Rec'd 12/27/13
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Environmental Resources Management

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December 24, 2013

William P. Scott
Gonzales Saggio & Harlan LLP
111 East Wisconsin Avenue, Suite 1000
Milwaukee, WI 53202

And

Nancy Ryan
Wisconsin Department of Natural Resources
2300 N. Dr. Martin Luther King, Jr. Drive
Milwaukee, WI 53212-3128

RE: Remedial Action Bid Proposal Submittal
Express Cleaners, 3941 North Main Street, Racine, WI
WDNR FID#252010000; BRRTS #02-52-547631

Dear Mr. Scott and Ms. Ryan:

Environmental Resources Management (ERM) is pleased to provide the enclosed remedial action bid proposal for the Express Cleaners site located at 3941 North Main Street, Racine, Wisconsin. This bid has been prepared in response to a November 20, 2013 letter from Gonzalez Saggio & Harlen, LLP on behalf of the Ehrlich Family Limited Partnership to provide environmental remediation services in accordance with Wisconsin Administrative Code NR Chapter 169 and the Dry Cleaner Environmental Response Fund (DERF) program.

ERM believes that we are the most qualified firm to successfully provide remedial services because of our:

- Demonstrated technical expertise for the required scope of services;
- Experience working and negotiating with regulatory agencies to receive approval for cost-effective activities;
- Committed team members comprised of local personnel to perform the technical work at competitive rates; and
- Innovative approaches to complex issues including experience with leading edge investigation and remedial technologies.

If you have any questions or require additional information, please feel free to contact me at (414) 977-4710.

Sincerely,

John C. Roberts

John Roberts, P.G.
Project Manager

Daniel W. Petersen

Daniel Petersen, Ph.D.,
Partner-In-Charge

Remedial Action Bid Proposal

Express Cleaners/ Ehrlich Family Limited Partnership
3941 N. Main Street, Racine, WI
WDNR FID #252010000; BRRTS #02-52-547631

www.erm.com

Delivering sustainable solutions in a more competitive world

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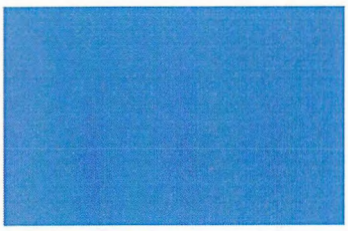
Section 1
ERM Capabilities

ERM Capabilities



ERM has the experience, expertise, and capabilities to develop and implement comprehensive, sole-source, cost-effective solutions to difficult environmental remediation problems. Since 1990, we have saved our clients over $1.5 billion.

ERM's business focuses strongly on the cleanup of industrial sites of all types. We have performed the full scope of remedial services at over 1,100 sites under federal regulatory programs encompassing every USEPA Region, and over 3,000 project sites under state-led programs. ERM's breadth of experience includes:

- Over 3,500 site assessments encompassing a diverse range of geological settings and contaminants;
- Over 3,000 remediation engineering assignments, including some with extensive bench and pilot testing of new technologies;
- Remedial design for projects with a constructed value of over $1 billion, encompassing virtually every commercially available technology, as well as ERM's licensed, patented, and registered technologies; and
- Construction management for over $60 million in remedial action annually.

ERM is accustomed to working with complex, multi-faceted objectives and has the experience to proceed according to project-specific objectives and strategy. We do not follow a "one size fits all" concept.

ERM's Wisconsin Operations

ERM's Wisconsin operations were founded in 1991 and has offices in Milwaukee and Appleton. We have exceptional experience with the Wisconsin Department of Natural Resources (WDNR) and Region 5 of the US Environmental Protection Agency (USEPA) requirements.

Our local team has strong relationships with local corporate leaders, legal firms, and service suppliers/subcontractors; and extensive knowledge of the region (geologic/ hydrogeologic conditions, air, waters and lands issues). ERM's long-term presence in Wisconsin and our active role in developing innovative approaches to environmental issues have led to ERM's solid local reputation and credibility.

Our Wisconsin staff is highly experienced and multi-disciplined. Over half of the staff has greater than 15 years in environmental consulting for industrial clients.

Locally, the ERM staff has successfully completed similar types of services such as:

- Recorded over 150 site closures granted by Wisconsin Department of Natural Resources (WDNR)
- Assisted communities such as Milwaukee, Kenosha, Racine, Cudahy, West Allis, Sheboygan, Plymouth, Manitowoc, and Two Rivers with brownfield redevelopments.
- Guided and assisted a number of local communities with identifying and securing state and/or federal financial assistance for brownfield developments.
- Completed the first WDNR accepted risk-based site closure in Wisconsin (chlorinated compound release in Green Bay, Wisconsin).

ERM Environmental Restoration Capabilities

Project Management/Monitoring Project Budgets

Effective communication, ability to listen, and sound leadership through experience are attributes of a great project manager. ERM trains their project managers in these skills to enhance their business acumen abilities. Our project managers think beyond client satisfaction, align individual staff with project objectives, and foster a culture of team work. ERM also has the accounting tools to track budgets on a weekly basis. Our project managers are trained to monitor these budgets and work with accountants for accounting integrity.

Building Demolition

ERM's approach to demolition projects includes an early focus on proper planning to help clients understand and avoid cost growth, and analyze and control the risks inherent in demolition projects. ERM provides a source of safe field support, skilled environmental professionals, experienced and trained decontamination managers and safety officers, and the financial capacity to complete the work. ERM's turnkey analysis and oversight project controls help ERM clients:

- Avoid cost growth through detailed scope evaluation and cost control;
- Select cost competitive, efficient, and safe contractors;
- Provide a safe work environment;
- Retain environmentally knowledgeable ERM personnel that will help maintain compliance during the site closure efforts;
- Ensure proper training certifications and safe work practices are followed;
- Define standard work practices to provide a safe and compliant project site;
- Define and control how assets are reused and allow clients to control which waste disposal facilities are used; and
- Collect, maintain, and provide documentation describing the efforts completed on site.

Risk Assessment and Cleanup Level Development

ERM's risk assessments emphasize site-specific analyses and avoid reliance on generic exposure scenarios or default exposure assumptions. Our approach provides realistic estimates of potential risk and prevents the derivation of overly conservative cleanup levels, while still ensuring the development of a defensible analysis and the protection of human health and the environment. Our focused, realistic analyses frequently result in significant reductions in project costs and risk-based closure for a wide variety of sites.

Risk-Based Remediation and Cost Control

Risk-based remediation:

- Is an effective means of reducing the potential threat from historical releases, while controlling overall expenditures;
- Focuses on achieving a level of risk reduction, rather than specific cleanup levels in the affected media; and
- Recognizes that controlling exposures to affected media reduces risks as effectively as removing the contaminants from the media.

Beyond direct risk control measures, use of innovative in-situ technologies can also reduce both overall costs and the potential for worker or off-site resident exposure.

Feasibility Study/ Remedial Alternatives Evaluation

Based on site investigation data and analysis, ERM develops feasibility studies to select the most appropriate remediation alternative and then designs the selected remedy. ERM's approach to remedial investigation and feasibility studies of remedial alternatives ensures the consideration and application of appropriate and innovative technologies (such as recycling, bioremediation, and in-situ technologies etc.). Consistent with the objectives to balance cost, risk, and residual liability, we emphasize permanent solutions where appropriate technology exists, and recommend containment when no acceptable remedial technology is available or where cost dictates such an approach.

Remedial Design

ERM has experience with nearly all types of soil and groundwater contaminants. We have designed and built, or provided construction management, for virtually every type of conventional soil and groundwater remediation systems for treating soil and groundwater contamination in Wisconsin. We have designed both traditional and innovative methods or processes for source control, on-site and off-site treatment, and in-situ or ex situ treatment. Long-term remedial goals are always kept in focus to provide appropriate systems that will yield the best results in the shortest time and at the lowest overall project costs. Innovative technologies and approaches are continuously evaluated/developed and gauged against existing methodologies resulting in utilization of the most effective and efficient cleanup methods possible.

Remedial System Construction

ERM has the in-house capability to construct or modify remediation systems. ERM's projects have ranged from small-scale pilot studies utilizing mobile treatment equipment to the full-scale design, construction, and operation of multi-million dollar soil and water treatment systems. ERM implements these projects using our OSHA-

certified field engineering and construction crews, supported by ERM's management and technical resources.

ERM offers several basic approaches to remediation system construction projects that recognize the unique issues and challenges. ERM provides clients with high-quality engineering, planning, and construction services while meeting budgets and deadlines.

Project Team / Key Personnel

ERM and our subcontractors proposed for this remedial approach have unique attributes that bring added value to the Ehrlich Family Limited Partnership (Ehrlich Family); Passionate Customer Commitment, Operational Excellence, and Business Acumen. The combination of these factors allows us to deliver proactive risk identification, reduction and retirement of risks, cost-effectiveness, regulatory compliance, and all other services and outcomes that meet your needs.

Passionate Customer Commitment

Regardless of project scope, size, or site, our goal is to establish and maintain a standard of performance excellence that provides you with the services you need, when you need them, and where you need them. This focus means understanding and aligning our resources with your goals and objectives. Our businesses and services are built around the belief that real economic benefits – such as reduced costs and increased productivity – are gained through outstanding performance. We continually demonstrate these traits through work already performed with our existing base of local clients and repeat customers. This is evidenced by our repeat customer base.

Operational Excellence

Ehrlich Family will receive an ERM culture that demands operational excellence and continual improvement. Our operational excellence process creates alignment and performance in the Ehrlich Family-ERM partnership while simplifying operations through:

- Sharing of resources, technology, best practices, and management tools
- Reducing the "learning curve" on new project phases.
- Allowing continuous elimination of non-value-added activities and maintaining a "lean" organization.
- Creating an agile organization that responds efficiently and promptly.
- Providing high-quality project execution.

ERM Team

John Roberts, who is located in ERM Milwaukee, WI office, will serve as Project Manager and Primary Point of Contact. Mr. Roberts is project manager on multiple chlorinated solvent remediation projects. He is proficient at program management in regards to product consistency, client satisfaction and involvement, financial budgeting, and regulatory liaison. Mr. Roberts will bring this type of passion, experience, and expertise to the contract.

Mr. Roberts will be supported by ERM's staff in the Milwaukee, WI office. ERM has the local licensed engineering and geology staff to complete any potential tasks to get the Express cleaners site remediated and closed. We understand the complex hydrogeologic conditions of southeastern Wisconsin and are experienced working within the WNDR regulatory framework. ERM's long-term presence in Wisconsin and our active role in developing innovative approaches to site closures for dry cleaner and other chlorinated solvent sites have led to strong reputation and credibility with the WDNR.

Carl Stay, P.E. and P.G. located in ERM's Milwaukee, WI office, will serve as the project's lead engineer and hydro-geologist. Mr. Stay has 18 years experience as an engineer and hydrogeologist in the environmental consulting and remediation industry. Mr. Stay is very experienced with Wisconsin Administrative Code, PECFA requirements, project finance awareness, and innovative investigative and remedial technologies. His experience includes working with a multiple number of contaminants and appropriate remedial technologies. Mr. Stay brings a high degree of experience and knowledge that will drive the project to a success.

Brenna Bellmer, Staff Geologist, also located in ERM's Milwaukee, WI office, has experience in contaminated site investigation and remediation experience in Wisconsin, Illinois, and Indiana. Her experience includes investigation techniques of soils, groundwater, and surface/storm waters. Ms. Bellmer has performed remedial investigations and remedial injections to address chlorinated solvent contamination in soil and groundwater. She is experienced with executing in-situ

technologies such as chemical oxidation and emulsified oil supplementation.

Commodity services will be contracted for drilling, geoprobing, laboratory, concrete cutting, removal/replacement, and remedial chemical oxidation injection services. ERM will contract these commodity service providers, oversee their activities, and responsible for their performance.

ERM has selected a remediation contractor to assist ERM with implementation of site remedial activities. The contractor is environmental remediation firm that specializes in in-situ remediation of soil and groundwater with soil mixing and ZVI. The contractor is one of the leading remediation subcontractors in the United States, providing state-of-the-art services in delivery and formulation for in-situ remediation. They bring the technical capabilities and experience to effectively and efficiently address the site contaminants.

Section 2
Project Understanding

Project Understanding

Project Understanding

ERM understands that the Ehrlich Family Limited Partnership (Ehrlich Family) owns the commercial building at 3921-3941 North Main Street, Racine, Wisconsin and the adjacent property to the east at 3936 North Bay Avenue. Dry cleaning businesses previously occupied the northern unit of the building (3941) beginning in 1971. ERM understands that the entire building is currently vacant.

Evaluations of the property's environmental quality/condition were initiated in 2006. Phase I and II Environmental Site Assessments (ESAs) were completed by Gabriel Environmental Services in March and April, 2006. Their results identified tetrachloroethene (PCE) concentrations exceeding regulatory standards in subsurface soil samples. Subsequent site investigations conducted in accordance with Wisconsin Administrative Code NR 700 series were completed by Northern Environmental in June 2007, August 2007 (SC Johnson investigation), May 2008, January 2009, June 2009, and April 2011. Based on the results, remedial actions for the site were determined to be warranted.

The Ehrlich Family is seeking financial reimbursement through the State's Dry Cleaner Environmental Fund (DERF) program. To comply with program requirements, the Ehrlich Family has requested environmental restoration bids for future remediation at the Site.

The following is ERM's understanding of the site relative to existing environmental conditions. This understanding has been developed based on the Request for Remedial Action Bid Proposal dated November 20, 2013, and Site investigation files provided to ERM from Gonzalez Saggio & Harlan, LLP.

Site Conceptual Model

Based upon our understanding of site environmental conditions taken from previous investigations, the Site is underlain by shallow fill and organic loam deposits overlying an eolian silty sand with thickness ranging between 5 feet on the east and 9 feet on the west. The fill and loam deposits are underlain by a silty clay unit of unknown thickness that slopes gently downward to the west.

The water table, as measured in Site monitoring wells, appears to slope away from a local north-south trending groundwater divide that is situated just east of the building. The eastern gradient is approximately 0.003 and the western gradient is approximately 0.03. The dominant groundwater flow direction is to the west, evidenced by the footprint of the contaminant plume. Slug test data indicates that the sand has a hydraulic conductivity of 2.1E-04 cm/sec, and assuming an aquifer porosity of 25%, the average linear groundwater velocity is estimated to be approximately 26 feet per year to the west.

VOCs detected in Site soils and groundwater are primarily associated with tetrachloroethene (PCE) and its degradation products trichloroethene (TCE) and dichloroethene (DCE). The greatest concentrations of PCE are located beneath the eastern portion of the dry cleaners and beneath the asphalt paved area east of the building. Typical wastes generated at dry cleaner facilities include spent solvents, filters and sludge. At many sites, these wastes were commonly discharged in dry wells or sewers, stored in leaky containers or discarded in dumpsters. Although no history of Site-specific product and waste handling practices are available, the Site conceptual model assumes that historic handling of dry cleaning solvents resulted in their release to the underlying soils and the downward migration into groundwater. VOCs continue to migrate through advective and diffusive transport processes to other locations at the Site, including unsaturated soils, and result in the contaminant footprint depicted in published Site maps and cross-sections.

