RMT
Integrated
Environmental
Solutions

744 Heartland Trail 53717-1934
P.O. Box 8923 53708-8923
Madison, WI
Telephone: 608-831-4444
Fax: 608-831-3334

File

November 27, 2001

Mr. Paul Kozol. P.E.
Wisconsin Department of Natural Resources
South Central Region
3911 Fish Hatchery Road
Fitchburg, WI 53711

Subject: OECI Final Workplan
Ashippun, Wisconsin

Dear Mr. Kozol:

Enclosed are four copies of the Final Workplan for the OECI groundwater degree and extent investigation in Ashippun, Wisconsin. RMT has revised the Workplan and the Sampling and Analysis Plan to reflect the modifications requested in the Wisconsin Department of Natural Resources (WDNR) draft approval letter dated November 21, 2001. Revisions were made to the following pages or tables in the document and are summarized in the order presented in the WDNR draft letter.

- Page 11 of the Workplan to address potential repairs to private wells, if necessary.
- Page 20 of the Workplan and Tables A-2, A-4, and A-5 of the Sampling and Analysis Plan to address soil sampling for VOCs, metals, and cyanide.
- Table 1 in the Workplan and Tables A-1, A-4 and A-5 in the Sampling and Analysis Plan to address the sampling for cyanide (weak acid dissociable).
- Page 9 of the Workplan to address sign-in/sign-out procedures.
- Page 20 of the Workplan to address proof of subcontractor 40-hour/8-hour training requirements.

Please call if you have questions or need additional information.

Sincerely,

RMT, Inc.

John C. Oswald, P.G.
Project Manager

cc: Central Files

I:\WPMSN\PJT\00-06105\01\L000610501-002.DOC

EPA COMMENTS on
SOW for CAPTURE ZONE INVESTIGATION at
OCONOMOWOC SITE
January 25, 2001

1) Page 2 "Investigation Goals", item E: "Sample the **newly** installed wells...". We may want to sample all monitoring wells, including the new ones to get the big picture.

2) Page 3 "Investigation Goals", item F: Please consider the following replacement language (more open): "Conduct all necessary tests and analyses to determine the effectiveness of contaminant capture by the currently operating well field. Tests and analyses should include pump tests on the five existing groundwater extraction wells to determine the current capture zone and hydraulic properties of the aquifer. Use the existing monitoring well network (as stated in A above) as observation wells or make recommendation on pump test observation well network and apply recommendation after approval by the WDNR.

3) Page 3 "Investigation Goals", item J: Please consider the following language modification: "Present the results of the above work in a report. The report shall include a discussion of findings and recommendations on how to improve the effectiveness of contaminant capture by the well field. The report shall also include the results....."

4) Page 3 "Consultant Responsibilities", item A first sentence: Please consider changing the term "capture zone" to something more general such as "well field effectiveness."

5) Page 5 "Project Proposal", item B: Please consider the following language modification: "The proposal shall contain a schedule **and order... However, all work shall be completed by February 1, 2002.**

6) Page 5 "Project Proposal", item E: Please consider adding a sixth item - **6. Subcontracts.**

7) Page 8 "VI. Investigation", item B: Please consider replacing the term "plume extraction"...with "contaminant extraction"...I'm not sure if we even have a defined plume anymore. Also, fourth line: Please consider modifying to read, "....,propose an increase in the number of, relocation of, **and/or modification of** extraction well,.....

8) Page 9, item F: Please consider changing title to something more generic such as "In-field Aquifer Tests"

9) Page 9, item F, 1: Please consider modifying sentence to read, "Methodology for calculating **aquifer tests** shall.....

10) Page 10, item F, 2: Please consider modifying the sentence to read: "**At a minimum, aquifer tests shall include a pump test** to be performed....."

11) Page 13, item E, 2, third sentence from the bottom: Typo...I think it should read "The cost estimate should have **an** accuracy... not **and** accuracy..."

11/19/01

TIME & DOLLAR ESTIMATE

FOR OECI DEGREE & EXTENT & CAPTURE ZONE

TOTAL HOURS/GOAL ITEM

II INVESTIGATION GOALS

A. USE 80 HOURS — FILE REVIEW, DATA REVIEW, SITE VISIT

B. " 20 HOURS — TRAIL RUN OF A MODEL HYDRO REVIEW

C. " 40 HOURS — ACCESS AGREEMENTS MINI REPORT

D. ASSUME 8 WELLS, (4 SHALLOW, 4 DEEP) = $32,000
USE AVG $4000/WELL
ABANDON – 5 WELLS X $100/WELL = $500

E. ASSUME $1000/WELL FULL QA/QC $8,000
INCLUDES DATA TABLES AND ANALYSIS

F. USE 120 HOURS — 5 DAYS 3 PEOPLE IN OFFICE REVIEW

G. " 20 HOURS

H. ASSUME 3 MORE WELLS X $4000/WELL = $12,000
USE 120 HOURS (SAME AS IN 'F' ABOVE)

I. " 40 HRS — 20 HOURS IN OFFICE
20 HOURS IN FIELD

J. " 200 HRS — MODELING AND COST ESTIMATE FINAL REPORT
TIME TO REACH STANDARDS CALC.
WORKPLANS

HOURS 80 + 20 + 40 + 120 + 20 + 120 + 40 + 200
= 640 HOURS
640 X $100/HOUR = $64,000

SUB COSTS $32,000
500
8,000
12,000
52,500

TOTAL $ 64,000 + $52,500 = $116,500

USE 10% CONTINGENCY
$116,500 X 1.1 = $128,200

Mayville - Schedule of Charges
January 1, 1999 - December 31, 1999

Hourly Personnel Charges *

Consultant, Project, and Technical Management	115
Project Technical II	99
Project Technical I	90
Staff Technical II	75
Staff Technical I	65
Senior Technician, Designer	75
Technician II	60
Technician I	55
Field/O&M Technician	45
Senior Project Administration	55
Administration	45

USE $100.00/HR

* Personnel include direct and contract employees

Dispute Resolution Support: Services in support of disputes (arbitration, litigation, etc.) involving client's information or interests, such as responding to discovery requests and subpoenas, are chargeable at the above rates.

Testimony rates (court, deposition, or hearing time) are 1.75 times the above rates, with a minimum of 4 hours per day.

Other Charges

Equipment Use		Std. Rate Sheet
Prints: Blueline, per square foot		0.15
Reproduction, per sheet		0.15
Communication/Shipping Charge: includes telephone, fax, CADD, postage, high-speed internet access, and courier services		2.9% of personnel charges
Vehicles:	Car, per mile	0.40
	Field vehicle	50.00/day plus 0.35/mile

Outside services, equipment, and facilities not furnished directly by RMT, Inc., will be billed at cost plus 7%, and may include, but are not limited to, the following:

- Aerial photography and mapping
- Meals and lodging
- Laboratory testing
- Printing and photographic reproduction
- Rental of equipment and vehicles
- Sample disposal
- Bonds required by project or client
- Sample shipment
- Special fees, permits, insurance, etc.
- Subcontractors to RMT, Inc.
- Supplies
- Transportation on public carriers

Payment: Net thirty (30) days. Thereafter, one percent (1%) interest per month on the unpaid balance will be charged.

RMT, Inc.
744 Heartland Trail - 53717-1934
P.O. Box 8923 - 53708-8923
Madison, WI
608/831-4444 - 608/831-3334 FAX

FINAL

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Scott McCallum, Governor
Darrell Bazzell, Secretary
Ruthe E. Badger, Regional Director

South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711-5397
Telephone 608-275-3266
FAX 608-275-3338
TTY 608-275-3231

November 26, 2001

Mr. John Oswald
RMT
744 Heartland Trail
Madison, WI 53717-1934

Subject: Review of Draft Workplan and Notice to Proceed, OECI Degree and Extent Study

Dear Mr. Oswald:

The Department of Natural Resources has reviewed the subject Workplan and grants Notice to Proceed provided the following clarifications are made to the Final Workplan.

- It is agreed that we will proceed with only one pump test (i.e. the "second" pump test) with an approximate cost saving of $19,000.
- It is agreed that we will proceed with the additional activities outlined in Item 4 of your Transmittal Letter. The additional cost for these activities is approximately $14,300.
- Page 11, 3rd bulleted item under Scope of Work, the last sentence. Please expand upon the discussion here. Indicate that if breakage of private well systems occur during the execution of the needed work and that when it is obvious the breakage is due to the age of the system, which could not tolerate normal removal and inspection activities, that the Department will reimburse the appropriate party for any repair work, and that the repair work must be done immediately and continuously so as to avoid any lengthy disruption of service. Check to see if well driller's insurance covers this activity. Indicate that RMT/driller will plan for storing water for a household prior to pulling the well and that a separate temporary potable water source will be provided if repairs will take longer than two hours from the time of the breakage.
- Appendix A Table A-2. It appears that soil samples are collected for TOC analysis only. I don't know if it is mentioned elsewhere but make provisions for the sampling and analysis of soils for the listed VOC's and Metals and Cyanide, say a maximum of three samples. I know we are sampling and doing PIDs, but if we get some samples that read high I would like to sample and run the analysis.
- You have mentioned a different type of Cyanide testing, what is the additional cost and benefits for this testing, assuming that we still run the total and amenable Cyanide.

- If you have not already done so, indicate in the appropriate place in the Workplan that all RMT employees and contractors and subcontractors shall sign-in and sign-out with Mr. Groleau at the treatment plant for each day they are present on the site. Have your contractors and subcontractors who will be involved with hazardous waste operations (i.e. drillers) provide proof that they are 40hour/8hour trained prior to beginning work on the site. Surveyors are assumed not to be involved in hazardous waste operations.

- The Department acknowledges receipt of the RMT Health and Safety Plan.

- The Department recognizes the large amount of work planned for the winter months and acknowledges that maintaining schedule is weather dependent.

In general the Department fines the Draft Workplan to be well-organized and well thought out.

Sincerely,

Paul L Kozol

Paul L. Kozol, P.E.
Remediation and Redevelopment Engineer
South Central Region
(608) 275-3301

Cc: Dick Kalnicky - RR/3

Transmittal Letter

RMT, Inc. ("RMT")
744 Heartland Trail (53717-1934)
PO Box 8923 (53708-8923)
Madison, WI
Tel. (608) 831-4444 • Fax (608) 831-3334

To: Mr. Paul Kozol, P.E.
Wisconsin Department of Natural Resources
South Central Region
3911 Fish Hatchery Road
Fitchburg, WI 53711

Date: 11/19/01
Project No.: 6501.01
Subject: OECI Draft Workplan

Prepared By: John Oswald, P.G. **Title** Project Manager

Signature:

We are sending you:

COPIES	DATE	NO.	DESCRIPTION
1	11/19/01		OECI Draft Workplan

These items are transmitted as checked below:

Remarks

Paul,

Enclosed is a copy of the draft workplan for the OECI project in Ashippun, Wisconsin. Items to be aware of as you review the document are as follows:

1) As we had discussed during the past couple of weeks, the first pump test has been removed from the project. This results in realized savings of approximately $19,000.

2) The schedule has been revised to reflect the current stage of the project. It is dependent on decent weather over the next couple of weeks.

3) We need to discuss the specific cyanide analysis proposed in the RFP and provided in the workplan.

4) While reviewing the historical data, RMT concluded that a few additional items or tasks would provide valuable information that will assist us in the evaluation of the site. These additional tasks are discussed in the workplan. The tasks and their associated costs are summarized as follows:

- A site visit by John Oswald and Galen Kenoyer during Project Element 2 to assist with project logistics and discussions with APL staff. $2,950

- Coring approximately 45 feet of bedrock (15 feet in 3 borings each) + one additional field day to complete. These cores will assist us in evaluating the characteristics (confining layers) of the upper bedrock surface. The information will be used to calibrate the model. $3,100

- Sampling each existing site monitoring well (assumes 20 wells/6 inaccessible or dry)+3 duplicates, 1 MS/MSD + 2 extra field days. The last time a complete set of data was gathered was in 1992. $5,600

- Data validation of laboratory data. $1,350

- Review and resimulation of the Dames & Moore pumping test. $1,300

These additional tasks total $14,300. Please consider these additional tasks while reviewing the workplan as we believe they are important toward the overall evaluation of the site.

Paul, we will continue to strive for other efficiencies and cost saving ideas as the project moves forward. Please review the workplan and provide me with comments at your earliest convenience. You can call at 608-662-5452 with questions.

John

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744 Heartland Trail 53717-1934
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Madison, WI
Telephone: 608-831-4444
Fax: 608-831-3334

WORKPLAN
OCONOMOWOC ELECTROPLATING COMPANY, INC.
GROUNDWATER INVESTIGATION

PREPARED FOR
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

PREPARED BY
RMT, INC.
MADISON, WISCONSIN

November 2001

Thomas S. Silverman
Staff Hydrogeologist

Galen J. Kenoyer, Ph.D., P.G.
Senior Consulting Hydrogeologist

John C. Oswald, P.G.
Project Manager

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Section 1
Introduction

1.1 Background

The Oconomowoc Electroplating Company, Inc. (OECI), site is located at 2572 Oak Street in the unincorporated town of Ashippun, Wisconsin (Figure 1). Ashippun is located in southeastern Wisconsin, 40 miles west-northwest of Milwaukee, in the northwest ¼ of the southeast ¼ of Section 30, Township 9 North, Range 17 East. The 4-acre site is bounded by Oak, Elm, and Eva Streets, and a maintenance yard for the Town of Ashippun. Residential property is located adjacent to the site to the north, northwest, and west. Residences are also located beyond the maintenance yards to the east. There is no public drinking water supply system in the community, and most residences have private water supply wells on their property. Davy Creek and an associated wetland are located southwest of the site across Elm Street. The site slopes very gently toward Davy Creek.

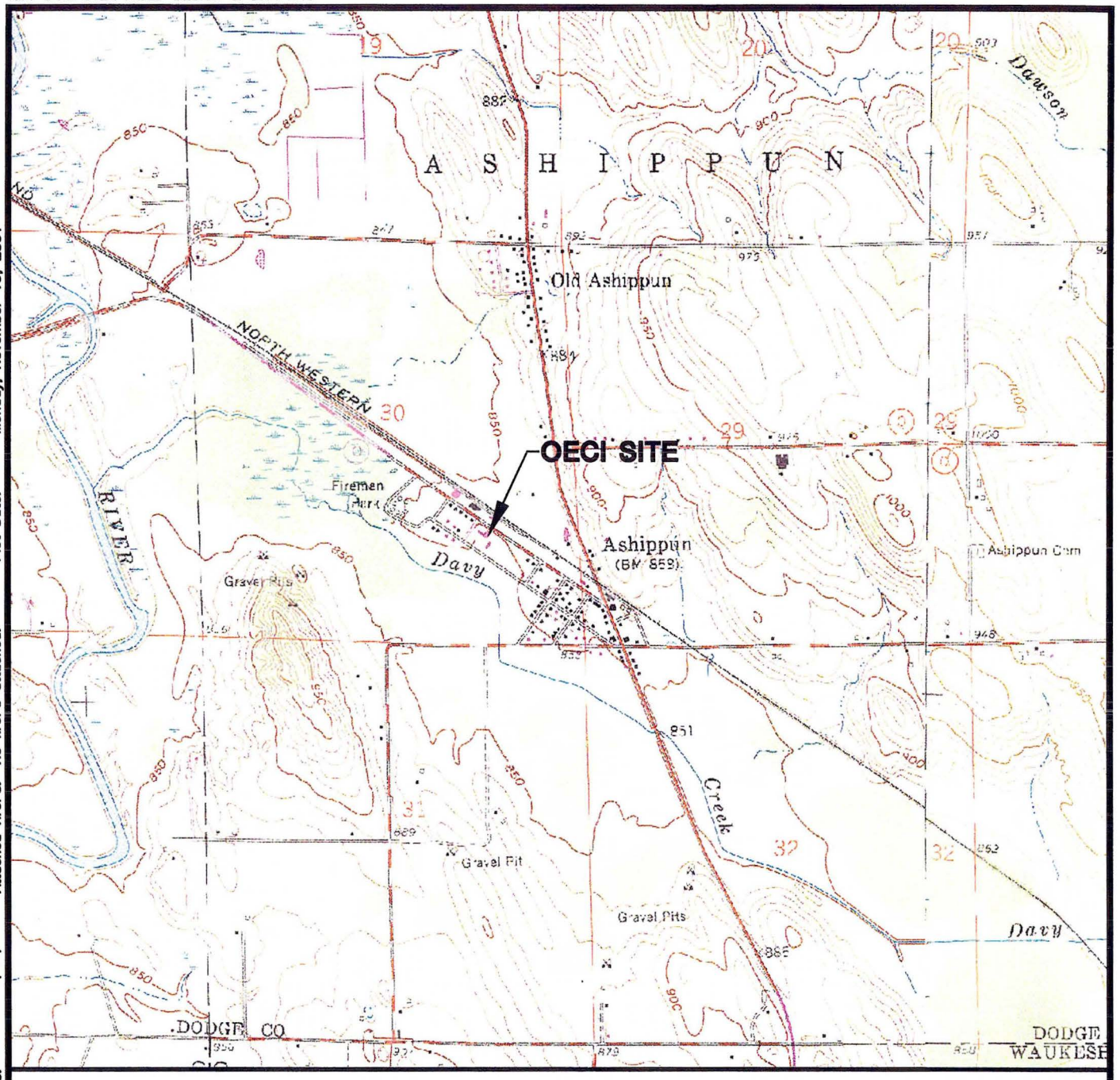
The OECI operated at the site from 1957 to 1991. The company used chlorinated solvents, cyanide, and various heavy metals, including chromium, cadmium, nickel, tin, zinc, and copper for metals cleaning and plating operations. Former waste disposal operations resulted in widespread contamination of soil, sediment, and groundwater.

The United States Environmental Protection Agency (USEPA) conducted a Preliminary Assessment of OECI in 1983, and the site was placed on the National Priorities List (NPL) based on that investigation. The Wisconsin Department of Natural Resources (WDNR) and Wisconsin Geological and Natural History Survey (WGNHS) conducted preliminary groundwater sampling efforts between 1983 and 1987. Chlorinated solvents and metals were detected in the groundwater.

The USEPA (through EBASCO, Inc.) conducted a Remedial Investigation/Feasibility Study at OECI in 1990. The RI determined that soil, sediment, sludge, and groundwater contained concentrations of chlorinated solvents, metals, and cyanide above regulatory levels of concern. The FS divided the site into four operable units (OUs): (1) lagoons, (2) contaminated soil, (3) contaminated groundwater, and (4) Davy Creek wetlands sediment.

A Record of Decision was signed on September 20, 1990, which established remedies for each OU. Removal operations were conducted between 1991 and 1994 to dismantle the facility and remove approximately 650 cubic yards of lagoon sediment/sludge, approximately 700 cubic yards of contaminated soil, and approximately 6,000 cubic yards of contaminated sediment in the wetlands around Davy Creek.

RMT COMPUTER AIDED DESIGN & DRAFTING



STATE LOCATION

0 2000 4000

SCALE: 1"=2000'

N

SITE LOCATION MAP
OECI FACILITY
ASHIPPUN, WI

SOURCE: BASE MAP FROM STONEBANK AND IXONIA 7.5 MIN. USGS QUADRANGLE.

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	
DATE:	NOVEMBER 2001
PROJ. #	06105.01
FILE #	61050101.DWG

FIGURE 1

PLOT DATA
Drawing Name: J:\06105\01\61050101.dwg
Operator Name: SIEWERTD
Scale: 1"=1'
Dwg Size: 53265 Bytes
Attached Xref's: No xref's attached.
Plot Time: 12:37.09 PM
Plot Date: Monday, November 19, 2001

The ROD states that the groundwater OU (OU-3) will be remediated to achieve state groundwater quality standards by groundwater extraction, treatment, and discharge to Davy Creek through a regulated Wisconsin Pollutant Discharge System (WPDES) outfall. The U.S. Army Corps of Engineers (USACE) was selected by the USEPA to prepare and implement a remedial design for the groundwater OU. The USACE (through Dames and Moore) conducted predesign aquifer testing and a treatability study in 1992. Subsequently, a groundwater extraction and treatment system was installed at the site. A series of five extraction wells were used to extract contaminated groundwater from the site, which was treated to remove metals, cyanide, and volatile organic compounds.

The system was constructed in 1996 and is operated by APL Environmental, with a typical combined extraction rate of 25 gpm. The USEPA Technology Innovation Office (TIO) reviewed the groundwater remediation system in 2000 and suggested that the capture zone be reviewed to maximize the effectiveness of the system. This workplan outlines the tasks to be performed to evaluate the current remediation system and presents alternatives to enhance the effectiveness of this system.

