloroform	ng/g	4.9	X	
Chloromethane	ng/g	19.0	x	
Chlorodibromomethane	ng/g	4.9	x	
1,2-Dichlorobenzene	ng/g	9.6	x	
1,3-Dichlorobenzene	ng/g	9.6	x	
1,4-Dichlorobenzene	ng/g	4.9	x	
Bromodichloromethane	ng/g	4.9	х	
1,1-Dichloroethane	ng/g	4.9	x	
1,2-Dichloroethane	ng/g	4.9	х	
1,1-Dichloroethylene	ng/g	9.6	х	
1,2-Dichloroethylene	ng/g	9.6	х	
Methylene Chloride(1)	ng/g	24.1	35.7	
1,2-Dichloropropane	ng/g	4.9	x	
cis-1,3-Dichloropropene	ng/g	19.0	х	
trans-1,3-Dichloropropene	ng/g	4.9	x	
Ethylbenzene	ng/g	9.6	х	
1,1,2,2-Tetrachloroethane	ng/g	9.6	x	
Tetrachloroethylene	ng/g	4.9	х	
Toluene	ng/g	4.9	х	
1,1,1-Trichloroethane	ng/g	4.9	х	
1,1,2-Trichloroethane	ng/g	4.9	х	
Trichloroethylene	ng/g	4.9	x	
Vinyl Chloride	ng/g	19.0	х	
Trichlorofluoromethane	ng/g	9.6	х	
Dichlorodifluoromethane	ng/g	19.0	х	
m-Xylene	ng/g	9.6	x	
o & p-Xylene	ng/g	9.6	х	

Analytical No.:

54047

X = Analyzed but not detected.
Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

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CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/19/91 REPORT DATE: 08/13/91 APPROVED BY: DJB OSB

Attn: Colin Reichhoff/George Hudak

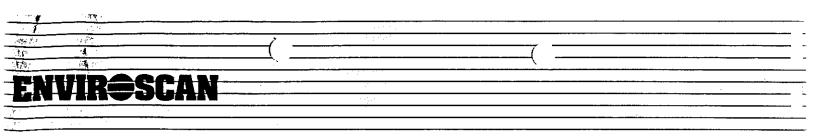
Total Petroleum Hydrocarbon (TPH) Analysis

			Analytical
	TPH Gasoline	TPH Diesel	No.
	~~~~~~~	~~~~ <b>~</b> ~~~~~	
# 3	x	x	54044
ŧ 9	x	x	54045
#16	x	x	54046
#17	х	x	54047
#18	x	x	54048
Detection Limit	5.9	5.9	
Units	43/9 ·	4 4 / 9	

X = Analyzed but not detected. Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

			1-800-338-SCAN	
Name:       Coll Rescendence         Company:       RREM       INC.         Address:       408       BOARD       OF         DVLUTH,       MN         Phone:       218       722       -391:         P.O. # / Project #:       9114         Quote / Reference #:       21111	<i>TRADE BUILDIN</i> <i>53802</i> <i>53802</i> <i>5</i> <i>9</i> ed on back apply. <b>Sample Handling</b> azardous ⊠ Refrigerate nable □ Work in Ho rritant □ Wear Glove	900d A76	Turnaround Time	b) L REQUESTS heet if necessary)
19054044 19054045 19054045		·····		REMARKS
19054046       7/17/41       10         19054046       7/17/91       3         19054047       1/11/91       3         19054048       7/17/41       3	.00 X 5B-7 .05 X 5B-7	T, #16, WEBSTER X #17, WEBSTER X	( × X	
RREM CHAIN OF CUS SAMPLERS: (Signature) MU RELINQUISHED BY: (Signature) RELINQUISHED BY: (Signature) RELINQUISHED BY: (Signature)	р Андак э) DATE/TIME 7/18/91 9:15	RD RECEIVED BY: (Signature) RECEIVED BY: (Signature)	Ship. Cont. OK? Rec'd Refrig.? Seals OK? Samples leaking	mm. N N/A 3.6 N N/A 3.6 Y N N/A Y N N/A
RELINQUISHED BY: (Signature	e) DATE/TIME	RECEIVED FOR LABORATO	RY DATE/TIME	



August 22, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Colin Reichhoff/George Hudak

Re: Project No. 9114



Please find enclosed the analytical results for the samples received August 8, 1991.

The VOC analyses were completed using a modified EPA Method 8021. All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

Jay C. Hunger

Jay C. Hunger Analytical Chemist

## N



303 W. Military Rd., Rothschild, WI 54474 1/800 338-SCAN Wisconsin Lab Certification No. 737053130

RREM, Inc.	CUST NUMBER: 9114
408 Board of Trade Building	SAMPLED BY: Client
Duluth, MN 55802	DATE REC'D: 08/08/91
	REPORT DATE: 08/22/91
	APPROVED BY: JCH TCH

Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	SB-16,#1	SB-16,#
Benzene	 ng/g	2.3	x	x
Bromoform	ng/g	9.2	x	x
Bromomethane	ng/g	18.0	х	x
Carbon Tetrachloride	ng/g	2.3	х	x
Chlorobenzene	ng/g	9.2	x	х
Chloroethane	ng/g	9.2	х	х
2-Chloroethylvinyl Ether	ng/g	23.0	x	x
Chloroform	ng/g	2.3	х	х
Chloromethane	ng/g	9.2	х	x
Chlorodibromomethane	ng/g	2.3	x	x
1,2-Dichlorobenzene	ng/g	4.5	х	x
1.3-Dichlorobenzene	ng/g	4.5 .	x	x
1,4-Dichlorobenzene	ng/g	2.3	x	х
Bromodichloromethane	ng/g	2.3	x	X
1.1-Dichloroethane	ng/g	2.3	х	х
1,2-Dichloroethane	ng/g	2.3	x	x
1.1-Dichloroethylene	ng/g	4.5	х	x
1,2-Dichloroethylene	ng/g	4.5	x	x
Methylene Chloride	ng/g	11.0	х	x
1,2-Dichloropropane	ng/g	2.3	х	x
cis-1,3-Dichloropropene	ng/g	9.2	x	х
trans-1,3-Dichloropropene	ng/g	2.3	x	x
Ethylbenzene	ng/g	4.5	х	x
1,1,2,2-Tetrachloroethane	ng/g	4.5	x	x
Tetrachloroethylene	ng/g	2.3	х	x
Toluene	ng/g	2.3	x	x
1,1,1-Trichloroethane	ng/g	2.3	x	x
1,1,2-Trichloroethane	ng/g	2.3	x	х
Trichloroethylene	ng/g	2.3	x	x
Vinyl Chloride	ng/g	9.2	X	x
Trichlorofluoromethane	ng/g	4.5	X	x
Dichlorodifluoromethane	ng/q	9.2	x	x
m-Xylene	ng/g	4.5	x	x
m-xyrana o & p-Xylana	ng/g	4.5	x	x

Analytical No.:

55042

55043

X = Analyzed but not detected. Results calculated on a dry weight basis.



# ANALYTICAL REPORT

55044

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55045

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303 W. Military Rd., Rothschild, WI 54474 1/800 338-SCAN Wisconsin Lab Certification No. 737053130

RREM, Inc.	CUST NUMBER:	9114
408 Board of Trade Building	SAMPLED BY:	Client
Duluth, MN 55802	DATE REC'D:	08/08/91
	REPORT DATE:	08/22/91
	APPROVED BY:	JCHJCH

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	SB-17,#1	SB-16,#13
		2.5	 X	x
Benzene	ng/g	2.5 9.7	x	x
Bromoform	ng/g		x	x
Bromomethane	ng/g	19.0	x	x
Carbon Tetrachloride	ng/g	2.5	x	x
Chlorobenzene	ng/g	9.7	x	x
Chloroethane	ng/g	9.7	x X	x
2-Chloroethylvinyl Ether	ng/g	24.0		x
Chloroform	ng/g	2.5	x	x
Chloromethane	ng/g	9.7	X	x
Chlorodibromomethane	ng/g	2.5	X	
1,2-Dichlorobenzene	ng/g	4.8	X	X
1,3-Dichlorobenzene	ng⁄g	4.8	x	X
1,4-Dichlorobenzene	ng/g	2.5	x	X
Bromodichloromethane	ng/g	2.5	X	X
1,1-Dichloroethane	ng/g	2.5	х	x
1,2-Dichloroethane	ng/g	2.5	x	х
1,1-Dichloroethylene	ng/g	4.8	х	x
1,2-Dichloroethylene	ng/g	4.8	x	x
Methylene Chloride	ng/g	12.0	x	x
1,2-Dichloropropane	ng/g	2.5	х	x
cis-1,3-Dichloropropene	ng/g	9.7	x	x
trans-1,3-Dichloropropene	ng/g	2.5	x	х
Ethylbenzene	ng/g	4.8	x	x
1,1,2,2-Tetrachloroethane	ng/g	4.8	x	х
Tetrachloroethylene	ng/g	2.5	X	х
Toluene	ng/g	2.5	x	x
1.1.1-Trichloroethane	ng/g	2.5	х	x
1,1,2-Trichloroethane	ng/g	2.5	x	х
Trichloroethylene	ng/g	2.5	x	х
Vinyl Chloride	ng/g	9.7	x	х
Trichlorofluoromethane	ng/g	4.8	x	х
Dichlorodifluoromethane	ng/g	9.7	x	x
m-Xylene	ng/g	4.8	х	х
a p-Xylene	5/ 5 ng/g	4.8	х	x

Analytical No.:

X = Analyzed but not detected. Results calculated on a dry weight basis.

# R=SGAN ANALYTICAL REPORT

303 W. Military Rd., Rothschild, WI 54474 1/800 338-SCAN Wisconsin Lab Certification No. 737053130

RREM, Inc.	CUST NUMBER: 9114	
408 Board of Trade Building	SAMPLED BY: Client	
Duluth, MN 55802	DATE REC'D: 08/08/91	
· · · · · · · · · · · · · · · · · · ·	REPORT DATE: 08/22/91	
	APPROVED BY: JCHJCH	

Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	SB-18,#2	SB-17,#9
Benzene		2.0	 X	x
Bromoform	ng/g	8.2	х	х
Bromomethane	ng/g	16.0	х	х
Carbon Tetrachloride	ng/g	2.0	x	х
Chlorobenzene	ng/g	8.2	x	х
Chloroethane	ng/g	8.2	x	х
2-Chloroethylvinyl Ether	ng/g	20.0	x	х
Chloroform	ng/g	2.0	x	х
Chloromethane	ng/g	8.2	x	x
Chlorodibromomethane	ng/g	2.0	x	x
1,2-Dichlorobenzene	ng/g	4.1	x	х
1.3-Dichlorobenzene	ng/g	4.1	x	x
1,4-Dichlorobenzene	ng/g	2.0	x	х
Bromodichloromethane	ng/g	2.0	x	х
1,1-Dichloroethane	ng/g	2.0	х	х
1,2-Dichloroethane	ng/g	2.0	х	x
1,1-Dichloroethylene	ng/g	4.1	х	x
1,2-Dichloroethylene	ng/g	4.1	x	x
Methylene Chloride	ng/g	10.0	x	х
1.2-Dichloropropane	ng/g	2.0	x	х
cis-1,3-Dichloropropene	ng/g	8.2	x	х
trans-1,3-Dichloropropene	ng/g	2.0	x	х
Ethylbenzene	ng/g	4.1	x	x
1,1,2,2-Tetrachloroethane	ng/g	4.1	x	х
Tetrachloroethylene	ng/g	2.0	x	х
Toluene	ng/g	2.0	x	х
1,1,1-Trichloroethane	ng/g	2.0	x	X
1,1,2-Trichloroethane	ng/g	2.0	x	х
Trichloroethylene	ng/g	2.0	x	x
Vinyl Chloride	ng/g	8.2	х	х
Trichlorofluoromethane	ng/g	4.1	x	х
Dichlorodifluoromethane	ng/g	8.2	х	x
m-Xylene	ng/g	4.1	x	x
n-xylene o & p-Xylene	ng/g	4.1	х	x
o « b-vliene	27 2			
Analytical No.:			55048	55046

X = Analyzed but not detected. Results calculated on a dry weight basis.

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# ENVIR=SCAN ANALYTI

ANALYTICAL REPORT

303 W. Military Rd., Rothschild, WI 54474 1/800 338-SCAN Wisconsin Lab Certification No. 737053130

RREM, Inc.	CUST NUMBER: 9114
408 Board of Trade Building	SAMPLED BY: Client
Duluth, MN 55802	DATE REC'D: 08/08/91
	REPORT DATE: 08/22/91
	APPROVED BY: JCH JCH
Attn: Colin Reichhoff/George Hudak	-

Detection Units Limit SB-17,#14 SB-18,#7 -----\_\_\_\_\_ \_\_\_\_ \_\_\_\_\_ Benzene 2.2 х х ng/g Bromoform 8.8 х х ng/g Bromomethane ng/g 18.0 х х Carbon Tetrachloride 2.2 х х ng/g Chlorobenzene 8.8 ng/g Х Х Chloroethane 8.8 ng/g х х 2-Chloroethylvinyl Ether ng/g 22.0 х х Chloroform 2.2 х х ng/g Chloromethane 8.8 х х ng/g Chlorodibromomethane 2.2 х ng/g х 1,2-Dichlorobenzene 4.3 ng/g х х 1,3-Dichlorobenzene ng/g 4.3 х х 1.4-Dichlorobenzene 2.2 ng/g х х Bromodichloromethane 2.2 х х ng/g 1,1-Dichloroethane ng/g 2.2 х х 1,2-Dichloroethane 2.2 Х х ng/g 1,1-Dichloroethylene 4.3 х х ng/g 1,2-Dichloroethylene 4.3 х X ng/g Methylene Chloride ng/g 11.0 х х 1,2-Dichloropropane ng/g 2.2 х х cis-1,3-Dichloropropene 8.8 х х ng/g trans-1,3-Dichloropropene 2.2 х х ng/g Ethvlbenzene 4.3 X х ng/g 1,1,2,2-Tetrachloroethane 4.3 ng/g х х Tetrachlorcethylene ng/g 2.2 х 9.3 Toluene 2.2 X х ng/g 1,1,1-Trichloroethane 2.2 ng/g х х 1,1,2-Trichloroethane 2.2 х х ng/g Trichloroethylene 2.2 х ng/g х Vinyl Chloride 8.8 Х х ng/g Trichlorofluoromethane 4.3 Х х ng/g Dichlorodifluoromethane 8.8 Х Х ng/g m-Xylene 4.3 x x ng/g o & p-Xylene ng/g 4.3 х х Analytical No.: 55047 55049 X = Analyzed but not detected.

Results calculated on a dry weight basis.



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303 W. Military Rd., Rothschild, WI 54474 1/800 338-SCAN Wisconsin Lab Certification No. 737053130

RREM, Inc.	CUST NUMBER: 9114
408 Board of Trade Building	SAMPLED BY: Client
Duluth, MN 55802	DATE REC'D: 08/08/91
	REPORT DATE: 08/22/91
	APPROVED BY: JCH JCH

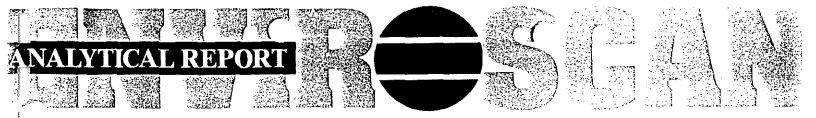
Attn: Colin Reichhoff/George Hudak

		Detection			
	Units	Limit	SB-19,#7	SB-19,#3	
Benzene	ng/g	2.0	 x	x	
Bromoform	ng/g	7.8	х	x	
Bromomethane	ng/g	16.0	х	x	
Carbon Tetrachloride	ng/g	2.0	х	x	
Chlorobenzene	ng/g	7.8	х	x	
Chloroethane	ng/g	7.8	x	x	
2-Chloroethylvinyl Ether	ng/g	19.0	x	x	
Chloroform	ng/g	2.0	х	x	
Chloromethane	ng/g	7.8	x	x	
Chlorodibromomethane	ng/g	2.0	x	x	
1,2-Dichlorobenzene	ng/g	3.9	x	х	
1,3-Dichlorobenzene	ng/g	3.9	x	x	
1,4-Dichlorobenzene	ng/g	2.0	x	x	
Bromodichloromethane	ng/g	2.0	x	х	
1,1-Dichloroethane	ng/g	2.0	x	х	
1,2-Dichloroethane	ng/g	2.0	X	x	
1,1-Dichloroethylene	ng/g	3.9	x	x	
1,2-Dichloroethylene	ng/g	3.9	x	x	
Methylene Chloride	ng/g	9.8	х	x	
1,2-Dichloropropane	ng/g	2.0	x	х	
cis-1,3-Dichloropropene	ng/g	7.8	x	x	
trans-1,3-Dichloropropene	ng/g	2.0	x	х	
Ethylbenzene	ng/g	3.9	x	х	
1,1,2,2-Tetrachloroethane	ng/g	3.9	x	x	
Tetrachloroethylene	ng/g	2.0	x	х	
Toluene	ng/g	2.0	х	х	
1,1,1-Trichloroethane	ng/g	2.0	x	X	
1,1,2-Trichloroethane	ng/g	2.0	x	х	
Trichloroethylene	ng/g	2.0	x	x	
Vinyl Chloride	ng/g	7.8	х	x	
Trichlorofluoromethane	ng/g	3.9	x	х	
Dichlorodifluoromethane	ng/g	7.8	х	x	
m-Xylene	ng/g	3.9	x	x	
o & p-Xylene	ng/g	3.9	x	x	
Analytical No.:			55051	55050	

X = Analyzed but not detected. Results calculated on a dry weight basis.

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	Address: <u>408</u> B	CARD	OF TH	LADE B	LDG	•		Normal		·	
	<u></u> Phone: ( <u>218</u> ) 7	<u>H /</u> 72 - 1	1 <u>N (</u> 3915	55802	·		D	Rush ate Neede	d		
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	Quote / Reference #: _ Note: Terms and cond		<u>-7</u> inted on	back apply		<u></u>				L REQUE	
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	Sample Type		Samp	le Handling	<u> </u>			MO		' / /	
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	LAB USE ONLY	DATE	TIME	COMP GRAB	<b> </b>	SAMPLE ID		1	$\square$	R	EMARKS
;		8/5/91	10:30	y x	5B-1	6 #1 WEBSTER	X				
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		8/5/91	2:10	X	5B-1	6, #13, WEBSTER	X				
	13055045 🗸	8/6/91	5:25	x	5B-1	7 # 1, WERSTER	X				
	13055046	8/6/91	6:30	X	SB-I	1 # 9 WEBSTER	X				
	13055047	0/6/91	8:27	X	5B-1	, # 14, WETSSTER	X				
	13055048	8/6/91	1:00	X	58-18	# 2 WEBSTER	X				
	13055049	8/6/91	1:32	X	58-18	# T. WEISTER	X				
	13055050	13/16/91	10:02	X	5B-19	# 3. WETSTER	X				
	-20-00-02	INII.	10:35	X	58-19	1,# 7, WEBSTER	X				
R	REM										
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	SAMPLERS: (Signa	ture) (J	iorge J.	Marca	h			Sample	s leaking	? Y`(N)	N/A
			10					-		1997 - 1997 - 1999 -	
	RELINQUISHED B					RECEIVED BY: (Signatu	re)				
1		idan			:30						
	RELINQUISHED B	Y: (Signat	ure)	DATE/TIN	٩E	RECEIVED BY: (Signatu	re)				
		V: /Sienet		DATE/TIN		RECEIVED FOR LABOR				1	
	RELINQUISHED B	r. (oignat			16	BY; (Signature)		8/OH_	11.1		



Date Rec'd 8/08/9/

	SAMPLE RECEIPT REPORT
	CLIENT: RREM, The.
	CLIENT: <u>RREM, The</u> 13- Anal No: <u>55042</u> to <u>55051</u>
Reference Code	Explanation
(1)	Sample(s) received at $68$ °C which is above the EPA protocol of 4°C. Recidin Coald France Blue
2.	Samples received without appropriate paperwork. Explain
З.	VOC vial(s) received with headspace contrary to EPA protocol. Explain
4.	Sample(s) received in bottles not furnished by Enviroscan. Preservation method, if used, are unknown.
<b>5</b> .	Sample(s) not properly preserved per EPA protocol for the following:
6.	Sample(s) not field filtered. Lab filtered upon receipt.
7.	Sample(s) received beyond EPA holding time for:
8.	Sample date/time not supplied by client. Actual holding time unknown.
9.	Insufficient sample size to complete analysis or obtain required detection limit.
10.	Other:



August 27, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Colin Reichhoff/George Hudak

Re: Project No. #9114

Please find enclosed the analytical results for the samples received July 25, 1991.

All analyses were done in accordance with EPA Methods (EPA-600/4-79-020, March, 1983 or SW-846, Third Edition).

The VOC analyses were completed using a modified EPA Method 8021. The Total Petroleum Hydrocarbons (TPH) analysis was completed using the California Method with a capillary GC/FID.

All results on soil/solid samples have been calculated on a dry weight basis.

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

Jay C. Hunger Analytical Chemist

303 West Military Road Rothschild, WI 54474 (715) 359-7226 An Affiliate of the Black Clawson Co.

## ANALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802 CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/25/91 REPORT DATE: 08/27/91 APPROVED BY: JCHJCH

## Attn: Colin Reichhoff/George Hudak

N		Detection				
	Units	Limit	SB-9 #3	SB-9 #11		
Benzene	ng/g	1.9	x	x		
Bromoform	ng/g	7.9	x	x		
Bromomethane	ng/g	16.0	x	x		
Carbon Tetrachloride	ng/g	1.9	x	x		
Chlorobenzene	ng/g	7.9	x	X		
Chloroethane	ng/g	7.9	x	х		
2-Chloroethylvinyl Ether	ng/g	20.0	x	x		
Chloroform	ng/g	1.9	x	x		
Chloromethane	ng/g	7.9	x	x		
Chlorodibromomethane	ng/g	1.9	x	х		
1,2-Dichlorobenzene	ng/g	3.9	x	x		
1,3-Dichlorobenzene	ng/g	3.9	x	х		
1,4-Dichlorobenzene	ng/g	1.9	x	x		
Bromodichloromethane	ng/g	1.9	x	x		
1,1-Dichloroethane	ng/g	1.9	x	x		
1,2-Dichloroethane	ng/g	1.9	x	x		
1,1-Dichloroethylene	ng/g	3.9	х	х		
1,2-Dichloroethylene	ng/g	3.9	x	х		
Methylene Chloride	ng/g	9.8	x	x		
1,2-Dichloropropane	ng/g	1.9	x	x		
cis-1,3-Dichloropropene	ng/g	7.9	x	х		
trans-1,3-Dichloropropene	ng/g	1.9	x	х		
Ethylbenzene	ng/g	3.9	x	x		
1,1,2,2-Tetrachloroethane	ng/g	3.9	x	x		
Tetrachloroethylene	ng/g	1.9	x	х		
Toluene	ng/g	1.9	x	х		
1,1,1-Trichloroethane	ng/g	1.9	x	х		
1,1,2-Trichloroethane	ng/g	1.9	x	х		
Trichloroethylene	ng/g	1.9	x	x		
Vinyl Chloride	ng/g	7.9	x	x		
Trichlorofluoromethane	ng/g	3.9	X	х		
Dichlorodifluoromethane	ng/g	7.9	x	x		
m-Xylene	ng/g	3.9	x	х		
o & p-Xylene	ng/g	3.9	x	x		
Analytical No.:			54352	54353		

X = Analyzed but not detected. Results calculated on a dry weight basis.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

ANALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	07/25/91
REPORT DATE:	08/27/91
APPROVED BY:	JCHJCU

Attn: Colin Reichhoff/George Hudak

	Units	Limit	SB-9 #16	SB-9 #18
Benzene	ng/g	2.3	x	х
Bromoform	ng/g	9.2	x	х
Bromomethane	ng/g	18.0	х	x
Carbon Tetrachloride	ng/g	2.3	х	x
Chlorobenzene	ng/g	9.2	х	х
Chloroethane	ng/g	9.2	x	х
2-Chloroethylvinyl Ether	ng/g	23.0	x	х
Chloroform	ng/g	2.3	x	х
Chloromethane	ng/g	9.2	x	х
Chlorodibromomethane	ng/g	2.3	х	х
1,2-Dichlorobenzene	ng/g	4.5	x	х
1,3-Dichlorobenzene	ng/g	4.5	x	x
1,4-Dichlorobenzene	ng/g	2.3	x	х
Bromodichloromethane	ng/g	2.3	x	x
1,1-Dichloroethane	ng/g	2.3	x	х
1,2-Dichloroethane	ng/g	2.3	x	х
1,1-Dichloroethylene	ng/g	4.5	x	х
1,2-Dichloroethylene	ng/g	4.5	x	x
Methylene Chloride(1)	ng/g	11.0	14.6	x
1,2-Dichloropropane	ng/g	2.3	x	x
cis-1,3-Dichloropropene	ng/g	9.2	x	х
trans-1,3-Dichloropropene	ng/g	2.3	x	x
Ethylbenzene	ng/g	4.5	x	x
1,1,2,2-Tetrachloroethane	ng/g	4.5	x	X
Tetrachloroethylene	ng/g	2.3	x	х
Toluene	ng/g	2.3	x	x
1,1,1-Trichloroethane	ng/g	2.3	x	x
1,1,2-Trichloroethane	ng/g	2.3	x	x
Trichloroethylene	ng/g	2.3	x	x
Vinyl Chloride	ng/g	92	x	х
Trichlorofluoromethane	ng/g	4.5	x	х
Dichlorodifluoromethane	ng/g	9.2	x	x
m-Xylene	ng/g	4.5	x	x
o & p-Xylene	ng/g	4.5	x	x
Analytical No.:			54354	54355

X = Analyzed but not detected.

Results calculated on a dry weight basis.





CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/25/91 REPORT DATE: 08/23/91 APPROVED BY: BMS

Attn: Colin Reichhoff/George Hudak

1.01	Customer Number	Lead	Detection Limit	Analytical Number
	SB-9 #3 SB-9 #11 SB-9 #16 SB-9 #18	x 4.62 x 1.82	1.7 1.8 1.8 1.8	54352 54353 54354 54355
2	Units	ħā∖ā	µg∕g	

X = Analyzed but not detected. Results calculated on a dry weight basis.

Il analyses conducted in accordance with Enviroscan Quality Assurance Program.



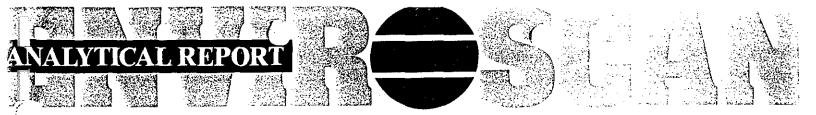
**YTICAL REPOR** 

CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 07/25/91 REPORT DATE: 08/28/91 APPROVED BY: CKC Ctc

Attn: Colin Reichhoff/George Hudak

## Total Petroleum Hydrocarbon (TPH) Analysis

	TPH Gasoline	TPH Diesel	Analytical
	~~~~~~~~~~		
SB-9 #3	x	x	54352
SB-9 #11	х	x	54353
SB-9 #16	х	x	54354
SB-9 #18	x	x	54355
Detection Limit	6.1	6.1	
Units	hā\ā	μα∖α	
X = Analyzed but not	t detected.		
Results calculated o	on a dry weight basis.		