Cleanup Objectives

ERM assumes that soil cleanup objectives will include an evaluation to non-industrial standards for the protection of human health. Groundwater cleanup objectives will reference the Wisconsin Administrative Code Chapter NR 140 Groundwater Enforcement Standards and Preventive Action Limits. Active remediation by soil mixing with zero valent iron (ZVI) is anticipated to greatly reduce the contaminant concentrations. However, long-term natural attenuation will be employed to reduce concentrations to achieve the remedial objectives.

Remediation

ERM's recommended remedial option for soil and groundwater has been selected in accordance with WAC Chapter NR 722. However, the potential for near-term property re-development is unknown and was not factored into the evaluation. The costs to perform enhanced reductive dechlorination (ERD) via soil mixing of ZVI will require building demolition. However, the soil mixing approach allows the addition of a greater quantity of ZVI than with direct push injection methods. The additional amendment reduces the potential need for follow-up injections to maintain reducing conditions and provides for a greater weight percent of ZVI in the ERD mixture.

Section 3
Project Approach

Project Approach

Project Approach

ERM has selected a preferred remedial option that involves soil mixing with zero valent iron (ZVI) to enhance reductive dechlorination in the saturated and unsaturated materials with a PCE concentration of 1 mg/kg. This would require demolishing the strip mall building to facilitate direct access to the impacted materials.

The overall closure strategy involves contaminant mass reduction in the high concentration portion of the plume via enhanced reductive dechlorination (ERD) followed by monitored natural attenuation to document that the plume is stable or decreasing in concentration. In simple terms, we recommend adding relatively innocuous materials to help degrade the contaminants of concern. The proposed soil mixing remedy will disturb the subsurface soils and may require time to stabilize prior to commencement of construction activities. Further, the remedy may also require time for shallow soil vapor risks to be mitigated. We have developed an approach to:

- Document the specifications of the preferred remedial design;
- Implement an active remedial approach to address the contaminant mass in soil, groundwater, and vapor, on and off the property to protect human health and the environment;
- Confirm the success of the active remediation system through groundwater monitoring; and
- Document remedial activities and follow-up monitoring to request a case closure within a reasonable timeframe.

The scope of work was developed in accordance with NR 169 and 700 series, WAC.

Task 1 – Remedial Action Risk Review

ERM requires that a review of the risks associated with the proposed ZVI soil mixing remedy is performed prior to selection and implementation of the remedy at the site. This process is critical to evaluating potential risks remedy such as soil instability, incompatibility of materials, utility concerns, etc. associated with the proposed prior to implementation. If the risk review process concludes that there are unacceptable risks associated with the ZVI soil mixing at the site, then modification of the proposed remedy will be necessary.

Task 2 – Building Demolition

ERM's approach to demolition projects includes an early focus on proper planning to help clients understand and avoid cost growth, and analyze and control the risks inherent in demolition projects. ERM provides a source of safe field support, skilled environmental professionals, experienced and trained decontamination managers and safety officers, and the financial capacity to complete the work.

The proposed remedial action will require demolition of the existing strip mall building to provide equipment access and reduce the potential for structural impacts to the remaining portion of the building during the mixing. All utilities will be disconnected and removed from the soil mixing area as part of the demolition. A detailed proposal is provided as Appendix A.

Task 3 –Remedial Action Implementation (Soil Mixing)

ERM proposes to implement the *in situ* remediation (i.e., ERD) via soil mixing technology to incorporate the proposed soil amendments. In this case, ERM experts have selected REDOX Tech zero valent iron (ZVI) as the preferred amendment. This mixture will be added to the area defined by the unsaturated soil PCE concentrations greater than 1 milligram per kilogram (mg/kg). The proposed area of soil mixing has been modified to optimize treatment of the

impacted source areas while reducing the potential for down-gradient migration of chlorinated solvent impacts. The following areas are proposed to be treated with ZVI:

1. The source area – a 3,700 square foot area will be treated to a depth of approximately 8 feet below ground surface (bgs). The primary purpose of treatment in this area will be to rapidly decholrinate source impacts.

2. The former utility corridor – a 15 foot by 50 foot area (oriented east-west) that extends from the water table to approximately 7 foot bgs located to the west of the source area. The primary purpose of treatment in this area will be to rapidly decholrinate impacts that are present in the vicinity of the former utility corridor.

3. The downgradient reactive zone – a 5 foot by 60 foot area (oriented north-south) that extends from the water table to approximately 7 feet bgs. The primary purpose of treatment in this area will be to act as a permeable reactive barrier to prevent migration of impacts down-gradient of the source area.

4. The 3936 N. Bay Ave area – a 900 square foot area will be treated to a depth of approximately 2 feet below ground surface (bgs). The primary purpose of treatment in this area will be to rapidly decholrinate source impacts.

A map of the proposed treatment areas is provided as **Figure 1.**

Although the current perched aquifer chemistry is not necessarily reducing (required for optimal degradation), given its vertical dimensions relative to the soil mixing program, the ZVI amendment is expected to overwhelm the conditions and maintain a localized reducing environment.

The current investigation data indicate that although visually the unconsolidated deposits are silty sand, the horizontal hydraulic conductivity of the perched zone is at the low end of the range for sand (10^{-4} to 10^{-6} centimeters per second). Also, a high proportion of the contaminant mass likely resides as localized adsorbed material within pore spaces, via surface tension. The soil mixing process provides a mechanism for penetrating into the soil matrix to ensure that the amendments are well distributed within the bedded silty sand interval.

Based on the relatively small area and shallow depth of the planned treatment zone, and the well documented efficacy of PCE treatment using ZVI, ERM does not recommend performing pilot or bench scale testing prior to implementing the full-scale soil mixing. The remediation contractor will maintain an excess volume of ZVI on site during the full-scale soil mixing in the event that visual observations indicate that modification of the soil mixing program is warranted. Also, inclusion of a ZVI PRB element to the remedy along the downgradient margin of the primary treatment area will reduce the likelihood of migration of residual PCE from the treatment area. The ZVI soil mixing is anticipated to greatly reduce the overall subsurface impacts, however, is not intended to immediately address all site impacts.

Demonstration of monitored natural attenuation (MNA) of residual impacts will be necessary to achieve site closure. ERM estimates that 2 years of MNA monitoring will likely be sufficient to demonstrate long-term reduction of site impacts, however residual impacts may remain on-site and monitoring for more than 2 years may be required.

Task 4 -Post-Active Remediation Groundwater Monitoring and Semi-Annual Reporting

The WDNR updated the NR700 series regulations and a require performing eight quarters of groundwater monitoring to prove that a plume has achieved a stable or decreasing condition. While there are provisions in the new regulation to request a variance (fewer rounds) it is our opinion that due to the scope of the planned remedial activities, such a variance will not be granted for this site. Therefore, our bid includes the requisite eight quarterly rounds of ground water sampling.

All of the existing monitoring wells within and immediately adjacent to the soil mixing area will need to be abandoned. ERM proposes to install three new monitoring wells within the treatment area and one new monitoring well immediately downgradient (west). Our proposed, post-

remediation monitoring well network is presented on **Figure 1.**

ERM will resume groundwater monitoring during the first full calendar quarter after the soil mixing is completed. Quarterly groundwater sampling will continue for two years. For each round of sampling, 13 monitoring wells will be sampled and analyzed for volatile organic compounds (VOCs) per WDNR specified analytical methods. ERM will collect a sample duplicate and a field blank for quality assurance purposes during each monitoring round. Wells will be sampled via all appropriate methods. ERM assumes that all purge water generated by sampling activities will be able to be discharged to the City of Racine public sewer system, as is the case with the City of Milwaukee.

Post remediation groundwater monitoring reports will be submitted to the WDNR semi-annually. ERM will prepare for parallel submission to WDNR a report providing the results of the remedial action and a report of the first two quarters of groundwater monitoring. These reports will follow WDNR guidelines for content.

Task 5 - Case Closure Request Report

ERM will prepare a case closure request report per WDNR guidelines. This closure report will outline the case for closure of the site which ERM assumes will be the appropriate course of action at the end of the two year groundwater monitoring period based on anticipated results of the proposed remedial action. It is anticipated that closure of the site will be contingent upon inclusion in the WDNR's GIS Registry of sites with residual impacts to soil and/or groundwater.

Project Scheduling

ERM understands that the Ehrlich Family wishes to select a contractor as soon as possible and expects a remedial action plan within a mutually satisfactory timeframe. ERM also understands that timely approvals of submitted documents to the WDNR are expected and will not inhibit implementation of the remedy. ERM estimates that the active remedial activities can be implemented within six months of consultant selection and authorization, dependent upon accessibility, weather, or other unforeseen time constraints.

ERM anticipates the project scheduling as depicted at the end of this section.

Access and Permits

ERM expects that all reasonable efforts to thoroughly access buildings and lands will be accommodated by the Ehrlich Family and others. ERM further expects that entry access, permits, local ordinances and approvals, where necessary, will be approved on a timely basis and will not inhibit ERM's ability to meet the Ehrlich Family's expected timeline.

Wisconsin Voluntary Party Liability Exemption (VPLE) Program

Enrollment of the Site in the VPLE program would not impact case closure, regardless of the type of remedial action implemented. There are no special closure criteria or considerations for sites in the VPLE program. Enrollment in the VPLE program would provide Ehrlich with an exemption from future liability only after the standard case closure process was completed. The liability exemption applies, for example, if subsurface impacts are discovered in the future to be more extensive than originally thought, or if environmental standards are modified.

Additional costs for enrollment in the program include a $250 application fee, a $1,000 advance deposit to WDNR for document review, and a $100 per hour WDNR labor charge if that deposit is exhausted during the document review. ERM would charge approximately $300 to complete and submit the enrollment application.

Sustainability

The WDNR's Remediation and Redevelopment Program recently embarked on a new initiative called Wisconsin's Initiative for Sustainable Cleanups (WISC). The emphasis of the WDNR initiative is to apply sustainable technologies in site remediation to save energy, reduce greenhouse gases and minimize waste through reuse and recycling. The goal

of the WISC program is to optimize remedies that are protective of public health, safety and the environment to make them economically sound and more sustainable to meet long-term needs and protect valuable state resources. The initiative is also committed to employing sustainable technologies which will help Wisconsin contribute solutions to global climate change concerns. The WDNR has developed guidance documents for consultants to use when designing and implementing sustainable remedial actions. This guidance will be followed during the design and implementation of the site remedial approach.

ERM is a global leader in identifying and implementing sustainable business solutions for our clients. As such, we are actively engaged in the emerging practice of incorporating sustainability concepts into the design and implementation of new and existing remedial actions. ERM personnel are at the forefront of sustainable remediation through their participation in workgroups with members from industry, regulatory agencies, and consultants that are evaluating sustainable approaches to remediation.

Section 4
Specific Information in Accordance with WAC NR 169

Specific Information in Accordance with WAC NR 169

The following information is provided to specifically comply with the DERF, Remedial Action Bid Checklist (form RR-756, July 2006).

NR 169.23 (2)(d) – Sealed Bids
ERM has included a sealed bid with this submittal. Table 1 provides a cost breakdown relative to each specific project tasks, as defined in the previous section of this proposal, and total project costs. A copy of ERM's Contract Terms and Conditions are provided in Appendix B.

NR 169.23(3)(b) - Statement of Consultant's Ability
ERM has reviewed all provided information and has developed an approach to meet all site objectives. We have the expertise, experience, and capabilities to design a suitable remedial action response. ERM staff will provide accurate technical reviews, plans, and designs; effectively oversee construction and operation of the remedial system; and monitor and document all site activties in an ethical, timely and professional manner. All work will be completed or overseen by Wisconsin-certified professionals

NR 169.23(6)(a) - Technical and Economic Feasibility Evaluation of Remedial Alternatives
ERM completed a technical and economic feasibility evaluation of remedial alternatives for the Site in accordance with WAC NR 722. Various technologies were compared based on the following criteria:

- Ability of the option to meet the remedial objectives (effectiveness);
- Implementability of the remedial alternative;
- Fiscal commitment of the remedial alternative; and
- Time requirement to achieve remedial objectives.

Appendix C contains a table that documents a list of remedial alternatives that were evaluated with respect to the criteria included in NR722 WAC. The comments column of the spreadsheet presents our evaluation of how each technology compares against the criteria relative to the specific conditions at the Express Cleaners site.

Based on these comparisons, ERM has selected in-situ Enhanced Reductive Dechlorination (ERD) using ZVI amendment via in-situ mixing to address the following:

- Soil and groundwater contamination, and
- A ZVI permeable reactive barrier (PRB) located downgradient of the primary soil mixing area to address the potential for impacted groundwater migration and contaminant vapors along the property boundaries.

Post-treatment groundwater monitoring will be performed to evaluate the contaminant plume response to the ERD and assess subsequent monitored natural attenuation (MNA) potential. ERM estimates that 2 years of MNA monitoring will likely be sufficient to demonstrate long-term reduction of site impacts. Although we cannot guarantee the success of the proposed remediation, ZVI has been successful in significantly decreasing chlorinated solvent impacts at numerous sites with similar conditions. Further, we believe that ZVI soil mixing provides a cost effective and easy to implement approach to remediating the site impacts.

NR 169.23 (6)(b) - Remedy for Closure
ERM has selected in situ remediation (i.e., ERD) via soil mixing technology to incorporate the proposed soil amendments. In this case, ERM experts have selected the Zero Valent Iron (ZVI) as the preferred amendment to address soil and groundwater contaminants to achieve site closure in accordance with WAC NR 726. This technology has been proven successful in significantly reducing chlorinated solvent concentrations in similar settings. Success is dependent upon maintaining reducing conditions

within the treatment zone such that the appropriate bacteria and/or ZVI can degrade the contaminants. Soil mixing will allow the ZVI to be evenly distributed throughout the treatment zone to reduce the potential for spotty distribution of the amendments. The ZVI will be applied in the following manner:

- Demolition of the strip mall building and removing utilities, monitoring wells, and parking lot surfaces from the treatment area.
- Application of the ZVI into subsurface soils and groundwater using mechanized soil mixing equipment within the previously determined 1,000 ug/kg saturated and unsaturated soil PCE concentration footprint (approximately 8 – 10 feet deep).

All of the existing monitoring wells within and immediately adjacent to the soil mixing area will need to be abandoned. ERM proposes to install three new monitoring wells within the treatment area and one new monitoring well immediately downgradient (west).

ERM will resume groundwater monitoring during the first full calendar quarter after the soil mixing is completed. Quarterly groundwater sampling will continue for two years.

Because the preferred remedial option requires demolition of the existing building above the contaminated area, a provision to mitigate the potential for vapors within the former dry cleaner is not relevant.

The proposed approach provides a comprehensive plan to address the highest concentrations at the site. The ERD approach focuses on direct application of ZVI to immediately destroy contaminants of concern (COCs) upon contact and substantially reduce residual concentrations of COCs. Mitigation of off-site groundwater migration and resulting vapors is addressed through the use of ZVI PRB and natural attenuation. Further detailed discussions of the proposed approach are provided in the prior section (Tasks 3, 4 and 5).

NR 169.23(6)(c) - Itemized List of Consultant and Contract Services

The following is a description and list of consultant and contract services for this proposed scope of work.

