

FINAL REPORT



**GROUNDWATER REMEDIAL
ACTIONS OPTIONS EVALUATION
REPORT**

**DB OAK FACILITY
700 – 710 OAK STREET
FORT ATKINSON,
JEFFERSON COUNTY
WISCONSIN**

Prepared for

Gardner Denver, Inc
1800 Gardner Expressway
Quincy, Illinois 62305

April 2009



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Project No. 0451-003-800



April 23, 2009

Janet DiMaggio
Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711

RE: WDNR BRRTS No. 03-28-176509
Groundwater Remedial Action Options Evaluation Report
D.B. Oak Facility, 700-710 Oak Street, Ft. Atkinson, Wisconsin

Dear Ms. DiMaggio:

On behalf of Garner Denver, please find enclosed our Groundwater Remedial Action Options Evaluation Report for the DB Oak property in Fort Atkinson, Wisconsin. In accordance with recommendations presented in this report, a Work Plan for nutrient injection to enhance in-situ biological reductive dechlorination will be submitted to WDNR under separate cover in the near future. The work plan will also include a request for an exemption to NR 140.28 (5), which is required for when injection and infiltration are used for remediation.

If you have any questions please call us at (608) 442-5223.

Sincerely,

NEWFIELDS

David P. Trainor
Principal

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Senior Geologist

cc: Mr. Mark T. Chiado, Gardner Denver, Inc

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Executive Summary

The DB Oak property is located at 700 -710 Oak Street in Fort Atkinson, Wisconsin. It is a triangular shaped parcel bordered by East Cramer Street to the north, Oak Street to the west-southwest, and the Union Pacific (formerly Chicago and Northwest) rail line to the east-southeast. A large building over 180,000 square feet in size and driveways and parking lots are located on the property. Residential lighting fixtures were manufactured at this facility by Thomas Industries or prior companies between 1939 and 1985 when Thomas sold the facility. The property is currently owned by DB Oak and the building is leased by 5Alarm Fire and Safety Equipment Inc. and Carnes and Associates as warehouse space.

In March 1994, soil and groundwater contamination was identified at the DB Oak property near a former tetrachloroethene (PCE) storage tank removed prior to Thomas sale of the property. The release was subsequently reported to the WDNR, and the Agency requested that Thomas Industries complete a site investigation to identify the lateral and vertical extent of subsurface contamination associated with the PCE release. Several phase of investigation were completed between 2004 and 2007. Investigation results indicate that groundwater quality has been impacted by chlorinated VOCs. PCE is the primary constituent of concern that exceeded groundwater quality standards, but degradation products of PCE (TCE, cis-DCE, 1,1-DCE, and vinyl chloride), and trans-DCE also exceed groundwater quality standards.

Soil samples collected in May 2005 from Geoprobe borings advanced near the former PCE tank and loading dock areas indicate the east side of the DB Oak facility building is the source areas for groundwater contamination. Contaminants are absorbed to the fine-grained soil matrix encountered in the saturated and unsaturated zones in this source area. Because groundwater is encountered at shallow depths, these contaminated soils are a source for groundwater contamination. The highest concentrations of chlorinated VOCs were detected in samples collected from MW-3 located adjacent to facility loading docks, and from MW-4 located adjacent to the former PCE tank. Elevated concentrations of chlorinated VOCs were also detected in samples collected from down gradient well MW-2. Samples collected from piezometer MW-3A, MW-3B, and MW-3C indicate that contaminants have migrated vertically at this location. Samples collected from down gradient piezometer MW-2A and side gradient piezometer MW-7A indicate contaminant have also migrated at depth from the source area. Chlorinated VOCs were not detected in samples collected from down gradient wells MW-6 and MW-6A located approximately 600 feet south of the property, or in samples collected from side gradient wells MW-1, MW-7, MW-7B, MW-8, MW-8A, and MW-8B.

Executive Summary

Thomas Industries elected to implement a remedial response for soil remediation using soil vapor extraction (SVE) prior to groundwater remediation. The SVE was installed in the loading dock area and former PCE tank areas on the east side of the facility building between October and December 2006. Final grading was completed in March 2007, and a construction documentation report was submitted to WDNR in May 2007. The SVE system has operated from mid-July 2007 to the end of the year, but was occasionally turned off during high water table conditions. A SVE system quarterly progress report was submitted to WDNR on December 6, 2007 summarizing results for the first three months of operation. As described in that report effluent air sample results indicate that the SVE system is removing chlorinated VOCs from the subsurface. Effluent concentrations measured after three months of operation were approximately half the concentration detected in the effluent samples collected after system startup. Additionally, soil samples collected in October 2007 indicate that target clean up standards have been achieved at six of the seven soil sample locations.

No additional soil remediation is planned because target clean up goals for soil have been achieved. Removal of VOCs by SVE will reduce contaminant flushing from the unsaturated zone, but contaminants remain in the saturated zone. Consequently, potential remedial alternatives for groundwater were evaluated in this report. A total of 15 remedial technologies were screened, and the following five remedial responses for groundwater were retained for further evaluation in accordance with Wisconsin Administrative Code NR 722 requirements:

- Option 1 Source removal using groundwater extraction system;
- Option 2 Source removal using electrical resistance heating;
- Option 3 In-situ treatment using chemical oxidation;
- Option 4 In-situ treatment using biological reductive de-chlorination; and
- Option 5 In-situ treatment using ozone sparging.

NR 722 criteria used to evaluate each alternative included the short-term effectiveness, the long-term effectiveness, the implementability, and restoration time frame. Cost estimates for implementing each remedial response were also prepared. Implementation costs include construction, engineering, and operation, maintenance, and monitoring (OM&M) costs. The remediation time frame and implementation costs are dependent upon the selected remediation technology. OM&M costs are dependant upon the remediation time frame, and construction costs are dependent upon the selected remedial technology.

Executive Summary

Option 2 has a shorter restoration time frame than Options 1 and 5, but yielded the highest implementation costs. Total costs for Options 1, 2 and 5 increases with the longer restoration time frames due to a cumulative increase in long term OM&M costs. Options 3 and 4 yielded the shortest estimated restoration time frames, but total costs for Option 3 and 4 increases with the number of in-situ treatment applications needed. Option 3 yielded the largest range of estimated costs indicating that this remedial response is sensitive to the number of applications needed to reduce contamination to acceptable levels. Although the restoration time frame would be longer, ozone sparge (Option 5) is the lower cost in-situ chemical oxidation technology compared to reagent injection (Option 3). Regardless, the estimated high cost scenario for Option 4 yielded a cost lower than the most likely scenario costs for the remaining options. Implementation costs for Option 4 are low because the existing SVE lateral piping can be used for treatment of the shallow groundwater plume; costs for installation of the SVE system were not included in this evaluation.

NewFields recommends implementation of Option 4 (in-situ biological reductive dechlorination). Based on the evaluation of potential remedial responses evaluated in this report, Option 4 has the shortest estimated restoration time frame and the lowest estimated costs. It is also effective as a short term and long term remedial response. Because the existing SVE lateral piping can be used, implementation of Option 4 will result in minimal site disturbance compared to the remaining alternatives evaluated in this report. Additionally, this remedial alternative is suitable to existing site conditions. Groundwater monitoring results indicate that reductive dechlorination is already occurring; nutrient injection will enhance this process.

A Work Plan for nutrient injection to enhance in-situ biological reductive dechlorination will be submitted to WDNR under separate cover. The work plan will include a detailed description for implementation and monitoring to evaluate the effectiveness of this remedial response. The work plan will also include a request for an exemption to NR 140.28 (5), which is required for when injection and infiltration are used for remediation.

1.1 SITE DESCRIPTION

The DB Oak property is located at 700 -710 Oak Street in Fort Atkinson, Wisconsin. As shown on Figure 1, the site is located on the north side of Fort Atkinson in the west ½ of the southwest ¼ of Section 34, Township 6 north, Range 14 east. The property is relatively flat and lies at an approximate elevation of 790 feet above mean sea level (MSL). In the vicinity of the site, regional topography slopes to the east and south towards the Rock River.

The DB Oak property is a triangular shaped parcel bordered by East Cramer Street to the north, Oak Street to the west-southwest, and the Union Pacific (formerly Chicago and Northwest) rail line to the east-southeast. A large building over 180,000 square feet in size and driveways and parking lots are located on the property. A parking lot and driveway accessible from North Main Street to the west and Oak Street to the south is located on the west side of the facility building. A gravel driveway and loading dock area is located on the east side of the facility building. This loading dock area is accessible from an asphalt driveway and small parking lot area located on the south side of the property and from a gravel driveway located on the north side of the facility building. A wooded undeveloped area is located between the driveway on the north side of the building and East Cramer Street. A large lawn area is located between the facility building and Oak Street. A site map for the facility is shown on Figure 2.

The DB Oak facility is currently leased to several tenants. Carnes and Associates utilizes the northern portion of the facility building as warehouse space, and 5 Alarm Fire & Safety Inc. (5 Alarm) occupies the southern portion of the facility building. The 5 Alarm portion of the building consists of offices, shop areas for outfitting emergency vehicles, and warehouse space. Residential homes are located on the west side of Oak Street and west of the DB Oak property fronting the east and west sides of North Main Street. The Lorman Iron and Metals Company (Lorman) is located on the east side of the DB Oaks property and the Union Pacific rail line. The DB Oaks property is accessible from the Lorman property via Lorman Drive. Properties south of the DB Oaks property include a parcel located at 600 Oak Street owned by Mr. Dale Maquet used for storage of equipment for a construction company, and property owned by 2L Lobe LLC and utilized for the storage of roll off boxes and dumpsters associated with the Lorman facility.

1.2 SITE HISTORY

Residential lighting fixtures were manufactured at the facility by Moe Brothers Manufacturing beginning in 1939; Moe Brothers Manufacturing changed its name to Moe Lighting in 1939 and was acquired by Thomas Industries¹ in 1948. Lighting fixtures continued to be manufactured at the facility until 1985 when Thomas sold the facility. The Wand Corporation (Wand) subsequently utilized the facility to manufacture storm doors and windows in 1985, but vacated the building by 1992 reportedly because of a bankruptcy filing. Two other businesses (Gross EMO and Wisconsin Packaging Corporation) occupied portions of the property between 1986 and 1994. Miller Machining began operating at a portion of the property in 1994. The property is currently owned by DB Oak and the building is leased by 5Alarm Fire and Safety Equipment Inc. and Carnes and Associates as warehouse space.

In an August 28, 1985 letter to Wand, RMT, Inc. identified a 10,000 gallon above ground storage tank (AST) that was used to store tetrachloroethene (PCE), and an 18,000 gallon underground storage tank (UST) that held No. 2 fuel oil (see Figure 2). The Wisconsin Department of Natural Resources (WDNR) subsequently performed a generator inspection on March 27, 1986, completed at the time Wand had occupied the property. The inspection was completed by Wendell Wojner of the WDNR and described in an April 1986 memo. As described in that memo, no hazardous waste was observed during the inspection. The inspection report indicated that the site had been decontaminated prior to remodeling the building. Decontamination included the removal of all hazardous waste stored on site, and the decontamination and removal of wastewater treatment tanks and degreasers. An electroplating line had been dismantled, and a new concrete floor installed; the old concrete floor had also been removed and transported off-site for disposal. A foundation for a large AST remained on site at the rear of the building, but the tank had been removed.

During a March 16, 1994 Phase I Environmental Site Assessment (ESA), Gabriel Midwest could not find evidence of the fuel oil UST. It also observed that the AST that held PCE was absent, but confirmed that the concrete AST cradle remained on-site. In March 1995 ATEC Associates Inc. (ATEC) completed a Phase II ESA of the DB Oak facility to identify potential releases from the former fuel oil UST, PCE AST, and a former 500 gallon gasoline UST; the latter was not identified in previous reports. The Phase II ESA consisted of the collection of soil and

¹ Thomas Industries was acquired by Gardner Denver in 2006. Thomas Industries remains a wholly owned subsidiary of Gardner Denver.

groundwater samples from Geoprobe borings. Trace levels of petroleum constituents (ethylbenzene, toluene, and xylenes) along with low concentrations of metals (arsenic, barium, chromium, and lead) were detected in soil and groundwater samples at various locations on the facility property. However, PCE and associated degradation products were detected in soil and groundwater samples along the east and south sides of the facility building. These compounds were detected at concentrations several orders of magnitude above regulatory standards. ATEC described the results of this investigation in a Phase II ESA report dated April 1995.

The WDNR was subsequently notified of the release. Internal discussions between Thomas Industries and the WDNR subsequently followed. However, these discussions ended shortly thereafter, and further activity was delayed until March 2004. At that time, the WDNR issued a letter requesting an immediate site investigation. Consequently, the Agency requested that Thomas Industries complete a site investigation to identify the lateral and vertical extent of subsurface contamination associated with the PCE release. Thomas then submitted a work plan to the WDNR in November 2004, and completed an initial hydrogeologic investigation in December 2004. That investigation consisted of the installation of five water table monitoring wells (MW-1, MW-2, MW-3, MW-4, and MW-5), two piezometers (MW-2A and MW-4A), in-situ permeability testing, and the collection of groundwater samples. Results of that investigation and recommendations for additional investigation were presented in a February 2005 status report.

Additional subsequent investigations included the collection of soil samples from Geoprobe borings advanced in the loading dock area on the east side of the facility building, and mobile laboratory analysis to further characterize potential contaminant source areas. These investigations also included the installation of another piezometer (MW-3A) in the source area, the installation of down gradient well nest (MW-6 and MW-6A), and the collection of groundwater samples from all site wells. NewFields completed this work between April and June 2005, and results are presented in the Site Investigation Report dated November 10, 2005.

The report results were discussed at a December 1, 2005 meeting with the Wisconsin Department of Natural Resource's (WDNR). The WDNR concurred with recommendations in that report to collect additional soil samples for TCLP analyses (to develop a waste profile) and bench scale testing to evaluate in-situ chemical oxidation (ISCO) as a potential remedial response for subsurface contamination. At that time, the WDNR also requested the installation of an additional side gradient well nest (MW-7 and MW-7A) and a deep piezometer (MW-3B) at the source area. NewFields submitted a Work Plan for a supplemental site investigation on January 25, 2006, and the supplemental site investigation was subsequently completed in March

2006. NewFields presented results of this investigation in a May 2006 status report along with recommendations to further characterize the vertical extent of groundwater contamination beneath the source area.

Thomas Industries elected to implement site remediation in two phases. Soil remediation would be performed during the first phase followed by groundwater remediation performed later as the second phase after the effects of soil remediation on groundwater were better understood. A Design Plan for Soil Remediation was submitted to WDNR by RMT on August 15, 2006. That plan proposed the installation of an in-situ vapor extraction (ISVE) system combined with soil conditioning to enhance soil permeability and the effectiveness of the ISVE system. In a WDNR letter dated September 8, 2006 the ISVE system (and soil conditioning) was conditionally approved as an interim remedial response. Soil conditioning and subsurface piping was subsequently installed in the loading dock area on the east side of the facility building between October and December 2006. Final grading was completed in March 2007, and a construction documentation report was submitted to the WDNR on May 2, 2007. The SVE system has operated from mid-July to the present, but was occasionally turned off during high water table conditions. A SVE system quarterly progress report was submitted to WDNR on December 6, 2007 summarizing results for the first three months of operation. As described in that report effluent air sample results indicate that the SVE system is removing chlorinated VOCs from the subsurface. Effluent concentrations measured after three months of operation were approximately half the concentration detected in the effluent samples collected after system startup. Additionally, soil samples collected in October 2007 indicate that target clean up standards have been achieved at six of the seven soil sample locations. Because target clean up goals have been achieved, no additional soil remediation is planned.

Approval conditions for the interim remedial response described in WDNR's September 8, 2006 letter included identification of the vertical extent of groundwater contamination at the MW-2, MW-3, and MW-7 well nest locations, and identification of the lateral and vertical extent of contamination in the area north of MW-7. NewFields submitted a July 25, 2007 Work Plan for zone sampling and well installation at these locations. The site work was subsequently completed in September and October 2007, and results are presented in December 2007 Supplemental Site Investigation Report. Results of that investigation and previous investigations have been used to evaluate potential remedial responses for groundwater in this report.

1.3 PURPOSE AND SCOPE

The purpose of this report is to present the results of additional groundwater samples collected in April 2008. April groundwater sample results and previous site investigation results were used to evaluate potential remedial responses for groundwater. This evaluation includes a screening of potential remedial technologies, and a detailed evaluation of potential remedial responses for groundwater.

2.1 INITIAL SITE INVESTIGATION RESULTS

A Phase II Site Assessment was completed at the DB Oak property in March 1995 by ATEC Associates Inc. (ATEC). That assessment included the collection of soil and groundwater samples from 31 Geoprobe borings. Results were presented in an April 1995 report prepared by ATEC.

ATEC stated that the purpose of the assessment was "... to determine the presence or absence of contamination that may be associated with former underground storage tanks (USTs), specifically one 19,000-gallon fuel oil and one 500-gallon gasoline UST, former above ground storage tanks (ASTs), one 10,000 gallon tetrachloroethene AST, past on-site activities or operations, and adjacent leaking UST facilities." ATEC reported that petroleum constituents were detected at low concentrations below clean up standards in soil and groundwater samples. However, chlorinated hydrocarbons including tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene, total (cis and trans) 1,2-dichloroethene, and vinyl chloride were detected in soil and groundwater samples collected along the east side of the facility building. These results indicated that releases from petroleum storage tanks have not impacted soil or groundwater quality at the site. However, chlorinated hydrocarbons detected in groundwater samples indicate a release of PCE.

An off-site investigation was also completed by Lorman Iron & Metals Company in the vicinity of a former waste oil tank located on the south end of the Lorman property. That investigation included the collection of soil samples, the installation of monitoring wells, and the collection of groundwater samples. Results of the site investigation indicated that the direction of groundwater flow is to the south-southeast, and that petroleum constituents from the former waste oil tank resulted in an impact to soil and groundwater quality at the site. Site remediation consisted of the removal of contaminated soil by excavation and groundwater monitoring. Chlorinated VOCs were detected in groundwater samples collected from site monitoring wells. However, the site was subsequently closed because concentrations of petroleum constituents and chlorinated VOCs declined after several years of groundwater monitoring. As shown on Figure 2, the Lorman property is located on the east side of the railway adjacent to the DB Oak property, and former wells MW-1, MW-2, and MW-3 are side gradient from the DB Oak property.

2.2 INITIAL HYDROGEOLOGIC INVESTIGATION

NewFields completed an initial hydrogeologic investigation at the DB Oak facility in accordance with a Work Plan dated November 8, 2004. That hydrogeologic investigation consisted of the installation of five water table observation wells (MW-1, MW-2, MW-3, MW-4, and MW-5), two piezometers (MW-3A and MW-4A), well development, the collection of groundwater samples for volatile organic compound (VOC) analysis, groundwater elevation measurements, and in-situ permeability tests. Site investigation activities were completed in December 2004, and results were presented in a February 2005 status report.

Recommendations for a deep piezometer and down gradient well nest to further characterize the lateral and vertical extent of groundwater contamination were included in the February 2005 status report. Piezometer MW-3B and down gradient well nest MW-6 and MW-6A were installed in April 2005 and a second round of groundwater samples were collected in June 2005. Results were presented in the November 2005 Site Investigation Status Report.

2.3 SOIL INVESTIGATION

Preliminary site investigation results and groundwater monitoring results indicate that potential source areas for groundwater contamination are present on the east side of the facility building near the former PCE tank and adjacent to loading docks. Additional investigation was recommended in the February 2005 status report to further characterize the lateral and vertical extent of soil contamination. Over 60 soil borings were subsequently advanced in on the east side of the facility in May 2005. Soil samples were analyzed by a mobile laboratory, and mobile laboratory results were used to guide the investigation. All soil samples were analyzed for benzene, toluene, PCE, trans-1,2-dichloroethene (transDCE), and degradation products of PCE including vinyl chloride, 1,1-dichloroethene (DCE), cis-1,2-dichloroethene (cisDCE), trichloroethene (TCE). Soil sample results were presented in a November 2005 Site Investigation Status Report. The lateral extent of soil contamination identified during that investigation is shown in Figure 3.

2.4 SUPPLEMENTAL SITE INVESTIGATION

A supplemental site investigation was completed in the fall of 2007 to further characterize the vertical extent of groundwater contamination. Vertical groundwater “zone” sampling was completed to select depths for deep peizometers. Zone sampling consisted of the collection of

groundwater samples as borings MW-2B, MW-3C, MW-7B, and MW-8B were advanced (see Figure 2). These soil borings were advanced using Sonic drilling methods. Groundwater zone samples were collected from the soil borings with a well point sampler installed as a temporary well. A two-inch diameter well point, five feet in length, was attached to the drill rod and lowered through the temporary casing to the desired sample interval. The temporary casing was then pulled back a minimum of five feet allowing the formation to collapse around the well point. A small diameter submersible pump was inserted into the drill rod and used to purge the well for a minimum of one hour before groundwater samples were collected. Samples were collected at the 60 to 65, 80 to 85, and 95 to 100 foot intervals from the MW-2B, MW-7B, and MW-8B boring locations; a sample was also collected at the 30 to 35 foot interval from the MW-8B boring. At the MW-3C location, samples were collected at the 100 to 105, 120 to 125, and 130 to 135 foot intervals². All samples were collected in laboratory provided containers, placed on ice, and analyzed for VOC analysis within 24-hours. Results were used to select screen depths for deep piezometers MW-2B, MW-3C, MW-7B, and MW-8B

Groundwater samples were collected from all existing wells following the installation of additional wells in September 2007, and results were presented in the December 2007 Supplemental Site Investigation Report. Another round of groundwater samples were collected in April 2008. Groundwater elevations measured in April 2008 are summarized in Table 1 and historic groundwater monitoring results are summarized in Table 2. Laboratory reports for April 2008 groundwater samples are included in Appendix A.

² A sample was collected from the 130 to 135 foot interval rather than the 140 to 145 foot interval because a fine grained low permeability silty clay unit was encountered between 132 and 145 feet.

3.1 ENVIRONMENTAL SETTING

3.1.1 Regional Geology

Geology in the vicinity of Fort Atkinson consists of alluvial deposits along the Rock River underlain by Pleistocene aged glacial sediments overlying Paleozoic aged sedimentary bedrock units. Glacial deposits include ground moraine, outwash deposits, and loess deposits. Bedrock units include Ordovician aged shales, dolomites, and sandstone units overlying Cambrian aged sandstone. Depth to bedrock beneath the DB Oak property is unknown. However, bedrock was encountered at a depth of 325 feet below the ground surface at the City of Fort Atkinson Well No. 6, and at depths of 252 and 277 feet below ground surface at City Well Nos. 3 and 4, respectively. As shown on Figure 1, well No. 6 is located approximately $\frac{3}{4}$ mile west of the DB Oak facility, and well Nos. 3 and 4 are located approximately $\frac{3}{4}$ miles to the south (see Figure 1).

3.1.2 Regional Hydrogeology

The upper most water bearing units in the vicinity of Fort Atkinson are the unconsolidated deposits. Groundwater is typically encountered within 20 feet of the ground surface, and the direction of groundwater flow is likely towards the nearby Rock River.

The City of Fort Atkinson utilizes five wells (well Nos. 3, 4, 5, 6, and 7) to obtain water from the deep bedrock aquifer for the municipal water supply. Water supply wells are between 985 and 1,066 feet deep, and are cased to bedrock encountered at depths between 250 and 325 feet below the ground surface. The regional direction of groundwater flow in the underlying bedrock aquifers is unknown. However, groundwater flow in the vicinity of the high capacity municipal water supply wells is likely influenced by localized cones of depression surrounding each well. City well Nos. 3, 4, 5, and 6 (see Figure 1³).

³ City well No. 7 is not shown on Figure 1; records indicate that it is located on Jamesway Street, which is located south-southeast of Well No. 5 but not shown on this figure.

3.1.3 Site Geology

Soil samples collected from site well borings identified shallow interbedded subsurface soil units consisting of clayey silt, silty clay, silt, clayey sand, silty sand, and sand. In general, fine grained interbedded soil units (silty clay and silt) were encountered in the upper portion of each monitoring well boring, and a fine to medium grained sand unit with interbedded silt and silty clay lenses was encountered beneath these shallow interbedded units. Soil units are shown on the Geologic Cross-Section included as Figure 4.

As shown on Figure 4, shallow interbedded silty clay, silt, clayey sand, and sand unit were also encountered within 15 feet of the ground surface at the MW-1, MW-2, MW-3, MW-4, MW-5, and MW-7 borings. Interbedded silty clay and sandy clay units were encountered to 25 feet bgs at the MW-8 well nest. In the MW-2A boring, interbedded silt and silty clay lenses were also encountered at depths between 17 and 28 feet bgs (this unit was also encountered at depths between 19 and 32 feet in the MW-2B boring). A clean poorly graded fine to medium grained sand was encountered beneath shallow interbedded fine grained soils at the MW-2, MW-3, and MW-4 locations. At MW-6 and MW-7, a dense fine-grained silty sand was encountered beneath the shallow interbedded soil units. This dense silty sand likely represents a glacial till deposit, while the sand encountered at depth in the remaining piezometers likely represents glacial outwash deposits.

The glacial till was encountered to the limits of exploration (41 feet bgs) at the MW-6A location, and to a depth of 28 feet bgs at MW-7A location. At the MW-7 location, the glacial till overlies outwash sand, which was encountered to the limit of exploration (100 feet bgs). This outwash sand was also encountered at depth in the MW-2, MW-3, MW-4, MW-7, and MW-8 locations. However, several fine-grained soil units were also encountered interbedded in the outwash sand unit. A two-foot thick silty clay was encountered at 93-feet bgs in the MW-2B boring. At the MW-3 well nest, silty clay was encountered between 35 and 41 feet bgs, and silt units were encountered between 48 and 51 and between 60 and 76 feet bgs. Silty clays were also encountered between 90 and 92, 100 and 125, and 132 and 145 bgs in the MW-3C boring. At the MW-8 well nest, a silty clay was encountered between 37 and 45 feet bgs, and, thin silts (one to two feet thick) were encountered at 64, 70, and at 80 feet bgs, and interbedded silt and silty clays were encountered between 84 and 114 feet bgs. No interbedded soil units were encountered in the MW-7B boring; outwash sand was encountered between 28 to 100 feet bgs at this location.

3.1.4 Site Hydrogeology

Data obtained from site monitoring wells were used to evaluate site hydrogeologic conditions. As described in Sections 2 above, previously completed investigations consisted of the installation of water table observation wells and in-situ permeability testing. The top of well casing elevation for each well and the ground surface elevation at each well location was surveyed relative to mean sea level datum. Prior to collecting April 2008 groundwater samples, static water levels were measured in all site monitoring wells. Reference elevations, ground surface elevations, depth to water measurements, and groundwater elevations are summarized in Table 1.

Static water levels prior to sample collection were also used to calculate groundwater elevations and prepare water table and potentiometric surface maps. In April 2008, groundwater elevations across the site ranged from 793 feet mean sea level (msl) on the north end to 787 feet msl on the south end of the site. Groundwater elevations for A horizon piezometers (MW-2A, MW-3A, MW-4A, MW-6A, MW-7A, and MW-8A) ranged from 793 feet msl on the north end to 786 on the south end of the site, and elevations for B horizon piezometers (MW-2B, MW-3B, MW-7B, and MW-8B) ranged from 788 on the north end of the site to 786 on the south end of the site. Based in these elevations, the direction of groundwater flow is south-southeast. Groundwater elevations measured in site water table observation wells in April 2008 are shown on Figure 5. Groundwater elevations measured for A horizon piezometers are shown on Figure 5A, and groundwater elevations measured for B horizon piezometers are shown on Figure 5B. Depth to water measurements and groundwater elevations are summarized in Table 1.

As shown on Figure 5, wells MW-1, MW-2, and MW-7 are located within a small groundwater depression. The shallow groundwater flow regime in this area is likely influenced by a drainage ditch originating at a storm drain outfall near MW-2 and extending south parallel to the railway towards the MW-6 well nest. This depression likely represents a discharge zone. However, groundwater discharge in this area is limited to the shallow groundwater flow regime; this depression is not apparent in the potentiometric surfaces for “A” and “B” horizon piezometers (see figure 5A and 5B).

As described in the December 2007 Supplemental Site Investigation Report, very slight vertical gradients were observed between A and B horizon piezometers at MW-2A/B, MW-3A/3B, MW-7A/7B, and MW-8A/8B, which indicates that flow is essentially horizontal in the underlying outwash sand unit. Slight vertical gradients between the water table and A horizon piezometers

were also observed at well nests MW-2, MW-4, and MW-7. Well screens for both water table observation wells and piezometers intersect the outwash sand unit at these locations, and slight vertical gradients indicate that groundwater flow is essentially horizontal in this unit. However, moderately strong downward vertical gradients observed at MW-3 and MW-8 locations indicate that the shallow interbedded fine grained soils restrict the vertical movement of groundwater between hydrogeologic units; well screens for MW-3 and MW-8 do not intersect the underlying outwash sand unit. The moderate downward vertical gradients observed at the MW-6/MW-6A well nest also indicates a restriction of groundwater between the upper and lower portions of the glacial till; the silt and clay content increases below 24 feet at the MW-6 well nest. Assuming a porosity of 25-percent a horizontal gradient of 0.025 ft/ft, the average linear velocity for shallow groundwater is 0.94 feet per day, or approximately 343 feet per year. Assuming a porosity of 25-percent, and horizontal gradients of 0.018 ft/ft (measured for "A" horizon piezometers) and 0.005 ft/ft (measured for "B" horizon piezometers), the average linear velocity for the underlying outwash sand unit ranges from 491 to 1,697 feet per year. The relationship between groundwater flow conditions and contaminant transport is described further in Section 3.2.2 below.

3.2 SITE INVESTIGATION RESULTS

3.2.1 Soil Contaminant Distribution

Soil sample results indicate that PCE and PCE degradation constituents are present at elevated concentrations on the east side of the DB Oak property between the facility building and the railway line. As shown on Figure 3, total VOC concentrations exceeded 10,000 ppb (10 ppm) at an area located in the vicinity of the former PCE tank near wells MW-4/MW-4A, and at areas located adjacent to the loading dock area near wells MW-3/MW-3A. The lateral extent of total VOCs exceeding 1 ppm is also shown on Figure 3.

3.2.2 Groundwater Contaminant Distribution

The lateral extent of total VOCs detected in water table wells is shown on Figure 5. No VOCs were detected in October 2007 or April 2008 samples collected from wells MW-1, MW-6, and MW-8; low VOC concentration were detected in MW-5 and MW-7 samples. These results indicate the lateral extent of contamination to the north, west, and southwest has been defined. However, elevated concentrations of chlorinated VOCs were detected in samples collected from wells MW-2, MW-3, and MW-4. The highest concentrations of VOCs have historically been detected in MW-3 samples indicating a source area near this well. PCE has consistently been

detected at elevated concentrations in MW-3 samples indicating it was the primary compound released. Elevated PCE concentrations in MW-4 samples also indicate a source area near the former PCE tank. Well MW-2 is located down gradient from these source areas.

Groundwater samples collected at depth indicate that chlorinated VOCs have also migrated vertically on the east side of the DB Oak facility. No VOCs were detected in September 2007 and April 2008 samples collected from piezometers MW-6A, MW-8A, and MW-8B⁴. As shown in Figure 5A, the vertical extent of total VOCs is greatest at the MW-3 well nest. Elevated VOCs were detected in piezometers MW-3A and MW-3B, but declined significantly in MW-3C samples. Elevated concentrations of VOCs were detected in samples collected from shallow down gradient piezometers MW-2A and MW-7A. However, VOC concentrations declined significantly in samples collected from down gradient deep piezometers MW-2B and MW-7B. The lateral extent of total VOC concentrations for “A” and “B” horizon piezometers are shown on Figures 5A and 5B, respectively.

Dissolved phase constituents migrate from the source area with groundwater by advection, which is equivalent to transport at the average linear velocity of groundwater. The greater the average linear velocity, the greater the travel distance (per unit time) due to advection. However, as dissolved phase contaminants migrate from the source area through the porous media, concentrations decline due to dispersion. Dispersion is the mechanical mixing of groundwater containing dissolved phase constituents with ‘clean’ groundwater. Dispersion results in dilution of dissolved phase constituents with distance from the source area; the greater the average linear velocity the greater the dilution (per unit time). As described in Section 3.1.4, calculated horizontal average linear groundwater velocity increase with depth. Although advection has resulted in the migration of contaminants with groundwater, monitoring results indicate that contaminant migration is dominated by dispersion, and that dispersion has resulted in a decline in contaminant concentrations with distance from the source area. As shown on Figures 5, 5A, and 5B, the lateral extent of total VOC isoconcentration contours for 10,000 and 1,000 µg/l are smaller with depth.

⁴ Low concentration of bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected in the October 2007 MW-8A sample. These results appear anomalous because these compounds were not detected in any other October samples. Additional samples will be needed to verify that these constituents are not associated with the PCE release.

Contaminant transport may also be influenced by adsorption of constituents onto aquifer material. Adsorption rates are typically higher on fine grained low permeability units (i.e. silty clays, silts, and sandy silts units) compared to coarse grained permeable units (i.e. clean sands and sandy gravel units). PCE concentrations in October 2007 and April 2008 samples collected from piezometers MW-3A, MW-3B, and MW-3C indicate that PCE migrated vertically through the saturated zone at this source area. The lithology encountered at the MW-3 well nest has likely influenced the vertical migration of contaminants. As shown on Figure 4, piezometers MW-3A, MW-3B, and MW-3C are screened in silty sand interbedded with silty clay units. The fine grained low permeability units may restrict the vertical migration of groundwater, but contaminants may adsorb onto the silt and silty clay soil matrix, which would then slowly diffuse into groundwater flowing through permeable sands.

Groundwater monitoring results also indicate that chemical partitioning has occurred. Chemical partitioning includes reactions that transform constituents over time and distance from the source area, most likely by reductive dechlorination. This degradation has resulted in the distribution of contaminant mass such that PCE concentrations decline with distance from the source area. However, proportionally there is an increase in degradation product concentrations with lateral and vertical distance from the source area. Because degradation products (TCE, cis-DCE and vinyl chloride) are also more soluble than PCE, and therefore more mobile in groundwater than PCE, a dissolved phase chlorinated VOC plume has formed down gradient from the source area. The vertical extent of PCE and cisDCE in September and October 2007 groundwater samples are shown on Figures 4A and 4B, respectively.

4.1 EVALUATION AND NEED FOR REMEDIATION

Chlorinated VOCs were detected in soil and groundwater samples collected during the initial site investigation completed in March 1995. Water table observation wells and piezometers were installed between December 2004 and September 2007 to further characterize groundwater flow conditions and the lateral and vertical extent of chlorinated VOCs. Groundwater samples collected from water table observation wells and piezometers indicate groundwater quality at the DB Oak property has been impacted by PCE, trans-DCE, and degradation products of PCE including TCE, cis-DCE, 1,1-DCE, and vinyl chloride. Soil and groundwater samples collected during recently completed site investigations indicate that VOCs absorbed into shallow fine grained soil units encountered near a former PCE tank and near the loading dock area on the east side of the facility are behaving as a source for chlorinated VOCs in groundwater.

Because PCE, TCE, cis-DCE, trans-DCE, 1,1-DCE, and vinyl chloride exceed their respective Enforcement Standards per Wisconsin Administrative Code NR 140 in samples collected from site monitoring wells, further site restoration is warranted. Restoration may include implementation of natural attenuation as a final remedial response for contaminated groundwater above regulatory standards providing that specific conditions are met to ensure the protection of human health and the environment. Typically, conditions include eliminating direct exposure pathways by removing, treating, or containing contaminants, preventing the off-site migration of contaminants with groundwater, and groundwater monitoring for an extended period of time to demonstrate that the plume is stable or is a receding plume with no off-site migration. Additional groundwater monitoring will likely be required to further characterize site conditions, or to evaluate site conditions following remediation.