Date Rec'd 7/25/9/

## SAMPLE RECEIPT REPORT

CLIENT: <u>RREM</u>, <u>Jrc</u>. 3-Anal No.: <u>54352 to 54355</u>

<u>Reference Code</u>

(1)

2.

З.

Explanation

- Sample(s) received at  $\frac{17.1}{c}$ °C which is above the EPA protocol of 4°C. in cooler F colled pKs (
- Samples received without appropriate paperwork. Explain \_\_\_\_\_
- VOC vial(s) received with headspace contrary to EPA protocol. Explain\_\_\_\_\_
- Sample(s) received in bottles not furnished by
   Enviroscan. Preservation method, if used, are unknown.
- 5. Sample(s) not properly preserved per EPA protocol for the following:
- Sample(s) not field filtered. Lab filtered upon receipt.
  - Sample(s) received beyond EPA holding time for:
- 8. Sample date/time not supplied by client. Actual holding time unknown.
- 9. Insufficient sample size to complete analysis or obtain required detection limit.

Other:\_\_\_\_\_

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7.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

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REQUEST FO	303 W.	MILITA	ARY RD.		HSCHI	LD, WI 544	177 (	800-	338-	SCAN		n	
Name: <u>Colin Rej</u> Company: <u>RREM</u>	<u>CHHOF</u>	<del>-</del>   Ge	EORGE +	<b>UDA</b>	<u></u>				ound	Time			
Address: 408 BOD DULUTH	RD OF , MN 22-3	- 55	BUILDING 802-				C	] Nor ] Rus	sh				
P.O. # / Project #:7	49114					······	D		leede: 'reappr	d oved by	Lab)		
Quote / Reference #: . Note: Terms and cond			back apply						ANA	LYTIC	CAL	REQUES	
Sample Type (Check all that apply) Groundwater Wastewater Soil Soil Waste Oil Other	□ Fla □ Ski □ Hig	Samp nhazardo immable in Irritant ghly Toxic her (spec	⊡ Wor □ Wea	rigerate k in Hoo			5	200 / act	645.02	THI WE	The second se	et if necessary	
LAB USE ONLY	DATE		No. of Containers COMP GRAB	-	SAMP	LE ID			Ja Ja	75°	0/	BEI	MARKS
03054352 /	7/22/91			5 <u>8-</u> 9	) #3	WEBSTER	X	X	X	É(			
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03054354	7/23/91	3:50 m	X	5B-9	<u>#16</u>	WEIBSTER	. Х	X	X				
03054355	7/23/41	5:20 <sub>pin</sub>		<u>58-9</u>	, <u>#</u> /8,	WEBSTER	X	X	X				
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## Appendix F

Enviroscan Groundwater Chemistry Results and Chain-of-Custody Documents



October 9, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

Attn: Colin Reichhoff/George Hudak

Re: Project No. 9114



Please find enclosed the analytical results for the samples received September 20, 1991.

The VOC analyses were completed using EPA Method 8010/8020.

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

Hunger

Jay C. Hunger Analytical Chemist



CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	
APPROVED BY:	JCH JGH

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Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	91-1	91-2A
Benzene	 µg/l	0.2	 x	 x
Bromoform	µg/1	2.0	x	x
Bromomethane	μg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	х	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	$\mu q/1$	0.5	х	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	х	x
1,2-Dichlorobenzene	µg/1	1.0	х	x
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/1	0.5	x	х.
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	х	x
1,2-Dichloroethane	µg/1	0.5	х	х
1,1-Dichloroethylene	µg/1	0.4	х	х
1,2-Dichloroethylene	µg/1	1.0	х	х
Methylene Chloride	µg/1	2.5	х	х
1,2-Dichloropropane	µg/1	0.5	х	х
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	х	x
Ethylbenzene	µg/1	1.0	х	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	x
Tetrachloroethylene	µg/1	0.5	х	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	х	x
1,1,2-Trichloroethane	µg/1	0.5	х	х
Trichloroethylene	µg/1	0.2	x	х
Vinyl Chloride	µg/1	0.2	х	х
Trichlorofluoromethane	µg/1	1.0	х	х
Dichlorodifluoromethane	µg/1	2.0	х	x
m & p-Xylene	µg/1	1.0	х	х
o-Xylene	µg/1	1.0	x	х
Analytical No.:			57277	57278

X = Analyzed but not detected.





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RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/09/91
APPROVED BY:	<b>јсн</b> 26н

57279

57280

### Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	91-2B	91-3
Benzene	 µg∕l	0.2	0.5	
Bromoform	μg/1 μg/1	2.0	x	x
Bromomethane	μg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	µg/1	0.5	x	x
Chloromethane	μg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	X	x
1,2-Dichlorobenzene	µg/1	1.0	1.4	x
1,3-Dichlorobenzene	μg/1	1.0	x	x
1,4-Dichlorobenzene	μg/1	0.5	x	x
Bromodichloromethane	μg/1	0.5	x	x
1,1-Dichloroethane	μg/l	0.5	x	x
1,2-Dichloroethane	μg/1	0.5	x	83.6
1,1-Dichloroethylene	µg/1	0.4	x	x
1,2-Dichloroethylene	μg/1	1.0	х	x
Methylene Chloride	µg/1	2.5	x	x
1,2-Dichloropropane	µg/1	0.5	0.7	x
cis-1,3-Dichloropropene	µg/1	2.0	X	х
trans-1,3-Dichloropropene	μg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	x
Tetrachloroethylene	µg/1	0.5	112.	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	$\mu g/1$	0.5	x	x
Trichloroethylene	µg/1	0.2	6.1	x
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	х	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	х	x
o-Xylene	µg/1	1.0	x	x

Analytical No.:

X = Analyzed but not detected.

Il analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST	NUMBER:	9114
SAMPL	ED BY:	Client
DATE	REC'D:	09/20/91
REPOR	T DATE:	10/07/91
APPRO	VED BY:	лсн Дсн

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	91-4	91-5A-1
Benzene	µg/1	0.2	x	х
Bromoform	µg/1	2.0	x	х
Bromomethane	µg/1	4.0	х	х
Carbon Tetrachloride	µg/1	0.5	x	х
Chlorobenzene	µg/1	2.0	X	x
Chloroethane	µg/1	2.0	x	х
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	µg/1	0.5	x	х
Chloromethane	µg/1	2.0	х	х
Chlorodibromomethane	µg/1	0.5	x	x
1,2-Dichlorobenzene	µg/1	1.0	X	x
1,3-Dichlorobenzene	µg/1	1.0	X	x
1,4-Dichlorobenzene	µg/1	0.5	x	x
Bromodichloromethane	µg/1	0.5	x	x
1,1-Dichloroethane	µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	2.9	х
1,1-Dichloroethylene	µg/1	0.4	x	х
1,2-Dichloroethylene	µg/1	1.0	x	х
Methylene Chloride	µg∕1	2.5	x	x
1,2-Dichloropropane	µg/1	0.5	x	x
cis-1,3-Dichloropropene	µg/1	2.0	X	х
trans-1,3-Dichloropropene	µg/1	0.5	x	х
Ethylbenzene	µg/1	1.0	X	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	х
Tetrachloroethylene	µg/1	0.5	15.3	8.0
Toluene	µg/1	0.5	x	х
1,1,1-Trichloroethane	µg/1	0.5	x	х
1,1,2-Trichloroethane	µg/1	0.5	x	x
Trichloroethylene	µg/1	0.2	0.2	x
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	х	х
Dichlorodifluoromethane	µg/1	2.0	х	х
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg∕1	1.0	x	x
Analytical No.:			57281	57282

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	JCH 26H

## Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	91-5A-2	91–5B
Benzene	 μg/l	0.2	 X	
Bromoform	µg/1	2.0	x	x
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	μς/l	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	µg/1	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	x	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	x
1,4-Dichlorobenzene	$\mu g / 1$	0.5	x	x
Bromodichloromethane	µg/1	0.5	X	x
1,1-Dichloroethane	µg/1	0.5	х	x
1,2-Dichloroethane	µg/1	0.5	x	0.8
1,1-Dichloroethylene	µg/1	0.4	x	x
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/1	2.5	х	x
1,2-Dichloropropane	µg/1	0.5	х	x
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	x
Tetrachloroethylene	µg/1	0.5	7.7	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/1	0.5	x	x
Trichloroethylene	µg/1	0.2	x	х
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	х	х
Dichlorodifluoromethane	µg/1	2.0	x	х
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			57283	57284

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/09/91
APPROVED BY:	JCH ZCH

ĺ

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	91-6	91-7
Benzene	μg/1	 0.2	 x	 x
Bromoform	μg/1	2.0	X	x
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	μg/1	0.5	x	x
Chlorobenzene	μg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	$\mu q/1$	5.0	х	x
Chloroform	$\mu g/1$	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	x	х
1,2-Dichlorobenzene	µg/1	1.0	x	х
1,3-Dichlorobenzene	µg/1	1.0	x	x
1,4-Dichlorobenzene	µg/1	0.5	x	х
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	х	x
1,2-Dichloroethane	µg/1	0.5	x	x
1,1-Dichloroethylene	µg/1	0.4	x	х
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/1	2.5	x	x
1,2-Dichloropropane	µg/1	0.5	х	x
cis-1,3-Dichloropropene	µg/1	2.0	x	X
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	31.8	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/1	0.5	x	x
Trichloroethylene	µg/1	0.2	0.4	x
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg∕1	1.0	x	x
Analytical No.:			57285	57286

X = Analyzed but not detected.

## NALYTICAL REPORT



- · · · ·

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802 CUST NUMBER: 9114 SAMPLED BY: Client DATE REC'D: 09/20/91 REPORT DATE: 10/07/91 APPROVED BY: JCH JCH

## Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	91-8	O₩-1
Benzene	μg/l	0.2	 x	 x
Bromoform	μg/1 μg/1	2.0	x	x
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	μg/1 μg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	μg/1	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	x	x
1,2-Dichlorobenzene	μg/1	1.0	x	x
1,3-Dichlorobenzene	μg/1	1.0	x	x
1,4-Dichlorobenzene	μg/l	0.5	x	x
Bromodichloromethane	µg/1	0.5	x	x
1,1-Dichloroethane	μg/l	0.5	x	x
1,2-Dichloroethane	μg/1	0.5	x	x
1,1-Dichloroethylene	μg/1	0.4	x	x
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	μg/l	2.5	x	х
1,2-Dichloropropane	µg/1	0.5	X	x
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	$\mu q/1$	1.0	x	x
1,1,2,2-Tetrachloroethane	μg/1	1.0	x	х
Tetrachloroethylene	µg/1	0.5	x	13.8
Toluene	µg/1	0.5	0.6	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	$\mu g/1$	0.5	x	x
Trichloroethylene	µg/1	0.2	х	х
Vinyl Chloride	$\mu g/1$	0.2	х	x
Trichlorofluoromethane	$\mu g/1$	1.0	x	х
Dichlorodifluoromethane	µg/1	2.0	х	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			57287	57288

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	JCH ZCH

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	0 W - 2	0 W - 3
Benzene	µg/1	0,2	x	x
Bromoform	µg/1	2.0	x	х
Bromomethane	µg/1	4.0	x	х
Carbon Tetrachloride	µg/1	0.5	х	x
Chlorobenzene	µg/1	2.0	х	x
Chloroethane	µg∕l	2.0	х	х
2-Chloroethylvinyl Ether	µg/1	5.0	X	x
Chloroform	µg/1	0.5	х	х
Chloromethane	µg/1	2.0	х	x
Chlorodibromomethane	µg/1	0.5	x	x
1,2-Dichlorobenzene	µg/1	1.0	х	х
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/l	0.5	x	x
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	4.3	x
1,1-Dichloroethylene	µg/1	0.4	x	x
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/l	2.5	x	х
1,2-Dichloropropane	µg/1	0.5	x	x
cis-1,3-Dichloropropene	µg/1	2.0	x	х
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg∕l	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	2.3	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/l	0,5	x	x
Trichloroethylene	µg/1	0.2	х	x
Vinyl Chloride	µg/1	0.2	х	x
Trichlorofluoromethane	μg/l	1.0	X	x
Dichlorodifluoromethane	µg/1	2.0	х	X
m & p-Xylene	µg/1	1.0	х	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			57289	57290

X = Analyzed but not detected.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	JCH JCH

#### Attn: Colin Reichhoff/George Hudak

		Detection		
	Units	Limit	0W-4	0 W - 5
Benzene	 μg/l	0.2	 x	 x
Bromoform	µg/1	2.0	x	х
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	х
Chlorobenzene	µg/1	2.0	X	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	X	х
Chloroform	µg/1	0.5	x	x
Chloromethane	µg/1	2.0	х	х
Chlorodibromomethane	µg/1	0.5	х	х
1,2-Dichlorobenzene	µg/1	1.0	х	x
1,3-Dichlorobenzene	µg/1	1.0	х	x
1,4-Dichlorobenzene	µg/1	0.5	х	x
Bromodichloromethane	$\mu g/1$	0.5	x	х
1,1-Dichloroethane	µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	X	x
1,1-Dichloroethylene	µg/1	0.4	x	x
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/1	2.5	x	х
1,2-Dichloropropane	µg/1	0.5	х	x
cis-1,3-Dichloropropene	µg/1	2.0	x	х
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	X	х
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	x
Tetrachloroethylene	µg/1	0.5	x	3.5
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	х	х
1,1,2-Trichloroethane	µg/1	0.5	x	х
Trichloroethylene	µg/1	0.2	х	х
Vinyl Chloride	µg/1	0.2	х	х
Trichlorofluoromethane	µg/1	1.0	x	х
Dichlorodifluoromethane	µg/1	2.0	х	x
m & p-Xylene	µg/1	1.0	х	x
o-Xylene	µg/1	1.0	х	х
Analytical No.:			57291	57292

X = Analyzed but not detected.

l analyses conducted in accordance with Enviroscan Quality Assurance Program. Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	<b>јсн ДСН</b>

Attn: Colin Reichhoff/George Hudak

	Detection			
	Units	Limit	0 W - 6	0 W - 7
Benzene	µg/1	0.2	x	х
Bromoform	µg/1	2.0	х	х
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	х
2-Chloroethylvinyl Ether	µg/1	5.0	x	х
Chloroform	µg/1	0.5	x	х
Chloromethane	µg/1	2.0	x	х
Chlorodibromomethane	µg/1	0.5	x	х
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/1	0.5	x	` x
Bromodichloromethane	µg/1	0.5	x	х
1,1-Dichloroethane	µg/1	0.5	x	х
1,2-Dichloroethane	µg/1	0.5	X	х
1,1-Dichloroethylene	µg/1	0.4	x	х
1,2-Dichloroethylene	µg/1	1.0	x	х
Methylene Chloride	µg/1	2.5	х	х
1,2-Dichloropropane	µg/1	0.5	x	Х
cis-1,3-Dichloropropene	µg/1	2.0	х	х
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	х
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	1.3	1.3
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	х	x
1,1,2-Trichloroethane	µg/1	0.5	x	х
Trichloroethylene	µg/1	0.2	x	х
Vinyl Chloride	µg/1	0.2	х	х
Trichlorofluoromethane	µg/1	1.0	X	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	х	х
Analytical No.:			57293	57294

X = Analyzed but not detected.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	лсн <i>26н</i>

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## Attn: Colin Reichhoff/George Hudak

	Detection				
	Units	Limit	0 W - 8	0W-9-1	
Benzene	 μg/l	0.2	 x		
Bromoform		2.0	x	x x	
Bromomethane	µg/1	4.0	x	x	
Carbon Tetrachloride	µg/1	0.5	x	x	
Chlorobenzene	μg/1	2.0	x		
Chloroethane	µg/1	2.0	x	x	
2-Chloroethylvinyl Ether	µg/1			x	
Chloroform	µg/1	5.0	x	x	
Chloromethane	µg/1	0.5	x	x	
Chlorodibromomethane	µg/1	2.0	x	x	
	µg/1	0.5	X	X	
1,2-Dichlorobenzene	µg/1	1.0	X	x	
1,3-Dichlorobenzene	µg/1	1.0	. X	x	
1,4-Dichlorobenzene	µg/1	0.5	x	x	
Bromodichloromethane	µg/1	0.5	x	x	
1,1-Dichloroethane	µg/1	0.5	x	х	
1,2-Dichloroethane	µg/1	0.5	х	х	
1,1-Dichloroethylene	µg/1	0.4	х	х	
1,2-Dichloroethylene	µg/1	1.0	x	x	
Methylene Chloride	µg/1	2.5	x	х	
1,2-Dichloropropane	µg/1	0.5	x	х	
cis-1,3-Dichloropropene	µg/1	2.0	х	x	
trans-1,3-Dichloropropene	µg/1	0.5	х	x	
Ethylbenzene	µg/1	1.0	x	х	
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	х	
Tetrachloroethylene	µg/1	0.5	13.2	x	
Toluene	µg/1	0.5	x	x	
1,1,1-Trichloroethane	µg/1	0.5	х	х	
1,1,2-Trichloroethane	µg/1	0.5	х	x	
Trichloroethylene	µg/1	0.2	x	x	
Vinyl Chloride	µg/1	0.2	х	х	
Trichlorofluoromethane	µg/1	1.0	x	x	
Dichlorodifluoromethane	µg/1	2.0	x	x	
m & p-Xylene	μg/1	1.0	x	x	
o-Xylene	µg/1	1.0	x	x	
Analytical No.:			57295	57296	

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	лсн2 <i>с</i> Н

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Attn: Colin Reichhoff/George Hudak

	Units	Limit	0 w - 9 - 2	VW-2
Benzene	µg/1	0.2	х	x
Bromoform	µg/1	2.0	х	x
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	х
2-Chloroethylvinyl Ether	µg/1	5.0	х	x
Chloroform	µg/1	0.5	x	x
Chloromethane	µg/1	2.0	х	x
Chlorodibromomethane	µg/1	0.5	х	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/1	0.5	х	x
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	х	x
1,2-Dichloroethane	µg/1	0.5	х	2.8
1,1-Dichloroethylene	µg/1	0.4	x	х
1,2-Dichloroethylene	µg/1	1.0	х	х
Methylene Chloride	µg/1	2.5	х	X
1,2-Dichloropropane	µg/1	0.5	х	x
cis-1,3-Dichloropropene	µg/l	2.0	х	x
trans-1,3-Dichloropropene	µg/1	0.5	x	х
Ethylbenzene	µg/1	1.0	х	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	x	х
Toluene	µg/1	0.5	х	х
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/1	0.5	х	х
Trichloroethylene	µg/1	0.2	х	x
Vinyl Chloride	µg/1	0.2	x	х
- Trichlorofluoromethane	$\mu g/1$	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	х	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			57297	57298

X = Analyzed but not detected.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	09/20/91
REPORT DATE:	10/07/91
APPROVED BY:	лсн <u>л</u> сн

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### Attn: Colin Reichhoff/George Hudak

		Detection		
5	Units	Limit	FB	TRIP BLK-LW
Benzene	μg/1	0.2	 x	 x
Bromoform	µg/1	2.0	x	x
Bromomethane	μg/1	4.0	x	x
Carbon Tetrachloride	μg/1	0.5	x	x
Chlorobenzene	µg/1	2,0	x	x
Chloroethane	μg/1	2.0	x	x
2-Chloroethylvinyl Ether	μg/1	5.0	x	x
Chloroform	μg/1 μg/1	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	μg/1	0.5	x	x
1,2-Dichlorobenzene	$\mu q/1$	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	X
1,4-Dichlorobenzene	µg/1	0.5	x	x
Bromodichloromethane	μg/1 μg/1	0.5	x	x
1,1-Dichloroethane	µg/1 µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	x	x
1,1-Dichloroethylene	µg/1	0.4	x	x
1,2-Dichloroethylene	μg/1 μg/1	1.0	x	x
Methylene Chloride		2.5	x	x
1,2-Dichloropropane	µg/1	2.5	x	x
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
	µg/1			
Ethylbenzene	µg/1	1.0	x 	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x 	x
Tetrachloroethylene	µg/1	0.5	X	x
Toluene	µg/1	0.5	X	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/1	0.5	X	x
Trichloroethylene	µg/1	0.2	x	x
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg∕l	1.0	x	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			57299	57300

X = Analyzed but not detected.