1.2 Conceptual Model

Glacial till, outwash, and Paleozoic sedimentary rocks underlie the site. The till/outwash is composed mainly of unconsolidated sand and silty sand, with interbedded sandy silt and silty clay. Drumlins are abundant in the vicinity of the site, forming elongated hills oriented northwest to southeast (see Figure 1). Bedrock is interbedded dolomite and shale of the Maquoketa Formation. The bedrock surface is irregular, but is generally encountered from 25 to 50 feet below grade, and slopes to the west. Shallow groundwater is encountered in the sandy till at a depth that ranges from 0.5 to 8 feet. The estimated hydraulic conductivity based on an aquifer test is 2.8×10^{-3} centimeters/second (cm/s), with a transmissivity of 1.7 cm^2/s. Groundwater generally flows to the west at a gradient of 0.001 to 0.006.

Testing on monitoring wells installed in the Maquoketa Formation estimate the hydraulic conductivity at less than 1×10^{-6} cm/s. It is believed that the groundwater flow in the bedrock is governed by secondary permeability associated with fractures. Whether the monitoring wells have encountered the principal water-bearing fractures is uncertain. Domestic wells in the vicinity typically utilize groundwater from the dolomite members of the Maquoketa Formation, but at deeper intervals than are monitored at the site. Low concentrations (below 1 µg/L) of site-related constituents have been detected in some adjacent domestic wells (P. Kozol, personal communication, May 2001).

A groundwater contaminant plume is identified at the site in the shallow aquifer that overlies the bedrock. Constituents in the groundwater are chlorinated solvents, including trichloroethene (TCE); tetrachloroethene (PCE); 1,1,1 trichloroethane (1,1,1-TCA); and associated breakdown products of these constituents. Inorganic constituents detected in groundwater at concentrations of concern are nickel, cadmium, copper, lead, and cyanide. Concentrations of all of these constituents have generally declined since initial investigations and subsequent remedial activities.

A groundwater extraction and treatment system was installed in 1996. The system extracts groundwater from five wells designed to collect groundwater from the till/outwash. Extraction wells each pump at an average of approximately 5 gallons per minute. The groundwater is treated to remove volatile organics, metals, and cyanide. The treatment system operates continuously, but has experienced periodic shutdowns due to problems with scaling and biofouling. Little data are available on the effectiveness of the capture zone for the extraction system.

1.3 Issues and Project Objectives

1.3.1 Issues

The OECI site has been identified as a site with relatively high operating costs and a long projected operating life, to achieve groundwater cleanup standards (Remediation System Evaluation, Oconomowoc Electroplating Superfund Site, Ashippun, Wisconsin, USACOE, USEPA, 2000). Analysis of potential enhancements to the groundwater recovery system requires a comprehensive understanding of the geology, hydrogeologic parameters, and contaminant distribution in the aquifer.

Several data gaps have been identified in the Remediation System Evaluation Report, and in conversations with DNR and EPA personnel. The extent of the groundwater plume is not well defined in the residential area west of MW-15D, or east of EW-3, MW-05, and EW-5. Data from the residential wells are limited by incomplete knowledge of the well depth and geology of the screened interval.

A thorough analysis of aquifer parameters and the capture zone associated with the existing extraction well system has not been conducted. Results from a single pumping test conducted on one of the recovery wells indicate that, at the current combined pumping rates of about 25 gpm, the capture zone associated with the system should encompass a broad area, including all of the site. However, groundwater head data from some areas (e.g., well MW-15D) suggest that the capture zone associated with one or more extraction wells may be incomplete. Also, contaminant concentration trends in

monitoring wells near the wetland also indicate that some contaminated groundwater may not be fully captured from the existing operations.

Optimization of the groundwater recovery and treatment can result in significant reductions in the life-cycle cost of remediation. If contaminated groundwater at higher concentrations migrates off-site to the east or west into drinking water supplies, the groundwater extraction system would need to be expanded, and may necessitate an alternative drinking water supply for nearby residents. The existing system may also be inefficient and costly if, as the Remediation System Evaluation Report indicates, a substantial portion of the extracted groundwater comes from the surface water in the adjacent wetland.

1.3.2 Objectives

The overall objective for this work is to evaluate the effectiveness of the existing groundwater extraction system in containing the migration of dissolved constituents of concern in the groundwater, and to identify measures that may improve the effectiveness of the recovery of groundwater by the pump-and-treat system. Associated objectives are as follows:

- To evaluate the effectiveness of the groundwater monitoring system and install any additional monitoring wells that are needed to fill data gaps
- To create an accurate base map of all relevant features of the site
- To define the full extent of site-related constituents
- To identify enhancements to the existing groundwater extraction system that will make it more efficient and effective in controlling the contaminant plume
- To estimate the time needed to achieve groundwater cleanup standards at the site

1.4 Summary of Approach

This workplan divides the OECI groundwater investigation into four specific project elements and 12 tasks. The tasks are presented in the approximate order in which they will be performed. Task 1 involves compiling and reviewing existing reports and documentation. Tasks 2 through 11 detail the site investigation. Task 12 details the site investigation report, which will be submitted to the WDNR upon completion of this project. The site investigation outlined in Tasks 2 through 11 is summarized in the paragraphs below.

Task 2 involves a site reconnaissance to determine if each monitoring well in the current monitoring network is functioning as it was intended, and to collect one round of water level measurements from all functioning site wells, including the monitoring wells and the extraction

wells. This task will include an interview with APL personnel to identify the data that are collected on the system influent, the water level data, and the extraction rates/volumes.

Task 3 involves a survey of residential wells in the vicinity of the site. Specifically, the purpose of this task is to identify nearby private wells and collect relevant data, such as well depth, well construction details, geologic formations encountered, etc. For residential wells where no information is available, a physical inspection (possibly including downhole inspection by a remote camera) may be required. Access agreements will be obtained for homeowners' whose wells will need to be entered as part of Task 7.

Task 4 involves conducting a civil survey of the site features, including monitoring wells, extraction wells, structures, property boundaries, and private wells on nearby properties. Horizontal locations of significant features and topographic contours of the surface will be included on a new base map that will be developed for the site. Elevations of all wells will be included in the survey to assist in the creation of potentiometric surface maps and geologic cross sections.

Task 5 involves a detailed review of the effectiveness of the monitoring and extraction well network. To complete this task, RMT will prepare cross section figures to illustrate the stratigraphy beneath the site, water table/potentiometric surface maps, and contaminant plume maps to help determine the adequacy of the current monitoring well network. RMT will also evaluate the adequacy of the extraction well network through a review of available data. Construction of a 3-dimensional groundwater flow model also begins under this task. The model will be constructed to simulate past and present hydrogeologic conditions at the site, and to evaluate the extent of capture of the existing extraction system. Finalization of the groundwater flow model after the completion of the pumping tests, and the development of a contaminant transport model are discussed in Task 11.

Task 6 involves the recommendation to the WDNR of modifications to the monitoring well network based on the findings from the data evaluation and the groundwater flow model. If the recommendations involve the construction of new wells (permanent or temporary) on the property of adjacent landowners, obtaining access agreements will be included as Task 7.

Task 7 will involve obtaining access agreements if necessary as identified in Task 3 and Task 6.

Task 8 involves the installation of new permanent monitoring wells recommended in Task 6. In addition to the new permanent monitoring wells, RMT will install up to 15 temporary piezometers (1-inch–diameter PVC) in the vicinity of the extraction wells to monitor the aquifer response during pumping tests described below. The horizontal location and elevation of the new monitoring wells and piezometers will be surveyed for inclusion on the site maps.

Task 9 involves collecting a round of groundwater samples from the site wells, including the new monitoring wells, the residential wells, the existing monitoring wells, and the extraction wells. The groundwater samples will be analyzed for the specific list of constituents provided in the Scope of Services section (Section 2).

Task 10 involves performing separate pumping tests on each of the site extraction wells. Drawdown during the individual pumping test will be monitored in the extraction well, the adjacent temporary piezometers, and, where appropriate, in nearby monitoring wells. The objective of the pumping tests is to collect sufficient hydrogeologic data to aid in the evaluation of the capture effectiveness of the extraction wells.

The pumping test data will be evaluated using the AQTESOLV® software package to obtain values of transmissivity (T) and storage coefficient (S). These data will be used in Task 11 to refine the input parameters for the groundwater flow model described above. The laboratory analytical data from the groundwater sampling results will be used to calibrate a contaminant transport model that will be developed to simulate the transport and fate of site contaminants. The purpose of the contaminant transport model is to help identify enhancements to the existing groundwater extraction system that will make it more efficient and effective in controlling the contaminant plume and to provide an estimate the time needed to achieve groundwater cleanup standards at the site.

The field methods and laboratory analyses to be performed under this project are described in the Sampling and Analysis Plan (SAP) included in Appendix A. The Hazard Assessment and the Health and Safety Plan for the fieldwork are included in Appendix B.

Section 2
Site Investigation

PROJECT ELEMENT 1

Task 1: Data Review

Objective

- To compile and review existing reports and documents to establish current conditions at the site and develop a logical path forward.

Scope of Work

- Compile and review pertinent reports and documents relevant to previous site investigations and the groundwater pump-and-treat system installed at the OECI site. Particular emphasis will be placed on the hydrogeology, the nature and extent of contamination, the details of the monitoring and extraction wells, and the operations and maintenance of the groundwater treatment system.
- Attend the fieldwork coordination meeting (if necessary) with the WDNR, the USEPA, and RMT, upon completion of the Workplan.

Output

- A summary table of site-specific historical reports and documents.

PROJECT ELEMENT 2

Task 2: Monitoring Well Integrity Verification

Objective

- To determine whether each monitoring well in the current monitoring network is functioning as it was intended, and to identify problems that may affect the integrity of any of the monitoring wells.

Scope of Work

- Compile existing site monitoring well information (i.e., well logs and well construction details), and create a simple database for internal usage of well construction materials, elevations, depths, and monitored horizons. This database will also include new well information compiled during the tasks listed below.
- Review analytical and hydrologic data to identify monitoring wells that provide spurious and/or questionable data. Wells identified through this review will be inspected for evidence of damage or improper construction.
- Locate, inspect, and measure the depth to the bottom of each monitoring well to verify that well logs are accurate, or to determine if the well integrity has been compromised.
- Install simple staff gauges at up to three locations on Davy Creek, and measure surface water elevations at the same time as the monitoring wells' water levels are measured. Existing fixed objects will be used as reference points for the staff gauges (i.e., bridge and top of wetland piezometer), where appropriate.
- Install up to three 1.25-inch–diameter drive-point piezometers along the northern perimeter (within the water) of the adjacent wetlands. One piezometer will be hand-driven to a depth of 3 to 5 feet below the wetland bottom. Two shallow piezometers will be driven into the peat, above the base of the wetland: (1) adjacent to the aforementioned deeper piezometer, and (2) in the nearest wetland area in the vicinity of existing piezometer MW-16S. The purpose of these piezometers is to provide water level monitoring points in wetlands to investigate the influence of surface water on groundwater during the pumping tests.
- Collect one round of water level measurements from all functioning site wells and Davy Creek, including the monitoring wells and the extraction wells, under current conditions (i.e., while the extraction wells are pumping).
- Conduct site visits (by Galen Kenoyer and John Oswald) to review site features and discuss facility operation with APL staff for logistical purposes needed for the drilling investigation and the pump test.
- RMT staff and its subcontractors will sign-in and sign-out at the treatment plant each day they are on-site throughout the duration of the project.

Output

- A summary of the findings to be compiled in a technical memorandum, including recommendations for each well. Potential recommendations include no action, redevelopment, downhole camera logging, replacement, and plugging/abandonment. The memorandum will include a revised site map that includes the existing wells and notes of any well that has been removed or taken out of service. This information will be discussed with the WDNR and the USEPA, as outlined in Task 6.

Assumptions

- Twenty-three existing OECI monitoring wells are accessible. Wells MW11S, MW11D, and MW11B are no longer accessible.
- The well elevation survey will be completed during the topographic survey and is included in Task 4.

Task 3: Private Well Survey

Objective

- To identify nearby private wells and collect relevant well construction data to be used for an evaluation of contaminant risk to the nearby residents.

Scope of Work

- Conduct a records search of available documents and state databases to identify nearby private water supply wells. Available information on each well will be compiled, including such data as well depth, well construction details, geologic formations encountered, production intervals, etc.
- Conduct a door-to-door well survey of nearby residences and businesses along Highway O (Oak Street) from the Thermogas site northwest to Ann Street, between Ann and Eva Streets, and along the southwestern side of Elm Street, to verify the literature and database search and to obtain information from private wells not located in the records search. An additional trip to the county assessor's office may be necessary to verify older well log information. Wells outside this search area will be evaluated on a case-by-case basis, as more data become available, for possible inclusion into the program.
- Identify water supply wells for which no subsurface data are available, and request permission from the well owner to physically open and inspect the well. Physical inspection may include removal of the pump and appurtenances from up to seven wells, measurement of water levels as feasible, and chlorination of the wells. The WDNR will be notified prior to physically opening a water supply well to obtain their concurrence on the matter. RMT will hire a subcontractor to perform this activity, and will not be responsible for damage caused to the well or its internal pumps and appurtenances. If breakage of private well systems (i.e. piping, wiring, pump, seal) occurs during the execution of the work, and if it is obvious the breakage is due to the age of the system, which could not tolerate normal removal and inspection activities, the WDNR will reimburse the appropriate party for any repair work. The repair work will be done immediately and continuously so as to avoid any lengthy disruption of service. RMT will ask the homeowners to store water prior to accessing the well and pulling the pump. RMT or the well driller will maintain a separate temporary potable water source up to 25 gallons per household, should breakage of the well appurtenance occur during the investigation and is expected to take longer than 2 hours to repair.
- Evaluate data collected in the records search to identify those wells that may be impacted by the migration of site-related constituents.

Output

- A listing of residential potable water supply wells in the study area and a brief description of each. This compilation will be included in a technical memorandum to be distributed to the project team (RMT, the WDNR, and the USEPA).

Assumptions

- The WDNR will draft a cover letter to the residents who will be visited by RMT staff to obtain well information and to residential well owners whose wells require a physical inspection.
- Private well pump removal/video logging will be evaluated on a case-by-case basis depending on the records search. Based on discussions with the WDNR on July 20, 2001, an estimated seven private wells may need to be accessed to evaluate the well's construction and depth.
- The renewal/obtainment of access agreements from adjacent property owners for continued access to applicable areas through the course of this investigation will be performed as specified in Task 7.

Task 4: Site Topographic and Monitoring Well Survey

Objective

- To provide permanent, definable locations and elevations for all pertinent monitoring points and site features used in this study.

Scope of Work

- Conduct a civil survey of the horizontal location and elevation of each monitoring well to verify the accuracy of, and to document any changes from, the previous survey. A follow-up survey will be conducted (see Task 8) to record survey data for any additional wells or sampling points, following field efforts. Surveying will reference State Plane Coordinates and elevations relative to established USGS benchmarks, and will be conducted by a surveyor registered and in good standing with the State of Wisconsin. A description of procedures for the civil survey is included in the SAP in Appendix A.
- Subcontract with Aero-Metric of Sheboygan, Wisconsin, to create a digital topographic contour map using the State Plane Coordinate System. Conversion factors for Wisconsin Trans Mercator (WTM) and latitude and longitude will be provided on the map. The scale of the map will be 1" = 200' and will incorporate an area slightly greater than the southeast quarter of Section 30 and a portion of the southwest quarter of Section 29, Township 9, Range 17 East. The approximate area dimensions will be 3,600 feet in the east/west direction by 2,800 feet in the north/south direction.
- Prepare an updated project-specific base map for the OECI site, based on the new surveys. The map will include topography; existing site features; treatment system buildings; outlines of the former buildings; effluent gallery; existing, abandoned, and new well locations; soil berms; private wells; benchmarks; staff gauges on Davy Creek; the location of the former facility; the margin of wetlands; and other pertinent site features. The map will be printed as a 24-inch by 36-inch plan sheet and will be used as the base map over which other appropriate information (i.e., potentiometric surface, plume maps, etc.) can be superimposed.

Output

- A new base map that includes locations and elevations of existing wells, in addition to structures, roads, water bodies, etc.

Assumptions

- Approval is granted by Dodge County for the use of the existing digital orthophotography in order to create the base map. Aero-Metric already has the electronic files.
- Benchmarks for horizontal and vertical control are present, visible, and in good condition.

Task 5: Review of the Effectiveness of Monitoring/Extraction Well Networks – Groundwater Flow Modeling (Phase I)

Objectives

- To determine the reliability of the current monitoring well network in providing an accurate portrayal of the lateral and vertical distribution of contaminants, especially in regard to the system's effectiveness in serving to protect nearby residential wells and crucial wetlands habitat.
- To determine the effectiveness of the existing groundwater extraction network in removing contaminant mass and providing sufficient hydrologic control to contain the migration of the contaminant plume.

Scope of Work

- Review available data on the current monitoring network to determine the capability of the system to accurately define the extent of contamination.
- Prepare appropriate figures that illustrate subsurface and hydrogeology through cross sections (up to four), potentiometric/water table surface maps (up to three), and contaminant plume maps. Equipotential and groundwater flow lines will be added, as appropriate, to illustrate interpretations pertinent to groundwater flow and contaminant transport. The lateral and vertical distribution of contaminants will be superimposed on maps and cross sections with the current monitoring network, to ascertain the appropriateness of the current wells, and to identify data gaps where additional wells would be beneficial.
- Evaluate the current extraction well network through a review of available data on the placement, construction, pumping history, and contaminant mass removal.
- Re-evaluate the results from the pumping test performed by Dames and Moore in the Spring of 1992 to determine the appropriateness of the solution methods chosen for the determination of aquifer parameters.
- Utilize historical data from the above tasks to provide sufficient data to construct a three-dimensional groundwater flow and contaminant transport model.
- Construct a 3-dimensional groundwater flow model of the site using the Modflow code. Use the graphical model interface code Visual Modflow or Groundwater Vistas to prepare detailed and accurate data input for the model based on available hydrogeologic data for the site. Use at least three layers to simulate the shallow, intermediate, and deep groundwater beneath the site. Incorporate data from pumping tests on hydraulic conductivity, and create zones of varying hydraulic conductivity within and between layers. Calibrate the flow model to the hydraulic heads measured under pumping and nonpumping conditions.

- Calculate the 3-dimensional extent of the capture zone around each of the extraction wells, based on average pumping rates at each extraction well using particle tracking from the ModPath code, in conjunction with the Modflow model.
- Facilitate an accurate and detailed presentation of the model results by using pre- and post-processing software (Visual MODFLOW or Groundwater Vistas). These graphical packages will allow two- and three-dimensional views of the relationship of hydrostratigraphy and plume migration.

Outputs

- A brief technical memorandum discussing the reanalysis of the historical pumping test results.
- Figures and preliminary modeling outputs to be compiled for presentation as outlined in Task 6.

Task 6: Recommended Monitoring Well Network Modifications

Objective

- To determine the optimum number, depths, and locations of monitoring wells necessary for an effective monitoring network design.

Scope of Work

- Use results from the capture zone analysis and data analysis (Task 5) to determine the most effective placement of monitoring wells to monitor the present and future extent of the contaminant plume.
- Prepare recommendations for the WDNR's and the USEPA's review on the state of the current monitoring system, and identify locations where additional wells are necessary to fill data gaps. Also, determine if any existing wells are redundant, unnecessary, or in need of repair and whether any monitoring wells should be replaced or abandoned.
- Use potentiometric surface maps, pumping test data, and the flow model to determine locations for any piezometers or observation wells that need to be added to the monitoring network to best determine the extent of influence of the extraction system.
- Present results of the initial evaluation of the site monitoring and extraction system to the WDNR and the USEPA. Proposed well locations will be presented using appropriate maps, drawings, and figures to support these recommendations.
- Refine and resubmit the revised monitoring strategy based on review and comments from the WDNR and the USEPA.

Outputs

- A list of monitoring wells used in the revised monitoring network that includes wells to be added, deleted, installed, and plugged/abandoned. Present results of the listing along with supporting documentation from the reanalyzed pump test and analysis, and modeling as a technical memorandum to the Project Team with a follow-up meeting with the WDNR and the USEPA to discuss findings and obtain consensus on the path forward.
- Figures that summarize the results of the model calibration and capture zone analysis conducted in Task 5, and that show the extent of the zone of capture around each pumping well.

Assumptions

- A half-day project team meeting will be held at RMT's office in Madison to discuss the recommended modification to the monitoring well network, and the results of the capture zone analysis.
- Any proposed additional wells located on private property will require access agreements. Obtaining these agreements is discussed in Task 7.

Task 7: Obtaining Access Agreements (If Necessary)

Objective

- To obtain access agreements from private well owners and from property owners whose property is to be accessed for drilling or monitoring well installation.

Scope of Work

- Request access approval from the property owners around the site in order to conduct the site investigation. The access agreements will follow the format provided in the WDNR Request for Proposal and will be negotiated to allow for the installation of borings and monitoring wells, the continued access to the wells by the WDNR, and the sampling of private water supply wells, as necessary. If we cannot obtain the owner's approval of the WDNR form after our initial request, we will notify the WDNR to develop an alternative strategy.
- Renew existing access agreements.

Outputs

- Signed access agreements.