ERM – Environmental Resources Management- the environmental consultant leading the project. ERM will manage all aspects and contractors of the project including;

- Design of remedial approach and document submittal;
- Oversee remedial approach construction and implementation;
- Conduct post-remedial groundwater monitoring collection and documentation to monitor remediation progress; and
- Closure report documentation.

Demolition Subcontractor – Assuming that the site utilities have been isolated and capped/relocated, the demolition subcontractor will remove piping and wiring from the planned soil mixing area. ERM understands that all asbestos containing materials have been abated from the premises. The building, floor slab and foundation footings will be demolished and the materials disposed of at an appropriately licensed landfill as construction and demolition materials.

Remediation Subcontractor – The remediation subcontractor will be contracted by ERM to provide material and services associated with the ERD activities. The subcontractor will perform the soil mixing of ZVI throughout the entire treatment zone footprint.

Drilling Services – A drilling service provider will be contracted by ERM to construct the replacement and new groundwater monitoring wells.

Laboratory Services – A laboratory service provider will be contracted by ERM to provide analytical services throughout the project. The laboratory will be a State of Wisconsin certified laboratory.

Utility Locator – A private utility locator will be contracted by ERM to provide subsurface utility locations. This will ensure that any subsurface work will not adversely encounter any of the subsurface utilities.

Disposal Services – A disposal service provider will be contracted by ERM to provide appropriate soil, concrete, and if necessary, groundwater transportation and disposal services.

NR 169.23(6)(d) - Remedial Action Pilot Test Estimate
A gene trac test for the presence of CVOC dechlorinating bacteria will be performed prior to full-scale remedial implementation. Samples collected using Microbial Insights, Inc. baited Bio-Trap® samplers from within the contaminant zone will be submitted their laboratory for bacterial testing. This information will be used to determine whether additional bacterial culture amendment will be needed to be added to the ERD formulation. The estimated cost for the Bio-Trap® testing is $1,900.

NR 169.23(6)(e) - Total Cost Estimate
ERM has assumed that the existing building will be demolished before commencing remediation. The RFP requested itemization of the demolition costs. Our sealed bid includes three tables. Table 1 presents the costs to demolish all the building before commencing remediation, implement the remedial approach, and prepare site closure documentation. As requested, line item costs for the building demolition are provided as Table 2.

The cost tables provided by ERM include a detailed list for the total cost of consultant and contractor services. The total cost includes subtotals for each component of the remedial action plan. Upon acceptance of this proposal, ERM will issue an invoice for 30% of the total cost. The payment terms are 30 days from the date of the invoice, and ERM standard Terms and Conditions are provided as Appendix C.

NR 169.23(6)(f) - Hours and Cost per Units
ERM has provided an estimated price per hour for every service and a total estimated cost for all services broken down in Table 1 contained within the sealed bid.

Table 3 provides the estimated hours of service provided. ERM understands that the Ehrlich Family expects the remedial action plan to be implemented within a mutually satisfactory timeframe.

NR 169.23(9)(a) - Consultant Certification Statement
ERM's remedial approach/action for the contaminated soil and groundwater will be in accordance with WAC NR 700 series. Upon WDNR request, ERM will provide documents and records of contract services. ERM did not prepare the proposal in collusion with any other consultant bidding on this project.

NR 169.23 (9)(b)(1) - Certification of Insurance
A copy of ERM's Certificate of Insurance is provided in Appendix D. We comply with all of the requirements as set forth in the regulation except for the maximum deductible requirement of $25,000/claim. ERM's deductible is $250,000/claim. Included in Appendix D is a statement from a company Principal stating that ERM has the financial responsibility for specific requirement of $25,000/claim.

Environmental Resources Management, Inc.
Bid Proposal Response for Remedial Action
Express Cleaners/ Ehrlich Family Limited Partnership
3941 N. Main Street, Racine, WI

Table 1
Cost Estimate for Demolition and Remediation

Task	Activity/Description	Total Estimated Costs
1.	**Risk Review**	
	ERM Labor	$3,415
	Total Task 1	**$3,415**
2.	**Building Demolition**	
	ERM Labor	$9,890
	Demolition Subcontractor	$77,900
	Field Supplies	$730
	Miscellaneous Supplies	$250
	Total Task 2	**$88,770**
3	**Remedial Action Implementation**	
	ERM Labor	$40,050
	Remediation Subcontractor	$129,420
	Drilling Subcontractor	$7,020
	Utility Locator	$1,620
	Laboratory	$1,840
	Travel	$2,430
	Field Supplies	$3,000
	Miscellaneous Supplies	$390
	WDNR Fees	$750
	Total Task 3	**$186,520**
4.	**Post-Remediation Groundwater Monitoring and Reporting**	
	ERM Labor	$34,720
	Waste Subcontractor	$650
	Laboratory	$7,780
	Travel	$1,070
	Field Supplies	$5,820
	Miscellaneous Supplies	$860
	Total Task 4	**$50,900**
5.	**Site Closure Report**	
	ERM Labor	$8,040
	WDNR Fees	$750
	Miscellaneous Supplies	$30
	Total Task 5	**$8,820**
	Grand Total	**$338,430**

Environmental Resources Management, Inc.
Bid Proposal Response for Remedial Action
Express Cleaners/ Ehrlich Family Limited Partnership
3941 N. Main Street, Racine, WI

Table 2
Demolition Line Item Breakdown

Item		Amount	Unit Cost	Unit	Total
1	Demolish Building and Dispose at a Landfill	1.00	$ 62,650	Lump	62,650
2	Remove Footings and Concrete Floors, and Backfill as Necessary[1]	-	-	-	-
3	Remove Exterior Concrete and Asphalt	3,200	$ 1.50	Square Foot	$ 4,800
4	Perform Sewer, Water, and Utility Disconnects[1]	-	-	-	-
5	Supply and Erect Temporary Fencing as Required and Appropriate	750	$ 10.50	Linear foot	$ 7,880
6	Supply and Erect Silt Fencing as Required and Appropriate[2]	-	$ 2.00	Linear foot	$ -
7	Obtain all Necessary Permits	-	-	-	-
8	Supply and Perform Backfill as Necessary Throughout the Property[3]	107	$ 24	Ton (stone)	$ 2,570
9	Other Miscellaneous Costs, as Necessary[1]	-	-	-	-
TOTAL					77,900

Notes:

1 - Included in Item 1.

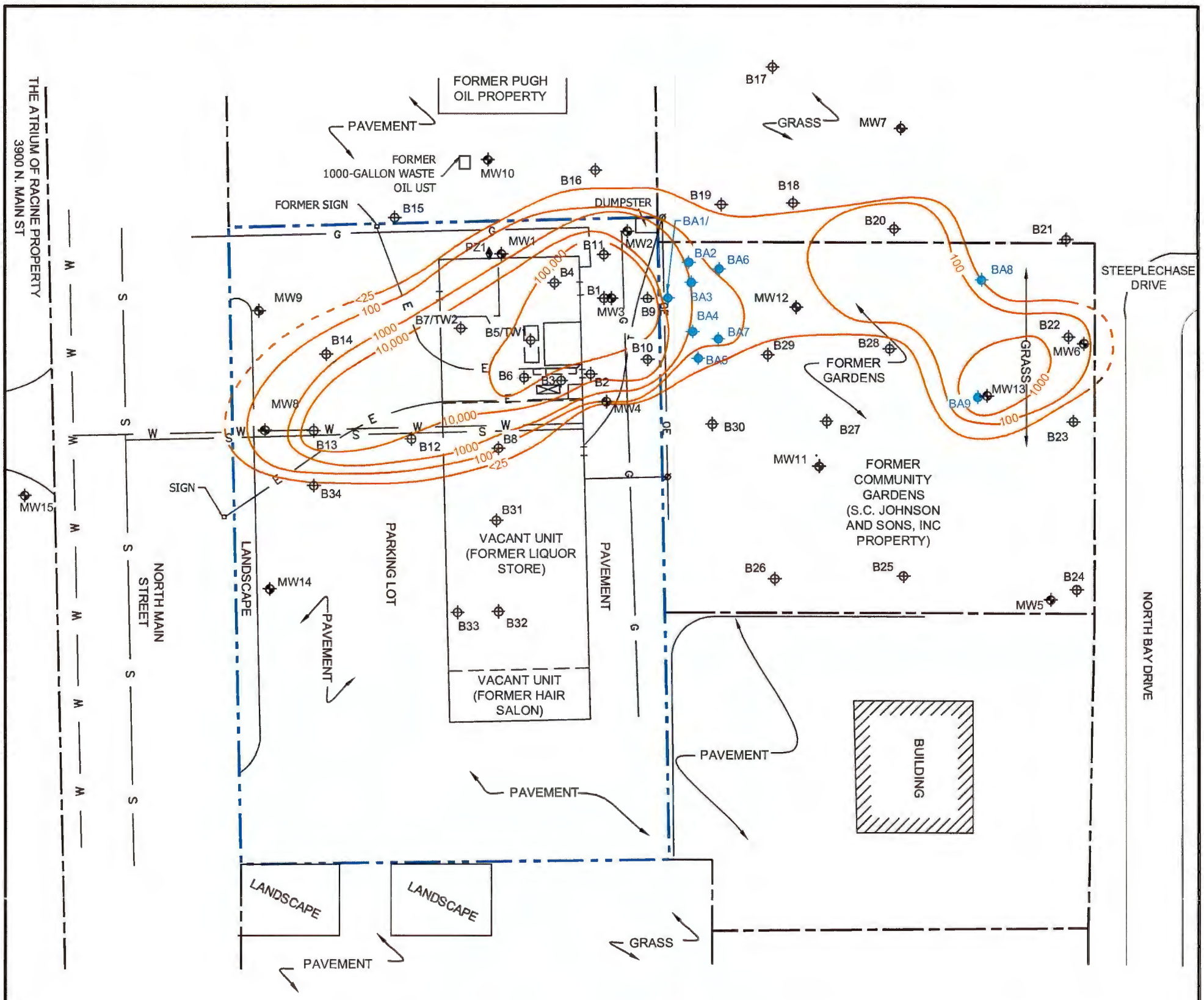
2 - Silt fencing is not necessary

3 - Backfill cost shown is an estimate subject to change due to currently unknown factors related to the depth and placement of subsurface support features beneath the currently existing building.

Environmental Resources Management, Inc.
Bid Proposal Response for Remedial Action
Express Cleaners/ Ehrlich Family Limited Partnership
3941 N. Main Street, Racine, WI

Table 3
Labor Breakdown

Position	Rate	Building Demolition Hours	Site Remediation and 2 yrs Groundwater Monitoring Hours	
Partner	$210	4	11	3150
Program Manager	$210	6	15	4410
Project Manager	$131	18	156	22794
Demo Manager	$110	40	8	5280
Engineer	$90		351	31590
Geologist	$70		272	19040
CAD Operator	$70		44	3080
Administrative Assistant	$90		18	1620
Total		68	875	90,969



LEGEND

- SUBJECT PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARIES
- OE — OVERHEAD ELECTRIC LINE
- G — UNDERGROUND GAS LINE
- W — WATERMAIN
- E — BURIED ELECTRIC LINE
- S — BURIED SANITARY SEWER
- T — BURIED TELEPHONE LINE
- ⌀ — UTILITY POLE
- FORMER DRY CLEANING MACHINE LOCATION
- EXISTING DRY CLEANING MACHINE
- MW1 — 2" MONITORING WELL LOCATION AND IDENTIFICATION
- B34 — BOREHOLE LOCATION AND IDENTIFICATION
- BA5 — HAND AUGER NEAR SURFACE SAMPLE LOCATION AND IDENTIFCATION
- PZ1 — PIEZOMETER LOCATION AND IDENTIFICATION
- TW2 — 1" TEMPORARY MONITORING WELL LOCATION AND IDENTIFICATION
- —100— UNSATURATED SOIL PCE ISOCONCENTRATION LINE IN MICROGRAMS PER KILOGRAM (DASHED WHERE INFERRED)

Sample Location	Sample Depth (feet)	Soil PCE Concentration (ug/kg)
PZ1	1-3	370
MW1	3.5-5.5	430
MW2	1-3	1740
MW3	1-3	8400
MW4	1-3	<25
MW6	2-4	48
MW8	1-3	330
MW12	1-3	<18
MW14	3-5	<24
MW15	2-4	<24
B1	4	121,000
B2	2	9900
B2	12	465
B3	4	21,100
B4	2-4	270,000
B4	4-6	1,380
B4	14-16	270
B5	2-4	66,000
B5	10-12	305
B6	2-4	136,000
B6	12-14	174
B7	2-4	10,200
B7	6-8	77,000
B8	2-4	67
B9	0-2	92,000
B9	8-10	770,000
B10	2-4	14,000
B10	8-10	28
B11	2-4	63,000
B11	6-8	590,000
B12	2-4	1370
B13	2-4	112
B13	6-8	68,000
B14	2-4	131
B15	2-4	<25

Sample Location	Sample Depth (feet)	Soil PCE Concentration (ug/kg)
B15	4-6	<25
B16	2-4	<25
B17	2-4	<25
B18	2-4	<25
B19	2-4	<25
B20	2-4	104
B21	2-4	<25
B22	2-4	670
B23	2-4	<25
B24	2-4	<25
B25	2-4	<25
B26	2-4	<25
B27	2-4	<25
B28	2-4	<25
B29	2-4	<25
B30	2-4	<25
B31	2-4	<25
B32	2-4	<25
B33	2-4	<25
B34	3-5	<24
BA1	2	130
BA2	0.5	650
BA2	2	700
BA3	0.5	1200
BA3	2	1300
BA4	0.5	690
BA4	2	100
BA5	3	43
BA6	0.5	56
BA6	2	74
BA7	0.5	84
BA7	2	380
BA8	1.5	<25
BA9	0.5	33
BA9	2	1200

SCALE IN FEET
20 0 20 40

Bonestroo
12075 N CORPORATE PKWY, STE 200
MEQUON, WISCONSIN 53092
P: 262-241-4466 F: 262-241-4901

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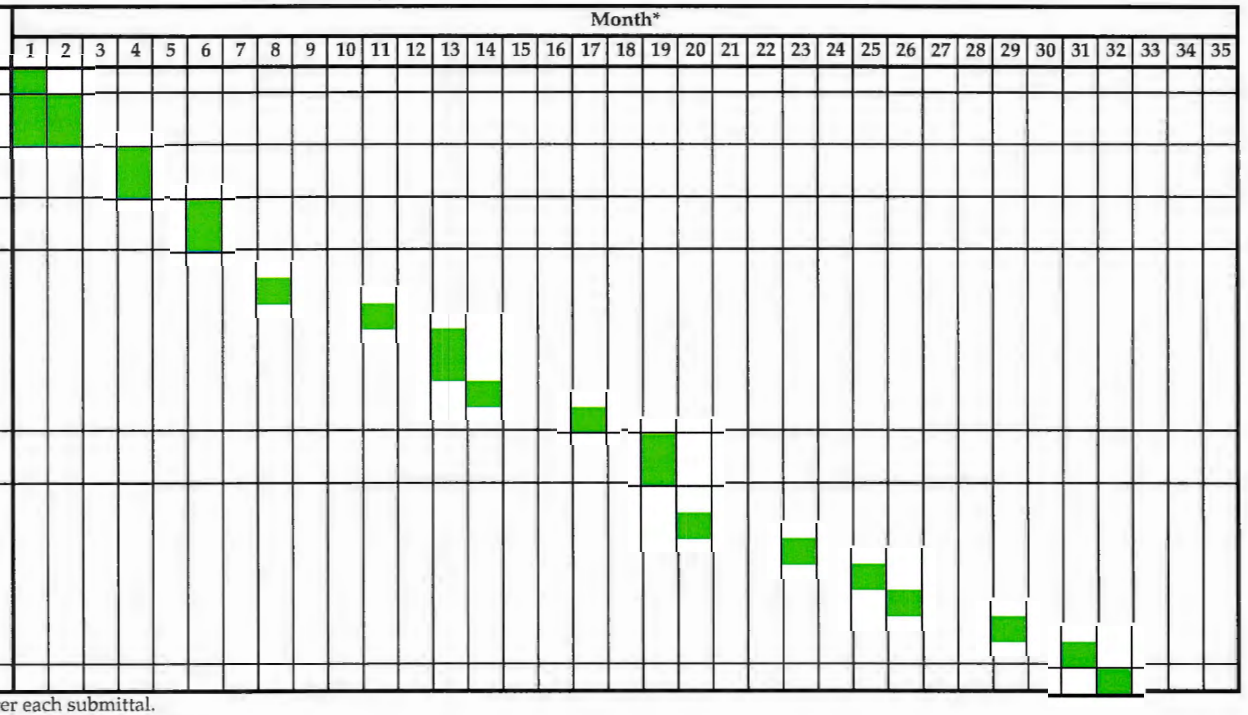
SITE LAYOUT