REQUEST FO	303 W. I	MILITA	RY RD.	ROT	HSCHILD, WI 544	74 1-8	300-338-50	CAN	
Acon.			RMATIO		IND FF	-			
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Quote / Reference #: _ Note: Terms and cond	litions prim	nted on			/		ANAL	YTICAL	REQUESTS
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Ľ	Solid Waste		n (speci	ity) Pors			1.0/	) St			
C ۲	Other						127	vb/ ∕	' /		
-	delayors of the state the	1		No. of Container			$\left  \right _{a}$	ŧ/ /	/ /	' /	
لیا <sub>ک</sub> ر ا	AB USE ONLY	DATE	TIME 1	COMP GRA	7	SAMPLE ID	VV	/_/		<u></u>	EMARKS
· _ · )	057287	9/17/91/	0.30an	3	91-	8	X				
	3057288	9/18/9/ 4	1:42pm	3	00	N-1	X				
12 	03057289V	1/18/91 4	108pm	3	OU	J-Z	X				
(···	03057290	9/19/91	0:4Dan	3	OU	<i>U-3</i>	X				
101000000000000000000000000000000000000	0 <b>3057291</b> /	9/14/91 1	15m	3	OU	0-4	X				
At C	0305 <b>7292</b>	9/18/91 1	: 55pm	3	OU	1-5	X				
Ö	3057293.	9/18/41 2	2:33ph	3	OU	)-6	X				
	3057294	<u> </u>	1:20am			1-7	X				
* (	305 <b>7295</b>	7/18/91 3	3:33,77	3	OW	-8	Ý				
	03057296	1				1-9-1	X				
RK	EM S SIDE VI		<u> 20 9 9 9</u>		_(		<u> </u>				
	CHAIN O		MO	NVP	FCO	RD		Ship. Co	and Se ont: OK?	SY) N	N/A
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		M	nga	phas				Comme	80 SZ (1977-1977		AND
	RELINQUISHED B	Y; (Signatui	re) <sup>7</sup>	DATE/TI	ME	RECEIVED BY: (Signate	ure)	Rec.	dan	ite no	
ار ر <u>ب</u>	Harry p	Wilch			2'30m					13种。	
	RELINQUISHED B	Y: (Signatui	re)	DATE/TI	ME	RECEIVED BY: (Signati	ure)				
		V. (Simmetri		<u>האדריתי</u>		RECEIVED FOR LABO		AND ON THE	TIME		
(	RELINQUISHED B	r: (Signatui	re)	DATE/TI	ME	BY: (Signature)	HAIUHY	9/ DATE/	INE IN		

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	`						WI 544	/4 1-	000-0	000-0	DAN			
Con	ne: <u>GEOLGE</u> npany: <u>RREM</u> iress: <u>408 B</u> 0		/ COLIN	Rek	CH#				urnaro 1 Norr		<u> Fime</u>			
P.O	ne: (218) 7	M.) 22-30 2.0, #,	5581 715	02						èedec	y wed by			
	e: Terms and cond		ited on ba						A					
	Sample Type heck all that apply) Groundwater Wastewater Soil Solid Waste Oil Other	□ Flarr □ Skin □ High	Irritant Ily Toxic r (specify)	Ø Ref. □ Wol □ Wet	rigerate rk in Ho ar Glove	ed es			COL ENT.			Sincer	if necessa	
	B USE ONLY	DATE		No. of Intainers		SAMPLE	D	E D					/ 	EMARKS
_	<mark>3057297</mark> √			3	04	1-9-2		X						<u></u>
<u> </u>	057298 - 🗸	9/19/41 1	2:31pm	3	VW	1-2		χ						
50 0	3057299	9/17/91 3	3.22 pm	3	F	8		X						
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	RELINQUISHED BY	(: (Signatur	re) [	DATE/TIN	ИE	RECEIVED	BY: (Signatu	ıre)						
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HTTHEJUMA

November 5, 1991

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802



Attn: George Hudak

Re: Project No. 9114

Please find enclosed the analytical results for the samples received October 18, 1991. The results were faxed to you on November 1, 1991.

The VOC analyses were completed using EPA Method 8010/8020.

The chain of custody document is enclosed. If you have any questions about the results, please call. Thank you for using Enviroscan Corp. for your analytical needs.

Sincerely,

Enviroscan Corp.

C. Hunger

Jay C. Hunger Analytical Chemist

## ANALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

9114
Client
10/18/91
11/01/91
11/01/91 јснЈ,С.9 <del>,</del>

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Attn: George Hudak

		Detection		
	Units	Limit	91-8	91-3
Benzene	µg/1	0.2	0.4	0.7
Bromoform	µg/1	2.0	x	х
Bromomethane	µg/l	4.0	х	x
Carbon Tetrachloride	µg/1	0.5	х	х
Chlorobenzene	µg/1	2.0	X	х
Chloroethane	µg/1	2.0	x	х
2-Chloroethylvinyl Ether	µg/1	5.0	x	х
Chloroform	µg/1	0.5	x	х
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	х	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/1	0.5	х	x
Bromodichloromethane	µg/1	0.5	х	х
1,1-Dichloroethane	µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	х	90.2
1,1-Dichloroethylene	µg/1	0.4	x	х
1,2-Dichloroethylene	µg/1	1.0	x	х
Methylene Chloride	µg/1	2.5	х	х
1,2-Dichloropropane	µg/1	0.5	х	х
cis-1,3-Dichloropropene	µg/1	2.0	х	х
trans-1,3-Dichloropropene	µg/1	0.5	х	x
Ethylbenzene	µg/1	1.0	x	х
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	х	х
Toluene	µg/1	0.5	5.6	х
1,1,1-Trichloroethane	µg/1	0.5	х	x
1,1,2-Trichloroethane	µg/1	0.5	x	х
Trichloroethylene	µg/1	0.2	x	0.3
Vinyl Chloride	µg/1	0.2	х	х
Trichlorofluoromethane	µg/1	1.0	х	х
Dichlorodifluoromethane	µg/1	2.0	×	х
m & p-Xylene	µg/1	1.0	х	х
o-Xylene	µg/1	1.0	x	х
Analytical No.:			58756	58757

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCHJ,C.A.
	v

Attn: George Hudak

	Detection			
	Units	Limit	91-1	91-21
Benzene	μg/1	0.2	0.6	0.5
Bromoform	µg/1	2.0	х	х
Bromomethane	μg/1	4.0	x	х
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	х
2-Chloroethylvinyl Ether	µg/1	5.0	x	х
Chloroform	µg/1	0.5	х	х
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	x	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	х	x
1,4-Dichlorobenzene	µg/1	0.5	x	х
Bromodichloromethane	µg/1	0.5	x	x
1,1-Dichloroethane	µg/1	0.5	x	х
1,2-Dichloroethane	µg/1	0.5	х	x
1,1-Dichloroethylene	µg/1	0.4	х	х
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/1	2.5	х	x
1,2-Dichloropropane	µg/1	0.5	х	x
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	х
Tetrachloroethylene	µg/1	0.5	x	x
Tolusne	µg/1	0.5	1.0	0.9
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/1	0.5	x	x
Trichloroethylene	µg/l	0.2	х	х
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	х	х
Dichlorodifluoromethane	μg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	х	X
Analytical No.:			58758	5875





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	,,
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCH J. E. A.

Attn: George Hudak

	Detection				
	Units	Limit	91 – 2B	91-4	
Benzene	µg/1	0.2	x	0.5	
Bromoform	µg/1	2.0	x	x	
Bromomethane	µg/1	4.0	x	x	
Carbon Tetrachloride	µg/1	0.5	x	x	
Chlorobenzene	µg/1	2.0	x	X	
Chloroethane	µg/1	2.0	X	x	
2-Chloroethylvinyl Ether	µg/1	5.0	х	х	
Chloroform	µg/1	0.5	x	х	
Chloromethane	µg/1	2.0	x	x	
Chlorodibromomethane	µg/1	0.5	х	X	
1,2-Dichlorobenzene	µg/1	1.0	1.4	х	
1,3-Dichlorobenzene	µg/1	1.0	x	х	
1,4-Dichlorobenzene	µg/1	0.5	x	x	
Bromodichloromethane	µg/1	0.5	x	x	
1,1-Dichloroethane	µg/1	0.5	x	x	
1,2-Dichloroethane	µg/1	0.5	x	1.5	
1,1-Dichloroethylene	µg/1	0.4	x	X	
1,2-Dichloroethylene	µg/1	1.0	2.2	x	
Methylene Chloride	µg/1	2.5	x	x	
1,2-Dichloropropane	µg/1	0.5	0.6	x	
cis-1,3-Dichloropropene	µg/1	2.0	x	x	
trans-1,3-Dichloropropene	µg/1	0.5	x	x	
Ethylbenzene	µg/1	1.0	x	x	
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	х	
Tetrachloroethylene	µg∕1	0.5	105.	11.5	
Toluene	μg/1	0.5	x	0.7	
1,1,1-Trichloroethane	µg/1	0.5	x	x	
1,1,2-Trichloroethane	µg/1	0.5	x	x	
Trichloroethylene	µg/1	0.2	7.2	x	
Vinyl Chloride	µg/1	0.2	x	x	
Trichlorofluoromethane	µg/1	1.0	x	x	
Dichlorodifluoromethane	µg/1	2.0	x	x	
m & p-Xylene	µg/1	1.0	x	x	
o-Xylene	µg/1	1.0	x	x	

Analytical No.:

58760 58761

### ANALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCH Y.C.A

Attn: George Hudak

	Detection			
	Units	Limit	91-5A	91-5B
Benzene	 µg∕1	0.2	0.4	0.4
Bromoform	µg/1	2.0	х	x
Bromomethane	µg/l	4.0	x	x
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	х	х
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	х
Chloroform	µg/1	0.5	х	х
Chloromethane	µg/1	2.0	X	х
Chlorodibromomethane	µg/1	0.5	х	х
1,2-Dichlorobenzene	µg/1	1.0	x	х
1,3-Dichlorobenzene	µg/1	1.0	x	х
1,4-Dichlorobenzene	µg/1	0.5	х	· x
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	x	x
1,2-Dichloroethane	µg/1	0.5	х	0.8
1,1-Dichloroethylene	µg/1	0.4	х	x
1,2-Dichloroethylene	µg/1	1.0	х	х
Methylene Chloride	µg/1	2.5	x	x
1,2-Dichloropropane	µg/1	0.5	x	x
cis-1,3-Dichloropropene	µg/1	2.0	x	х
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	х	x
Tetrachloroethylene	µg/1	0.5	5.1	х
Toluene	µg/1	0.5	0.8	x
1,1,1-Trichloroethane	µg/1	0.5	x	x
1,1,2-Trichloroethane	µg/l	0.5	x	x
Trichloroethylene	µg/1	0.2	x	x
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylese	µg/1	1.0	x	x
Analytical No.:			58762	58763





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCH J.C. A.
	ri i

ť

Attn: George Hudak

	Detection				
	Units	Limit	91-7	91-6-1	
Benzene					
benzene Bromoform	µg/1	0.2	x	0.3	
Bromonethane	µg/1	2.0	x	x	
Carbon Tetrachloride	µg/1	4.0	x x	x x	
Chlorobenzene	µg/l µg/l	2.0	x	x	
Chloroethane	μg/1 μg/1	2.0	x	x	
2-Chloroethylvinyl Ether	µg/1 µg/1	2.0	x	x	
Chloroform	µg/1 µg/1	0.5	x	x	
Chloromethane	μη/1 μη/1	2.0	x	x	
Chlorodibromomethane	µg/1	0.5	x	x	
1,2-Dichlorobenzene	µg/1	1.0	x	x	
1,3-Dichlorobenzene	µg/1	1.0	x	x	
1,4-Dichlorobenzene	µg/1	0.5	· x	x	
Bromodichloromethane	μg/1	0.5	X	x	
1,1-Dichloroethane	µg/1	0.5	x	x	
1,2-Dichloroethane	μq/1	0.5	x	x	
1,1-Dichloroethylene	µg/1	0.4	x	x	
1,2-Dichloroethylene	µg/1	1.0	x	x	
Methylene Chloride	µg/1	2.5	x	x	
1,2-Dichloropropane	µg/1	0.5	x	x	
cis-1,3-Dichloropropene	µg/1	2.0	x	x	
trans-1,3-Dichloropropene	µg/1	0.5	x	x	
Ethylbenzene	$\mu g/1$	1.0	x	х	
1,1,2,2-Tetrachloroethane	μg/1	1.0	x	x	
Tetrachloroethylene	$\mu g/1$	0.5	0.6	32.0	
Toluene	µg/1	0.5	x	x	
1,1,1-Trichloroethane	µg/1	0.5	x	x	
1,1,2-Trichloroethane	$\mu q / 1$	0.5	x	х	
Trichloroethylene	µg/1	0.2	х	0.7	
Vinyl Chloride	µg/1	0.2	x	х	
Trichlorofluoromethane	µg/1	1.0	х	x	
Dichlorodifluoromethane	µg/1	2.0	x	х	
m & p-Xylene	µg/1	1.0	х	х	
o-Xylene	µg∕1	1.0	x	x	
Analytical No.:			58764	58765	

### NALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	J ⊂ H J. C. 44,
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(

Attn: George Hudak

	Detection			
	Units	Limit	91-6-2	o₩-4
Benzene	 µg/l	0.2	0.2	 x
Bromoform	µg/1	2.0	х	х
Bromomethane	$\mu q/l$	4.0	x	х
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	μg/l	5.0	x	x
Chloroform	µg/1	0.5	X	x
Chloromethane	$\mu q/1$	2.0	x	x
Chlorodibromomethane	$\mu g/1$	0.5	х	х
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	x	x
1,4-Dichlorobenzene	µg/1	0.5	x	x
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	$\mu q/1$	0.5	x	x
1,2-Dichloroethane	μg/1	0.5	x	x
1,1-Dichloroethylene	µg/1	0.4	х	х
1,2-Dichloroethylene	µg/1	1.0	x	x
Methylene Chloride	µg/1	2.5	х	x
1,2-Dichloropropane	$\mu q/1$	0.5	x	x
cis-1,3-Dichloropropene	μg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	$\mu q/1$	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	52.5	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0,5	x	x
1,1,2-Trichloroethane	µg/1	0.5	x	x
Trichloroethylene	µg/1	0.2	0.6	x
Vinyl Chloride	µg/1	0.2	x	х
Trichlorofluoromethane	µg/1	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			58766	5876

X = Analyzed but not detected.

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Sectores ....

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	
APPROVED BY:	JCHJ,C.A,

(

Attn: George Hudak

	Detection			
	Units	Limit	0W-5-1	O₩-5-2
Benzene	 μg/l	0.2	 x	 x
Bromoform	μg/1	2.0	x	x
Bromomethane	µg/1	4.0	x	x
Carbon Tetrachloride	μg/1	0.5	x	x
Chlorobenzene	μg/1	2.0	x	x
Chloroethane	μg/l	2.0	x	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	μg/1	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	μg/1	0.5	x	x
1,2-Dichlorobenzene	μς/l	1.0	x	x
1.3-Dichlorobenzene	µg/1	1.0	x	x
1,4-Dichlorobenzene	μg/1	0.5	x	x
Bromodichloromethane	μg/1 μg/1	0.5	x	x
1,1-Dichloroethane	μg/1	0.5	x	x
1,2-Dichloroethane	µg/1 µg/1	0.5	x	x
1,1-Dichloroethylene	µg/1 µg/1	0.4	x	X
1,2-Dichloroethylene	μg/1 μg/1	1.0	x	x
Methylene Chloride	μg/1 μg/1	2.5	x	x
1,2-Dichloropropane		0.5	x	x
cis-1,3-Dichloropropene	µg/1	2.0	x	x
· · · ·	µg/1	0.5	x	x
trans-1,3-Dichloropropene	µg/1	1.0	x	
Ethylbenzene	µg/1		x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0		x
Tetrachloroethylene	µg/1	0.5	2.1	2.1
Toluene	µg/1	0.5	x	X
1,1,1-Trichloroethane	µg/1	0.5	X	x
1,1,2-Trichloroethane	µg/1	0.5	X	x
Trichloroethylene	µg/1	0.2	x	X
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	X	x
Dichlorodifluoromethane	µg/1	2.0	x	X
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	x	x
Analytical No.:			58768	58769