Assumptions:

- An access agreement will not be required solely to sample a homeowner's private well from their tap.

PROJECT ELEMENT 3

Task 8: Boring/Monitoring Well Installation

Objective

- To install permanent and temporary monitoring wells in locations approved by the WDNR and the USEPA.

Scope of Work

- Prepare and administer two subcontracts for a well driller and Geoprobe® subcontractor.
- Contact a utility locating service to mark underground utilities in the area of proposed drilling activities.
- Observe and document the installation and development of up to six monitoring wells at locations determined in Task 6. Three of the wells will be installed in the interval immediately above the bedrock surface by hollow-stemmed auger drilling methods. Three additional wells will be installed approximately 15 feet into the bedrock and will be nested with the respective three shallower wells. The number of borings and monitoring wells may be adjusted based on findings in Task 6. Hollow-stemmed augers will be used within the unconsolidated material for drilling the shallow portion of the deep wells. A 2-inch core rod will be used to collect continuous core samples of the bedrock to the prescribed depth of the bedrock wells. Air-rotary drilling methods will be used in the cored borehole to ream the hole to a 6-inch diameter. Each of the six wells will be installed near the anticipated plume margins, where concentrations will be low, thus likely limiting the potential for significant downward migration in the bedrock aquifer and the need for double-cased wells. However, double-casing will be used if field-screening indicates significant levels of organic vapors. The monitoring wells will be installed in accordance with WAC NR 141. The wells will be constructed of 2-inch PVC with 5-foot screen lengths. The depth and screen length of the monitoring wells may be adjusted based on the findings in Task 6. Current estimates are for 315 feet of total drilling. Drilling, well construction, and development methods are discussed in detail in the QAPP included in Appendix A.
- Collect soil samples continuously to the bedrock surface in the three deep borings for lithologic analysis. Collect a continuous core from the bedrock for lithologic analysis. The shallow wells in a well nest will be installed last, and no samples will be collected.
- Field-screen the unconsolidated soil at 5-foot intervals using a photoionization detector (PID) to determine the relative concentration of VOCs in the samples.
- Observe and document the abandonment of up to four monitoring wells in accordance with WAC NR 141. Four monitoring wells are expected to be abandoned at depths averaging 30 feet.
- Observe and document the installation and development of up to three 1-inch PVC temporary piezometers near each of the five extraction wells to an approximate depth of

20 feet utilizing a Geoprobe®. The intended purpose of these piezometers is to measure water levels during the pumping tests. The location and construction details are contingent on the findings in Task 6. The borings will be sampled continuously to total depth, and a PID will be used to field-screen the soil to determine the relative concentration of volatile organic compounds (VOCs) in the samples. Soil boring methods are discussed in the Sampling and Analysis Plan (SAP) included in Appendix A.

- Collect six soil samples for total organic carbon (TOC) analysis for contaminant sorption calculations.
- Collect up to three soil samples if elevated PID readings are recorded. The samples will be analyzed for VOCs, metals, and cyanide.
- Conduct a second site civil survey to include the horizontal location and vertical elevations of the up to 12 Geoprobe® temporary piezometers, the three driven temporary piezometers, and the six new monitoring wells.
- Manage Investigation-Derived Wastes (IDW) in a safe and secure manner as specified in the attached QAPP included in Appendix A. IDW actions will include collecting and containerizing all drill cuttings, development water, sampling purge water, personal protective equipment, etc. Liquids will be discharged to the groundwater treatment system, while solids will remain on-site in a secure location for disposal at a later date.
- Provide the WDNR with proof that the drilling subcontractors are 40-hour and 8-hour trained prior to beginning site work.

Outputs

- WDNR soil boring logs, WDNR well construction and development forms, WDNR well information form (WIF), and WDNR abandonment forms for inclusion in the final report (Task 12). The surveyed borings and wells will be added to the base map.

Assumptions

- The temporary wells will be installed within 60 feet of the respective extraction well. The location of the temporary wells may be modified based on site features, geologic conditions, or access.
- IDW drums can be stored within the fenced area of the treatment building for disposal at a later date. Soil sampling required for disposal will be done in the future.
- Access to the treatment building is available during normal business hours.
- Level D personal protective equipment is sufficient for all fieldwork.
- Flush-mounted monitoring wells will be constructed for off-site wells.
- The four well abandonments will be completed during other on-site well installation activities.

Task 9: Groundwater/Surface Water Sampling

Objective

- To collect one round of groundwater, surface water, and drinking water samples for laboratory analysis.

Scope of Work

- Measure groundwater levels at up to 32 site monitoring wells and five extraction wells prior to purging and collecting a sample.
- Collect groundwater samples from the six new monitoring wells, the 20 existing monitoring wells (MW-1S, MW-1D, MW-2S, MW-2D, MW-3D, MW-4S, MW-4D, MW-5D, MW-7, MW-8, MW-9S, MW-10S, MW-10D, MW-12S, MW-12D, MW-12B, MW-13S, MW-14D, MW-15D, and MW-16S), the five extraction wells (EW-1 through EW-5), and the up to 10 private wells approximately 2 to 4 weeks after well installation is completed.
- Sample monitoring wells using low-flow sampling techniques with no filtration. Samples will be analyzed for the site-specific contaminants of concern listed in Table 1. The sample analysis methods for the groundwater and surface water sampling are presented in the SAP (Appendix A).
- Sample the extraction wells, using low flow rate methods if possible, without compromising the remediation system. This may require removal of the pumps, wiring, and piping. Samples will be analyzed for the same parameters listed for the monitoring well analysis as indicated in the WDNR RFP dated May 2, 2001, or as listed in Table 1.
- Evaluate private wells on a case-by-case basis to determine an appropriate sampling method. Low flow rate samples will be collected from private wells if practicable, but experience suggests that they will most likely be sampled from a tap nearest the wellhead. Samples will be analyzed for the same parameters listed for the monitoring well analysis as indicated in the WDNR RFP dated May 2, 2001, or as shown in Table 1.
- Monitor groundwater indicator parameters (pH, temperature, dissolved oxygen [DO], and specific conductance) during low-flow purging to determine chemical parameter stabilization and for natural attenuation characterization. Oxidation/Reduction potential will be monitored at the time of sampling.
- Collect a total of two surface water samples, from the adjacent wetlands near MW-12 and from Davy Creek near the Lincoln Road Bridge. Those samples will be analyzed for copper only to determine any impact to the wetlands from groundwater discharge.
- Ship the analytical samples to EnChem Laboratories for analysis. Samples will be analyzed at a level of quality typical for sites under the Superfund program. Full CLP validation packages are not required at this time; however, the laboratory will be apprised to maintain the data in a database for possible full disclosure at a later date.

Table 1
Analytical Parameters for Groundwater Samples
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

FIELD PARAMETERS	
Temperature	Oxidation reduction potential
Dissolved oxygen	Dissolved oxygen
pH	
VOLATILE ORGANIC COMPOUNDS - EPA METHOD 8260	
1,1-Dichloroethane	Chlorobenzene
1,1-Dichloroethene	Chlorodibromomethane/Dibromochloromethane
1,1,1-Trichloroethane	Chloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane/	Chloroform
1,1,2-Trichlorotrifluoroethane	Chloromethane
1,1,2-Trichloroethane	cis-1,2-Dichloroethene
1,1,2,2-Tetrachloroethane	cis-1,3-Dichloropropene
1,2-Dibromo-3-chloropropane	Cyclohexane
1,2-Dibromoethane	Dichlorodifluoromethane
1,2-Dichlorobenzene	Ethylbenzene
1,2-Dichloroethane	Isopropyl benzene
1,2-Dichloropropane	Methyl tert-butyl ether
1,2,4-Trichlorobenzene	Methyl acetate
1,3-Dichlorobenzene	Methylcyclohexane
1,4-Dichlorobenzene	Methylene chloride
2-Butanone	Styrene
2-Hexanone	Tetrachloroethene
4-Methyl-2-pentanone	Toluene
Acetone	trans-1,2-Dichloroethene
Benzene	trans-1,3-Dichloropropene
Bromodichloromethane	Trichloroethene
Bromoform	Trichlorofluoromethane
Bromomethane	Vinyl chloride
Carbon disulfide	Xylenes, total
Carbon tetrachloride	
METALS	
Arsenic	Manganese
Barium	Mercury
Cadmium	Nickel
Chromium +6	Selenium
Chromium, total	Silver
Copper	Thallium
Iron	Zinc
Lead	
OTHER	
Cyanide	Cyanide, weak acid dissociable
Cyanide, amenable	

Outputs

- Analytical data in hard copy and electronic formats (in ASCII on 3.5-in IBM formatted diskettes or equivalent) consistent with WDNR formatting protocols for environmental data. Two copies of data in each format will be provided in the site investigation report.
- A hard copy of the analytical results for submittal to the WDNR project manager after an internal quality assurance review of the data is performed.

Assumptions

- Private wells currently under an annual monitoring program will not be included as any of the 10 private wells.
- Monitoring wells MW-11S, MW-11D, and MW-11B are not accessible. Monitoring wells MW-3S, MW-5, and MW-6 have historically been dry or have not had enough water to collect a groundwater sample. However, if these wells are determined to have a sufficient volume of water, a sample will be collected.
- Purge water from the monitoring wells will be contained and discharged in the treatment plant.
- Level D personal protective equipment is sufficient for all fieldwork.

Task 10: Pumping Tests

Objectives

- To collect sufficient hydrologic data to evaluate the capture effectiveness of the extraction wells.
- To refine estimates of hydraulic parameters in the aquifer using the improved monitoring and observation well network.

Scope of Work

- Measure groundwater levels at each of the existing monitoring wells and pumping wells to obtain initial hydraulic head data of the aquifer during routine operation of the current groundwater extraction system.
- Shut down the extraction well system for an estimated 48 hours, and measure the recovery of water levels in a selected network of up to 20 monitoring wells across the site and in adjacent areas. This recovery analysis will show the response of the aquifer to the combined pumping of all five extraction wells. This recovery test will also allow the groundwater system to return to nonpumping equilibrium levels, prior to the onset of individual pumping tests.
- Conduct an aquifer pumping test at each of the five groundwater extraction wells individually. Pumping rates will be determined after a review of available extraction well data. Water levels will be measured at monitoring points to better define the groundwater response to pumping. The pumping tests will be of sufficient duration to investigate any effects of boundary conditions (i.e., adjacent wetland and infiltration gallery) and/or leakage from the bedrock aquifer.
- Monitor up to eight monitoring wells around each extraction well using pressure transducers and data loggers. Collect manual water level measurements in the extraction wells as a cross-check on the transducer/data logger measurements.
- Monitor an additional set of up to six monitoring wells manually, periodically during the duration of each test. Included in this set of wells will be background wells (outside the area of influence) and wetland temporary piezometers. All measurements will be accurate to 0.01 ft.
- Measure precipitation and barometric pressure throughout the pump tests.
- Evaluate aquifer response data using AQTESOLV® software to obtain values of storativity coefficient, transmissivity, hydraulic conductivity, etc.
- Subcontract with a security service during the overnight hours of the pumping tests.

Outputs

- Pumping test data for model revisions.
- A summary of the results of the pumping tests to be included in a Technical Memorandum for distribution to the project team. The revised model will be presented as an appendix to the final report (Task 12).

Assumptions

- Five 24-hour pumping tests will be conducted, with 24 hours between the pumping tests to allow for aquifer recovery. The duration of the pumping tests may be increased if the aquifer has not reached (or come close to) a steady state within the first 24 hours. Similarly, the recovery period may also need to be extended if the aquifer does not recover to near ambient, nonpumping conditions within 24 hours.
- The temporary piezometers will remain in-place until the WDNR and the USEPA comment on the final report.

Task 11: Groundwater Flow (Phase II) and Contaminant Transport Modeling

Objectives

- To refine the groundwater flow model based on new data from the pumping tests, providing a more accurate simulation of the capture zone of the extraction well system.
- To develop a contaminant transport model that accurately represents the three-dimensional transport of contaminants in the groundwater system.
- To identify enhancements to the operation of the existing groundwater extraction system that will optimize its effectiveness in achieving target cleanup levels in an efficient manner.

Scope of Work

- Refine the groundwater flow model by integrating pumping test estimates of aquifer parameters into the model.
- Develop a three-dimensional contaminant transport model of the site, using the MT3DMS code in conjunction with the Modflow model.
- Calibrate the transport model to measured concentrations of contaminants over the site as follows:
    - Over time, based on the historical record of concentrations at the site
    - Over space, incorporating the 3-dimensional distribution of contaminants at the site
- Use the model to evaluate whether there may be small remnants of residual nonaqueous-phase liquids (NAPL) in the source area, which could represent a long-term source, by testing the possibility of simulating the historical record of contaminants at the site without these concentrated sources.
- Evaluate up to eight different pumping scenarios, including the existing operations, to identify an optimal scenario that will enhance the effectiveness of the groundwater extraction system and reduce the life-cycle costs of site remediation.
- Estimate the time needed to achieve target cleanup levels for the various groundwater contaminants at the site, under the optimal extraction system scenario that was identified.

Outputs

- Results of the transport model simulations to be presented in a progress meeting with the WDNR and the USEPA, to arrive at a consensus in identifying the optimal groundwater pumping scenario.
- Estimates of the time to achieve target cleanup levels to be simulated for each of the contaminants of interest.

- A summary of model results, documentation of the transport model calibration and simulations, and supporting figures and tables to be presented in the final report (Task 12).

Assumptions

- Up to 15 different chemical constituents will be simulated with the transport model.
- The optimal pumping scenario will be identified, based on model results, in an half-day working meeting with the WDNR and the USEPA in Madison. The meeting will be held at a point in time that allows the flow of work to proceed smoothly.

PROJECT ELEMENT 4

Task 12: Site Investigation Report

Objective

- To prepare a report that documents site investigation activities, summarizes and evaluates the data collected and the modeling efforts, and provides recommendations of the effectiveness of the pump-and-treat system to capture the contaminant plume.

Scope of Work

- Prepare a site investigation report based on the format outlined in WAC NR 716.15(2) and the WDNR RFP dated May 2, 2001. The report will include the following:
    - A cover letter referencing the WDNR's identification number for the study area.
    - An executive summary describing the site investigation results, conclusions, and recommendations.
    - A section describing the general information for the site, including study area property owners; the contractor; consultants' names, addresses, and telephone numbers; and a location map.
    - A section describing the background information for the study area.
    - A section describing the methods of investigation.
    - A discussion of the private well survey results.
    - A section presenting the description of the results of the site investigation sufficient to characterize the geologic, hydrologic, and hydrogeologic conditions in the study area, including a description of the sequence of site investigation activities.
    - Summary tables of analytical and hydrologic data. Modeling results will be presented with two- and three-dimensional depictions of the subsurface stratigraphy and plume dimensions. Discussions will be prepared that describe the significance of these data and describe the hydrologic effects, contaminant removal effectiveness, and cost-effectiveness of the extraction and monitoring systems.
    - A base map depicting topography; site features; treatment system buildings; outliers of the former facility; effluent gallery; existing, abandoned, and new well locations; private wells; surface water staff gauges; benchmarks; the location of the former facility; the margin of wetlands; and any other site pertinent features.
    - Up to four geologic cross sections, perpendicular to each other, with at least one parallel to the predominant groundwater flow direction. Flow nets will be superimposed on the cross sections. The vertical distribution of contamination will be shown on the cross sections.
    - A water table map and tables of calculated vertical and horizontal gradients.

- Up to three potentiometric surface maps.
- Up to five contaminant isoconcentration maps that illustrate the degree and extent of contamination.
- The site investigation technical data to be included in appendices to the report. These will include boring logs, monitoring well construction forms, well development forms, well abandonment forms, water level measurements, pumping test data, aquifer testing calculations, modeling results, analytical results (physical and chemical data from the laboratories), chain-of-custody documentation, and other relevant data.
- Flow model documentation, including conceptual model, parameter zones, boundary conditions, calibration results, and capture zone analysis results.
- A map showing the extent of the capture zones surrounding each of the extraction wells, under current pumping conditions.
- Results of the transport model simulations, including parameter values, calibration results, evaluation of various pumping scenarios, estimated extent of plume, and estimated time to achieve target cleanup levels in the aquifer.
- Conclusions that present the overall effectiveness of pump-and-treat as a remedial strategy at the OECI site. That includes recommendations for improving or otherwise enhancing the remedial effectiveness in light of alternative remedial strategies while maintaining adequate protection of human health and the environment.

Output

- A report first to be issued as a draft for review by the project team. Three copies will be submitted to WDNR offices in Fitchburg, Wisconsin; and two copies will be submitted to USEPA Region V offices in Chicago, Illinois. The final document will be issued upon receipt of comments from the WDNR and the USEPA. The document will be issued as final within 10 days from receipt of regulatory comments. RMT, Inc., will meet with the Project Team following issuance of the final report, if requested.

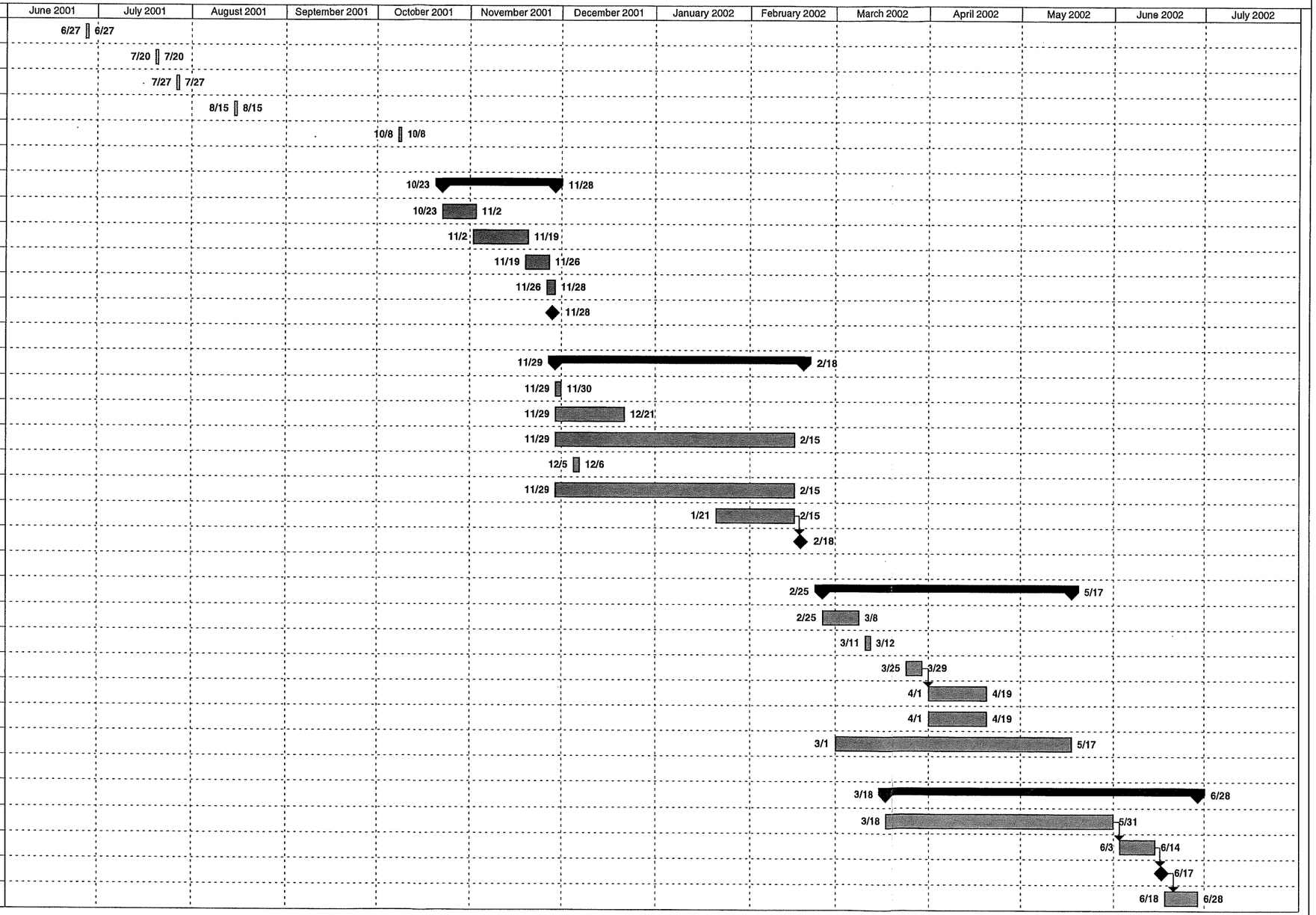
Section 3
Schedule

RMT's proposed project schedule is presented on Figure 2. Timely development of the findings and conclusions from each milestone, the formulation of recommendations for the next phase of work, and the communication and discussion of these with the RMT/WDNR/USEPA project team are critical so that decisions can be made regarding the future direction of the work. To facilitate communications, discussions, and decisions, RMT recommends pre-establishing meeting schedules at key points in the project.