Site investigation results were used to evaluate groundwater remedial options. A description of remedial action objectives, clean-up goals, and a screening of potential remedial technologies at the DB Oak facility follows.

4.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives state the specific goals of the various remedial actions that are described in this report. The general goal of these objectives is to protect human health and mitigate environmental risks posed by the contaminants at the site. Specific goals include the following:

- Minimize potential risk to human health and to aquatic and terrestrial animals and to the environment from exposure to contaminants;
- Limit future migration of contaminants to receptors;
- Limit, to the extent practicable, on site migration of contaminants; and
- Minimize short-term risk to human health and to aquatic and terrestrial animals and to the environment from exposure to contaminants during the implementation of the remedial action.

4.3 CLEAN UP GOALS

Groundwater standards are covered in Wisconsin Admin. Code (WAC) chapter NR 140. Site closure standards are defined in WAC chapter NR 726. An evaluation may be performed for soils or groundwater at this site for the purpose of calculating site specific cleanup standards. Until such site-specific standards are determined for the site, the Enforcement Standards for PCE, TCE, cis-DCE, trans-DCE, 1,1-DCE, and vinyl chloride promulgated in the WAC apply.

4.4 SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR GROUNDWATER

NewFields screened potential remedial alternative technologies for groundwater capable of preventing direct contact with subsurface contamination and reducing the toxicity and mobility of contaminants, which will improve groundwater quality. Applicable remedial technologies screened for groundwater contaminated with chlorinated VOCs at the DB Oak site are summarized in Table 3. As shown in Table 3, the following 15 remedial technologies were screened.

- No further action'
- Containment using engineered surface barrier;
- Containment using engineered vertical barrier;
- Containment using groundwater extraction system;

- Source removal using groundwater extraction system;
- Source removal using multiphase vapor extraction
- Source removal using in-situ-flushing;
- Source removal using electrical resistance heating;
- In-situ treatment using chemical oxidation;
- In-situ treatment using biological reductive de-chlorination;
- In-situ treatment using ozone sparging;
- In-situ treatment using chemical fixation;
- In-situ treatment using passive reactive barrier wall; and
- Natural attenuation as a final remedial response, and
- Institutional controls.

No Further Action

The “no action” alternative for groundwater has been included as a basis for comparing the other alternatives per Title 40 Code of Federal Regulations (40 CFR §300.430(e)(6)), which requires consideration of the no-action alternative at every site. Implementation of no further action consists of leaving contaminated groundwater in place; no engineering, maintenance, or monitoring will be required.

Containment

Containment for groundwater contamination consists of the utilization of natural or man-made barriers to prevent potential exposure to or migration of contaminants with subsurface contamination. Containment technologies screened in this report include engineered surface barriers, vertical barrier walls, and barrier wells. Engineered surface barriers include low permeability clay caps and asphalt or concrete pavement. Engineering vertical barriers include sheet pile and slurry walls, which require groundwater extraction to reduce the hydraulic head behind the barrier. Barrier wells are down gradient groundwater extraction installed for hydraulic control to prevent off-site migration of contaminants.

Surface barriers eliminate the direct contact with subsurface contamination and significantly reduce infiltration and contaminant flushing from the unsaturated zone. Surface barriers were not evaluated as a stand alone remedial technology, but they could be used in combination with other remedial responses that were retained for further evaluation. Vertical barrier walls and barrier

wells could be implemented to prevent the off-site migration of contaminants. Operation, maintenance, and monitoring would be required for an extended period of time because chlorinated VOCs adsorbed onto fine grained soil particles in the saturated zone would remain as a source for groundwater. However, engineered vertical barriers (with groundwater extraction) and down gradient barrier wells were not retained for further evaluation. Groundwater extraction was retained for further evaluation as source removal remedial technologies described below.

Source Removal and On-site Treatment

Source removal alternatives evaluated for groundwater consist of the physical removal and on-site treatment of contaminated groundwater. Source removal technologies screened in this report include groundwater extraction, multiphase vapor extraction, in-situ flushing, and electrical resistance heating (ERH). Groundwater extraction uses water as a carrier to remove contaminants from the saturated zone. Multiphase-extraction uses an induced vacuum to remove fluids from the subsurface; fluids removed by this method include vapors from the unsaturated zone, dissolved phase contaminants in groundwater, and non-aqueous phase liquids (NAPL). In-situ flushing is a hybrid groundwater extraction technique. After contaminated groundwater is extracted and treated on-site, it is re-injected into contaminated zones to flush additional contaminants. A surfactant or co-solvent could be mixed with injected water to further enhance recovery by increasing the mobility of contaminants. ERH also uses water as a carrier, but removal is enhanced by in-situ heating to increase the mobility of contaminants. It is very effective for removing contaminants absorbed onto fine grained soils.

Groundwater extraction and ERH were retained for further evaluation as Options 1 and 2, respectively, but multiphase extraction and in-situ flushing were not retained. Multiphase vapor extraction was not retained because this remedial technology will require numerous wells (possibly over 100 well points) for the shallow fine grained soil units. Additionally, vacuum extraction from the unsaturated zone would be limited to one atmosphere less head losses, or a maximum depth on 28 feet, which would prevent groundwater extraction below this depth. In-situ flushing was not retained because the shallow interbedded fine grained low permeability soils encountered at the site may limit the reinjection of treated water.

In-situ Treatment

In-situ chemical oxidation, biological reductive dechlorination, ozone sparging, chemical fixation, and passive reactive barrier walls were screened as source treatment remedial technologies. Chemical oxidation and ozone sparge utilizes chemicals that are strong oxidizers to break down chlorinated VOCs into CO₂ and H₂O end products. Biological reductive dechlorination requires the addition of nutrients to enhance the biodegradation of chlorinated VOCs, which groundwater monitoring results indicate is already occurring. These remedial technologies were retained for further evaluation.

In-situ chemical oxidation can be used to treat unsaturated and saturated soils in source areas, in particular interbedded fine grained soil units where VOCs are adsorbed onto the soil matrix. Chemical oxidation compounds can be introduced into contaminated zones by mixing in excavations, or injected into soil borings as a liquid. For in-situ chemical oxidation, hydrogen peroxide, sodium permanganate, and potassium permanganate are often used as oxidizing agents to degrade VOCs. Hydrogen peroxide is used to remediate organic compounds by forming free hydroxyl radicals via Fenton's Reaction Chemistry. The application of hydrogen peroxide results in an exothermic reaction that generates heat, oxygen, and carbon dioxide by a series of chemical reactions. Permanganate is a strong oxidizing agent that has the ability to add oxygen, remove hydrogen or remove electrons. Sodium permanganate has a higher solubility than potassium permanganate, which allows it to be used in more concentrated forms.

A treatability study was completed in April 2006. Sodium permanganate and Fenton's Reagent were found to be effective in reducing the levels of chlorinated solvents in the test samples used in the study. Bench scale study results indicate that a 0.66-percent dosage rate for Fenton's Reagent will reduce the chlorinated solvent concentration by greater than 90-percent. Sodium permanganate dosage rates of 0.50- and 0.75-percent reduced the levels of chlorinated solvents by greater than 90-percent. The higher sodium permanganate dosage rate (0.75-percent) is likely due to reducing conditions in the soil. As evident in the data, PCE daughter products were observed in the sample requiring 0.75-percent dosage rate. Additional oxidant (permanganate) will likely be required to overcome the reduced conditions. Sodium permanganate dosages higher than 0.5-percent generally require more than one injection, which may require two injections and increase treatment costs. The bench scale treatability study report is included in Appendix B.

Another oxidizing agent provided by Deep Earth Technologies, Inc. is Cool-Ox. This propriety product relies upon a tailored mixture, an important component of which is an aqueous suspension of solid peroxygen compounds, which can be injected into the subsurface via small diameter borings. Theoretically this suspension results in a slow, protracted release of hydrogen peroxide. Through a number of chemical processes, the hydrogen peroxide generates components which attack and destroy VOC without the generation of heat and off-gases. In-situ treatment for the shallow and deep plumes using Cool-Ox injection via soil borings is evaluated as Option 3.

Because the site exhibits reductive dechlorination characteristics, treatment using biological reductive dechlorination was recommended for consideration in the bench scale treatability study. Biological reductive de-chlorination is another in-situ treatment that can be used to reduce contaminant concentrations in the saturated zone. For chlorinated VOCs, this technology requires the injection of microbes (bacteria inoculation) to degrade constituents of concern, or injecting a nutrient source to enhance the indigenous anaerobic degradation. Groundwater monitoring results indicate that reductive de-chlorination is already occurring albeit at a slow rate. For the shallow plume (up to 75 feet below ground surface), concentrations of the source material (PCE) remain high relative to degradation compounds (cis-DCE and vinyl chloride). The shallow plume is suitable for nutrient injection to stimulate the indigenous microbial population and increase the rate of degradation. Elevated cis-DCE concentrations at depth indicate that reductive de-chlorination has degraded the source material, which indicates that the microbial population may not include bacteria cultures to further degrade degradation products. Microbial injection is suitable for the deeper plume (below 75 feet) to enhance further degradation. Consequently, reductive de-chlorination using nutrient injection for the shallow plume and bacteria inoculation for the deep plume was evaluated for the deep plume as Option 4.

In-situ chemical oxidation can also be completed by ozone sparging. Ozone is the trivalent form of oxygen, generated naturally through reaction of UV rays from the sun with the oxygen present in the upper atmosphere, creating the protective ozone layer. In water, ozone decomposes to form the free radicals $\text{HO}\cdot$ and $\text{HO}_2\cdot$. These free radicals are strong oxidizers and react with chlorinated contaminants in water to form carbon dioxide, water and chloride salts. The free radical reaction attacks the double bond of the chlorinated alkene; thus, the typical degradation product, vinyl chloride, is not produced during oxidation by ozone. However, degradation products including cis-1,2 DCE and vinyl chloride have been detected in samples collected during the supplemental site investigation, and may continue to form independent from the ozone sparging. Ozone sparging was evaluated as Option 5.

Chemical fixation requires the addition of a chemical reagent to the subsurface to fixate (immobilize) chlorinated VOCs in the soil matrix. Although this remedial technology works best with inorganic compounds, it can be used for organic compounds. Based on total chlorinated VOC concentrations in soil, ex-situ mixing will likely be required. The excavation of contaminated soil may constitute generation of a hazardous waste. Treating hazardous waste on-site and returning the treated waste to the excavation would constitute placement. Generation and placement will require Agency approval, which may be difficult to permit. Consequently, chemical fixation was not retained for further evaluation.

Passive reactive barrier (PRB) walls are installed down gradient from source areas. Contaminants are treated as they migrate with groundwater and pass through the barrier wall. Typically, zero valent iron fillings are placed in a trench perpendicular to the direction of groundwater flow to promote the reductive dechlorination of chlorinated VOCs. However, a PRB wall was not evaluated because this remedial technology will not reduce contaminant mass or toxicity. Additionally, PRBs can typically be installed at depths up to 20 feet, and groundwater contamination occurs at depths below 20 feet at the DB Oak site. A PRB wall was not retained for further evaluation.

Natural Attenuation and Institutional Controls

Institutional controls and monitored natural attenuation were not retained for screening as stand alone remedial responses; both technologies were evaluated as elements of other active remedial alternatives.

5.1 EVALUATION CRITERIA

Groundwater remedial alternatives retained for further evaluation include the following:

- Source removal using groundwater extraction system;
- Source removal using electrical resistance heating;
- In-situ treatment using chemical oxidation;
- In-situ treatment using biological reductive de-chlorination; and
- In-situ treatment using ozone sparging.

These potential remedial alternatives are capable of reducing the mobility, toxicity, and volume of contamination in groundwater, and are technically and economically feasible. A description of each potential response, the technical feasibility, and economic feasibility is included in the following sections. Considerations for evaluating the feasibility of each option are based on the following criteria outlined in Wisconsin Admin. Code chapter NR 722:

- Long-term Effectiveness;
- Short-term Effectiveness;
- Implementability;
- Restoration time-frame; and
- Cost.

5.2 OPTION 1: SOURCE REMOVAL – GROUNDWATER EXTRACTION

5.2.1 Option 1: Description

Option 1 consists of the installation of a groundwater extraction system that includes five shallow and one deep extraction wells. Groundwater will be used as a carrier to removed chlorinated VOCs from the saturated zone. Extracted groundwater will be treated on-site with an air stripper prior to discharge to a nearby drainage swale via the existing storm sewer. Treatment equipment will be placed inside a small building constructed on the loading dock adjacent to the MW-3 well nest (see figure 6).

Five shallow and one deep extraction wells will be installed within the plume at locations shown on Figure 6. Shallow extraction well will be installed approximately 60 feet below ground surface (bgs). The deep extraction well will be installed near the MW-3 well nest approximately 110 feet bgs. Each extraction well will be constructed with well screens 30-feet in length. Shallow trenches will be excavated between each well and the treatment building for installation of discharge lines and electrical conduit. Conceptually, each extraction well will produce between ten and 15 gallons per minute. An aquifer performance test will be needed to evaluate optimal pumping rates and contaminant concentrations. This information will be used during the design phase to select the proper down hole electric pumps and air stripper for treatment. The pumping rate and contaminant concentrations will also be needed to obtain a discharge permit for the treated groundwater.

5.2.2 Option 1: Long-Term Effectiveness

The long-term effectiveness of groundwater extraction is considered moderate. This remedial response will reduce the toxicity, volume, and mobility of chlorinated VOCs within the shallow and deep portions of the plume over time. Groundwater extraction is a long-term remedial response that can effectively be used to remove contaminant mass from the saturated zone. After contaminant concentrations decline to acceptable levels, natural attenuation can be implemented as a final remedial response.

5.2.3 Option 1: Short-Term Effectiveness

The short-term effectiveness of groundwater extraction is considered low. Rapid removal of contaminants from permeable zones can be expected. However, contaminant mass adsorbed to interbedded fine grained soil units will slowly diffuse into permeable units, which may require operation of the groundwater extraction system for an extended period of time.

Installation of the groundwater extraction system will disturb use of the loading dock and use of the driveway on the east side of the facility building during construction, but not during operation. Short-term human health risks from exposure to fugitive dust and odor during installation will be limited to the work areas; it is anticipated that these short-term exposure conditions could be managed by personal protective equipment.

5.2.4 Option 1: Implementability

The technical implementability of groundwater extraction is considered moderate. Extraction wells, utility trenches, and the on-site treatment building could be installed, but would result in significant site disturbance. Following installation, operation of the groundwater extraction system will not interfere with current site use. Long term groundwater monitoring will be needed to evaluate the effectiveness of the groundwater extraction system while in operation, and to determine when natural attenuation can be implemented as a final remedial response.

5.2.5 Option 1: Restoration Time Frame

The restoration time frame for this remedial response is low. The groundwater extraction system could be installed within a short period of time, but the groundwater extraction system would need to be operated for an extended period of time to lower contaminant concentrations within the plume to acceptable levels before natural attenuation can be implemented as a final remedial response. The restoration time frame for groundwater extraction could be shortened if in-situ chemical oxidation is used to reduce contaminant concentrations in the shallow saturated zone. In-situ chemical oxidation alternatives are evaluated as Options 3 and 4.

NewFields has assumed that operation of the groundwater extraction system will be required for 15 to 20 years. Groundwater samples will be collected quarterly for the first three years of operation, and semi-annually thereafter. However, remediation may be completed in a shorter time frame if a significant decline in contaminant concentrations is observed, and groundwater monitoring indicates that the plume is stable and contaminants are not migrating off-site. The duration of groundwater monitoring and implementation of natural attenuation will be contingent upon Agency approval.

5.2.6 Option 1: Costs

Implementation costs include construction, engineering, and operation, maintenance, and monitoring costs. Estimated construction costs include costs for installation of groundwater extraction wells, lateral piping, and the on-site treatment building. Engineering costs include costs for preparation of technical specifications and plans, bid letting, construction oversight, and preparation of a construction documentation report. Long term operation, maintenance, and monitoring costs include groundwater monitoring, and annual report preparation using a four-

percent discount rate to determine present value for these future costs. All costs include a 20% contingency added to the total. A detailed cost breakdown is presented in Appendix C.

Overall costs for groundwater extraction are high because groundwater extraction will likely be required for 15 to 20 years to reduce contaminant concentrations to acceptable levels for implementation of natural attenuation. As shown in Appendix C the total present value for groundwater extraction is \$1,070,320 for 15-years of operation and \$1,211,897 for 20-years of operation. (Appendix C also includes cost of \$1,328,036 and \$1,423,265 for 25 and 30 years of operation, respectively.)

5.3 OPTION 2: SOURCE REMOVAL – ELECTRICAL RESISTIVITY HEATING

5.3.1 Option 2: Description

Electrical Resistivity Heating (ERH) is an in-situ electrical heating technology that uses electrodes placed within contaminated zones to enhance contaminant recovery using groundwater extraction. Electrodes can be installed either vertically to about 100 feet or horizontally underneath buildings. ERH heats the contaminated zone up to 100 °C, which raises the vapor pressure of volatile organic compounds in the subsurface and increase the mobility of contaminants. Mobilized contaminants are then removed from the saturated zone using groundwater extraction wells.

At the DB Oak site, ERH will require the installation of electrodes at various depths to heat the shallow and deep plumes. Approximately 68 electrodes will be installed at depths between 20 and 50 feet for shallow plume heating. Contaminants mobilized by shallow heating will be recovered using five shallow groundwater extraction wells described in Section 5.2.1. An additional 12 deep electrodes will be installed at depths between 80 and 100 feet near the MW-3 well nest, and contaminants mobilized by deep heating will be recovered using the deep groundwater extraction well described in Section 5.2.1. Extracted groundwater will be treated on-site with an air stripper prior to discharge to a nearby drainage swale via the existing storm sewer. Treatment equipment will be placed inside a small building constructed on the loading dock adjacent to the MW-3 well nest (see figure 7).

5.3.2 Option 2: Long-Term Effectiveness

The long-term effectiveness of ERH is considered high. This remedial response will permanently reduce the toxicity, volume, and mobility of chlorinated VOCs within the shallow and deep portions of the plume. After contaminant concentrations decline to acceptable levels, groundwater monitoring will be used to confirm natural attenuation as a final remedial response.

5.3.3 Option 2: Short-Term Effectiveness

The short-term effectiveness of ERH is considered high. This remedial response will reduce the toxicity, volume, and mobility of chlorinated VOCs within the shallow and deep portions of the plume within several years. Heating increases the mobility of contaminant mass adsorbed to interbedded fine grained soil units to permeable units, which will reduce the operation time for groundwater extraction.

Installation activities will disturb use of the loading dock and use of the driveway on the east side of the facility building during the construction, but not during operation. Short-term human health risks from exposure to fugitive dust and odor during installation will be limited to the work areas; it is anticipated that these short-term exposure conditions could be managed by personal protective equipment.

5.3.4 Option 2: Implementability

The technical implementability of ERH is considered low. Extraction wells, electrodes, utility trenches, and an on-site treatment building could be installed, but will result in significant site disturbance during construction and during the first three to six months of operation. To optimize contaminant removal rates, electrodes will be installed within low permeability units to increase the mobility of contaminants adsorbed to the fine grained soil matrix. The migration of contamination to permeable soil units will increase contaminant removal rates from each groundwater extraction well.

5.3.5 Option 2: Restoration Time Frame

The restoration time frame for this remedial response is moderate. The ERH system could be installed within a short period of time. Heating will likely be required for three to six months,

but groundwater extraction may be required for three to five years to lower contaminant concentrations within the plume before natural attenuation could be implemented as a final remedial response. Remediation may be completed in a shorter time frame if a significant decline in contaminant concentrations is observed, and groundwater monitoring indicates that the plume is stable and contaminants are not migrating off-site. The duration of groundwater monitoring and implementation of natural attenuation will be contingent upon Agency approval.

5.3.6 Option 2: Costs

Implementation costs include construction, engineering, and operation, maintenance, and monitoring costs. Estimated construction costs include costs for installation of groundwater extraction wells, lateral piping, the on-site treatment building electrode installation, ERH heating equipment, and energy costs. Engineering costs include costs for preparation of technical specifications and plans, bid letting, construction oversight, and preparation of a construction documentation report. Long term operation, maintenance, and monitoring costs include groundwater monitoring, and annual report preparation using a four-percent discount rate to determine present value for these future costs. All costs include a 20% contingency added to the total. A detailed cost breakdown is presented in Appendix C.

Overall costs for ERH are high because construction costs and energy costs for ERH are high. However, ERH will significantly reduce long-term operation, maintenance, and monitoring compared to conventional groundwater extraction. NewFields has assumed that heating will likely be required for three to six months, but groundwater extraction will be required for two to three years. As shown in Appendix C the total present value for groundwater extraction is \$3,250,650 for three years of operation and \$3,329,028 for five years of operation. (Appendix C also includes cost of \$3,366,462, \$3,433,515 and \$3,470,986 for 10, 15, and 20 years of operation, respectively.)

5.4 OPTION 3: IN SITU TREATMENT - CHEMICAL OXIDATION

5.4.1 Option 3: Description

In-situ chemical oxidation (ISCO) using Cool-Ox would consist of the injection of this product through small diameter borings advanced in a regular grid pattern. Injection of reagent for the shallow and deep plumes would be completed simultaneously. For the shallow plume, NewFields has assumed that an average of five gallons of reagent will be used for each cubic

yard within the treatment zone. This will require approximately 380 borings within the area shown on Figure 8 where total VOCs exceeded 10 ppm in the shallow saturated zone.. Borings would be advanced on approximate six-foot centers to depths between three and 13 feet below ground surface on the east side of the facility (see Figure 8). For the deep plume, and additional 100 direct push Geoprobe borings would be advanced in the vicinity of the MW-3 well nest. Reagent would then be injected into the boring as the drill rod is removed to treat the zone between 45 and 75 feet bgs at each boring location. These borings will be advanced on 10-foot centers. Groundwater samples will be collected 30, 60, and 90 days after injection to evaluate the effectiveness of this remedial response.

5.4.2 Option 3: Long-Term Effectiveness

The long-term effectiveness of in-situ chemical oxidation is considered high. This remedial response will permanently reduce the toxicity, volume, and mobility of chlorinated VOCs within the shallow and deep portions of the plume. Groundwater monitoring results will be used to evaluate the effectiveness of chemical oxidation. After contaminant concentrations decline to acceptable levels, natural attenuation will be implemented as a final remedial response.

5.4.3 Option 3: Short-Term Effectiveness

The short-term effectiveness of chemical oxidation is considered very high. This remedial response will reduce the toxicity, volume, and mobility of chlorinated VOCs within the shallow and deep portions of the plume immediately after treatment. In the short term the in-situ treatment activities will disturb use of the loading dock and use of the driveway on the east side of the facility building. Short-term human health risks from exposure to fugitive dust and odor during installation will be limited to the work areas; it is anticipated that these short-term exposure conditions could be managed by personal protective equipment.

5.4.4 Option 3: Implementability

The technical implementability for in-situ treatment using chemical oxidation is considered moderate because multiple applications may be needed to reduce contaminant concentrations to acceptable levels. As described in section 5.4.1 above, groundwater monitoring will be required after the initial application to evaluate the effectiveness of chemical oxidation. Results will be used to determine if additional applications are needed to reduce contaminant concentrations.

Additionally, this remedial response will require an exemption to NR 140.28(5) WAC, which is required for when injection and infiltration are used for remediation.

5.4.5 Option 3: Restoration Time Frame

The restoration time frame for this remedial response is considered high. In-situ chemical treatment can be completed within a short period of time. Chemical oxidation of contaminants will be completed rapidly after chemicals are applied, but groundwater monitoring may be required for three to five years until to ensure contaminant concentrations within the plume decline before natural attenuation can be implemented as a final remedial response. Remediation may be completed in a shorter time frame if a significant decline in contaminant concentrations is observed, and groundwater monitoring indicates that the plume is stable and contaminants are not migrating off-site. The duration of groundwater monitoring and implementation of natural attenuation will be contingent upon Agency approval.

5.4.6 Option 3: Costs

Implementation costs include reagent injection, engineering, site restoration, and long-term monitoring costs. Engineering costs include costs for preparation of bid letting, construction oversight, and preparation of a construction documentation report. Groundwater monitoring will be used to evaluate natural attenuation as a final remedial response following in-situ treatment. Long term monitoring costs include groundwater monitoring and annual report preparation using a four-percent discount rate to determine present value for these future costs. All costs include a 15% contingency added to the total. A detailed cost breakdown is presented in Appendix C.

Chemical oxidation of contaminants will be completed rapidly after chemicals are applied to lower contaminant concentrations within the plume. However actual contaminant reduction rates will not be known until after contaminated zones are treated. Consequently, best case, most likely, and worst case cost estimates were prepared for increasing levels of treatment as follows:

- **Best Case Cost Estimate** – Shallow ISCO application for area where total VOCs in saturated zone soils exceed 1 ppm (approximately 32,000 square feet between 3 and 13 feet bgs).
- **Most Likely Cost Estimate** – Shallow ISCO application for area where total VOCs in saturated zone soils exceed 10 ppm (13,700 square feet between 3 and 13 feet bgs) and

deep ISOC application where groundwater concentrations exceed 10,000 ppb at depth (approximately 10,000 square feet between 15 and 75 feet bgs).

- **High Cost Estimate** – Two shallow ISCO applications for area where total VOCs in saturated zone soils exceed 10 ppm (13,700 square feet between 3 and 13 feet bgs) and deep ISOC application where groundwater concentrations exceed 10,000 ppb at depth (approximately 10,000 square feet between 45 and 75 feet bgs).

As shown in Appendix C the total present value for costs for in-situ chemical oxidation are \$943,008 (best case cost estimate with 3 years of monitoring), \$1,274,440 (most likely cost estimate with 5 years of monitoring), and \$1,617,341 (worst case cost estimate with 5 years of monitoring). Appendix C also includes cost for 10, 15, and 20 years of monitoring for each scenario.

5.5 OPTION 4: IN-SITU TREATMENT – BIOLOGICAL REDUCTIVE DECHLORINATION

5.5.1 Option 4: Description

In-situ biological reductive de-chlorination will consist of nutrient injection for the shallow plume and microbe injection (bacteria inoculation) for the deep plume to enhance the indigenous microbial populations and stimulate reductive dechlorination that is already occurring.

Nutrient injection will consist of the injection of Edible Oil Substrate (EOS) or 3-D Mircoemulsion (3DMe) into the aquifer. EOS and 3DMe are commercially available propriety products that provide a carbon and energy source to accelerate the anaerobic biodegradation of the chlorinated solvents. EOS consists of a micro-emulsion of food-grade soybean oil, surfactants, macro and micronutrients, and vitamins formulated to stimulate reductive dechlorination of chlorinated VOCs. All materials used in the process are Generally Recognized As Safe (GRAS), food-grade materials to aid in gaining regulatory approval for in situ application. 3DME consists of esterified lactic acid and esterified long chain fatty acids. The advantage of this structure is that it allows for the controlled-release of lactic acid (which is among the most efficient electron donors) and the controlled-release of fatty acids (a very cost effective source of slow release hydrogen). Upon injection, the controlled release of lactic acid dominates serving to initiate and stimulate anaerobic dechlorination. Over time the controlled-release of fatty acids will dominate, acting to continue microbial stimulation.

Site conditions are suitable for both EOS and 3DMe. Each product has its advantages and disadvantages. 3DMe and EOS are both electron donors that will dissolve slowly over time. 3DMe is more soluble than EOS and will dissolve faster. The higher solubility 3DMe solution will penetrate aquifer material faster than EOS and began the reductive de-chlorination reaction sooner. However, EOS has higher fatty acid content and will be more persistent in the aquifer. This will result in a longer donor life compared to 3DMe, which will reduce the volume of material required needed for supplemental injections.

For the shallow plume, the lateral piping for the existing SVE system and direct push technology will be used for nutrient injection. Approximately 1,500 liner feet of lateral SVE piping spaced approximately 20 feet apart will be used as an infiltration gallery to treat the uppermost 5 to 15 feet of the shallow plume. This piping was installed between three and four feet below the previous ground surface (additional soil was placed over the lateral piping after it was installed). Vender supplied EOS and 3DMe are delivered in concentrated form, and mixed on site with water prior to injection. The initial application will require approximately 36,250 gallons of a solution containing 10-percent EOS or 18,000 gallons of a solution containing 10-percent 3DMe will be pumped into the lateral piping, which will the permeate via gravity drainage. To increase the effectiveness of EOS or 3DMe injection using the lateral piping network, it must be injected during high water table conditions. The effectiveness of both EOS and 3DMe could be enhanced if it is mixed with water containing additional nutrients and sulfate reducing bacteria.

For the shallow and intermediate plumes, the initial application will require approximately 121 borings advanced near the MW-3 well nest within the contaminated zone where total VOCs exceed 10,000 µg/l (see Figure 8). Approximately 500 gallons of EOS or 364 gallons of 3DMe will be injected in each boring advanced between 15 and 75 feet below ground surface.

For the deep plume, bacteria inoculation will consist of the direct injection of living bacteria culture into an injection well. Commercially available products include BAC-9 supplied by EOS and BDI Plus supplied by Regenesis. Both products would require the installation of an injection well up gradient from the MW-3 well nest. This injection well will be installed 100 and 110 feet below ground surface to target the zone within between the MW-3B and MW-3C screened intervals where elevated degradation products remain. Wells MW-3B and MW-3C will be used as down gradient monitoring wells to evaluate the effectiveness of the bacteria inoculation for the deep plume.

Groundwater samples will be collected quarterly and analyzed for dissolved oxygen, oxidation reduction potential and VOCs for one year following the initial injection. Results will then be used to estimate the supplemental injection volume required.

5.5.2 Option 4: Long-Term Effectiveness

The long-term effectiveness of in-situ treatment using reductive dechlorination is considered high. Nutrient injection will stimulate reductive dechlorination following treatment, which will result in a long-term reduction in the volume, toxicity, and mobility of contaminants in groundwater. However, it may take three to five years for reductive dechlorination to reduce contamination concentrations to acceptable levels.

5.5.3 Option 4: Short-Term Effectiveness

The short-term effectiveness of this option is considered high. Implementation can be completed within a short time frame (i.e. several weeks). However, reductive dechlorination may take three to five years to reduce contamination concentrations to acceptable levels.

In the short term the construction activities will disturb use of the loading dock and use of the driveway on the east side of the facility building. Post injection monitoring will not interfere with current site activities. Short-term human health risks from exposure to fugitive dust and odor during installation will be limited to the work areas; it is anticipated that these short-term exposure conditions could be managed by personal protective equipment.

5.5.4 Option 4: Implementability

The technical implementability for biological reductive de-chlorination is considered moderate. Use of the existing SVE lateral piping will result in minimal site disturbance. However, as described in section 5.5.1 above, multiple applications may be needed to reduce contaminant concentrations to acceptable levels. Additionally, this remedial response will require an exemption to NR 140.28(5) WAC, which is required for when injection and infiltration are used for remediation.

5.5.5 Option 4: Restoration Time Frame

The restoration time frame for this remedial response is considered high. The in-situ treatment of the shallow and deep plumes for biological reductive de-chlorination could be completed within several weeks with minimal site disturbance. Nutrient injection will stimulate reductive de-chlorination, which will consist of a series of reactions that will breakdown chlorinated VOCs. Following nutrient injection, groundwater monitoring will be required for three to five years before contaminant concentrations are reduced to acceptable concentrations and natural attenuation can be implemented as a final remedial response. Remediation may be completed in a shorter time frame if a significant decline in contaminant concentrations is observed, and groundwater monitoring indicates that the plume is stable and contaminants are not migrating off-site. The duration of groundwater monitoring and implementation of natural attenuation will be contingent upon Agency approval.

5.5.6 Option 4: Costs

Implementation costs include reagent mixing and injection, engineering, site restoration, and long-term monitoring costs. Estimated injection costs include costs for the injection of EOS or 3DMe into the lateral SVE piping network and direct push borings for the shallow plume and bacterial inoculation via an injection well for the deep plume. Engineering costs include costs for preparation of bid letting, construction oversight, and preparation of a construction documentation report. Long term monitoring costs include groundwater monitoring and annual report preparation using a four-percent discount rate to determine present value for these future costs. All costs include a 15% contingency added to the total. A detailed cost breakdown is presented in Appendix C.

EOS and 3DMe injection can be completed rapidly, but groundwater monitoring may be required for three to five years to ensure contaminant concentrations within the plume decline before natural attenuation can be implemented as a final remedial response. Actual contaminant reduction rates will not be known until contaminated zones are treated. Consequently, best case, most likely, and worst case cost estimates were prepared for increasing levels of treatment as follows:

- ***Best Case Cost Estimate*** – EOS or 3DMe injection using SVE lateral piping and direct push borings where groundwater concentrations exceed 10,000 µg/l at depth (between 15

and 75 feet bgs) for the shallow and intermediate treatment zone and bacteria inoculation via an injection well for the deep plume.

- **Most likely Cost Estimate** – EOS or 3DMe injection using SVE lateral piping and direct push borings where groundwater concentrations exceed 10,000 µg/l at depth (between 15 and 75 feet bgs) for the shallow and intermediate treatment zones and bacteria inoculation via an injection well for the deep plume. For EOS, supplemental injection using direct push borings will be required for the shallow plume. For 3DMe, supplemental injection using the SVE lateral and direct push borings will be required for the shallow and intermediate plume.
- **Worst Case Cost Estimate** – EOS injection using SVE lateral piping and direct push borings where groundwater concentrations exceed 10,000 µg/l at depth (between 15 and 75 feet bgs) for the shallow and intermediate treatment zones, and bacteria inoculation via an injection well for the deep plume. Supplemental EOS injection using direct push for the intermediate plume, supplemental 3DMe injection using the SVE lateral and direct push borings for the shallow and intermediate plume, and supplemental bacteria inoculation via an injection well for the deep plume.

With respect to cost, the fundamental difference between EOS and 3DMe is 1) the unit cost per gallon, 2) volume of material required for treatment per unit area. The unit cost for 3DMe is higher than EOS, but the manufacturer for 3DMe recommends less material for treatment compared to the EOS manufacturer's recommendation. If the same amount of material of both materials were used, EOS treatment would yield a lower cost. However, 3DMe would yield a lower cost if less material is required for treatment. Both will likely require supplemental applications to achieve the desired results. Results from the first year of monitoring will be used to estimate the volume required for supplemental injection. For the purpose of preparing cost estimates in this report, NewFields has assumed that supplemental injections will be required for EOS and 3DMe. Because more EOS will be injected during the initial application, we have assumed that the supplement application will most likely require 15-percent of the initial volume injected. The supplemental injection for 3DMe will most likely require 40-percent of the initial volume injected. Worst case cost estimates include supplement injection and supplemental bacteria inoculation.

As shown in Appendix C the total present value costs for biological reductive dechlorination using EOS are \$770,478 (best case cost estimate with 3 years of monitoring), \$900,432 (most likely cost estimate with 5 years of monitoring), and \$988,019 (worst case cost estimate with 5 years of monitoring). Appendix C also includes cost costs for 10, 15, and 20 years of monitoring

for each scenario. The total present value cost for biological reductive dechlorination using 3DMe yielded best case costs of \$657,948 (with 3 years of monitoring), \$899,578 (most likely cost estimate with 5 years of monitoring), and \$1,035,001 (worst case cost estimate with 5 years of monitoring). The best case cost estimate for 3DMe is lower than the best case cost for EOS, and the most likely cost estimate for EOS and 3DMe and less than \$1,000 part. However, the worst case cost for 3DMe is almost five percent above the worst case cost for EOS.