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

# ANALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCHJ,C.44,
	-

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Attn: George Hudak

UnitsLimit $OW-6$ Benzene $\mu g/1$ $0.2$ XBromoform $\mu g/1$ $2.0$ XBromosthane $\mu g/1$ $4.0$ XCarbon Tetrachloride $\mu g/1$ $0.5$ XChlorobenzene $\mu g/1$ $2.0$ XChlorotethane $\mu g/1$ $2.0$ X2-Chlorothylvinyl Ether $\mu g/1$ $5.0$ XChloroform $\mu g/1$ $0.5$ XChlorobenzene $\mu g/1$ $0.5$ XChlorothylvinyl Ether $\mu g/1$ $0.5$ XChlorodibromomethane $\mu g/1$ $0.5$ X1, 2-Dichlorobenzene $\mu g/1$ $0.5$ X1, 3-Dichlorobenzene $\mu g/1$ $0.5$ X1, 4-Dichlorobenzene $\mu g/1$ $0.5$ X1, 1-Dichloroethane $\mu g/1$ $0.5$ X1, 2-Dichloroethane $\mu g/1$ $0.5$ X1, 2-Dichloroethane $\mu g/1$ $0.4$ X1, 2-Dichloroethylene $\mu g/1$ $0.5$ X1, 1-Dichloroethylene $\mu g/1$ $0.5$ X1, 2-Dichloroethylene $\mu g/1$ $0.5$ X1, 2-Dichloroethylene $\mu g/1$ $0.5$ X1, 2-Dichloropropane $\mu g/1$ $0.5$ X1, 3-Dic	0 W - 8  0 . 2 X X X X X X X X X X X
Benzene       µg/l       0.2       X         Bromoform       µg/l       2.0       X         Bromomethane       µg/l       4.0       X         Carbon Tetrachloride       µg/l       0.5       X         Chlorobenzene       µg/l       2.0       X         Chloroethane       µg/l       2.0       X         2-Chloroethylvinyl Ether       µg/l       2.0       X         Chloroform       µg/l       0.5       X         Chloroethane       µg/l       0.5       X         Chlorobenzene       µg/l       0.5       X         Chlorobenzene       µg/l       0.5       X         Chlorobenzene       µg/l       1.0       X         1,3-Dichlorobenzene       µg/l       0.5       X         1,4-Dichlorobenzene       µg/l       0.5       X         J.1-Dichloroethane       µg/l       0.5       X         1,1-Dichloroethane       µg/l       0.5       X         1,2-Dichloroethane       µg/l       0.4       X         1,2-Dichloroethylene       µg/l       0.4       X         1,2-Dichloroethylene       µg/l       0.5       X	0.2 X X X X X X X
Bromoform $\mu g/1$ 2.0XBromomethane $\mu g/1$ 4.0XCarbon Tetrachloride $\mu g/1$ 0.5XChlorobenzene $\mu g/1$ 2.0XChloroethane $\mu g/1$ 2.0X2-Chloroethylvinyl Ether $\mu g/1$ 5.0XChloroform $\mu g/1$ 0.5XChlorodibromomethane $\mu g/1$ 0.5X1,2-Dichlorobenzene $\mu g/1$ 1.0X1,3-Dichlorobenzene $\mu g/1$ 0.5X1,4-Dichlorobenzene $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.0X	x x x x x x x x
Bromomethane $\mu g/1$ 4.0XCarbon Tetrachloride $\mu g/1$ 0.5XChlorobenzene $\mu g/1$ 2.0XChloroethane $\mu g/1$ 2.0X2-Chloroethylvinyl Ether $\mu g/1$ 5.0XChloroform $\mu g/1$ 0.5XChloroethane $\mu g/1$ 0.5XChloroethane $\mu g/1$ 0.5XChloroethane $\mu g/1$ 0.5XChlorobenzene $\mu g/1$ 0.5X1,2-Dichlorobenzene $\mu g/1$ 1.0X1,4-Dichlorobenzene $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.0X	x x x x x x
Carbon Tetrachloride $yg/l$ 0.5XChlorobenzene $yg/l$ 2.0XChloroethane $yg/l$ 2.0X2-Chloroethylvinyl Ether $yg/l$ 5.0XChloroform $yg/l$ 0.5XChloromethane $yg/l$ 0.5XChlorodibromomethane $yg/l$ 0.5X1,2-Dichlorobenzene $yg/l$ 1.0X1,3-Dichlorobenzene $yg/l$ 1.0X1,4-Dichlorobenzene $yg/l$ 0.5X1,1-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,1-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethylene $yg/l$ 0.5X1,2-Dichloroethylene $yg/l$ 0.5X1,2-Dichloroethylene $yg/l$ 0.5X1,2-Dichloroethylene $yg/l$ 0.5X1,2-Dichloroethylene $yg/l$ 0.5X1,2-Dichloropropane $yg/l$ 2.0X	x x x x
Chlorobenzene $yg/l$ 2.0XChloroethane $yg/l$ 2.0X2-Chloroethylvinyl Ether $yg/l$ 5.0XChloroform $yg/l$ 0.5XChloromethane $yg/l$ 0.5XChlorodibromomethane $yg/l$ 0.5X1,2-Dichlorobenzene $yg/l$ 1.0X1,3-Dichlorobenzene $yg/l$ 0.5X1,4-Dichlorobenzene $yg/l$ 0.5X1,1-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.5X1,2-Dichloroethane $yg/l$ 0.4X1,2-Dichloroethylene $yg/l$ 1.0XMethyleneChloride $yg/l$ 2.5X1,2-Dichloropropane $yg/l$ 0.5X1,2-Dichloropropane $yg/l$ 0.5X	x x x
Chloroethane $\mu g/1$ 2.0X2-chloroethylvinyl Ether $\mu g/1$ 5.0XChloroform $\mu g/1$ 0.5XChloromethane $\mu g/1$ 0.5XChlorodibromomethane $\mu g/1$ 0.5X1,2-Dichlorobenzene $\mu g/1$ 1.0X1,3-Dichlorobenzene $\mu g/1$ 1.0X1,4-Dichlorobenzene $\mu g/1$ 0.5X1,1-Dichlorobenzene $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethylene $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0X1,2-Dichloroethylene $\mu g/1$ 1.0XMethyleneChloride $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.0X	x x
2-Chloroethylvinyl Ether $\mu g/1$ 5.0XChloroform $\mu g/1$ 0.5XChloromethane $\mu g/1$ 2.0XChlorodibromomethane $\mu g/1$ 0.5X1,2-Dichlorobenzene $\mu g/1$ 1.0X1,3-Dichlorobenzene $\mu g/1$ 1.0X1,4-Dichlorobenzene $\mu g/1$ 0.5XBromodichloromethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0XMethyleneChloride $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.0X	x
Chloroform $\mu g/1$ 0.5XChloromethane $\mu g/1$ 2.0XChlorodibromomethane $\mu g/1$ 0.5X1,2-Dichlorobenzene $\mu g/1$ 1.0X1,3-Dichlorobenzene $\mu g/1$ 1.0X1,4-Dichlorobenzene $\mu g/1$ 0.5XBromodichloromethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0XMethyleneChloride $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.0X	
Chloromethane $\mu g/l$ 2.0XChlorodibromomethane $\mu g/l$ 0.5X1,2-Dichlorobenzene $\mu g/l$ 1.0X1,3-Dichlorobenzene $\mu g/l$ 1.0X1,4-Dichlorobenzene $\mu g/l$ 0.5XBromodichloromethane $\mu g/l$ 0.5X1,1-Dichloroethane $\mu g/l$ 0.5X1,2-Dichloroethane $\mu g/l$ 0.5X1,2-Dichloroethane $\mu g/l$ 0.5X1,1-Dichloroethane $\mu g/l$ 0.4X1,2-Dichloroethylene $\mu g/l$ 1.0XMethyleneChloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 2.0X	x
Chlorodibromomethane $\mu g/l$ 0.5X1,2-Dichlorobenzene $\mu g/l$ 1.0X1,3-Dichlorobenzene $\mu g/l$ 1.0X1,4-Dichlorobenzene $\mu g/l$ 0.5XBromodichloromethane $\mu g/l$ 0.5X1,1-Dichloroethane $\mu g/l$ 0.5X1,2-Dichloroethane $\mu g/l$ 0.5X1,1-Dichloroethane $\mu g/l$ 0.4X1,2-Dichloroethylene $\mu g/l$ 1.0X1,2-Dichloroethylene $\mu g/l$ 0.4X1,2-Dichloroethylene $\mu g/l$ 1.0XMethyleneChloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 2.0X	
$1, 2-Dichlorobenzene$ $\mu g/l$ $1.0$ X $1, 3-Dichlorobenzene$ $\mu g/l$ $1.0$ X $1, 4-Dichlorobenzene$ $\mu g/l$ $0.5$ XBromodichloromethane $\mu g/l$ $0.5$ X $1, 1-Dichloroethane$ $\mu g/l$ $0.5$ X $1, 2-Dichloroethane$ $\mu g/l$ $0.5$ X $1, 1-Dichloroethylene$ $\mu g/l$ $0.4$ X $1, 2-Dichloroethylene$ $\mu g/l$ $1.0$ XMethylene Chloride $\mu g/l$ $2.5$ X $1, 2-Dichloropropane$ $\mu g/l$ $2.0$ X	x
1,3-Dichlorobenzene $\mu g/1$ 1.0X1,4-Dichlorobenzene $\mu g/1$ 0.5XBromodichloromethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.5X1,2-Dichloroethane $\mu g/1$ 0.5X1,1-Dichloroethane $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0XMethyleneChloride $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X1,2-Dichloropropane $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5X2.0XX	x
$1,4-\text{Dichlorobenzene}$ $\mu g/1$ $0.5$ $X$ Bromodichloromethane $\mu g/1$ $0.5$ $X$ $1,1-\text{Dichloroethane}$ $\mu g/1$ $0.5$ $X$ $1,2-\text{Dichloroethane}$ $\mu g/1$ $0.5$ $X$ $1,1-\text{Dichloroethylene}$ $\mu g/1$ $0.4$ $X$ $1,2-\text{Dichloroethylene}$ $\mu g/1$ $1.0$ $X$ $1,2-\text{Dichloroethylene}$ $\mu g/1$ $2.5$ $X$ $1,2-\text{Dichloropropane}$ $\mu g/1$ $0.5$ $X$ $1,2-\text{Dichloropropane}$ $\mu g/1$ $0.5$ $X$	x
Bromodichloromethane $\mu g/l$ 0.5X1,1-Dichloroethane $\mu g/l$ 0.5X1,2-Dichloroethane $\mu g/l$ 0.5X1,1-Dichloroethylene $\mu g/l$ 0.4X1,2-Dichloroethylene $\mu g/l$ 1.0X1,2-Dichloroethylene $\mu g/l$ 1.0XMethylene Chloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 0.5Xcis-1,3-Dichloropropene $\mu g/l$ 2.0X	x
$1,1-Dichloroethane$ $\mu g/l$ $0.5$ $X$ $1,2-Dichloroethane$ $\mu g/l$ $0.5$ $X$ $1,1-Dichloroethylene$ $\mu g/l$ $0.4$ $X$ $1,2-Dichloroethylene$ $\mu g/l$ $1.0$ $X$ Methylene Chloride $\mu g/l$ $2.5$ $X$ $1,2-Dichloropropane$ $\mu g/l$ $0.5$ $X$ $1,2-Dichloropropane$ $\mu g/l$ $2.0$ $X$	x
1,2-Dichloroethane $\mu g/l$ 0.5X1,1-Dichloroethylene $\mu g/l$ 0.4X1,2-Dichloroethylene $\mu g/l$ 1.0XMethyleneChloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 0.5Xcis-1,3-Dichloropropene $\mu g/l$ 2.0X	x
1,1-Dichloroethylene $\mu g/1$ 0.4X1,2-Dichloroethylene $\mu g/1$ 1.0XMethyleneChloride $\mu g/1$ 2.5X1,2-Dichloropropane $\mu g/1$ 0.5Xcis-1,3-Dichloropropene $\mu g/1$ 2.0X	x
1,2-Dichloroethylene $\mu g/l$ 1.0XMethyleneChloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 0.5Xcis-1,3-Dichloropropene $\mu g/l$ 2.0X	x
Methylene Chloride $\mu g/l$ 2.5X1,2-Dichloropropane $\mu g/l$ 0.5Xcis-1,3-Dichloropropene $\mu g/l$ 2.0X	x
1,2-Dichloropropane $\mu g/1$ 0.5Xcis-1,3-Dichloropropene $\mu g/1$ 2.0X	x
cis-1,3-Dichloropropene µg/l 2.0 X	х
	x
$t_{rans-1}$ 3-Dicbloropropens $u_{\sigma}/l$ 0.5 X	x
clans-1,5-Dichioptopene pg/2 0.5 x	x
Ethylbenzene µg/l 1.0 X	x
1,1,2,2-Tetrachloroethane $\mu g/l$ 1.0 X	х
Tetrachloroethylene $\mu g/l$ 0.5 0.9	12.9
Toluene µg/l 0.5 X	х
1,1,1-Trichloroethane $\mu g/l$ 0.5 X	х
1,1,2-Trichloroethane $\mu g/1$ 0.5 X	x
Trichloroethylene µg/l 0.2 X	x
Vinyl Chloride µg/l 0.2 X	х
Trichlorofluoromethane µg/l 1.0 X	x
Dichlorodifluoromethane $\mu g/l$ 2.0 X	х
m & p-Xylene µg/1 1.0 X	x
o-Xylene $\mu g/1$ 1.0 X	x
Analytical No.: 58770	58771

X = Analyzed but not detected.

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#### All analyses conducted in accordance with Enviroscan Quality Assurance Program.

THE REPORT AND AND AND AND WISCORSIN Lab Certification No. 737053130





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
APPROVED BY:	JCHJ.C.H.
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Attn: George Hudak

		Detection		
	Units	Limit	0 W - 9	0 W - 3
Benzene	µg/1	0.2	х	0.2
Bromoform	µg/1	2.0	х	x
Bromomethane	µg/1	4.0	x	х
Carbon Tetrachloride	µg∕1	0.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	х	x
2-Chloroethylvinyl Ether	µg/1	5.0	x	x
Chloroform	µg/1	0.5	х	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	х	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0	х	x
1,4-Dichlorobenzene	µg/1	0.5	х	x
Bromodichloromethane	µg/1	0.5	х	x
1,1-Dichloroethane	µg/1	0.5	х	х
1,2-Dichloroethane	µg/1	0.5	х	x
1,1-Dichloroethylene	µg/1	0.4	х	х
1,2-Dichloroethylene	µg/1	1.0	х	х
Methylene Chloride	µg/1	2.5	х	x
1,2-Dichloropropane	µg/1	0.5	х	х
cis-1,3-Dichloropropene	µg/1	2.0	x	x
trans-1,3-Dichloropropene	µg/1	0.5	x	x
Ethylbenzene	µg/1	1.0	х	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
Tetrachloroethylene	µg/1	0.5	x	x
Toluene	µg/1	0.5	x	x
1,1,1-Trichloroethane	µg/1	0.5	х	х
1,1,2-Trichloroethane	µg/1	0.5	x	х
Trichloroethylene	µg/1	0.2	х	х
Vinyl Chloride	µg/1	0.2	X	х
Trichlorofluoromethane	µg/1	1.0	х	x
Dichlorodifluoromethane	µg/1	2,0	х	х
m & p-Xylene	µg/1	1.0	x	x
o-Xylene	µg/1	1.0	x	x

Analytical No.:

58772 58773

X = Analyzed but not detected.

#### All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

# NALYTICAL REPORT



RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCHJ,C.A.
	v

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Attn: George Hudak

	Detection				
÷		Units	Limit	0W-7	0 W − 2
	Benzene	µg/1	0.2	0.3	0.2
1	Bromoform	µg/1	2.0	x	x
	Bromomethane	µg/1	4.0	x	х
1	Carbon Tetrachloride	µg/1	0.5	x	х
	Chlorobenzene	µg/1	2.0	x	x
÷	Chloroethane	µg/1	2.0	x	x
	2-Chloroethylvinyl Ether	µg/1	5.0	х	x
	Chloroform	µg/l	0.5	х	x
	Chloromethane	µg/1	2.0	x	x
	Chlorodibromomethane	µg/1	0.5	x	x
	1,2-Dichlorobenzene	µg/1	1.0	x	x
	1,3-Dichlorobenzene	µg/1	1.0	x	х
	l,4-Dichlorobenzene	µg/1	0.5	х	х
	Bromodichloromethane	µg/1	0.5	x	x
	1,1-Dichloroethane	µg/1	0.5	x	х
•	1,2-Dichloroethane	µg/1	0.5	х	2.5
	1,1-Dichloroethylene	µg/1	0.4	х	х
	1,2-Dichloroethylene	µg/1	1.0	x	х
	Methylene Chloride	µg/1	2.5	x	x
	1,2-Dichloropropane	µg/1	0.5	х	x
	cis-1,3-Dichloropropene	µg/1	2.0	x	х
	trans-1,3-Dichloropropene	µg/1	0.5	x	x
	Ethylbenzene	µg/1	1.0	x	x
	1,1,2,2-Tetrachloroethane	µg/1	1.0	x	х
	Tetrachloroethylene	$\mu g/1$	0.5	1.6	1.2
	Toluane	µg/1	0.5	0.5	х
	1,1,1-Trichloroethane	µg/1	0.5	x	x
	1,1,2-Trichloroethane	µg/1	0.5	х	х
	Trichloroethylene	µg/1	0.2	x	x
	Vinyl Chloride	µg/1	0.2	x	х
	Trichlorofluoromethane	µg/1	1.0	x	x
	Dichlorodifluoromethane	µg/1	2.0	X	x
	m & p-Xylene	µg/1	1.0	х	x
	o-Xylene	µg/1	1.0	x	x

Analytical No.:

58774

58775

X = Analyzed but not detected.

100 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130



CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCHL.C.A.
	U.

Attn: George Hudak

		Detection		
	Units	Limit	0W-1	V W - 2
Benzene	µg/1	0.2	1.1	х
Bromoform	µg/1	2.0	х	x
Bromomethane	µg/1	4.0	x	х
Carbon Tetrachloride	µg/1	0.5	x	x
Chlorobenzene	µg/1	2.0	х	x
Chloroethane	µg/1	2.0	х	x
2-Chloroethylvinyl Ether	µg/1	5.0	х	х
Chloroform	µg/1	0.5	x	x
Chloromethane	µg/1	2.0	x	x
Chlorodibromomethane	µg/1	0.5	x	х
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg∕1	1.0	х	x ·
1,4-Dichlorobenzene	µg/1	0.5	х	x
Bromodichloromethane	µg/1	0.5	x	х
1,1-Dichloroethane	µg/1	0.5	х	x
1,2-Dichloroethane	µg∕1	0.5	x	2.7
1,1-Dichloroethylene	µg/1	0.4	х	х
1,2-Dichloroethylene	µg/1	1.0	х	х
Methylene Chloride	µg/1	2.5	X	х
1,2-Dichloropropane	µg/1	0.5	x	х
cis-1,3-Dichloropropene	µg/1	2.0	х	x
trans-1,3-Dichloropropene	µg/1	0.5	X	х
Ethylbenzene	µg/1	1.0	3.3	x
l,1,2,2-Tetrachloroethane	µg∕1	1.0	x	х
Tetrachloroethylene	µg∕1	0.5	9.4	х
Toluene	µg∕1	0.5	0.5	x
1,1,1-Trichloroethane	µg/1	0.5	x	х
1,1,2-Trichloroethane	µg/1	0.5	x	х
Trichloroethylene	µg∕1	0.2	x	х
Vinyl Chloride	µg/1	0.2	x	x
Trichlorofluoromethane	µg/1	1.0	x	x
Dichlorodifluoromethane	µg/1	2.0	x	x
m & p-Xylene	µg/1	1.0	1.1	х
o-Xylene	$\mu g/1$	1.0	x	х

Analytical No.:

58776 58777

X = Analyzed but not detected.

Enviroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

# NALYTICAL REPORT

RREM, Inc. 408 Board of Trade Building Duluth, MN 55802

CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	10/18/91
REPORT DATE:	11/01/91
REPORT DATE: APPROVED BY:	JCH J.L.A.

Attn: George Hudak

		Detection		
	Units	Limit	F B – 1	F B
Benzene	μg/1	0.2	 x	 x
Bromoform	μg/1 μg/1	2.0	x	x
Bromomethane	µg/1 µg/1	4.0	x	x
Carbon Tetrachloride	μg/1 μg/1	9.5	x	x
Chlorobenzene	µg/1	2.0	x	x
Chloroethane	µg/1	2.0	x	x
2-Chloroethylvinyl Ether	μg/1 μg/1	5.0	x	x
Chloroform	μg/1 μg/1	0.5	x	x
Chloromethane	μg/1	2.0	x	x
Chlorodibromomethane	μg/1 μg/1	0.5	x	x
1,2-Dichlorobenzene	µg/1	1.0	x	x
1,3-Dichlorobenzene	µg/1	1.0		x
1.4-Dichlorobenzene	μg/1 μg/1	0.5	x. x	x
Bromodichloromethane	μg/1 μg/1	0.5	x	x
1,1-Dichloroethane	μg/1 μg/1	0.5	x	x
1,2-Dichloroethane	μg/1 μg/1	0.5	x	x
1,1-Dichloroethylene	μg/1 μg/1	0.4	x	x
1,2-Dichloroethylene	μg/1 μg/1	1.0	x	x
Methylene Chloride	μg/1	2.5	x	x
1,2-Dichloropropane	μg/1 μg/1	0.5	x	x
cis-1,3-Dichloropropene	μg/1 μg/1	2.0	x	x
trans-1,3-Dichloropropene		0.5	x	X
Ethylbenzene	µg/1	1.0	x	x
1,1,2,2-Tetrachloroethane	µg/1	1.0	x	x
· · ·	µg/1	0.5	x	x
Tetrachloroethylene Toluene	µg/1			
	µg/1	0.5	x x	X
1,1,1-Trichloroethane	µg/1	0.5		X
1,1,2-Trichlorcethane	µg/1	0.5	X	X
Trichloroethylene	µg/1	0.2	X	x
Vinyl Chloride	µg/1	0.2	X	X
Trichlorofluoromethane	µg/1	1.0	X	X
Dichlorodifluoromethane	µg/1	2.0	X	x
m & p-Xylene	µg/1	1.0	X	x
o-Xylene	µg/1	1.0	x	х

Analytical No.:

58778 58779

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.