Wisconsin Department of Natural Resources
Oconomowoc Electroplating Company, Inc., Groundwater Investigation Project

Project Schedule

ID	Task Name
1	Notice of Consultant Selection
2	Meeting with WDNR to structure scope and cost for contract
3	Finalization of scope and cost for contract
4	Contract execution
5	Receipt of signed contract from WDNR
6	
7	**1.0 Historical Review/Workplan**
8	1.1 Historical Review
9	1.2 Draft Workplan Preparation and Submittal
10	1.3 WDNR/USEPA review of draft workplan and comment submittal
11	1.4 Final Workplan Submittal (within 10 days following receipt of comments)
12	-- WDNR/USEPA Approval of Workplan (meeting)
13	
14	**2.0 Site Investigation - Phase 1**
15	2.1 Monitoring Well Integrity (drive-point well installation)
16	2.2 Private Well Survey
17	2.3 Access Agreements
18	2.4 Topographic Survey/Existing Well Survey
19	2.5 Effectiveness of Monitoring Well/Extraction Well Networks - Flow Modeling
20	2.6 Recommended Monitoring Well Network Modifications
21	-- Meeting with WDNR/USEPA to discuss well network modifications
22	
23	**3.0 Site Investigation - Phase 2**
24	3.1 Monitoring Well Installation/Geoprobe Temporary Wells
25	-- Monitoring Well Civil Survey #2
26	3.2 Groundwater/Surface Water Monitoring
27	-- Laboratory Analysis
28	3.3 Extraction Well Pump Tests (requires favorable weather conditions)
29	3.4 Contaminant Transport Modeling - System Optimization
30	
31	**4.0 Reporting**
32	4.1 Draft Investigation Report Submittal (within 60 days of completion of field activities)
33	4.2 WDNR/USEPA review of draft investigation report and comment submittal
34	-- Meeting with WDNR/USEPA to discuss report
35	4.3 Final Investigation Report Submittal (within 10 days following receipt of comments)



Proj.: WDNR/OECI GW Investigation
Updated: 11/19/01

Task | Progress | Summary | Rolled Up Split | Rolled Up Progress | Project Summary
Split | Milestone | Rolled Up Task | Rolled Up Milestone | External Tasks

Figure 2

Section 4
Project Team

RMT has selected several key staff for this project based on their past experience on similar work. An organizational chart is contained on Figure 3.

The project will be managed by ***Mr. John C. Oswald, P.G.*** Mr. Oswald has nearly 10 years of environmental and hydrogeologic experience, including at the Algoma Landfill Superfund site in Wisconsin and the WDNR-Mayville Coke Plant site, also in Wisconsin. He is a project manager and senior geologist in our Madison office. He will be the primary client contact for the WDNR, responsible for technical outputs and compliance with the schedule and budget.

Mr. Galen Kenoyer, Ph.D., will be the lead groundwater/contaminant modeler for the project. He will develop both the groundwater flow and the contaminant transport models for the site, and will integrate available hydrogeologic data into the models to construct accurate simulations of actual site conditions. He will use the models to identify enhancements to the groundwater extraction system that will optimize the effectiveness of the system. Dr. Kenoyer has extensive experience in developing accurate models to identify optimal remediation strategies for CERCLA sites across the country, including the Lemberger site in Wisconsin, and the Crab Orchard site in Illinois.

Mr. James Wedekind will serve as the lead hydrogeologist. Mr. Wedekind is a senior hydrogeologist in RMT's Madison office. He has developed and reviewed Superfund site investigations and remedial approaches at sites across the country. He will also serve as technical coordinator for the project. He will assist Mr. Oswald and Dr. Kenoyer in preparing quality outputs, consistent with company standards and client expectations.

Quality assurance/quality control review will be provided by ***Mr. John M. Rice, P.E.*** Mr. Rice is a senior hydrologist with extensive experience in Superfund investigations.

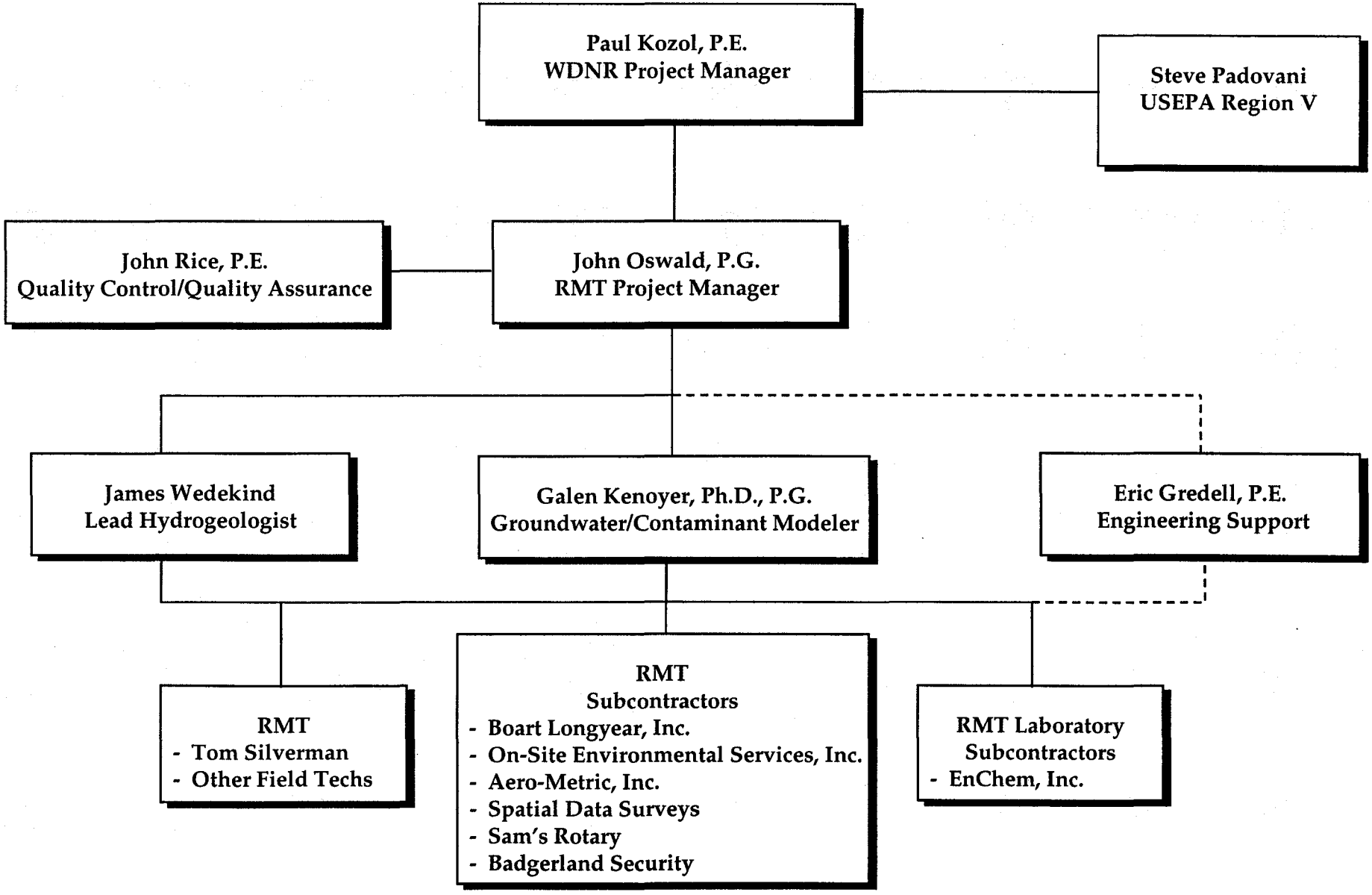
Mr. Eric Gredell will provide quality assurance/quality control assistance with respect to the engineering details of the extraction system operations.

Mr. Thomas Silverman will have primary responsibility for performing the pumping tests, the Geoprobe® investigation, the monitoring well construction, and the groundwater monitoring on this project. Tom will also provide modeling assistance under Galen's direction. Tom has over 2 years of experience in the field of hydrogeology. He has developed and implemented

groundwater and statistical evaluation programs for the investigation and remediation of contaminated sites.

We will round out our project team with well-qualified field staff and technicians. We will subcontract the drilling, surveying, and laboratory work to local firms on the basis of qualifications and price.

Figure 3
Oconomowoc Electroplating Company, Inc.
Project Team



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Appendix A
Sampling and Analysis Plan

Integrated
Environmental
Solutions

744 Heartland Trail 53717-1934
P.O. Box 8923 53708-8923
Madison, WI
Telephone: 608-831-4444
Fax: 608-831-3334

SAMPLING AND ANALYSIS PLAN
OCONOMOWOC ELECTROPLATING COMPANY, INC.
ASHIPPUN, WISCONSIN

PREPARED FOR
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

PREPARED BY
RMT, INC.

November 2001

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Section 1
Introduction

This document presents the Sampling and Analysis Plan (SAP) for performing the groundwater investigation for the Oconomowoc Electroplating Company, Inc. (OECI), site. The activities addressed by the Sampling and Analysis Plan (SAP) are described in the Workplan to which this SAP is attached. The purpose of the SAP is to define the sampling and data-gathering methods to be used during the investigation. The rationale for the sampling is described in the Workplan to which this SAP is appended.

Section 2
Sampling Location and Frequency

The basis for the groundwater and surface water sampling locations is provided in Section 2 of the Workplan to which this SAP is appended. Sampling points will be determined after the review of the monitoring well network and preliminary modeling are completed (described in Section 2 of the Workplan).

Each of the selected monitoring and private water supply wells will be sampled once. Surface water will be sampled once, at two locations: (1) from the wetland area near MW-12, and (2) from Davy Creek, near the Lincoln Road bridge. Surface water samples will be collected during the groundwater sampling period.

Analytical parameters are presented in Table A-1. The two surface water samples will be analyzed for copper only. The frequency of investigative and field-related quality control samples is provided in Table A-2.

Table A-1
Analytical Parameters for Groundwater Samples
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

FIELD PARAMETERS	
Temperature	Oxidation reduction potential
Dissolved oxygen	Dissolved oxygen
pH	
VOLATILE ORGANIC COMPOUNDS - EPA METHOD 8260	
1,1-Dichloroethane	Chlorobenzene
1,1-Dichloroethene	Chlorodibromomethane/Dibromochloromethane
1,1,1-Trichloroethane	Chloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane/1,1,2-Trichlorotrifluoroethane	Chloroform
	Chloromethane
1,1,2-Trichloroethane	cis-1,2-Dichloroethene
1,1,2,2-Tetrachloroethane	cis-1,3-Dichloropropene
1,2-Dibromo-3-chloropropane	Cyclohexane
1,2-Dibromoethane	Dichlorodifluoromethane
1,2-Dichlorobenzene	Ethylbenzene
1,2-Dichloroethane	Isopropyl benzene
1,2-Dichloropropane	Methyl tert-butyl ether
1,2,4-Trichlorobenzene	Methyl acetate
1,3-Dichlorobenzene	Methylcyclohexane
1,4-Dichlorobenzene	Methylene chloride
2-Butanone	Styrene
2-Hexanone	Tetrachloroethene
4-Methyl-2-pentanone	Toluene
Acetone	trans-1,2-Dichloroethene
Benzene	trans-1,3-Dichloropropene
Bromodichloromethane	Trichloroethene
Bromoform	Trichlorofluoromethane
Bromomethane	Vinyl chloride
Carbon disulfide	Xylenes, total
Carbon tetrachloride	
METALS	
Arsenic	Manganese
Barium	Mercury
Cadmium	Nickel
Chromium +6	Selenium
Chromium, total	Silver
Copper	Thallium
Iron	Zinc
Lead	
OTHER	
Cyanide	Cyanide, weak acid dissociable
Cyanide, amenable	

Table A-2
Summary of Environmental and QC Samples
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

MATRIX	ANALYTICAL GROUP	INVESTIGATIVE SAMPLES[1]	QC SAMPLES			SI TOTAL[3]
			DUPLICATE	TRIP BLANKS[2]	MS/ MSD[3]	
Surface water	Copper	2	0	0	0	2
Soil	TOC	6	0	0	0	6
	VOCs	3	0	1	0	3
	Metals	3	0	0	0	0
	Cyanide	3	0	0	0	0
Groundwater (26 monitoring wells, 5 extraction wells, and 10 private wells)	VOCs	41	3	1/batch	1/1	46
	Metals/ Cyanide	41	3	0	1/1	46

Notes:
SI – site investigation.
TOC – total organic carbon.
MS/MSD - matrix spike/matrix spike duplicate.
(1) The number of investigative samples is approximate. The actual number will be determined based on the recommended monitoring well network and modifications described in Task 5 of the Workplan.
(2) Trip blanks are laboratory QC samples not charged to the project. One trip blank per batch of shipped VOC samples will be included.
(3) SI total does not include the number of trip blanks, since that depends on the number of batches shipped.

Section 3
Investigation Procedures

3.1 Well and Sample Designation

Up to six soil monitoring wells are to be installed as part of the site investigation depending on the findings in Task 6 of the attached Workplan. It is assumed at this time that the six wells will be installed as three nests of two wells each, where three wells will be installed in the interval immediately above the bedrock surface and three wells will be installed approximately 15 feet into the bedrock. The wells will be identified beginning with MW-17, MW-18, MW-19, etc. The wells installed immediately above the bedrock surface will be labeled with an "I" suffix (e.g., MW-17I, MW-18I, etc.), while the wells installed into the bedrock will be labeled with a "B" suffix (e.g., MW-17B, MW-18B, etc.). If any wells are installed in the shallow unconsolidated material (above the "I" wells), and intersect the water table, they will be labeled with an "S" suffix (e.g., MW-17S, MW-18S, etc.).

Soil samples will be collected for the visual/manual description of the soil type as well as for aquifer characteristics (total organic carbon [TOC]) analyses. Each sample will be labeled with the identification of the well to be installed in that boring. The field records will record both the sample identification and the depth range of the soil sample.

Up to 15 temporary piezometers will be installed as part of the site investigation. The temporary piezometers will be identified as TP-1, TP-2, TP-3, etc. Soil samples will be collected for the visual/manual description of the soil type and designated with the identification of the temporary piezometer to be installed in that boring. The field records will record both the sample identification and the depth range of the soil sample.

Groundwater samples will be collected from a select set of monitoring points, including the proposed monitoring wells, the existing monitoring wells, and the private water supply wells. Private water supply wells will be designated as PW-1, PW-2, etc. Surface water samples will be identified as SW-1 (from the wetland area near MW-12) and SW-2 (from Davy Creek, near the Lincoln Road bridge).

Blind duplicate quality control samples will be numbered sequentially beginning with "Duplicate 1," etc. A DNR well ID/TAG will be applied to each groundwater monitoring well.

3.2 Chain-of-Custody Procedures

The sampler is responsible for sample custody from the time of sample collection to receipt at the laboratory or until samples are shipped by commercial carrier. A sample is considered under custody if any of the following conditions apply:

- The sample is in a person's possession.
- The sample is in that person's view after being in his or her possession.
- The sample was in that person's possession and then placed in a secured location.
- The sample is in a designated and identified secure area.

The possession of samples must be traceable from the time of collection through the use of chain-of-custody procedures. Specific chain-of-custody records must accompany all sample shipping containers to document the transfer of the shipping containers and samples from the field to the laboratory receiving the samples for analysis. The procedures to be implemented are as follows:

1. Prepare sample containers with preapplied labels by the laboratory.
2. Identify and label each sample in the field with indelible ink.
3. Complete Chain-of-Custody Records in the field to indicate sample identification, number of containers filled, sampling date, sampling time, sample collector's name, and sample preservation, if applicable. This information will also be noted in the field notes.
4. Package shipping containers with samples, Chain-of-Custody Records, and ice packs. Each set of sample containers to be transported to the laboratory is assigned a Chain-of-Custody Record, which travels with the shipping container(s).
5. Seal and ship containers to the appropriate laboratory. Containers will be transported to the laboratory by one of four methods: overnight delivery service, local courier service, laboratory pick-up, or RMT delivery. All intermediate individuals will be identified on the Chain-of-Custody Record, and, if applicable, copies of all bills-of-lading will be retained.
6. Receive and check shipping containers in the laboratory for broken seals or damaged sample containers. If no problems are noted, samples are logged into the laboratory, and the Chain-of-Custody Record is completed. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.
7. Include copies of the Chain-of-Custody Record with the analytical data.

An example of a Chain-of-Custody Record is shown in Attachment A. If an error is discovered on a sample Chain-of-Custody Record, the person who made the error should correct it when possible. Corrections or insertions are made by crossing out the incorrect information and inserting the correction needed. The date and the initials of the person making the correction

will be written beside the correction. The procedure applies to words or figures inserted or added to a previously recorded statement. Completed Chain-of-Custody Records will be placed in a plastic bag, sealed, and placed inside of the shipping container. After icing the samples, the coolers will be sealed and shipped to the laboratory using one of the delivery methods listed above. Once the samples are received in the laboratory, they are handled and processed in accordance with the analysis plan.

If a Chain-of-Custody Record is lost in shipment, a written statement will be prepared by the person who collected the samples. The written statement will list the samples that were reported on the lost form and describe when and how the samples were collected. The statement will include information such as field log book entries regarding the sample.

The laboratory assigns a unique, serially numbered identifier to each sample received by the laboratory. The laboratory then follows the sample through the laboratory sample handling, analysis, storage, and reporting processes by means of a standardized tracking report.

3.3 Field Records and Photographs

Daily field activities will be recorded on the forms as provided in Attachment A. These include forms for soil borings, monitoring well construction and development, well and borehole abandonment, groundwater sampling, and water level measurements. Additionally, general field notes will be recorded in a bound field notebook. Wherever appropriate, standard WDNR forms will be used. Photographs taken in the field will be labeled and retained with the field notes for the project.

3.4 Soil Borings and Subsurface Soil Sampling

Soil borings into which the monitoring wells will be installed will be drilled with a 6 ¼-inch–diameter hollow-stemmed auger (HSA) down to the top of the bedrock. Soil samples will be collected continuously to the top of the bedrock using a 2-inch split-spoon in accordance with ASTM D-1586. Borings that penetrate into the bedrock will be drilled with air rotary methods. Borings drilled into bedrock will be cored the entire length of drilling within the bedrock. For monitoring wells that are nested, soil sampling will be performed only on the deeper of the two wells.

The temporary piezometers will be installed within a Geoprobe® boring. The Geoprobe® boring will be advanced using 2-inch macro-core hollow-stemmed probes or a dual-tube probe. Soil samples will be collected continuously in 4-foot intervals according to ASTM D-1586 to the determined depth.

Piezometers that are installed in the wetland will be hand-driven to the desired depth. No soil samples will be collected from hand-driven piezometers.

The soil samples will be described by an RMT geologist or hydrogeologist using the Unified Soil Classification System in accordance with ASTM Method D-2488. The geologist will record on boring log forms geologic observations for each sample interval or any change in material. An example of the form is provided in Attachment A. One representative sample (about 0.5 L) of each major stratigraphic unit will be retained in either clean glass jars or plastic bags for subsequent quality control review of the geologist's boring log and for field-screening with a PID.

Field-screening will consist of the following:

- Collect approximately 250 mL of soil.
- Place the soil in a Ziploc™ plastic bag, and seal the bag; or place the sample in a jar covered with foil.
- Allow the sealed bag or jar to stand at ambient air temperatures for at least 1 hour. (If the air temperature is less than 15°C, place the bag in a heated vehicle.)
- Pierce the side of the bag or foil with a sharp instrument, and insert the PID sampling tip.
- Measure vapor concentrations in the bag in accordance with the user's manual.
- Record the value in the field notebooks or applicable boring log.

All soil cuttings generated by drilling and soil samples not retained as described above will be placed in containers and managed as investigation-derived waste as described in Subsection 3.12 of this SAP.

3.5 Monitoring Well, Observation Well, and Drive-Point Piezometer Installation and Development

A monitoring well construction form is presented in Attachment A. The temporary monitoring wells will be constructed using 1-inch–diameter PVC well casing and 5-foot screens. The permanent monitoring wells will be constructed of 2-inch–diameter Schedule 40 polyvinyl chloride (PVC) well casing and 5-foot screens. The monitoring wells and the temporary wells (to the extent possible) will be constructed in accordance with Wisconsin Administrative Code (WAC) NR 141. All casing and screen sections will have threaded connections; no solvent cements will be used in well assembly. The well screens will have factory-made 0.010-inch slots. Well and screen sections will be precleaned and shipped from the manufacturer in sealed plastic bags.

For the monitoring wells, the well casing and screen will be inserted through the hollow-stemmed auger or drill casing when the auger has reached the planned depth of the bottom of the well. The 1-inch–diameter temporary observation wells will be installed through the macro-core or dual-tube core of the Geoprobe®. For both the temporary piezometers and the monitoring wells, a silica sand filter pack will be placed around the well screen as the augers or cores are withdrawn from the borehole. The filter pack will extend at least 2 feet above the top of the well screen. In the monitoring wells, at least 1 foot of fine-grained silica sand will be added above the filter pack. The top of the well casing will extend about 2 to 3 feet above ground surface. The annular space of the temporary observation wells and monitoring wells will be completed in accordance with NR 141. The seal will extend to the ground surface and will be sloped away from the casing to prevent ponding of water around the base of the well.