5.6 OPTION 5: IN-SITU TREATMENT – OZONE SPARGE SYSTEM

5.6.1 Option 5: Description

Option 5 includes installation of an ozone sparge system that will be installed to remediate groundwater contamination. Ozone is the trivalent form of oxygen, generated naturally through reaction of UV rays from the sun with the oxygen present in the upper atmosphere, creating the protective ozone layer. Conceptually, 72 ozone sparge points would be installed and ozone mixed with air would be injected into the subsurface at shallow intermediate and deep intervals within the on-site plume. Commercially, ozone is generated by a high voltage discharge through air or oxygen in an ozone generator. Generally, yields are on the order of 1 to 3 percent ozone by volume in air and 2 to 6 percent ozone by volume in oxygen. In water, ozone decomposes to form the free radicals HO· and HO₂·. These free radicals are strong oxidizers and react with chlorinated contaminants in water to form carbon dioxide, water and chloride salts. The free radical reaction attacks the double bond of the chlorinated alkene; thus, the typical degradation product, vinyl chloride, is not produced during oxidation by ozone. However, degradation products including cis-1,2 DCE and vinyl chloride have been detected in samples collected during the supplemental site investigation, and may continue to form independent from the ozone sparging.

Historic groundwater-monitoring results indicate that reductive dechlorination is occurring, and will likely continue under normal processes such as dilution, dispersion and attenuation. Ozone sparging will enhance reductive dechlorination and the rate of degradation should accelerate. To evaluate the effectiveness of this remedial response, groundwater samples will be collected quarterly for the first three years of operation, and semi-annually thereafter. NewFields has assumed that annual ozone sparging will be required for three to five years, but groundwater monitoring may be required for another five to ten years. The duration of groundwater monitoring will be contingent upon Agency approval.

5.6.2 Option 5: Long-Term Effectiveness

The long-term effectiveness of ozone sparge is considered high. This remedial response will permanently reduce the toxicity, volume, and mobility of chlorinated VOCs within the saturated zone on the east side of the DB Oak facility. A decline in contaminant concentrations can be expected within several years, but groundwater monitoring will be required to demonstrate that groundwater quality improves before natural attenuation can be implemented as a final remedial response. Human health risks will be reduced significantly with the removal of the contaminants from the source areas.

5.6.3 Option 5: Short-Term Effectiveness

The short-term effectiveness of this option is considered moderate. As described above, a rapid and permanent decline in the toxicity, volume, and mobility of chlorinated VOCs within the source area on the east side of the DB Oak facility can be expected within several years.

In the short term use of the loading dock and driveway on the east side of the facility building will be interrupted during construction, but operation of the ozone sparge system will not interfere with current site activities. Short-term human health risks from exposure to fugitive dust and odor during installation will be limited to the work areas; it is anticipated that these short-term exposure conditions could be managed by personal protective equipment.

5.6.4 Option 5: Implementability

The technical implementability for ozone sparge system is considered moderate. Installation of the ozone sparge system will result in significant site disturbance during construction. Although installation will interfere with site activities, long-term operation of the system will not interfere with current site activities. Groundwater monitoring will be needed to evaluate the effectiveness of ozone sparge while in operation, and to determine when natural attenuation can be implemented as a final remedial response.

5.6.5 Option 5: Restoration Time Frame

The restoration time frame for this option is considered moderate. Installation could be completed within a short period of time, and groundwater quality improvements can be expected

within three to five years, but groundwater monitoring may be required for another five to ten years. The duration of groundwater monitoring will be contingent upon Agency approval.

5.6.6 Option 5: Costs

Costs to implement this remedial response include construction, engineering, and operation, maintenance, and monitoring costs. Estimated construction costs include costs for installation of ozone sparge wells, control panels, and lateral piping. Engineering costs include costs for preparation of technical specifications and plans, bid letting, construction oversight, and preparation of a construction documentation report. Long term operation, maintenance, and monitoring costs include operating the ozone sparge system, groundwater monitoring, and annual report preparation using a four-percent discount rate to determine present value for these future costs. All costs include a 20% contingency added to the total. A detailed cost breakdown is presented in Appendix C.

Overall costs for ozone sparge are moderate because operation of the ozone sparge system will likely be required for five to fifteen years to reduce contaminant concentrations to acceptable levels for implementation of natural attenuation. As shown in Appendix C the total present value for ozone sparge is \$1,129,908 for three years of operation and \$1,197,292 for five years of operation. (Appendix C also includes cost of \$1,251,843 and \$1,295,949 for 15 and 20 years of monitoring, respectively.)

The DB Oak property is located at 700 -710 Oak Street in Fort Atkinson, Wisconsin. It is a triangular shaped parcel bordered by East Cramer Street to the north, Oak Street to the west-southwest, and the Union Pacific (formerly Chicago and Northwest) rail line to the east-southeast. A large building over 180,000 square feet in size and driveways and parking lots are located on the property. Residential lighting fixtures were manufactured at this facility by Moe Brothers Manufacturing beginning in 1939; Moe Brothers Manufacturing changed its name to Moe Lighting in 1939 and was acquired by Thomas Industries⁵ in 1948. Lighting fixtures continued to be manufactured at the facility until 1985 when Thomas sold the facility. The Wand Corporation (Wand) subsequently utilized the facility to manufacture storm doors and windows in 1985, but vacated the building by 1992 reportedly because of a bankruptcy filing. Two other businesses (Gross EMO and Wisconsin Packaging Corporation) occupied portions of the property between 1986 and 1994. Miller Machining began operating at a portion of the property in 1994. The property is currently owned by DB Oak and the building is leased by 5Alarm Fire and Safety Equipment Inc. and Carnes and Associates as warehouse space.

A Phase I Environmental Site Assessments (ESA) were completed in 1994 identified former petroleum storage tanks and a former PCE storage tank at the DB Oak property. Soil and groundwater contamination was identified in the vicinity of the former PCE tanks during a subsequent Phase II ESA completed in March 1994. This release was subsequently reported to the WDNR, and the Agency requested that Thomas Industries complete a site investigation to identify the lateral and vertical extent of subsurface contamination associated with the PCE release. Several phase of investigation were completed between 2004 and 2007. Investigation results indicate that groundwater quality has been impacted by chlorinated VOCs. PCE is the primary constituent of concern that exceeded groundwater quality standards, but degradation products of PCE (TCE, cis-DCE, 1,1-DCE, and vinyl chloride), and trans-DCE also exceed groundwater quality standards.

Soil samples collected in May 2005 from Geoprobe borings advanced near the former PCE tank and loading dock areas indicate the east side of the DB Oak facility building is the source areas for groundwater contamination. Contaminants are absorbed to the fine-grained soil matrix encountered in the saturated and unsaturated zones in this source area. Because groundwater is encountered at shallow depths, these contaminated soils are a source for groundwater

⁵ Thomas Industries was acquired by Gardner Denver in 2006. Thomas Industries remains a wholly owned subsidiary of Gardner Denver.

contamination. The highest concentrations of chlorinated VOCs were detected in samples collected from MW-3 located adjacent to facility loading docks, and from MW-4 located adjacent to the former PCE tank. Elevated concentrations of chlorinated VOCs were also detected in samples collected from down gradient well MW-2. Samples collected from piezometer MW-3A, MW-3B, and MW-3C indicate that contaminants have migrated vertically at this location. Samples collected from down gradient piezometer MW-2A and side gradient piezometer MW-7A indicate contaminant have also migrated at depth from the source area. Chlorinated VOCs were not detected in samples collected from down gradient wells MW-6 and MW-6A located approximately 600 feet south of the property, or in samples collected from side gradient wells MW-1, MW-7, MW-7B, MW-8, MW-8A, and MW-8B.

Thomas Industries elected to implement a remedial response for soil remediation using soil vapor extraction (SVE) prior to groundwater remediation. The SVE was installed in the loading dock area on the east side of the facility building between October and December 2006. Final grading was completed in March 2007, and a construction documentation report was submitted to WDNR in May 2007. The SVE system has operated from mid-July 2007 to the end of the year, but was occasionally turned off during high water table conditions. A SVE system quarterly progress report was submitted to WDNR on December 6, 2007 summarizing results for the first three months of operation. As described in that report effluent air sample results indicate that the SVE system is removing chlorinated VOCs from the subsurface. Effluent concentrations measured after three months of operation were approximately half the concentration detected in the effluent samples collected after system startup. Additionally, soil samples collected in October 2007 indicate that target clean up standards have been achieved at six of the seven soil sample locations.

No additional soil remediation is planned because target clean up goals for soil have been achieved. Removal of VOCs by SVE will reduce contaminant flushing from the unsaturated zone, but contaminants remain in the saturated zone. Consequently, potential remedial alternatives for groundwater were evaluated in this report. A total of 15 remedial technologies were screened, and the following five remedial responses for groundwater were retained for further evaluation:

- Source removal using groundwater extraction system;
- Source removal using electrical resistance heating;
- In-situ treatment using chemical oxidation;
- In-situ treatment using biological reductive de-chlorination; and
- In-situ treatment using ozone sparging.

Potential remedial responses were evaluated in accordance with Wisconsin Administrative Code NR 722 requirements. Criteria used to evaluate each alternative included the short-term effectiveness, the long-term effectiveness, the implementability, restoration time frame, and costs. Based on the detailed evaluation of potential remedial responses in Section 5, evaluation criteria are ranked below.

Evaluation Criteria	OPTION 1 Groundwater Extraction	OPTION 2 ERH	OPTION 3 In-situ Chemical Oxidation	OPTION 4 In-situ, Biological Reductive De-chlorination	OPTION 5 Ozone Sparging
Short-term Effectiveness	1	3	3	3	2
Long-Term Effectiveness	2	3	3	3	3
Implementability	2	1	2	2	2
Restoration Time Frame	1	2	3	3	2
Cost ⁶	2	1	2	3	3
Overall Ranking	8	10	13	14	12

High = 3, Moderate = 2, Poor = 1

As shown above, Option 1 (groundwater extraction) yielded the lowest score, Options 2 (ERH) and 5 (ozone sparge) yielded the next highest scores. Scores for these remedial responses would be higher if these remedial responses could reduce the restoration time frame, which would also lower remediation costs. Options 3 (in-situ chemical oxidation) and 4 (biological reductive dechlorination) yielded the highest scores. Implementability and cost scores for Options 3 (in-situ chemical oxidation) and Option 4 (biological reductive de-chlorination) could both be improved if multiple applications are not needed.

⁶ The remedial alternative with the highest cost was assigned a score of 1 (poor), and the lowest cost remedial alternative was assigned a score of 3 (high).

To address uncertainty associated with the implementation of each potential remedial response, a range of cost estimates was prepared. Implementation costs include construction, engineering, and operation, maintenance, and monitoring costs. Actual costs for Options 1 (groundwater extraction), Option 2 (ERH), and Option 3 (ozone sparge) are dependent upon the operation time required to reduce contamination to acceptable levels. Actual costs for Options 3 (in-situ chemical oxidation) and Option 4 (biological reductive dechlorination) are dependent upon the number of applications required to reduce contamination to acceptable levels. The range of estimated costs for each alternative includes estimated low, most likely and high costs. The range of estimated costs and estimated remediation time frames for each remedial response are summarized below.

Potential Remedial Responses	Range of Estimated Costs			Range of Estimated Costs
	Best Case Cost	Most Likely Cost	Worst Case Cost	
OPTION 1 Groundwater Extraction	\$1,056,520 (for 15 years)	\$1,198,097 (for 20 years)	\$1,314,236 (for 25 years)	\$257,716
OPTION 2 ERH	\$3,236,850 (for 3 years)	\$3,315,228 (for 5 years)	\$3,352,662 (for 10 years)	\$115,812
OPTION 3 In-situ Chemical Oxidation	\$930,703 (for 3 years)	\$1,262,135 (for 5 years)	\$1,605,036 (for 5 years)	\$674,333
OPTION 4 In-situ Biological Reductive Dechlorination with EOS	\$770,478 (for 3 years)	\$900,432 (for 5 years)	\$988,019 (for 5 years)	\$217,541
OPTION 4 In-situ Biological Reductive Dechlorination with 3DMe	\$657,948 (for 3 years)	\$899,578 (for 5 years)	\$1,035,001 (for 5 years)	\$377,053
OPTION 5 Ozone Sparging	\$1,116,108 (for 5 years)	\$1,183,492 (for 10 years)	\$1,238,043 (for 15 years)	\$121,935

As shown above, Option 2 has a shorter restoration time frame than Options 1 and 5, but yielded the highest implementation costs. Total costs for Options 1, 2 and 5 increase with the estimated restoration time frame due to a cumulative increase in long term OM&M costs. Options 3 and 4 yielded the shortest estimated restoration time frames, but total costs for Option 3 and 4 increase with the number of in-situ applications needed. Option 3 yielded the largest range of estimated costs indicating that this remedial response is sensitive to the number of applications needed to reduce contamination to acceptable levels. Although the restoration time frame would be longer, ozone sparge (Option 5) is a lower cost in-situ chemical oxidation technology compared to reagent injection (Option 3). Regardless, the estimated worst case cost estimates for Option 4 using both EOS and 3DMe yielded lower costs than the most likely scenario costs for the remaining options. Implementation costs for Option 4 are low because the existing SVE lateral piping can be used for treatment of the shallow groundwater plume; costs for installation of the SVE system were not included in this evaluation.

NewFields recommends implementation of Option 4 (in-situ biological reductive dechlorination). Based on the evaluation of potential remedial responses evaluated in this report, Option 4 has the shortest estimated restoration time frame and the lowest estimated costs. It is also effective as a short term and long term remedial response. Because the existing SVE lateral piping can be used, implementation of Option 4 will result in minimal site disturbance compared to the remaining alternatives evaluated in this report. Additionally, this remedial alternative is suitable to existing site conditions. Groundwater monitoring results indicate that reductive dechlorination is already occurring; nutrient injection will enhance this process.

A Work Plan for nutrient injection to enhance in-situ biological reductive dechlorination using either EOS and/or 3DMe will be submitted to WDNR under separate cover. The work plan will include a detailed description for implementation and monitoring to evaluate the effectiveness of this remedial response. Implementation will include treatment of the shallow plume using existing SVE lateral piping, treatment using direct push borings where groundwater concentrations exceed 10,000 $\mu\text{g/l}$ at depth (between 15 and 75 feet bgs), and bacteria inoculation via an injection well for the deep plume. Groundwater samples will be collected following initial treatment, and will be used to determine if supplemental treatment will be needed. The work plan will also include a request for an exemption to NR 140.28 (5), which is required for when injection and infiltration are used for remediation.

Phase II Environmental Site Assessment, D.B. Oak Property, 700-710 Oak Street, Fort Atkinson, Wisconsin, ATEC Project No. 74-07-95-00018. Prepared by ATEC Associates, Inc. April 26, 1995.

Work Plan for Hydrogeologic Site Investigation and Evaluation of Potential Remedial Responses. Prepared by NewFields, November 8, 2004.

Hydrogeologic Site Investigation Status Report, D.B. Oaks Facility, 700-710 Oak Street, Ft. Atkinson, Wisconsin. Prepared by NewFields, February 11, 2005.

Site Investigation Status Report, D.B. Oaks Facility, 700-710 Oak Street, Ft. Atkinson, Wisconsin. Prepared by NewFields, November 10, 2005.

Supplemental Site Investigation Status Report, D.B. Oaks Facility, 700-710 Oak Street, Ft. Atkinson, Wisconsin. Prepared by NewFields, May 3, 2006.

Design Plan for Soil Remediation System, D.B. Oaks Facility in Ft. Atkinson, Wisconsin. Prepared by RMT, August 2006.

Construction Documentation Report for Soil Remediation System, D.B. Oaks Facility in Ft. Atkinson, Wisconsin. Prepared by RMT, May 2, 2007.

Quarterly Progress Report, D.B. Oaks Facility – WDNR BRRTs #03-28-176509, Ft. Atkinson, Wisconsin. Prepared by RMT, December 6, 2007.

Supplemental Site Investigation Status Report, D.B. Oaks Facility, 700-710 Oak Street, Ft. Atkinson, Wisconsin. Prepared by NewFields, December 21, 2007.

Draft Guidance for Hazardous Waste Remediation, Publication RR-705-WA, Wisconsin Department of Natural Resources, Bureau for Remediation and Redevelopment, Bureau for Waste Management.

Tables

**Table 1
Groundwater Elevations
DB Oaks Facility, Fort Atkinson, Wisconsin**

Well Location	Date Well Installed	Reference Elevation	Ground Surface Elevation	Depth to Top of Screen	Depth to Bottom of Screen	Top of Screen Elevation	Bottom of Screen Elevation	October 25, 2007		December 13, 2007		April 20, 2008	
								Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	Dec. 2004	793.36	791.3	8	18	783.3	773.3	11.21	782.15	1.21	781.15	6.12	787.24
MW-2	Dec. 2004	791.21	791.5	5.5	15.5	786.0	776.0	9.24	781.97	--	--	4.85	786.36
MW-2A	Dec. 2004	791.27	791.5	35	4	756.5	751.5	9.34	781.93	--	--	4.70	786.57
MW-2B	Sep. 2007	791.20	791.5	75	80	716.10	711.1	9.38	781.82	--	--	4.74	786.46
MW-3	Dec. 2004	793.20	790.9	3	13	787.9	777.9	5.84	787.36	6.25	786.95	4.75	788.45
MW-3A	Apr. 2005	793.51	790.9	43	48	747.9	742.9	10.88	782.63	11.66	781.85	7.32	786.19
MW-3B	Mar. 2006	793.50	791.1	75	80	716.1	711.1	10.90	782.55	11.70	781.75	7.10	786.35
MW-3C	Sep. 2007	793.49	791.0	125	130	666.0	661.0	14.52	778.97	11.75	781.74	7.35	786.14
MW-4	Dec. 2004	799.24	796.8	5	15	791.8	781.8	7.65	791.59	7.58	791.66	6.22	793.02
MW-4A	Dec. 2004	799.13	797.1	34	39	763.1	758.1	7.55	791.58	7.48	791.65	6.11	793.02
MW-5	Dec. 2004	798.51	796.2	4	14	792.2	782.2	7.34	791.17	7.03	791.48	4.15	794.36
MW-6	Apr. 2005	797.29	797.7	6	16	791.7	781.7	12.47	784.82	--	--	2.73	794.56
MW-6A	Apr. 2005	797.45	797.8	35	40	762.8	757.8	16.60	780.85	--	--	11.48	785.97
MW-7	Mar. 2006	794.48	792.0	10	20	782.0	772	12.15	782.33	13.03	781.45	7.16	787.32
MW-7A	Mar. 2006	794.28	792.1	40	45	751.1	747.1	12.03	782.25	13.01	781.27	7.04	787.24
MW-7B	Sep. 2007	794.24	791.8	80	85	711.8	706.8	12.00	782.24	12.97	781.27	7.02	787.22
MW-8	Sep. 2007	795.03	792.8	10	20	782.8	772.8	3.75	791.28	3.76	791.27	2.27	792.76
MW-8A	Sep. 2007	795.17	792.8	45	50	747.8	742.8	11.25	783.92	11.99	783.18	7.57	787.60
MW-8B	Sep. 2007	795.19	792.7	80	85	712.7	707.7	11.27	783.92	12.01	783.18	7.59	787.60

Note: Wells MW-3A, MW-6, and MW-6A were installed in April 2005. The remaining wells were installed in December 2004.
Reference elevations surveyed by Woodman & Associates on July 14, 2005.

Table 2 (Page 3 of 3)
Historic Groundwater Sample Results
DB Oaks Facility, Fort Atkinson, Wisconsin

Constituent	PAL	ES	MW-7						MW-7A						MW-7B					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	--	--	<0.15	<0.57	<0.50	<0.50	--	--	<0.68	<5.7	<5.0	<0.50	--	--	--	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	--	--	<0.17	<0.89	<0.50	<0.50	--	--	<10	<8.9	<5.0	<0.50	--	--	--	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	--	--	0.89	<0.83	<0.50	<0.50	--	--	270	290	<5.0	<0.50	--	--	--	--	<0.50	<0.50
Trichlorethene (TCE)	0.5	5	--	--	2.9	1.4	0.63	<0.50	--	--	200	180	110	<0.50	--	--	--	--	0.87	0.73
Tetrachloroethene (PCE)	0.5	5	--	--	5.4	4.9	3.5	<0.50	--	--	850	560	310	0.67	--	--	--	--	6.9	6.4
Vinyl Chloride (VC)	0.02	0.2	--	--	<0.2	<0.18	<0.50	<0.50	--	--	<8.3	<1.8	<5.0	<0.50	--	--	--	--	<0.50	<0.50
Total VOCs					9.19	6.3	4.13	0.00			1,320	1,030	420	0.67					7.77	7.13

Constituent	PAL	ES	MW-8						MW-8A						MW-8B					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	1.3
Trichlorethene (TCE)	0.5	5	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	1.4
Tetrachloroethene (PCE)	0.5	5	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	1.9	--	--	--	--	<0.50	4
Vinyl Chloride (VC)	0.02	0.2	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50	--	--	--	--	<0.50	<0.50
Total VOCs							0	0					0.0	1.9					0	6.7

All units reported in µg/l.
 < - Detected below Limit of Detection.

PAL - Preventive Action Limit per Wisconsin Admin. Code sec. NR 141.10.
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Concentrations exceeding the PAL are in italics.
 Concentrations exceeding the ES have been shaded

**Table 2 (Page 2 of 3)
Historic Groundwater Sample Results
DB Oaks Facility, Fort Atkinson, Wisconsin**

Constituent	PAL	ES	MW-4					MW-4A						
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	<120	<210	<150	--	<25	<500	<0.24	<0.41	<0.15	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	<54	<170	<170	--	<25	<500	<0.11	<0.35	<0.17	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	<66	<200	<190	--	42	600	0.89	<0.40	0.29	--	<0.50	<0.50
Trichloroethene (TCE)	0.5	5	10,000	4,700	38,000	--	1,500	43,000	23	0.59	0.97	--	8.5	1.1
Tetrachloroethene (PCE)	0.5	5	2,500	2,500	5,400	--	2,000	14,000	7.1	1.2	6.9	--	1.2	1.5
Vinyl Chloride (VC)	0.02	0.2	<82	<53	<200	--	<25	<500	<0.16	<0.11	<0.2	--	<0.50	<0.50
Total VOCs			12,500	7,200	43,400		3,542	57,600	30.99	1.79	8.16		9.70	2.60

Constituent	PAL	ES	MW-5					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	<0.24	<0.41	<0.15	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	<0.11	<0.35	<0.17	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	0.21	<0.40	<0.19	--	<0.50	<0.50
Trichloroethene (TCE)	0.5	5	1.2	<0.25	0.77	--	<0.50	0.81
Tetrachloroethene (PCE)	0.5	5	2.3	<0.31	0.17	--	<0.50	0.78
Vinyl Chloride (VC)	0.02	0.2	<0.16	<0.11	<0.2	--	<0.50	<0.50
Total VOCs			3.71	0	0.94		0	1.59

Constituent	PAL	ES	MW-6					MW-6A						
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	--	<0.41	<0.15	--	<0.50	<0.50	--	<0.41	<0.14	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	--	<0.35	<0.17	--	<0.50	<0.50	--	<0.35	<0.21	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	--	<0.40	<0.19	--	<0.50	<0.50	--	<0.40	<0.34	--	<0.50	<0.50
Trichloroethene (TCE)	0.5	5	--	<0.25	0.35	--	<0.50	<0.50	--	<0.25	<0.19	--	<0.50	<0.50
Tetrachloroethene (PCE)	0.5	5	--	<0.31	<0.16	--	<0.50	<0.50	--	<0.31	<0.16	--	<0.50	<0.50
Vinyl Chloride (VC)	0.02	0.2	--	<0.11	<0.2	--	<0.50	<0.50	--	<0.11	<0.17	--	<0.50	<0.50
Total VOCs				0	0.35		0	0		0	0		0	0

All units reported in µg/l.
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Table 2 (Page 1 of 3)
Historic Groundwater Sample Results
DB Oaks Facility, Fort Atkinson, Wisconsin

Constituent	PAL	ES	MW-1					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	<0.24	<0.41	<0.15	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	<0.11	<0.35	<0.17	--	<0.50	<0.50
cis-1,2-Dichloroethene (c-DCE)	7	70	0.14	<0.40	<0.19	--	<0.50	<0.50
Trichlorethene (TCE)	0.5	5	<0.12	<0.25	0.4	--	<0.50	<0.50
Tetrachloroethene (PCE)	0.5	5	<0.13	<0.31	<0.16	--	<0.50	<0.50
Vinyl Chloride (VC)	0.02	0.2	<0.16	<0.11	<0.2	--	<0.50	<0.50
Total VOCs			0.14	0	0.4		0	0

Constituent	PAL	ES	MW-2						MW-2A						MW-2B					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	18	<210	<76	--	<25	<25	<12	<10	16	--	<25	<25	--	--	--	--	<0.50	<0.50
trans-1,2-Dichloroethene (t-DCE)	20	100	32	160	<85	--	<25	<25	<5.4	<8.7	20	--	<25	<25	--	--	--	--	<0.50	<0.50
Cis-1,2-Dichloroethene (c-DCE)	7	70	5,900	3,800	6,400	--	1,800	560	380	350	3,800	--	1,800	2,100	--	--	--	--	19	10
Trichlorethene (TCE)	0.5	5	140	160	450	--	520	85	69	83	700	--	530	620	--	--	--	--	6.2	5.5
Tetrachloroethene (PCE)	0.5	5	120	<150	190	--	<25	120	44	110	320	--	360	610	--	--	--	--	15	15
Vinyl Chloride (VC)	0.02	0.2	33	<53	<98	--	27	<25	29	36	91	--	<25	<25	--	--	--	--	<0.50	<0.50
Total VOCs			6,243	4,120	7,040		2,347	765.0	522	579	4,947		2,690	3,330					40.2	30.5

Constituent	PAL	ES	MW-3						MW-3A					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	<1,200	<1,000	<380	<140	<200	<130	--	<210	<76	<140	<125	<250
trans-1,2-Dichloroethene (t-DCE)	20	100	<540	<870	<420	<220	<200	<130	--	250	190	<220	190	<250
cis-1,2-Dichloroethene (c-DCE)	7	70	6,800	2,600	3,500	3,000	5,800	2,100	--	13,000	12,000	14,000	11,000	16,000
Trichlorethene (TCE)	0.5	5	17,000	5,500	7,200	5,100	3,300	3,100	--	2,300	2,900	1,900	1,500	2,700
Tetrachloroethene (PCE)	0.5	5	34,000	27,000	28,000	22,000	10,000	24,000	--	3,000	4,200	1,700	2,100	4,400
Vinyl Chloride (VC)	0.02	0.2	<820	<270	<490	79	710	<130	--	910	740	580	520	990
Total VOCs			57,800	35,100	38,700	30,179	19,810	29,200		19,460	20,030	18,180	15,310	24,090

Constituent	PAL	ES	MW-3B						MW-3C					
			Sample Date	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007	4/21/2008	12/16/2004	6/1/2005	3/28/2006	11/2/2006	10/25/2007
1,1-Dichloroethene (DCE)	0.7	7	--	--	<76	<71	<100	<100	--	--	--	--	<1.0	<5
trans-1,2-Dichloroethene (t-DCE)	20	100	--	--	<85	<110	<100	<100	--	--	--	--	1	<5
cis-1,2-Dichloroethene (c-DCE)	7	70	--	--	600	400	330	530	--	--	--	--	110	49
Trichlorethene (TCE)	0.5	5	--	--	2,800	1,800	1,200	2,400	--	--	--	--	1.4	<5
Tetrachloroethene (PCE)	0.5	5	--	--	17,000	9,700	5,300	12,000	--	--	--	--	3.2	<5
Vinyl Chloride (VC)	0.02	0.2	--	--	<98	<22	<100	<100	--	--	--	--	2.8	<5
Total VOCs					20,400	11,900	6,830	14,930					118.4	49.0

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Table 3 (Page 1 of 4)
Potential Groundwater Remedial Responses – Technology Screening
D.B Oaks Facility, Fort Atkinson, Wisconsin

Remedial Response	Remedial Technology	Description	Evaluation	Cost	Status
<i>No Further Action</i>	None	<ul style="list-style-type: none"> No additional investigation or site remediation. 	<ul style="list-style-type: none"> Would not be acceptable to regulatory Agency at this time. 	Low	<ul style="list-style-type: none"> Not retained for further evaluation
<i>Containment</i>	<ul style="list-style-type: none"> Engineered Surface Barrier 	<ul style="list-style-type: none"> Install asphalt pavement as engineered surface barrier over area where total VOCs exceed 1 ppm. Perform long term monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Asphalt pavement would prevent direct contact with contamination, but would not reduce toxicity, mobility, or contaminant mass in saturated zone. Asphalt pavement would also prevent further groundwater contamination by preventing infiltration from flushing contaminants from unsaturated zone soils. Source for groundwater contamination would remain on site. Groundwater monitoring would be required for an extended period of time. 	Low to Moderate	<ul style="list-style-type: none"> Not retained for further evaluation, but could be used with other remedial technologies.
	<ul style="list-style-type: none"> Vertical Barrier Walls Groundwater Extraction 	<ul style="list-style-type: none"> Install slurry wall to a depth of approximately 100 feet down gradient from source area. Install groundwater extraction well behind barrier wall to reduce hydraulic head behind barrier wall. Perform long term monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Vertical barriers with groundwater extraction would prevent off-site migration of contaminants with groundwater. Source for groundwater contamination would remain on site, but groundwater extraction would slowly reduce toxicity and contaminant mass. Permit would be required to discharge treated water. Long term operation and maintenance of groundwater extraction system would be required because source for groundwater contamination would remain on-site. Groundwater monitoring would be required for an extended period of time. 	Very High	<ul style="list-style-type: none"> Not retained for further evaluation.
	<ul style="list-style-type: none"> Engineered Surface Barrier Barrier Wells 	<ul style="list-style-type: none"> Install groundwater extraction wells to create cone(s) of depression that would prevent contaminants from migrating off-site. Install asphalt pavement as engineered surface barrier over plume to reduce infiltration and recharge to aquifer. Perform long term monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Asphalt pavement would prevent direct contact with contamination, but would not reduce toxicity, mobility, or contaminant mass in saturated zone. Asphalt pavement would also prevent further groundwater contamination by preventing infiltration from flushing Source for groundwater contamination would remain on site, but groundwater extraction would result in slow reduction in contaminant mass while preventing off-site migration of groundwater contaminants. Permit would be required to discharge treated water. Long term operation and maintenance of groundwater extraction system would be required because source for groundwater contamination would remain on-site. Groundwater monitoring would be required for an extended period of time. 	Very High	<ul style="list-style-type: none"> Not retained for further evaluation.

Table 3 (Page 2 of 4)
Potential Remedial Responses – Technology Screening
D.B Oaks Facility, Fort Atkinson, Wisconsin

Remedial Response	Remedial Technology	Description	Evaluation	Cost	Status
<i>Source Removal and On-site Treatment</i>	<ul style="list-style-type: none"> Groundwater Extraction 	<ul style="list-style-type: none"> Install on-site extraction wells and horizontal well in shallow trenches within plume to remove contaminated groundwater. Construct on-site treatment system to remove VOCs from extracted groundwater. Perform groundwater monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Would reduce contaminant mass, toxicity, and mobility in saturated zone. Extraction wells would be required to contaminated groundwater from deep plume. Shallow groundwater contamination could be removed using horizontal wells installed in trenches. Lateral to extraction wells would need to be placed in trenches, which may require off-site disposal of contaminated soil as hazardous waste. Permit would be required to discharge treated water. Long term operation and maintenance of groundwater extraction system would be required because source for groundwater contamination would remain on-site. Groundwater monitoring would be required for several years. 	Moderate to High	<ul style="list-style-type: none"> Retained for further evaluation.
	<ul style="list-style-type: none"> Multiphase Vacuum Extraction 	<ul style="list-style-type: none"> Install multiphase vacuum recovery wells and connect to vacuum blower to remove VOC gases from the unsaturated zone and VOC contaminated groundwater from the saturated zone. Perform groundwater monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Would reduce contaminant mass, toxicity, and mobility. Numerous extraction wells would be required because fine grained soil would require close spacing of wells. Lateral to extraction wells would need to be placed in trenches, which may require off-site disposal of contaminated soil as hazardous waste. Permit would be required to discharge treated water. Vacuum extraction would limit remediation in the saturated zone to depths less than 28 feet (equivalent to atmospheric pressure less head losses). Groundwater monitoring would be required for several years. 	Moderate to High	<ul style="list-style-type: none"> Not retained for further evaluation because would not be applicable for groundwater contamination below 28 feet.
	<ul style="list-style-type: none"> In-situ Flushing 	<ul style="list-style-type: none"> Contaminated groundwater would be extracted from extraction wells and/or interceptor trenches. Injection of a flushing solution to increase the solubility of VOCs in groundwater, which increases the mobility of VOCs in groundwater. Perform monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> Would result in reduction in contaminant mass, and would prevent migration of contaminants with groundwater. Agency approval would be required for injection of the flushing solution, and permit would be required to discharge treated water. Groundwater monitoring would be needed for several years. 	High	<ul style="list-style-type: none"> Not retained for further evaluation because soil permeability is too low for soil flushing to be effective.