EXPRESS CLEANERS, INCORPORATED
3941 N. MAIN STREET
RACINE, WISCONSIN

DATE: 04/15/08 | DRAWN BY: BMP | REVISED: 2011-04-21 AJS | PROJECT NUMBER: 003592-09001-0 | FIGURE 1

ANTICIPATED PROJECT SCHEDULE

No.	Task	Month*
	Project Authorization	
1	Risk Review	
2	Building Demolition	
3	Remedial Action Implementation (Soil Mixing)	
4	First Year of Groundwater Monitoring • 1st Quarterly Event • 2nd Quarterly Event Semi-Annual Monitoring Report and Remedial Action Completion Report • 3rd Quarterly Event • 4th Quarterly Event	
4	First Annual Monitoring Report	
4	Second Year of Groundwater Monitoring • 1st Quarterly Event • 2nd Quarterly Event Semi-Annual Monitoring Report • 3rd Quarterly Event • 4th Quarterly Event Second Annual Monitoring Report	
5	Closure Report	



* The schedule allows for 60 day review by WDNR after each submittal.

** The remedial action implementation will begin after the building is demolished and is contingent upon subcontractor equipment availability.

Appendix A
Demolition Proposal

Environmental
Resources
Management

700 W. Virginia Street
Suite 601
Milwaukee, WI 53204
(414) 289-9505
(414) 289-9552 (fax)
http://www.erm.com

ERM

December 23, 2013

William P. Scott
Gonzales Saggio & Harlan LLP
225 East Michigan Street
Milwaukee, WI 53202

Re: **Demolition of Structure (3941 N. Main St., Racine, WI)**

Dear Mr. Scott:

Environmental Resources Management, Inc. (ERM) is pleased to submit this proposal to Gonzalez Saggio & Harlan, LLP on behalf of the Ehrlich Family Limited Partnership (Client) for completing the demolition and removal of the Client-owned one-story commercial building (Site) located at 3941 North Main Street in Racine, Wisconsin (Site). ERM conducted a pre-bid site walk at the Site on 15 February 2012 to review and document the existing Site conditions, as well as, meet multiple potential subcontractors.

The demolition will be performed prior to commencing soil remediation activities at the site as described in the ERM proposal dated August 19, 2011, and proposal addendum to which this letter is attached. An estimated cost to demolish the northern 5,000 square feet of the above referenced structure was included in the August 2011 proposal. This proposed scope of work, special terms and conditions, and supplemental estimated probable costs are being provided as part of an addendum to the August 2011 proposal in response to the EFLP's request.

ERM APPROACH AND BENEFITS

ERM's approach to demolition projects includes an early focus on proper planning to help clients understand and avoid cost growth, and analyze and control the risks inherent in demolition projects. ERM provides a source of safe field support, skilled environmental professionals, experienced and trained decontamination managers and safety officers, and the financial capacity to complete the work.

ERM's turnkey analysis and oversight project controls help ERM clients:

- Avoid **cost growth** through detailed scope evaluation and cost control;
- Select **cost competitive, efficient, and safe** contractors;
- Provide a **safe work** environment;
- Retain environmentally knowledgeable ERM personnel that will help maintain **compliance** during the site closure efforts;
- Ensure proper training certifications and **safe work practices** are followed;
- Define standard work practices to provide a **safe and compliant** project site;
- Define and **control** how assets are reused and allow clients to control which waste disposal facilities are used; and
- Collect, maintain, and provide **documentation** describing the efforts completed on site.

SCOPE OF WORK

1. ERM, or it's subcontractor, will install temporary fencing around the work area.

2. ERM, or it's subcontractor, will arrange for the disconnection of one water main and one sanitary sewer within the property limits.

3. ERM, or it's subcontractor, will provide, erect and maintain all barricades, traffic control devices, hand railings, toe boards, safety devices, safety measures and security measures necessary for the protection of ERM, or it's subcontractor, 's employees and agents until the completion of work specified under this Agreement.

4. Upon the completion of work under this Agreement, ERM, or it's subcontractor, will remove all safety devices and measures and security measures put in place for the work effort.

5. ERM, or it's subcontractor, will remove the universal wastes and refrigerant gasses from the work area.

6. ERM, or it's subcontractor, will remove the following structures:

~7,900 Square foot strip mall including attached sidewalk in front and the overhead sign near roadway

ERM, or it's subcontractor, will remove these structures down to 6 feet below surrounding grade.

ERM, or it's subcontractor, will remove, load, haul and legally dispose of all combustible, metallic, and solid fill debris resulting from the above captioned removal work. The concrete floor or footings in the former dry cleaner space may be impacted with tetrachloroethene or other compounds. Waste characterization of the concrete will be performed by ERM prior to building demolition. Some concrete may require transportation and disposal as special waste. Costs for managing the demolition debris as special or hazardous waste were not included in the original proposal, and are not included in this addendum.

7. Upon completion ERM, or it's subcontractor, will leave the site ready for the planned soil remediation.

Work by Client

Client agrees to perform the following at no cost to ERM, or its subcontractor, and in a timely manner so as not to impede the progress of ERM, or its subcontractor's, work described herein:

1. Unless otherwise provided herein, identify, remove, and dispose of any substance that is controlled or regulated by any law, statute, ordinance or regulation or any substance designated as a hazardous waste or hazardous substance under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or both. This includes potential mercury switches and PCB ballast identified during the site walk. ERM can, for an additional cost, manage the removal of any asbestos containing material identified during the asbestos survey. Alternatively, the client can manage the proper collection and disposal of asbestos-containing materials.
2. Authorize ERM, or its subcontractor, to utilize any or all of the following equipment and/or devices to complete the work described in this Agreement:
    - Oxygen cutting torches
    - Pneumatically powered drills and breakers

- Hydraulically powered breakers
- Diesel power skid steer loaders

3. Authorize ERM, or its subcontractor, to operate heavy equipment and trucks throughout the work area.
4. Provide convenient access for the entry of heavy equipment and trucks into the work area.

Contract Conditions

Client and ERM agree that:

1. ERM, or its subcontractor, shall occupy the entire work area exclusively upon the commencement of ERM, or its subcontractor's, work. ERM, or its subcontractor, shall not be responsible for the safety of any person who enters the work area unless such person has been specifically authorized by ERM, or its subcontractor, to enter the work area.
2. Client shall at all times be exclusively responsible for damage to or loss of any property, which is not owned by ERM, or its subcontractor. Client shall be exclusively responsible for damage to or loss of any salvage that is to become the property of ERM, or its subcontractor, until the commencement of work by ERM, or its subcontractor. After the commencement of work by ERM, or its subcontractor, ERM, or its subcontractor, shall be exclusively responsible for any damage to or loss of tools, equipment, salvage, or property, which is owned by ERM, or its subcontractor.
3. ERM, or its subcontractor, will schedule work on a single shift basis five days each week.
4. Client will convey to ERM, or its subcontractor, all rights to, title to, and interest in all building contents and/or salvage materials not listed above that is currently located within the dismantling area.
5. Topsoil and seed are excluded from this contract.

ERM Turn-Key Project Management

1. ERM will mobilize necessary personnel and equipment to the Site to perform the work. This subcontractor will meet ERM's health and

safety requirements and sign a contract agreeing to perform the work in accordance with the proposed terms and conditions of this contract.

2. ERM will prepare a health and safety plan for the work to ensure that the work is performed in a safe and efficient manner.
3. ERM will provide a full-time Demolition Manager/Field Safety Officer who will oversee the subcontractor at the site from the initial mobilization until all of the work is complete and the Subcontractor has departed the property. The duties of that individual will include, but not be limited to:
    - Assuring that daily safety meetings are performed;
    - Coordinating efforts with EFLP to minimize Subcontractor delays;
    - Oversee our subcontractor to ensure that the job requirements and scope of services are being followed;
    - Oversee our subcontractor to ensure that their Health & Safety Plan and site safety requirements are being followed;
    - Obtain photo-documentation of activities for a final report;
    - Review any potential requests for a change order from the Subcontractor, and either recommend approval or rejection, with reasons, to Client;
    - Interface between subcontractor and client representatives on all questions and concerns;
    - Meet with subcontractor's Superintendent daily, at end of day, to discuss in detail planned Subcontractor activities for the following work day. Provide a simplified summary report of those plans; and
    - Ensure that subcontractor keeps the work area in a clean, uncluttered condition and that they maintain traffic and pedestrian controls.
4. As the project becomes Substantially Complete, ERM's Demolition Manager will attend an initial inspection with Client and document in a "Punch List" outstanding items requiring repair or completion. The Demolition Manager will, following his inspection, report when the Punch List items and activities are successfully completed for final inspection and approval by Client.

5. Following final site work completion, cleanup, and demobilization by our subcontractor, ERM will prepare a final report that includes daily reports, photo-documentation, records of waste and scrap shipment, lien releases, meeting notes, and other relevant project information. The purpose of this report is to assist in closing out the project, and to provide documentation that may be requested of Client by others.

PROJECT TIMETABLE

- The project is anticipated to require five total work days.
- Demolition Effort: Three days on site to complete all work as identified in the Scope of Work.

ESTIMATED COSTS

This project will be conducted on an Estimated Probable Cost (EPC) basis, as described more fully below. These EPC values may be modified based on actual costing to complete the project. This quote assumes that EFLP will have adequate information and support personnel to conduct the services herein.

The EPC for the above scope of services regarding DD&D Turnkey Management for a five work day project period is **$88,770**. Some concrete may require transportation and disposal as special or hazardous waste, which would result in a cost increase.

The following project-specific terms and conditions apply to this SOW:

- The term **Substantial Completion** is further defined as follows:
    - Includes only the activities, tasks, or physical attributes contained in the Project SOW, associated addendum, change order, or Certificate of Completion.
    - Excludes any and all physical or administrative activities not specified in the scope of work change order, such as required of Client.
- The term **Project Period** is further defined as follows in context of unavoidable delays:

- Cost and schedule commitments contained in this SOW or other Project Contract Document will be subject to equitable adjustments for delays caused by Client's failure to provide any required approval or suitable Project Site access or by occurrences or circumstances beyond ERM or Subcontractor's reasonable control, including without limitation, fires, floods, earthquakes, strikes, riots, war, terrorism, threat of terrorism, acts of God, acts or regulations of a governmental agency, emergency, security measure, unusual weather conditions or other circumstances ("Force Majeure"). If ERM determines in its sole discretion, based on circumstances surrounding the Project, that the health or safety of its personnel or its subcontractors' personnel is, or may be, at risk in performing Services, such circumstances will constitute a Force Majeure, and ERM will have the right to take any measure it deems necessary to protect personnel at Client's expense. If it is impracticable for ERM to obtain authorization from Client in an emergency affecting the health or safety of persons, the environment, or property, ERM may, at its discretion, act to prevent threatened damage, injury, or loss at Client's expense. Stoppage or interruption caused by any of the above that results in additional cost beyond that identified in any Project Contract Document for the performance of any Services under any Project Contract, will entitle ERM to an adjustment to the Project Contract price and performance schedule referenced in the applicable Project Contract.
- ERM will maintain a record of delays in the Project Schedule that constitute a Force Majeure.
- A Project Schedule, Milestone or Completion element that is extended due to Force Majeure events will likewise extend the other schedule-driven Project Completion aspects of this SOW.

PROJECT TEAM

Daniel W. Petersen, Ph.D., P.G., will be the Partner-in-Charge and will be the team leader. He will be responsible for the overall direction of the project. Dan has 20 years environmental experience in the Midwest and has directed demolition projects ranging from asbestos abatement and

universal waste removal to the demolition and contaminated site construction of heavy industrial buildings.

David Schleiff will be the Demolition Manager. David has more than 15 years of experience in multiple industries and the United States Army, with 10 years of project management experience in the construction and demolition industries in both the private and federal markets in multiple regions of the US. David has extensive experience in contract management, implementation and negotiations, as well as, project design processes, construction and demolition project delivery and construction and demolition processes.

ASSUMPTIONS

- EFLP is the client.
- Client will retain one knowledgeable mechanical/electrical person that has knowledge of the utilities, equipment, and process lines.
- Client will terminate electrical, gas and fiber optic utilities prior to project start.
- Scrap value from the equipment removal or sale of the equipment by ERM is part of the compensation to ERM's subcontractors for the completion of this work. The current costs do not include any scrap value give back amount.
- A Client employee or designee will sign all manifests as the generator of regulated wastes or arrange to have ERM included as an agent to facilitate manifest signatures for regulated waste disposal.
- No work delays will be experienced due to security, labor conflicts, or severe weather.
- The costs do not include the rerouting of existing utilities.
- The costs do not include the removal of any soils, or bulk hazardous materials.

Appendix B
Personnel Profiles and Selected Examples of Relevant Experience

Daniel W. Petersen, Ph.D, P.G.

Dan Petersen has more than 20 years of experience addressing the environmental needs of industrial, commercial, and legal clients. His primary fields of expertise include: brownfield development; site investigation and remediation under CERCLA, RCRA, and voluntary cleanup programs; due diligence for mergers, acquisitions, and divestitures including large portfolios; developing compliance assessment and compliance management programs for large industrial and commercial clients; and overseeing permitting programs for industrial and commercial clients.

Dan has extensive experience in the characterization and remediation of environmentally challenged properties including active industrial facilities, former landfills, and abandoned manufacturing facilities. His activities have included site characterization, vapor surveys, large scale excavations, demolition, *in situ* stabilization and destruction, engineered barriers, contaminated site construction, and multi-tiered risk evaluation. He has also directed multi-million dollar redevelopment projects.