The permanent monitoring wells will be protected with a steel casing with a lockable cover which will be placed into the bentonite seal. The top of the protective casing will extend from 0.2 to 1 inch above the PVC well cap. The steel casing will be equipped with a drain hole immediately above the seal. If the wells are located on private property, flush-mounted protective casing may be necessary. These casings will be set in cement. The temporary 1-inch–diameter piezometers will utilize 2-inch PVC pipe as protective casing with an expandable cap and lock. Additionally, or as an alternative to the 2-inch PVC protective casings, zip ties may be used to secure the 1-inch well cap to the casing through holes drilled in both the cap and the casing.

The drive-point piezometers to be installed in the wetlands will consist of 1 ¼-inch galvanized steel with a 3-foot screen. One piezometer will be driven into the aquifer to a depth of 5 feet below the base of the peat, or until refusal is encountered. Two shallow piezometers will be hand-driven into the wetland, above the base of the peat. One of the shallow piezometers will be installed adjacent to the sub-peat piezometer. The second shallow piezometer will be installed in the nearest wetland area in the vicinity of MW-16S. These wells will be covered with a threaded screw cap and no lock.

Each permanent and temporary well that will be sampled will be developed after installation is completed to remove fines from the filter pack and the immediate formation to minimize the production of suspended solids during subsequent sampling. Development will consist of mild surging of the screened interval using a surge block, followed by the pumping of groundwater to remove the suspended fine sediment released from the aquifer by the surging. Cycles of surging and pumping will continue until 10 well volumes have been removed or until the water is clear. The wells will be developed in accordance with NR 141.

All groundwater generated by the development process will be collected in containers and managed as described in Subsection 3.12 of this SAP.

3.6 Monitoring Well and Observation Well Abandonment

Monitoring wells and temporary piezometers that require abandonment will be abandoned in accordance with WAC NR 141.

3.7 Sampling Procedures

Groundwater sampling of monitoring wells will proceed from the least impacted to the most impacted wells, based on historical data from previously collected groundwater samples.

3.7.1 Groundwater Sampling Procedures

Groundwater sampling procedures are designed to provide representative samples that have not been altered or contaminated by the sampling procedures. The specific procedures outlined in the following paragraphs are based on accepted and established procedures (e.g., USEPA, 1998).

Sample collection activities include measuring water levels, decontaminating equipment, purging the well prior to sampling, measuring field water quality parameters, collecting the sample, and preparing the samples for shipment to the laboratory.

Low-flow purge-and-sample techniques will be followed for groundwater sampling as described below:

1. Open the monitoring well, and measure the water level in the well with a decontaminated water level indicator.
2. Insert dedicated HDPE tubing into each well. The lower end of the tubing will be placed approximately 1 foot below the top of the well screen. Attach approximately 1 foot of silicon tubing to the upper end of the HDPE tubing. The silicon tubing will be inserted in the peristaltic pump head since it provides better suction than HDPE tubing.
3. Check, calibrate, and install (as required) in-field measurement equipment.
4. Purge the well at a flow rate between 0.1 and 0.5 L/min as measured with a graduated container and a clock. Measure drawdown induced by pumping. If drawdown during purging is less than 5 feet, continue as described below.
5. Measure pH, temperature, oxidation-reduction potential (ORP), dissolved oxygen (DO), and specific conductance at 5-minute increments during pumping. Purging will be considered completed when the following criteria outlined in Table A-3 are met between three consecutive 5-minute intervals.

Table A-3
Stabilization Criteria
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	CRITERIA
Dissolved oxygen	± 0.5 mg/L
Specific conductance (temperature corrected)	± 5 percent µmhos/cm
pH	± 0.2 pH units
Temperature	± 0.5°C

Note:
Oxidation reduction potential will be recorded during purging, but will not be used as a stabilization criteria.

- If stability is not achieved for all three measurements within six well volumes or if drawdown in the well exceeds 5 feet at a pumping rate of 0.1 L/min before stability is achieved, terminate purging. Record the last measurements made as the sample measurements. If stability has not been achieved, note the unstable values in the sampling log.
- If the well is purged dry at the minimum pumping rate of 0.1 L/minute before stabilization is achieved, terminate pumping. After the well has recovered sufficiently, collect a groundwater sample.

6. Begin sample collection as soon after purging is completed as possible. The containers and preservatives specified in Table A-4 will be used. Fill the sample containers for the VOCs first, the metals second, and cyanide last.
7. Complete sample collection and chain-of-custody documentation.
8. Cap the well, and close and lock the protective casing cover, as appropriate.

Private wells will be allowed to run for 10 to 15 minutes or until the holding tank has been drained prior to collecting a sample. A sample will be collected from a tap nearest the wellhead and prior to any treatment devices.

The groundwater samples will be placed in an iced cooler and stored in accordance with chain-of-custody requirements until shipment to EnChem Laboratories in Madison, Wisconsin, is arranged. Monitoring well purging, equipment calibration, and sample collection will be recorded on the Groundwater Sample Log form. An example of the log is provided in Attachment A. Chain-of-Custody Records will be completed for all samples as described in Subsection 3.2 of this SAP.

A peristaltic pump will be used to collect groundwater samples. This method of sample collection is appropriate at the site because the depth to water is minimal (less than 10 feet), such that devolatilization of VOCs will be negligible (USEPA, 1998). Furthermore, dedicated HDPE tubing will be used at each well, minimizing the potential for cross-contamination at each well.

Groundwater pumped during purging and other general waste materials generated by the sampling and in-field analyses will be collected and managed as investigation-derived waste as described in Subsection 3.12 of this SAP.

Table A-4
Summary of Analytical Program
Sample Containers and Preservation Methods
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	LABORATORY METHOD	CONTAINER(S)	MINIMUM SAMPLE VOLUME	FIELD FILTER (0.45 µm)	PRESERVATION METHOD	HOLDING TIME[1]
Groundwater and Private Wells						
Volatile organic compounds	SW-846 Method 8260B	3 x 40 mL glass VOA vials with Teflon® septum	2 x 40 mL VOA vials	N	Cool to 4°C; HCL to pH<2; protect from light	14 days (sample should remain on-site less than 24 hours)
Metals: As, Ba, Cd, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Tl, Zn	EPA Method 345.1/SW-846 Method 6020 (ICP-MS)	1-L high-density polyethylene bottle	500 mL	N	Cool to 4°C; HNO_3 to pH<2	Mercury - 28 days Other metals - 6 months
Amenable cyanide	EPA Method 335.1/SW-846 Method 9010B	One 500-mL HDPE bottle	250 mL	N	Cool to 4°C; NaOH to pH<2	14 days
Total cyanide	EPA Method 335.1/SW-846 Method 9012A	One 500-mL HDPE bottle	250 mL	N	Cool to 4°C; NaOH to pH<2	14 days
Weak acid dissociable cyanide	SM4500CN	One 500-mL HDPE bottle	250 mL	N	Cool to 4°C; NaOH to pH<2	14 days
Chromium VI	EPA Method 345.1/ SW-846 Method 7196A	One 250-mL HDPE bottle	25 mL	N	Cool to 4°C	24 hours
Surface Water						
Copper	EPA Method 345.1/SW-846 Method 6020 (ICP-MS)	One 500-mL HDPE bottle	100 mL	N	Cool to 4°C; HNO_3 to pH<2	6 months

Table A-4 (Continued)
Summary of Analytical Program
Sample Containers and Preservation Methods
WDNR – Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	LABORATORY METHOD	CONTAINER(S)	MINIMUM SAMPLE VOLUME	FIELD FILTER (0.45 µm)	PRESERVATION METHOD	HOLDING TIME[1]
Soil						
Volatile organic compounds	SW-846 Method 8260B	Stainless Steel EnCore	Full EnCore	NA	Cool to 4°C	48 hours
Metals: As, Ba, Cd, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Tl, Zn	SW-846 Method 6020	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	Mercury – 28 days Other metals – 6 months
Amenable cyanide	EPA Method 335.1/SW-846 Method 9010B	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	14 days
Total cyanide	EPA Method 335.1/SW-846 Method 9012A	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	14 days
Weak acid dissociable cyanide	SM4500CN	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	14 days
Total organic carbon	SW-846 Method 9060	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	28 days
Chromium VI	SW-846 Method 8260B	One 8 oz plastic jar	One 8-oz plastic jar	NA	Cool to 4°C	30 days

Notes:
NA = not applicable.
(1) The holding time is from sample collection.

3.7.2 Surface Water Sampling

Surface water levels will be measured from several site locations, including the three wetland piezometers and up to three locations of staff gauges on Davy Creek. Surface water samples will be collected from a total of two locations and analyzed for copper only. To collect the surface water sample, the open sample container will be slowly submerged in the water, with care taken not to release any of the sample preservative within the sample container. The filled container will be placed in the sample cooler on ice until shipment to the designated laboratory.

3.7.3 Field Filtering

Since groundwater samples will be collected using low-flow sampling techniques, and are therefore expected to be clear, field-filtering of the metals sample will not be required.

3.7.4 Soil Sampling

One soil sample from each of the six soil borings described in Task 8 of the Workplan will be collected for laboratory analysis of total organic carbon (TOC) concentration. The soil samples will be collected from the hollow-stemmed auger split-spoon (or equivalent) used during the soil boring. One 4-ounce jar per sample will be filled at a depth to be determined during Task 6 of the Workplan.

3.7.5 General Quality Assurance Considerations

The sample collection procedures presented in this SAP are designed to provide samples of the required quality for the site investigation. All field personnel will be required to understand the requirements of this SAP and will be trained in the use of the equipment and the techniques specified.

The equipment used for in-field measurement will be maintained, calibrated, and used in the field according to the procedures described in this SAP.

The contractors who will be operating drilling rigs are required to understand the use of their equipment and will be required to clean and maintain the equipment in proper working order. Field staff will observe the contractors' activities and will note any actions that may impair the quality of the sample collection efforts. Problems will be recorded in the field notes, and the project manager will be notified. Corrective actions, if required, will be coordinated by the project manager.

Personnel involved in the collection of samples are required to read, understand, and follow the procedures specified in this SAP. Problems that may affect the quality of the sampling effort will be recorded in the field notes by the field personnel most directly involved with the problem, and the project manager will be notified. The project manager is responsible for coordinating the development and implementation of corrective actions.

3.7.6 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support decisions made during evaluation activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are two analytical levels that address various data uses, and the QA/QC effort and methods required to achieve the desired level of quality. For this natural attenuation evaluation, these levels are as follows:

Screening Data

These data are generated by less precise analytical methods with less rigorous sample preparation than those with definitive level methods. Sample preparation steps may be restricted to simple procedures, such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantification, although the quantification may be relatively imprecise. A portion of screening data may be confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality.

Screening quality data will be used for field-measured parameters such as pH, temperature, specific conductance, dissolved oxygen, redox potential (ORP, Eh), depth to groundwater, and health and safety monitoring. These data will be used for determining the progress of the monitoring well purge process, the general groundwater quality, the potential for natural attenuation, and possibly as input to computer fate and transport models.

Definitive Data

These data are generated using rigorous analytical methods, such as approved USEPA methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or

computer-generated electronic files. Data may be generated at the site or at an off-site location as long as QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error or precision of the analytical method must be determined.

The following data will be collected to meet definitive data quality objectives:

- Groundwater will be analyzed for VOCs, cyanide, and metals in accordance with USEPA analytical protocols and data validation procedures.
- Soil will be analyzed for TOC in accordance with USEPA analytical protocols and data validation procedures.

3.7.7 Analytical Quality Assurance Considerations

Field Duplicates

Blind field duplicate samples, prepared by splitting a single sample between two separate containers, will be used to evaluate sampling and analytical reproducibility (precision). Points at which duplicate samples are to be collected will be selected by field personnel, and these samples will be submitted as blind duplicates to the laboratory.

Field Equipment Blanks

No field equipment blanks are necessary since all samples will be collected from clean, dedicated tubing.

Trip Blanks

Trip blanks will be analyzed to assess the possible cross-contamination of VOCs resulting from diffusion through septa during sample shipment. Trip blanks, consisting of 40-mL VOA vials with deionized ASTM Type 2 organic-free water, are generated in the laboratory and accompany VOC sample coolers from the laboratory to the field and back to the laboratory. VOC trip blank containers are not opened in the field.

3.8 Sample Handling and Analysis

This section presents general sample handling and analysis protocols. EnChem, Inc., of Madison, Wisconsin, will perform the chemical analyses and will provide all necessary precleaned sample containers.

3.8.1 Sample Containers, Preservation Methods, and Holding Times

Sample containers, preservation methods, and holding times that meet USEPA standards for solid and liquid samples intended for chemical analyses are summarized in Table A-4. For samples intended for VOC analysis, the sample containers will be filled completely (no headspace or airspace). The remaining containers will be filled completely to minimize the airspace beneath the cap to the extent practicable. Samples for visual determination of soil type will be about 0.5 L in size and will be placed in clean glass jars or plastic bags.

Samples for chemical analysis will be kept in the dark and on ice in a metal or hard-plastic ice chest or cooler from the time the samples are collected until they are delivered to the laboratory.

For delivery of samples to the laboratory, the following procedures will be implemented:

1. Collect and preserve the samples as outlined in Table A-4 and this SAP.
2. Place sample containers in a laboratory shipping container(s). Pack samples securely with packing material to protect sample containers from accidental breakage during shipment and to ensure that the samples do not leak or spill.
3. Fill shipping container with enough ice to last the trip.
4. Complete the Chain-of-Custody Records as described in Subsection 3.2 of this SAP.
5. Include the Chain-of-Custody Record inside the shipping container lid.
6. If the samples are shipped via overnight delivery service, seal the shipping container with strapping tape.
7. Deliver or ship the container to the laboratory. Use overnight shipping methods whenever required by short holding times or project schedules.

3.8.2 Laboratory Detection Limits

The laboratory Limits of Detection (LODs) and Limits of Quantitation (LOQs) are presented in Table A-5 for each analyte measured for during the site investigation.

Table A-5
EnChem Laboratory Limits of Detection
Effective June 2001 to June 2002
WDNR – Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	UNITS	LOD[1]	ANALYTICAL METHOD
GROUNDWATER ANALYSIS			
Wet Chemistry			
Cyanide, amenable	mg/L	0.0021	9010B
Cyanide, total	mg/L	0.0021	9012A
Cyanide, weak acid dissociable	mg/L	0.0022	SM4500 CN
Metals			
Arsenic	µg/L	0.20	6020
Barium	µg/L	0.14	6020
Cadmium	µg/L	0.15	6020
Chromium	µg/L	0.26	6020
Copper	µg/L	0.73	6020
Iron	µg/L	19	6020
Lead	µg/L	0.086	6020
Manganese	µg/L	0.098	6020
Mercury	µg/L	0.16	6020
Nickel	µg/L	0.18	6020
Selenium	µg/L	0.31	6020
Silver	µg/L	0.11	6020
Thallium	µg/L	0.062	6020
Zinc	µg/L	0.56	6020
Chromium, hexavalent	mg/L	0.012	7196A
Volatiles - EPA List 8260			
1,1 - Dichloroethane	µg/L	0.61	8260B
1,1-Dichloroethene	µg/L	0.47	8260B
1,1,1-Trichloroethane	µg/L	0.53	8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane/1,1,2-Trichlorotrifluoroethane	µg/L	0.79	8260B
1,1,2-Trichloroethane	µg/L	0.47	8260B
1,1,2,2-Tetrachloroethane	µg/L	0.68	8260B
1,2-Dibromo-3-Chloropropane	µg/L	1.24	8260B
1,2-Dibromoethane	µg/L	0.49	8260B
1,2-Dichlorobenzene	µg/L	0.36	8260B
1,2-Dichloroethane	µg/L	0.54	8260B
1,2-Dichloropropane	µg/L	0.34	8260B
1,2,4-Trichlorobenzene	µg/L	0.36	8260B

Table A-5 (Continued)
EnChem Laboratory Limits of Detection
Effective June 2001 to June 2002
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	UNITS	LOD[1]	ANALYTICAL METHOD
GROUNDWATER ANALYSIS (CONTINUED)			
Volatiles (Continued)			
1,3-Dichlorobenzene	µg/L	0.64	8260B
1,4-Dichlorobenzene	µg/L	0.43	8260B
2-Butanone	µg/L	1.25	8260B
2-Hexanone	µg/L	0.61	8260B
4-Methyl-2-pentanone	µg/L	0.61	8260B
Acetone	µg/L	3.09	8260B
Benzene	µg/L	0.44	8260B
Bromodichloromethane	µg/L	0.41	8260B
Bromoform	µg/L	0.58	8260B
Bromomethane	µg/L	0.94	8260B
Carbon disulfide	µg/L	0.40	8260B
Carbon tetrachloride	µg/L	0.90	8260B
Chlorobenzene	µg/L	0.43	8260B
Chlorodibromomethane/Dibromochloromethane	µg/L	0.43	8260B
Chloroethane	µg/L	0.63	8260B
Chloroform	µg/L	0.41	8260B
Chloromethane	µg/L	0.44	8260B
cis-1,2-Dichloroethene	µg/L	0.46	8260B
cis-1,3-Dichloropropene	µg/L	0.54	8260B
Cyclohexane	µg/L	0.35	8260B
Dichlorodifluoromethane	µg/L	0.61	8260B
Ethylbenzene	µg/L	0.50	8260B
Isopropyl benzene	µg/L	0.39	8260B
Methyl tert-butyl ether	µg/L	0.44	8260B
Methyl acetate	µg/L	0.53	8260B
Methylcyclohexane	µg/L	0.28	8260B
Methylene chloride	µg/L	0.38	8260B
Styrene	µg/L	0.37	8260B
Tetrachloroethene	µg/L	0.41	8260B
Toluene	µg/L	0.40	8260B
trans-1,2-Dichloroethene	µg/L	0.64	8260B
trans-1,3-Dichloropropene	µg/L	0.26	8260B
Trichloroethene	µg/L	0.49	8260B

Table A-5 (Continued)
EnChem Laboratory Limits of Detection
Effective June 2001 to June 2002
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	UNITS	LOD[1]	ANALYTICAL METHOD
GROUNDWATER ANALYSIS (CONTINUED)			
Volatiles (Continued)			
Trichlorofluoromethane	µg/L	0.47	8260B
Vinyl chloride	µg/L	0.17	8260B
Xylenes, total	µg/L	1.25	8260B
SOIL ANALYSIS			
Total organic carbon	mg/kg	91	9060
Wet Chemistry			
Cyanide, amenable	mg/kg	0.25T	9010B
Cyanide, total	mg/kg	0.25	9012A
Cyanide, weak and dissociable	mg/kg	0.11	SM4500CN
Metals			
Arsenic	mg/kg	0.63	6020
Barium	mg/kg	0.058	6020
Cadmium	mg/kg	0.066	6020
Chromium	mg/kg	0.15	6020
Copper	mg/kg	0.10	6020
Iron	mg/kg	2.3	6020
Iron	mg/kg	2.6	6020
Lead	mg/kg	0.44	6020
Manganese	mg/kg	0.027	6020
Mercury	mg/kg	0.0031	6020
Nickel	mg/kg	0.39	6020
Selenium	mg/kg	0.59	6020
Thallium	mg/kg	0.74	6020
Zinc	mg/kg	0.29	6020
Chromium, hexavalent	mg/kg	0.33	345.1
Volatiles - EPA List 8260			
1,1 - Dichloroethane	ug/kg	0.46	8260B
1,1 - Dichloroethene	ug/kg	0.78	8260B
1,1,1 - Trichloroethane	ug/kg	0.66	8260B
1,1,2 - Trichloro - 1,2,2 - Trifluoroethane / 1,1,2 - Trichlorotrifluororethane	ug/kg	0.86	8260B
1,1,2 - Trichloroethane	ug/kg	0.87	8260B
1,1,2,2 - Tetrachloroethane	ug/kg	0.60	8260B
1,2 - Dibromo - 3 - Chloropropane	ug/kg	1.59	8260B
1,2 - Dibromoethane	ug/kg	0.76	8260B
1,2 - Dichlorobenzene	ug/kg	0.59	8260B
1,2 - Dichloroethane	ug/kg	0.47	8260B
1,2 - Dichloropropane	ug/kg	0.56	8260B

Table A-5 (Continued)
EnChem Laboratory Limits of Detection
Effective June 2001 to June 2002
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	UNITS	LOD[1]	ANALYTICAL METHOD
SOIL ANALYSIS (CONTINUED)			
Volatiles (Continued)			
1,2,4 - Trichlorobenzene	ug/kg	0.57	8260B
1,3 - Dichlorobenzene	ug/kg	0.57	8260B
1,4 - Dichlorobenzene	ug/kg	0.77	8260B
2 - Butanone	ug/kg	2.46	8260B
2 - Hexanone	ug/kg	1.12	8260B
4 - Methyl - 2 - pentanone	ug/kg	1.31	8260B
Acetone	ug/kg	3.15	8260B
Benzene	ug/kg	0.44	8260B
Bromodichloromethane	ug/kg	0.46	8260B
Bromoform	ug/kg	1.58	8260B
Bromomethane	ug/kg	1.15	8260B
Carbon disulfide	ug/kg	0.77	8260B
Carbon tetrachloride	ug/kg	0.84	8260B
Chlorobenzene	ug/kg	0.61	8260B
Chlorodibromomethane / Dibromochloromethane	ug/kg	0.86	8260B
Chloroethane	ug/kg	0.71	8260B
Chloroform	ug/kg	0.48	8260B
Chloromethane	ug/kg	0.73	8260B
cis - 1,2 - Dichloroethene	ug/kg	0.49	8260B
cis - 1,3 - Dichloropropene	ug/kg	0.55	8260B
Cyclohexane	ug/kg	0.55	8260B
Dichlorodifluoromethane	ug/kg	1.05	8260B
Ethylbenzene	ug/kg	0.73	8260B
Isopropyl benzene	ug/kg	0.64	8260B
Methyl - tert - butyl - ether	ug/kg	0.55	8260B
Methyl Acetate	ug/kg	1.22	8260B
Methylcyclohexane	ug/kg	0.62	8260B
Methylene chloride	ug/kg	0.62	8260B
Styrene	ug/kg	0.64	8260B
Tetrachloroethene	ug/kg	0.93	8260B
Toluene	ug/kg	0.73	8260B
trans - 1,2 - Dichloroethene	ug/kg	0.87	8260B
trans - 1,3 - Dichloropropene	ug/kg	0.61	8260B
Trichloroethene	ug/kg	0.60	8260B
Trichlorofluoromethane	ug/kg	0.89	8260B
Vinyl chloride	ug/kg	0.81	8260B

Table A-5 (Continued)
EnChem Laboratory Limits of Detection
Effective June 2001 to June 2002
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

PARAMETER	UNITS	LOD[1]	ANALYTICAL METHOD
SOIL ANALYSIS (CONTINUED)			
Volatiles (Continued)			
Xylene, total	ug/kg	1.9	8260B

Notes:
LOD is the Limit of Detection and is also known as the Method Detection Limit.
(1) LODs are subject to change dependent on sample volume, laboratory dilutions, and moisture content (for soil analyses only). Additionally, LODs can be updated by the laboratory.