CUST NUMBER:	9114
SAMPLED BY:	Client
DATE REC'D:	
REPORT DATE:	11/01/91/
REPORT DATE: Approved by:	JCH J. C. A.
	//

Attn: George Hudak

UnitsLimitTRIPBLK-BRBenzene $\mu g/l$ 0.2XBromoform $\mu g/l$ 2.0XBromomethane $\mu g/l$ 4.0XCarbon Tetrachloride $\mu g/l$ 0.5XChlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 5.0X			Detection	
Benzene $\mu g/l$ 0.2XBromoform $\mu g/l$ 2.0XBromomethane $\mu g/l$ 2.0XCarbon Tetrachloride $\mu g/l$ 0.5XChlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X		Units	Limit	TRIP BLK-BR
Bromoform $\mu g/l$ 2.0XBromomethane $\mu g/l$ 4.0XCarbon Tetrachloride $\mu g/l$ 0.5XChlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X				
Bromomethane $\mu g/l$ 4.0XCarbon Tetrachloride $\mu g/l$ 0.5XChlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X				
Carbon Tetrachloride $\mu g/l$ 0.5XChlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X		-		
Chlorobenzene $\mu g/l$ 2.0XChloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X				
Chloroethane $\mu g/l$ 2.0X2-Chloroethylvinyl Ether $\mu g/l$ 5.0XChloroform $\mu g/l$ 0.5X				
2-Chloroethylvinyl Ether $\mu g/1$ 5.0 X Chloroform $\mu g/1$ 0.5 X		µg∕1		x
Chloroform $\mu g/1$ 0.5 X		µg/1	2.0	x
	2-Chloroethylvinyl Ether	µg/1	5.0	x
	Chloroform	µg/1	0.5	x
CALOFOMETRADE $\mu g/1 = 2.0$ X	Chloromethane	µg/1	2.0	X
Chlorodibromomethane $\mu g/l$ 0.5 X	Chlorodibromomethane	µg∕1	0.5	x
1,2-Dichlorobenzene $\mu g/l$ 1.0 X	1,2-Dichlorobenzene	µg/1	1.0	X
1,3-Dichlorobenzene $\mu g/l$ 1.0 X	1,3-Dichlorobenzene	µg/1	1.0	x
1,4-Dichlorobenzene $\mu g/l$ 0.5 X	1,4-Dichlorobenzene	µg/1	0.5	· X
Bromodichloromethane $\mu g/l$ 0.5 X	Bromodichloromethane	µg/1	0.5	х
1,1-Dichloroethane $\mu g/l$ 0.5 X	1,1-Dichloroethane	µg/1	0.5	X
1,2-Dichloroethane $\mu$ g/l 0.5 X	1,2-Dichloroethane	µg/1	0.5	X
1,1-Dichloroethylene µg/l 0.4 X	1,1-Dichloroethylene	µg/1	0.4	x
1,2-Dichloroethylene $\mu g/1$ 1.0 X	1,2-Dichloroethylene	µg∕1	1.0	x
Methylene Chloride $\mu g/l$ 2.5 X	Methylene Chloride	µg/1	2.5	x
1,2-Dichloropropane $\mu g/1$ 0.5 X	1,2-Dichloropropane	µg/1	0.5	x
cis-1,3-Dichloropropene $\mu g/1$ 2.0 X	cis-1,3-Dichloropropene	μg/1	2.0	x
trans-1,3-Dichloropropene $\mu g/l$ 0.5 X	trans-1,3-Dichloropropene	µg/1	0.5	X
Ethylbenzene $\mu g/l$ 1.0 X	Ethylbenzene	µg/1	1.0	х
1,1,2,2-Tetrachloroethane $\mu$ g/l 1.0 X	1,1,2,2-Tetrachloroethane	µg/1	1.0	x
Tetrachloroethylene $\mu g/l$ 0.5 X	Tetrachloroethylene	µg/1	0.5	x
Toluene $\mu g/1$ 0.5 X	Toluene	µg/1	0.5	x
1,1,1-Trichloroethane $\mu g/1$ 0.5 X	1,1,1-Trichloroethane	µg/1	0.5	x
1,1,2-Trichloroethane $\mu g/1$ 0.5 X	1,1,2-Trichloroethane	µg/1	0.5	x
Trichloroethylene µg/l 0.2 X	Trichloroethylene	µg/1	0.2	x
Vinyl Chloride $\mu g/1$ 0.2 X	Vinyl Chloride	µg/1	0.2	x
Trichlorofluoromethane µg/l 1.0 X	Trichlorofluoromethane	µg/1	1.0	x
Dichlorodifluoromethane $\mu g/l$ 2.0 X	Dichlorodifluoromethane	µg∕1	2.0	x
m & p-Xylene µg/l 1.0 X	m & p-Xylene	µg/1	1.0	x
o-Xylene µg/1 1.0 X	o-Xylene	µg/1	1.0	x

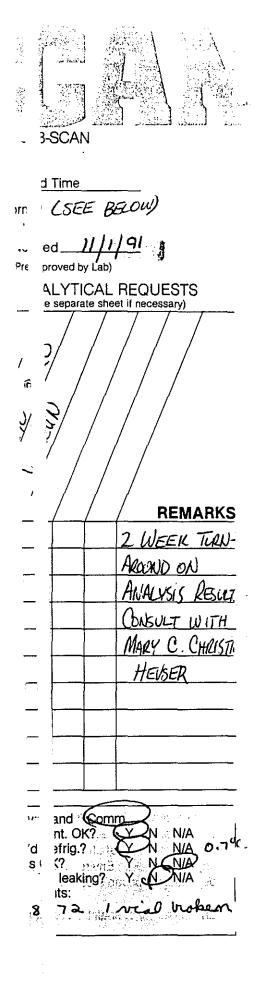
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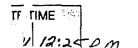
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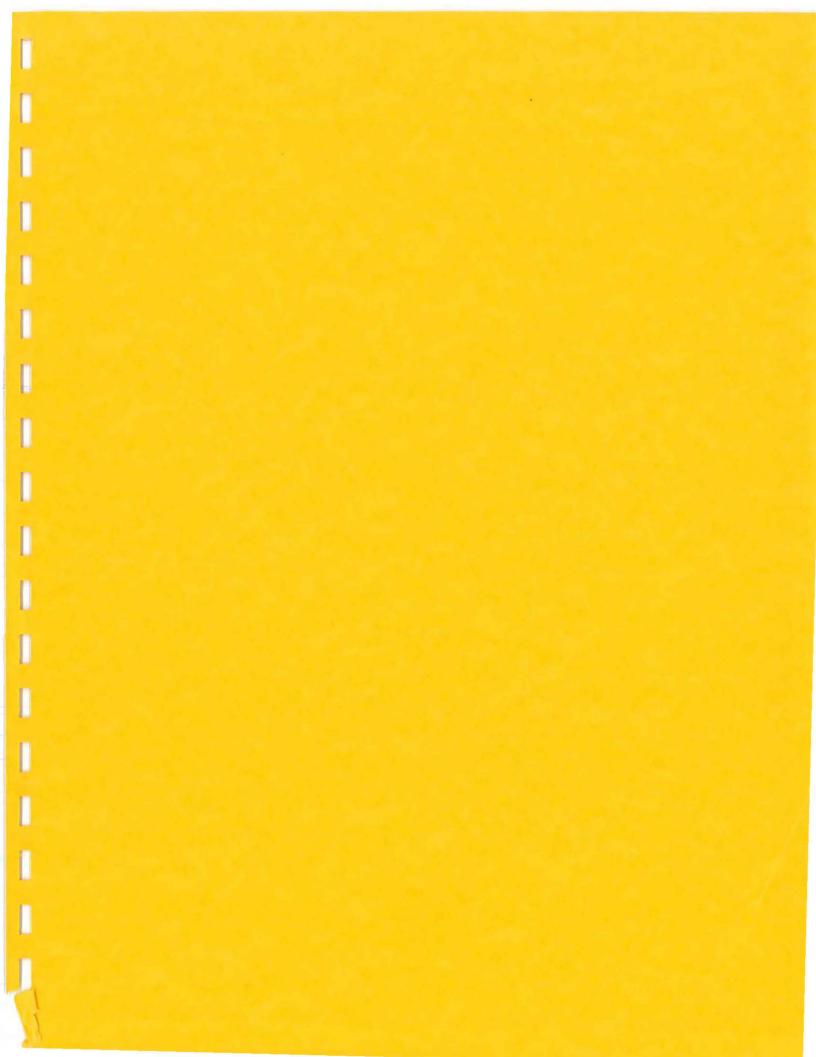
X = Analyzed but not detected.

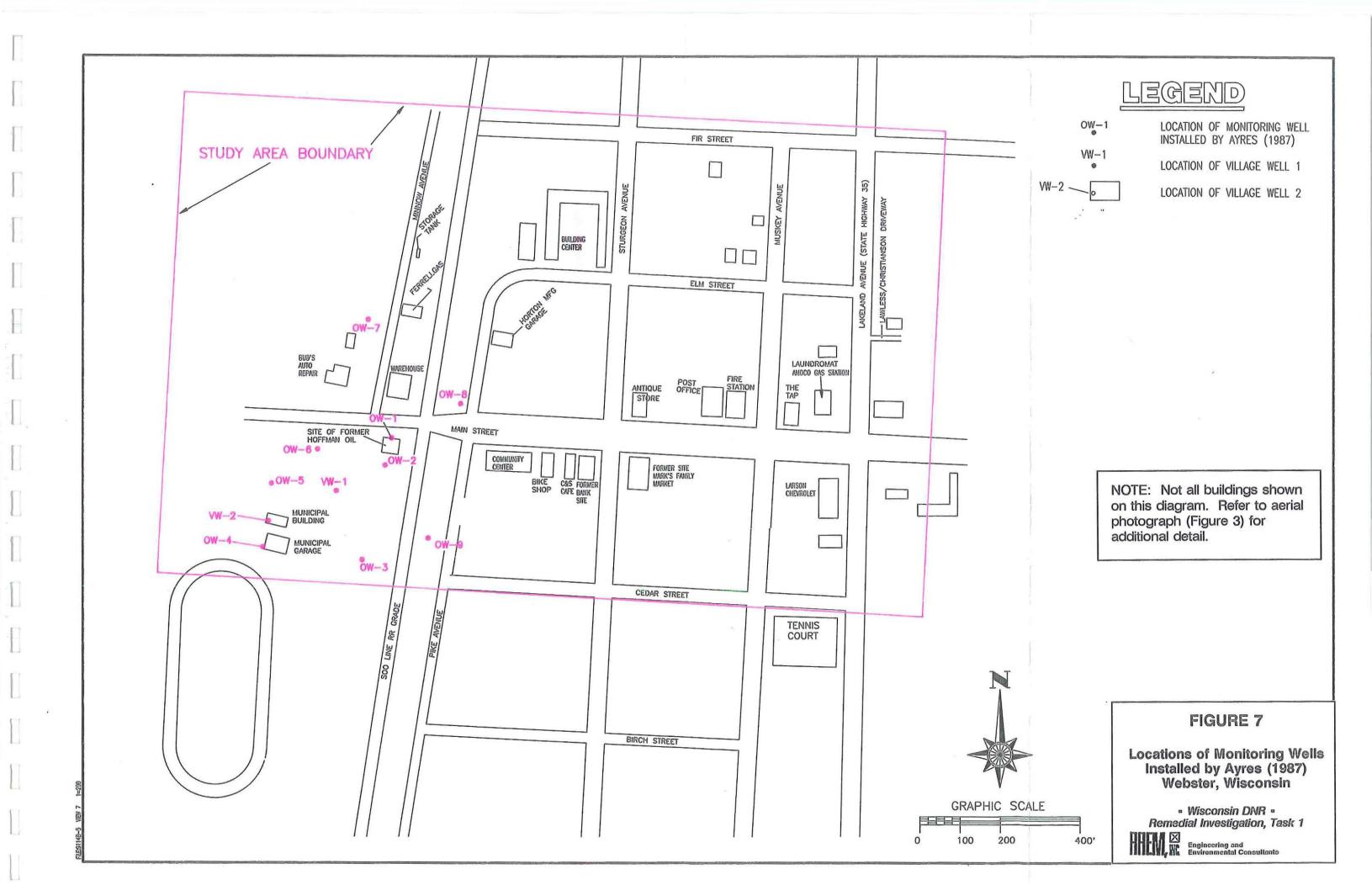
viroscan Inc., 303 West Military Rd., Rothschild, WI 54474 1/800/338-SCAN Wisconsin Lab Certification No. 737053130

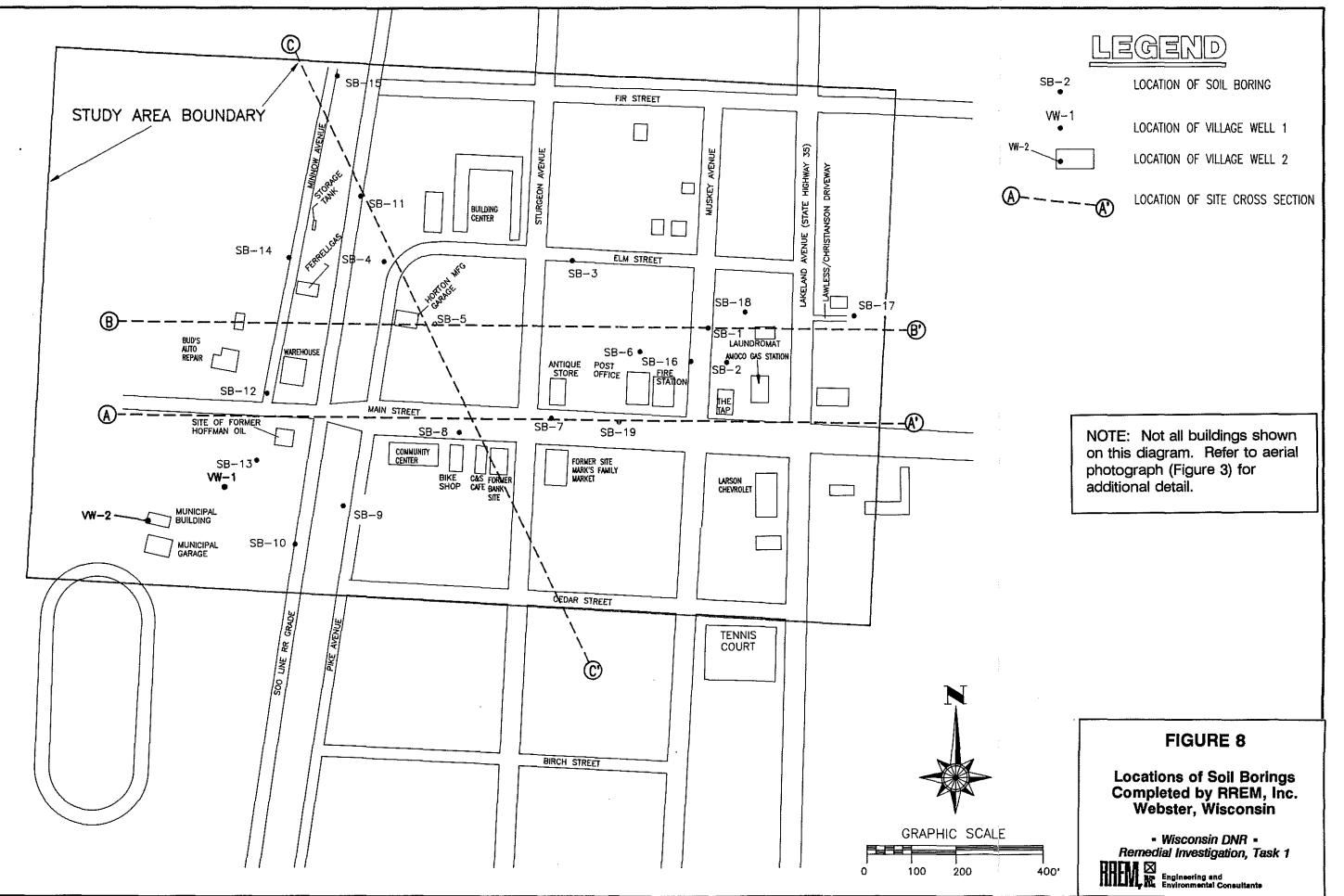
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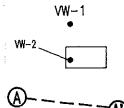