Dan has in-depth knowledge and experience in the negotiation and closure of Brownfield sites under the Illinois Environmental Protection Agency (IEPA) Site Remediation Program for property redevelopment. Key tasks included preparation of brownfield grant applications; site/source investigations; remedial action design; calculation of corrective action objectives; preparation of remedial objective reports under Tiers 1, 2, and 3; negotiation of corrective action objectives; evaluation of vapor intrusion issues under proposed IEPA regulations; and supervision of these aforementioned activities.

His transactional expertise includes the assessment of small and large commercial and industrial portfolios as part of due-diligence activities. Dan has directed transaction projects for more than 300 sites and deals worth over a billion dollars. These sites have included petroleum, chemical manufacturing, packaging, health care, heavy manufacturing, and explosives. He has also developed comprehensive liability models using Monte Carlo analyses to evaluate likely and reasonable worst case scenarios for individual sites and portfolios.

Dan is also experienced at assembling teams to assist clients with national and global environmental and safety compliance auditing and compliance improvement programs

Registrations

- Licensed Professional Geologist, State of Illinois
- Registered Professional Geologist, State of Wisconsin

Fields of Competence

- Site investigation and remediation industrial/ commercial facilities, airports, railroad facilities, and landfills
- Hazardous waste characterization, treatment, and disposal
- Negotiation of closure strategies for abandoned and active industrial facilities
- Facility decommissioning, demolition and contaminated site construction
- Evaluation of environmental liabilities using Monte Carlo analysis
- Development of HSE auditing programs

Credentials

- Ph.D., Sedimentology, Geochemistry, and Quantitative Paleobiology, University of Cincinnati, 1994
- M.S., Geology, University of Cincinnati, 1987
- B.S., Geology, University of Illinois, Urbana-Champaign, 1984

Key Projects

Closure of TCE DNAPL site in central Illinois. Developed strategies for source control and natural attenuation to address soil and groundwater impacts. Prepared risk evaluation and negotiated remedial objectives and closure strategies with the IEPA. Worked with city to negotiate groundwater use ordinance. Designed simplified extraction system resulting in removal of over 500 gallons of TCE. NFR received from IEPA.

Closure of a former municipal incinerator landfill in a northern suburb of Chicago. Activities included assistance with the preparation of a brownfield grant application; preparation of reports for the brownfield grant; conducting soil and groundwater investigations; preparing remedial action plans; removal of TCLP lead impacted fill, conducting negotiations with the IEPA for closure of the site; and reviewing contracting issues with prospective purchasers. Closure was contigent on use of future parking lots and new buildings for engineered barriers, which required agreements with IEPA to issue NFR after completion of construction. The new retail space now generates several million dollars per year in tax revenues.

Directed the environmental due-diligence for the acquisition of landscape equipment and supply company with more than 300 locations. Utilized selective onsite inspections and environmental database reviews to assess environmental liabilities in an extremely limited time period. Was able to complete the work with limited site interaction.

Directed due-diligence for the merger of a heavy manufacturing division of a Fortune 500 company. Activities included onsite assessment, data base reviews, data room reviews, internet research of historic locations, and liability assessment. Was able to complete the extremely confidential work with limited site access.

Designed and directed Monte Carlo simulations for the assessment of environmental liabilities of transaction portfolios and individual facilities as part of due-diligence and financial reserve assessment. The Monte Carlo simulations included the probabilistic evaluation of potential environmental impacts, remediation scenarios, regulatory intervention, property redevelopment, and litigation. The results included the improved assessment of future liabilities of a superfund site, the negotiation of multi-million dollar reduction in the purchase price of a manufacturing target, and the successful closure of several portfolios with environmental liabilities.

Implemented compliance auditing program for global Fortune 500 manufacturing operation. Activities included assessment of environmental, health and safety, and local regulatory concerns across the EU, North America, and southeast Asia. The program identified and prioritized concerns, which were put into a database for tracking. ERM then worked with the client to address the concerns.

Directed U.S. compliance auditing program for one of the world's largest food suppliers. Responsibilities included identifying regulatory experts, addressing client concerns, and assuring quality control through assuring staff commitments, verifying scheduling and working with ERM's global network to assure that the projects were staffed appropriately.

Closure of former steel wire mill. Designed and implemented a site investigation, risk evaluation, and remedial action at a former steel wire manufacturing facility in Chicago, Illinois. Through the use of engineered barriers, institutional controls and source removal, the site was closed in less than 18 months. As a result, the property was sold and is active once again. Because of stormwater requirements, implementation of

the engineered barrier was cost prohibitive. Therefore, a permeability engineered barrier was developed that allowed water infiltration, but prevented exposure to the impacted soils. As a result, no stormwater detention was deemed necessary. This IEPA-approved design resulted in cost savings of up to $500,000. Comprehensive NFR received from IEPA for the property.

Brownfield redevelopment project of a former aircraft parts manufacturer and petroleum blending operation. Managed acquisition investigations of distressed properties; prepared engineering estimates for building demolition, soil remediation, stormwater management infrastructure, and building pad preparations; oversaw aforementioned activities; and prepared information packages for TIF application and reimbursement packages. The extensive investigations lead to the redevelopment of the property without obtaining an NFR from the IEPA. Developed and managed a contaminated site construction strategy allowing contaminated media to be left in place resulting in multi-million dollar savings.

Brownfield redevelopment project for a former retail property. Managed acquisition investigations of distressed properties; prepared engineering estimates for building demolition, soil remediation, stormwater management infrastructure, and building pad preparations; oversaw aforementioned activities; and prepared information packages for TIF application and reimbursement packages. Negotiated with the IEPA to permit the removal and replacement of TCLP lead impacted fill material with permits required. Used *in situ* soil stabilization techniques to reduce soil management costs for excess soils, worked with contractors to design and build a slab on pile foundation structure in characteristically hazardous soils, and negotiated with IEPA and CDOE to address cleanup issues, while taking LEEDs credit for remediation and not working under and IEPA program. This permitted development of the project using TIF funds in a case where full remediation would not have been economically feasible. Managed facility construction in contaminated portions of site to permit development of the facility while leaving impacts in place with significant cost savings.

Abandoned wood treating facility. Designed and implemented site investigations, risk evaluations, and corrective action activities at a large, abandoned wood treating facility in northeastern Illinois. Current plans call for the use of buildings and asphalt parking lots as engineered barriers and selective source removal to address free-product. Worked with a municipality and railroad to negotiate construction of a railroad right of way through property. The site characterization has been completed and pilot testing initiated for removal of free product.

Brownfield redevelopment project for a vacant property that was formerly used for manufacturing of appliances and water heaters. As a result of development, impacted fill materials were historically placed on the property. The building was later demolished with the building slab left in place. Remediation costs were reduced using site-specific remediation objectives, recycling/reuse of concrete on the property, division of the property into industrial-commercial and residential parcels, and extensive statistical analysis. The existing building concrete slab was demolished, crushed, and utilized for engineered backfill on site. Over 10,000 tons of impacted soils were excavated and transported to a licensed facility for disposal. As the remediation progressed, additional samples were collected to help identify soils above ROs to reduce excavation volumes/costs. ERM-RCM worked with IEPA to develop a statistical data evaluation program to assess residual impacts. As a result of the detailed work, a comprehensive NFR was quickly issued for the property which permitted the development of a public school.

Implemented petroleum dating techniques, risk evaluations, and cost evaluations to determine LUST cost allocations for former nationwide petroleum marketer.

Co-authored work plans for the investigation of a light nonaqueous phase liquid investigation and coordinated

and supervised soil and groundwater field activities at a CERCLA site in northeastern Illinois.

Conducted environmental investigations related to a fuel dump and a propylene glycol release for a major U.S. airline at O'Hare International Airport. Efforts included evaluating radar traces, collecting samples, conducting risk evaluations, and preparing reports.

Designed and implemented site investigations and risk evaluations for railroad facilities including various petroleum related investigations and remediation, vapor intrusion evaluations, and lead evaluations.

Directed Phase I and Phase II Environmental Assessments for the feasibility evaluation for constructing a new hangar at Midway Airport, Chicago, Illinois.

Co-authored work, remedial investigation (RI), and/or remedial design plans and required investigative reports for CERCLA, RCRA, site remediation program, and LUST sites in Illinois, Indiana, New York Michigan, and Nebraska.

Closure of environmental issues associated with an auto parts manufacturer. Designed and implemented and soil and groundwater investigation at a former industrial facility with methylene chloride soil and groundwater contamination. Based on a risk evaluation, a remedial action strategy was negotiated, which resulted in receipt of a "No Further Remediation" letter within one year of submittal of the initial investigation reports to the IEPA. The expedited closure schedule permitted transfer of the property.

Closed brownfield site in northeastern Illinois under a 60-day time constraint. Activities included preparation of a Remedial Objectives Report, elimination of exposure routes, and negotiation of closure with the IEPA.

John C. Roberts, P.G.

Mr. Roberts has more than 30 years of diversified experience as a geologist and hydrogeologist in environmental consulting, remediation, and the mining industries. For the past 19 years at ERM, he has been responsible for technical, regulatory, and/or administrative management and implementation of multi-discipline CERCLA, RCRA, and state program remedial studies and remedial action designs. He has also been involved with merger and acquisition related multi site Phase I and II ESAs and property redevelopment projects for private industry. Many projects have been complex from a geological and regulatory standpoint with project budgets ranging from $10,000 to $2 million.

Mr. Roberts is highly experienced in the application of many direct and indirect site characterization and screening methods, including aerial photography and surface and borehole geophysics. He is experienced in deep recovery and injection well design, operation, and maintenance, and works routinely with both organic and inorganic contaminants including non-aqueous phase liquids (NAPLs).

Mr. Roberts' past experience includes employment (12 years) with the minerals division of a multinational manufacturing and chemical company, where he developed mining related exploration/site characterization skills. His experience includes the management of both domestic and international projects with budgets up to $2 million. He has served as "in-house" consultant for several large industrial facilities to perform baseline and contaminated groundwater assessments, and has been engaged in land acquisition, permitting, and reclamation activities.

Registrations & Professional Affiliations

- Registered Professional Geologist, States of Wisconsin, Indiana, and Pennsylvania
- American Institute of Professional Geologists
- National Ground Water Association
- Federation of Environmental Technologists
- Wisconsin Ground Water Association

Fields of Competence

- Project management
- Ground water investigation and remediation
- Remedial system design
- Remedial action options evaluations
- Injection well design, operation, and maintenance
- Insitu chemical oxidation
- Insitu enhanced bioremediation
- Phase I and II audits and site investigations
- Risk-based corrective action
- Metallic and industrial minerals mining geology

Education

- M.S., Geology, Idaho State University, 1981
- B.S., Geology, University of Wisconsin - Oshkosh, 1975

Languages

- English, native speaker

Publications

Roberts et al., "Characterization and Treatment of a Trichloroethene Plume in the Fractured Stockton Formation," Battelle Fifth International Conference on

Remediation of Chlorinated and Recalcitrant Compounds, Monterey California, May 22-25, 2006

Roberts et al., "Optimization of a Water Supply Well for Recovery of a Trichloroethene Plume," Battelle Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey California, May 19 – 22, 2008

Key Projects

Superfund Site Management
Pennsylvania
Project Manager/Coordinator for a Superfund site in Pennsylvania where the public water supply aquifer had been contaminated by chlorinated solvents to a depth of > 300 feet. Activities included the O&M of a pump and treat system that feeds into a public water utility and implementing supplemental insitu remedial technologies to the remedy to accelerate the clean-up. Involved in development and successful implementation of an innovative reconfiguration a water utility well to eliminate the need for inorganic treatment.

Multi Faceted TCE Soil and Groundwater Remediation
Directed the design and implementation of multi faceted TCE soil and groundwater remediation. TCE impacts occurred in saturated and unsaturated glacial deposits and the underlying limestone bedrock aquifer. Treatment focused on the glacial deposits and included SVE, air sparging, enhanced bioremediation, and insitu chemical oxidation using sodium permanganate. Horizontal wells were used to access the impacts beneath the active manufacturing facility. Emulsified oil supplement was used in areas where reductive dechlorination was already occurring while sodium permanganate recirculation was applied more oxidized areas.

Multi Site Remediation Program
Director of a multi-site remediation program for a major industrial client's U.S. legacy sites. Performed oversees remediation and monitoring activities, including the use of innovative technologies to move the sites to closure. Also involved with preparing cost estimates for corporate environmental reserve estimation.

Evaluation of Bacterial Contamination
Project Manager/Technical Director for an evaluation of bacterial contamination in a +1MM gallon per day industrial water supply well. The evaluation identified the source of the well contamination and led to litigation and settlement between the well owner and the responsible party.

Waste Injection Well Design, Permitting, Installation, and Testing
Indiana
Coordinator for design, permitting, installation, testing, and O&M of a 4,400-foot deep waste injection well for a remedial design/remedial action (RD/RA) at Superfund sites in Gary, IN.

Site Investigation and Soil Remediation
Chicago, IL
Directed site investigation and soil remediation activities during the voluntary cleanup of a former ink manufacturing plant site in Chicago, IL.

Superfund Site Management
Indiana
Site Coordinator for field activities during a RD/RA, including installation and sampling of ground water monitoring wells, surface sediment, and pond sampling, land surveying and land titles/access at Superfund sites in Gary, IN.

Crane Manufacturing Facility Environmental Analysis
Chicago, IL
Project Manager for the resolution of environmental issues on a former crane manufacturing facility redevelopment project for a power cogeneration/waste incinerator near Chicago, IL.

Soil and Groundwater Remediation
Project Manager for numerous projects including: site investigations, soil and groundwater remediation, and residual waste permitting.

SVE Pilot Testing Activities
Coordinated SVE pilot testing activities at several sites with chlorinated solvent and gasoline contamination that lead to full scale SVE and groundwater sparging system construction.

Site Investigation Activities at Chemical Distribution Facility
Chicago, IL
Directed litigation support/site investigation activities at a former chemical formulation/distribution facility in Chicago, IL. The work included contaminant dating through analysis of tritium in pore water.

PCB Investigation
Wisconsin
Project Manager for the investigation of PCB-containing river sediments in central WI, including review of potential stream sediment depositional environments and the locations of industrial PCB contributors.

Indoor Air Quality Studies
Wisconsin
Project Manager for indoor air quality studies at a former MGP site and a shopping center built on fill materials showing evidence of petroleum contaminated soil and groundwater.
Designed and coordinated an investigation and monitoring program to evaluate potential ground water contamination adjacent to a large evaporative tailings pond in southwestern WY.

Well and Stream Installation and Monitoring
Michigan
Conducted monitoring well installation and sampling and stream sampling during remedial investigation of Superfund site in Muskegon, MI.

Fractured Bedrock Aquifer Analysis
Illinois
Evaluated a fractured bedrock aquifer with respect to ground water analytical results in support of litigation activities for a Superfund site near Byron, IL.

Installation and Sampling of Monitoring Well
Indiana
Directed installation and sampling of a monitoring well and piezometer network, and reported the results as part of an emergency action at a former 200-acre refinery site in East Chicago, IN.

Geologic Evaluation of Bedrock and Fill Materials
Wisconsin
Performed a detailed geologic evaluation of bedrock and fill materials at an operating bulk fuel terminal in Janesville, WI. Work was performed in support of an SVE system design and installation project that included monitored natural attenuation as groundwater remedy.