3.8.3 Selection of Analytes

The analytical program for the site investigation is presented in Section 2 of the Workplan.

3.9 Field Chemical Methods

With any field analytical measurement, the equipment used must be suitable for the analytical method to be made and must be properly calibrated. In addition to being accurate, field analyses must be conducted on a sample representative of the source from which it was collected. Therefore, the type of sample and the location of the sampling site are critical.

Specific field analytical techniques to be utilized for groundwater samples are presented in this section. The methodology and equipment to be used for each field parameter are outlined in Table A-6.

3.9.1 Methodology

Groundwater samples will be collected using low-flow pumping techniques as discussed in Subsection 3.7 of this SAP. Temperature, pH, DO, ORP, and specific conductance, will be measured at each well during purging. The water chemistry in wells will be considered stable when the criteria outlined in Table A-3 are met between three consecutive measurements taken at 5-minute intervals. Field measurements will be made and laboratory samples will be collected following stabilization. Well sampling information will be recorded on the forms as described in Subsection 3.7 of this SAP.

To provide basic groundwater quality characterization and information, samples will be field-analyzed for pH, temperature, DO, ORP, and specific conductance. These parameters will be measured using a flow-through cell.

3.9.2 Calibration and Measurement

A Geotech P3 flow-through cell (or equivalent) equipped with temperature, DO, ORP, specific conductance, and pH electrodes will be utilized and connected to the discharge from the pump.

The equipment will be checked for any mechanical or electrical failures, weak batteries, and cracked or fouled electrodes before mobilizing for field activities. Calibrations and repairs will be recorded in the notebook, along with the date and the name of the person making repairs/calibrations.

Table A-6
Field Parameter Methods and Equipment
WDNR - Oconomowoc Electroplating Company, Inc.
Ashippun, Wisconsin

FIELD PARAMETERS	METHOD/EQUIPMENT
Dissolved oxygen	360.1[(1)]/Probe
Oxidation-reduction potential	[(2)]Redox electrode
pH	150.1[(1)]/pH electrode
Temperature	From conductivity probe
Specific conductivity	120.1[(1)]/Electrical conductivity meter
Depth to water	Electric tape

Notes:
(1) USEPA 600/4-79-020 Methods for Chemical Analysis of Water and Waste.
(2) Standard Methods for the Examination of Water and Wastewater, 19th Edition, 1995.

Measurement of pH

The pH probe will be calibrated during use utilizing pH 4 and pH 7 buffer solutions according to the procedures included in the instruction manual for the instrument. The meter will be calibrated before use each day and every 4 to 6 hours during the day following the initial calibration. The pH of each sample will be measured in the flow-through cell. The pH measurements will be recorded to the nearest 0.1 pH unit.

Measurement of Specific Conductance

The specific conductance probe will be calibrated according to the procedure outlined in the instruction manual for the instrument. The meter will be calibrated before use each day and every 4 to 6 hours during the day following the initial calibration. Specific conductance measurements will be made in the flow-through cell, and are automatically corrected by the instrument to 25°C. Measurements will be reported to the nearest 1 µmhos/cm (or equivalent).

Measurement of Temperature

Temperature will be measured to the nearest 0.1°C within the flow-through cell. Temperature measurements are utilized directly by the instrument to correct the specific conductance reading.

Measurement of Oxidation-Reduction Potential (ORP)

The ORP probe will be checked against a standard solution. The probe will be checked before use each day and every 4 to 6 hours during the day following the initial calibration. ORP measurements will be made in the flow-through cell. Measurements will be reported to the nearest 1 milli-Volt.

Measurement of Dissolved Oxygen (DO)

The DO probe will be calibrated according to the procedure outlined in the instruction manual for the instrument. The meter will be calibrated before use each day and every 4 to 6 hours during the day following the initial calibration. DO measurements will be made in the flow-through cell. Measurements will be reported to the nearest 0.1 mg/L

3.10 Field Physical Methods

Field measurements of topographic features, water levels, and physical measurements will be required during the field investigations. The scope of such measurements depends upon the purpose of the particular investigation.

Sampling locations utilized during the field investigation will be surveyed and depicted on the topographic map(s) developed for the site in such a manner that their location(s) is firmly established. Surveying will be conducted according to the standard procedures described below. Control points used during the survey will be marked in the field and noted on the topographic map(s).

3.10.1 Site Mapping

Site mapping will be conducted to different levels of accuracy based on the specific project needs.

Horizontal Survey of Monitoring Wells and Soil Sampling Locations

Accurate, complete, and informative field notes in surveying are a primary objective in site mapping. The field notes are the most reliable record of the measurements made and the information gathered in the field. As stated in Subsection 3.3, information gathered will be recorded. Notes will be permanent, legible, and complete.

The field notes will accomplish the following:

- Provide adequate and complete information that can be understood by someone other than the note taker
- Provide documentation of work completed or data gathered

The surveyor is encouraged to use notebook space liberally in recording necessary data. Explanatory remarks are encouraged to clarify the field procedures and provide added details. Field sketches are also very useful and will be used freely. Two important aspects of each survey to be addressed in the field notes are as follows:

- ***Starting and ending basis of the survey*** - The surveyor will explain and document the starting and ending points of the survey. This applies to both horizontal and vertical control. This will require a paragraph of explanation and sketches and/or cross-references to data in notes of previous surveys.

- ***Clear indication of final results and checking procedures*** - The final results and checks will be plainly indicated. Erasures will not be used as they raise uncertainties about the reliability of the data. Alterations, additions, revisions, reductions, or comments added to field notes will be written in colored ink to indicate that such information is not part of the original field record. The person making such notations will initial and date each page so affected.

Following is a checklist of information to include in the notebook:

- Date
- Names of survey crew members
- Condition of weather, observed temperatures, relative wind speed, and barometric pressure if an electronic distance meter (*e.g.*, a total station) is to be used
- Equipment used, listing the serial number or other identification
- Location of survey by section description or other legal parcel identification
- Project and element number
- North arrow
- Description of all monuments found
- Measurements as made (slope distance and vertical angles, temperature, taping, horizontal angles, etc.)
- Corrected distances and angles
- Description of monuments set
- Relation of possession or encroachments to survey lines
- Outline or sketch of major traverse or property boundary

Elevation (Vertical) Survey of Monitoring Wells

The elevation of the measuring point of monitoring wells, observation wells, drive-point piezometers, staff gauges, and other important site features (possibly including residential wells) will be surveyed to allow correlation of water levels. Additionally, ground elevations may be required for topographic purposes. Standard engineering leveling techniques, as described in basic surveying textbooks, establish the methodology for providing vertical control. The datum referenced for elevation control is the National Geodetic Vertical Datum (NGVD) of 1929, informally known as sea level datum, established by the U.S. Coast and Geodetic Survey. Benchmarks of known elevation will be

used. If no benchmark is located in the vicinity of a site investigation, an arbitrary temporary benchmark will be established on a permanent location (*i.e.*, bridge wingwall, foundation, or corner post). The location of benchmarks utilized will be shown on a site sketch map. Elevation surveys will be conducted to form a circuit; for example, the survey line will close back to a benchmark. Third-order accuracy will be obtained on level circuits; for example, on a 1-mile circuit, the closure will be within 0.05 foot. Length of sight will not ordinarily exceed 250 feet, with turning point back shots and fore shots deviating no more than 50 feet from one another.

3.10.2 Groundwater Level Measurement

The measurement of the groundwater level in monitoring wells is typically conducted in conjunction with groundwater sampling. Data from such measurements are needed to establish groundwater gradients, and ultimately, the direction of groundwater flow.

Groundwater level measurements are made in reference to an established reference point on the monitoring well casing. This reference point will be documented in field records, as described in Subsection 3.3. Reference point elevations will surveyed to NGVD, as described in Subsection 3.10.1 of this SAP.

Manual Groundwater Level Measuring Techniques

Groundwater level measurements will be made and recorded to the nearest 0.01 foot. The calculated elevations will be reported to the nearest 0.01 foot. The depth to groundwater will be measured using an electronic water level indicator. This method consists of a spool of small-diameter insulated steel cable with a probe attached to the end. When the probe comes in contact with the water, the circuit is closed and a meter, light, and/or buzzer attached to the probe signals contact with water. Batteries are normally used for a power source. Depth to water is read from permanent marks on the cable to which the probe is attached. Depth is recorded to the nearest 0.01 foot by measuring the distance between the nearest permanent foot mark and the point where the meter indicated the water level. Before use, these devices are prepared according to the manufacturer's instructions (if appropriate) and checked for visual damage or defects.

Depth to Bottom Measuring Techniques/Well Plumbness

The depth to bottom of wells will be measured by utilizing a steel tape with a weight or "plopper." The wells will be sounded by lowering the tape to the

bottom of the well and measuring the bottom to the nearest 0.01 foot. The plumbness of a well will be evaluated by lowering a 2-inch–diameter PVC bailer down each monitoring well.

3.10.3 Aquifer Pumping Tests

Pumping tests will be performed on each of the five extraction wells (EW-1 through EW-5) currently in use at the site. Pumping tests on each of the wells will be performed individually while water levels at selected adjacent observation and monitoring wells are recorded continuously. Additional monitoring points, typically located farther from the pumped well, will be measured for water level periodically during the pumping test, using manual techniques.

Prior to beginning the pumping test, field staff will measure groundwater levels at each of the existing monitoring wells and extraction wells. The extraction wells will be shut down for an estimated 48 hours, and the recovery of water levels will be measured in a selected network of up to 20 monitoring wells across the site and in adjacent areas. The pumping test will begin after the water levels return to nonpumping equilibrium levels.

Prior to initiating the pumping test, the extraction well and a combination of up to seven additional temporary piezometers and monitoring wells will be outfitted with an *in situ* pressure transducer. The pressure transducers will be connected via cable to a data logger. The data logger will record water level drawdown measured at each of the pressure transducers during the course of the pumping test. The data logger will be housed in a container secured to the extraction well. Water levels will be measured manually with an electronic water level indicator at up to six other site wells and wetland piezometers during the duration of each pumping test. Manual measurements will also be collected from the extraction well being pumped as a cross-check on the transducer/data logger measurements. Data will be downloaded to a computer following each pumping test.

The data collected from the data logger and manual water level measurements will be imported into the AQTESOLV® software package. Curve fitting techniques, using confined, leaky confined, or unconfined solutions as appropriate, will be used to estimate aquifer parameters. The data will be used to help calculate aquifer parameters such as transmissivity, hydraulic conductivity, and storage coefficient for different areas of the site.

3.11 Decontamination

3.11.1 Personnel

Personnel decontamination procedures are provided in the Health and Safety Plan included in Appendix B.

3.11.2 Sample Containers

Chemical Analyses

Sample containers for chemical analyses will be provided by EnChem. The type of sample container for different analyses are listed in Table A-4.

Physical Analyses

No physical analyses are proposed for the field investigation.

3.11.3 Drilling and Well Installation/Development Equipment

Decontamination Area

A decontamination area will be established at the site. A temporary impermeable containment structure will be established in the area. The containment structure will include provision for the collection of wastewater and soil that are generated by the decontamination process. Management of these investigation-derived wastes (IDW) is described in Subsection 3.12 of this SAP. The area will be equipped with a high-pressure hot-water spray washer and a tank or drums for the storage of water used in decontamination. Potable water from a nearby municipality or public source of water will be used for decontamination.

Decontamination Procedures

All downhole drilling and well development equipment will be decontaminated prior to the start of drilling and between each boring or monitoring well location. This equipment includes, but is not limited to, items such as hollow-stemmed augers, drilling rods, drill casing, soil samplers, surge blocks and rods, pumps, and water level indicators. The contractor will be responsible for ensuring that all downhole equipment is subjected to decontamination.

Decontamination will be by high-pressure hot-water washing within the decontamination area. The contractor will be responsible for checking that the equipment is properly cleaned.

The aboveground portions of drill rigs will, at a minimum, be decontaminated before the start, and at the end, of the field investigation. If the drilling vehicles come into contact with subsurface soil, the vehicle will be decontaminated before beginning work at a new boring location.

3.11.4 Sampling and Field Measurement Equipment

Soil Samplers

Soil sampling equipment will be decontaminated as described in Subsection 3.11.3 at the start and end of the field investigation and before each new boring location. The samplers will be scrubbed with a brush using a non-phosphate detergent and rinsed in city potable water before each soil sample is collected. Soil and water generated by this process will be managed as IDW, as described in Subsection 3.12 of this SAP.

Downhole Measurement Instruments

These instruments include, but are not limited to, water-level indicators and pressure transducers. This equipment will be rinsed with potable or deionized water and wiped dry before use on the site. Rinsing and drying will also take place between each monitoring well measured during the course of a site visit. Rinse waters will be managed as IDW, as described in Subsection 3.12 of this SAP, and paper towels used to dry the equipment will be disposed with personal protective equipment (PPE), as described in the HSP.

Groundwater Sampling Pumps

Because a peristaltic pump that does not come in contact with the groundwater sample will be used to collect groundwater samples, the pumps will not require decontamination.

In-field Chemistry Instruments

In-field measurement electrodes will be rinsed with deionized water, and the flow-through cell will be rinsed with potable water. This procedure will be applied at the beginning and end of each sampling round and prior to, and

following, each monitoring well sample collection. Rinse waters will be collected and managed as IDW as described in Subsection 3.12 of this SAP.

3.12 Investigation-Derived Waste Management

3.12.1 Personal Protective Equipment and Waste

Procedures for the management of personal protective equipment, decontamination fluids, and other wastes are described in the Health and Safety Plan (HSP), which is included in Appendix B of the Workplan.

3.12.2 Boring and Well Installation Soil

The spread of subsurface soil at the ground surface will be kept to the smallest area practicable. Soil generated by boring will be collected in 55-gallon WisDOT-approved drums or a roll-off box and staged within a fenced-in area of the site. The soil will be disposed at a later date.

3.12.3 Monitoring Well Development, Sampling, and Equipment Decontamination Water

Water produced during the monitoring well development and sampling will be collected and contained in WisDOT-approved 55-gallon drums or a temporary tank. Equipment decontamination water will be managed in a similar manner. The water will be discharged to the treatment plant.

Section 4
References

USEPA. 1998. Technical protocol for evaluating natural attenuation of chlorinated solvents in groundwater. U.S. Environmental Protection Agency, Office of Research and Development, EPA/600/R-98/128. September 1998.

Attachment A
Example Forms

Table of Contents

Chain-of-Custody Record

(Please Print Legibly)

Company Name: _____

Branch or Location: _____

Project Contact: _____

Telephone: _____

Project Number: _____

Project Name: _____

Project State: _____

Sampled By (Print): _____

EN CHEM INC.

1241 Bellevue St., Suite 9
Green Bay, WI 54302
920-469-2436
FAX 920-469-8827

525 Science Drive
Madison, WI 53711
608-232-3300
FAX: 608-233-0502

CHAIN OF CUSTODY

58513

Page _____ of _____

P.O. # _____ Quote # _____

Mail Report To: _____

Company: _____

Address: _____

Invoice To: _____

Company: _____

Address: _____

Mail Invoice To: _____

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=EnCore F=Methanol G=NaOH
H = Sodium Bisulfate Solution I = Other

FILTERED? (YES/NO)

PRESERVATION (CODE)*

ANALYSES REQUESTED

TOTAL # OF BOTTLES SENT

Data Package Options
(please circle if requested)
Results Only
EnChem Level III (Subject to Surcharge)
EnChem Level IV (Subject to Surcharge)

Regulatory Program
UST
RCRA
SDWA
NPDES
CERCLA
_____

Matrix Codes
W=Water
S=Soil
A=Air
C=Charcoal
B=Biota
Sl=Sludge

LABORATORY ID (Lab Use Only)	FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)

Rush Turnaround Time Requested (TAT) - Prelim
(Rush TAT subject to approval/surcharge)
Date Needed: _____
Transmit Prelim Rush Results by (circle):
Phone Fax E-Mail
Phone #: _____
Fax #: _____
E-Mail Address: _____

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

En Chem Project No.

Sample Receipt Temp.