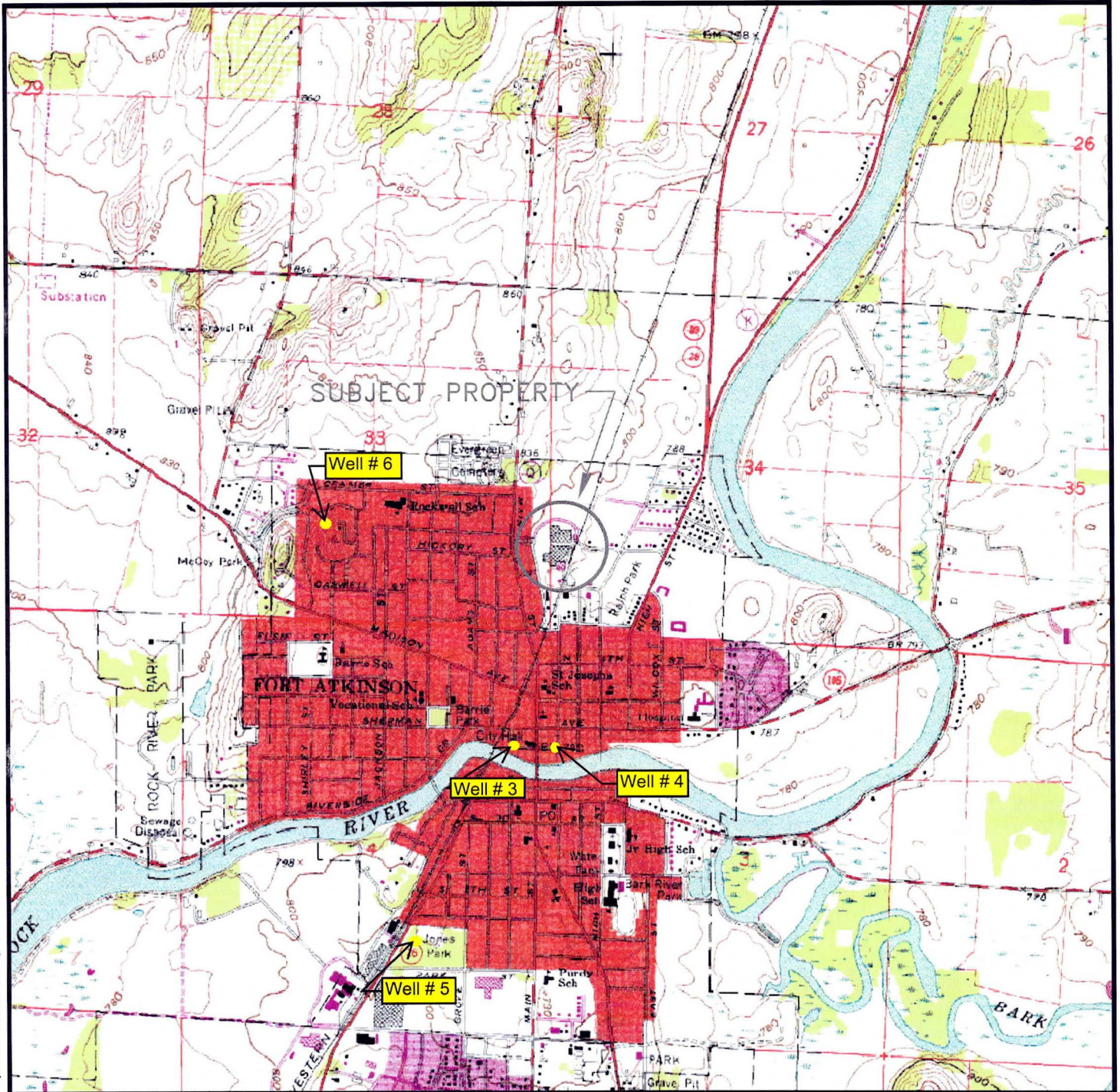
Table 3 (Page 3 of 4)
Potential Remedial Responses – Technology Screening
D.B Oaks Facility, Fort Atkinson, Wisconsin

Remedial Response	Remedial Technology	Description	Evaluation	Cost	Status
<i>Source Removal and On-site Treatment</i>	<ul style="list-style-type: none"> • Electrical Resistance Heating (ERH) 	<ul style="list-style-type: none"> • Install array of electrodes in to heat subsurface and enhance the mobility of VOCs in fine grained soil units. • Install on-site extraction wells and horizontal well in shallow trenches within plume to remove contaminated groundwater. • Utilize existing SVE system to recover vapors. Construct on-site treatment system for on-site treatment of VOCs from extracted groundwater. • Perform groundwater monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> • Would reduce contaminant mass, toxicity, and mobility in saturated zone. • Extraction wells would be required to contaminated groundwater from deep plume. • Shallow groundwater contamination could be removed using horizontal wells installed in trenches. Lateral to extraction wells would need to be placed in trenches, which may require off-site disposal of contaminated soil as hazardous waste. • Permit would be required to discharge treated water. • Permit would be required to discharge treated water. • Long term operation and maintenance of groundwater extraction system would be required because source for groundwater contamination would remain on-site. • Groundwater monitoring would be required for several years 	High	<ul style="list-style-type: none"> • Retained for further evaluation
	<i>In-situ Treatment</i>	<ul style="list-style-type: none"> • In-Situ Treatment by Chemical Oxidation 	<ul style="list-style-type: none"> • Introduce strong oxidizing chemicals into the subsurface to degrade chlorinated VOCs to CO₂ and H₂O end products. • Perform groundwater monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> • Would reduce contaminant mass, toxicity, and mobility in saturated zone. • Numerous injection points would be required to mix reagent within contaminated zone. • Multiple applications may be needed. Pilot test may be needed to evaluate best oxidizing chemicals to use and mixing rates • Permit or Agency approval would be required to inject chemicals into the subsurface. • Soil samples would be required to evaluate remediation. • Groundwater monitoring would be required for several years. 	High
<ul style="list-style-type: none"> • In-situ Treatment by Biological Reductive Dechlorination 		<ul style="list-style-type: none"> • Introduce nutrients into the subsurface to promote the biological degradation of chlorinated VOCs by reductive dechlorination. • Perform groundwater monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> • Would reduce contaminant mass, toxicity, and mobility in saturated zone. • Several injection points would be required to inject nutrients into the subsurface. • Permit or Agency approval would be required to inject chemicals into the subsurface. • Pilot test would be needed to evaluate best mixing rates and nutrients needed for in-situ treatment. • Groundwater monitoring would be required for several years. 	Moderate	<ul style="list-style-type: none"> • Retained for further evaluation

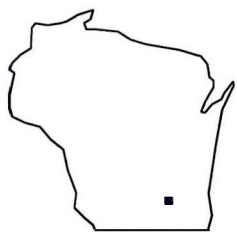
Table 3 (Page 4 of 4)
Potential Remedial Responses – Technology Screening
D.B Oaks Facility, Fort Atkinson, Wisconsin

Remedial Response	Remedial Technology	Description	Evaluation	Cost	Status
<i>In-situ Treatment</i>	<ul style="list-style-type: none"> • Ozone Sparge 	<ul style="list-style-type: none"> • Install of sparge wells at various depths within the plume. • Discharge lines between ozone control panel and sparge wells would be installed in shallow trenches. 	<ul style="list-style-type: none"> • Would reduce contaminant mass, toxicity, and mobility in saturated zone. • Numerous sparge wells would be required at various depths. • Permit or Agency approval would be required to inject ozone into the subsurface. • Soil samples would be required to evaluate remediation. • Groundwater monitoring would be required for several years. 		<ul style="list-style-type: none"> • Retained for further evaluation
	<ul style="list-style-type: none"> • In-situ Treatment by Chemical Fixation 	<ul style="list-style-type: none"> • Inject or mix chemically reagent in contaminated soil mass to fix (immobilize) chlorinated VOCs in subsurface. • Perform monitoring to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> • Would not reduce contaminant mass, but would reduce toxicity and mobility of contaminants. • Chemicals would be mixed in excavations completed in hot spot areas where total chlorinated VOCs exceed 10 ppm, and by injection points in areas where total chlorinated VOCs exceed 1 ppm. • Pilot test would be needed to evaluate best mixing rates, but ex-situ mixing may be required for hot spot areas. • Permit or Agency approval would be required to inject or mix chemicals in the subsurface; hazardous waste generation and on-site treatment would need regulatory issues. • Soil samples would be required to evaluate remediation, and multiple applications may be needed. • Groundwater monitoring would be required for several years. 	High	<ul style="list-style-type: none"> • Not retained for further evaluation because chlorinated VOCs concentrations are high, and ex-situ mixing would be required. Hazardous waste issues would make permitting difficult.
	<ul style="list-style-type: none"> • In-situ Treatment by Passive Reactive Barrier Wall 	<ul style="list-style-type: none"> • Installation of a permeable reactive barrier that intersects the groundwater plume. Zero valent iron, typically iron filings, is placed in a trench, and chlorinated VOCs are reduced by reductive dechlorination as groundwater passes through the trench. • Groundwater monitoring will be performed to evaluate remediation effectiveness. 	<ul style="list-style-type: none"> • Would not reduce contaminant mass or toxicity in source area, but would reduce toxicity and mobility of contaminants migrating with groundwater. • Groundwater monitoring would be required for several years. • Construction of a PRB wall below a depth of 20 feet would be difficult to implement, but could be used in combination with vertical barrier walls installed at depth. 	Moderate	<ul style="list-style-type: none"> • Not retained for further evaluation because would not remediate source area or groundwater contamination at depth.
<ul style="list-style-type: none"> • Natural Attenuation and Institutional Controls 	<ul style="list-style-type: none"> • Groundwater monitoring • GIS Closure • Deed restriction 	<ul style="list-style-type: none"> • Perform additional groundwater monitoring to show that plume is stable or receding and that natural attenuation is acceptable as a final remedial response. 	<ul style="list-style-type: none"> • Would not be acceptable to regulatory Agency at this time, but would be acceptable following implementation of a remedial response that would reduce contaminant mass, toxicity, and mobility of contaminants. 	Low	<ul style="list-style-type: none"> • Not retained for further evaluation. • Could be used in combination with other remedial responses.

Figures



BASE MAP SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, FORT ATKINSON, WISCONSIN, DATED 1987.



QUADRANGLE LOCATION



NORTH
SCALE: 1"=2400'

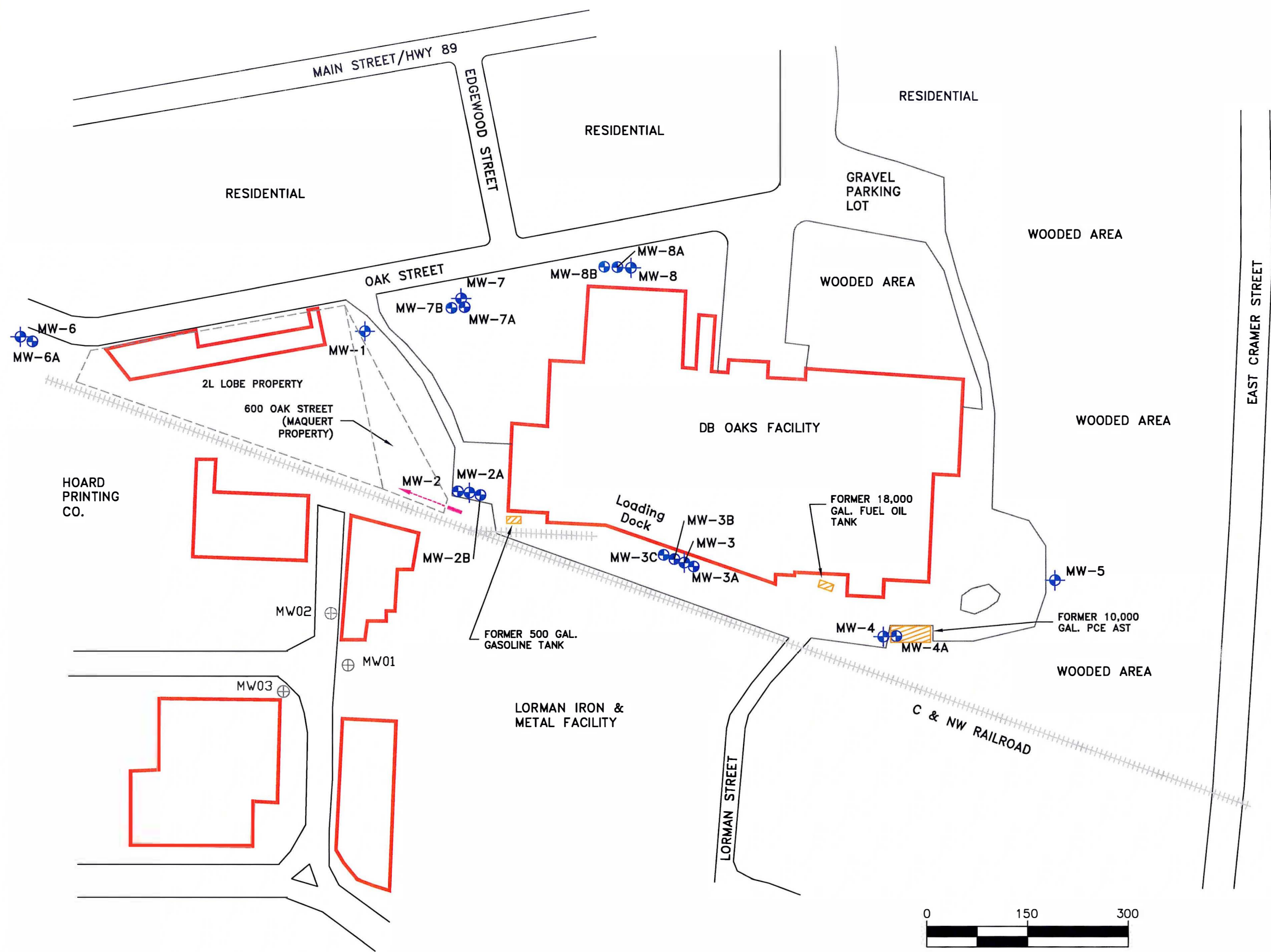
**FORMER THOMAS FACILITY
FORT ATKINSON, WISCONSIN**

**FIGURE 1
SITE LOCATION**







DRN. BY DDZ
DATE 17.AUG.2005

PROJECT NO. 0451-002-800

NEWFIELDS



LEGEND

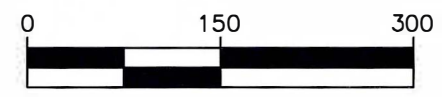
-  EXISTING MONITORING WELL
-  EXISTING PIEZOMETER
-  ABANDONED MONITORING WELL ASSOCIATED WITH LORMAN IRON & METAL
-  FORMER TANKS
-  CULVERT
-  SURFACE DITCH/DIRECTION OF FLOW

SOURCES:

ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
 AERIAL PHOTO, APRIL 21, 1996.



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SCALE: 1" = 150'
 SCALE IS APPROXIMATE

**FIGURE 2
SITE MAP**

FORMER THOMAS INDUSTRIES
 FORT ATKINSON, WISCONSIN

MW-2A
 MW-2B
 MW-2

DB OAKS BUILDING



MW-3B

MW-3C

MW-3

MW-3A

MW-4








MW-4A

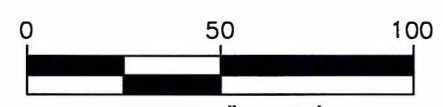
LORMAN IRON &
 METAL FACILITY

C & NW RAILROAD

LORMAN STREET

LEGEND

-  INDOOR GEOPROBE BORING
-  PRIMARY GEOPROBE BORING
-  SECONDARY GEOPROBE BORING
-  TOTAL VOC CONCENTRATION (10 PPM)
(5,115 CUBIC YARDS TO 10 FT.)
-  TOTAL VOC CONCENTRATION (1 PPM)
(6,504 CUBIC YARDS TO 10 FT.)
-  STORM SEWER
-  GAS LINE



SCALE: 1" = 50'
 SCALE IS APPROXIMATE

SOURCES:
 ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
 AERIAL PHOTO, APRIL 21, 1996.



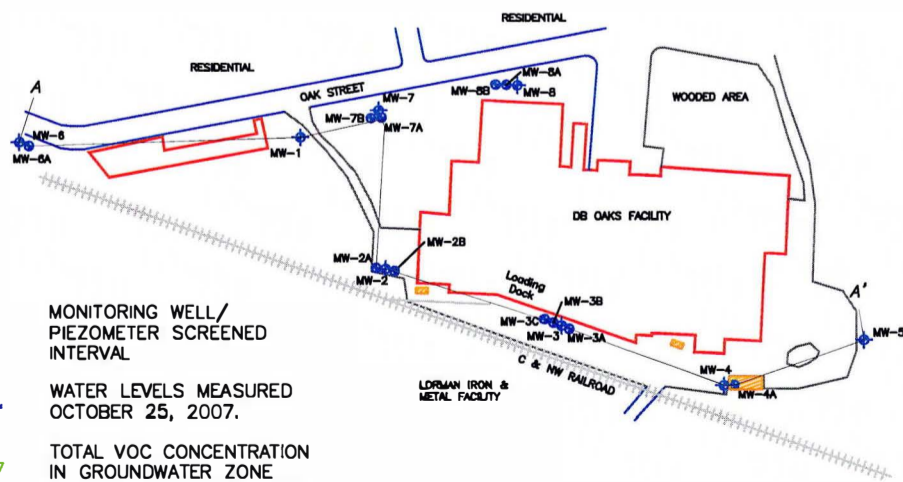
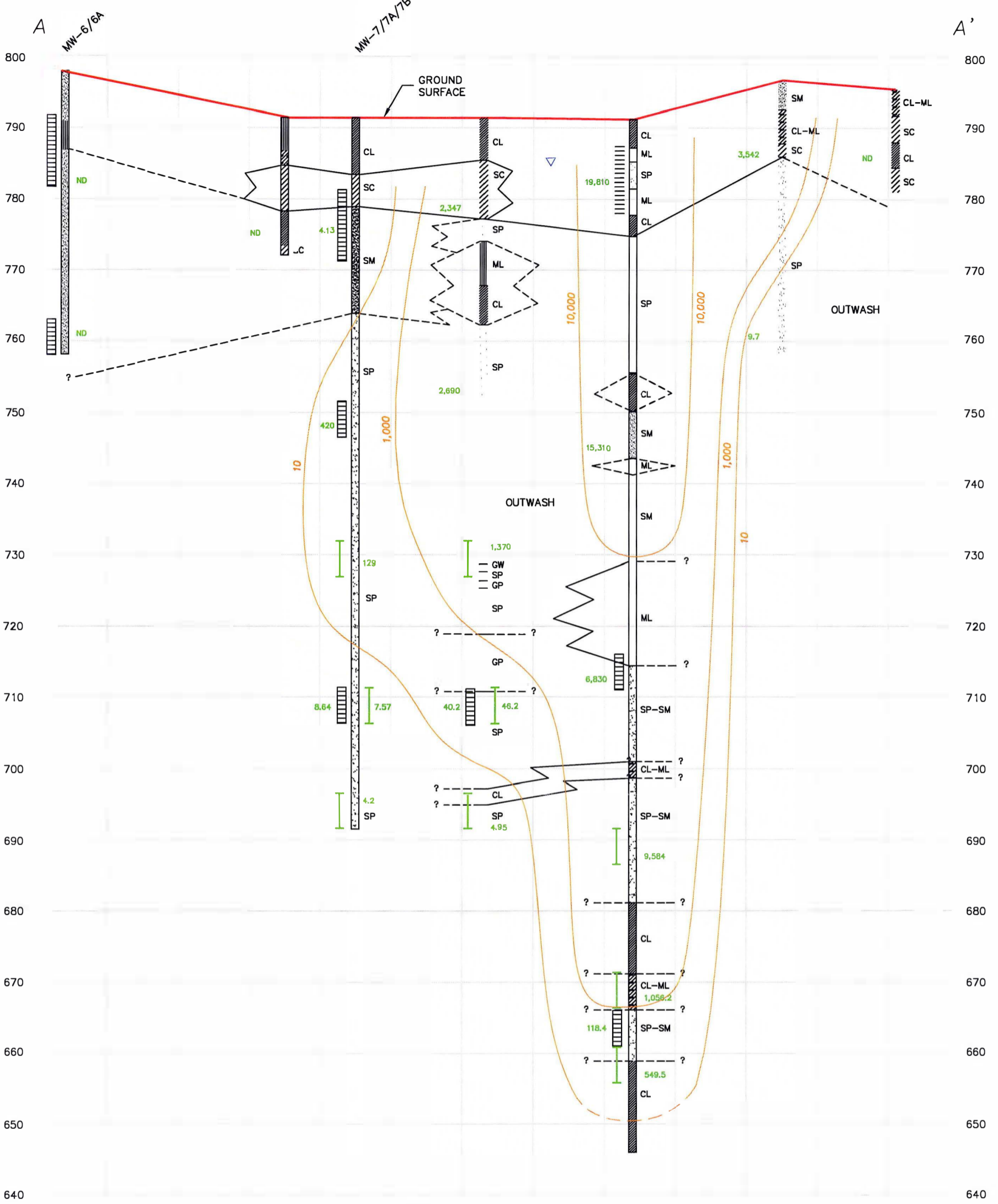
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**FIGURE 3
 LATERAL EXTENT OF SOIL
 CONTAMINATION**

FORMER THOMAS INDUSTRIES
 FORT ATKINSON, WISCONSIN

JANUARY 15, 2009

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- LEGEND:**
- CLAY (CL)
 - CLAY/SILT (CL-ML)
 - SILT (ML)
 - CLAYEY SAND (SC)
 - SILTY SAND (SM)
 - SAND (SP)
 - GRAVEL (GP OR GW)
 - MONITORING WELL/PIEZOMETER SCREENED INTERVAL
 - WATER LEVELS MEASURED OCTOBER 25, 2007.
 - TOTAL VOC CONCENTRATION IN GROUNDWATER ZONE SAMPLE, SEPTEMBER 2007
 - TOTAL VOC CONCENTRATION MEASURED OCTOBER 2007
 - TOTAL VOC CONCENTRATION

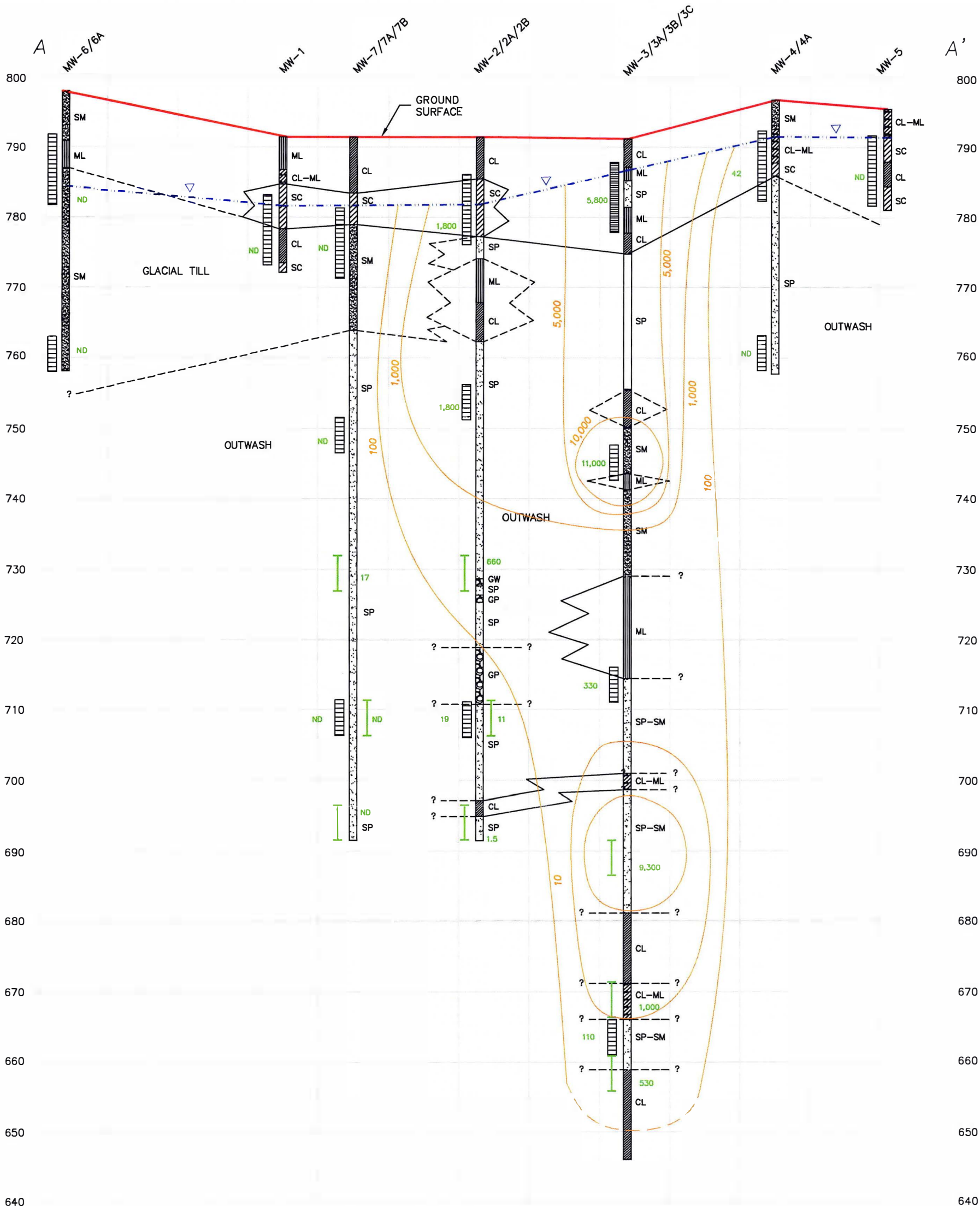
SCALE:
 HORIZ. 1" = 200'
 VERT. 1" = 15'

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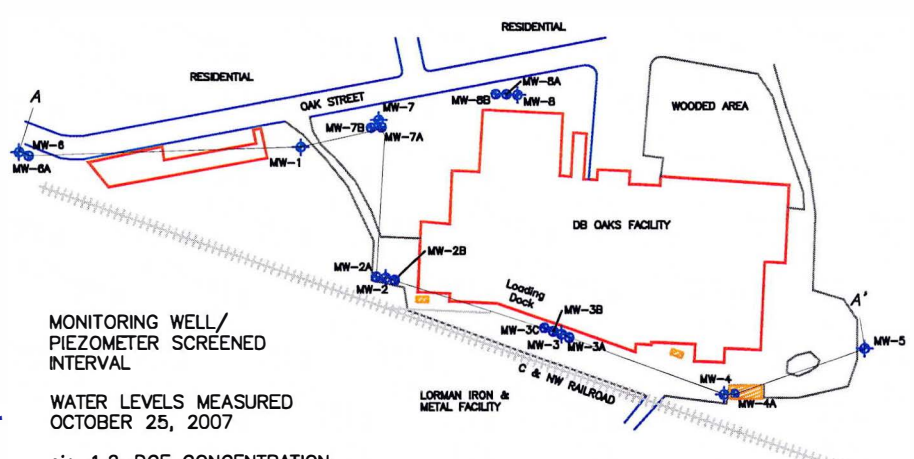
**FIGURE 4
 VERTICAL EXTENT OF TOTAL VOCs**

FORMER THOMAS INDUSTRIES
 FORT ATKINSON, WISCONSIN

JANUARY 15, 2009



CROSS SECTION LOCATION



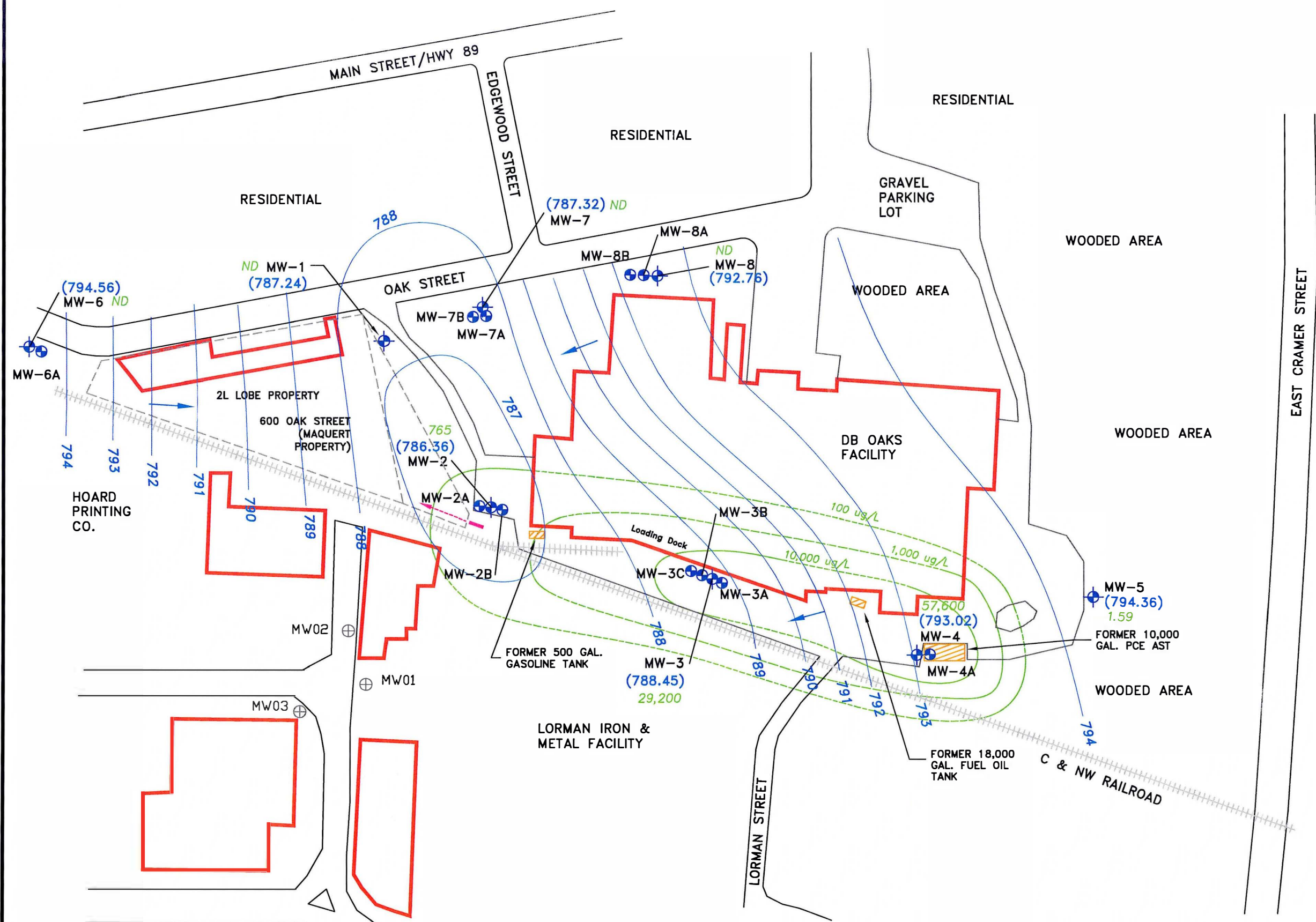
SCALE:
 HORIZ. 1" = 200'
 VERT. 1" = 15'

- LEGEND:**
- CLAY (CL)
 - CLAY/SILT (CL-ML)
 - SILT (ML)
 - CLAYEY SAND (SC)
 - SILTY SAND (SM)
 - SAND (SP)
 - GRAVEL (GP OR GW)
 - MONITORING WELL/PIEZOMETER SCREENED INTERVAL
 - WATER LEVELS MEASURED OCTOBER 25, 2007
 - cis-1,2-DCE CONCENTRATION IN GROUNDWATER ZONE SAMPLE, SEPTEMBER 2007
 - cis-1,2-DCE CONCENTRATION MEASURED OCTOBER 2007
 - cis-1,2-DCE CONCENTRATION












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FIGURE 4B
VERTICAL EXTENT OF
cis-1,2-Dichloroethylene
 FORMER THOMAS INDUSTRIES
 FORT ATKINSON, WISCONSIN

JANUARY 15, 2009



LEGEND

-  EXISTING MONITORING WELL
-  EXISTING PIEZOMETER
-  ABANDONED MONITORING WELL ASSOCIATED WITH LORMAN IRON & METAL
-  FORMER TANKS
-  CULVERT
-  SURFACE DITCH/DIRECTION OF FLOW
-  (790.68) GROUNDWATER ELEVATION
-  789 — GROUNDWATER ELEVATION CONTOUR
-  — GROUNDWATER FLOW DIRECTION
-  0.35 TOTAL VOC CONCENTRATION (ug/L)
-  ——— TOTAL VOC ISOCONCENTRATION CONTOUR

NOTES:
GROUNDWATER ELEVATIONS MEASURED ON APRIL 20, 2008.

SOURCES:
ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
AERIAL PHOTO, APRIL 21, 1996.

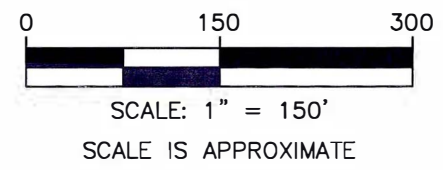


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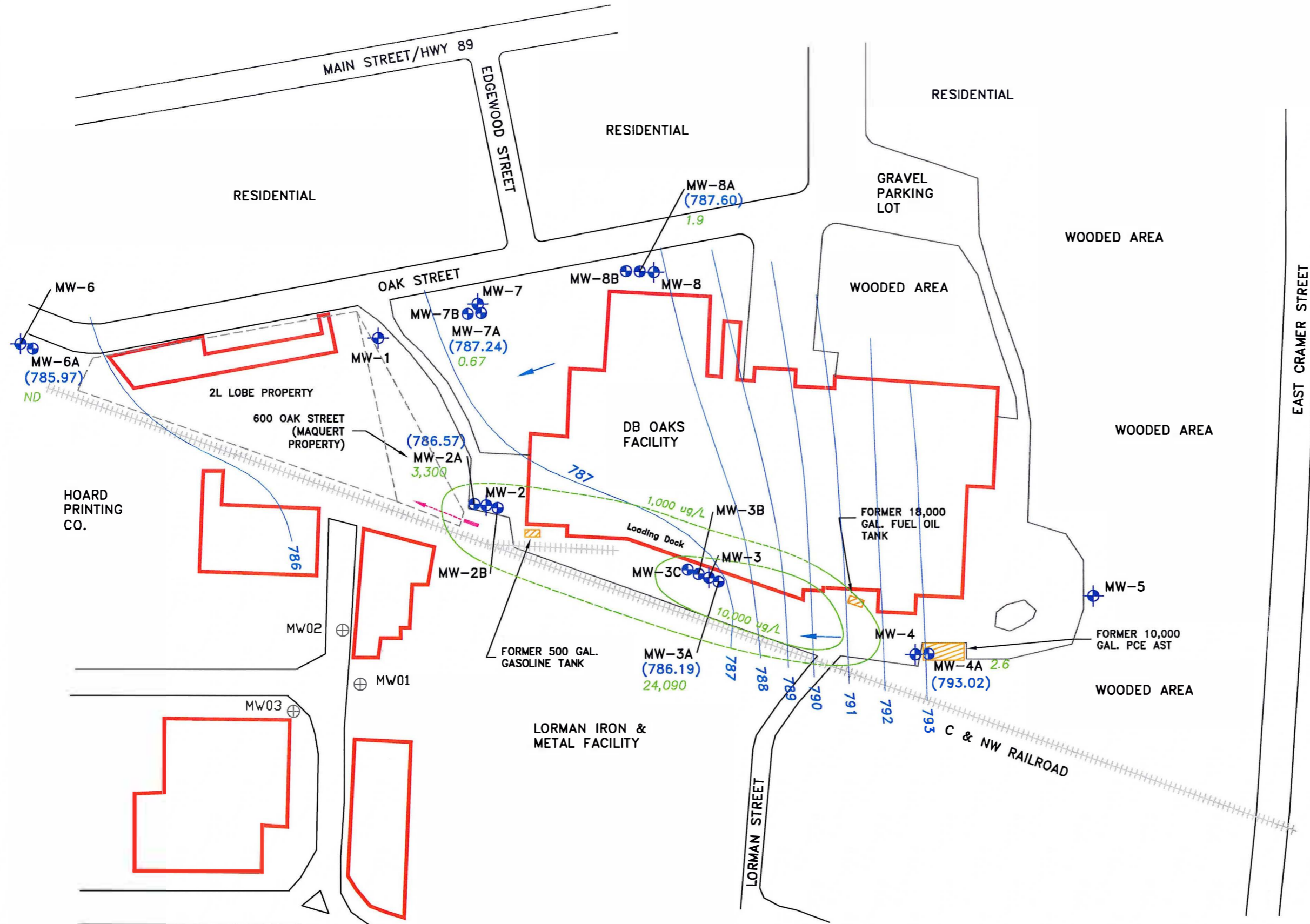
FIGURE 5
GROUNDWATER ELEVATIONS & TOTAL VOC ISOCONCENTRATION CONTOURS - SHALLOW WATER TABLE WELLS

FORMER THOMAS INDUSTRIES
FORT ATKINSON, WISCONSIN

JANUARY 15, 2009



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LEGEND

- EXISTING MONITORING WELL
- EXISTING PIEZOMETER
- ABANDONED MONITORING WELL ASSOCIATED WITH LORMAN IRON & METAL
- FORMER TANKS
- CULVERT
- SURFACE DITCH/DIRECTION OF FLOW
- (790.68) GROUNDWATER ELEVATION
- 789 GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- 0.35 TOTAL VOC CONCENTRATION (ug/L)
- TOTAL VOC ISOCONCENTRATION CONTOUR

NOTES:
GROUNDWATER ELEVATIONS MEASURED ON APRIL 20, 2008.

SOURCES:
ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
AERIAL PHOTO, APRIL 21, 1996.