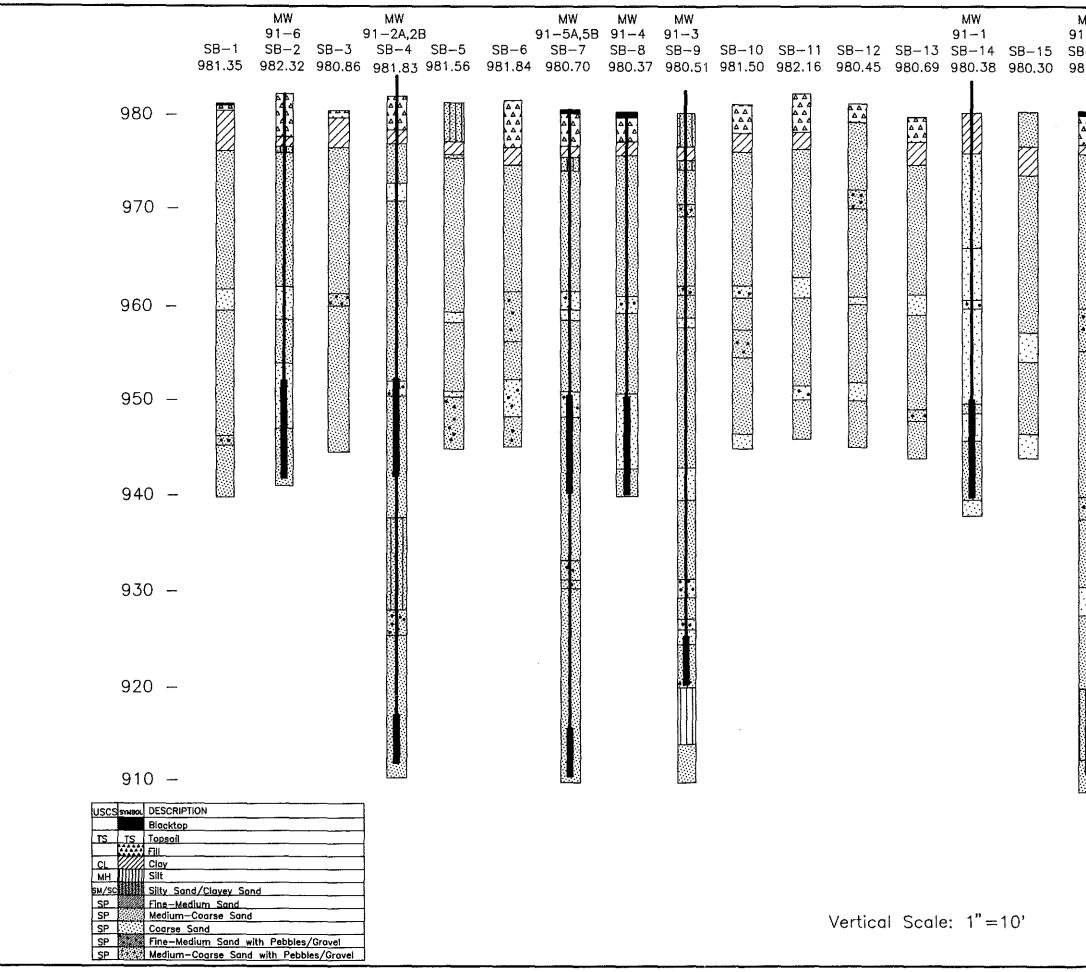










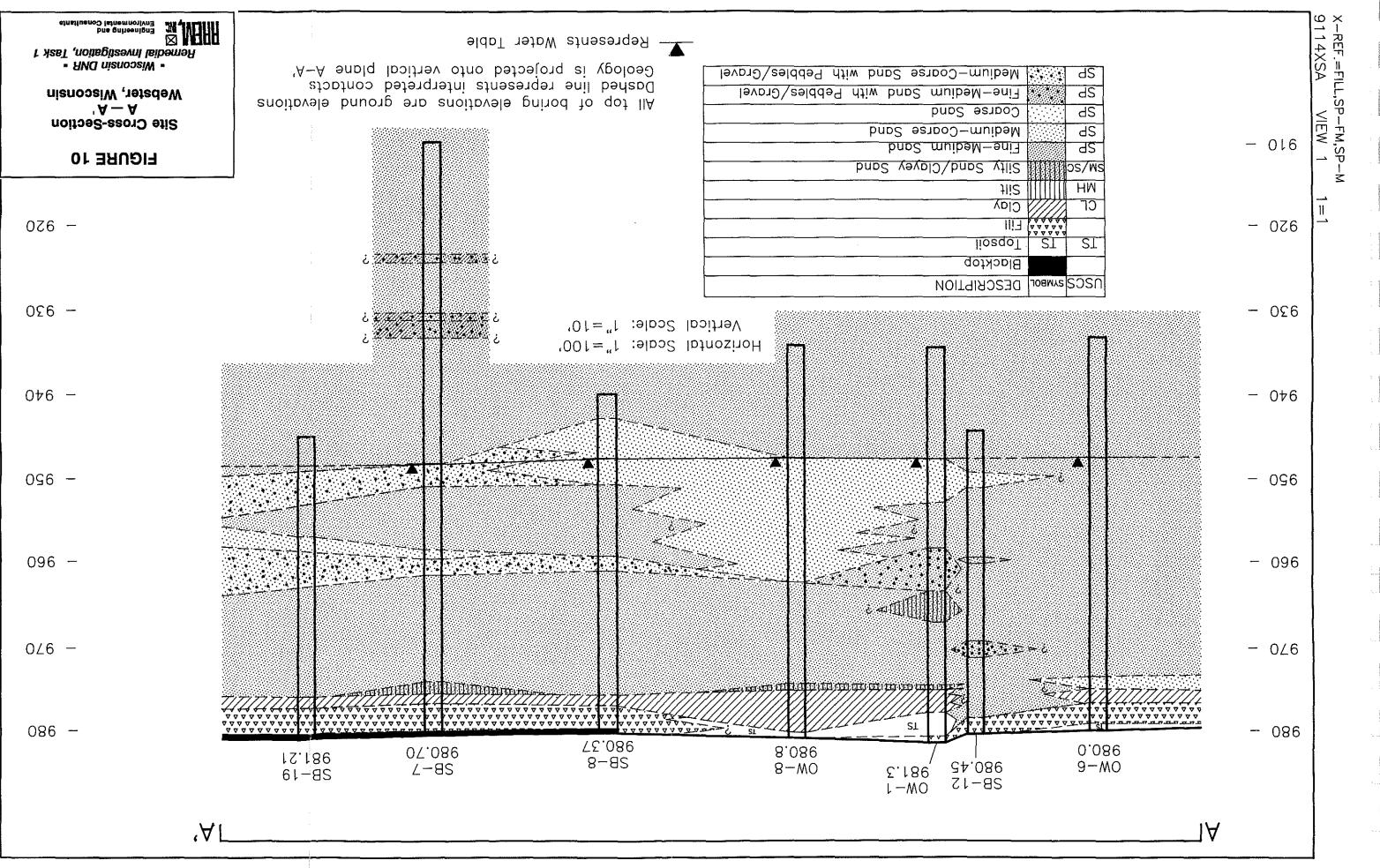


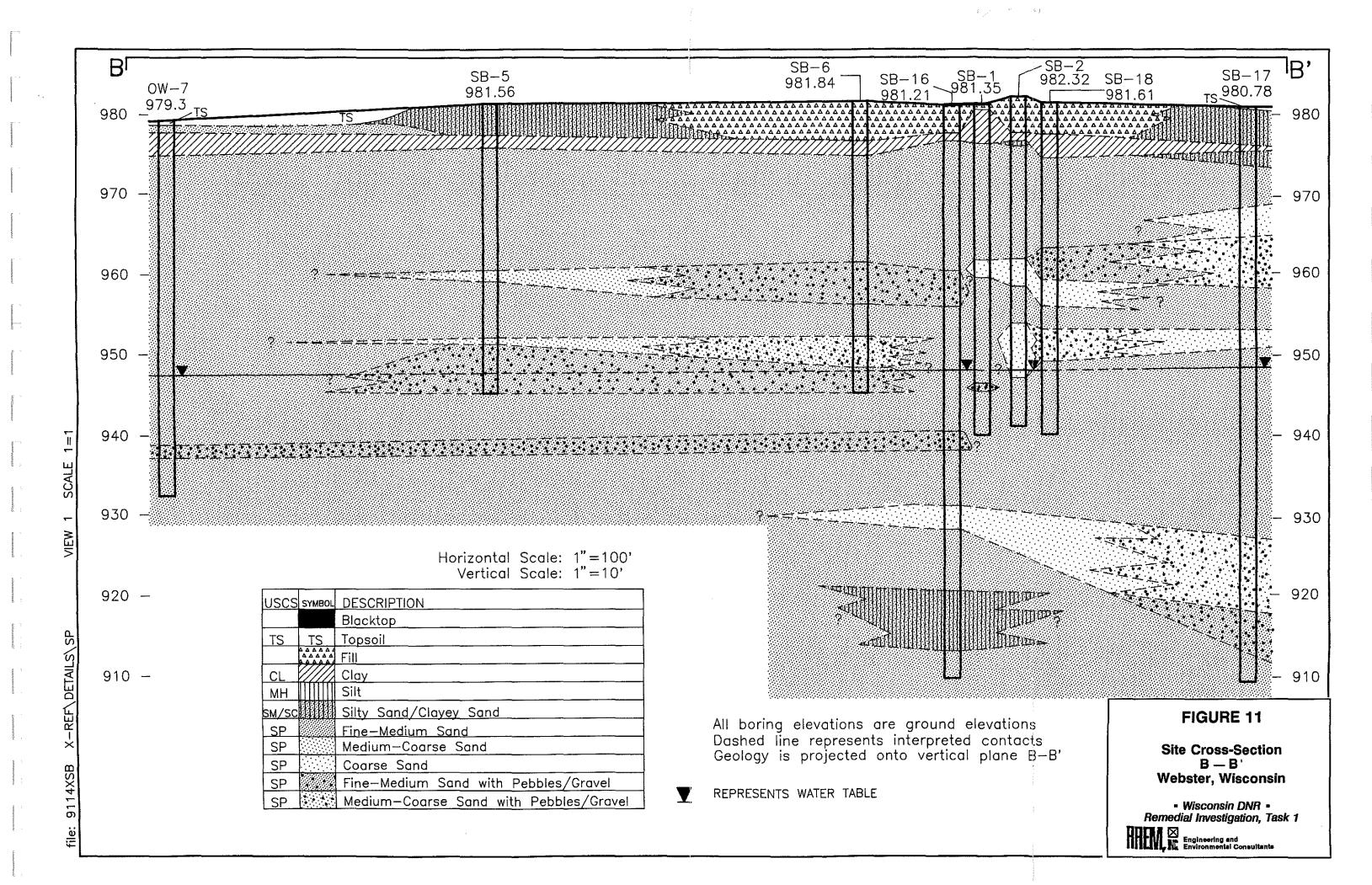
9114COMP VIEW 1

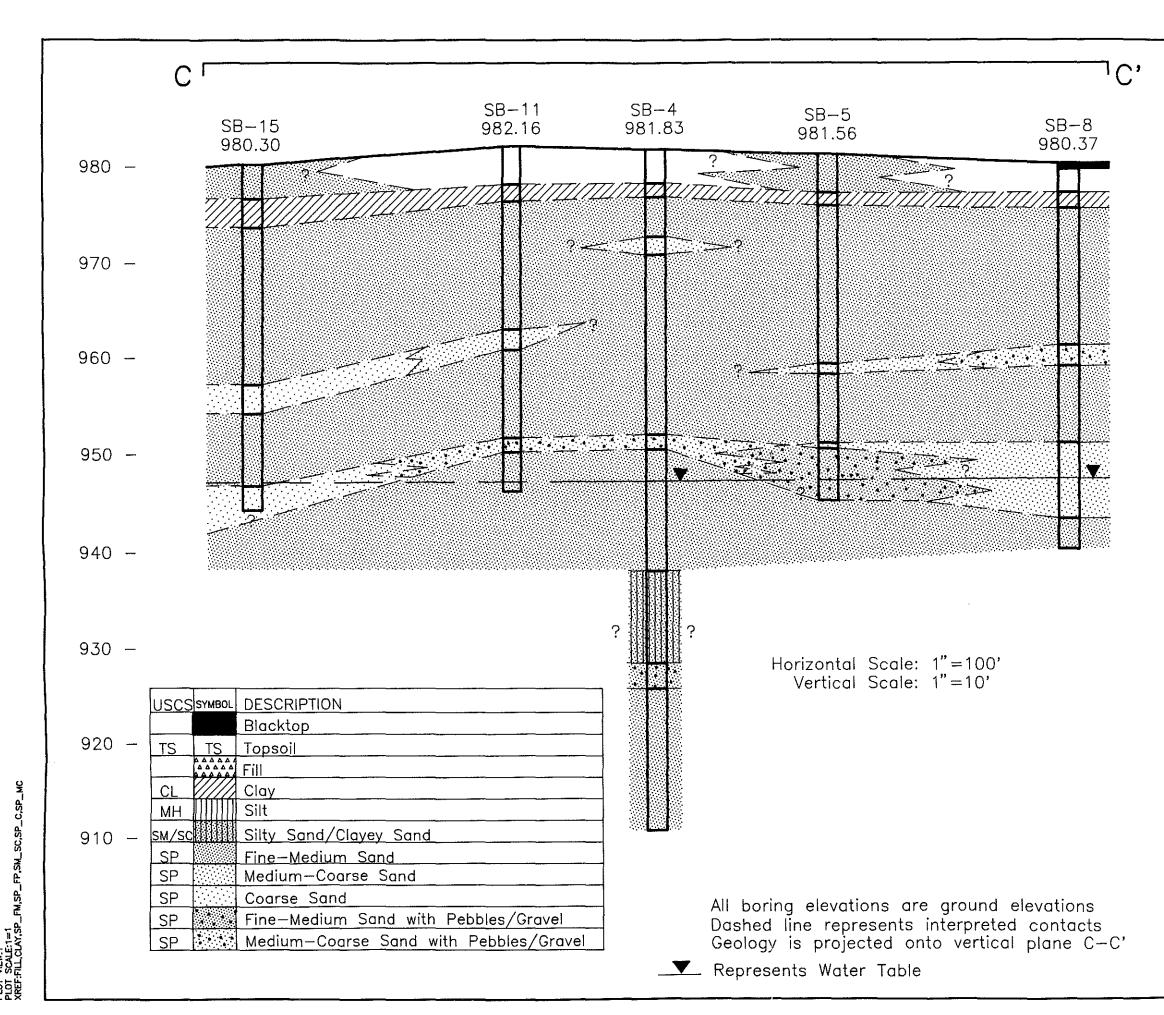
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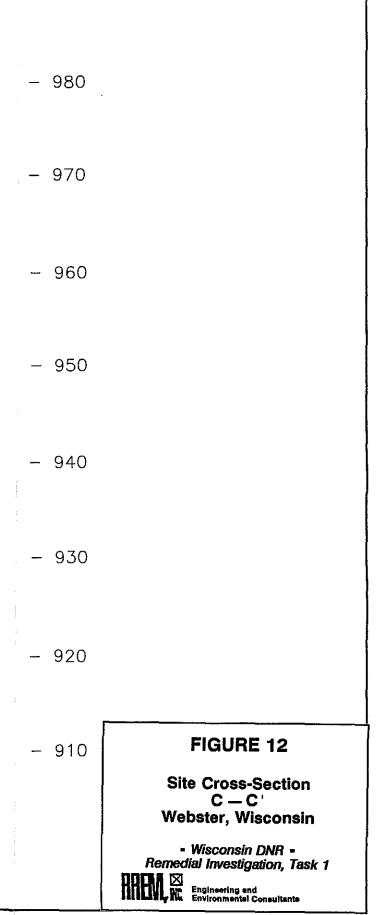


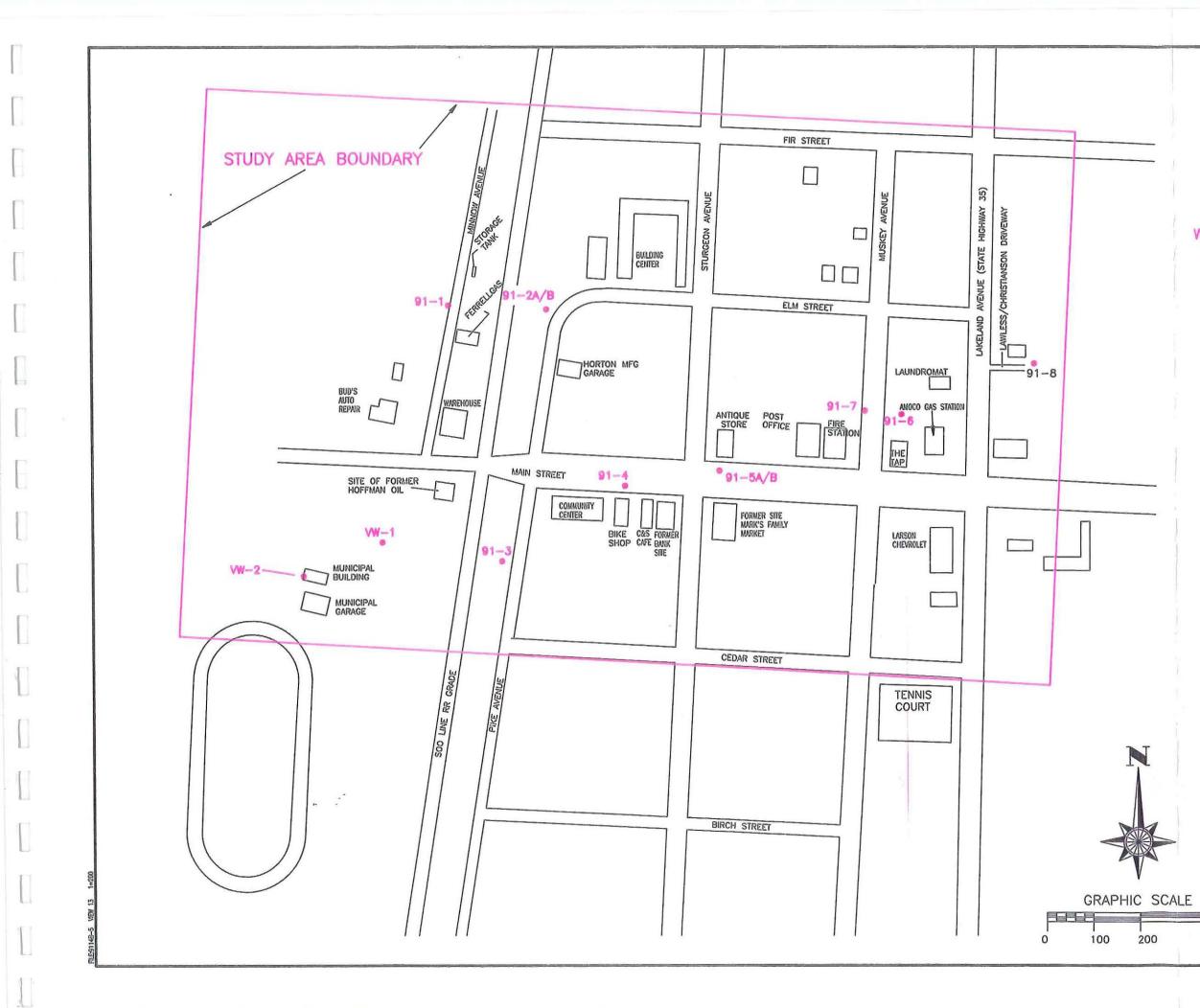




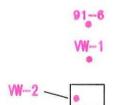
ame:9114XSC T VIEW:1 SCALE:1=1 :FILL,CLAY CT

PLOT PLOT XREF:









400'

LOCATION OF MONITORING WELL INSTALLED BY RREM (1991) LOCATION OF VILLAGE WELL 1

LOCATION OF VILLAGE WELL 2

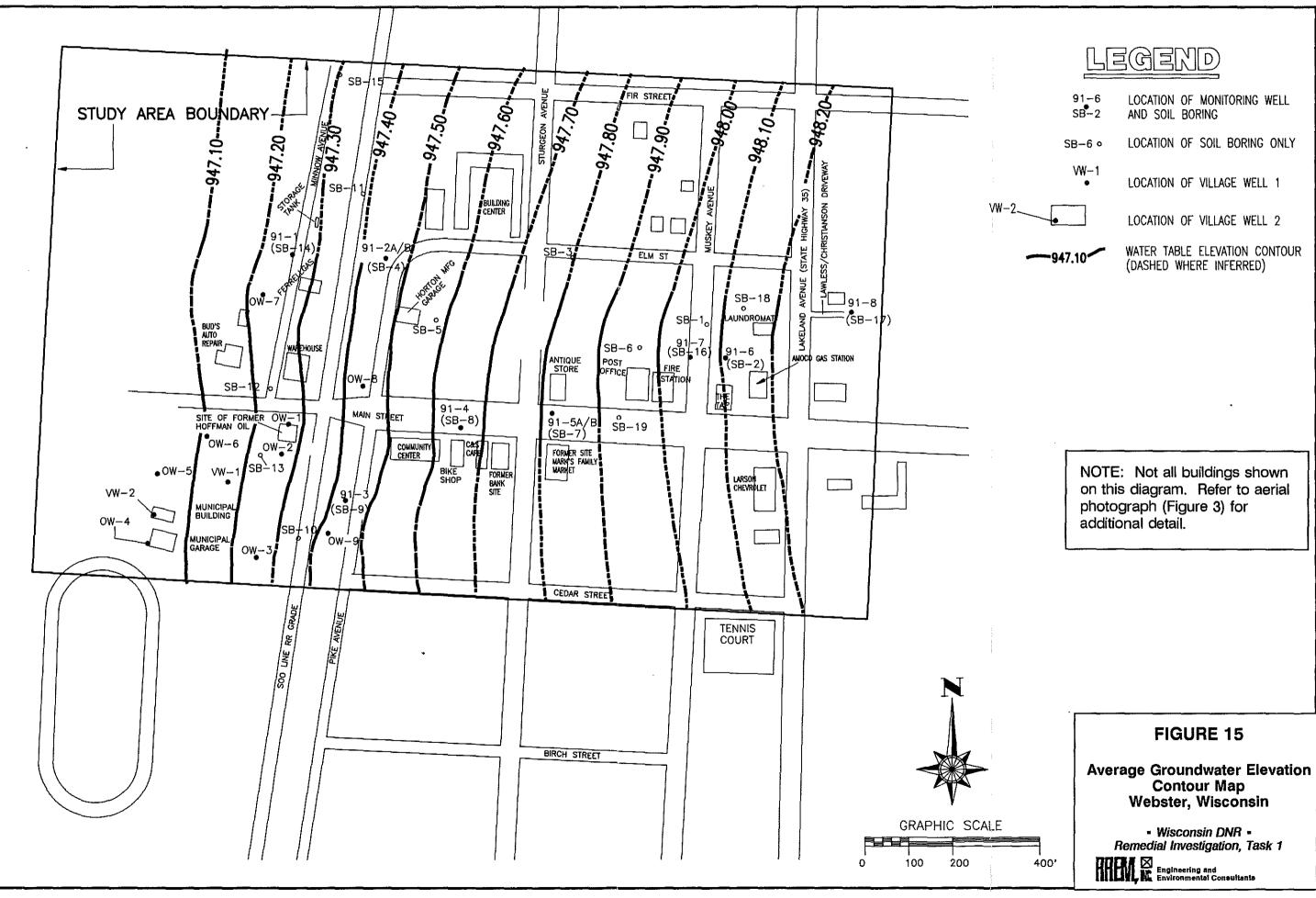
NOTE: Not all buildings shown on this diagram. Refer to aerial photograph (Figure 3) for additional detail.

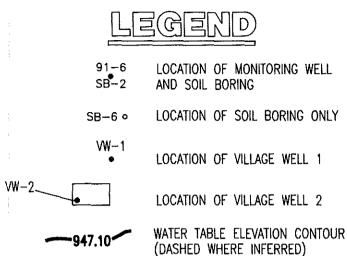
#### **FIGURE 13**

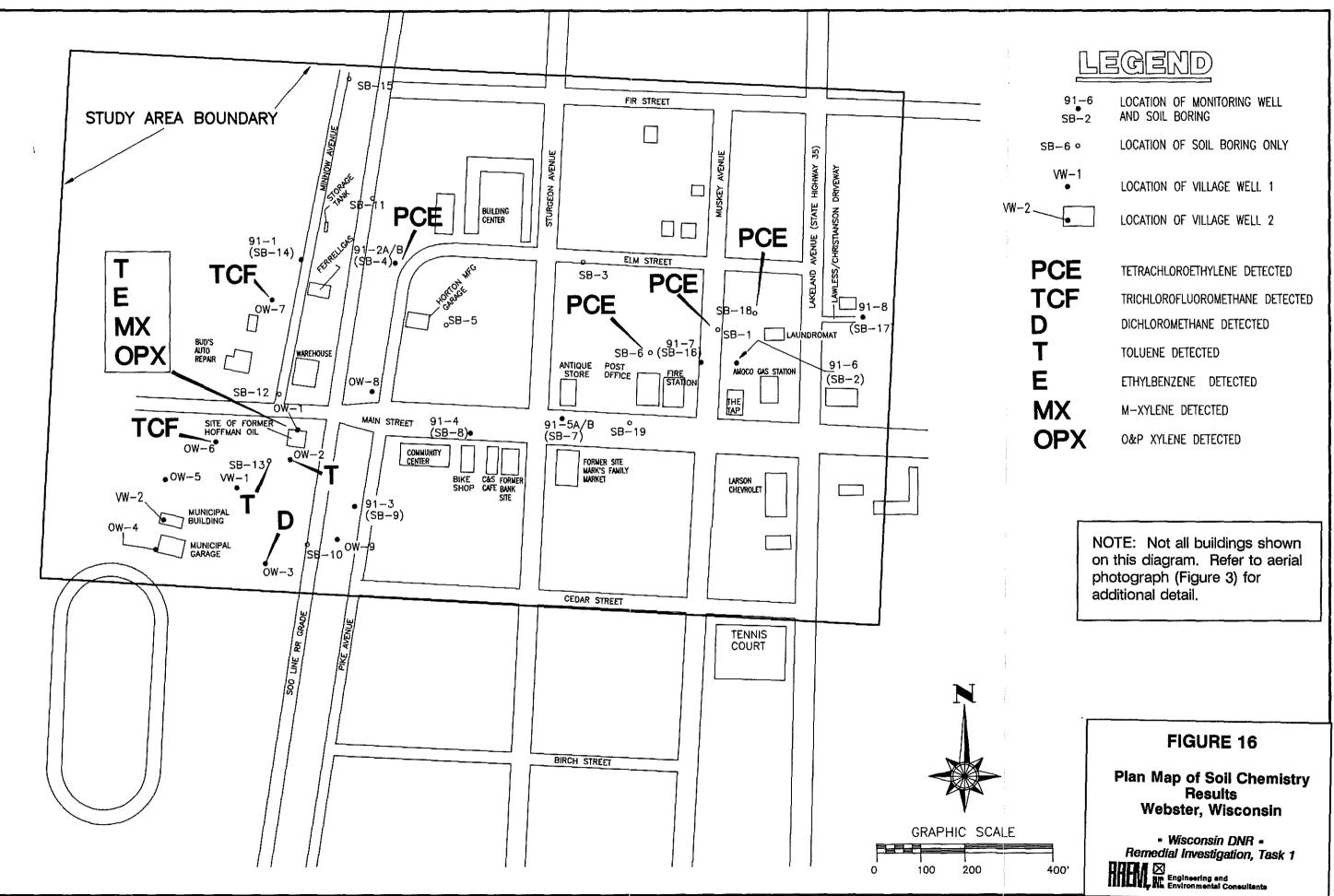
Locations of Monitoring Wells Installed by RREM, Inc. (& Webster Village Wells 1 & 2)

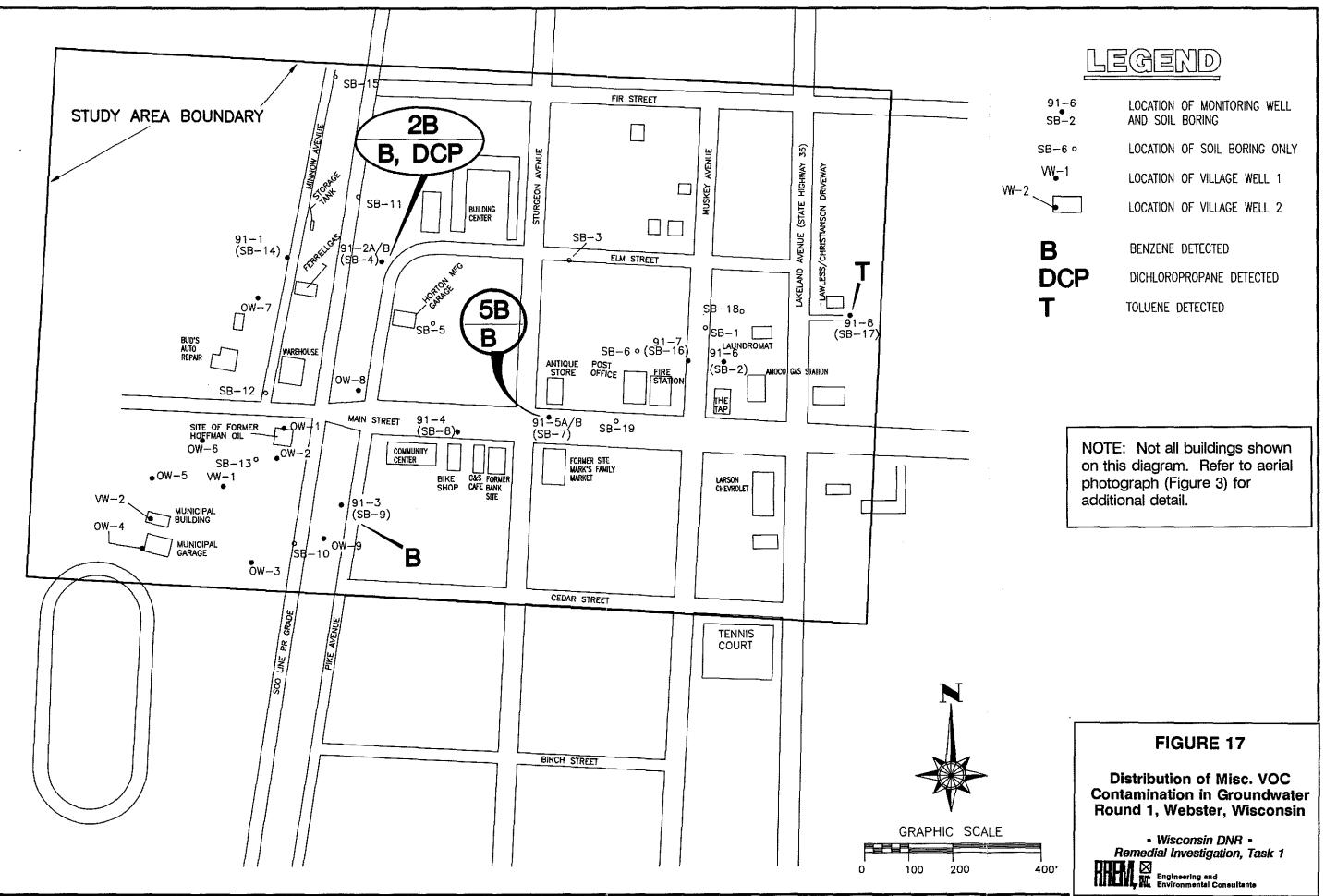
Wisconsin DNR
 Remedial Investigation, Task 1