Sample Receipt pH (Wet/Metals)

Cooler Custody Seal

Present / Not Present

Intact / Not Intact

Version 1.0: 9/00

Soil Boring Log Information

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page _____ of _____

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
	_ _ _ _ _ _ _	

Boring Drilled By: Name of crew chief (first, last) and Firm First Name: Last Name: Firm:	Date Drilling Started m m / d d / y y y y	Date Drilling Completed m m / d d / y y y y	Drilling Method

WI Unique Well No.	DNR Well ID No.	Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
_ _ _ _ _ _ _	_ _ _ _		_____ Feet MSL	_____ Feet MSL	_____ inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane _____ N, _____ E S/C/N
_____ 1/4 of _____ 1/4 of Section _____, T _____ N, R _____ E/W

Lat ° ' "
Long ° ' "

Local Grid Location
_____ Feet ☐ N ☐ S _____ Feet ☐ E ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
		_ _ _	

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	

Monitoring Well Construction and Development

State of Wisconsin
Department of Natural Resources

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

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_ _ _ _ _ _ _	_ _	_ _ _ _ _ _ _ _	_ _ _

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐ ___

3. Time spent developing well _ _ _ _ min.

4. Depth of well (from top of well casisng) _ _ _ . _ ft.

5. Inside diameter of well _ _ . _ _ in.

6. Volume of water in filter pack and well casing _ _ _ . _ gal.

7. Volume of water removed from well _ _ _ . _ gal.

8. Volume of water added (if any) _ _ _ . _ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. _ _ _ . _ _ ft.	_ _ _ . _ _ ft.
Date	b. _ _ / _ _ / _ _ m m d d y y	_ _ / _ _ / _ _ m m d d y y
Time	c. _ _ : _ _ ☐ a.m. ☐ p.m.	_ _ : _ _ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	_ _ . _ inches	_ _ . _ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_ _ _ _ . _ mg/l	_ _ _ _ . _ mg/l
15. COD	_ _ _ _ . _ mg/l	_ _ _ _ . _ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: _____

Firm: _____

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: _ _ _

Firm: _____

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

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name	Local Grid Location of Well	Well Name
	_____ ft. ☐ N. ☐ S. _____ ft. ☐ E. ☐ W.	
Facility License, Permit or Monitoring Number	**Grid Origin Location**	**Wis. Unique Well Number / DNR Well Number**
_ _ _ _ _ _ _ _	Lat. _ _ _ _ _ _ Long. _ _ _ _ _ _ or	_ _ _ _ _ _ _ _ / _ _ _ _
Type of Well Water Table Observation Well ☐ 11	St. Plane _____ ft. N, _____ ft. E.	**Date Well Installed**
Piezometer ☐ 12	**Section Location of Waste/Source**	m m / d d / y y
Distance Well Is From Waste/Source Boundary	___1/4 of ___ 1/4 of Sec. ___, T. ___ N, R. ___ ☐ E. ☐ W.	**Well Installed By: (Person's Name and Firm)**
ft.	**Location of Well Relative to Waste/Source**	
Is Well A Point of Enforcement Std. Application?	u ☐ Upgradient s ☐ Sidegradient	
☐ Yes ☐ No	d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation _ _ _ _ . _ _ ft. MSL
B. Well casing, top elevation _ _ _ _ . _ _ ft. MSL
C. Land surface elevation _ _ _ _ . _ ft. MSL
D. Surface seal, bottom _ _ _ _ . _ ft. MSL or _ _ . _ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

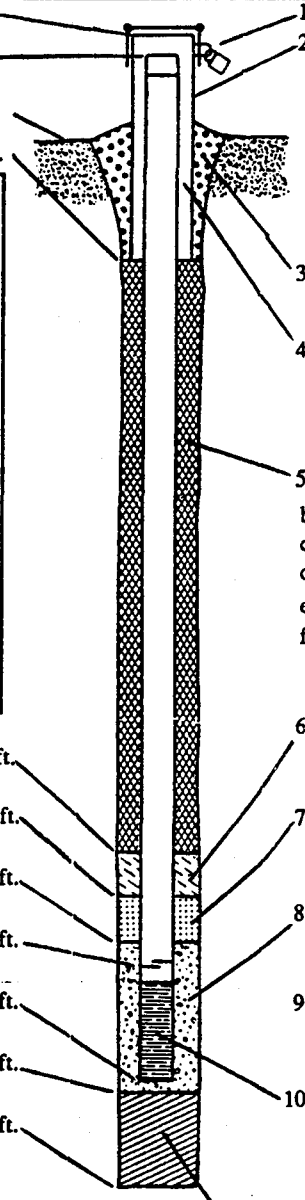
14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☐ 41
_____ Other ☐ _ _

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis):
_____

E. Bentonite seal, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
F. Fine sand, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
G. Filter pack, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
H. Screen joint, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
I. Well bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
J. Filter pack, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
K. Borehole, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
L. Borehole, diameter _ _ . _ in.
M. O.D. well casing _ _ . _ _ in.
N. I.D. well casing _ _ . _ _ in.



1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: _ _ . _ in.
b. Length: _ _ . _ ft.
c. Material: Steel ☐ 04
_____ Other ☐ _ _
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
_____ Other ☐ _ _
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐ _ _
_____ Other ☐ _ _
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. _____ Other ☐ _ _
7. Fine sand material: Manufacturer, product name & mesh size
a. _____ _ _
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. _____ _ _
b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23
Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐ _ _
10. Screen material: _____ _ _
a. Screen type: Factory cut ☐ 11
Continuous slot ☐ 01
_____ Other ☐ _ _
b. Manufacturer _____
c. Slot size: 0. _ _ _ in.
d. Slotted length: _ _ . _ ft.
11. Backfill material (below filter pack): None ☐ 14
_____ Other ☐ _ _

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Meter Calibration Log

METER CALIBRATION LOG

PROJECT NAME: _____ DATE: _____

PROJECT NUMBER: _____ SAMPLER: _____

MODEL: Geotech P3 SERIAL NO.: _____

pH METER

Meter Check	Buffer Check	Asymmetry (mV)	Slope (mV/pH)	Time

Buffer Lot Numbers: pH 4: _____ pH 7: _____ Admissible Asymmetry Range: ±30 mV Slope: -50 to -62 mV/pH

CONDUCTIVITY METER

Temp. of Calibration Soln	Corrected Cond. @ 25°C	Time

Calibration Solution Lot Number: _____

Calibration Range for Solution 1313 – 1510 µmhos/cm

REDOX METER

Temp C°	E_H Reading (mV)	Time

Calibration Solution Lot Number: _____

Calibration Range for Solution 225 – 250 mV

Problems/Corrective Actions: _____

_____

_____ _____ _____ _____

Signed Date QC'd By Date

Water Sample Log

WATER SAMPLE LOG

Sheet _____ of _____

744 Heartland Trail Madison, WI 53717-8923 P. O. Box 8923 (Zip: 53708-8923) (608) 831-4444 FAX: (608) 831-3334

PROJECT NAME	PREPARED		CHECKED		PROJECT NO.
	By:	Date:	By:	Date:	

SAMPLE NO.: _____ WELL DIAMETER: ☐ 2" ☐ 4" ☐ Other _____

WELL MATERIAL: ☐ PVC ☐ SS ☐ Iron ☐ Other _____

SAMPLE TYPE: ☐ GW ☐ WW ☐ SW ☐ DW ☐ Leachate ☐ Other _____

PURGING

TIME: _____ DEPTH TO WATER: _____ + 0.00 T/PVC

WELL VOLUME: _____ gallons DEPTH TO BOTTOM: _____ + _____ T/PVC

TOTAL VOLUME REMOVED: _____ Liters METHOD: ☐ Bailer, _____ ☐ Pump, _____

ODOR: ☐ None ☐ Other _____ COLOR: _____ TURBIDITY: ☐ None ☐ Slight ☐ Moderate ☐ Very

DISPOSAL METHOD: ☒ Ground ☐ POTW ☐ Drum ☐ Other _____

SAMPLE

TIME: _____ DATE: _____

ODOR: ☐ None ☐ Other _____ COLOR: _____ TURBIDITY: ☐ None ☐ Slight ☐ Moderate ☐ Very

pH: _____ E_H _____ mV D.O. _____ ppm Turbidity NA TEMPERATURE: _____ °C

COMMENTS: _____ CORRECTED CONDUCTIVITY: _____ µmhos/cm

FILTRATE (0.45 µm)

☒ NOT APPLICABLE

ODOR: ☐ None ☐ Other _____ COLOR: _____ COMMENTS: _____

BOTTLES FILLED

PRESERVATIVE CODES:
A - None B - HNO3 C - H_2SO4 D - NaOH E - HCL F- _____

Number	Size	Type	Preservative	Filtered	Number	Size	Type	Preservative	Filtered

CHAIN-OF-CUSTODY NUMBER: _____ DATE SHIPPED: _____ METHOD: **Fed Ex/RMT Delivery**

AIRBILL NUMBER: _____ SIGNED: _____ DATE: _____

Stabilization Test

STABILIZATION TEST

PROJECT NAME: _____ WELL NUMBER: _____

PROJECT NUMBER: _____ WELL DIAMETER: _____

DATE: _____ SAMPLER: _____

Type of pump or bailer used: _____

Pumping rate (gallons/minute): _____

Water level before purging (nearest 0.01 ft. below reference point): _____ + 0.00 T/PVC

Depth to bottom of well: _____ + T/PVC

Problems: _____

Weather conditions: _____

Time	Purge Rate (mL/min)	Turbidity (NTU)	Dissolved Oxygen (ppm)	pH (SU)	Conductivity Corrected to 25 °C (µmhos/cm)	E_H (mV)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Purge Volume (L)
		NA							

NOTE: STABILIZATION TEST IS COMPLETE WHEN **3 SUCCESSIVE READINGS** AGREE WITHIN THE FOLLOWING LIMITS: pH - ±0.2 SU; COND. – 5% µmohs/cm; TEMP. - ±0.5°C; D.O. - ±0.5 mg/L

_____ _____ _____ _____

Signed Date QC'd By Date

Well/Borehole Abandonment

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B Rev. 8-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location | County

___ 1/4 of ___ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

(If applicable)

_____ Gov't Lot _____ Grid Number

Grid Location

_____ ft. ☐ N. ☐ S., _____ ft. ☐ E. ☐ W.

Civil Town Name

Street Address of Well

City, Village

(2) FACILITY NAME

Original Well Owner (If Known)

Present Well Owner

Street or Route

City, State, Zip Code

Facility Well No. and/or Name (If Applicable) | WI Unique Well No. _ _ _ _ _ _

Reason For Abandonment

Date of Abandonment

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) _____

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☐ Borehole

Construction Report Available? ☐ Yes ☐ No

Construction Type:
☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) _____ Casing Diameter (ins.) _____
(From groundsurface)

Casing Depth (ft.) _____

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? _____ Feet

(4) Depth to Water (Feet) _____

Pump & Piping Removed?	☐ Yes	☐ No	☐ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☐ Not Applicable
Screen Removed?	☐ Yes	☐ No	☐ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain _____

Was Casing Cut Off Below Surface?	☐ Yes	☐ No
Did Sealing Material Rise to Surface?	☐ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☐ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

(5) Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
	Surface			

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work

Signature of Person Doing Work | Date Signed

Street or Route | Telephone Number ( )

City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected | District/County

Reviewer/Inspector

Follow-up Necessary

F-344 DNR/COUNTY

Groundwater Monitoring Well Information

Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM

Chapter 281 and 289, Wis. Stats.
Form 4400-89

Rev. 7-98

Facility Name	Facility ID Number	License, Permit or Monitoring No.	Date	Completed By (Name and Firm)

WI Unique Well No	Well Name	DNR Well ID Number	Well Location	Dir. N/E	Dir. S/W	Date Established	Well Casing Diam.	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Reference MSL (√)	Reference Site Datum (√)	Depths Screen Top	Depths Initial Groundwater	Depths Well Depth	Screen Length	Well Type	Well Status	Enf. Stds.	Grad-ient	Distance to Waste

Location Coordinates Are:

☐ State Plane Coordinate ☐ Local Grid System
☐ Northern
☐ Central
☐ Southern

Grid Origin Location: (Check if estimated: ☐)

Lat. ____ ° ____ ' ____ " Long. ____ ° ____ ' ____ " or

St. Plane ____ ft. N. ____ ft. E. S/C/N Zone

Remarks:

Completion of this form is mandatory under s. NR 507.14 and NR 110.25 Wis. Adm. Code. Failure to file this form may result in forfeiture of not less than $10 nor more than $5,000 for each day of violation. Personally identifiable information provided is intended to be used by the Department for the purposes related to the waste management program.

INSTRUCTIONS FOR GROUNDWATER MONITORING WELL INFORMATION FORM 4400-89

This form, when completed provides a record of information for each well or sampling point that is part of a facility's groundwater monitoring program. It provides the facility or consultant with a means of presenting in a consistent format the well data which the department requires during a site review process. It should be updated as new wells are added to the monitoring program.

Each element of the form is described below. Complete the form with the necessary information, using the description of the elements as a guide.

Facility Name: The name of the site or landfill.

Facility ID Number: Fill in the nine digit Facility ID (FID) assigned to the site.

License/Permit/Monitoring Number: The number assigned by the Department to the facility. If unknown, leave blank.

Date: The date on which the form is filled out (mm/dd/yyyy).

Completed By: The name and firm of person completing the form.

WI Unique Well No: The Wisconsin Unique Well Number assigned to the well. These numbers are available from the Department and are to be assigned to all newly drilled wells.

Well Name: The common well name given to the well by the facility or consultant; e.g. MW-21 OW-5.

DNR Well ID Number: The 3 digit number assigned to the well by the Department, for use by the Department.

Well Location: The location of the well, measured in feet, in relation to a grid system origin established for the site or state plane coordinate system.

Dir: The location direction for the well relative to the grid origin. If state plane coordinates are used these should be N and E.

Date Established: The installation date of the well.

Well Casing Diam.: The inside diameter of the pipe used in the well construction, in inches.

Well Casing Type: The type of pipe used: plastic (P), steel (S), or other (0).

Elevations:

Top of Well Casing: The elevation, of the top of the well casing (not top of protective pipe), in feet.

Ground Surface: The elevation, in feet, of the ground surface adjacent to the well.

Reference: Are elevations referenced to Mean Sea Level (MSL) or to a particular site datum

Appendix B
Hazard Assessment, and Health and Safety Plan

Hazard Assessment

1. General Information

Project: OECI **Project Number:** 6105.01

Site Address: Ashippun, Wisconsin **Project Manager:** John Oswald

Prepared By: Thomas Silverman **Date:** 11/12/01

Approved By: _____ (PM) _____ (HSC)
John Oswald Jon Harlson

Date: 11/27/01 11/29/01

Proposed Scope of Work and Specific Tasks: Site visit, groundwater sampling, soil sampling, surface water sampling, observation and documentation of soil borings and well drillings, and aquifer testing. The aquifer testing will likely involve long shifts of work and work at night.

RMT Role On-site:

- ☒ Resident Project Representative (*e.g.*, "Observe and Document")
- ☐ Construction Manager (*e.g.*, Managing Contractor/General Contractor)
- ☐ Representative for Client (*e.g.*, "Agent for Owner")
- ☒ Other (describe) Soil, surface water, and groundwater sampling, aquifer testing

Proposed Dates of On-site Work: Begin 11/01 End 8/02

Background Information Review: ☐ Preliminary ☐ Moderate ☒ Substantial

Documentation/Summary Overall Hazard: ☐ Serious ☐ Moderate ☒ Low ☐ Unknown

2. Site Characterization

Facility Description: Former electroplating company

Status: ☐ Active ☒ Inactive ☐ Unknown

Operations (current and past): Used chlorinated solvents and metals for cleaning and plating operations.

Unusual Features (utilities, terrain, etc.): Wetlands located southwest of site.

History (worker or nonworker injury, complaints from public, previous agency action): USEPA National Priorities List since 1983.

3. Site Classification:

Site Type Allocated:

- ☐ 1 Known or controlled hazards
- ☐ 2 Known and/or controlled hazards, but with invasive or hazardous activities
- ☒ 3 Regulated by 29 CFR 1910.120

Comments:

4. Hazard Evaluation

Potential Chemical Hazards:

SUBSTANCE NAME [1]	PHYSICAL STATE	KNOWN CONCENTRATION LEVELS PRESENT [2]	POTENTIAL ROUTES OF EXPOSURE	ACGIH TLV	OSHA PEL
Arsenic	Groundwater	25 µg/L	Dermal/Inhalation/Ingestion	0.01 mg/m³	0.01 mg/m³
Barium	Groundwater	100 µg/L	Dermal/Inhalation/Ingestion	0.5 mg/m³	0.5 mg/m³
Cadmium	Groundwater	1.2 µg/L	Dermal/Inhalation/Ingestion	0.002 mg/m³ (R)	0.005 mg/m³
Chromium, total	Groundwater	270 µg/L	Dermal/Inhalation/Ingestion	0.05 mg/m³	0.5 mg/m³
Copper	Groundwater	600 µg/L	Dermal/Inhalation/Ingestion	1 mg/m³	1 mg/m³
Iron	Groundwater	15,000 µg/L	Dermal/Inhalation/Ingestion	5 mg/m³	10 mg/m³
Lead	Groundwater	32 µg/L	Dermal/Inhalation/Ingestion	0.05 mg/m³	0.05 mg/m³
Manganese	Groundwater	350 µg/L	Dermal/Inhalation/Ingestion	0.2 mg/m³	5 mg/m³
Nickel	Groundwater	260 µg/L	Dermal/Inhalation/Ingestion	0.1 mg/m³	1 mg/m³
Selenium	Groundwater	5.5 µg/L	Dermal/Inhalation/Ingestion	0.2 mg/m³	0.2 mg/m³
Silver	Groundwater	5 µg/L	Dermal/Inhalation/Ingestion	0.01 mg/m³	0.01 mg/m³
Thallium	Groundwater	9.9 µg/L	Dermal/Inhalation/Ingestion	0.1 mg/m³	0.1 mg/m³
Zinc	Groundwater	1,700 µg/L	Dermal/Inhalation/Ingestion	10 mg/m³	15 mg/m³
Cyanide	Groundwater	30 µg/L	Dermal/Inhalation/Ingestion	None established	None established
1,1-Dichloroethane	Groundwater	61 µg/L	Dermal/Inhalation/Ingestion	100 ppm	100 ppm
1,1-Dichloroethene	Groundwater	53 µg/L	Dermal/Inhalation/Ingestion	None established	None established
cis-1,2-Dichloroethene	Groundwater	75 µg/L	Dermal/Inhalation/Ingestion	200 ppm	200 ppm
1,1,1-Trichloroethane	Groundwater	557 µg/L	Dermal/Inhalation/Ingestion	None established	None established
TCE	Groundwater	1,220 µg/L	Dermal/Inhalation/Ingestion	50 ppm	100 ppm
Vinyl chloride	Groundwater	119 µg/L	Dermal/Inhalation/Ingestion	1 ppm	1 ppm

(1) Attach MSDS if available.
(2) Attach laboratory results or tables if available.

Ionizing Radiation:

Did the "client" use radioactive materials on site, past or present: ☐ Yes (complete table below) ☒ No

Possibility of contamination or exposure due to past or present use of radioactive materials: ☐ Yes (complete table below) ☒ No

SOURCE	QUANTITY	PHYSICAL STATE	POTENTIAL OF EXPOSURE	CONTROL MEASURE

If the answers to the above questions are both No, this table will remain blank.

Will a nuclear moisture/density or XRF gauge be used on site? ☐ Yes (see below) ☒ No

If yes, will it be a RMT gauge? ☐ Yes (see below) ☐ No (see Subcontractor H&S Qualifications/ Performance Form)

If the answer to any questions in this section is "Yes," send a copy of the Hazard Assessment and Health & Safety Plan to the RMT Radiation Safety Officer (RSO).

Physical Safety Hazards On-site and Control Measures

HAZARD	CONTROL MEASURE
Below-ground utilities	Will be located and marked by Digger's Hotline.
Cold stress	Take frequent breaks, wear appropriate clothing, and drink plenty of fluids.
Confined space	Not applicable.
Excavations	Not applicable.
Explosion hazards	Not applicable.
Facility piping/equipment	Not applicable.
Fork lifts	Not applicable.
Hand tools	Use caution when using hand tools, and only use appropriate tool for the task.
Heat stress	Take frequent breaks if heat is excessive, and drink plenty of fluids.
Insects	Use bug repellent.
Lockout/Tagout	Not applicable.
Noise	Wear ear plugs when noise levels exceed 85 dBA.
Poisonous plants	Wear long pants and gloves.
Radiation	Not applicable.
Railroad/Trains	Not applicable.
Scaffolding	Not applicable.
Severe weather	Do not work when weather is severe; be prepared to take shelter.

HAZARD	CONTROL MEASURE
Slips/Trips/Falls	Exercise caution when moving around the site, especially when heavy equipment is in use.
Traffic-vehicular/pedestrian	Use orange safety cones when working near the street.
Uneven surfaces	Exercise caution when moving around the site.
Waterways	Do not attempt to cross waterways unless supervision is available.
Animals (dogs, etc.)	Be aware of any animals on-site, or adjacent to the site. Care should be taken if any animals are encountered.
Chemical drums	Drums should be clearly labeled with the name of the contents. Drums should only be handled with the appropriate equipment.
Evening work	If work is performed during the evening hours, work will be limited by the availability and quality of artificial lighting. Care should also be taken to avoid slip, trip, and fall hazards that are not as easy to identify during low-light conditions.
Heavy equipment operation	Contractor is responsible for safe operation of equipment. All mobile heavy equipment must have a functioning backup alarm, and operators must comply with equipment manufacturer's instructions. Maintain proper distance and remain in line of sight of operator and out of reach of equipment. Isolate equipment swings if possible. Make eye contact with the equipment operator before approaching the equipment. Understand and review hand signals.
Insects (ticks, bees, spiders, etc.)	Use insect repellant as necessary, and as specifically allowed on-site, based on potential cross-contamination of samples, etc. Wear long-sleeved shirts and long pants, if possible. Check for ticks at the end of each day.
Poisonous plants	Be able to identify any local poisonous plants, and avoid them if possible, or wear protective clothing as necessary. When removing potentially exposed PPE, the PPE should be carefully and thoroughly washed or decontaminated.
Poor lighting	Do not enter areas where visibility is inadequate to allow safe movement and work. Wear reflective clothing or vests if working in low-light conditions and in areas where there are traffic concerns.
Portable heaters	Be aware of portable heater locations, and stay a safe distance from them.
Power washing equipment	Stay clear of the power washing nozzles and equipment.
Sample preservative chemicals	Wear safety glasses and nitrile gloves when adding preservative chemicals to sample bottles or vials.