Bedrock Joint Evaluation
Wyoming
Designed and conducted a bedrock joint evaluation to determine preferential solution mine cavity growth directions and locate site injection and recovery wells. Designed well field arrangement and oversaw installation and testing of deep (2,600 feet) solution mine injection and recovery wells in southwestern WY.

Deep Drilling Trona Exploration Project
Spain
Directed a deep (3,000 feet) drilling trona exploration project near Valladolid, Spain. The project utilized oil field-type drilling, solids control, and geophysical well logging equipment.

Development of Trona Solution Mine Monitoring Technique
Directed a seismic contractor in the development of techniques for monitoring trona-solution mine (2,600 feet deep) cavity growth over time to determine whether the cavities were confined to permitted areas.

Subsurface Mineral Exploration Drilling Project Management
Western US
Directed over 20 subsurface mineral exploration drilling projects in the Western United States. Pre-drilling target definition was determined through detailed mapping, geophysical, aerial photographic, geochemical and mineralogical studies.

Carl B. Stay, P.E., P.G.

Carl Stay is a Senior Project Engineer with over 24 years experience as an engineer and hydrogeologist in the environmental consulting and remediation industry. Mr. Stay has diverse experience in the petroleum, metals, chemical, and manufacturing industries. He has experience with geologic mapping; field investigations; and aerial photograph interpretation and is proficient with ground water and chemical fate and transport modeling applications. Experienced with treatability studies; risk-based corrective action (RBCA) evaluations; and technical advising for investigation and remediation projects at Superfund, Resource Conservation and Recovery Act (RCRA), emergency action, voluntary cleanup, leaking underground storage tank (UST) sites. Proficient at preparing spill prevention control and countermeasures plans (SPCC), and Phase I environmental site assessments (ESAs).

Directed field operations involving investigation of nature and extent of contamination due to petroleum and chlorinated solvent releases in Wisconsin, Michigan, and Illinois. Provided technical support for evaluating contaminant trends for natural attenuation and risk-based options.

Conducted ground water fate and transport modeling of UST, RCRA and Superfund sites in Illinois, Indiana, Michigan, and Wisconsin. Successfully modeled complex geologic and hydrogeologic regimes and simulated the effects of the installation of remedial design alternatives including vapor extraction, liquid recovery and reinjection of remediated ground water. Experienced in the use of analytical element and finite-difference modeling of ground water regimes.

Performed borehole geophysical logging and flowpath evaluation in fractured bedrock aquifer settings.

Registration

- Registered Professional Engineer, State of Wisconsin
- Registered Professional Geologist, State of Wisconsin

Fields of Competence

- Hydrogeological investigations
- Ground water monitoring
- Regional and local-scale ground water modeling
- Ground water flowpath evaluation
- Hydrogeochemical studies
- Aquifer tests
- Water-supply evaluations
- Wellhead delineation
- Borehole geophysical logging
- Ground water-surface water interactions
- Contaminant transport pathways analysis
- Storm water run-off investigations
- Bench-scale testing and treatability studies
- Risk-based corrective action evaluations
- Remediation design and implementation
- Water treatment system operation and maintenance
- Low cost and sustainable remedial technologies

Education

- M.B.A., University of Phoenix, 2010.
- M.S., Civil (Environmental) Engineering, Brigham Young University, 1988
- B.S., Geology, Brigham Young University, 1986

Professional Affiliations

- National Ground Water Association

Key Projects

Contaminated Site Management
Project manager for contaminated sites in Illinois and Wisconsin bringing site status closer to completion of investigative and remedial actions. Familiar with the Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO) and Wisconsin's risk-based approach to investigation and remediation under the Wisconsin Administrative Code (WAC) Chapter NR 700 series of regulations.

Aquifer Testing
Designed and conducted multiple-well, high-cpacity aquifer tests in support of an environmental impact statement for precious metal mine siting in Michigan.

Sodium Permanganate Injection System Design
Designed and constructed a sodium permanganate injection system into three 200-foot long horizontal wells including determining well yields and injection rates, monitoring well network and safe delivery of chemical oxidant into the subsurface.

EOS Pilot Study
Designed and implemented pilot study for injecting emulsified oil substrate (EOS) at a site impacted with chlorinated volatile organic compounds (VOCs).

Remediation System Design
Successfully designed and implemented a remediation system in Wisconsin that included a combination of source removal excavation and installation of infiltration gallery for injection of sodium persulfate.

Remediation System Design
Designed and installed remediation system for basement sump discharge water containing polychlorinated biphenyls in Wisconsin. Previously, sump discharge to a local wetland led to investigating nature and extent of PCB contamination in wetland sediments.

RCRA Facility Closure
Successfully closed RCRA-regulated facility in Illinois using a natural attenuation approach, deed restrictions, and land use control restrictions.

Litigation Support
Provided litigation support for evaluation of sources of bacterial contamination in a high capacity industrial water-supply well in Wisconsin.

Borehole Geophysical Logging
Conducted borehole geophysical logging, geochemical and flowpath analysis in a fractured bedrock aquifer leading to recommendations and implementation of deep water-supply well reconfiguration thereby improving the quality of the well water.

Stormwater Pollution Prevention
Project manager for preparing stormwater pollution prevention plans (SPPP), and Spill Prevention Control and Countermeasures (SPCC) plans in Illinois, Maine, Michigan, and Wisconsin.

Phase I ESA
Conducted and evaluated Phase I ESAs and phase II site investigations to identify or address recognized environmental conditions at numerous properties throughout the Midwest.

Well Evaluation
Evaluated water-supply well field for well-head protection area in Muskegon, Michigan. Consideration of nearby Superfund site to determine potential for affecting well field due to migrating contaminant plume.

Computer Modeling
Provided computer modeling fate and transport of contaminants at superfund sites in Michigan, Indiana, and Illinois. Modeling included consideration of three-dimensional aspects of site geology, pumping and reinjection of water, interaction of nearby surface water bodies, and separate-phase oil migration.

Pilot Scale Design of Free-Phase Hydrocarbon Recovery System
Provided pilot-scale design, construction, and operation of a free-phase hydrocarbon recovery system for a large oil refinery in Indiana. Data reduction of field measurements, and computer modeling of ground water flow for the determination of full-scale remedial design parameters.

Bulk Fule Storage Facility Investigation
Investigated bulk fuel storage facilities in Germantown, Janesville, and Delavan, Wisconsin leading to characterizing the distribution and migration of petroleum-related VOCs in the subsurface under complex geologic and geometric relationships. Solved ground water flow problems associated with previously misunderstood conceptual models of the flow regimes.

Ground Water Flow Pattern
Solved complex subsurface geologic structures within a former filled-in bedrock quarry in Janesville, WI. Played

key role in solving complex ground water flow patterns and constructing a conceptual model, which was subsequently used by the Wisconsin Department of Natural Resources (WDNR) as a model site for implementing natural attenuation of petroleum-VOCs.

Superfund Remediation
Technical advisor for evaluating capture efficiency of remediation systems at superfund and RCRA sites in Michigan, Indiana, Pennsylvania and Wisconsin.

Site Investigation
Performed site investigation studies and evaluations at petroleum and chlorinated solvent spill sites in Illinois and Wisconsin leading to the successful closure of these sites and no-further-action letters from governmental agencies.

Landfill Closure
Successfully closed chemical and putrescent landfill in Morris, Illinois, designed and implemented 30-year schedule of post closure care.

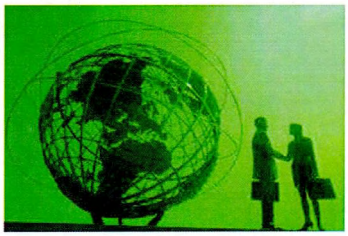
Operations and Maintenance Manual Preparation
Prepared operations and maintenance manual for existing ground water pump and treat system in Milwaukee, WI and made several recommendations to property owner for optimizing the system.

High Capacity Water Supply Well Bid Specifications
Performed siting, design and preparation of bid specifications for high-capacity water supply well in northern Nevada. Field investigations for siting spring collector systems in Washington to enhance existing community water supply. Evaluated existing coastal water-supply wells to determine maximum capacity to avoid drawing deeper saline ground water into system.

Ground Water Flow Models
Prepared and implemented three-dimensional ground water flow models for petroleum, RCRA and Superfund sites in Michigan City and Gary Indiana; Muskegon, Howell and Detroit, Michigan; Waterloo, Iowa; and Lamont, Illinois. Successful implementation and recommendations based on model results helped to evaluate site conceptual models leading to successful implementation of remedial action.

Plume Visualization Modeling
Constructed several plume visualizations using CTECH, Inc.'s Mining and Environmental Visualization System (MVS/EVS) providing a way to visualize historical and up-to-date groundwater and soil plume configurations.

Brenna M Bellmer



Ms. Brenna Bellmer is a Staff Geologist within ERM based in Milwaukee. She has a B.S. in Geology from the University of Wisconsin Oshkosh .

Brenna graduated in May of 2012 with a degree in geology. Prior to joining ERM, Brenna worked in the oil and gas industry logging bedrock stratigraphy on production wells in the West Texas Permian Basin. She has additional field experience in New Mexico, and the Florida Keys. She also spent two weeks in South Dakota and six weeks in Utah performing bedrock mapping as well as creating subsurface geologic cross sections of various mountain ranges.

Since joining ERM, Brenna has been involved in groundwater monitoring, and implementing in-situ remediation projects. In-situ remediation included enhanged bioremediation injections and oversight of chemical oxidation injections. Currently Brenna is working out of Milwaukee on a Contaminated Site Management project team.

Fields of Competence

- Geology
- Environmental Field Sampling
- Vapor Intrusion Sampling
- Data Management
- Subsurface Mapping
- Sediment Description

Training and Certification

- 40 Hour HAZWOPER Certification

Key Industry Sectors

- Oil and Gas
- Chemical Manufacturing

Education

- B.S. in Geology, University of Wisconsin Oshkosh- May 2012

Languages

- Native Speaker

Key Projects

Inactive Industrial Site in Remediation, Marion, Indiana
Particiapted on a bioremediation team that performed a full scale Bioinjection program across an inactive industrial site with multiple contaminant source areas. Conducted quarterly groundwater sampling for groundwater monitoring of site while in remediation phase utilizing peristaltic low flow sampling techniques.

Active Industrial Site, Lafayette, Indiana
Conducted quarterly groundwater sampling events for performance monitoring at a large active pharmaceutical manufacturing site utilizing Grundfos control box with dedicated pumps. Collected potentiometric data for construction of potentiometric surface maps of multiple groundwater units. Conducted oversight of soil borehole drilling, well installation (monitoring, injection, and temporary wells) and In Situ Chemical Oxidation Remedial Injections oversight for a Pilot Scale Remediation Study.

Inactive Industrial Site, Kentland, Indiana
Designed and implemented filtration system to treat/clean thousands of gallons of contaminated wastewater held in a frac tank with Granular Activated Carbon Filter drums so wastewater could be released into sewers.

Inactive Industrial Site, Indianapolis, Indiana
Conducted exploratory trenching oversight across an inactive industrial site collecting soil sample for analysis, conducted groundwater sampling and sewer sampling utilizing bladder pump low flow sampling techniques.

Active Industrial Site, Hagerstown, Indiana Location,
Conducted vapor intrusion assessment; subslab vapor sampling and indoor air sampling utilizing summa canisters with helium leak testing techniques.

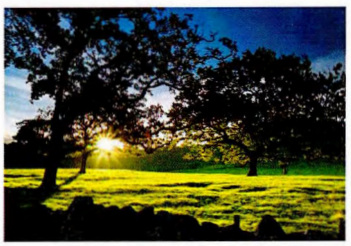
Active Industrial Site, Logansport, Indiana
Conducted bail-down testing and groundwater sampling at an active industial site with known free product beneath the property.

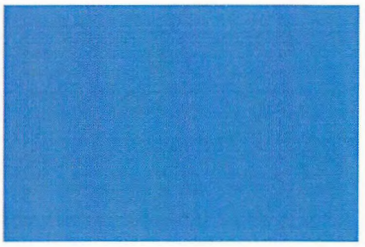
Logging Bedrock Core Samples, West, Texas
Logged stratigraphic lithology of bedrock cuttings on production wells in the West Texas Permain Basin. Assessed cuttings for prescence of petroleum and quality of petroleum if present.

Confidential Auto Parts Manufacturer

Sub-Slab Vapor Withdrawal System to Remediate VOC-Impacted Air

Ohio





Background

ERM was contracted by a confidential auto parts manufacturer to conduct environmental investigations related to the presence of chlorinated compounds at their manufacturing facility in Cleveland, Ohio, where degreasing operations had resulted in chlorinated VOC impact to site soils. Results of a risk assessment conducted as part of site investigation activities determined that inhalation of vapors in indoor air could pose a potentially unacceptable risk to future workers in some of the interior areas of the building.

ERM's Role

Conduct Indoor Air Sampling Program - ERM collected indoor air samples in several areas of the main plant building. Sampling was conducted using Summa canisters with flow control devices to sample over a 24-hour period; two rounds of sampling were conducted four months apart. Air-sampling results showed that concentrations of two VOC compounds, TCE and Vinyl Chloride, were above target risk-based levels calculated in the risk assessment. Based on these results, and after consultation with Ohio EPA Voluntary Action Program (VAP) staff, the client elected to install a sub-slab ventilation system in two areas of the plant where acceptable indoor air concentrations were observed.

Design, Install, and Operate a Sub-Slab Ventilation System - The purpose of the ventilation system was to lower the indoor air concentration of compounds of concern to below calculated risk-based levels. The system comprised three main perforated 4-inch diameter slotted polyvinyl chloride (PVC) pipes extending approximately 30 feet in the Former Hard Chrome area. Two vertical slotted pipes were installed in the Training Room area. The pipes are connected together and are jointed to a central pipe that runs vertically to the roof. An industrial exhaust fan is mounted on the roof. The ventilation system collects vapors from beneath the floor slab to prevent the vapors from migrating to indoor air inside of the affected areas.

Benefits and Results

The sub-slab vapor withdrawal system was installed and operated by ERM for a period of one month, after which the indoor air sampling was repeated. *Air Sampling results showed that VOCs were reduced to acceptable levels in indoor air.* The system was put into continuous operation as part of the O&M Plan for the site.

Confidential Client

Adhesive Manufacturing Facility
Green Bay, Wisconsin

Situation

ERM was retained during a property transaction to investigate and remediate shallow soil and ground water volatile organic compound contamination adjacent to and underneath the facility building which had resulted from small-quantity "housekeeping" type spills and leaks of solvent materials. The data collected during the site investigation was used to calculate site-specific soil cleanup objectives for direct contact risk and the protection of ground water, to conduct contaminant fate and transport modeling to predict the concentrations of constituents at the downgradient property boundary, and to evaluate the technical and economic feasibility of several remedial options.

ERM's Approach

The results of the remedial action options evaluation indicated that natural attenuation would be a feasible and appropriate remedial action for the site. However, without the treatment or removal of the soil "hot spot", institutional controls to prevent exposure to soils exceeding the direct contact cleanup objectives would be necessary.

Results

The "hot spot" soils were excavated and disposed of as nonhazardous waste, and the soils exceeding the direct contact cleanup objectives were removed successfully.

Modeling demonstrated that residual soil contamination would not result in the exceedance of ground water standards at the property boundary.

Ground water monitoring confirmed that the contaminant plume was limited in extent, had stabilized, and did not extend past the property boundary.