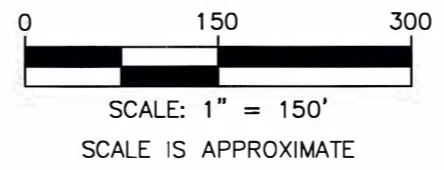


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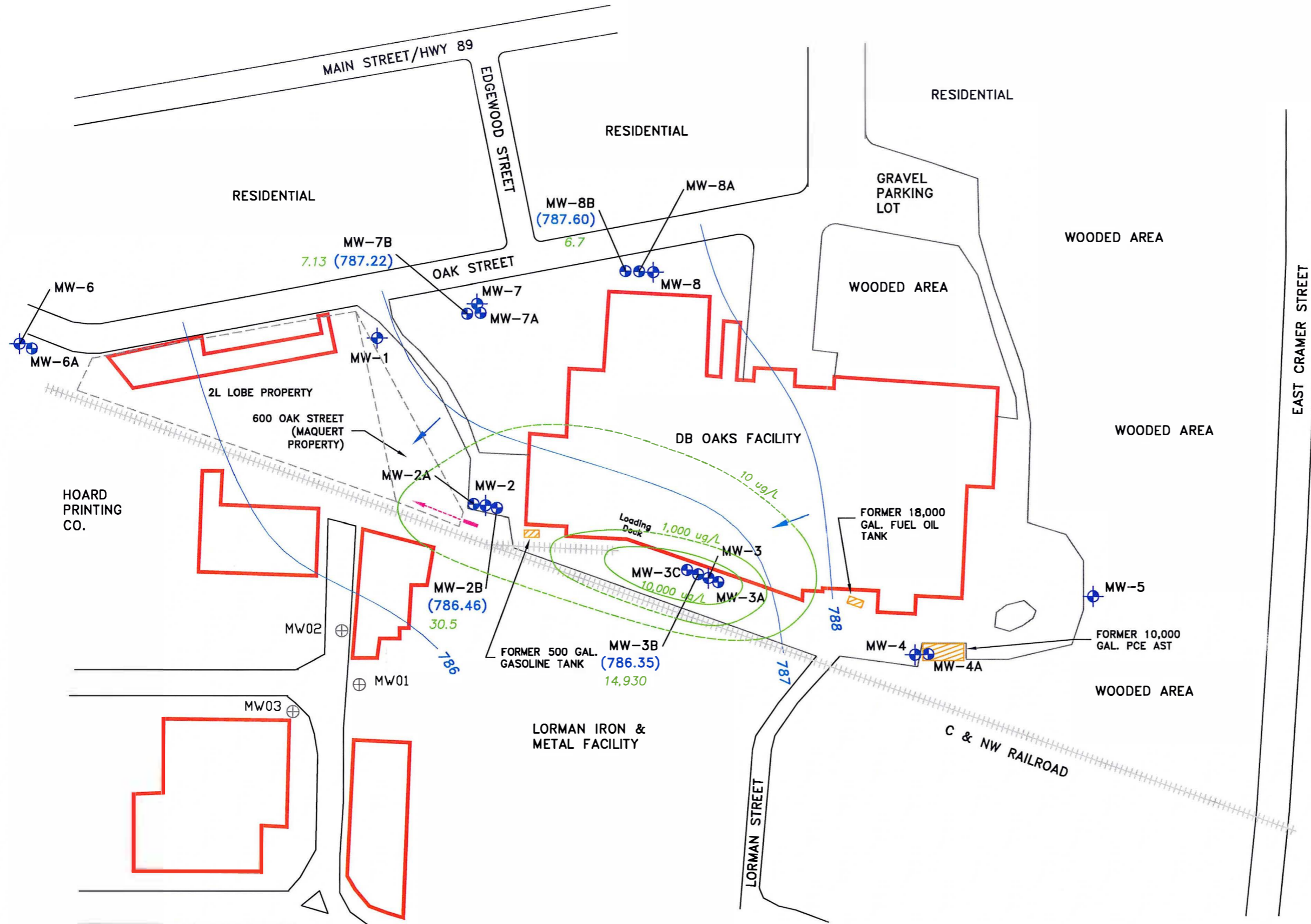
FIGURE 5A
GROUNDWATER ELEVATIONS & TOTAL VOC ISOCONCENTRATION CONTOURS - "A" HORIZON PIEZOMETERS

FORMER THOMAS INDUSTRIES
FORT ATKINSON, WISCONSIN

JANUARY 15, 2009



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LEGEND

- EXISTING MONITORING WELL
- EXISTING PIEZOMETER
- ABANDONED MONITORING WELL ASSOCIATED WITH LORMAN IRON & METAL
- FORMER TANKS
- CULVERT
- SURFACE DITCH/DIRECTION OF FLOW
- (790.68) GROUNDWATER ELEVATION
- 789 — GROUNDWATER ELEVATION CONTOUR
- ← GROUNDWATER FLOW DIRECTION
- 0.35 TOTAL VOC CONCENTRATION (ug/L)
- TOTAL VOC ISOCONCENTRATION CONTOUR

NOTES:
GROUNDWATER ELEVATIONS MEASURED ON APRIL 20, 2008.

SOURCES:

ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.

AERIAL PHOTO, APRIL 21, 1996.

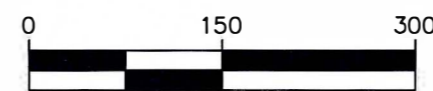


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FIGURE 5B
GROUNDWATER ELEVATIONS & TOTAL VOC ISOCONCENTRATION CONTOURS - "B" HORIZON PIEZOMETERS

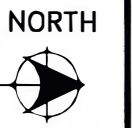
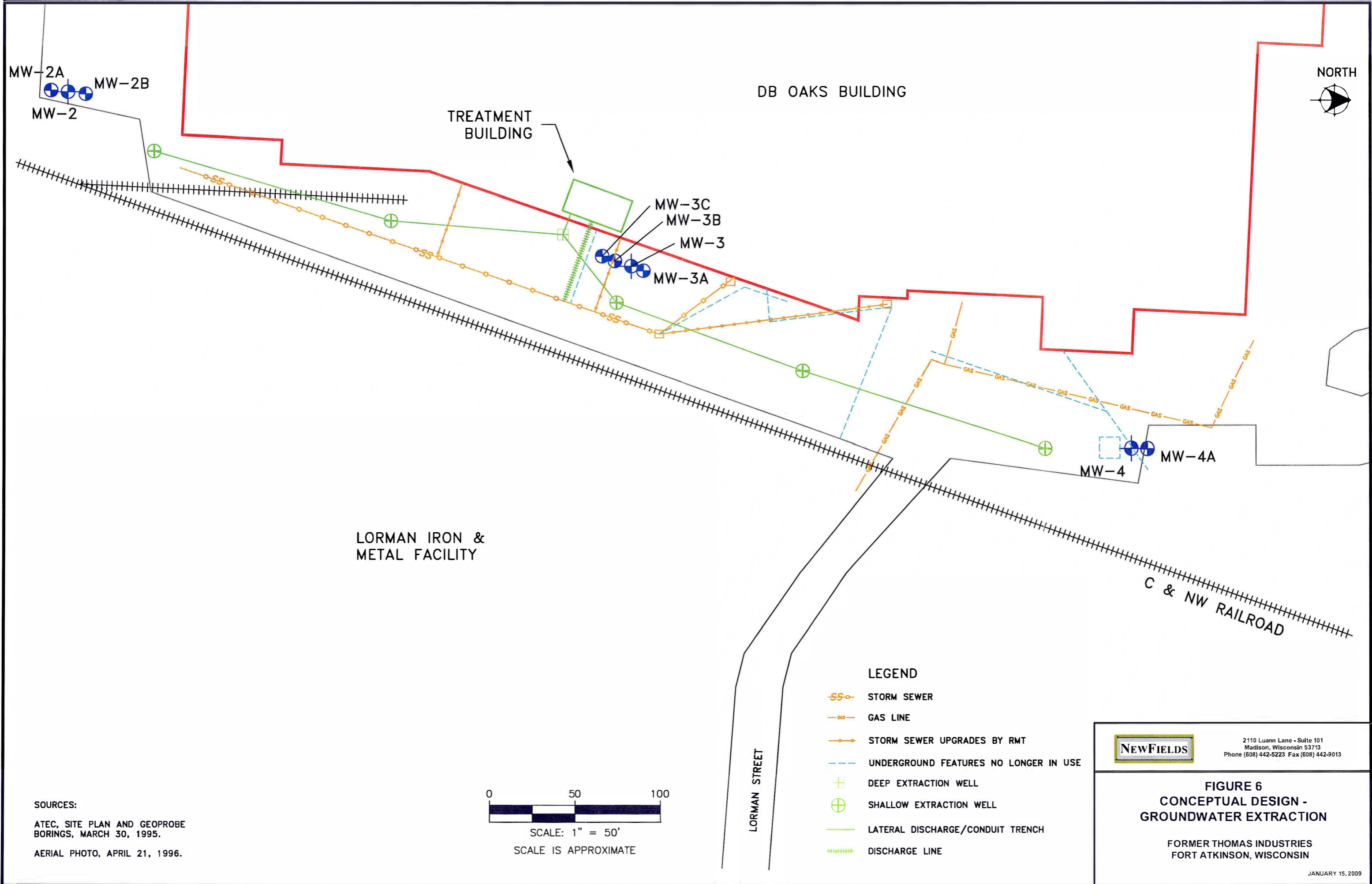
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FORT ATKINSON, WISCONSIN

JANUARY 15, 2009



SCALE: 1" = 150'

SCALE IS APPROXIMATE



DB OAKS BUILDING

TREATMENT BUILDING

LORMAN IRON & METAL FACILITY

C & NW RAILROAD

LORMAN STREET

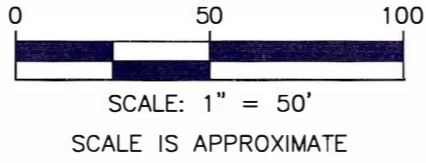
MW-2A
MW-2B
MW-2

MW-3C
MW-3B
MW-3
MW-3A

MW-4
MW-4A

LEGEND

- STORM SEWER
- GAS LINE
- STORM SEWER UPGRADES BY RMT
- UNDERGROUND FEATURES NO LONGER IN USE
- DEEP EXTRACTION WELL
- SHALLOW EXTRACTION WELL
- LATERAL DISCHARGE/CONDUIT TRENCH
- DISCHARGE LINE



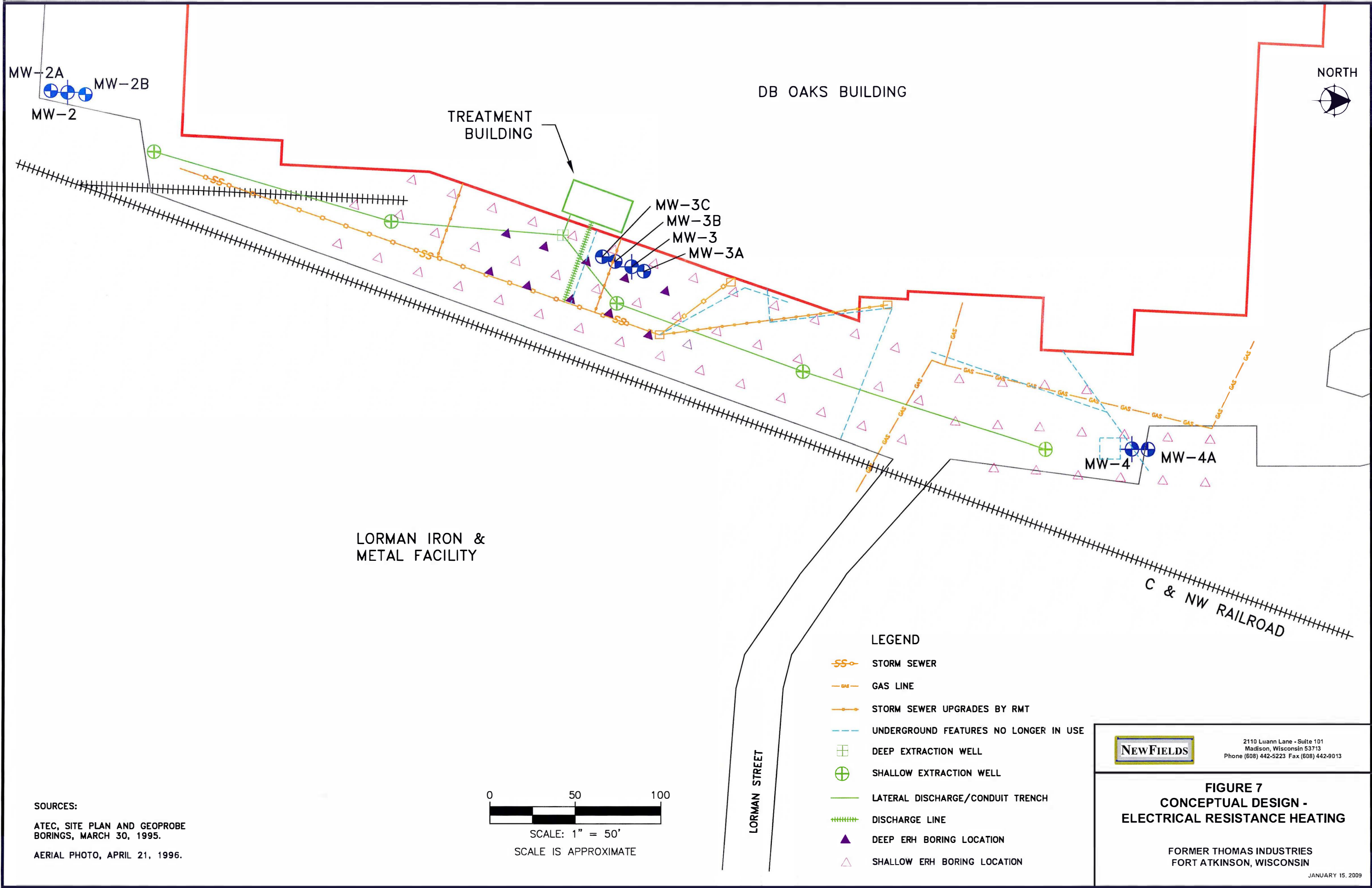
SOURCES:
ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
AERIAL PHOTO, APRIL 21, 1996.



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FIGURE 6
CONCEPTUAL DESIGN -
GROUNDWATER EXTRACTION

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FORT ATKINSON, WISCONSIN



DB OAKS BUILDING

TREATMENT BUILDING

LORMAN IRON & METAL FACILITY

C & NW RAILROAD

LORMAN STREET

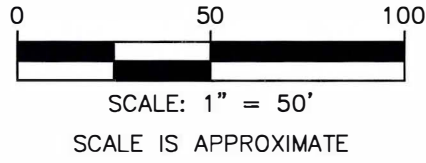
MW-2A
MW-2B
MW-2

MW-3C
MW-3B
MW-3
MW-3A

MW-4
MW-4A

LEGEND

- STORM SEWER
- GAS LINE
- STORM SEWER UPGRADES BY RMT
- UNDERGROUND FEATURES NO LONGER IN USE
- DEEP EXTRACTION WELL
- SHALLOW EXTRACTION WELL
- LATERAL DISCHARGE/CONDUIT TRENCH
- DISCHARGE LINE
- DEEP ERH BORING LOCATION
- SHALLOW ERH BORING LOCATION



SOURCES:
ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
AERIAL PHOTO, APRIL 21, 1996.



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FIGURE 7
CONCEPTUAL DESIGN -
ELECTRICAL RESISTANCE HEATING

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JANUARY 15, 2009

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MW-2A
MW-2B
MW-2

DB OAKS BUILDING



10,000 ug/L

MW-3C
MW-3B
MW-3
MW-3A

LORMAN IRON &
METAL FACILITY

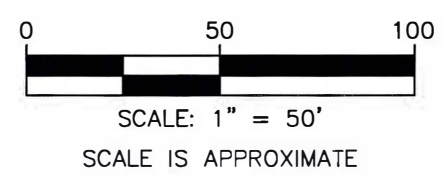
MW-4
MW-4A

C & NW RAILROAD

LORMAN STREET

NOTES:
SHALLOW INJECTION BORINGS WILL BE SPACED ON A 6 FOOT GRID INSIDE RED SHADED AREAS, DENOTING 10 PPM (mg/Kg) TOTAL VOCs IN SOIL (SEE FIGURE 3).
DEEP INJECTION BORINGS WILL BE SPACED ON A 10 FOOT GRID INSIDE THE GREEN OUTLINED AREA, DENOTING 10,000 ug/L TOTAL VOCs IN GROUNDWATER IN "B" HORIZON PIEZOMETERS (SEE FIGURE 5B).

SOURCES:
ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
AERIAL PHOTO, APRIL 21, 1996.



- LEGEND**
- TOTAL VOC CONCENTRATION IN SOIL (10 PPM) (5,115 CUBIC YARDS TO 10 FT.)
 - STORM SEWER
 - GAS LINE
 - STORM SEWER UPGRADES BY RMT
 - UNDERGROUND FEATURES NO LONGER IN USE
 - 10,000 TOTAL VOC CONCENTRATION IN GROUNDWATER IN "B" HORIZON (ug/L)
 - TOTAL VOC (GROUNDWATER) ISOCONCENTRATION CONTOUR



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FIGURE 8
CONCEPTUAL DESIGN -
IN-SITU CHEMICAL OXIDATION

FORMER THOMAS INDUSTRIES
FORT ATKINSON, WISCONSIN

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MW-2A
MW-2B
MW-2

DB OAKS BUILDING



10,000 ug/L

MW-3C
MW-3B
MW-3
MW-3A

SVE BLOWER SYSTEM










LORMAN IRON &
METAL FACILITY

MW-4
MW-4A

C & NW RAILROAD

LORMAN STREET

LEGEND

-  TOTAL VOC CONCENTRATION IN SOIL (10 PPM)
(5,115 CUBIC YARDS TO 10 FT.)
-  STORM SEWER
-  STORM SEWER UPGRADES BY RMT
-  GAS LINE
-  UNDERGROUND FEATURES NO LONGER IN USE
-  10,000 TOTAL VOC CONCENTRATION
IN GROUNDWATER IN "B" HORIZON (ug/L)
-  TOTAL VOC (GROUNDWATER)
ISOCONCENTRATION CONTOUR
-  EXISTING SVE LATERAL CARRIER PIPING
-  EXISTING SVE PERFORATED LATERAL PIPING



SCALE: 1" = 50'
SCALE IS APPROXIMATE

SOURCES:

ATEC, SITE PLAN AND GEOPROBE BORINGS,
MARCH 30, 1995.

AERIAL PHOTO, APRIL 21, 1996.

RMT, FIGURE 4, SVE SYSTEM & NEW
STORMWATER PIPING LAYOUT, MAY 2, 2007.



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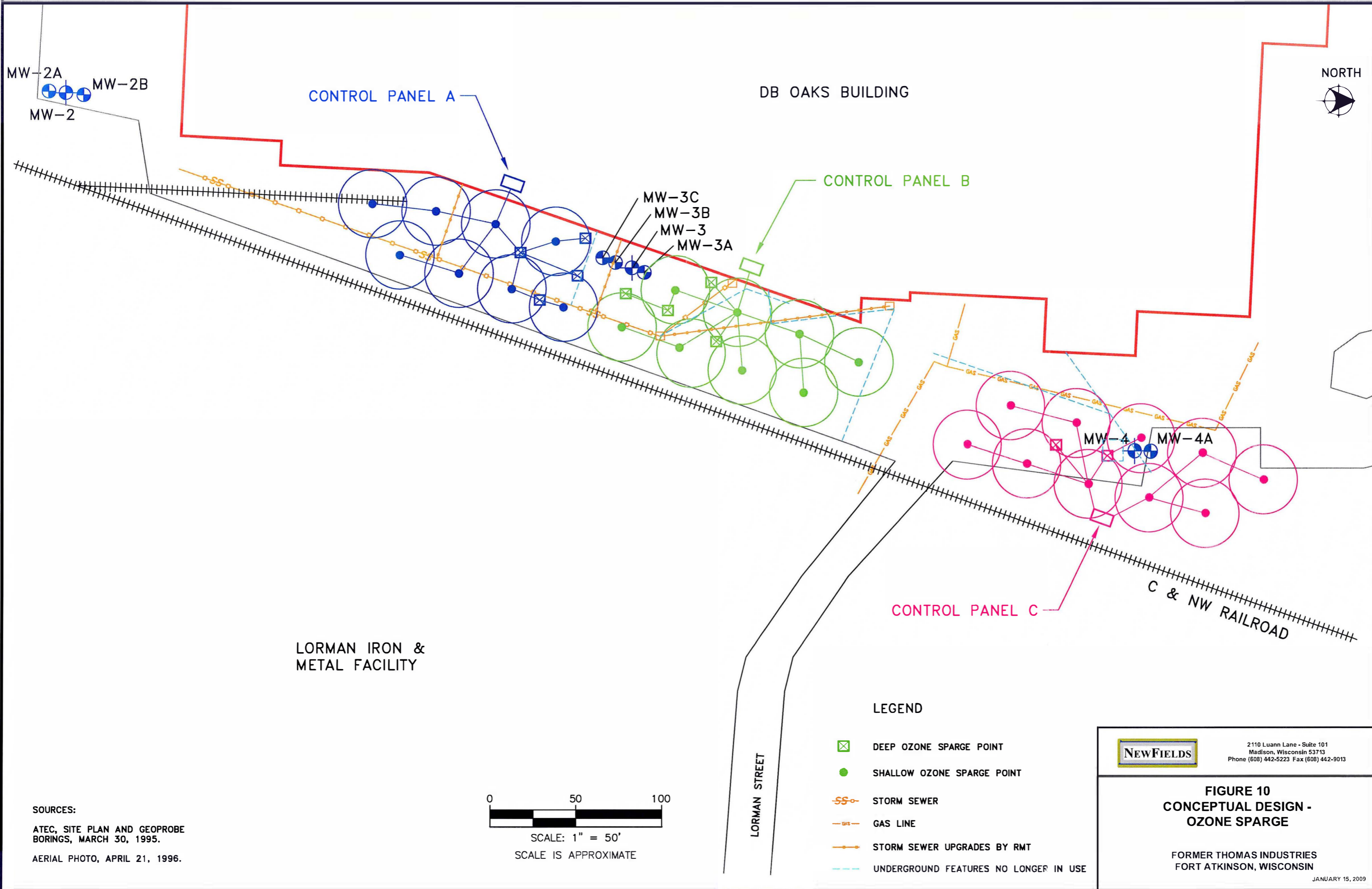
FIGURE 9
CONCEPTUAL DESIGN -
BIOLOGICAL REDUCTIVE
DECHLORINATION

FORMER THOMAS INDUSTRIES
FORT ATKINSON, WISCONSIN

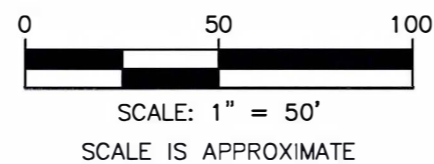
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C:\PROJECTS\THOMAS\FORTATKINSON\CADFILES\JAN2009REPORT\FIG9

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SOURCES:
 ATEC, SITE PLAN AND GEOPROBE BORINGS, MARCH 30, 1995.
 AERIAL PHOTO, APRIL 21, 1996.



LEGEND

- DEEP OZONE SPARGE POINT
- SHALLOW OZONE SPARGE POINT
- STORM SEWER
- GAS LINE
- STORM SEWER UPGRADES BY RMT
- UNDERGROUND FEATURES NO LONGER IN USE



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**FIGURE 10
 CONCEPTUAL DESIGN -
 OZONE SPARGE**

FORMER THOMAS INDUSTRIES
 FORT ATKINSON, WISCONSIN

Appendix A

Laboratory Reports April 2008 Groundwater Samples

May 2, 2008

Mark McCulloch
NewFields
2110 Luann Lane, Suite 101
Madison, WI 53713

re: DB Oak - Fort Atkinson, WI - Project Number 0451-003

Dear Mr. McCulloch,

Enclosed you will find the analytical results for the samples collected April 20-21, 2008.
Please feel free to call if you have any questions.

Sincerely,



Gregory J Graf
Quality Manager

Enclosures
jce

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-1	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-01
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
WI Lab Certification #113289110

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Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-1	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-01
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	< 0.50
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260
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Approved by: *M. Finckh*
 Date: *5/15/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-1	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-01
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			107%
Toluene-D8			97.8%
4-Bromofluorobenzene			98.3%

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Approved by: *M. Jensen*
Date: *5/8/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-02
Sample Type:	Water		

<u>Compound</u>	Reporting Detection Limit	Quantitation Limit	Sample Result
Dichlorodifluoromethane	0.50	1.7	< 25
Chloromethane	1.0	3.3	< 50
Vinyl Chloride	0.50	1.7	< 25
Bromomethane	5.0	17	< 250
Chloroethane	5.0	17	< 250
Trichlorofluoromethane	0.50	1.7	< 25
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 25
1,1-Dichloroethene	0.50	1.7	< 25
Acetone	20	67	< 1000
Carbon Disulfide	0.50	1.7	< 25
Methylene Chloride	2.0	6.7	< 100
Methyl-t-butyl Ether	0.50	1.7	< 25
t-1,2-Dichloroethene	0.50	1.7	< 25
n-Hexane	0.50	1.7	< 25
1,1-Dichloroethane	0.50	1.7	< 25
Diisopropyl Ether	0.50	1.7	< 25
2,2-Dichloropropane	0.50	1.7	< 25
c-1,2-Dichloroethene	0.50	1.7	560
2-Butanone (MEK)	20	67	< 1000
Tetrahydrofuran	10	33	< 500
Bromochloromethane	0.50	1.7	< 25
Chloroform	0.50	1.7	< 25
1,1,1-Trichloroethane	0.50	1.7	< 25
Carbon Tetrachloride	0.50	1.7	< 25
1,1-Dichloropropene	0.50	1.7	< 25
Benzene	0.50	1.7	< 25
1,2-Dichloroethane	0.50	1.7	< 25
Trichloroethene	0.50	1.7	85
1,2-Dichloropropane	0.50	1.7	< 25
Dibromomethane	0.50	1.7	< 25
Bromodichloromethane	0.50	1.7	< 25

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Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-02
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 25
4-Methyl-2-pentanone (MIBK)	20	67	< 1000
Toluene	0.50	1.7	< 25
1,1,2-Trichloroethane	0.50	1.7	< 25
t-1,3-Dichloropropene	0.50	1.7	< 25
Tetrachloroethene	0.50	1.7	120
1,3-Dichloropropane	0.50	1.7	< 25
2-Hexanone	20	67	< 1000
Dibromochloromethane	0.50	1.7	< 25
1,2-Dibromoethane	0.50	1.7	< 25
Chlorobenzene	0.50	1.7	< 25
1,1,1,2-Tetrachloroethane	0.50	1.7	< 25
Ethylbenzene	0.50	1.7	< 25
m+p-Xylene	1.0	3.3	< 50
o-Xylene	0.50	1.7	< 25
Styrene	0.50	1.7	< 25
Bromoform	0.50	1.7	< 25
Isopropylbenzene	0.50	1.7	< 25
1,1,2,2-Tetrachloroethane	0.50	1.7	< 25
Bromobenzene	0.50	1.7	< 25
1,2,3-Trichloropropane	1.0	3.3	< 50
n-Propyl benzene	0.50	1.7	< 25
2-Chlorotoluene	0.50	1.7	< 25
1,3,5-Trimethylbenzene	0.50	1.7	< 25
4-Chlorotoluene	0.50	1.7	< 25
t-Butyl benzene	0.50	1.7	< 25
1,2,4-Trimethylbenzene	0.50	1.7	< 25
sec-Butyl benzene	0.50	1.7	< 25
1,3-Dichlorobenzene	0.50	1.7	< 25
p-Isopropyl toluene	0.50	1.7	< 25
1,4-Dichlorobenzene	0.50	1.7	< 25

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Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-02
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 25
1,2-Dichlorobenzene	0.50	1.7	< 25
1,2-Dibromo-3-chloropropane	0.50	1.7	< 25
1,2,4-Trichlorobenzene	2.0	6.7	< 100
Hexachlorobutadiene	2.0	6.7	< 100
Naphthalene	5.0	17	< 250
1,2,3-Trichlorobenzene	2.0	6.7	< 100
Dibromofluoromethane			103%
Toluene-D8			97.5%
4-Bromofluorobenzene			96.3%

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Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2A	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-03
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 25
Chloromethane	1.0	3.3	< 50
Vinyl Chloride	0.50	1.7	< 25
Bromomethane	5.0	17	< 250
Chloroethane	5.0	17	< 250
Trichlorofluoromethane	0.50	1.7	< 25
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 25
1,1-Dichloroethene	0.50	1.7	< 25
Acetone	20	67	< 1000
Carbon Disulfide	0.50	1.7	< 25
Methylene Chloride	2.0	6.7	< 100
Methyl-t-butyl Ether	0.50	1.7	< 25
t-1,2-Dichloroethene	0.50	1.7	< 25
n-Hexane	0.50	1.7	< 25
1,1-Dichloroethane	0.50	1.7	< 25
Diisopropyl Ether	0.50	1.7	< 25
2,2-Dichloropropane	0.50	1.7	< 25
c-1,2-Dichloroethene	0.50	1.7	2100
2-Butanone (MEK)	20	67	< 1000
Tetrahydrofuran	10	33	< 500
Bromochloromethane	0.50	1.7	< 25
Chloroform	0.50	1.7	< 25
1,1,1-Trichloroethane	0.50	1.7	< 25
Carbon Tetrachloride	0.50	1.7	< 25
1,1-Dichloropropene	0.50	1.7	< 25
Benzene	0.50	1.7	< 25
1,2-Dichloroethane	0.50	1.7	< 25
Trichloroethene	0.50	1.7	620
1,2-Dichloropropane	0.50	1.7	< 25
Dibromomethane	0.50	1.7	< 25
Bromodichloromethane	0.50	1.7	< 25

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Approved by: *M. Luskens*
 Date: *5/8/08*

8260 VOCs

Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2A	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-03
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 25
4-Methyl-2-pentanone (MIBK)	20	67	< 1000
Toluene	0.50	1.7	< 25
1,1,2-Trichloroethane	0.50	1.7	< 25
t-1,3-Dichloropropene	0.50	1.7	< 25
Tetrachloroethene	0.50	1.7	610
1,3-Dichloropropane	0.50	1.7	< 25
2-Hexanone	20	67	< 1000
Dibromochloromethane	0.50	1.7	< 25
1,2-Dibromoethane	0.50	1.7	< 25
Chlorobenzene	0.50	1.7	< 25
1,1,1,2-Tetrachloroethane	0.50	1.7	< 25
Ethylbenzene	0.50	1.7	< 25
m+p-Xylene	1.0	3.3	< 50
o-Xylene	0.50	1.7	< 25
Styrene	0.50	1.7	< 25
Bromoform	0.50	1.7	< 25
Isopropylbenzene	0.50	1.7	< 25
1,1,2,2-Tetrachloroethane	0.50	1.7	< 25
Bromobenzene	0.50	1.7	< 25
1,2,3-Trichloropropane	1.0	3.3	< 50
n-Propyl benzene	0.50	1.7	< 25
2-Chlorotoluene	0.50	1.7	< 25
1,3,5-Trimethylbenzene	0.50	1.7	< 25
4-Chlorotoluene	0.50	1.7	< 25
t-Butyl benzene	0.50	1.7	< 25
1,2,4-Trimethylbenzene	0.50	1.7	< 25
sec-Butyl benzene	0.50	1.7	< 25
1,3-Dichlorobenzene	0.50	1.7	< 25
p-Isopropyl toluene	0.50	1.7	< 25
1,4-Dichlorobenzene	0.50	1.7	< 25

Method Reference: Modified 8260
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Approved by: *m. Jurskova*
 Date: *5/1/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2A	Dilution Factor:	50
Date Collected:	04/20/08	Lab Sample Number:	A081707-03
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 25
1,2-Dichlorobenzene	0.50	1.7	< 25
1,2-Dibromo-3-chloropropane	0.50	1.7	< 25
1,2,4-Trichlorobenzene	2.0	6.7	< 100
Hexachlorobutadiene	2.0	6.7	< 100
Naphthalene	5.0	17	< 250
1,2,3-Trichlorobenzene	2.0	6.7	< 100
Dibromofluoromethane			104%
Toluene-D8			98.6%
4-Bromofluorobenzene			98.4%

Method Reference: Modified 8260
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Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-04
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 0.50	
Chloromethane	1.0	3.3	< 1.0	
Vinyl Chloride	0.50	1.7	< 0.50	
Bromomethane	5.0	17	< 5.0	
Chloroethane	5.0	17	< 5.0	
Trichlorofluoromethane	0.50	1.7	< 0.50	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50	
1,1-Dichloroethene	0.50	1.7	< 0.50	
Acetone	20	67	< 20	
Carbon Disulfide	0.50	1.7	< 0.50	
Methylene Chloride	2.0	6.7	< 2.0	
Methyl-t-butyl Ether	0.50	1.7	< 0.50	
t-1,2-Dichloroethene	0.50	1.7	< 0.50	
n-Hexane	0.50	1.7	< 0.50	
1,1-Dichloroethane	0.50	1.7	< 0.50	
Diisopropyl Ether	0.50	1.7	< 0.50	
2,2-Dichloropropane	0.50	1.7	< 0.50	
c-1,2-Dichloroethene	0.50	1.7	10	
2-Butanone (MEK)	20	67	< 20	M
Tetrahydrofuran	10	33	< 10	
Bromochloromethane	0.50	1.7	< 0.50	
Chloroform	0.50	1.7	< 0.50	
1,1,1-Trichloroethane	0.50	1.7	< 0.50	
Carbon Tetrachloride	0.50	1.7	< 0.50	
1,1-Dichloropropene	0.50	1.7	< 0.50	
Benzene	0.50	1.7	< 0.50	
1,2-Dichloroethane	0.50	1.7	< 0.50	
Trichloroethene	0.50	1.7	5.5	
1,2-Dichloropropane	0.50	1.7	< 0.50	
Dibromomethane	0.50	1.7	< 0.50	
Bromodichloromethane	0.50	1.7	< 0.50	

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Approved by: *m. Jendryas*
Date: *5/15/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-04
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	15
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

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Approved by: *M. Swisher*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-2B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-04
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			104%
Toluene-D8			98.5%
4-Bromofluorobenzene			98.2%

M = Matrix Spike and/or Matrix Spike Duplicate recovery was outside acceptance limits.