Engineering and Environmental Consultants



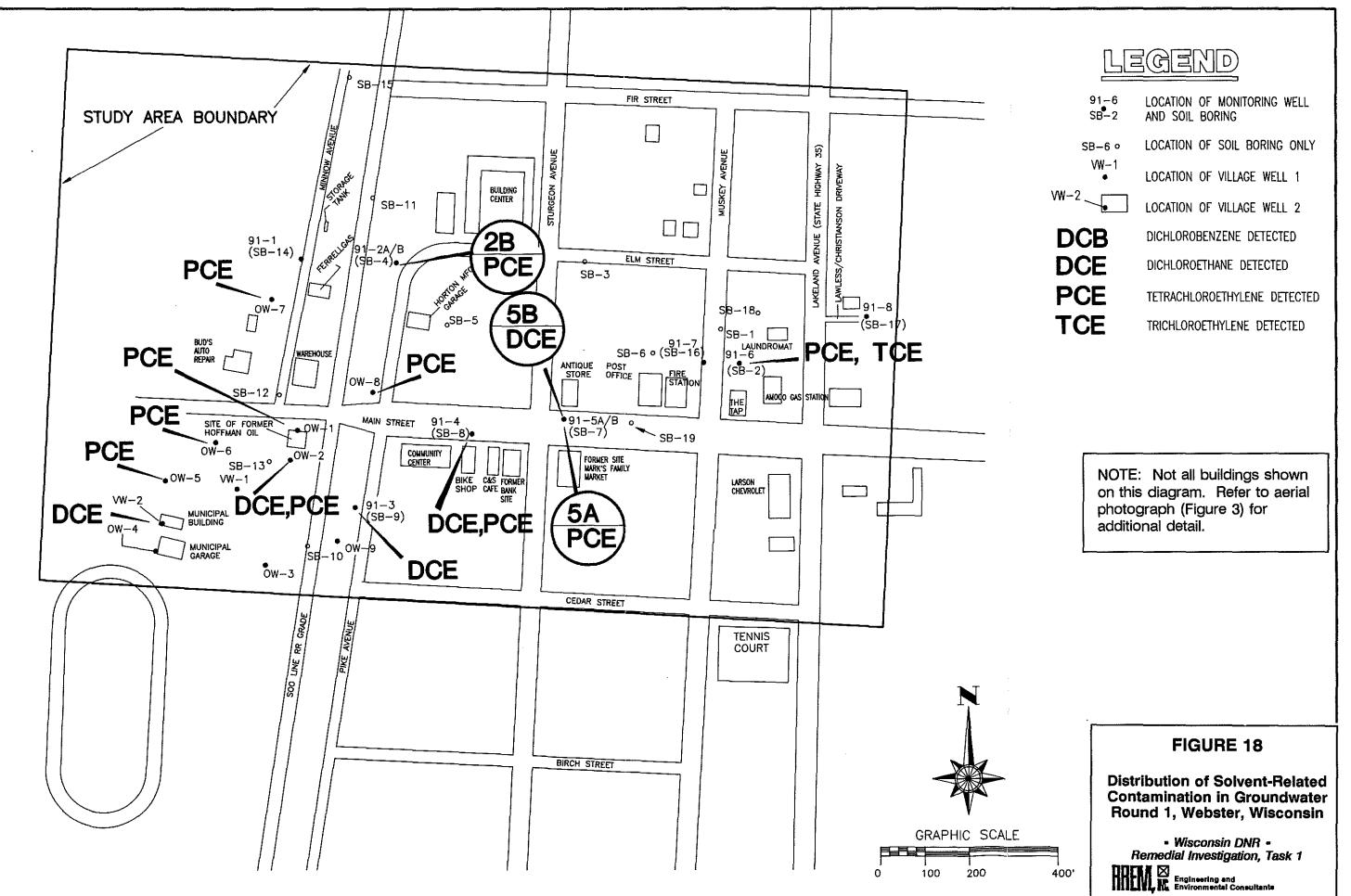


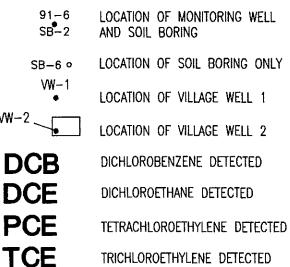


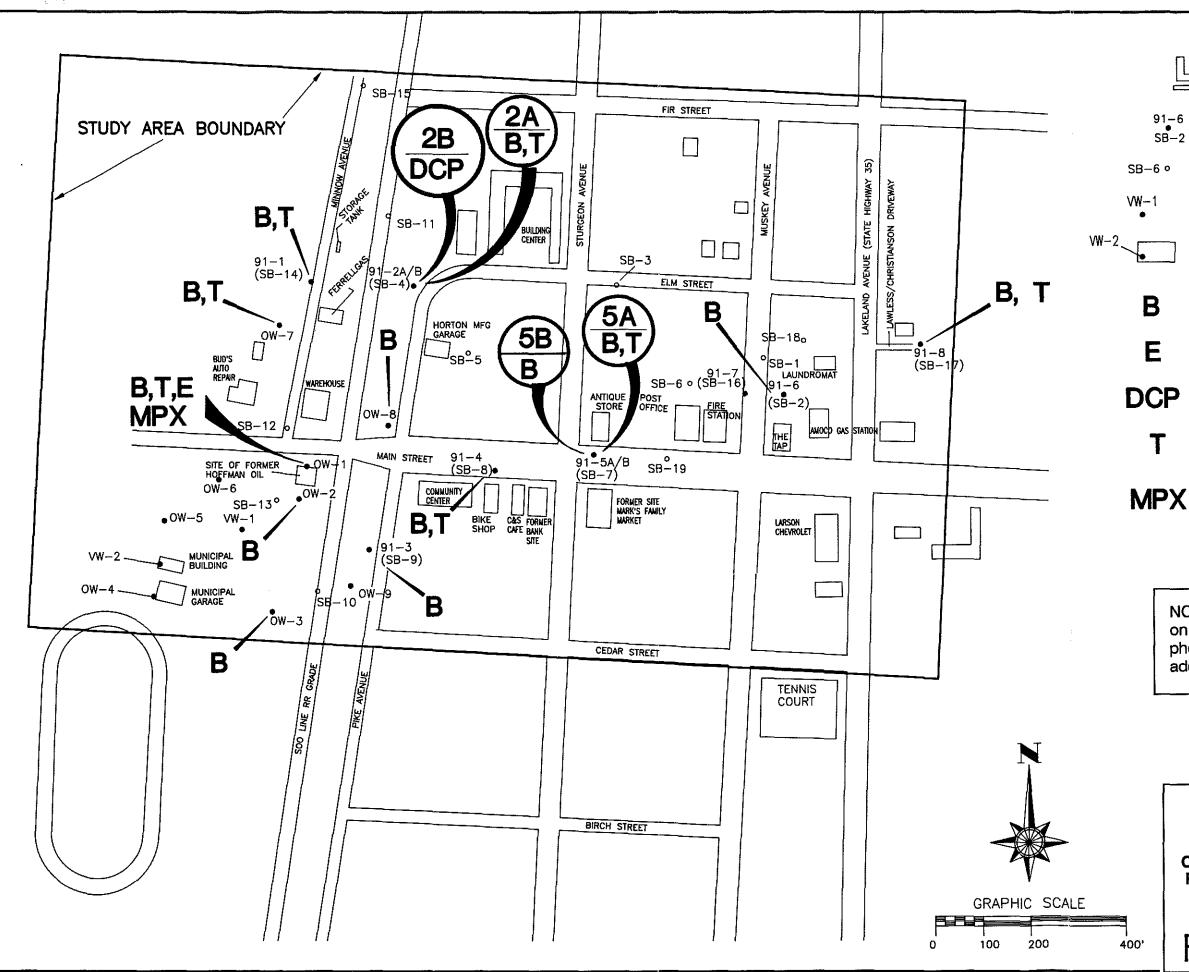




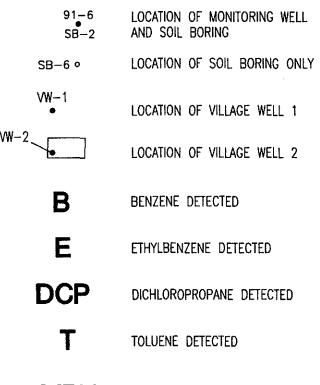
91- SB-	) -	LOCATION OF MONITORING WELL AND SOIL BORING
SB-0	6 0	LOCATION OF SOIL BORING ONLY
₩-2.	1	LOCATION OF VILLAGE WELL 1
vii-2		LOCATION OF VILLAGE WELL 2
В		BENZENE DETECTED
D	CP	DICHLOROPROPANE DETECTED
Т		TOLUENE DETECTED







### LEGEND



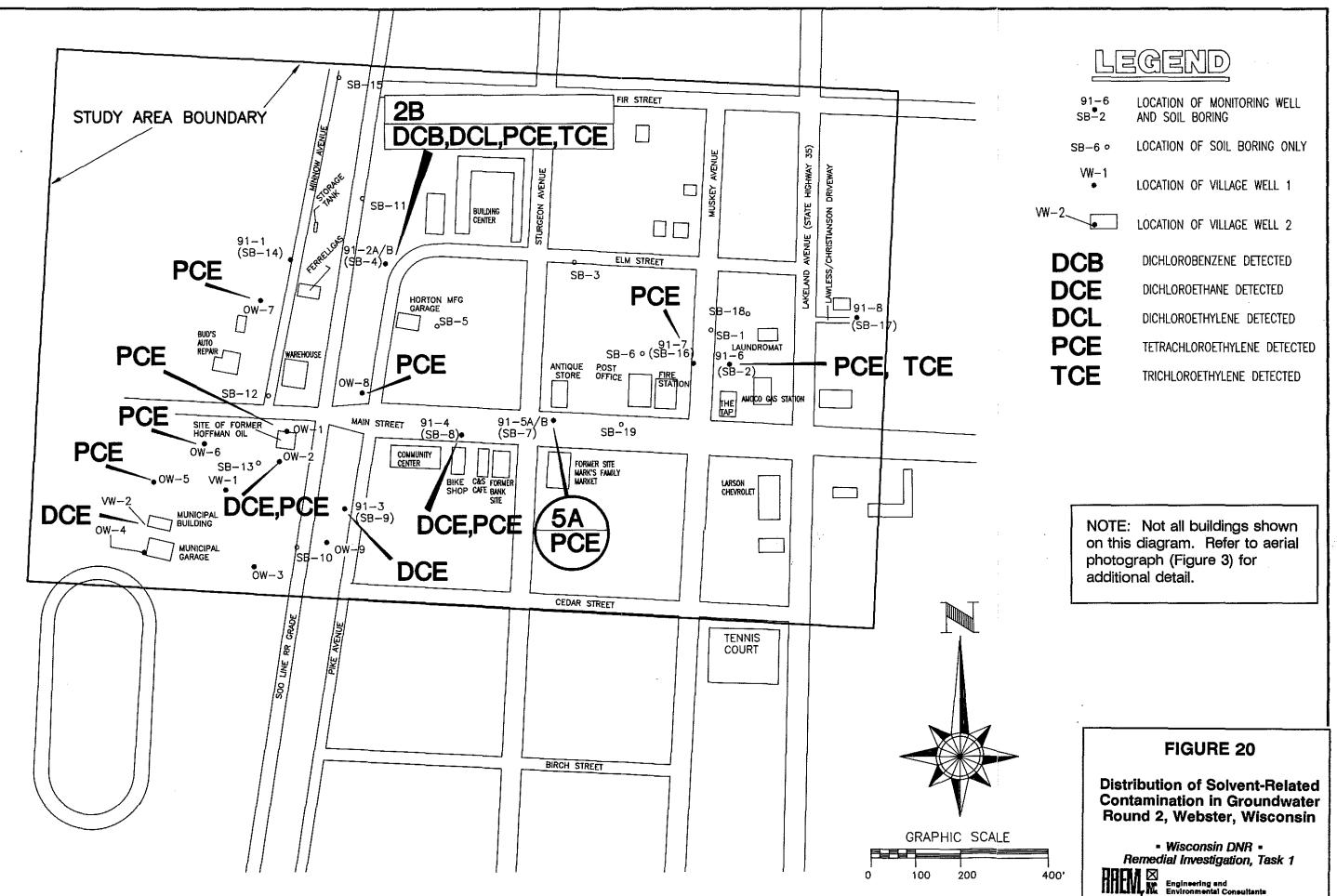
NOTE: Not all buildings shown on this diagram. Refer to aerial photograph (Figure 3) for additional detail.

M&P XYLENE DETECTED

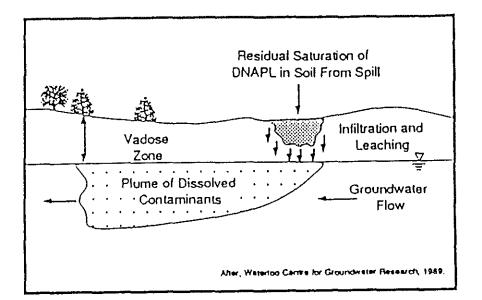
### **FIGURE 19**

Distribution of Misc. VOC Contamination in Groundwater Round 2, Webster, Wisconsin

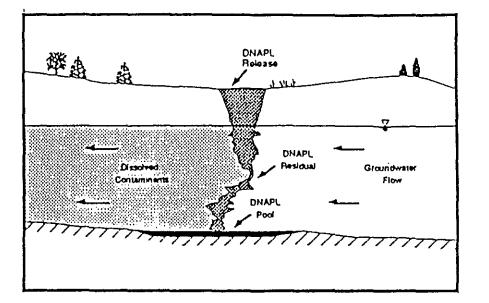
Wisconsin DNR =
 Remedial Investigation, Task 1
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 Engineering and
 Environmental Consultante



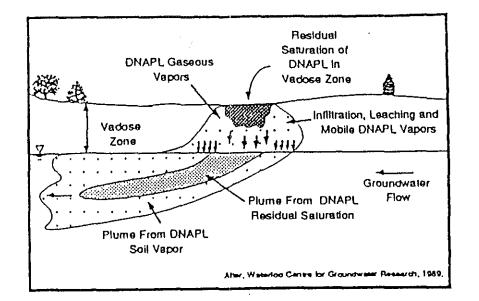
91-6 SB <sup>-</sup> 2	Location of Monitoring Well And Soil Boring
SB-6 °	LOCATION OF SOIL BORING ONLY
\W−1 ●	LOCATION OF VILLAGE WELL 1
₩-2 <b></b>	LOCATION OF VILLAGE WELL 2
DCB	DICHLOROBENZENE DETECTED
DCE	DICHLOROETHANE DETECTED
DCL	DICHLOROETHYLENE DETECTED
PCE	TETRACHLOROETHYLENE DETECTED
TCE	TRICHLOROETHYLENE DETECTED



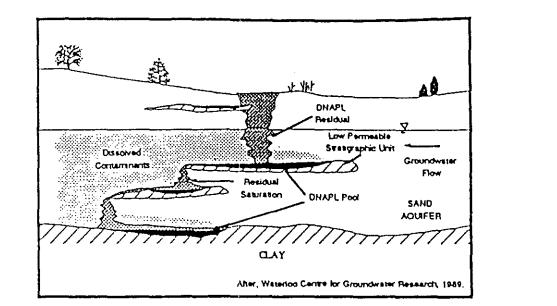
The entire volume of DNAPL is exhausted by residual saturation in the vadose zone prior to DNAPL reaching the water table. Soluble phase compounds may be leached from the DNAPL residual saturation and contaminate the ground water.



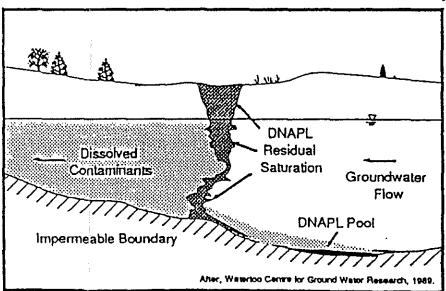
Migration of DNAPL through the vadose zone to an Impermeable boundary.

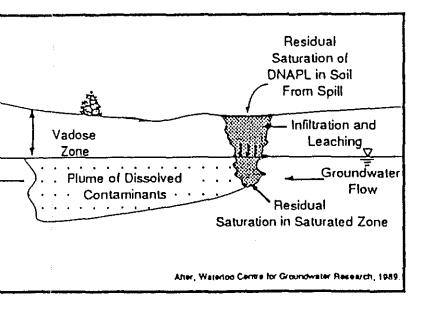


Migration of DNAPL vapors from the spill area and subsequent contamination of the soils and ground water.



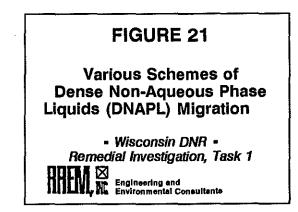
Perched and deep DNAPL reservoirs.

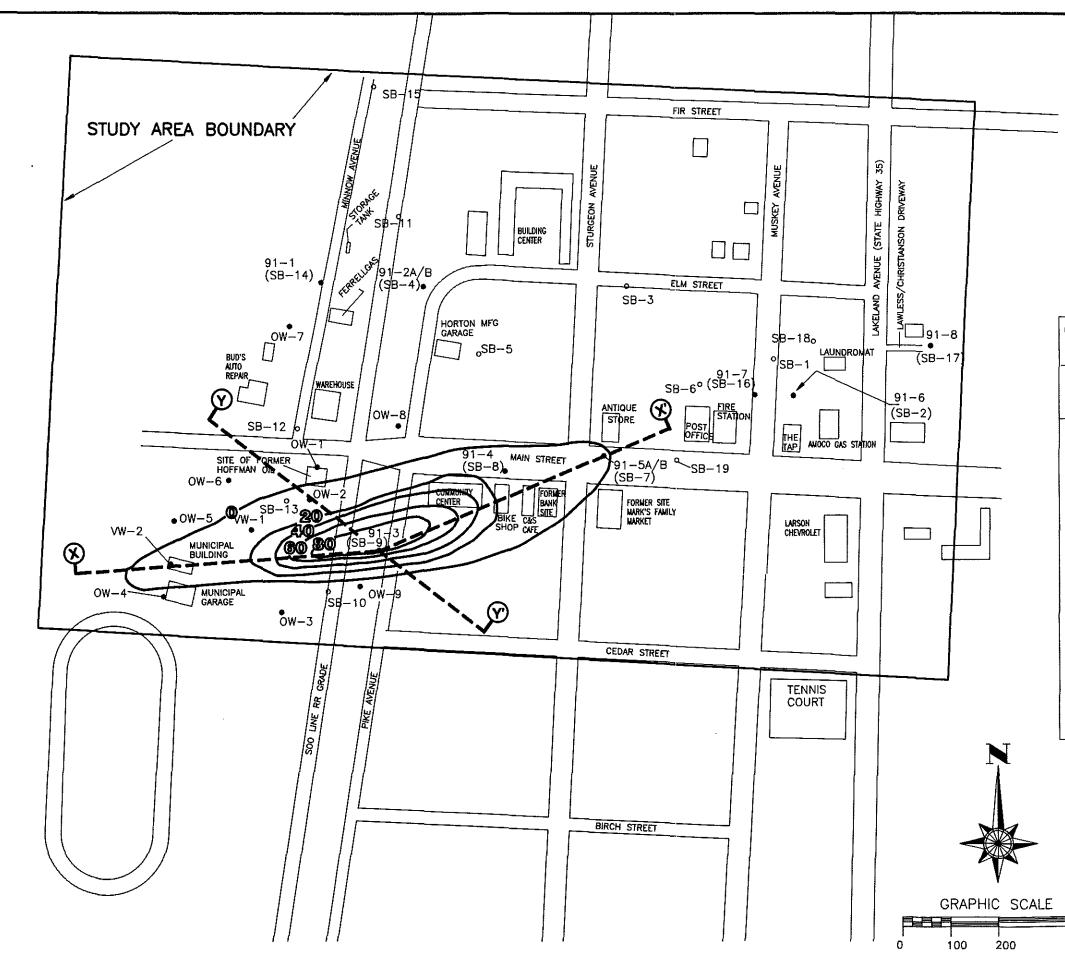




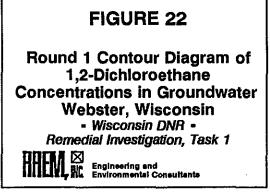
The volume of DNAPL is sufficient to overcome the residual saturation in the vadose zone and consequently penetrates the water table.

Stratigraphic gradient different from ground water gradient results in a different direction of flow of the ground water and continuous phase DNAPL.