The Wisconsin Department of Natural Resources granted the site closure request without the application of institutional controls.

REDOX TECH, LLC

"Providing Innovative In Situ Soil and Groundwater Treatment"

A CASE STUDY FOR THE VADOSE ZONE APPLICATION OF PERMANGANATE TO TREAT SOIL CONTAMINATED WITH TCE

In April 2009, Redox Tech was contracted by ERM, Inc. to use its in situ soil blending technique to apply potassium permanganate into the vadose zone at a site in Yorkville, IL. The objective of this work was to reduce concentrations of TCE in soil within the source area to below the soil saturation limit of 1,300 m/kg. Historic sampling showed concentrations above 10,000 mg/kg, suggesting free phase was present. Prior applications of oxidants using conventional backhoes and excavators were able to reduce concentrations but were unsuccessful at reaching the cleanup objectives. In fact, spikes in concentrations illustrated that thorough mixing could not be achieved.

Approximately 75 cubic yards of silty clay soil encompassing an area of 500 square feet and extending from 4-8 feet below ground surface was treated with potassium permanganate. Potassium permanganate is a strong oxidant which has been proven to treat TCE. To estimate the amount of permanganate required, Redox Tech used a conservative contaminant mass of 7,000 mg/kg (the highest concentrations detected in the previous sampling round) and a permanganate to TCE ratio of 2.4 to 1. This resulted in an estimated loading rate of 2,335 pounds of potassium permanganate. To account for any natural oxidant demand (NOM) of the soils, including other contaminants, an additional permanganate load of 1g/kg (i.e. 335 pounds) was applied.

To address the target zone, the upper four feet of soil was removed from the treatment area using an excavator and stockpiled onto an adjacent treatment area. The potassium permanganate was delivered to the site in a dry crystal powder and spread across the treatment zone. Water was used to solubilize the potassium permanganate while being mixed with the in situ soil blender. Blending continued until a consistent mixture was obtained. Upon completion of the treatment area, the upper four feet of soil was replaced into the excavated area.

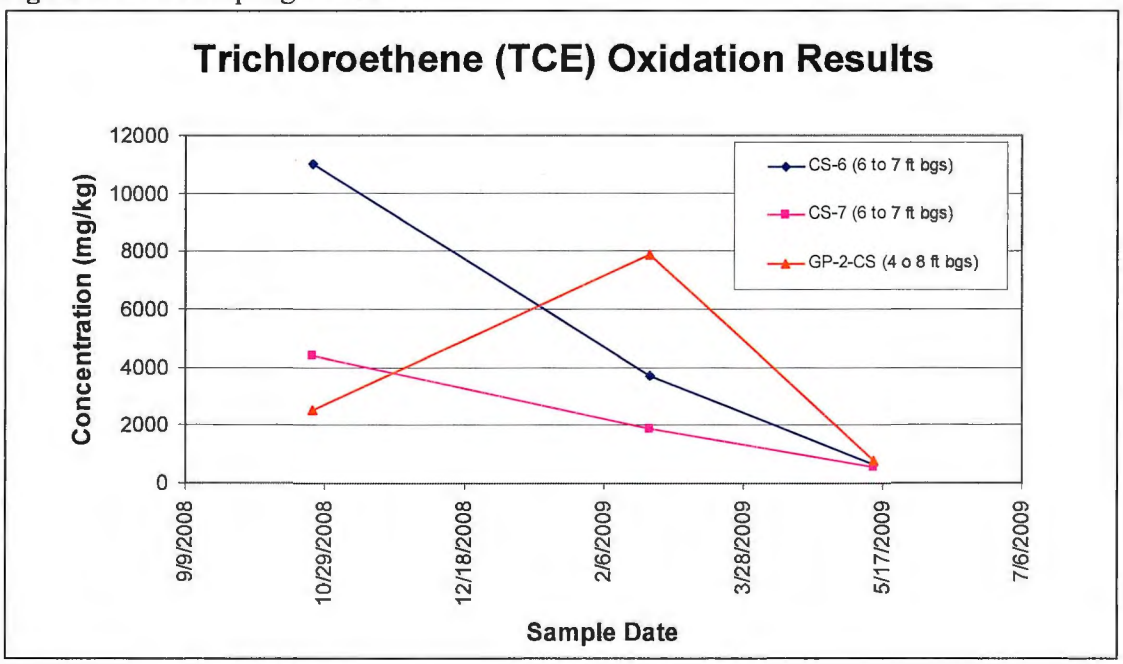
The in situ blender is mounted on a large excavator with a modified diesel engine and hydraulic power system. The mixer is capable of mixing dry soil as well as sludge material to depths of 18 feet below ground surface. Utilizing hydraulic pressure of 5,000 psi, a 28-inch diameter mixing drum with specifically designed teeth is rotated at speeds up to 100 rpm with a torque of 300 lbs per foot. This rugged durability allows the mixing drum to penetrate all soil types, even with the presence of backfill materials such as bricks, boulders and rebar.

Since chemical oxidation requires direct contact with the target contaminants, the effectiveness of the remediation strategy is often limited by the ability to distribute the chemical amendments throughout the soil medium. The blending process breaks soil loose, allowing for the rotary teeth to blend the reagent(s) and the soil into a relatively homogeneous mixture.

2800 CENTRE CIRCLE DRIVE, DOWNERS GROVE, IL 60515 TEL 630.705.0390 FAX 630.705.0409
WWW.REDOX-TECH.COM E-MAIL: MARKESIC@REDOX-TECH.COM

Soil samples were collected in May 2009, approximately six weeks after the blending work was completed. **Figure 1** presents graphical representation of the results from the soil samples CS-6, CS-7 and GP-2-CS. Results indicated that the soil remediation objective was achieved.

Figure 1. Soil Sampling Results



CONTACT INFORMATION: Steve Markesic;
markesic@redox-tech.com
Phone: 630-705-0390

Confidential Client
Racine, Wisconsin

Decontamination & Dismantlement

Situation

A confidential client engaged ERM to perform a turn-key decontamination and dismantlement (D&D) of a portion of a large chemical processing facility in southeastern Wisconsin. The client has operated their portion of the facility to manufacture surfactants and intermediate resin products for other chemical processors that formulate commercial and retail end products. The equipment owner built a new plant in Michigan and ERM will rig out, and transfer selected components to expand the facility. The supporting process equipment will be removed as scrap and structures will be retained for future use by the property owner. Due to the owner's requirement to vacate the property by the time the lease expires, the work is being conducted under an expedited schedule.

ERM's Approach

Understand Project Objectives. ERM worked closely with the client for more than 16 months to define and refine the project scope based on business, operational, and information technology requirements.

Preparation and Planning. ERM worked with the client during negotiations with the equipment owner regarding which components would be dismantled and transported to MI and which would demolished or retained. ERM prepared the D&D Design Project Manual, subcontractor request for bid documents, implemented competitive bidding and subcontractor selection processes, and was engaged to turn-key the D&D Project with the selected subcontractor. ERM will provide project management, on-site construction management, and health and safety oversight for this six month project.

Meet Project Schedule. ERM used its experience with similar projects as a basis for project planning and execution in order to facilitate meeting the aggressive scheduling goals ahead of the start of the D&D activities.

Experience and Expertise. ERM has extensive experience in D&D projects, and drew upon a national network of highly qualified subcontractors to bid-out the work in a cost-effective and timely manner.

Local Management. The project team included the use of ERM consultants and ERM construction management professionals from the Milwaukee, WI; Exton, PA; Indianapolis, IN; and Rolling Meadows, IL offices.

Results

ERM completed the preparation and planning portion of this $1.8 Million (USD) D&D project and initiated the field phase in January 2010. The final scope of work for the field portion of the project includes:

- Completing the kickoff meeting with ERM, ERM subcontractors, facility representatives (actively working onsite), and client representatives;
- Decontamination of equipment and structures not flushed out by the client or property owner;
- Segregation of process equipment utilities and process lines from house utilities and support systems;
- Dismantling numerous tanks, reactor vessels, select process piping, pumps, slakers, and agitators for shipment to the new facility or recycling as scrap;
- Critical lifts of large tanks and equipment for shipment to the new facility;
- Preservation of building infrastructure systems such as steam, fire suppression, water, and electrical that are necessary for continued facility operation after the processes are removed;
- Decontamination of the buildings to remove resins and other adhered materials; and
- Providing access for additional activities that will be completed after the dismantlement, including assessment and remediation of potential soil and groundwater impacts resulting from client operations.

ERM is providing general contracting, professional consultation, and safety supervision during the D&D work. The work was successfully completed on schedule and on budget.

Confidential Client

Phytoremediation to Control Off-Site Contaminant Migration

St. Thomas, Ontario, Canada

Background

ERM installed a phytoremediation barrier along the boundaries of this property to prevent off-site migration of volatile organic compounds at this site in Ontario, Canada. ERM's approach for this site was to install phyto-remedial barriers, using hybrid poplars, along the property boundaries for perimeter control, primarily due to the very low maintenance costs associated with that technology. Phyto-reduction of contaminant concentrations occurs in several ways. These include hydraulic control, phytodegradation, phytoextraction, phytostabilization; phytovolatilization; rhizodegradation; and rhizofiltration.

Engineered vegetation growth has been utilized in both soil and water quality improvement for many years. Beginning with surface water treatments, aquatic plants are used for removal of both organic and inorganic contaminants. Additionally, many fast-growing plants have the capability to remove vast quantities from the water table through the process of evapotranspiration.

Phytoremedial barrier one year after installation

Most of the phytoremediation sites across North America use the fast-growing hybrid poplar trees. The populus species include poplar, cottonwood, and aspen. The hybrids are specifically engineered for fast growth and resiliency to low-level contaminants.

ERM's Role

Implementation of phytoremediation at the site included:

- Using a decision-tree approach to determine the applicability of phytoremediation to a site
- Defining physical depth to groundwater table and extent of contaminant plume
- Desired outcome of phytoremediation efforts
- Designating areas for long-term planting
- Planting the trees
- Maintaining the trees.

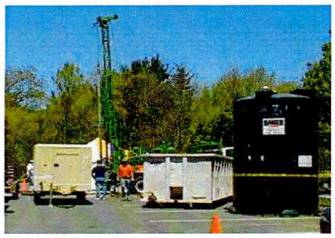
In June, 2005, ERM installed a phyto-remedial barrier along the northeast corner of the property, which consisted of approximately 100 hybrid poplars planted to a depth of approximately 2 to 2.5-metres below grade. Phyto-remedial barriers were then installed along the remaining portions of the north and west property boundaries in March, 2006.

Benefits and Results

By December 2006, the hybrid poplar, phyto-remedial barrier had experienced significant growth, and the survival rate of the trees was excellent. Current (2011) groundwater monitoring has confirmed several orders of magnitude in contaminant reductions occur across the phytoremediation barrier.

Confidential Client

Former Manufacturing Facility
Milwaukee, Wisconsin



Situation

This client retained ERM to evaluate the site investigation and remedial action options evaluation (RAOE) completed for a site that formerly was used for the manufacture and assembly of steam radiators and temperature controls. Another consulting firm's previous investigative work at the facility had revealed the presence of volatile organic compounds (VOCs) and petroleum constituents in the soil, and VOCs in the ground water underlying the site. However, the vertical impact of the ground water contamination had not been fully delineated, and a costly remediation option (i.e., >$2,000,000) had been recommended to address the contamination at the site.

ERM's Approach

ERM completed the site investigation work at the facility by defining the vertical extent of the ground water contamination, installing three replacement monitoring wells to eliminate contaminant carrydown in the existing wells, and conducting ground water sampling.

ERM used the newly developed and existing site data to prepare a revised RAOE that included a detailed assessment of risk posed by the soil and ground water contamination using accepted Wisconsin Department of Natural Resources (WDNR) methodologies. This assessment revealed that the existing contamination did not represent a risk to the current tenants or to the adjoining properties, and therefore, the soil and ground water contamination was potentially suitable for natural attenuation. However, to shorten the remediation time frame, ERM recommended that the excavation and off-site disposal of several soil "hot spots" be combined with the natural attenuation of ground water and residual soil contamination.

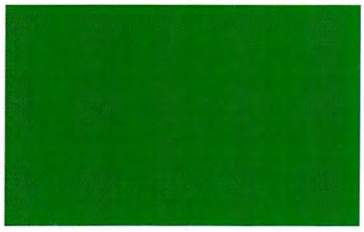
Results

The revised RAOE, including the assessment of risk, was approved by the WDNR without comment. The "hot spot" soil removal was successfully completed and ERM initiated a groundwater monitored natural attenuation monitoring program.

ERM's alternative remedial action was based on a detailed risk analysis and a monitored natural attenuationremedy resulted in significant cost savings to the client while maintaining compliance with applicable WDNR regulations.

The Home Depot
Milwaukee, WI

Assessment and Development of Properties
For Retail Development



Situation

ERM was retained to assist The Home Depot with the acquisition and development of the former Caterpillar Factory parcel located on the south side of Milwaukee, WI. The 20 - acre site had been developed during the 1980's and included a Pick'n Save grocery, food court, office space, and a Builder's Square Retail Store.

ERM's Approach

ERM performed Phase I and Phase II Environmental Site Assessments (ESAs) of the property, including the two stores which were still operating. The Phase I ESA identified the presence of potential asbestos containing materials, unabandoned underground petroleum storage tanks (USTs), and areas of potential soil impacts from hazardous chemicals, metals and foundry sand fill.

A Phase II Assessment and asbestos survey was performed on the properties following the Phase I findings. After the completion of the Phase II ESA, and asbestos surveys, The Home Depot decided to move forward with the purchase and site development. ERM worked with local and state regulatory agencies to prepare the properties for the development.

Scope of Work

ERM contracted with The Home Depot to complete the following work at the site

- ✓ Review site plans to identify potential areas of impact due to past manufacturing operations,
- ✓ Soil and ground water sampling to evaluate potential site impact areas related to former site operations,
- ✓ Sewer inspection and dye testing,
- ✓ Preparation of bid packages for removal and closure of petroleum UST's,
- ✓ Preparation of bid packages for removal and asbestos containing materials,
- ✓ Conduct soil removal for benzene impacted soils associated with a former paint line,
- ✓ Perform an assessment of background arsenic concentrations,
- ✓ Obtain a deed restriction from the WDNR to allow soils with benzene and metals concentrations exceeding WDNR standards to remain in place, and
- ✓ Receive a No Further Action Letter from WDNR.

Site re-development activities and operation of the Pick'n Save were proceeding during the completion of the work scope. ERM coordinated their activities with the retail operator and worked during off-hours in order to not interfere with customers. Following the successful and safe site cleanup and the approval of the deed restriction to leave the benzene and arsenic impacted soils in place during the future site construction activities, the Home Depot was constructed.

Results

The project resulted in the successful and safe demolition of the site structures and subsequent site development to support the Home Depot retail store and relocation of the Pick'n Save. During the project ERM contracted and managed site cleanup activities in a timely manner to prepare the site for construction activities.

Confidential Client

Manufacturing Facility
Milwaukee, Wisconsin

Situation

The manufacturing facility is located in a heavily industrial area with a history of environmental issues. Soil and groundwater impacts at the site were discovered during a Phase II investigation in the vicinity of a former outdoor staging area for waste paint, spent solvents, cutting oils and lubricants. Arsenic above the typical range of regional soil concentrations was found in a localized area and volatile organic compounds were detected in groundwater in concentrations that exceeded state standards.