Method Reference: Modified 8260
 WI Lab Certification #113289110

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Approved by: *M. Furukawa*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08, 04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3	Dilution Factor:	250, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-05
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 130
Chloromethane	1.0	3.3	< 250
Vinyl Chloride	0.50	1.7	< 130
Bromomethane	5.0	17	< 1300
Chloroethane	5.0	17	< 1300
Trichlorofluoromethane	0.50	1.7	< 130
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 130
1,1-Dichloroethene	0.50	1.7	< 130
Acetone	20	67	< 5000
Carbon Disulfide	0.50	1.7	< 130
Methylene Chloride	2.0	6.7	< 500
Methyl-t-butyl Ether	0.50	1.7	< 130
t-1,2-Dichloroethene	0.50	1.7	< 130
n-Hexane	0.50	1.7	< 130
1,1-Dichloroethane	0.50	1.7	< 130
Diisopropyl Ether	0.50	1.7	< 130
2,2-Dichloropropane	0.50	1.7	< 130
c-1,2-Dichloroethene	0.50	1.7	2100
2-Butanone (MEK)	20	67	< 5000
Tetrahydrofuran	10	33	< 2500
Bromochloromethane	0.50	1.7	< 130
Chloroform	0.50	1.7	< 130
1,1,1-Trichloroethane	0.50	1.7	< 130
Carbon Tetrachloride	0.50	1.7	< 130
1,1-Dichloropropene	0.50	1.7	< 130
Benzene	0.50	1.7	< 130
1,2-Dichloroethane	0.50	1.7	< 130
Trichloroethene	0.50	1.7	3100
1,2-Dichloropropane	0.50	1.7	< 130
Dibromomethane	0.50	1.7	< 130
Bromodichloromethane	0.50	1.7	< 130

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Approved by: *M. Jenz...*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08, 04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3	Dilution Factor:	250, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-05
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 130
4-Methyl-2-pentanone (MIBK)	20	67	< 5000
Toluene	0.50	1.7	< 130
1,1,2-Trichloroethane	0.50	1.7	< 130
t-1,3-Dichloropropene	0.50	1.7	< 130
Tetrachloroethene	0.50	1.7	24000
1,3-Dichloropropane	0.50	1.7	< 130
2-Hexanone	20	67	< 5000
Dibromochloromethane	0.50	1.7	< 130
1,2-Dibromoethane	0.50	1.7	< 130
Chlorobenzene	0.50	1.7	< 130
1,1,1,2-Tetrachloroethane	0.50	1.7	< 130
Ethylbenzene	0.50	1.7	< 130
m+p-Xylene	1.0	3.3	< 250
o-Xylene	0.50	1.7	< 130
Styrene	0.50	1.7	< 130
Bromoform	0.50	1.7	< 130
Isopropylbenzene	0.50	1.7	< 130
1,1,2,2-Tetrachloroethane	0.50	1.7	< 130
Bromobenzene	0.50	1.7	< 130
1,2,3-Trichloropropane	1.0	3.3	< 250
n-Propyl benzene	0.50	1.7	< 130
2-Chlorotoluene	0.50	1.7	< 130
1,3,5-Trimethylbenzene	0.50	1.7	< 130
4-Chlorotoluene	0.50	1.7	< 130
t-Butyl benzene	0.50	1.7	< 130
1,2,4-Trimethylbenzene	0.50	1.7	< 130
sec-Butyl benzene	0.50	1.7	< 130
1,3-Dichlorobenzene	0.50	1.7	< 130
p-Isopropyl toluene	0.50	1.7	< 130
1,4-Dichlorobenzene	0.50	1.7	< 130

Method Reference: Modified 8260
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Approved by: *M. Jenkins*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/23/08, 04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3	Dilution Factor:	250, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-05
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 130
1,2-Dichlorobenzene	0.50	1.7	< 130
1,2-Dibromo-3-chloropropane	0.50	1.7	< 130
1,2,4-Trichlorobenzene	2.0	6.7	< 500
Hexachlorobutadiene	2.0	6.7	< 500
Naphthalene	5.0	17	< 1300
1,2,3-Trichlorobenzene	2.0	6.7	< 500
Dibromofluoromethane			101%
Toluene-D8			97.2%
4-Bromofluorobenzene			99.4%

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *m. Leishane*
Date: *5/5/08*

8260 VOCs

Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3A	Dilution Factor:	500
Date Collected:	04/21/08	Lab Sample Number:	A081707-06
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 250
Chloromethane	1.0	3.3	< 500
Vinyl Chloride	0.50	1.7	990
Bromomethane	5.0	17	< 2500
Chloroethane	5.0	17	< 2500
Trichlorofluoromethane	0.50	1.7	< 250
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 250
1,1-Dichloroethene	0.50	1.7	< 250
Acetone	20	67	< 10000
Carbon Disulfide	0.50	1.7	< 250
Methylene Chloride	2.0	6.7	< 1000
Methyl-t-butyl Ether	0.50	1.7	< 250
t-1,2-Dichloroethene	0.50	1.7	< 250
n-Hexane	0.50	1.7	< 250
1,1-Dichloroethane	0.50	1.7	< 250
Diisopropyl Ether	0.50	1.7	< 250
2,2-Dichloropropane	0.50	1.7	< 250
c-1,2-Dichloroethene	0.50	1.7	16000
2-Butanone (MEK)	20	67	< 10000
Tetrahydrofuran	10	33	< 5000
Bromochloromethane	0.50	1.7	< 250
Chloroform	0.50	1.7	< 250
1,1,1-Trichloroethane	0.50	1.7	< 250
Carbon Tetrachloride	0.50	1.7	< 250
1,1-Dichloropropene	0.50	1.7	< 250
Benzene	0.50	1.7	< 250
1,2-Dichloroethane	0.50	1.7	< 250
Trichloroethene	0.50	1.7	2700
1,2-Dichloropropane	0.50	1.7	< 250
Dibromomethane	0.50	1.7	< 250
Bromodichloromethane	0.50	1.7	< 250

Method Reference: Modified 8260
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Approved by: *m. Zurek*
 Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3A	Dilution Factor:	500
Date Collected:	04/21/08	Lab Sample Number:	A081707-06
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 250
4-Methyl-2-pentanone (MIBK)	20	67	< 10000
Toluene	0.50	1.7	< 250
1,1,2-Trichloroethane	0.50	1.7	< 250
t-1,3-Dichloropropene	0.50	1.7	< 250
Tetrachloroethene	0.50	1.7	4400
1,3-Dichloropropane	0.50	1.7	< 250
2-Hexanone	20	67	< 10000
Dibromochloromethane	0.50	1.7	< 250
1,2-Dibromoethane	0.50	1.7	< 250
Chlorobenzene	0.50	1.7	< 250
1,1,1,2-Tetrachloroethane	0.50	1.7	< 250
Ethylbenzene	0.50	1.7	< 250
m+p-Xylene	1.0	3.3	< 500
o-Xylene	0.50	1.7	< 250
Styrene	0.50	1.7	< 250
Bromoform	0.50	1.7	< 250
Isopropylbenzene	0.50	1.7	< 250
1,1,2,2-Tetrachloroethane	0.50	1.7	< 250
Bromobenzene	0.50	1.7	< 250
1,2,3-Trichloropropane	1.0	3.3	< 500
n-Propyl benzene	0.50	1.7	< 250
2-Chlorotoluene	0.50	1.7	< 250
1,3,5-Trimethylbenzene	0.50	1.7	< 250
4-Chlorotoluene	0.50	1.7	< 250
t-Butyl benzene	0.50	1.7	< 250
1,2,4-Trimethylbenzene	0.50	1.7	< 250
sec-Butyl benzene	0.50	1.7	< 250
1,3-Dichlorobenzene	0.50	1.7	< 250
p-Isopropyl toluene	0.50	1.7	< 250
1,4-Dichlorobenzene	0.50	1.7	< 250

Method Reference: Modified 8260
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Approved by: *m. Lenz*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3A	Dilution Factor:	500
Date Collected:	04/21/08	Lab Sample Number:	A081707-06
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 250
1,2-Dichlorobenzene	0.50	1.7	< 250
1,2-Dibromo-3-chloropropane	0.50	1.7	< 250
1,2,4-Trichlorobenzene	2.0	6.7	< 1000
Hexachlorobutadiene	2.0	6.7	< 1000
Naphthalene	5.0	17	< 2500
1,2,3-Trichlorobenzene	2.0	6.7	< 1000
Dibromofluoromethane			109%
Toluene-D8			99.2%
4-Bromofluorobenzene			98.2%

Method Reference: Modified 8260
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Approved by: *M. Linde*
Date: *4/25/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3B	Dilution Factor:	250
Date Collected:	04/21/08	Lab Sample Number:	A081707-07
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 130
Chloromethane	1.0	3.3	< 250
Vinyl Chloride	0.50	1.7	< 130
Bromomethane	5.0	17	< 1300
Chloroethane	5.0	17	< 1300
Trichlorofluoromethane	0.50	1.7	< 130
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 130
1,1-Dichloroethene	0.50	1.7	< 130
Acetone	20	67	< 5000
Carbon Disulfide	0.50	1.7	< 130
Methylene Chloride	2.0	6.7	< 500
Methyl-t-butyl Ether	0.50	1.7	< 130
t-1,2-Dichloroethene	0.50	1.7	< 130
n-Hexane	0.50	1.7	< 130
1,1-Dichloroethane	0.50	1.7	< 130
Diisopropyl Ether	0.50	1.7	< 130
2,2-Dichloropropane	0.50	1.7	< 130
c-1,2-Dichloroethene	0.50	1.7	530
2-Butanone (MEK)	20	67	< 5000
Tetrahydrofuran	10	33	< 2500
Bromochloromethane	0.50	1.7	< 130
Chloroform	0.50	1.7	< 130
1,1,1-Trichloroethane	0.50	1.7	< 130
Carbon Tetrachloride	0.50	1.7	< 130
1,1-Dichloropropene	0.50	1.7	< 130
Benzene	0.50	1.7	< 130
1,2-Dichloroethane	0.50	1.7	< 130
Trichloroethene	0.50	1.7	2400
1,2-Dichloropropane	0.50	1.7	< 130
Dibromomethane	0.50	1.7	< 130
Bromodichloromethane	0.50	1.7	< 130

Method Reference: Modified 8260
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Approved by: *nr. Jurskova*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3B	Dilution Factor:	250
Date Collected:	04/21/08	Lab Sample Number:	A081707-07
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 130
4-Methyl-2-pentanone (MIBK)	20	67	< 5000
Toluene	0.50	1.7	< 130
1,1,2-Trichloroethane	0.50	1.7	< 130
t-1,3-Dichloropropene	0.50	1.7	< 130
Tetrachloroethene	0.50	1.7	12000
1,3-Dichloropropane	0.50	1.7	< 130
2-Hexanone	20	67	< 5000
Dibromochloromethane	0.50	1.7	< 130
1,2-Dibromoethane	0.50	1.7	< 130
Chlorobenzene	0.50	1.7	< 130
1,1,1,2-Tetrachloroethane	0.50	1.7	< 130
Ethylbenzene	0.50	1.7	< 130
m+p-Xylene	1.0	3.3	< 250
o-Xylene	0.50	1.7	< 130
Styrene	0.50	1.7	< 130
Bromoform	0.50	1.7	< 130
Isopropylbenzene	0.50	1.7	< 130
1,1,2,2-Tetrachloroethane	0.50	1.7	< 130
Bromobenzene	0.50	1.7	< 130
1,2,3-Trichloropropane	1.0	3.3	< 250
n-Propyl benzene	0.50	1.7	< 130
2-Chlorotoluene	0.50	1.7	< 130
1,3,5-Trimethylbenzene	0.50	1.7	< 130
4-Chlorotoluene	0.50	1.7	< 130
t-Butyl benzene	0.50	1.7	< 130
1,2,4-Trimethylbenzene	0.50	1.7	< 130
sec-Butyl benzene	0.50	1.7	< 130
1,3-Dichlorobenzene	0.50	1.7	< 130
p-Isopropyl toluene	0.50	1.7	< 130
1,4-Dichlorobenzene	0.50	1.7	< 130

Method Reference: Modified 8260
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Approved by: *M. J. Johnson*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3B	Dilution Factor:	250
Date Collected:	04/21/08	Lab Sample Number:	A081707-07
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 130
1,2-Dichlorobenzene	0.50	1.7	< 130
1,2-Dibromo-3-chloropropane	0.50	1.7	< 130
1,2,4-Trichlorobenzene	2.0	6.7	< 500
Hexachlorobutadiene	2.0	6.7	< 500
Naphthalene	5.0	17	< 1300
1,2,3-Trichlorobenzene	2.0	6.7	< 500
Dibromofluoromethane			102%
Toluene-D8			97.8%
4-Bromofluorobenzene			97.5%

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Swishone*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3C	Dilution Factor:	10
Date Collected:	04/21/08	Lab Sample Number:	A081707-08
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 5.0
Chloromethane	1.0	3.3	< 10
Vinyl Chloride	0.50	1.7	< 5.0
Bromomethane	5.0	17	< 50
Chloroethane	5.0	17	< 50
Trichlorofluoromethane	0.50	1.7	< 5.0
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 5.0
1,1-Dichloroethene	0.50	1.7	< 5.0
Acetone	20	67	< 200
Carbon Disulfide	0.50	1.7	< 5.0
Methylene Chloride	2.0	6.7	< 20
Methyl-t-butyl Ether	0.50	1.7	< 5.0
t-1,2-Dichloroethene	0.50	1.7	< 5.0
n-Hexane	0.50	1.7	< 5.0
1,1-Dichloroethane	0.50	1.7	< 5.0
Diisopropyl Ether	0.50	1.7	< 5.0
2,2-Dichloropropane	0.50	1.7	< 5.0
c-1,2-Dichloroethene	0.50	1.7	49
2-Butanone (MEK)	20	67	< 200
Tetrahydrofuran	10	33	< 100
Bromochloromethane	0.50	1.7	< 5.0
Chloroform	0.50	1.7	< 5.0
1,1,1-Trichloroethane	0.50	1.7	< 5.0
Carbon Tetrachloride	0.50	1.7	< 5.0
1,1-Dichloropropene	0.50	1.7	< 5.0
Benzene	0.50	1.7	< 5.0
1,2-Dichloroethane	0.50	1.7	< 5.0
Trichloroethene	0.50	1.7	< 5.0
1,2-Dichloropropane	0.50	1.7	< 5.0
Dibromomethane	0.50	1.7	< 5.0
Bromodichloromethane	0.50	1.7	< 5.0

Method Reference: Modified 8260

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Approved by: *M. Sinalone*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3C	Dilution Factor:	10
Date Collected:	04/21/08	Lab Sample Number:	A081707-08
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 5.0
4-Methyl-2-pentanone (MIBK)	20	67	< 200
Toluene	0.50	1.7	< 5.0
1,1,2-Trichloroethane	0.50	1.7	< 5.0
t-1,3-Dichloropropene	0.50	1.7	< 5.0
Tetrachloroethene	0.50	1.7	< 5.0
1,3-Dichloropropane	0.50	1.7	< 5.0
2-Hexanone	20	67	< 200
Dibromochloromethane	0.50	1.7	< 5.0
1,2-Dibromoethane	0.50	1.7	< 5.0
Chlorobenzene	0.50	1.7	< 5.0
1,1,1,2-Tetrachloroethane	0.50	1.7	< 5.0
Ethylbenzene	0.50	1.7	< 5.0
m+p-Xylene	1.0	3.3	< 10
o-Xylene	0.50	1.7	< 5.0
Styrene	0.50	1.7	< 5.0
Bromoform	0.50	1.7	< 5.0
Isopropylbenzene	0.50	1.7	< 5.0
1,1,2,2-Tetrachloroethane	0.50	1.7	< 5.0
Bromobenzene	0.50	1.7	< 5.0
1,2,3-Trichloropropane	1.0	3.3	< 10
n-Propyl benzene	0.50	1.7	< 5.0
2-Chlorotoluene	0.50	1.7	< 5.0
1,3,5-Trimethylbenzene	0.50	1.7	< 5.0
4-Chlorotoluene	0.50	1.7	< 5.0
t-Butyl benzene	0.50	1.7	< 5.0
1,2,4-Trimethylbenzene	0.50	1.7	< 5.0
sec-Butyl benzene	0.50	1.7	< 5.0
1,3-Dichlorobenzene	0.50	1.7	< 5.0
p-Isopropyl toluene	0.50	1.7	< 5.0
1,4-Dichlorobenzene	0.50	1.7	< 5.0

Method Reference: Modified 8260

WI Lab Certification #113289110

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Approved by: *m. Jurek*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-3C	Dilution Factor:	10
Date Collected:	04/21/08	Lab Sample Number:	A081707-08
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 5.0
1,2-Dichlorobenzene	0.50	1.7	< 5.0
1,2-Dibromo-3-chloropropane	0.50	1.7	< 5.0
1,2,4-Trichlorobenzene	2.0	6.7	< 20
Hexachlorobutadiene	2.0	6.7	< 20
Naphthalene	5.0	17	< 50
1,2,3-Trichlorobenzene	2.0	6.7	< 20
Dibromofluoromethane			108%
Toluene-D8			98.1%
4-Bromofluorobenzene			96.7%

Method Reference: Modified 8260
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Approved by: *M. Jurskiewicz*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4	Dilution Factor:	1000
Date Collected:	04/20/08	Lab Sample Number:	A081707-09
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	<	500
Chloromethane	1.0	3.3	<	1000
Vinyl Chloride	0.50	1.7	<	500
Bromomethane	5.0	17	<	5000
Chloroethane	5.0	17	<	5000
Trichlorofluoromethane	0.50	1.7	<	500
1,1,2-Trichlorotrifluoroethane	0.50	1.7	<	500
1,1-Dichloroethene	0.50	1.7	<	500
Acetone	20	67	<	20000
Carbon Disulfide	0.50	1.7	<	500
Methylene Chloride	2.0	6.7	<	2000
Methyl-t-butyl Ether	0.50	1.7	<	500
t-1,2-Dichloroethene	0.50	1.7	<	500
n-Hexane	0.50	1.7	<	500
1,1-Dichloroethane	0.50	1.7	<	500
Diisopropyl Ether	0.50	1.7	<	500
2,2-Dichloropropane	0.50	1.7	<	500
c-1,2-Dichloroethene	0.50	1.7		600
2-Butanone (MEK)	20	67	<	20000
Tetrahydrofuran	10	33	<	10000
Bromochloromethane	0.50	1.7	<	500
Chloroform	0.50	1.7	<	500
1,1,1-Trichloroethane	0.50	1.7	<	500
Carbon Tetrachloride	0.50	1.7	<	500
1,1-Dichloropropene	0.50	1.7	<	500
Benzene	0.50	1.7	<	500
1,2-Dichloroethane	0.50	1.7	<	500
Trichloroethene	0.50	1.7		43000
1,2-Dichloropropane	0.50	1.7	<	500
Dibromomethane	0.50	1.7	<	500
Bromodichloromethane	0.50	1.7	<	500

J

Method Reference: Modified 8260

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Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4	Dilution Factor:	1000
Date Collected:	04/20/08	Lab Sample Number:	A081707-09
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 500
4-Methyl-2-pentanone (MIBK)	20	67	< 20000
Toluene	0.50	1.7	< 500
1,1,2-Trichloroethane	0.50	1.7	< 500
t-1,3-Dichloropropene	0.50	1.7	< 500
Tetrachloroethene	0.50	1.7	14000
1,3-Dichloropropane	0.50	1.7	< 500
2-Hexanone	20	67	< 20000
Dibromochloromethane	0.50	1.7	< 500
1,2-Dibromoethane	0.50	1.7	< 500
Chlorobenzene	0.50	1.7	< 500
1,1,1,2-Tetrachloroethane	0.50	1.7	< 500
Ethylbenzene	0.50	1.7	< 500
m+p-Xylene	1.0	3.3	< 1000
o-Xylene	0.50	1.7	< 500
Styrene	0.50	1.7	< 500
Bromoform	0.50	1.7	< 500
Isopropylbenzene	0.50	1.7	< 500
1,1,2,2-Tetrachloroethane	0.50	1.7	< 500
Bromobenzene	0.50	1.7	< 500
1,2,3-Trichloropropane	1.0	3.3	< 1000
n-Propyl benzene	0.50	1.7	< 500
2-Chlorotoluene	0.50	1.7	< 500
1,3,5-Trimethylbenzene	0.50	1.7	< 500
4-Chlorotoluene	0.50	1.7	< 500
t-Butyl benzene	0.50	1.7	< 500
1,2,4-Trimethylbenzene	0.50	1.7	< 500
sec-Butyl benzene	0.50	1.7	< 500
1,3-Dichlorobenzene	0.50	1.7	< 500
p-Isopropyl toluene	0.50	1.7	< 500
1,4-Dichlorobenzene	0.50	1.7	< 500

Method Reference: Modified 8260
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Approved by: *m. Linschme*
 Date: *5/15/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4	Dilution Factor:	1000
Date Collected:	04/20/08	Lab Sample Number:	A081707-09
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 500
1,2-Dichlorobenzene	0.50	1.7	< 500
1,2-Dibromo-3-chloropropane	0.50	1.7	< 500
1,2,4-Trichlorobenzene	2.0	6.7	< 2000
Hexachlorobutadiene	2.0	6.7	< 2000
Naphthalene	5.0	17	< 5000
1,2,3-Trichlorobenzene	2.0	6.7	< 2000
Dibromofluoromethane			109%
Toluene-D8			99.1%
4-Bromofluorobenzene			99.2%

J = Estimated.

Method Reference: Modified 8260
 WI Lab Certification #113289110

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Approved by: *Mr. Lindberg*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-10
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 0.50	
Chloromethane	1.0	3.3	< 1.0	
Vinyl Chloride	0.50	1.7	< 0.50	
Bromomethane	5.0	17	< 5.0	
Chloroethane	5.0	17	< 5.0	
Trichlorofluoromethane	0.50	1.7	< 0.50	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50	
1,1-Dichloroethene	0.50	1.7	< 0.50	
Acetone	20	67	< 20	
Carbon Disulfide	0.50	1.7	< 0.50	
Methylene Chloride	2.0	6.7	< 2.0	
Methyl-t-butyl Ether	0.50	1.7	< 0.50	
t-1,2-Dichloroethene	0.50	1.7	< 0.50	
n-Hexane	0.50	1.7	< 0.50	
1,1-Dichloroethane	0.50	1.7	< 0.50	
Diisopropyl Ether	0.50	1.7	< 0.50	
2,2-Dichloropropane	0.50	1.7	< 0.50	
c-1,2-Dichloroethene	0.50	1.7	< 0.50	
2-Butanone (MEK)	20	67	< 20	
Tetrahydrofuran	10	33	< 10	
Bromochloromethane	0.50	1.7	< 0.50	
Chloroform	0.50	1.7	< 0.50	
1,1,1-Trichloroethane	0.50	1.7	< 0.50	
Carbon Tetrachloride	0.50	1.7	< 0.50	
1,1-Dichloropropene	0.50	1.7	< 0.50	
Benzene	0.50	1.7	< 0.50	
1,2-Dichloroethane	0.50	1.7	< 0.50	
Trichloroethene	0.50	1.7	1.1	J
1,2-Dichloropropane	0.50	1.7	< 0.50	
Dibromomethane	0.50	1.7	< 0.50	
Bromodichloromethane	0.50	1.7	< 0.50	

Method Reference: Modified 8260

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Approved by: *m. J. Johnson*
 Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-10
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
c-1,3-Dichloropropene	0.50	1.7	< 0.50	
4-Methyl-2-pentanone (MIBK)	20	67	< 20	
Toluene	0.50	1.7	< 0.50	
1,1,2-Trichloroethane	0.50	1.7	< 0.50	
t-1,3-Dichloropropene	0.50	1.7	< 0.50	
Tetrachloroethene	0.50	1.7	1.5	J
1,3-Dichloropropane	0.50	1.7	< 0.50	
2-Hexanone	20	67	< 20	
Dibromochloromethane	0.50	1.7	< 0.50	
1,2-Dibromoethane	0.50	1.7	< 0.50	
Chlorobenzene	0.50	1.7	< 0.50	
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50	
Ethylbenzene	0.50	1.7	< 0.50	
m+p-Xylene	1.0	3.3	< 1.0	
o-Xylene	0.50	1.7	< 0.50	
Styrene	0.50	1.7	< 0.50	
Bromoform	0.50	1.7	< 0.50	
Isopropylbenzene	0.50	1.7	< 0.50	
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50	
Bromobenzene	0.50	1.7	< 0.50	
1,2,3-Trichloropropane	1.0	3.3	< 1.0	
n-Propyl benzene	0.50	1.7	< 0.50	
2-Chlorotoluene	0.50	1.7	< 0.50	
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50	
4-Chlorotoluene	0.50	1.7	< 0.50	
t-Butyl benzene	0.50	1.7	< 0.50	
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50	
sec-Butyl benzene	0.50	1.7	< 0.50	
1,3-Dichlorobenzene	0.50	1.7	< 0.50	
p-Isopropyl toluene	0.50	1.7	< 0.50	
1,4-Dichlorobenzene	0.50	1.7	< 0.50	

Method Reference: Modified 8260
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Approved by: *m. Linsens*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-4A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-10
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			110%
Toluene-D8			96.8%
4-Bromofluorobenzene			96.4%

J = Estimated.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Jirishens*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-5	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-11
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 0.50	
Chloromethane	1.0	3.3	< 1.0	
Vinyl Chloride	0.50	1.7	< 0.50	
Bromomethane	5.0	17	< 5.0	
Chloroethane	5.0	17	< 5.0	
Trichlorofluoromethane	0.50	1.7	< 0.50	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50	
1,1-Dichloroethene	0.50	1.7	< 0.50	
Acetone	20	67	< 20	
Carbon Disulfide	0.50	1.7	< 0.50	
Methylene Chloride	2.0	6.7	< 2.0	
Methyl-t-butyl Ether	0.50	1.7	< 0.50	
t-1,2-Dichloroethene	0.50	1.7	< 0.50	
n-Hexane	0.50	1.7	< 0.50	
1,1-Dichloroethane	0.50	1.7	< 0.50	
Diisopropyl Ether	0.50	1.7	< 0.50	
2,2-Dichloropropane	0.50	1.7	< 0.50	
c-1,2-Dichloroethene	0.50	1.7	< 0.50	
2-Butanone (MEK)	20	67	< 20	
Tetrahydrofuran	10	33	< 10	
Bromochloromethane	0.50	1.7	< 0.50	
Chloroform	0.50	1.7	< 0.50	
1,1,1-Trichloroethane	0.50	1.7	< 0.50	
Carbon Tetrachloride	0.50	1.7	< 0.50	
1,1-Dichloropropene	0.50	1.7	< 0.50	
Benzene	0.50	1.7	< 0.50	
1,2-Dichloroethane	0.50	1.7	< 0.50	
Trichloroethene	0.50	1.7	0.81	J
1,2-Dichloropropane	0.50	1.7	< 0.50	
Dibromomethane	0.50	1.7	< 0.50	
Bromodichloromethane	0.50	1.7	< 0.50	

Method Reference: Modified 8260
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Approved by: *M. Linders*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-5	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-11
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
c-1,3-Dichloropropene	0.50	1.7	< 0.50	
4-Methyl-2-pentanone (MIBK)	20	67	< 20	
Toluene	0.50	1.7	0.77	B, J
1,1,2-Trichloroethane	0.50	1.7	< 0.50	
t-1,3-Dichloropropene	0.50	1.7	< 0.50	
Tetrachloroethene	0.50	1.7	0.78	J
1,3-Dichloropropane	0.50	1.7	< 0.50	
2-Hexanone	20	67	< 20	
Dibromochloromethane	0.50	1.7	< 0.50	
1,2-Dibromoethane	0.50	1.7	< 0.50	
Chlorobenzene	0.50	1.7	< 0.50	
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50	
Ethylbenzene	0.50	1.7	< 0.50	
m+p-Xylene	1.0	3.3	< 1.0	
o-Xylene	0.50	1.7	< 0.50	
Styrene	0.50	1.7	< 0.50	
Bromoform	0.50	1.7	< 0.50	
Isopropylbenzene	0.50	1.7	< 0.50	
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50	
Bromobenzene	0.50	1.7	< 0.50	
1,2,3-Trichloropropane	1.0	3.3	< 1.0	
n-Propyl benzene	0.50	1.7	< 0.50	
2-Chlorotoluene	0.50	1.7	< 0.50	
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50	
4-Chlorotoluene	0.50	1.7	< 0.50	
t-Butyl benzene	0.50	1.7	< 0.50	
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50	
sec-Butyl benzene	0.50	1.7	< 0.50	
1,3-Dichlorobenzene	0.50	1.7	< 0.50	
p-Isopropyl toluene	0.50	1.7	< 0.50	
1,4-Dichlorobenzene	0.50	1.7	< 0.50	

Method Reference: Modified 8260

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Approved by: *m. Linschens*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-5	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-11
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			99.2%
Toluene-D8			97.7%
4-Bromofluorobenzene			97.2%

J = Estimated.

B = Analyte detected in associated method blank.

Method Reference: Modified 8260

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Approved by: *M. Longhead*
 Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-12
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. J. Jirishano*
Date: *5/5/08*

8260 VOCs

Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-12
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	< 0.50
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260

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 Date: *5/10/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-12
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			95.2%
Toluene-D8			109%
4-Bromofluorobenzene			96.8%

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *m. Lindberg*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-13
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
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Approved by: *M. J. Janssen*
 Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-13
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	< 0.50
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260

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Approved by: *M. J. Fisher*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-6A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-13
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			125%
Toluene-D8			97.3%
4-Bromofluorobenzene			114%

Method Reference: Modified 8260
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8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-14
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
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Approved by: *M. Janssens*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-14
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
c-1,3-Dichloropropene	0.50	1.7	< 0.50	
4-Methyl-2-pentanone (MIBK)	20	67	< 20	
Toluene	0.50	1.7	< 0.50	
1,1,2-Trichloroethane	0.50	1.7	< 0.50	
t-1,3-Dichloropropene	0.50	1.7	< 0.50	
Tetrachloroethene	0.50	1.7	0.67	J
1,3-Dichloropropane	0.50	1.7	< 0.50	
2-Hexanone	20	67	< 20	
Dibromochloromethane	0.50	1.7	< 0.50	
1,2-Dibromoethane	0.50	1.7	< 0.50	
Chlorobenzene	0.50	1.7	< 0.50	
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50	
Ethylbenzene	0.50	1.7	< 0.50	
m+p-Xylene	1.0	3.3	< 1.0	
o-Xylene	0.50	1.7	< 0.50	
Styrene	0.50	1.7	< 0.50	
Bromoform	0.50	1.7	< 0.50	
Isopropylbenzene	0.50	1.7	< 0.50	
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50	
Bromobenzene	0.50	1.7	< 0.50	
1,2,3-Trichloropropane	1.0	3.3	< 1.0	
n-Propyl benzene	0.50	1.7	< 0.50	
2-Chlorotoluene	0.50	1.7	< 0.50	
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50	
4-Chlorotoluene	0.50	1.7	< 0.50	
t-Butyl benzene	0.50	1.7	< 0.50	
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50	
sec-Butyl benzene	0.50	1.7	< 0.50	
1,3-Dichlorobenzene	0.50	1.7	< 0.50	
p-Isopropyl toluene	0.50	1.7	< 0.50	
1,4-Dichlorobenzene	0.50	1.7	< 0.50	

Method Reference: Modified 8260

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Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-14
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			113%
Toluene-D8			100%
4-Bromofluorobenzene			96.6%

J = Estimated.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Jankowski*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7A	Dilution Factor:	5
Date Collected:	04/20/08	Lab Sample Number:	A081707-15
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>		<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	<	2.5
Chloromethane	1.0	3.3	<	5.0
Vinyl Chloride	0.50	1.7	<	2.5
Bromomethane	5.0	17	<	25
Chloroethane	5.0	17	<	25
Trichlorofluoromethane	0.50	1.7	<	2.5
1,1,2-Trichlorotrifluoroethane	0.50	1.7	<	2.5
1,1-Dichloroethene	0.50	1.7	<	2.5
Acetone	20	67	<	100
Carbon Disulfide	0.50	1.7	<	2.5
Methylene Chloride	2.0	6.7	<	10
Methyl-t-butyl Ether	0.50	1.7	<	2.5
t-1,2-Dichloroethene	0.50	1.7	<	2.5
n-Hexane	0.50	1.7	<	2.5
1,1-Dichloroethane	0.50	1.7	<	2.5
Diisopropyl Ether	0.50	1.7	<	2.5
2,2-Dichloropropane	0.50	1.7	<	2.5
c-1,2-Dichloroethene	0.50	1.7		39
2-Butanone (MEK)	20	67	<	100
Tetrahydrofuran	10	33	<	50
Bromochloromethane	0.50	1.7	<	2.5
Chloroform	0.50	1.7	<	2.5
1,1,1-Trichloroethane	0.50	1.7	<	2.5
Carbon Tetrachloride	0.50	1.7	<	2.5
1,1-Dichloropropene	0.50	1.7	<	2.5
Benzene	0.50	1.7	<	2.5
1,2-Dichloroethane	0.50	1.7	<	2.5
Trichloroethene	0.50	1.7		51
1,2-Dichloropropane	0.50	1.7	<	2.5
Dibromomethane	0.50	1.7	<	2.5
Bromodichloromethane	0.50	1.7	<	2.5

Method Reference: Modified 8260

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 Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7A	Dilution Factor:	5
Date Collected:	04/20/08	Lab Sample Number:	A081707-15
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	<	2.5
4-Methyl-2-pentanone (MIBK)	20	67	<	100
Toluene	0.50	1.7	<	2.5
1,1,2-Trichloroethane	0.50	1.7	<	2.5
t-1,3-Dichloropropene	0.50	1.7	<	2.5
Tetrachloroethene	0.50	1.7	<	210
1,3-Dichloropropane	0.50	1.7	<	2.5
2-Hexanone	20	67	<	100
Dibromochloromethane	0.50	1.7	<	2.5
1,2-Dibromoethane	0.50	1.7	<	2.5
Chlorobenzene	0.50	1.7	<	2.5
1,1,1,2-Tetrachloroethane	0.50	1.7	<	2.5
Ethylbenzene	0.50	1.7	<	2.5
m+p-Xylene	1.0	3.3	<	5.0
o-Xylene	0.50	1.7	<	2.5
Styrene	0.50	1.7	<	2.5
Bromoform	0.50	1.7	<	2.5
Isopropylbenzene	0.50	1.7	<	2.5
1,1,2,2-Tetrachloroethane	0.50	1.7	<	2.5
Bromobenzene	0.50	1.7	<	2.5
1,2,3-Trichloropropane	1.0	3.3	<	5.0
n-Propyl benzene	0.50	1.7	<	2.5
2-Chlorotoluene	0.50	1.7	<	2.5
1,3,5-Trimethylbenzene	0.50	1.7	<	2.5
4-Chlorotoluene	0.50	1.7	<	2.5
t-Butyl benzene	0.50	1.7	<	2.5
1,2,4-Trimethylbenzene	0.50	1.7	<	2.5
sec-Butyl benzene	0.50	1.7	<	2.5
1,3-Dichlorobenzene	0.50	1.7	<	2.5
p-Isopropyl toluene	0.50	1.7	<	2.5
1,4-Dichlorobenzene	0.50	1.7	<	2.5

Method Reference: Modified 8260
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Approved by:

M. Fisher

Date:

5/5/08

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7A	Dilution Factor:	5
Date Collected:	04/20/08	Lab Sample Number:	A081707-15
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>		<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	<	2.5
1,2-Dichlorobenzene	0.50	1.7	<	2.5
1,2-Dibromo-3-chloropropane	0.50	1.7	<	2.5
1,2,4-Trichlorobenzene	2.0	6.7	<	10
Hexachlorobutadiene	2.0	6.7	<	10
Naphthalene	5.0	17	<	25
1,2,3-Trichlorobenzene	2.0	6.7	<	10
Dibromofluoromethane				107%
Toluene-D8				98.2%
4-Bromofluorobenzene				96.6%

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by:

M. Jurek

Date:

5/5/08

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-16
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 0.50	
Chloromethane	1.0	3.3	< 1.0	
Vinyl Chloride	0.50	1.7	< 0.50	
Bromomethane	5.0	17	< 5.0	
Chloroethane	5.0	17	< 5.0	
Trichlorofluoromethane	0.50	1.7	< 0.50	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50	
1,1-Dichloroethene	0.50	1.7	< 0.50	
Acetone	20	67	< 20	
Carbon Disulfide	0.50	1.7	< 0.50	
Methylene Chloride	2.0	6.7	< 2.0	
Methyl-t-butyl Ether	0.50	1.7	< 0.50	
t-1,2-Dichloroethene	0.50	1.7	< 0.50	
n-Hexane	0.50	1.7	< 0.50	
1,1-Dichloroethane	0.50	1.7	< 0.50	
Diisopropyl Ether	0.50	1.7	< 0.50	
2,2-Dichloropropane	0.50	1.7	< 0.50	
c-1,2-Dichloroethene	0.50	1.7	< 0.50	
2-Butanone (MEK)	20	67	< 20	M
Tetrahydrofuran	10	33	< 10	
Bromochloromethane	0.50	1.7	< 0.50	
Chloroform	0.50	1.7	< 0.50	
1,1,1-Trichloroethane	0.50	1.7	< 0.50	
Carbon Tetrachloride	0.50	1.7	< 0.50	
1,1-Dichloropropene	0.50	1.7	< 0.50	
Benzene	0.50	1.7	< 0.50	
1,2-Dichloroethane	0.50	1.7	< 0.50	
Trichloroethene	0.50	1.7	0.73	J
1,2-Dichloropropane	0.50	1.7	< 0.50	
Dibromomethane	0.50	1.7	< 0.50	
Bromodichloromethane	0.50	1.7	< 0.50	

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Lindstrom*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-16
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	6.4
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Jindera*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-7B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-16
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			111%
Toluene-D8			98.9%
4-Bromofluorobenzene			95.6%

J = Estimated.