Site Health & Safety Plan

1. General Information

Project: OECI **Project Number:** 6105.01

Site Address: Ashippun, Wisconsin **Project Manager:** John Oswald

Prepared By: Thomas Silverman **Date:** 11/12/01

Approved By: John Oswald (PM) John Harrison (HSC)

Date: 11/27/01 11/27/01

TEAM MEMBER	RESPONSIBILITIES
Tom Silverman	RMT Site Health and Safety Representative, Observation and Documentation, Groundwater and Soil Sampling, Aquifer Testing
Lance Bakken	Groundwater Sampling, Aquifer Testing

2. Training and Medical Surveillance

Training Level Required:

☒ HAZWOPER 40/8 hour, First Aid, CPR (for all Type 3 sites)

☐ Specialty (*e.g.*, confined space, lockout/tagout, Troxler radiation safety)

List:

Medical Surveillance Level Required:

☒ HAZWOPER physical

☐ Special medical tests

List:

Exceptions/Modifications to training or medical surveillance required: None

3. Personal Protection

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

LOCATION	JOB FUNCTION	LEVEL OF PROTECTION
Near boreholes and wells	Observation and documentation of drilling, and soil and groundwater sampling	☒ D ☐ C ☐ B ☐ A
		☐ D ☐ C ☐ B ☐ A
		☐ D ☐ C ☐ B ☐ A
		☐ D ☐ C ☐ B ☐ A

Specific protective equipment for each level is as follows: (1)

Level A

Respiratory:
- ☐ SCBA
- ☐ Air-Line Supplied Air Respirator
- ☐ Other (describe)

Level B

Respiratory:
- ☐ SCBA
- ☐ Air-Line Supplied Air Respirator
- ☐ Other - Level C-D plus the following exceptions/modifications -

Level C

Respiratory - Air-purifying respirator with cartridge/canister type:
- ☐ HEPA, acid gas, organic vapors (*e.g.*, MSA GMC-H)
- ☐ HEPA only
- ☐ Other - Level D plus the following exceptions/modifications -

Level D

Respiratory - None

Other:
- ☒ Safety glasses
- ☒ Hard hat
- ☒ Safety shoes
- ☒ Ear plugs/muffs
- ☐ Snake chaps/Gaiters
- ☒ Protective clothing and/or gloves required (*i.e.*, modified Level D)
- ☐ Other (describe)

Other skin, eyes, and fall protection required:

Gloves:
- ☐ Butyl rubber
- ☐ PVC-coated
- ☐ Neoprene
- ☒ Nitrile
- ☐ Other (describe)

Protective clothing:
- ☐ Tyvek® or equivalent
- ☐ Tyvek® polyethylene-coated or equivalent
- ☐ Tyvek® Saranex® or equivalent
- ☐ Other (describe)

Radiation Safety:
- ☐ Dosimeter Badge
- ☐ Other (describe)

(1) See RMT Health and Safety Manual for minimum criteria.

Criteria for changing protection levels are as follows:

CHANGE:	APPROVALS REQUIRED [1]		
	HSR	HSC	CHSM
To Level when N/A	☐	☐	☐
To Level when	☐	☐	☐
To Level when	☐	☐	☐
To Level when	☐	☐	☐
Evacuate the area when: N/A			

[1] HSR: On-site Health & Safety Representative
HSC Regional Health & Safety Coordinator
CHSM Corporate Health & Safety Manager

Changes to the level of protection shall be made after the required approvals are obtained. All changes shall be recorded in the field log and reported to the HSC as soon as possible.

4. Air Monitoring

The following monitoring instruments shall be used on-site to measure airborne contaminant concentrations in the breathing zone:

	FREQUENCY OF MONITORING
☐ Combustible Gas Indicator	
☐ O_2 Monitor	
☐ Colorimetric Tubes (type)	
☒ PID	Periodically during soil sampling for analytical purposes only
☐ FID	
☐ Other (specify)	

5. Site Control (Describe or attach sketch)

Work Zones:

Support Zone: RMT field vehicle

Contamination Reduction Zone (area used for decontamination): Back of RMT field vehicle

Exclusion Zone (area considered contaminated): Area immediately surrounding the borings and wells

Site Entry Procedures:

☒ Notify Site Health and Safety Representative.

☒ Read Health & Safety Plan and sign Acknowledgment Statement

☐ Check in with facility security guard.

☒ Wear proper personal protective equipment.

☐ Attend facility orientation.

☒ Conduct "Toolbox" safety meeting.

☐ Other (specify):

Decontamination Procedures:

Personnel: Contain and dispose gloves and other disposable protective clothing, and wash hands with soap and water prior to eating, drinking, driving, or leaving the site.

Equipment: PPE and sampling equipment will be appropriately contained and disposed. Decontaminate sampling equipment using Alconox soap and potable water.

Investigation-derived Material Disposal:

☒ ***Leave on site for disposal.*** Waste drums will be disposed following completion of the project.

☐ ***Other (describe)***

Work Limitations (time of day, buddy system, etc.): Drilling and sampling will only be performed during daylight hours. Aquifer testing will continue into the night hours. During this time, groundwater measurements will be collected at regular intervals.

Troxler Radiation Safety:

☒ Radiation information is not applicable to this project.

☐ Notify RSO.

☐ Wear dosimeter badge when handling gauge.

☐ Post applicable radiation signs.

☐ Post emergency numbers.

☐ Provide at least two lock systems for overnight storage.

☐ Maintain storage at least 15 feet from full-time workstations.

☐ Block and brace gauge during "all" transportation.

☐ Limit "public" exposure to gauge while in use.

☐ Provide sketch of gauge storage to RSO.

Contingency Planning

LOCAL EMERGENCY RESOURCES:	
Ambulance 911	Hospital Emergency Room 911
Police 911	Fire Department 911
USEPA Contact	Poison Control Center Wisconsin 800/815-8855
Other	

SITE RESOURCES:	
Water Supply Supplied on site and at nearby municipality	Radio Supplied by RMT
Telephone Supplied by RMT	Other

EMERGENCY CONTACTS:	
RMT Technical Contact:	James Wedekind 608/662-5469
RMT Project Manager (PM):	John Oswald 608/662-5452
RMT Corporate Health & Safety Manager (CHSM):	Shannon Posey 864/234-9431 (work) 864/787-7918 (cell) 864/898-3003 (home)
Radiation Safety Officer (RSO):	John Hanson 608/662-5238 (work) 608/220-2502 (radiation program emergency only) 608/222-4588 (home)
RMT Health & Safety Coordinator (HSC):	John Hanson 608/662-5238 (work)
RMT Field Contact	Tom Silverman 608/662-5408
Contractor Contact:	
Client Contact:	Paul Kozol 608/275-3301

Emergency Routes (give directions AND attach map):

Hospital: Community Health Services, 791 Summit Avenue, Oconomowoc, Wisconsin WI 53066. (262) 569-9400

Follow Highway 67 south toward Oconomowoc. Highway 67 turns into S. Main Street. When Highway 16 and 67 turn left (east), stay on Main St. Take left at Summit Ave, near railroad tracks. Continue until 791 Summit Ave.

Other:

Emergency Procedures:

If an emergency develops at the site, the discoverer will take the following course of action:

- Notify the proper emergency services (fire, police, ambulance, etc.) for assistance.
- Notify other affected personnel at the site.
- Contact RMT and the client representative to inform them of the incident as soon as possible.
- Prepare a summary report of the incident for RMT and the client representative.

Emergency Equipment Required On-site:

☒	First Aid/Bloodborne Pathogens Kit	☒	Fire Extinguisher
☐	Eye Wash	☐	Spill Control Media
☐	Shower	☐	Other: (describe)
☐	Other: (describe)	☐	Other: (describe)

Acknowledgment Statement:

As an employee of RMT, Inc., I have reviewed the Hazard Assessment and Site Health & Safety Plan. I hereby acknowledge that I have received the required level of training and medical surveillance, that I am knowledgeable about the contents of this site-specific Health & Safety Plan, and that I will use personal protective equipment and follow procedures specified in the Health & Safety Plan.

Signatures of RMT Site Personnel (Required):

_____ **Date:** _____

_____ **Date:** _____

_____ **Date:** _____

_____ **Date:** _____

RMT

Health & Safety Plan
Initial Report of Incident

1. Type of Incident

☐ Injury/exposure only ☐ Property loss only ☐ Injury and property loss ☐ Reportable incident without injury or property loss
☐ Ergonomic symptoms

Project Number:	Project Name:	Date of Incident/Exposure:	Time:	☐ AM ☐ PM

Incident/exposure or office location:

Name of RMT employee involved:

Name(s) of witnesses to incident, if any:

If incident caused death or serious injury, this report must be called in to the Health & Safety Director and Human Resources Manager *immediately*!!!

2. Injury/Exposure

Injured employee's full name:	Did injured see a doctor? ☐ Yes ☐ No
Name and address of treating doctor (and hospital, if one was used):	Was employee treated in an emergency room? ☐ Yes ☐ No
Describe affected body part and the type/degree of damage or exposure:	Was employee hospitalized overnight? ☐ Yes ☐ No

If the incident resulted in a fatality, enter date of death _____

3. Incident Description and Analysis

Give detailed description of incident (attach additional pages if necessary):

Provide an explanation if the incident was associated with the following:

Job factors:

Personal factors:

Unsafe conditions:

Unsafe practices:

Other:

4. Ergonomic Symptom Survey

Check Area: ☐ Neck ☐ Shoulder ☐ Elbow/forearm ☐ Hand/wrist ☐ Fingers
☐ Upper back ☐ Low back ☐ Thigh/knee ☐ Lower leg ☐ Ankle/foot

Height:	Weight:	Age:	☐ Male	☐ Female

Glasses: ☐ Yes ☐ No | Contacts: ☐ Yes ☐ No | Hearing Air: ☐ Yes ☐ No | Physical disability ☐ Yes ☐ No

Check all boxes that describe the duties you perform on a regular basis or reflect common conditions at work.

☐ Low light conditions	☐ Awkward reach conditions	☐ Handling heavy objects
☐ High reach distances	☐ Insufficient rest of muscles	☐ Prolonged typing
☐ High or fast pace work	☐ Prolonged bending	☐ Twisting more than 45 degrees
☐ Prolonged stooping	☐ Reaching below knees	☐ Heavy stair usage
☐ Lifting above shoulders	☐ Heavy repetitive lifting	☐ Awkward work height
☐ Prolonged standing	☐ Prolonged sitting	☐ Prolonged computer usage

Check all boxes that best describe your problem:

☐ Aching	☐ Numbness (asleep)	☐ Tingling	☐ Other
☐ Burning	☐ Pain	☐ Weakness	☐ Other
☐ Cramping	☐ Swelling	☐ Other	☐ Other
☐ Loss of color	☐ Stiffness	☐ Other	☐ Other

4. Ergonomic Symptom Survey (continued)

When did you first notice the problem? Month: Year:

How long does each episode last?

How many separate episodes have you had in the last year?

What do you think caused the problem?

Have you had this problem in the last 7 days? ☐ Yes ☐ No

How would you rate this problem: Now – None ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Unbearable

When it was the Worst – None ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Unbearable

Please comment on what you think would improve your symptoms:

5. Property Damage/Loss/Theft

Exactly what was damaged, lost, or stolen?

Was this reported to police? ☐ Yes ☐ No If yes, list departments involved:

Describe amount of damage/lost/theft:

6. Action Items

List actions which could be taken to prevent the occurrence of this incident in the future, or to minimize the effects of future incidents.

7. Signature

Name of person completing this form: Office Location: Date:

Signature of person completing this form:

Send this report to the Health & Safety Coordinator who will provide copies to the Corporate Health & Safety Manager, and Human Resources Manager, as required.

This report does not replace a Worker's Compensation (First Report of Injury) or Insurance Claim form which may need to be completed for Human Resources or Loss Prevention.	**Office Use Only** **Reportable: ☐ Yes ☐ No**

Health & Safety
Initial Report of Incident

Section 1 This report is required to be completed if an incident involves the following:

- A work-related injury, illness, or exposure affecting an RMT employee or other personnel working or visiting the location (Sections 1, 2, 3, and 6).
- The development of signs/symptoms related to musculoskeletal disorders (MSDs) or other possible ergonomic issues (Sections 1, 2, 4, and 7).
- Property theft, loss, or damage through an accident, mechanical failure, weather conditions, etc. (Sections 1, 3, 5, and 6).
- A combination of the above (Sections 1,2, 3, 5, and 6).
- Be sure to list any witnesses and their company affiliation, if known. If there is a death or serious injury, the Health and Safety Director and Human Resources Manager must be notified ***immediately.***

Section 3 Examples: Job factors may include long work hours, improper equipment, failure of safety devices, etc.

- Unsafe conditions may include weather, poor ventilation or lighting, traffic, slippery ground, etc.
- Unsafe practices may include failure to use safety devices, failure to follow company policies or procedures, etc.
- Personal factors may include lack of sleep, prior illness, improper training, etc.

Section 5 Describe the property which was damaged/lost/stolen. Include police report number, if applicable. An insurance claim form is probably required. The office Administrative Supervisor can supply a form and answer questions.

Section 6 Describe any actions you feel may be effective to prevent the recurrence.

Section 7 Print your name followed by your signature, office location, and the date that you completed the form. The completed form goes to your office's Health and Safety Coordinator who will provide copies to appropriate managers as required.

Health & Safety Plan
Investigation of Near Miss Incident

Each incident should be investigated. The object is to prevent recurrence and it is only by thorough investigation (visit scene of incident and talk to witness) that real causes can be determined and corrected.

Name of Person Involved in Near Miss:	Job Title:	Office Location:

Age:	☐ Female ☐ Male	Length of time with RMT:	Date of Near Miss:	Time:	☐ AM ☐ PM

Project Number:	Project Name:	Near Miss Location:

Was employee temporarily working in another department or job at time of Near Miss? ☐ Yes ☐ No	How long has employee worked at job where Near Miss occurred?

How did Near Miss occur? Tell all objects and substances involved in Near Miss. What machine or tool? What operations?

Please indicate which of the following contributed to the Near Miss:

☐Failure to secure	☐Improper instructions	☐Lack of training or skill	☐Poor housekeeping
☐Horseplay	☐Improper maintenance	☐Operating without authority	☐Poor ventilation
☐Improper dress	☐Improper protective equipment	☐Physical or mental defect	☐Unsafe equipment
☐Improper guarding	☐Inoperative safety device	☐Unsafe arrangement or process	☐Unsafe position

Analysis and Review

Give us your honest comments on the following questions. We are not trying to blame anyone. Your opinion may help us to prevent repetition.

What do you consider the real cause of this Near Miss? (Please do not use the word "careless.")

What steps are being taken to prevent similar incidents or recurrences? (Example: Employees are being instructed in correct lifting and to get assistance with heavy loads.)

Name of person completing this form: Office Location: Date:

Signature of person completing this form:

Send this report to the Health & Safety Coordinator who will provide copies to the Corporate Health & Safety Manager, Project Manager, Department Manager, and/or Human Resources Manager, as required.

Health & Safety
Investigation of Near Miss Incident

This report is required to be completed if the potential for an incident occurs. This involves an incident that could have resulted in an accident, but fortunately/luckily was avoided. The following example will be used throughout this form: A ladder, its base resting on a slick surface, is leaning up against the side of building. A worker climbs the ladder to get onto the roof. As the worker is climbing onto the roof from the ladder, the ladder slips out from under the worker. The worker makes it onto the roof as the ladder falls to the ground. The potential for a damaging accident occurred, but fortunately was avoided. This is a near miss.

The following questions should be answered when completing this form:

- How did the Near Miss occur?
- What do you consider the real cause of this Near Miss?
- What steps are being taken to prevent similar incidents or recurrences?

Analysis and Review

- What do you consider the real cause of the Near Miss?

  Using the near miss example described above, the real cause of the near miss is simply that the base of the ladder was placed on a slick surface that allowed it to slide out as the worker made his/her transition from the top of the ladder onto the roof.

- What steps are being taken to prevent similar incidents or recurrences?

  Continuing with the example given above, the worker should have had an assistant holding the ladder as he/she was climbing to the roof. Also, to keep the base of the ladder from slipping, a rubber mat should have been placed under the ladder.

RMT Project/Field Safety Audit Form

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA [1]	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ [2]
General					
Were subcontractors qualified for the project by using RMT's subcontractor H&S Qualification form?					
For RMT projects with temporary offices, are OSHA and job-site warning posters posted?					
For RMT projects with temporary offices, are job-site injury records kept?					
Is there an RMT site-specific health and safety plan available on site?					
Are all RMT personnel current on training requirements (*i.e.*, 40-Hour HAZWOPER, 8-Hour Refresher)?					
Is the H&S plan signed by all on-site RMT personnel?					
Are H&S procedures listed in the RMT H&S plan being followed by RMT personnel?					
Does the RMT H&S plan address all obvious hazards at this site?					
Is the RMT H&S plan specific to the Project operations/RMT project responsibilities?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.

(2) Enter a √ when the corrective action has been completed.

RMT Project/Field Safety Audit Form

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Is training documentation for RMT employees available on site?					
Are all containers labeled to clearly identify there contents?					
Are all RMT personnel current with medical surveillance protocol?					
Is at least one RMT employee on site currently trained in CPR and First Aid?					
Is appropriate PPE identified on the RMT H&S plan?					
Is the PPE being utilized by RMT personnel as directed in the H&S plan?					
Are subcontractors using appropriate personal protective equipment to protect their employees?					
Are hot work zones established for hazardous waste operation and enforced?					
Are medical facilities identified on the RMT H&S plan?					
Are compressed gas cylinders being used on site? If so, are these cylinders properly secured?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

RMT Project/Field Safety Audit Form

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Are written directions to this medical facility clear?					
Are work areas neat and free of trip/fall hazards?					
Is waste being disposed of properly?					
Are passageways and walkways unobstructed?					
Is there adequate lighting in passageways and work areas?					
For projects with potential hazardous releases or fire hazards, has an evacuation plan been developed?					
Hazard Communication					
Are MSDSs for RMT-supplied materials available?					
Are MSDS for subcontractors - supplied materials available?					
Have employees received hazard communication training?					
Hazardous substances clearly marked?					
Is there an Emergency Response Plan or plan in place in case of a release (*i.e.*, spill kit)?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Fire Protection/Prevention					
Is fire-fighting equipment available?					
Have RMT personnel been trained in use of fire-fighting equipment?					
Is equipment in proper working condition?					
Are "no smoking" signs posted in appropriate locations?					
Electrical					
Are ground fault circuit interrupters needed and in use?					
Are electrical dangers posted?					
Are terminal/discount/breaker dead front boxes equipped with covers?					
Are covers used?					
Have known underground/overhead utilities been identified and clearly marked?					
Power Tools					
Is good housekeeping practiced where power tools are in use?					
Are power tools and cords in good condition?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Are power tools properly grounded or double insulated?					
Are mechanical ties and guards in use with power tools?					
Are power tools stored neatly when not in use?					
Are the right tools for the job being used?					
Ladders					
Are ladders inspected and in good condition?					
Are ladders properly secured to prevent slipping, sliding, or falling?					
Do side rails extend 36 inches above the top of the landing?					
Are rungs and cleats over 12 inches on center?					
Are stepladders fully open when in use?					
Are metal ladders being used around electrical equipment?					
Are ladders maintained and properly stored?					
Are ladders painted?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Scaffolding					
Is there a competent person on sight?					
Are all connections secure?					
Is scaffold tied into structure when it exceeds 4 times the base width of the scaffold?					
Are working areas free of debris, snow, grease, ice?					
Are workers protected from falling objects?					
Is the scaffold plumb and square with crossbracing?					
Are guard rails, intermediate rails, toe-boards, and end rails in place for scaffolds over 10 feet?					
Is scaffold equipment in good working order?					
If scaffold is illegal to climb, is proper notification attached?					
Have employees received training in proper scaffold use?					
Manholes and Confined Space Entry					
Has access and egress been provided?					
Has an entry permit been obtained?					
Have hazards been properly identified?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

RMT Project/Field Safety Audit Form

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Is air monitoring equipment on site, appropriate, calibrated, and in use?					
Are areas being ventilated before entry and during occupation?					
Have attendant and rescue personnel been identified?					
Have entrant, attendant, and rescue personnel been identified?					
Is proper rescue equipment on site? Inspected?					
Is appropriate lighting provided?					
Motor Vehicles					
Have operators received training?					
Brakes, lights, horn, seat belts intact and functioning?					
Are personnel carried in a safe manner?					
Are backup lights or warning signal working?					
Are fire extinguishers carried, if appropriate?					
Excavations/Shoring					
Any excavation entry by RMT staff?					
Is the competent person overseeing the trenching excavation work on site?					

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.

Project Name: _____ **Project No.** _____

HSC Name _____ **Office Location** _____ **Date of Audit** _____

QUESTION/ ELEMENT	YES NO NA (1)	COMMENTS	CORRECTIVE ACTION NEEDED	DEADLINE FOR CORRECTION	√ (2)
Is shoring appropriate?					
Is access and egress provided for employees working in excavations of 4 feet or greater in depth?					
For excavation in which employees enter, are materials stored within 2 feet of the excavation?					
Is the excavation barricaded?					
If sloping and benching is used as the protective system for employees, have soils been classified					
Are excavations inspected daily?					
Are excavations over 20 feet in depth in which employees enter, designed by APE?					

HSC Signature: _____ PM Signature: _____

(1) Enter Y for yes, N for no, or NA for not applicable. If no, comment, action plan to correct, date of completion of corrective action, and person responsible for completing corrective action.
(2) Enter a √ when the corrective action has been completed.