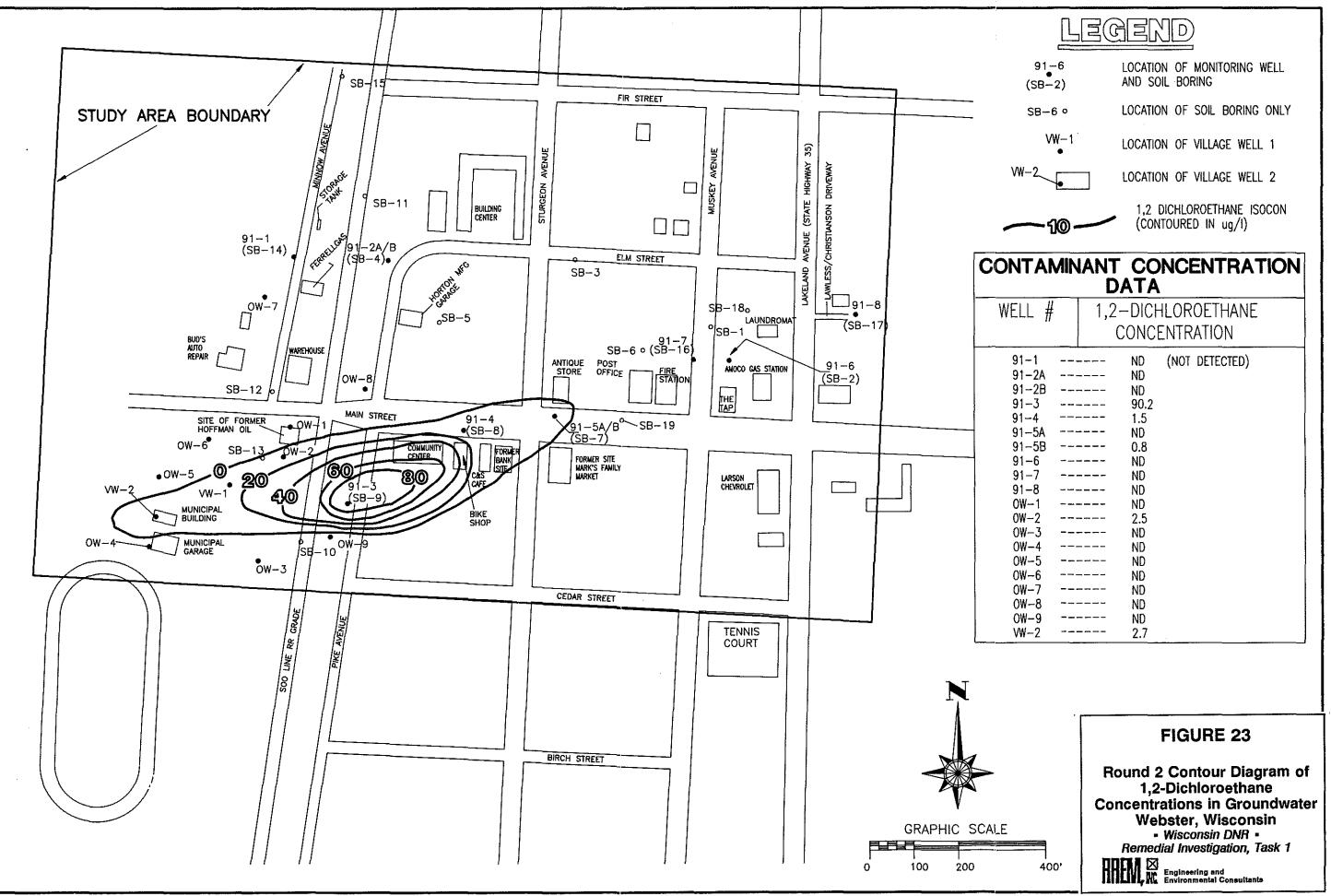




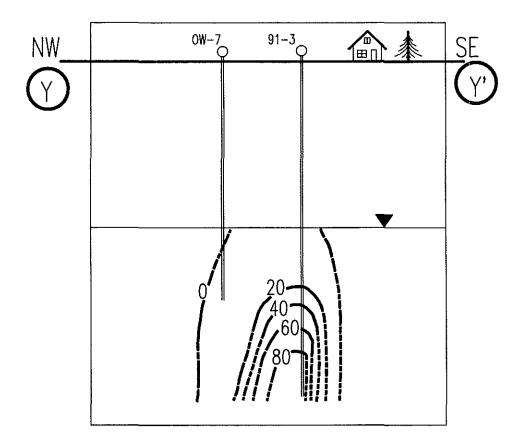
<u>, , , , , , , , , , , , , , , , , , , </u>	LEGEND
91-6 (SB-2) SB-6 ° VW-1	LOCATION OF MONITORING WELL AND SOIL BORING LOCATION OF SOIL BORING ONLY LOCATION OF VILLAGE WELL 1 LOCATION OF VILLAGE WELL 2
×	CENTERLINES OF CONCEPTUAL CONTAMINANT PLUME X-SECTIONS
<u></u>	1,2 DICHLOROETHANE ISOCON (CONTOURED IN ug/I)
CONTAMIN	ANT CONCENTRATION DATA
WELL #	1,2-DICHLOROETHANE CONCENTRATION
91-1 91-2A 91-2B 91-3 91-5A 91-6 91-7 91-8 0W-1 0W-2 0W-3 0W-5 0W-6 0W-7 0W-8 0W-9 VW-2	ND       (NOT DETECTED)         ND       ND         ND       83.6         ND       83.6         ND       0.8         ND       0.8         ND       ND         ND <td< th=""></td<>

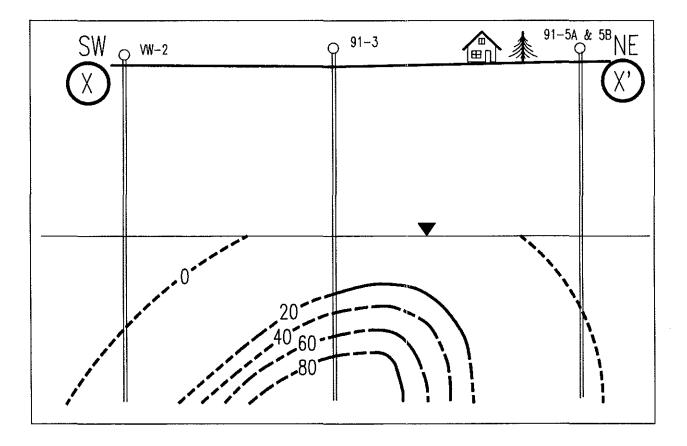


400'

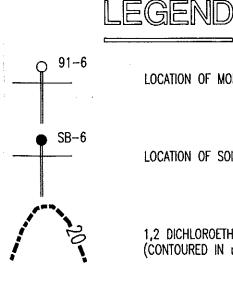


LEGEND					
91-6 (SB-2)	LOCATION OF MONITORING WELL AND SOIL BORING				
SB-6 °	LOCATION OF SOIL BORING ONLY				
VW-1	LOCATION OF VILLAGE WELL 1				
VW-2	LOCATION OF VILLAGE WELL 2				
<u> </u>	1,2 DICHLOROETHANE ISOCON (CONTOURED IN ug/I)				
CONTAMIN	IANT CONCENTRATION DATA				
WELL #	1,2-DICHLOROETHANE CONCENTRATION				
91-1 91-2A 91-2B 91-3 91-4 91-5B 91-6 91-6 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5 0W-6 0W-7 0W-8 0W-9 0W-2	ND       (NOT DETECTED)         ND       90.2          ND          ND				





SCALE 1=1 23 VIEW FILE: 9114B-4 .,...



LOCATION OF MONITORING WELL

LOCATION OF SOIL BORING

1,2 DICHLOROETHANE ISOCON (CONTOURED IN ug/I)

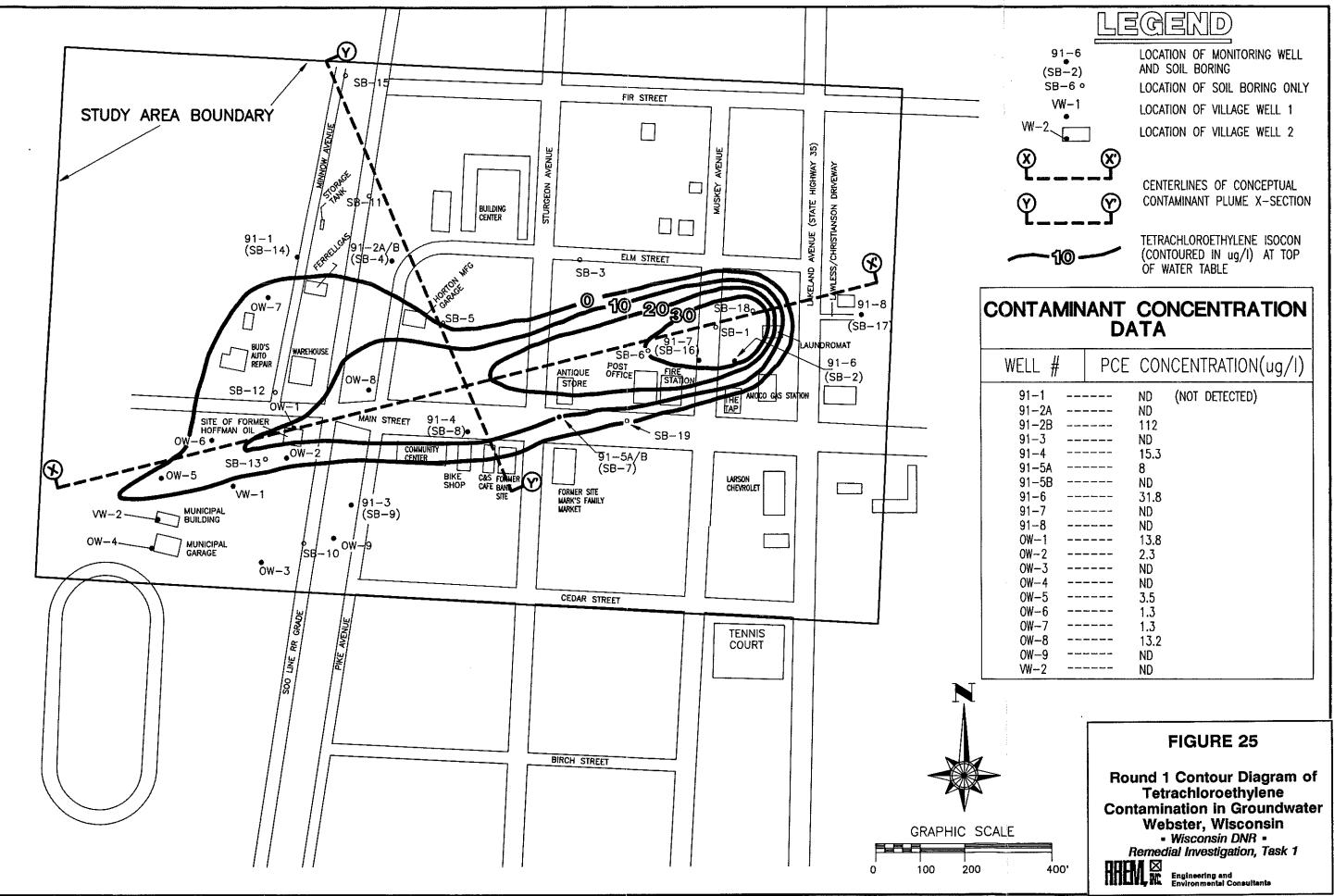
WATER TABLE

HORZ. SCALE 1"=200' VERT. SCALE 1"=20'

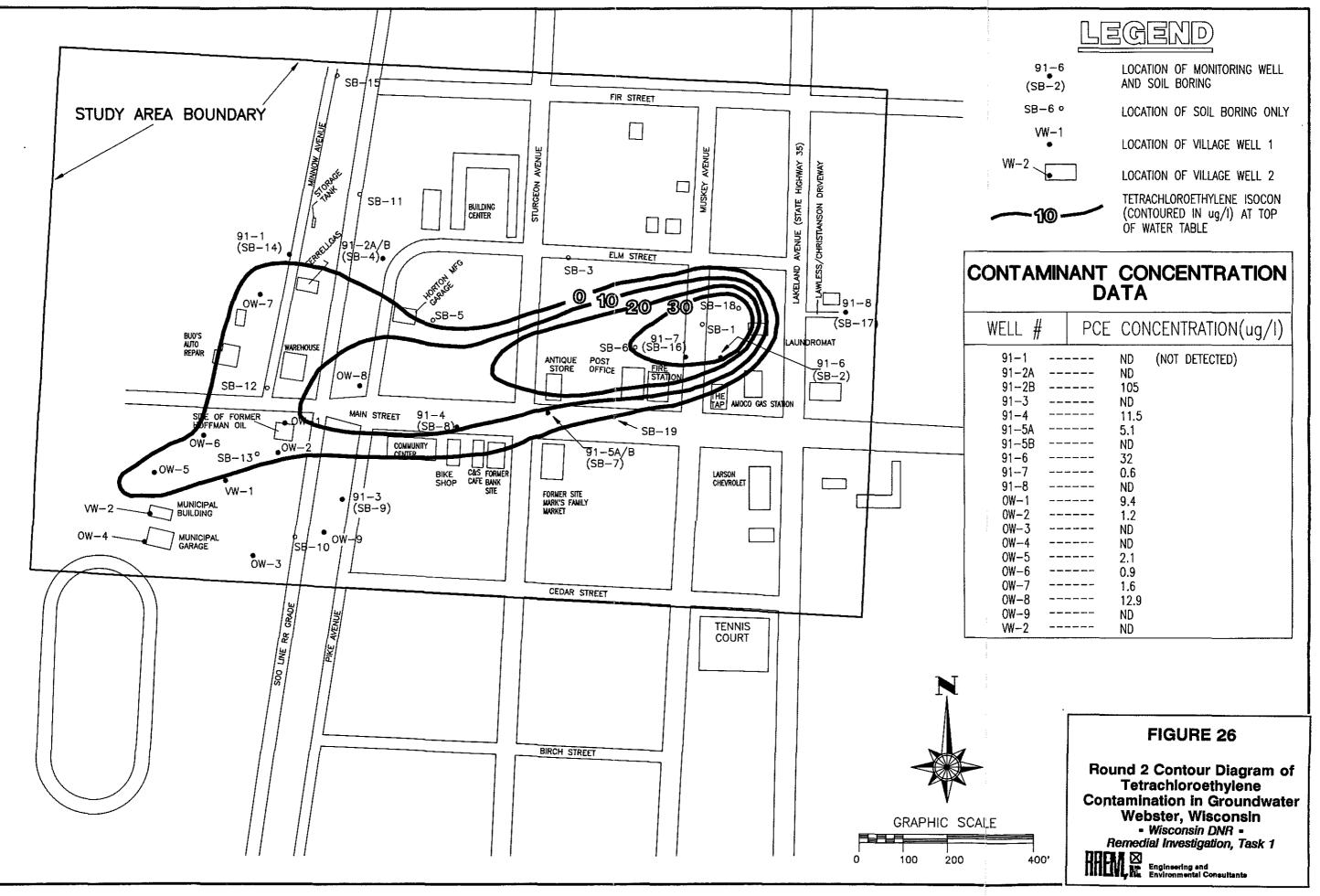
### FIGURE 24

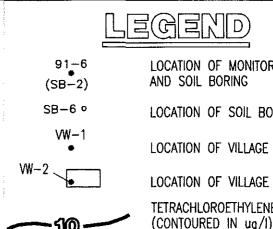
Conceptual Vertical Distribution of 1,2-Dichloroethane Contamination in Groundwater Webster, Wisconsin - Wisconsin DNR -Remedial Investigation, Task 1

Engineering and Environmental Consultants

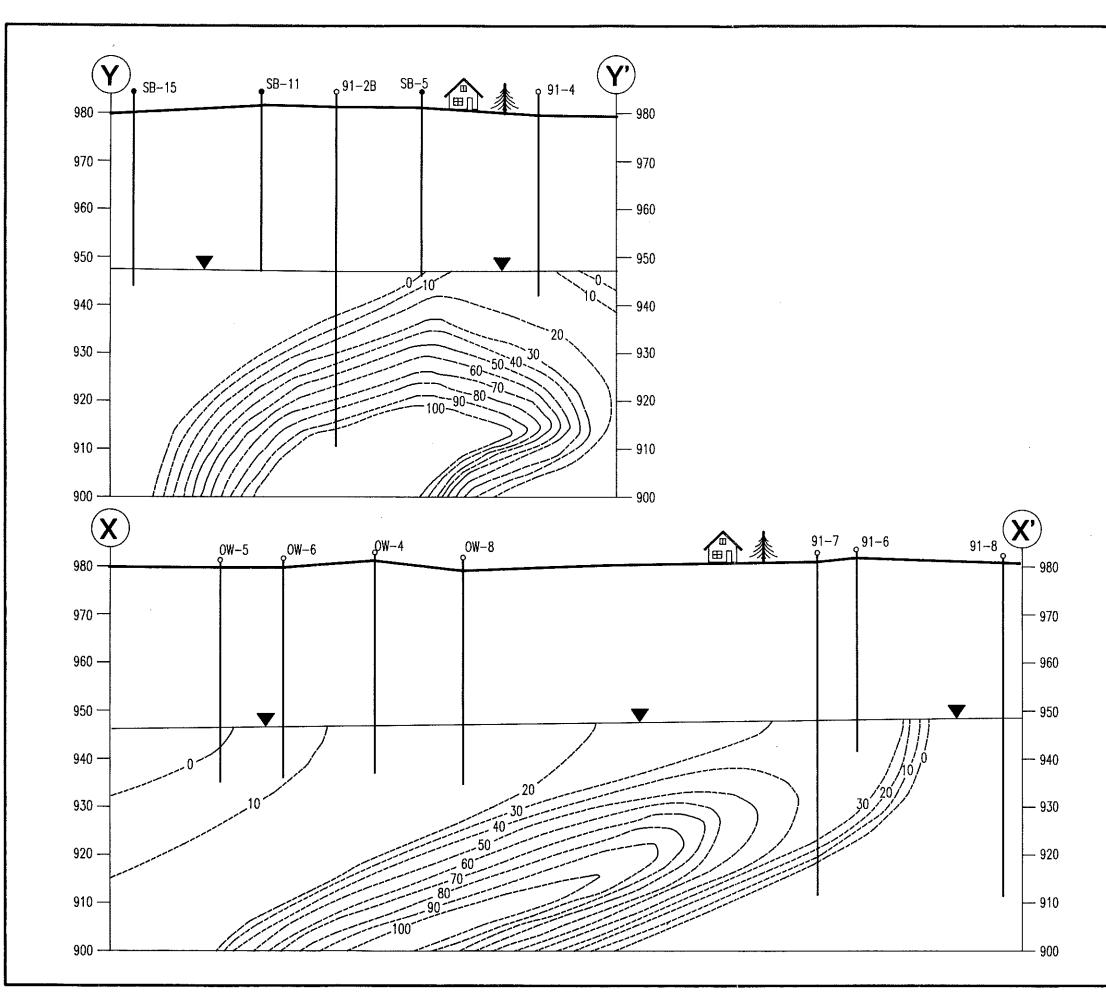


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91-6 (SB-2)		LOCATION OF MONITORING WELL AND SOIL BORING
SB-6 9	,	LOCATION OF SOIL BORING ONLY
₩-1		LOCATION OF VILLAGE WELL 1
₩-2 <b>_</b>		LOCATION OF VILLAGE WELL 2
 ⊘	່໑	
Ŷ	 	CENTERLINES OF CONCEPTUAL CONTAMINANT PLUME X-SECTION
<u> </u>	~	TETRACHLOROETHYLENE ISOCON (CONTOURED IN ug/I) AT TOP OF WATER TABLE
CONTAMIN		CONCENTRATION
	DA	ATA
WELL #		CONCENTRATION(ug/I)
WELL #		CONCENTRATION(ug/l)
91-1 91-2A		CONCENTRATION(ug/I)
91-1 91-2A 91-2B		CONCENTRATION(ug/I) ND (NOT DETECTED) ND 112
91-1 91-2A 91-2B 91-3		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND
91-1 91-2A 91-2B 91-3 91-4		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3
91-1 91-2A 91-2B 91-3		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-8		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND ND
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-8 0W-1		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND ND 13.8
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-8 0W-1 0W-2		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND 13.8 2.3
91-1 91-2A 91-2B 91-3 91-4 91-5B 91-5B 91-6 91-7 91-8 0W-1 0W-2 0W-3 0W-4		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND ND 13.8
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND ND 13.8 2.3 ND ND 3.5
91-1 91-2A 91-2B 91-3 91-5A 91-5B 91-6 91-7 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5 0W-6		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND 31.8 ND 13.8 2.3 ND ND 3.5 1.3
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5 0W-6 0W-7		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND 31.8 ND 13.8 2.3 ND ND 3.5 1.3 1.3
91-1 91-2A 91-2B 91-3 91-4 91-5B 91-6 91-7 91-8 0W-1 0W-2 0W-3 0W-5 0W-6 0W-7 0W-8		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND 31.8 ND ND 13.8 2.3 ND ND 3.5 1.3 1.3 13.2
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5 0W-6 0W-7		CONCENTRATION(ug/l) ND (NOT DETECTED) ND 112 ND 15.3 8 ND 31.8 ND 31.8 ND 13.8 2.3 ND ND 3.5 1.3 1.3





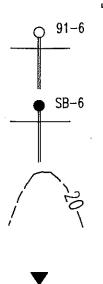
		<u></u>				
CONTAMINANT CONCENTRATION DATA						
WELL #		PCE	CONCENTRATION(ug/I)			
91-1 91-2A 91-2B 91-3 91-4 91-5A 91-5B 91-6 91-7 91-8 0W-1 0W-2 0W-3 0W-4 0W-5 0W-6 0W-7 0W-8 0W-9			ND (NOT DETECTED) ND 105 ND 11.5 5.1 ND 32 0.6 ND 9.4 1.2 ND ND 2.1 0.9 1.6 12.9 ND			



FILE: 9114B-4 VIEW 26 SCALE

II

FGFND



LOCATION OF MONITORING WELL

LOCATION OF SOIL BORING

TETRACHLOROETHYLENE ISOCON (CONTOURED IN ug/l)

WATER TABLE

HORZ. SCALE 1"=200' VERT. SCALE 1"=20'

### FIGURE 27

Conceptual Vertical Distribution of Tetrachloroethylene Contamination in Groundwater Webster, Wisconsin • Wisconsin DNR • Remedial Investigation, Task 1

> Engineering and Environmental Consultants