M = Matrix Spike and/or Matrix Spike Duplicate recovery was outside acceptance limits.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *m. Jirchova*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-17
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
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Approved by: *M. Jindal*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-17
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	< 0.50
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260
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 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-17
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			108%
Toluene-D8			97.5%
4-Bromofluorobenzene			97.5%

Method Reference: Modified 8260

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Date:

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**8260 VOCs
Summary of Test Results**

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-18
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260
WI Lab Certification #113289110

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Date: *5/5/08*

**8260 VOCs
Summary of Test Results**

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-18
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 0.50
4-Methyl-2-pentanone (MIBK)	20	67	< 20
Toluene	0.50	1.7	< 0.50
1,1,2-Trichloroethane	0.50	1.7	< 0.50
t-1,3-Dichloropropene	0.50	1.7	< 0.50
Tetrachloroethene	0.50	1.7	1.9
1,3-Dichloropropane	0.50	1.7	< 0.50
2-Hexanone	20	67	< 20
Dibromochloromethane	0.50	1.7	< 0.50
1,2-Dibromoethane	0.50	1.7	< 0.50
Chlorobenzene	0.50	1.7	< 0.50
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50
Ethylbenzene	0.50	1.7	< 0.50
m+p-Xylene	1.0	3.3	< 1.0
o-Xylene	0.50	1.7	< 0.50
Styrene	0.50	1.7	< 0.50
Bromoform	0.50	1.7	< 0.50
Isopropylbenzene	0.50	1.7	< 0.50
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50
Bromobenzene	0.50	1.7	< 0.50
1,2,3-Trichloropropane	1.0	3.3	< 1.0
n-Propyl benzene	0.50	1.7	< 0.50
2-Chlorotoluene	0.50	1.7	< 0.50
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50
4-Chlorotoluene	0.50	1.7	< 0.50
t-Butyl benzene	0.50	1.7	< 0.50
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50
sec-Butyl benzene	0.50	1.7	< 0.50
1,3-Dichlorobenzene	0.50	1.7	< 0.50
p-Isopropyl toluene	0.50	1.7	< 0.50
1,4-Dichlorobenzene	0.50	1.7	< 0.50

Method Reference: Modified 8260
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Approved by:

M. Jankens

Date:

5/5/08

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8A	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-18
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			110%
Toluene-D8			97.0%
4-Bromofluorobenzene			95.2%

Method Reference: Modified 8260

WI Lab Certification #113289110

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Approved by:

M. Lindberg

Date:

5/5/08

**8260 VOCs
Summary of Test Results**

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-19
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 0.50	
Chloromethane	1.0	3.3	< 1.0	
Vinyl Chloride	0.50	1.7	< 0.50	
Bromomethane	5.0	17	< 5.0	
Chloroethane	5.0	17	< 5.0	
Trichlorofluoromethane	0.50	1.7	< 0.50	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50	
1,1-Dichloroethene	0.50	1.7	< 0.50	
Acetone	20	67	< 20	
Carbon Disulfide	0.50	1.7	< 0.50	
Methylene Chloride	2.0	6.7	< 2.0	
Methyl-t-butyl Ether	0.50	1.7	< 0.50	
t-1,2-Dichloroethene	0.50	1.7	< 0.50	
n-Hexane	0.50	1.7	< 0.50	
1,1-Dichloroethane	0.50	1.7	< 0.50	
Diisopropyl Ether	0.50	1.7	< 0.50	
2,2-Dichloropropane	0.50	1.7	< 0.50	
c-1,2-Dichloroethene	0.50	1.7	1.3	J
2-Butanone (MEK)	20	67	< 20	
Tetrahydrofuran	10	33	< 10	
Bromochloromethane	0.50	1.7	< 0.50	
Chloroform	0.50	1.7	< 0.50	
1,1,1-Trichloroethane	0.50	1.7	< 0.50	
Carbon Tetrachloride	0.50	1.7	< 0.50	
1,1-Dichloropropene	0.50	1.7	< 0.50	
Benzene	0.50	1.7	< 0.50	
1,2-Dichloroethane	0.50	1.7	< 0.50	
Trichloroethene	0.50	1.7	1.4	J
1,2-Dichloropropane	0.50	1.7	< 0.50	
Dibromomethane	0.50	1.7	< 0.50	
Bromodichloromethane	0.50	1.7	< 0.50	

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *rv. Linsden*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-19
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
c-1,3-Dichloropropene	0.50	1.7	< 0.50	
4-Methyl-2-pentanone (MIBK)	20	67	< 20	
Toluene	0.50	1.7	0.50	B, J
1,1,2-Trichloroethane	0.50	1.7	< 0.50	
t-1,3-Dichloropropene	0.50	1.7	< 0.50	
Tetrachloroethene	0.50	1.7	4.0	
1,3-Dichloropropane	0.50	1.7	< 0.50	
2-Hexanone	20	67	< 20	
Dibromochloromethane	0.50	1.7	< 0.50	
1,2-Dibromoethane	0.50	1.7	< 0.50	
Chlorobenzene	0.50	1.7	< 0.50	
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50	
Ethylbenzene	0.50	1.7	< 0.50	
m+p-Xylene	1.0	3.3	< 1.0	
o-Xylene	0.50	1.7	< 0.50	
Styrene	0.50	1.7	< 0.50	
Bromoform	0.50	1.7	< 0.50	
Isopropylbenzene	0.50	1.7	< 0.50	
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50	
Bromobenzene	0.50	1.7	< 0.50	
1,2,3-Trichloropropane	1.0	3.3	< 1.0	
n-Propyl benzene	0.50	1.7	< 0.50	
2-Chlorotoluene	0.50	1.7	< 0.50	
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50	
4-Chlorotoluene	0.50	1.7	< 0.50	
t-Butyl benzene	0.50	1.7	< 0.50	
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50	
sec-Butyl benzene	0.50	1.7	< 0.50	
1,3-Dichlorobenzene	0.50	1.7	< 0.50	
p-Isopropyl toluene	0.50	1.7	< 0.50	
1,4-Dichlorobenzene	0.50	1.7	< 0.50	

Method Reference: Modified 8260

WI Lab Certification #113289110

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Approved by: *Mr. Linsbena*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	MW-8B	Dilution Factor:	1
Date Collected:	04/20/08	Lab Sample Number:	A081707-19
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			106%
Toluene-D8			100%
4-Bromofluorobenzene			99.1%

J = Estimated.

B = Analyte detected in associated method blank.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *M. Furukawa*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #1	Dilution Factor:	5, 50
Date Collected:	04/20/08	Lab Sample Number:	A081707-20
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	<	2.5
Chloromethane	1.0	3.3	<	5.0
Vinyl Chloride	0.50	1.7		3.0
Bromomethane	5.0	17	<	25
Chloroethane	5.0	17	<	25
Trichlorofluoromethane	0.50	1.7	<	2.5
1,1,2-Trichlorotrifluoroethane	0.50	1.7	<	2.5
1,1-Dichloroethene	0.50	1.7		6.8
Acetone	20	67	<	100
Carbon Disulfide	0.50	1.7	<	2.5
Methylene Chloride	2.0	6.7	<	10
Methyl-t-butyl Ether	0.50	1.7	<	2.5
t-1,2-Dichloroethene	0.50	1.7		15
n-Hexane	0.50	1.7	<	2.5
1,1-Dichloroethane	0.50	1.7	<	2.5
Diisopropyl Ether	0.50	1.7	<	2.5
2,2-Dichloropropane	0.50	1.7	<	2.5
c-1,2-Dichloroethene	0.50	1.7		2000
2-Butanone (MEK)	20	67	<	100
Tetrahydrofuran	10	33	<	50
Bromochloromethane	0.50	1.7	<	2.5
Chloroform	0.50	1.7	<	2.5
1,1,1-Trichloroethane	0.50	1.7	<	2.5
Carbon Tetrachloride	0.50	1.7	<	2.5
1,1-Dichloropropene	0.50	1.7	<	2.5
Benzene	0.50	1.7	<	2.5
1,2-Dichloroethane	0.50	1.7	<	2.5
Trichloroethene	0.50	1.7		620
1,2-Dichloropropane	0.50	1.7	<	2.5
Dibromomethane	0.50	1.7	<	2.5
Bromodichloromethane	0.50	1.7	<	2.5

Method Reference: Modified 8260

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Approved by: *M. Linsch...*
Date: *5/5/08*

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #1	Dilution Factor:	5, 50
Date Collected:	04/20/08	Lab Sample Number:	A081707-20
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	<	2.5
4-Methyl-2-pentanone (MIBK)	20	67	<	100
Toluene	0.50	1.7	<	2.5
1,1,2-Trichloroethane	0.50	1.7	<	2.5
t-1,3-Dichloropropene	0.50	1.7	<	2.5
Tetrachloroethene	0.50	1.7	<	640
1,3-Dichloropropane	0.50	1.7	<	2.5
2-Hexanone	20	67	<	100
Dibromochloromethane	0.50	1.7	<	2.5
1,2-Dibromoethane	0.50	1.7	<	2.5
Chlorobenzene	0.50	1.7	<	2.5
1,1,1,2-Tetrachloroethane	0.50	1.7	<	2.5
Ethylbenzene	0.50	1.7	<	2.5
m+p-Xylene	1.0	3.3	<	5.0
o-Xylene	0.50	1.7	<	2.5
Styrene	0.50	1.7	<	2.5
Bromoform	0.50	1.7	<	2.5
Isopropylbenzene	0.50	1.7	<	2.5
1,1,2,2-Tetrachloroethane	0.50	1.7	<	2.5
Bromobenzene	0.50	1.7	<	2.5
1,2,3-Trichloropropane	1.0	3.3	<	5.0
n-Propyl benzene	0.50	1.7	<	2.5
2-Chlorotoluene	0.50	1.7	<	2.5
1,3,5-Trimethylbenzene	0.50	1.7	<	2.5
4-Chlorotoluene	0.50	1.7	<	2.5
t-Butyl benzene	0.50	1.7	<	2.5
1,2,4-Trimethylbenzene	0.50	1.7	<	2.5
sec-Butyl benzene	0.50	1.7	<	2.5
1,3-Dichlorobenzene	0.50	1.7	<	2.5
p-Isopropyl toluene	0.50	1.7	<	2.5
1,4-Dichlorobenzene	0.50	1.7	<	2.5

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *m. fisher*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #1	Dilution Factor:	5, 50
Date Collected:	04/20/08	Lab Sample Number:	A081707-20
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>		<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	<	2.5
1,2-Dichlorobenzene	0.50	1.7	<	2.5
1,2-Dibromo-3-chloropropane	0.50	1.7	<	2.5
1,2,4-Trichlorobenzene	2.0	6.7	<	10
Hexachlorobutadiene	2.0	6.7	<	10
Naphthalene	5.0	17	<	25
1,2,3-Trichlorobenzene	2.0	6.7	<	10
Dibromofluoromethane				108%
Toluene-D8				99.0%
4-Bromofluorobenzene				95.9%

J = Estimated.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by:

M. J. J. J. J.

Date:

5/5/08

8260 VOCs Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #2	Dilution Factor:	50, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-21
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
Dichlorodifluoromethane	0.50	1.7	< 25	
Chloromethane	1.0	3.3	< 50	
Vinyl Chloride	0.50	1.7	62	J
Bromomethane	5.0	17	< 250	
Chloroethane	5.0	17	< 250	
Trichlorofluoromethane	0.50	1.7	< 25	
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 25	
1,1-Dichloroethene	0.50	1.7	< 25	
Acetone	20	67	< 1000	
Carbon Disulfide	0.50	1.7	< 25	
Methylene Chloride	2.0	6.7	< 100	
Methyl-t-butyl Ether	0.50	1.7	< 25	
t-1,2-Dichloroethene	0.50	1.7	26	J
n-Hexane	0.50	1.7	< 25	
1,1-Dichloroethane	0.50	1.7	< 25	
Diisopropyl Ether	0.50	1.7	< 25	
2,2-Dichloropropane	0.50	1.7	< 25	
c-1,2-Dichloroethene	0.50	1.7	2200	
2-Butanone (MEK)	20	67	< 1000	
Tetrahydrofuran	10	33	< 500	
Bromochloromethane	0.50	1.7	< 25	
Chloroform	0.50	1.7	< 25	
1,1,1-Trichloroethane	0.50	1.7	< 25	
Carbon Tetrachloride	0.50	1.7	< 25	
1,1-Dichloropropene	0.50	1.7	< 25	
Benzene	0.50	1.7	< 25	
1,2-Dichloroethane	0.50	1.7	< 25	
Trichloroethene	0.50	1.7	2900	
1,2-Dichloropropane	0.50	1.7	< 25	
Dibromomethane	0.50	1.7	< 25	
Bromodichloromethane	0.50	1.7	< 25	

Method Reference: Modified 8260

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Approved by: *M. Linders*
Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #2	Dilution Factor:	50, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-21
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
c-1,3-Dichloropropene	0.50	1.7	< 25
4-Methyl-2-pentanone (MIBK)	20	67	< 1000
Toluene	0.50	1.7	< 25
1,1,2-Trichloroethane	0.50	1.7	< 25
t-1,3-Dichloropropene	0.50	1.7	< 25
Tetrachloroethene	0.50	1.7	17000
1,3-Dichloropropane	0.50	1.7	< 25
2-Hexanone	20	67	< 1000
Dibromochloromethane	0.50	1.7	< 25
1,2-Dibromoethane	0.50	1.7	< 25
Chlorobenzene	0.50	1.7	< 25
1,1,1,2-Tetrachloroethane	0.50	1.7	< 25
Ethylbenzene	0.50	1.7	< 25
m+p-Xylene	1.0	3.3	< 50
o-Xylene	0.50	1.7	< 25
Styrene	0.50	1.7	< 25
Bromoform	0.50	1.7	< 25
Isopropylbenzene	0.50	1.7	< 25
1,1,2,2-Tetrachloroethane	0.50	1.7	< 25
Bromobenzene	0.50	1.7	< 25
1,2,3-Trichloropropane	1.0	3.3	< 50
n-Propyl benzene	0.50	1.7	< 25
2-Chlorotoluene	0.50	1.7	< 25
1,3,5-Trimethylbenzene	0.50	1.7	< 25
4-Chlorotoluene	0.50	1.7	< 25
t-Butyl benzene	0.50	1.7	< 25
1,2,4-Trimethylbenzene	0.50	1.7	< 25
sec-Butyl benzene	0.50	1.7	< 25
1,3-Dichlorobenzene	0.50	1.7	< 25
p-Isopropyl toluene	0.50	1.7	< 25
1,4-Dichlorobenzene	0.50	1.7	< 25

Method Reference: Modified 8260

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Approved by: *M. Jirshans*
 Date: *5/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/24/08, 04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Dup #2	Dilution Factor:	50, 500
Date Collected:	04/21/08	Lab Sample Number:	A081707-21
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 25
1,2-Dichlorobenzene	0.50	1.7	< 25
1,2-Dibromo-3-chloropropane	0.50	1.7	< 25
1,2,4-Trichlorobenzene	2.0	6.7	< 100
Hexachlorobutadiene	2.0	6.7	< 100
Naphthalene	5.0	17	< 250
1,2,3-Trichlorobenzene	2.0	6.7	< 100
Dibromofluoromethane			104%
Toluene-D8			100%
4-Bromofluorobenzene			94.2%

J = Estimated.

Method Reference: Modified 8260
WI Lab Certification #113289110

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Approved by: *m. Jursky*
Date: *8/5/08*

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Trip Blank	Dilution Factor:	1
Date Collected:	-	Lab Sample Number:	A081707-22
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
Dichlorodifluoromethane	0.50	1.7	< 0.50
Chloromethane	1.0	3.3	< 1.0
Vinyl Chloride	0.50	1.7	< 0.50
Bromomethane	5.0	17	< 5.0
Chloroethane	5.0	17	< 5.0
Trichlorofluoromethane	0.50	1.7	< 0.50
1,1,2-Trichlorotrifluoroethane	0.50	1.7	< 0.50
1,1-Dichloroethene	0.50	1.7	< 0.50
Acetone	20	67	< 20
Carbon Disulfide	0.50	1.7	< 0.50
Methylene Chloride	2.0	6.7	< 2.0
Methyl-t-butyl Ether	0.50	1.7	< 0.50
t-1,2-Dichloroethene	0.50	1.7	< 0.50
n-Hexane	0.50	1.7	< 0.50
1,1-Dichloroethane	0.50	1.7	< 0.50
Diisopropyl Ether	0.50	1.7	< 0.50
2,2-Dichloropropane	0.50	1.7	< 0.50
c-1,2-Dichloroethene	0.50	1.7	< 0.50
2-Butanone (MEK)	20	67	< 20
Tetrahydrofuran	10	33	< 10
Bromochloromethane	0.50	1.7	< 0.50
Chloroform	0.50	1.7	< 0.50
1,1,1-Trichloroethane	0.50	1.7	< 0.50
Carbon Tetrachloride	0.50	1.7	< 0.50
1,1-Dichloropropene	0.50	1.7	< 0.50
Benzene	0.50	1.7	< 0.50
1,2-Dichloroethane	0.50	1.7	< 0.50
Trichloroethene	0.50	1.7	< 0.50
1,2-Dichloropropane	0.50	1.7	< 0.50
Dibromomethane	0.50	1.7	< 0.50
Bromodichloromethane	0.50	1.7	< 0.50

Method Reference: Modified 8260

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Approved by: *M. J. Jirishon*
 Date: *5/5/08*

**8260 VOCs
Summary of Test Results**

Project Name:	DB Oak	Date Analyzed:	04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Trip Blank	Dilution Factor:	1
Date Collected:	-	Lab Sample Number:	A081707-22
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>	
c-1,3-Dichloropropene	0.50	1.7	< 0.50	
4-Methyl-2-pentanone (MIBK)	20	67	< 20	
Toluene	0.50	1.7	0.63	B, J
1,1,2-Trichloroethane	0.50	1.7	< 0.50	
t-1,3-Dichloropropene	0.50	1.7	< 0.50	
Tetrachloroethene	0.50	1.7	< 0.50	
1,3-Dichloropropane	0.50	1.7	< 0.50	
2-Hexanone	20	67	< 20	
Dibromochloromethane	0.50	1.7	< 0.50	
1,2-Dibromoethane	0.50	1.7	< 0.50	
Chlorobenzene	0.50	1.7	< 0.50	
1,1,1,2-Tetrachloroethane	0.50	1.7	< 0.50	
Ethylbenzene	0.50	1.7	< 0.50	
m+p-Xylene	1.0	3.3	< 1.0	
o-Xylene	0.50	1.7	< 0.50	
Styrene	0.50	1.7	< 0.50	
Bromoform	0.50	1.7	< 0.50	
Isopropylbenzene	0.50	1.7	< 0.50	
1,1,2,2-Tetrachloroethane	0.50	1.7	< 0.50	
Bromobenzene	0.50	1.7	< 0.50	
1,2,3-Trichloropropane	1.0	3.3	< 1.0	
n-Propyl benzene	0.50	1.7	< 0.50	
2-Chlorotoluene	0.50	1.7	< 0.50	
1,3,5-Trimethylbenzene	0.50	1.7	< 0.50	
4-Chlorotoluene	0.50	1.7	< 0.50	
t-Butyl benzene	0.50	1.7	< 0.50	
1,2,4-Trimethylbenzene	0.50	1.7	< 0.50	
sec-Butyl benzene	0.50	1.7	< 0.50	
1,3-Dichlorobenzene	0.50	1.7	< 0.50	
p-Isopropyl toluene	0.50	1.7	< 0.50	
1,4-Dichlorobenzene	0.50	1.7	< 0.50	

Method Reference: Modified 8260

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Approved by:

M. Anderson

Date:

5/5/08

8260 VOCs
Summary of Test Results

Project Name:	DB Oak	Date Analyzed:	04/25/08
Project Location:	Fort Atkinson, Wisconsin	Concentration:	ug/L
Sample ID:	Trip Blank	Dilution Factor:	1
Date Collected:	-	Lab Sample Number:	A081707-22
Sample Type:	Water		

<u>Compound</u>	<u>Reporting Detection Limit</u>	<u>Quantitation Limit</u>	<u>Sample Result</u>
n-Butyl benzene	0.50	1.7	< 0.50
1,2-Dichlorobenzene	0.50	1.7	< 0.50
1,2-Dibromo-3-chloropropane	0.50	1.7	< 0.50
1,2,4-Trichlorobenzene	2.0	6.7	< 2.0
Hexachlorobutadiene	2.0	6.7	< 2.0
Naphthalene	5.0	17	< 5.0
1,2,3-Trichlorobenzene	2.0	6.7	< 2.0
Dibromofluoromethane			105%
Toluene-D8			101%
4-Bromofluorobenzene			96.1%

J = Estimated.

B = Analyte detected in associated method blank.

Method Reference: Modified 8260

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Approved by:

M. Zinschew

Date:

5/5/08



**Environmental Chemistry
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CHAIN OF CUSTODY

A081707

No. 019572 *

Page 1 of 2

Turn Around (circle one) Normal Rush
Report Due:

Project Number: 0451-003	Mail Report To: Mark McColloch	Invoice To: Mark McColloch Mark McColloch
Project Name: DB OAK	Company: New Fields	Company: New Fields
Project Location: FORT ATKINSON, WI	Address: 2110 Lucian Lane, Suite 101 Madison, WI 53713	Address: same
Sampled By (Print): Mark S. McColloch		P.O. No.: Quote No.:

Sample Description	Collection		Matrix	Total Bottles	Preserv*	Analysis Requested	Comments	Laboratory Number
	Date	Time						
MW-1	04/20	840	GW	2	HCl	VOLs		01
MW-2	04/20	950						02
MW-2A	04/20	955						03
MW-2B	04/20	940						04
MW-3	04/21	915						05
MW-3A	04/21	910						06
MW-3B	04/21	900					Vial Label Sample Time = 8:55 SW	07
MW-3C	04/21	1000						08
MW-4	04/20	1245						09
MW-4A	04/20	1230						10
MW-5	04/20	1145	↓	↓	↓	↓		11

*Preservation Code A=None B=HCL C=H2SO4 D=HNO3 E=EnCore F=Methanol G=NaOH O=Other(Indicate)	Relinquished By: <i>Mark S. McColloch</i>	Date/Time: 04/21/08 1:45	Received By: <i>J. W. D.</i>	Date/Time: 4/21/08 1345
	Relinquished By:	Date/Time:	Received By:	Date/Time:

Custody Seal: Present/Absent	intact/Not intact	Seal #'s	Receipt Temp: <u>Received on Ice</u>
Shipped Via: <u>Hand-Delivered</u>			Temp Blank Y N



**Environmental Chemistry
Consulting Services, Inc.**

2525 Advance Road Madison, WI 53718
Phone 608-221-8700 FAX 608-221-4889

CHAIN OF CUSTODY

A081707

No. 019573 *

Page 2 of 2

Turn Around (circle one) Normal Rush
Report Due:

Project Number: 0451-003-800	Mail Report To: Mark McCulloch	Invoice To: Mark McCulloch
Project Name: DB OAK	Company: New Fields	Company: New Fields
Project Location: FERT ATKINSON, WI	Address: 2110 Luann Lane, Suite 101 Madison, WI 53713	Address: Same
Sampled By (Print): Mark S. McCulloch		P.O. No.: Quote No.:

Sample Description	Collection		Matrix	Total Bottles	Preserv*	Analysis Requested	Comments	Laboratory Number		
	Date	Time								
MW-6	4/20	8:40	GW	2	HCl		Vial Label Sample Time = 8:50 A.M.	12		
MW-6A	4/20	8:55	↓	↓	↓			13		
MW-7	4/20	13:30								14
MW-7A	4/20	13:25								15
MW-7B	4/20	13:15								16
MW-8	4/20	10:50								17
MW-8A	4/20	10:55								18
MW-8B	4/20	11:00								19
DUP #1	4/20	-								20
DUP #2	4/21	-								21
TRIP BLANK										22

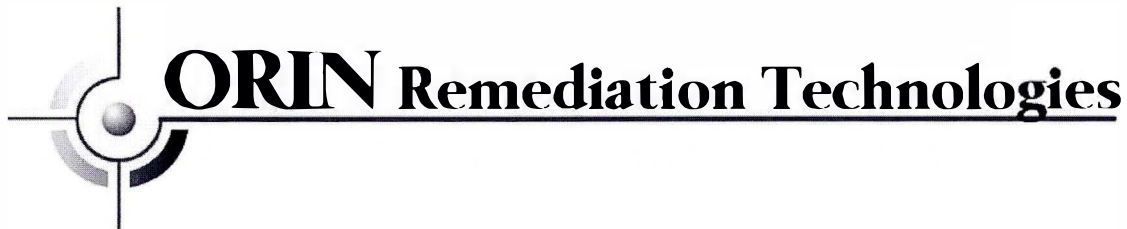
*Preservation Code A=None B=HCL C=H2SO4 D=HNO3 E=EnCore F=Methanol G=NaOH O=Other(Indicate)	Relinquished By: <i>Mark S. McCulloch</i>	Date/Time: 4/21/09 1:45	Received By: <i>J. Wil</i>	Date/Time: 4/21/09 13:45
	Relinquished By:	Date/Time:	Received By:	Date/Time:

Custody Seal: Present/Absent	Intact/Not Intact	Seal #'s	Receipt Temp: <u>Received on Ice</u>
Shipped Via: <u>Hand-Delivered</u>			Temp Blank Y N



Appendix B

**In-situ Chemical Oxidation
Bench Scale Treatability Report**



April 27, 2006

Mr. Mark McColloch
New Fields
2110 Luann Lane, Suite 101
Madison, WI 53713

Subject: Treatability Study Report for Chemical Oxidation at the DB Oaks Facility in Fort Atkinson, Wisconsin

Dear Mark,

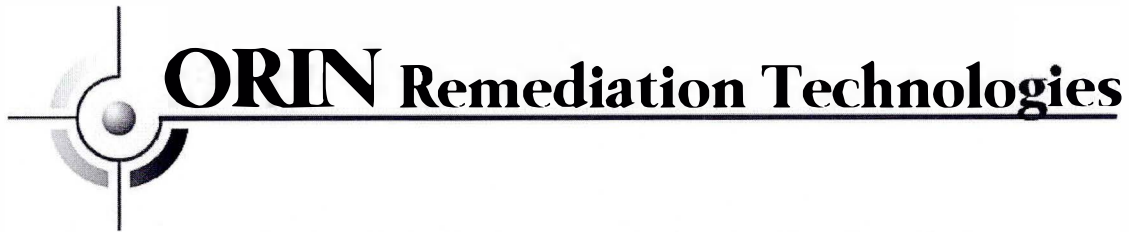
ORIN Remediation Technologies (ORIN) is pleased to submit the bench scale treatability study results for the DB Oaks Facility in Fort Atkinson, WI. The objective of this study was to evaluate the effectiveness of chemical oxidation to reduce the level of chlorinated solvents at the site.

Background

The purpose of the treatability study is to provide site-specific treatment chemistries and dosage levels to effectively remediate the chlorinated solvents in the saturated and unsaturated soils at the site. Contamination extends from the ground surface to 50 feet below ground surface (bgs). Saturated soils extend from 5 to 10 feet bgs to a depth of approximately 50 feet bgs. Soils in the area consist of silt, silty clay, and sandy clay. The primary contaminants of concern are chlorinated hydrocarbons.

Information provided to ORIN shows the major contaminants of concern are from a release of Tetrachloroethene (PCE). Groundwater at the site shows levels of PCE and PCE daughter products, including Trichloroethene (TCE), cis-1,2-Dichloroethene (cis-1,2-DCE), and Vinyl Chloride (VC), in excess of the Wisconsin Preventive Action Limit (PAL). The presence of PCE daughter products suggests natural reductive dechlorination is occurring at the site.

ORIN has proposed chemical oxidation and possibly reductive dechlorination as a remedial approach for the site. Sodium permanganate and Fenton's Reagent have been proposed for chemical oxidation and EOS[®] as a reductive dechlorination treatment chemistry. Fenton's Reagent is the proposed treatment



for the unsaturated soils. Fenton's Reagent will be mixed in the soils from a depth of ground surface to approximately 10 to 15 feet. Both sodium permanganate and EOS are proposed for the saturated zone. Injection is the proposed method of incorporating both the permanganate and EOS in the saturated soils.

ORIN evaluated only the chemical oxidation chemistries for this study. Sodium permanganate and Fenton's Reagent were proposed as test chemistries. Permanganate has been shown to effectively break down PCE and daughter products in soils and groundwater. Fenton's Reagent is also effective in reducing PCE and PCE daughter products.

New Fields collected samples on March 7, 2006. The samples collected for the study are shown in Table 1.

Table 1. Samples Received for Treatability Testing

SB-01 3-7'	SB-03 3-7'
SB-02 2-8'	SB-04 3-7'

The samples were received on ice by ORIN on March 7, 2006. Samples were received in amber soil jars with little or no headspace. Samples were refrigerated until treatment.

The procedure used and results for the study are provided below.

Procedure

Of the four samples received for testing, samples SB-02 2-8' and SB-04 3-7' were the most highly contaminated (Mark McColloch correspondence). Therefore, samples SB-02 2-8' and SB-04 3-7' were used in the study.

Each sample was homogenized in a stainless steel bowl immediately prior to treatment to minimize volatilization of the constituents of concern. In addition to treating the sample, a control was analyzed from the test sample to measure the concentration in the original sample.

Preliminary testing conducted by ORIN found permanganate Natural Oxidant Demand (NOD) dosage requirements of 0.74% wt./wt. sodium permanganate for sample SB-02 2-8' and 0.18% wt./wt. sodium permanganate for sample SB-04 3-7'. For the study, dosage rates were set below, near, and above the NOD for

each sample. A dosage rate that corresponds to a typical Fenton's Reagent application, when mixed in an *ex-situ* manner, was tested. The dosage rates used for sample SB-02 2-8' is shown in Table 2 and for sample SB-04 3-7' in Table 3.

Table 2. Treatment Chemistry and Dosage Rates used for Sample SB-02 2-8'

Sodium Permanganate	Fenton's Reagent
0.50%	0.66%
0.75%	
1.0%	

Note: Dosage rates are expressed on a wt./wt. basis

Table 3. Treatment Chemistry and Dosage Rates used for Sample SB-04 3-7'

Sodium Permanganate	Fenton's Reagent
0.10%	0.66%
0.20%	
0.50%	

Note: Dosage rates are expressed on a wt./wt. basis

Treatment of the test samples was performed by mixing each sample with an amount of chemical that corresponded to the treatment dosage. Samples were treated in 125ml glass jars with a Teflon lid. After treatment, the treated samples were allowed to stand at ambient temperature. The jar cap of samples treated with Fenton's Reagent was left loose to simulated exposure to the atmosphere as would occur in an actual field treatment. Permanganate treated samples had the cap screwed tight to minimize any volatilization and better represents the saturated soils after field injection.

After seven days of treatment, the treated and control sample were preserved for analyzed for volatile constituents following EPA method SW-846 8260B.

Results

Data for the testing is shown in Table 3 and Table 4. Data in each table is represented as concentration (mg/Kg) and as a percent reduction when compared to the control (parentheses). Only contaminants that were detected were reported.

As the data shows, both samples contained chlorinated solvents and sample SP-02 2-8' contained xylenes. For sample SP-02 2-8', as shown in Table 3, the control sample contained PCE, TCE and xylenes, with PCE being the highest in concentration at 93 mg/kg. Comparing the control to the treated samples shows significant reduction of both PCE and TCE when treated with sodium permanganate. A dosage of 0.75% produced a reduction of 93% for PCE and 92% for TCE and when compared to the control. A 0.5% dosage rate reduced the PCE by 80% and TCE by 93%. Dosage rates greater than 0.75% did not find to significantly reduce the PCE or TCE levels beyond the 0.75% dosage. Xylene levels were also reduced with sodium permanganate. Xylene levels were reduced by 75% when dosed at the 0.75% level. Fenton's Reagent was also found to reduce the PCE, TCE and xylene levels in the sample. At the 0.66% dosage level, PCE was reduced by 91%, TCE by 90% and xylene levels by 76%.

Slightly lower permanganate dosage levels were required to reduce the PCE concentration in sample SP-04 3-7'. A dosage rate of 0.50% sodium permanganate reduced the PCE level by 95% when compared to the control. No other contaminants were detected in sample SP04 3-7'. A 0.66% Fenton's Reagent dosage also reduced the PCE level by 94% when compared to the control.

Table 3.
Control and Treated Results for Sample SP-02 2-8'

	mg/Kg, wet weight				
	Control	0.50% Sodium Permanganate	0.75% Sodium Permanganate	1.0% Sodium Permanganate	0.66% Fenton's Reagent
Tetrachloroethene (PCE)	93	19 (80%)	7.2 (93%)	4.8 (95%)	8.7 (91%)
Trichloroethene (TCE)	4.6	0.37 (92%)	0.3 (93%)	0.26 (94%)	0.46 (90%)
m & p-Xylene	0.97	0.48 (51%)	0.24 (75%)	0.14 (86%)	0.23 (76%)

Table 4.
Control and Treated Results for Sample SP-04 3-7'

	mg/Kg, wet weight				
	Control	0.10% Sodium Permanganate	0.20% Sodium Permanganate	0.50% Sodium Permanganate	0.66% Fenton's Reagent
Tetrachloroethene	170	170 (0%)	37 (78%)	8.4 (95%)	9.7 (94%)

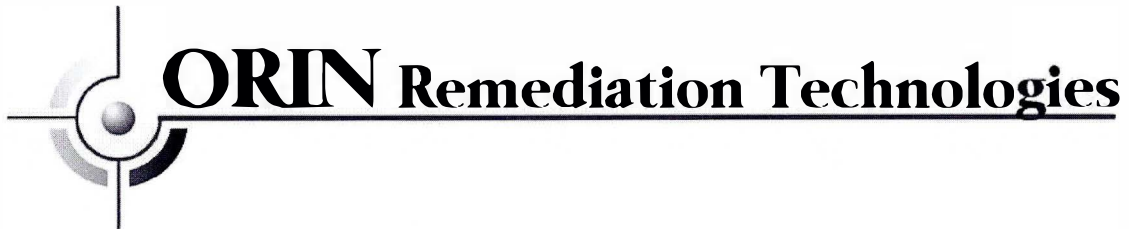
Discussion/Recommendations

Sodium permanganate and Fenton's Reagent were found to be effective in reducing the levels of chlorinated solvents in the test samples used in the study. This study found a sodium permanganate dosage rate of 0.75% reduced the levels of chlorinated solvents by greater than 90% in sample SP-02 2-8'. A lower dosage rate of 0.50% was found to reduce the PCE concentration in sample SP-04 3-7' by greater than 90%. The higher dosage rate required for SP-02 2-8' is likely due to the reducing conditions in the soil. As evident in the data, PCE daughter products were observed in the SP-02 2-8' sample. Because of the reducing conditions, additional oxidant (permanganate) is required to overcome the reduced conditions. This was also observed in the NOD test that was performed prior to the treatability test.

This study found that sodium permanganate will reduce the chlorinated solvent levels in the contaminated soils by greater than 90% using the proper dosage rate. A downside of using sodium permanganate at this site is the high dosage levels required. Sodium permanganate dosages higher than 0.5% generally require more than one injection. The high dosage rate and possibly two injections may make sodium permanganate treatment cost prohibitive. An alternative would be to consider EOS, a reductive dechlorination chemistry. Since the site already exhibits reductive dechlorination characteristics, EOS make be a more cost effective treatment and should be considered.

Fenton's Reagent was proposed for soils from the surface to a depth of 10 to 15 feet. Based on the data generated, a 0.66% Fenton's Reagent dosage will reduce the chlorinated solvent concentration by greater than 90%.

Based on the data generated in this study, ORIN recommends that sodium permanganate dosage level of 0.75% be used in areas that exhibit reductive



dechlorination characteristics (PCE daughter products present). In areas that where reductive dechlorination is not evident, a 0.50% dosage level should be sufficient to significantly reduce the solvent levels. In addition, EOS should be further evaluated as an alternative to permanganate. Mixing the shallow soils with a 0.66% Fenton's Reagent should significantly reduce the chlorinated solvents.

Sincerely,

ORIN Remediation Technologies, LLC

Andrew Wenzel
Operations Manager/Senior Chemist

Appendix C

Remedial Response Cost Estimates

DB Oak
 Fort Atkinson, Wisconsin

Summary of Remedial Alternatives

	Option 1	Option 2	Option 3	Option 4	Option 4	Option 5
	<i>Groundwater Extraction</i>	<i>Electrical Resistance Heating</i>	<i>In-situ Chemical Oxidation</i>	<i>Reductive Dechlorination with EOS</i>	<i>Reductive Dechlorination with 3DMe</i>	<i>In-situ Treatment with Ozone Sparge</i>
Best Case	\$1,070,320	\$3,250,650	\$943,008	\$770,478	\$657,948	\$1,129,908
Most Likely Cost	\$1,211,897	\$3,329,028	\$1,274,440	\$900,432	\$899,578	\$1,197,292
Worst Case	\$1,328,036	\$3,366,462	\$1,617,341	\$988,019	\$1,035,001	\$1,251,843
Cost Differential	\$257,716	\$115,812	\$674,333	\$217,541	\$377,053	\$121,935
Restoration Time Frame	15 to 25 yrs	3 to 10 yrs	3 to 5 yrs	3 to 5 yrs	3 to 5 yrs	5 to 15 yrs

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 1:**
Groundwater Extraction

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions
Groundwater Extraction System	Shallow Extraction Well Installation	5	Each	\$9,000	\$45,000	
	Deep Extraction Well Installation	1	Each	\$15,000	\$15,000	
	Discharge Line/Electrical Conduit	600	Linear Feet	\$100	\$60,000	
	Effluent Discharge Line	50	Linear Feet	\$50	\$2,500	
	Down hole Submersible Pumps	6	Estimate	\$4,500	\$27,000	
	Treatment System Building	1	Estimate	\$30,000	\$30,000	
	Treatment System (Air stripper, blower, holding tanks, transfer pumps)	1	Estimate	\$35,000	\$35,000	
	Electrical Hookup	1	Estimate	\$15,000	\$15,000	
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500	
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000	
	Well Abandonment (site closure)	1	Estimate	\$25,000	\$25,000	
	Subtotal				<u>\$269,000</u>	
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	5%	of	\$269,000	\$13,450	
		Subtotal			<u>\$13,450</u>	
	<u>Construction</u>					
Construction Oversight & Documentation Report	10%	of	\$269,000	\$26,900		
	Subtotal			<u>\$26,900</u>		
	Subtotal (Installation and Engineering)				\$309,350	
	20% Percent Contingency				<u>\$61,870</u>	
					<u>\$371,220</u>	
Annual Operation, Maintenance, and Monitoring (first year)	Utilities	12	Per Month	\$750.00	\$9,000	
	Maintenance	12	Per Month	\$1,500.00	\$18,000	
	Influent/Effluent Samples	4	Per Quarter	\$500.00	\$2,000	
	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				<u>\$66,000</u>	
	20% Percent Contingency				<u>\$13,200</u>	
					<u>\$79,200</u>	
	TOTAL (Installation and first year OM&M)				\$450,420	

\$66,000 years 1 to 3
\$49,000 after 3 years

Long Term OM&M		Annual Cost		P/A, 4%	Cost
		Years	(w/ contingency)		
	Present Value	0 - 5	\$71,040	4.452	\$316,270
	Present Value	0 - 10	\$64,920	8.111	\$526,566
	Present Value	0 - 15	\$62,880	11.118	\$699,100
	Present Value	0 - 20	\$61,860	13.590	\$840,677
	Present Value	0 - 25	\$61,248	15.622	\$956,816
	Present Value	0 - 30	\$60,840	17.292	\$1,052,045

Summary of All Costs		Capital Cost		OM & M Costs		Cost
		Years	(w/ contingency)	(w/ contingency)		
	Present Value	0 - 5	\$371,220	\$316,270	\$687,490	
	Present Value	0 - 10	\$371,220	\$526,566	\$897,786	
	Present Value	0 - 15	\$371,220	\$699,100	\$1,070,320	
	Present Value	0 - 20	\$371,220	\$840,677	\$1,211,897	
	Present Value	0 - 25	\$371,220	\$956,816	\$1,328,036	
	Present Value	0 - 30	\$371,220	\$1,052,045	\$1,423,265	

Best case cost estimate
Most likely cost estimate
Worst Case cost estimate

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 2:**
Electrical Resistance Heating

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions	
Electrical Resistance Heating	Shallow Extraction Well Installation	5	Each	\$9,000	\$45,000		
	Deep Extraction Well Installation	1	Each	\$15,000	\$15,000		
	Discharge Line/Electrical Conduit	600	Linear Feet	\$100	\$60,000		
	Effluent Discharge Line	50	Linear Feet	\$50	\$2,500		
	Down hole Submersible Pumps	6	Estimate	\$4,500	\$27,000		
	Treatment System Building	1	Estimate	\$30,000	\$30,000		
	Treatment System (Air stripper, blower, holding tanks, transfer pumps)	1	Estimate	\$35,000	\$35,000		
	Electrical Hookup	1	Estimate	\$15,000	\$15,000		
	Electrodes	70	Each	\$2,500	\$175,000		
	Electrode installation	70	Each	\$5,000	\$350,000		
	Lateral piping - electrodes	2000	Linear Feet	\$50	\$100,000		
	Six Phase Heating equipment	1	Estimate	\$500,000	\$500,000		
	Six Phase Heating construction and setup	1	Estimate	\$500,000	\$500,000		
	Temp. Monitoring Points	24	Each	\$1,000	\$24,000		
	Electrical costs	6	Per Month	\$50,000	\$300,000		
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500		
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000		
	Well Abandonment (site closure)	1	Estimate	\$25,000	\$25,000		
		Subtotal				<u>\$2,218,000</u>	
	Engineering Costs	<u>Design</u>					
Technical Specifications and Plans		5%	of	\$2,218,000	\$110,900		
						<u>\$110,900</u>	
Subtotal							
	<u>Construction</u>						
Construction Oversight & Documentation Report	10%	of	\$2,218,000	\$221,800			
					<u>\$221,800</u>		
	Subtotal					<u>\$221,800</u>	
	Subtotal (Installation and Engineering)				\$2,550,700		
	20% Percent Contingency				<u>\$510,140</u>		
					\$3,060,840		
Annual Operation, Maintenance, and Monitoring (first year)	Utilities	12	Per Month	\$750.00	\$9,000		
	Maintenance	12	Per Month	\$750.00	\$9,000		
	Influent/Effluent Samples	4	Per Quarter	\$500.00	\$2,000		
	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
	Subtotal				<u>\$57,000</u>		
	20% Percent Contingency				<u>\$11,400</u>		
					<u>\$68,400</u>		
	TOTAL (Installation and first year OM&M)				\$3,129,240		

\$57,000 years 1 to 3
\$40,000 years 3 to 5
\$21,000 after 5 years

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$68,400	2.775	\$189,810
Present Value	0 - 5	\$60,240	4.452	\$268,188
Present Value	0 - 10	\$37,680	8.111	\$305,622
Present Value	0 - 15	\$33,520	11.118	\$372,675
Present Value	0 - 20	\$30,180	13.590	\$410,146

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$3,060,840	\$189,810	\$3,250,650
Present Value	0 - 5	\$3,060,840	\$268,188	\$3,329,028
Present Value	0 - 10	\$3,060,840	\$305,622	\$3,366,462
Present Value	0 - 15	\$3,060,840	\$372,675	\$3,433,515
Present Value	0 - 20	\$3,060,840	\$410,146	\$3,470,986

Best case cost estimate
Most likely cost estimate
Worst Case cost estimate

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 3A: Best Case Cost Estimate**
In-situ Chemical Oxidation

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions
In-situ Chemical Oxidation	<u>Single ISCO Shallow Application - soil > 1 ppm</u>					3 depth top (ft)
	Treatment Volume	11,852	Cubic Yards	\$54.92	\$650,904	13 depth bottom (ft)
	Injection Points (6 ft centers)	889				32,000 injection area (sq. ft.)
	Subtotal				<u>\$650,904</u>	5 gallons per cubic yard
	<u>Site Restoration</u>					
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500	
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000	
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000	
	Subtotal				<u>\$19,500</u>	
	Subtotal (In-situ Treatment)					<u>\$670,404</u>
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	2%	of	\$670,404	\$13,408	
	Subtotal				<u>\$13,408</u>	
	<u>Construction</u>					
	Construction Oversight & Documentation Report	5%	of	\$670,404	\$33,520	
	Subtotal				<u>\$33,520</u>	
Subtotal (Installation and Engineering)					<u>\$717,332</u>	
15% Percent Contingency					<u>\$107,600</u>	
					<u>\$824,932</u>	
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				<u>\$37,000</u>	\$37,000 first 3 years
	15% Percent Contingency					<u>\$5,550</u>
					<u>\$42,550</u>	
TOTAL (Installation and first year OM&M)					<u>\$867,482</u>	

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$42,550	2.775	\$118,076
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$824,932	\$118,076	\$943,008
Present Value	0 - 5	\$824,932	\$156,666	\$981,598
Present Value	0 - 10	\$824,932	\$240,653	\$1,065,585
Present Value	0 - 15	\$824,932	\$309,414	\$1,134,346
Present Value	0 - 20	\$824,932	\$365,707	\$1,190,639

DB Oak
Fort Atkinson, Wisconsin

Source Removal *Option 3B: Most Likely Cost Estimate*
In-situ Chemical Oxidation

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions
In-situ Chemical Oxidation	<u>Single ISCO Shallow Application - soil > 10 ppm</u>					3 depth top (ft)
	Treatment Volume	5,074	Cubic Yards	\$54.92	\$278,668	13 depth bottom (ft)
	Injection Points (6 ft centers)	381				13,700 injection area (sq. ft.)
	Subtotal				\$278,668	5 gallons per cubic yard
In-situ Chemical Oxidation	<u>Deep ISCO Application</u>					45 depth top (ft)
	Treatment Volume	11,111	Cubic Yards	\$54.92	\$610,222	75 depth bottom (ft)
	Injection Points (6 ft centers)	100				10,000 injection area (sq. ft.)
	Subtotal				\$610,222	5 gallons per cubic yard
In-situ Chemical Oxidation	<u>Site Restoration</u>					
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500	
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000	
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000	
	Subtotal				\$19,500	
	Subtotal (In-situ Treatment)				\$908,390	
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	2%	of	\$908,390	\$18,168	
	Subtotal				\$18,168	
Engineering Costs	<u>Construction</u>					
	Construction Oversight & Documentation Report	5%	of	\$908,390	\$45,420	
	Subtotal				\$45,420	
	Subtotal (Installation and Engineering)				\$971,978	
	15% Percent Contingency				\$145,797	
					\$1,117,774	
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				\$37,000	\$37,000 first 3 years
	15% Percent Contingency				\$5,550	\$21,000 after 3 years
					\$42,550	
TOTAL (Installation and first year OM&M)					\$1,160,324	

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$42,550	2.775	\$118,076
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$1,117,774	\$118,076	\$1,235,851
Present Value	0 - 5	\$1,117,774	\$156,666	\$1,274,440
Present Value	0 - 10	\$1,117,774	\$240,653	\$1,358,428
Present Value	0 - 15	\$1,117,774	\$309,414	\$1,427,188
Present Value	0 - 20	\$1,117,774	\$365,707	\$1,483,481

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 3C: Worst Case Cost Estimate**
In-situ Chemical Oxidation

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions
In-situ Chemical Oxidation	<u>Shallow ISCO Application - soil > 10 ppm</u>					
	Treatment Volume	5,074	Cubic Yards	\$54.92	\$278,668	3 depth top (ft)
	Injection Points (6 ft centers)	381				13 depth bottom (ft)
	Subtotal				\$278,668	13,700 injection area (sq. ft.)
						5 gallons per cubic yard
	<u>Deep ISCO Application</u>					
	Treatment Volume	11,111	Cubic Yards	\$54.92	\$610,222	45 depth top (ft)
	Injection Points (6 ft centers)	278				75 depth bottom (ft)
	Subtotal				\$610,222	10,000 injection area (sq. ft.)
						5 gallons per cubic yard
	<u>Second Shallow ISCO Application - soil > 10 ppm</u>					
	Treatment Volume	5,074	Cubic Yards	\$54.92	\$278,668	3 depth top (ft)
	Injection Points (6 ft centers)	381				13 depth bottom (ft)
	Subtotal				\$278,668	13,700 injection area (sq. ft.)
						5 gallons per cubic yard
<u>Site Restoration</u>						
Deep piezometer at MW-4 well nest	1	Estimate		\$4,500	\$4,500	
Closure Request and Implementation	1	Estimate		\$10,000	\$10,000	
Well Abandonment (site closure)	1	Estimate		\$5,000	\$5,000	
Subtotal					\$19,500	
Subtotal (In-situ Treatment)					\$1,187,059	
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	2%	of	\$1,187,059	\$23,741	
	Subtotal				\$23,741	
	<u>Construction</u>					
	Construction Oversight & Documentation Report	5%	of	\$1,187,059	\$59,353	
Subtotal				\$59,353		
Subtotal (Installation and Engineering)					\$1,270,153	
15% Percent Contingency					\$190,523	
					\$1,460,676	
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				\$37,000	\$37,000 first 3 years
	15% Percent Contingency					\$5,550
					\$42,550	
TOTAL (Installation and first year OM&M)					\$1,503,226	

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$42,550	2.775	\$118,076
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$1,460,676	\$118,076	\$1,578,752
Present Value	0 - 5	\$1,460,676	\$156,666	\$1,617,341
Present Value	0 - 10	\$1,460,676	\$240,653	\$1,701,329
Present Value	0 - 15	\$1,460,676	\$309,414	\$1,770,089
Present Value	0 - 20	\$1,460,676	\$365,707	\$1,826,382

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4A: Best Case Cost Estimate**
In-situ Reductive Dechlorination with EOS Remediation

Description	Task	Quantity	Unit	Unit Cost	Cost		
In-situ Reductive Dechlorination	<u><i>In-situ EOS Application - Shallow via SVE Lateral Piping</i></u>						5 depth top (ft)
	Treatment Volume	11,741	Cubic Yards				15 depth bottom (ft)
	Gallons per cubic yard	36,250	Gallons	\$4.07	\$147,538		31,700 injection area (sq. ft.)
	Subtotal				\$147,538	10% EOS Treatment Chem	
	<u><i>In-situ EOS Application - Shallow and Intermediate Plume via Direct Push Borings</i></u>						15 depth top (ft)
	Gallons per cubic yard	60,500	Gallons	\$4.95	\$299,475		75 depth bottom (ft)
	Subtotal				\$299,475	121 Borings	
	<u><i>Bacteria Inoculation - Deep Plume</i></u>						500 Gallons per boring
	Injection Well	1	Estimate	\$4,500	\$4,500		12% EOS Treatment Chem
	Gallons per cubic yard	1	Estimate	\$59,180	\$59,180		1 Injection well
	Subtotal				\$63,680		
	<u><i>Site Restoration</i></u>						
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500		
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000		
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000		
	Subtotal				\$19,500		
	Subtotal (In-situ Treatment)					\$530,193	
Engineering Costs	<u><i>Design</i></u>						
	Technical Specifications and Plans	2%	of	\$530,193	\$10,604		
	Subtotal				\$10,604		
	<u><i>Construction</i></u>						
	Construction Oversight & Documentation Report	5%	of	\$530,193	\$26,510		
	Subtotal				\$26,510		
	Subtotal (Installation and Engineering)					\$567,306	
	15% Percent Contingency					\$85,096	
						\$652,402	
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
	Subtotal				\$37,000		\$37,000 first 3 years
	15% Percent Contingency					\$5,550	\$21,000 after 3 years
						\$42,550	
TOTAL (Installation and first year OM&M)					\$694,952		

Long Term OM&M	Years	Annual Cost	P/A, 4%	Cost
		(w/contingency)		
Present Value	0 - 3	\$42,550	2.775	\$118,076
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs	Years	Capital Cost	OM & M Costs	Cost
		(w/contingency)	(w/contingency)	
Present Value	0 - 3	\$652,402	\$118,076	\$770,478
Present Value	0 - 5	\$652,402	\$156,666	\$809,068
Present Value	0 - 10	\$652,402	\$240,653	\$893,055
Present Value	0 - 15	\$652,402	\$309,414	\$961,816
Present Value	0 - 20	\$652,402	\$365,707	\$1,018,109

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4B: Most Likely Cost Estimate**
In-situ Reductive Dechlorination with EOS Remediation

Description	Task	Quantity	Unit	Unit Cost	Cost		
In-situ Reductive Dechlorination	<u>In-situ EOS Application - Shallow via SVE Lateral Piping</u>						5 depth top (ft)
	Treatment Volume	11,852	Cubic Yards			15 depth bottom (ft)	
	Gallons per cubic yard	36,250	Gallons	\$4.07	\$147,538	32,000 injection area (sq. ft.)	
	Subtotal				\$147,538	10% EOS Treatment Chem	
	<u>In-situ EOS Application - Shallow and Intermediate Plume via Direct Push Borings</u>						15 depth top (ft)
	Gallons per cubic yard	60,500	Gallons	\$4.95	\$299,475	75 depth bottom (ft)	
	Subtotal				\$299,475	121 Borings	
						500 Gallons per boring	
	<u>Bacteria Inoculation - Deep Plume</u>						12% EOS Treatment Chem
	Injection Well	1	Estimate	\$4,500	\$4,500	1 Injection well	
	Gallons per cubic yard	1	Estimate	\$59,180	\$59,180		
	Subtotal				\$63,680		
	<u>Supplemental In-situ EOS Application - Shallow and Intermediate Plume via Direct Push</u>						
	Gallons per cubic yard	15,000	Gallons	\$4.95	\$74,250	30 Borings	
	Subtotal				\$74,250	500 Gallons per boring	
						12% EOS Treatment Chem	
	<u>Site Restoration</u>						
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500		
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000		
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000		
	Subtotal				\$19,500		
Subtotal (In-situ Treatment)					\$604,443		
Engineering Costs	<u>Design</u>						
	Technical Specifications and Plans	2%	of	\$604,443	\$12,089		
	Subtotal				\$12,089		
	<u>Construction</u>						
	Construction Oversight & Documentation Report	5%	of	\$604,443	\$30,222		
Subtotal				\$30,222			
Subtotal (Installation and Engineering)					\$646,753		
15% Percent Contingency					\$97,013		
					\$743,766		
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
	Subtotal				\$37,000	\$37,000 first 3 years	
	15% Percent Contingency				\$5,550	\$21,000 after 3 years	
					\$42,550		
TOTAL (Installation and first year OM&M)					\$786,316		

Long Term OM&M	Years	Annual Cost		P/A, 4%	Cost
		(w/ contingency)			
	0 - 3	\$42,550	2.775	\$118,076	
	0 - 5	\$35,190	4.452	\$156,666	
	0 - 10	\$29,670	8.111	\$240,653	
	0 - 15	\$27,830	11.118	\$309,414	
	0 - 20	\$26,910	13.590	\$365,707	

Summary of All Costs	Years	Capital Cost	OM & M Costs	Cost
		(w/ contingency)	(w/ contingency)	
	0 - 3	\$743,766	\$118,076	\$861,843
	0 - 5	\$743,766	\$156,666	\$900,432
	0 - 10	\$743,766	\$240,653	\$984,420
	0 - 15	\$743,766	\$309,414	\$1,053,180
	0 - 20	\$743,766	\$365,707	\$1,109,473

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4C: Worst Case Cost Estimate**
In-situ Reductive Dechlorination with EOS Remediation

Description	Task	Quantity	Unit	Unit Cost	Cost		
In-situ Reductive Dechlorination	<u>In-situ EOS Application - Shallow via SVE Lateral Piping</u>						5 depth top (ft)
	Treatment Volume	11,741	Cubic Yards				15 depth bottom (ft)
	Gallons per cubic yard	36,250	Gallons	\$4.07	\$147,538		31,700 injection area (sq. ft.)
	Subtotal				\$147,538		10% EOS Treatment Chem
	<u>In-situ EOS Application - Shallow via Direct Push Borings</u>						15 depth top (ft)
	Gallons per cubic yard	60,500	Gallons	\$4.95	\$299,475		75 depth bottom (ft)
	Subtotal				\$299,475		121 Borings
	<u>Bacteria Inoculation - Deep Plume</u>						500 Gallons per boring
	Injection Well	1	Estimate	\$4,500	\$4,500		12% EOS Treatment Chem
	Gallons per cubic yard	1	Estimate	\$59,180	\$59,180		1 Injection well screenec between MW-3B and I
Subtotal				\$63,680			
<u>Supplemental In-situ EOS Application - Shallow and Intermediate Plume via Direct Push</u>							
Gallons per cubic yard	15,000	Gallons	\$5.75	\$86,250		30 Borings	
Subtotal				\$86,250		500 Gallons per boring	
<u>Supplemental Bacteria Inoculation - Deep Plume</u>							
Gallons per cubic yard	1	Estimate	\$59,180	\$59,180			
Subtotal				\$59,180			
<u>Site Restoration</u>							
Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500			
Closure Request and Implementation	1	Estimate	\$10,000	\$10,000			
Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000			
Subtotal				\$19,500			
Subtotal (In-situ Treatment)					\$675,623		
Engineering Costs	<u>Design</u>						
	Technical Specifications and Plans	2%	of	\$675,623	\$13,512		
	Subtotal				\$13,512		
	<u>Construction</u>						
	Construction Oversight & Documentation Report	5%	of	\$675,623	\$33,781		
Subtotal				\$33,781			
Subtotal (Installation and Engineering)					\$722,916		
15% Percent Contingency					\$108,437		
					\$831,353		
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
	Subtotal				\$37,000	\$37,000 first 3 years	
	15% Percent Contingency					\$5,550	\$21,000 after 3 years
					\$42,550		
TOTAL (Installation and first year OM&M)					\$873,903		

Long Term OM&M	Years	Annual Cost	P/A, 4%	Cost
		(w/contingency)		
Present Value	0 - 3	\$42,550	2.775	\$118,076
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs	Years	Capital Cost	OM & M Costs	Cost
		(w/contingency)	(w/contingency)	
Present Value	0 - 3	\$831,353	\$118,076	\$949,430
Present Value	0 - 5	\$831,353	\$156,666	\$988,019
Present Value	0 - 10	\$831,353	\$240,653	\$1,072,007
Present Value	0 - 15	\$831,353	\$309,414	\$1,140,767
Present Value	0 - 20	\$831,353	\$365,707	\$1,197,060

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4D: Best Case Cost Estimate**
In-situ Reductive Dechlorination with 3DMe

Description	Task	Quantity	Unit	Unit Cost	Cost		
In-situ Reductive Dechlorination	<u>In-situ 3DMe Application - Shallow via SVE Lateral Piping</u>						5 depth top (ft)
	Treatment Volume	11,741	Cubic Yards			15 depth bottom (ft)	
	Gallons per cubic yard	18,000	Gallons	\$5.98	\$107,640	31,700 injection area (sq. ft.)	
						10% 3DMe	
	Subtotal				\$107,640		
In-situ Reductive Dechlorination	<u>In-situ 3DMe Application - Shallow and Intermediate via Direct Push Borings</u>						15 depth top (ft)
	Gallons per cubic yard	44,044	Gallons	\$5.98	\$263,383	75 depth bottom (ft)	
						121 Borings	
						364 Gallons per boring	
	Subtotal				\$263,383	10% 3DMe	
In-situ Reductive Dechlorination	<u>Bacteria Inoculation - Deep Plume</u>						
	Injection Well	1	Estimate	\$4,500	\$4,500	1 Injection well	
	Gallons per cubic yard	1	Estimate	\$56,235	\$56,235		
	Subtotal				\$60,735		
In-situ Reductive Dechlorination	<u>Site Restoration</u>						
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500		
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000		
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000		
	Subtotal				\$19,500		
	Subtotal (In-situ Treatment)				\$451,258		
Engineering Costs	<u>Design</u>						
	Technical Specifications and Plans	2%	of	\$451,258	\$9,025		
	Subtotal				\$9,025		
	<u>Construction</u>						
	Construction Oversight & Documentation Report	5%	of	\$451,258	\$22,563		
Subtotal				\$22,563			
	Subtotal (Installation and Engineering)				\$482,846		
	15% Percent Contingency				\$72,427		
					\$555,273		
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
	Subtotal				\$37,000	\$37,000 first 3 years	
		15% Percent Contingency				\$5,550	\$21,000 after 3 years
					\$42,550		
TOTAL (Installation and first year OM&M)					\$597,823		

Long Term OM&M	Years	Annual Cost		P/A, 4%	Cost
		(w/ contingency)	(w/ contingency)		
Present Value	0 - 3	\$37,000	2.775	\$102,675	
Present Value	0 - 5	\$35,190	4.452	\$156,666	
Present Value	0 - 10	\$29,670	8.111	\$240,653	
Present Value	0 - 15	\$27,830	11.118	\$309,414	
Present Value	0 - 20	\$26,910	13.590	\$365,707	

Summary of All Costs	Years	Capital Cost		OM & M Costs		Cost
		(w/ contingency)	(w/ contingency)	(w/ contingency)	(w/ contingency)	
Present Value	0 - 3	\$555,273	\$102,675			\$657,948
Present Value	0 - 5	\$555,273	\$156,666			\$711,939
Present Value	0 - 10	\$555,273	\$240,653			\$795,926
Present Value	0 - 15	\$555,273	\$309,414			\$864,687
Present Value	0 - 20	\$555,273	\$365,707			\$920,980

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4E: Most Likely Cost Estimate**
In-situ Reductive Dechlorination with 3DMe

Description	Task	Quantity	Unit	Unit Cost	Cost		
In-situ Reductive Dechlorination	<u>In-situ 3DMe Application - Shallow via SVE Lateral Piping</u>						
	Treatment Volume	11,741	Cubic Yards			5 depth top (ft)	
	Gallons per cubic yard	18,000	Gallons	\$5.98	\$107,640	15 depth bottom (ft)	
						31,700 injection area (sq. ft.)	
						10% 3DMe	
	Subtotal				\$107,640		
In-situ Reductive Dechlorination	<u>In-situ 3DMe Application - Shallow and Intermediate via Direct Push Borings</u>						
	Gallons per cubic yard	44,044	Gallons	\$5.98	\$263,383	15 depth top (ft)	
						75 depth bottom (ft)	
						121 Borings	
						364 Gallons per boring	
	Subtotal				\$263,383	10% 3DMe	
In-situ Reductive Dechlorination	<u>Bacteria Inoculation - Deep Plume</u>						
	Injection Well	1	Estimate	\$4,500	\$4,500	1 Injection well	
	Gallons per cubic yard	1	Estimate	\$56,235	\$56,235		
		Subtotal				\$60,735	
In-situ Reductive Dechlorination	<u>Supplemental In-situ 3DMe Application - Shallow via SVE Lateral Piping</u>						
	Treatment Volume	11,741	Cubic Yards			5 depth top (ft)	
	Gallons per cubic yard	9,000	Gallons	\$5.98	\$53,820	15 depth bottom (ft)	
						31,700 injection area (sq. ft.)	
						10% 3DMe	
	Subtotal				\$53,820		
In-situ Reductive Dechlorination	<u>Supplemental In-situ 3DMe Application - Shallow and Intermediate via Direct Push Borings</u>						
	Gallons per cubic yard	16,500	Gallons	\$5.98	\$98,670	15 depth top (ft)	
						75 depth bottom (ft)	
						30 Borings	
						550 Gallons per boring	
	Subtotal				\$98,670	10% 3DMe	
In-situ Reductive Dechlorination	<u>Site Restoration</u>						
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500		
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000		
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000		
		Subtotal				\$19,500	
	Subtotal (In-situ Treatment)				\$603,748		
Engineering Costs	<u>Design</u>						
	Technical Specifications and Plans	2%	of	\$603,748	\$12,075		
		Subtotal				\$12,075	
Engineering Costs	<u>Construction</u>						
	Construction Oversight & Documentation Report	5%	of	\$603,748	\$30,187		
		Subtotal				\$30,187	
	Subtotal (Installation and Engineering)				\$646,010		
		15%	Percent Contingency		\$96,902		
					\$742,912		
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000		
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000		
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000		
		Subtotal				\$37,000	\$37,000 first 3 years
			15%	Percent Contingency		\$5,550	\$21,000 after 3 years
					\$42,550		
	TOTAL (Installation and first year OM&M)				\$785,462		

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$37,000	2.775	\$102,675
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$742,912	\$102,675	\$845,587
Present Value	0 - 5	\$742,912	\$156,666	\$899,578
Present Value	0 - 10	\$742,912	\$240,653	\$983,565
Present Value	0 - 15	\$742,912	\$309,414	\$1,052,326
Present Value	0 - 20	\$742,912	\$365,707	\$1,108,619

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 4F: Worst Case Cost Estimate**
In-situ Reductive Dechlorination with 3DMe

Description	Task	Quantity	Unit	Unit Cost	Cost	
In-situ Reductive Dechlorination	<u>In-situ 3DMe Application - Shallow via SVE Lateral Piping</u>					5 depth top (ft)
	Treatment Volume	11,741	Cubic Yards			15 depth bottom (ft)
	Gallons per cubic yard	18,000	Gallons	\$5.98	\$107,640	31,700 injection area (sq. ft.)
	Subtotal				\$107,640	10% 3DMe
	<u>In-situ 3DMe Application - Shallow and Intermediate via Direct Push Borings</u>					15 depth top (ft)
	Gallons per cubic yard	44,044	Gallons	\$5.98	\$263,383	75 depth bottom (ft)
	Subtotal				\$263,383	121 Borings
	<u>Bacteria Inoculation - Deep Plume</u>					364 Gallons per boring
	Injection Well	1	Estimate	\$4,500	\$4,500	10% 3DMe
	Gallons per cubic yard	1	Estimate	\$56,235	\$56,235	1 Injection well
	Subtotal				\$60,735	
	<u>Supplemental In-situ 3DMe Application - Shallow via SVE Lateral Piping</u>					5 depth top (ft)
	Treatment Volume	11,741	Cubic Yards			15 depth bottom (ft)
	Gallons per cubic yard	18,000	Gallons	\$5.98	\$107,640	31,700 injection area (sq. ft.)
	Subtotal				\$107,640	10% 3DMe
	<u>Supplemental In-situ 3DMe Application - Shallow and Intermediate via Direct Push Borings</u>					15 depth top (ft)
	Gallons per cubic yard	16,500	Gallons	\$5.98	\$98,670	75 depth bottom (ft)
	Subtotal				\$98,670	30 Borings
	<u>Supplemental Bacteria Inoculation - Deep Plume</u>					550 Gallons per boring
	Gallons per cubic yard	1	Estimate	\$56,235	\$56,235	10% 3DMe
	Subtotal				\$56,235	
	<u>Site Restoration</u>					
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500	
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000	
	Well Abandonment (site closure)	1	Estimate	\$5,000	\$5,000	
	Subtotal				\$19,500	
	Subtotal (In-situ Treatment)				\$713,803	
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	2%	of	\$713,803	\$14,276	
	Subtotal				\$14,276	
	<u>Construction</u>					
Construction Oversight & Documentation Report	5%	of	\$713,803	\$35,690		
Subtotal				\$35,690		
	Subtotal (Installation and Engineering)				\$763,769	
	15% Percent Contingency				\$114,565	
					\$878,335	
Annual Operation, Maintenance, and Monitoring (first year)	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				\$37,000	\$37,000 first 3 years
	15% Percent Contingency				\$5,550	\$21,000 after 3 years
					\$42,550	
TOTAL (Installation and first year OM&M)					\$920,885	

Long Term OM&M

	Years	Annual Cost (w/ contingency)	P/A, 4%	Cost
Present Value	0 - 3	\$37,000	2.775	\$102,675
Present Value	0 - 5	\$35,190	4.452	\$156,666
Present Value	0 - 10	\$29,670	8.111	\$240,653
Present Value	0 - 15	\$27,830	11.118	\$309,414
Present Value	0 - 20	\$26,910	13.590	\$365,707

Summary of All Costs

	Years	Capital Cost (w/ contingency)	OM & M Costs (w/ contingency)	Cost
Present Value	0 - 3	\$878,335	\$102,675	\$981,010
Present Value	0 - 5	\$878,335	\$156,666	\$1,035,001
Present Value	0 - 10	\$878,335	\$240,653	\$1,118,988
Present Value	0 - 15	\$878,335	\$309,414	\$1,187,749
Present Value	0 - 20	\$878,335	\$365,707	\$1,244,042

DB Oak
Fort Atkinson, Wisconsin

Source Removal **Option 5:**
In-situ Treatment with Ozone Sparge

Description	Task	Quantity	Unit	Unit Cost	Cost	Assumptions
Groundwater Ozone Sparge System	Sparge Point Installation - Deep	36	Each	\$3,500	\$126,000	
	Sparge Point Installation - Shallow	36	Each	\$1,500	\$54,000	
	Lateral Sparge Lines	25,000	Linear Feet	\$3.00	\$75,000	
	Trenching	1,000	Linear Feet	\$50.00	\$50,000	
	Control Panel Installation	6	Estimate	\$50,000	\$300,000	
	Deep piezometer at MW-4 well nest	1	Estimate	\$4,500	\$4,500	
	Closure Request and Implementation	1	Estimate	\$10,000	\$10,000	
	Well Abandonment (site closure)	1	Estimate	\$15,000	\$15,000	
	Subtotal				<u>\$634,500</u>	
Engineering Costs	<u>Design</u>					
	Technical Specifications and Plans	5%	of	\$634,500	\$31,725	
		Subtotal			<u>\$31,725</u>	
	<u>Construction</u>					
Construction Oversight & Documentation Report	10%	of	\$634,500	\$63,450		
	Subtotal			<u>\$63,450</u>		
	Subtotal (Installation and Engineering)				\$729,675	
	20% Percent Contingency				<u>\$145,935</u>	
					<u>\$875,610</u>	
Annual Operation, Maintenance, and Monitoring (first year)	Utilities	12	Per Month	\$500.00	\$6,000	
	Maintenance	12	Per Month	\$1,000.00	\$12,000	
	Groundwater Sample Collection	4	Per Quarter	\$3,500.00	\$14,000	
	Laboratory Analysis	4	Per Quarter	\$4,500.00	\$18,000	
	Annual Report Preparation	1	Estimate	\$5,000.00	\$5,000	
	Subtotal				<u>\$55,000</u>	\$55,000 years 1 to 3
	20% Percent Contingency				<u>\$11,000</u>	\$36,500 after 3 years
					<u>\$66,000</u>	\$18,500 after 5 years
TOTAL (Installation and first year OM&M)					\$941,610	

Long Term OM&M	Years	Annual Cost	P/A, 4%	Cost
		(w/ contingency)		
Present Value	0 - 3	\$66,000	2.775	\$183,150
Present Value	0 - 5	\$57,120	4.452	\$254,298
Present Value	0 - 10	\$39,660	8.111	\$321,682
Present Value	0 - 15	\$33,840	11.118	\$376,233
Present Value	0 - 20	\$30,930	13.590	\$420,339

Summary of All Costs	Years	Capital Cost	M & M Costs	Cost	
		(w/ contingency)	(w/ contingency)		
Present Value	0 - 3	\$875,610	\$183,150	\$1,058,760	
Present Value	0 - 5	\$875,610	\$254,298	\$1,129,908	Best case cost estimate
Present Value	0 - 10	\$875,610	\$321,682	\$1,197,292	Most likely cost estimate
Present Value	0 - 15	\$875,610	\$376,233	\$1,251,843	Worst Case cost estimate
Present Value	0 - 20	\$875,610	\$420,339	\$1,295,949	