ERM's Approach

Approximately 18.5 tons of arsenic-impacted soil was excavated and transported to a local landfill for disposal. Given the shallow depth and limited volume of impacted soil, excavation and disposal was the determined to be the most advantagous remedial action.

ERM implemented a groundwater monitoring program to determine groundwater flow directions and contaminant concentrations trends. Four monitoring wells were installed in the vicinity of the former staging area. The data showed that VOC (1,1,1-TCA and TCE) groundwater impacts at the site were confined to a perched zone, and that contamination appeared to be migrating to the site from other sources.

In response to an initial case closure request, the Wisconsin Department of Natural Resources (WNDR) requested an additional monitoring well be installed in the downgradient direction and two more sampling rounds be conducted. The additional well was installed and VOCs were detected in a sample collected from the well. However, the specific constituents detected in the downgradient sample indicated a separate source. Additionally, the abrupt stratigraphic and groundwater elevation changes between the original wells and the new downgradient well indicated that the new well was screened outside of the perched zone.

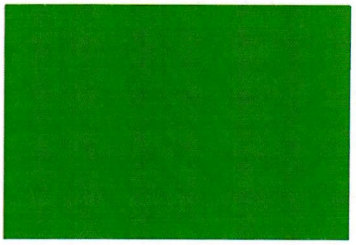
ERM then conducted agency file reviews and discovered that releases were documented at several surrounding properties. ERM gained access to monitoring wells on adjacent public and private lands, surveyed all wells relative to a common datum, and established that groundwater flowed from sites with documented releases toward our client's property.

Results

The WDNR granted case closure with an off-site liability exemption for VOC impacts detected in the downgradient well. The file reviews conducted to assess releases on surrounding sites saved ERM's client costs associated with additional groundwater investigation; an investigation of impacts for which our client was not responsible.

Confidential Client

Manufacturing Facility
Watertown, Wisconsin



Situation

Contamination due to a historic release of trichloroethene ("TCE") was detected in the unsaturated soil and ground water on the property, including areas underlying the manufacturing facility. This client retained ERM to evaluate site investigation activities and the effectiveness of an operating ground water extraction system completed by two previous consulting firms. Subsequently, ERM was retained to continue the site investigation and perform remedial actions as necessary.

Concentrations of TCE and its degradation products (cis-1,2-dichloroethene; trans-1,2-dichloroethene; and vinyl chloride) were detectedin the glacially deposited unconsolidated (sand, silt, and clay) and bedrock (Ordivician dolomaite) units. The concentration of the degradation products in relation to TCE indicated that substantial degradtion had already occurred, particularly in ground water adjacent to a drainage area with organic soils. Furthermore, ground water conditions appeared favorable for continuing degradation.

Sincethe primary source area and much of the impacted soil and groundwater was located below the floor slab of the existing building, ERM was tasked with designing and executing a remediation program that would minimize the impact to on-going operations for both the client and the building tenants.

ERM's Approach

In accordance with Wisconsin Administrative Code Chapter 700 requirements and state guidance documents, ERM prepared a Remedial Action Options Evaluation ("RAOE") and Remedial Action Design Report ("RADR"). The RADR detailed the design, operation and monitoring of a soil vapor extraction ("SVE") system to remediate soils and specified natural attenuation as the remedial approach for the impacted ground water. Within four days of submittal, WDNR approved the RADR with no comments.

Installation and construction if the SVE system was accomplished within the active facility during normal working hours. ERM included innovative construction methods to minimize facility inconvenience and prevent interruption to manufacturing processes. The SVE system operated for two years. Closure sampling in the area of treatment demonstrated that the SVE system had met its clean up objectives.

A soil and ground water sampling program within previously un-tested operating manufacturing areas revealed additional source areas, including the former locations of a degreasing operation and several chemical storage areas. Given the previous success of SVE at the site, ERM designed an extension of the system that utilized the existing equipment and controls. ERM managed the installation of five 300-foot long horizontal SVE wells beneath the building floor using directional drilling technology. This approach once again minimized inconvenience to facility operations.

The Wisconsin Department of Natural Resources (WDNR) conditionally accepted natural attenuation of ground water as the remedial option for TCE and its degradtion products in ground water, if the additional hot spot concentrations were addressed via active remediation. Also, the client desired to reduce the timeframe for long-term monitoring. ERM completed a second RAOE for ground water remediation to accelerate contaminant degradation. Groundwater monitoring revealed distinct differences in ground water conditions across the site. The differences necessitated implementation of two separate remedial technologies. In-situ chemical oxidation ("ISCO") was selected to treat one plume and enhanced bioremediation was selected for treatment of the second plume. ERM and this client selected this approach considering cost-effectiveness, safety, and the highest probability of success.

Results

The expanded SVE system was operated for approximately 18 months and subsequent soil sampling showed that the site specific remedial soil objectives were met.

The ISCO and enhanced bioremediation treatments were completed and the groundwater contaminant plumes are in the long-term monitoring phase.

International Petroleum Company of Delaware

Voluntary Remediation Using Phytoremediation
Wilmington, Delaware

Background

The International Petroleum Company (IPC) site is a 6.6-acre property along the Christina River in Wilmington, Delaware. The site has been used for petroleum-storage activities since the early 1900s. For the past 15 years, the site has been used for the recycling of used oil. The facility receives used oil and oily wastewaters, and the reclaimed oil is subsequently sold as a fuel for industrial kilns.

Subsequent to an ownership transaction in 2002, the site was entered into the Delaware Voluntary Cleanup Program (VCP). ERM conducted an extensive remedial investigation (RI) of soil, groundwater, and soil along the Christina River waterfront. The RI included a comprehensive risk assessment that evaluated both human health impacts, as well as ecological impacts to the wetlands along the river.

ERM's Role

To address issues identified in the RI, several remedial actions were undertaken, including impacted soil removal along the berm abutting the wetlands, installation of oil-water separators, and improvements in the secondary containments around the aboveground storage tanks (ASTs) on the property, several of which have a capacity of several hundred thousand gallons. Free-product was identified in several shallow wells on site, and the product is periodically removed from several extraction wells and recycled via the on-site product recycling process at IPC.

before

after

The remedy also included phytoremediation through the placement of approximately 70 hybrid poplars and willows at 5-foot centers along the berm abutting the wetlands along the Christina River. ERM also planted several hundred native wetland grasses and shrubs in the wetlands to improve the vegetative cover within the wetland area.

Benefits

The poplars, willows, and wetland plants are established, and the waterfront currently has a robust vegetative cover. The fast-growing poplars and willows are facilitating the interception of shallow petroleum-impacted groundwater as it migrates toward the river.

The Final Plan for the site was approved by the Delaware Department of Natural Resources and Environmental Control (DNREC) in 2005. The Plan required a deed restriction, continued free-product extraction, and monitoring of the phytoremediation and wetlands restoration effort.

Additional activities at the site included monitoring and risk evaluation of methyl tertiary-butyl ether (MTBE) that was identified in shallow groundwater at concentrations above the DNREC default standard. ERM continues to support the responsible party in the conduct of these O&M activities pursuant to the Final Plan.

Health Care Center Remediation Project Northern Illinois

Background

Historic metal manufacturing operations at an Illinois site resulted in releases of volatile organic compounds (VOCs) to the soil and subsequent groundwater. Dense nonaqueous phase liquid (DNAPL) consisting of trichloroethylene (TCE) was also present in the groundwater. Figures 1 and 2 illustrate the migration of the groundwater plume off-site to adjacent properties.

Figure 1 – Extent of the Groundwater Plume

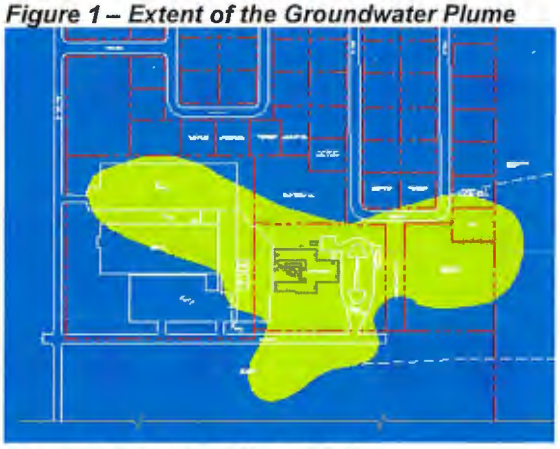
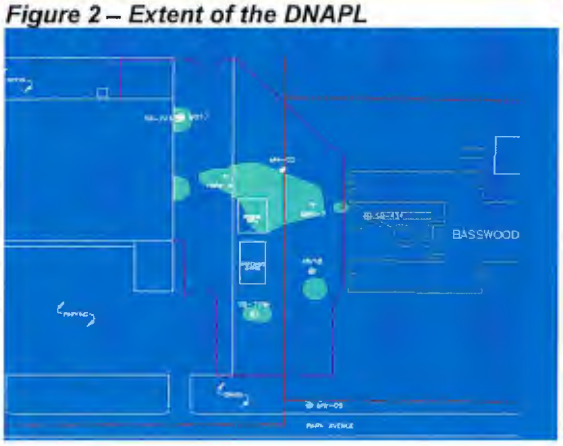


Figure 2 – Extent of the DNAPL



Role

ERM managed remedial construction of this $6.5 million dollar remediation project, and prepared all design/bidding documents. In addition, ERM negotiated with regulators to include cost-effective alternatives into the project design. The final remedy consisted of the following 5-Phases:

Phase 1 – Conducted air monitoring at the Health Care Center and crawl spaces at the residential homes. The samples did not exceed health standards. As a precaution, vapor barriers were added to the building crawl spaces over the plume.

Phase 2 – DNAPL wells were installed with pumps to extract the product. Over a 12-month operating period, 500-gallons of product were extracted.

Phase 3 - In-situ chemical oxidation (ISCO) was selected as the preferred cleanup option for the client's site. ERM designed and implemented the ISCO plan for the site. Preliminary tasks included compiling and evaluating geologic and hydrogeologic data, contaminant distribution data, and potential migration pathways. A pilot feasibility study was performed to evaluate the most effective oxidant and the required dosing. To capture ISCO off-gasses and prevent excess chemical from migrating off-site, a groundwater and vapor extraction system was constructed. Hydrogen peroxide was selected as the optimum chemical oxidant. Catalysts were added to the oxidant solution to boost the oxidation rate and effectiveness. Over a 16-month operating period, 2,500-gallons of product were destroyed.

Phase 4 - The metal manufacturing operations purchased the former Heath Care Center subsequent to closure and relocated residents and employees. With the purchase, the vacant single-story 15,140-square-foot

Photo 1 – Health Care Center – Pre-Demo

Photo 2 – Health Care – Center Post-Demo

building (see Photo 1) located on the 3-acres property was demolished.

ERM contracted and provided oversight of the demolition activities ($131,000), which included; asbestos abatement, in place utility abandonment, building demolition and backfilling with grass seeding. No below grade structures were constructed on the site, therefore, the crawl space floor and concrete block wall were demolished in place. No above or at grade structures (e.g., drive way), except previously existing trees and shrubs remained after demolition (see Photo 2).

Phase 5 – Post remediation sampling was performed for a duration of 18-months and a closure report was issued to the Illinois Environmental Protection Agency (IEPA). A No Further Remediation (NFR) determination under 35 Illinois Administrative Code (IAC) § 742.1015 (c) was obtained from the IEPA for the property. In addition, the following institutional controls were obtained.

- **City Ordinance -** Use of groundwater as a potable water supply is prohibited. All residences affected by plume are on public water supply.

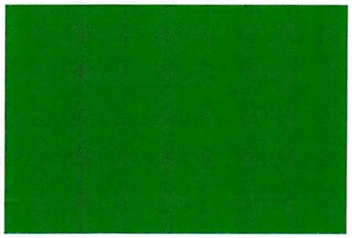
- **County Ordinance for the affected area -** Use of groundwater as a potable water supply is prohibited. All residences affected by plume are on public water supply. The county committed to preventing well installation in the affected area.

Benefits

The product removal and injection of the oxidant solution was accomplished as planned. ERM successfully treated the majority of soils in-situ to below the remedial objectives. The potential exposure risks to residents and property owners were limited/prevented via engineered and institutional controls.

Greiner's Lagoon Superfund Site

Phytoremediation Remedial Design andRemoval Action
Ballville Township, Sandusky County, Ohio



Background

The Greiner's Lagoon Superfund site (the Site), located in Sandusky County, Ohio, originally was developed in 1954 and contained four lagoons that were used to store waste oil from nearby industry. During the course of Site operations by various owners, a number of community complaints and legal actions were undertaken because of odors and releases from the lagoons. In about 1980 the site was shut down and from 1981 to 1988, USEPA implemented emergency actions to stabilize the Site. These actions included lagoon dike reinforcement, surface oil removal, liquids treatment and discharge, sludge solidification, lagoon backfilling, and placement of a soil cover over the filled lagoons.

ERMcompleted the design and field implementation of an innovative phytoremediation remedial design and removal action at the Site. The project was conducted under the authority of an Administrative Order of Consent (AOC) signed by USEPA and Lubrizol Corporation.

ERM's Role

Phytoremediation Remedy - As part of the AOC, ERM developed detail plans and specifications to implement a Phytoremediation Cap for the Site. Phytoremediation consists of using plants and trees to control groundwater flow and break down residual organic compounds into less toxic materials.

Regulatory Negotiation - ERM successfully negotiated the phytoremediation remedy with USEPA Region V as part of an Engineering Evaluation/Cost Analysis (EE/CA) conducted on behalf of Lubrizol. The remedy was approved by EPA for the Site.

Field Implementation - Site work was initiated by ERM in July 2005 and consisted of stormwater runoff control and regrading of the former disposal areas. Regrading was accomplished by mixing off-site soils into stabilized materials and relocating the mixed soil material to form a continuous profile along the northern portion of the Site. Topsoil was then placed and a fescue grass mixture was sown to stabilize the soil. Stormwater drainage from the entire site is collected in a perimeter drainage swale and discharged into an existing drainage culvert at one corner of the Site. Poplar and willow trees planted along Site boundaries provide a phytoremediation barrier to eliminate leachate breakouts, limit groundwater travel, and provide evapotranspiration of site groundwater.

Site Management - ERM has managed the site for our client since installation. Site management activities include periodic field reviews and, as necessary, planting additional trees and grass, applying fertilizer and cutting the grass.

Long-Term Operation and Maintenance (O&M) - The AOC requires monitoring of both on-site and off-site groundwater and repairing surface features to minimize surface and groundwater impacts. The long-term O&M program implemented by ERM includes annual sampling and analysis of existing and new groundwater monitoring wells.

Benefits

The phytoremediation remedy was demonstrated to be protective of the site and has controlled petroleum odors. *The remedy resulted in a cost savings well in excess of $1M over competing remedies.*

Confidential Client

Former Manufacturing Facility
St. Francis, Wisconsin

Situation

Contamination due to a release of chlorinated solvents was detected in the unsaturated soil and ground water underlying this former manufacturing facility. The source area was believed to have been associated with a former above ground storage container used to hold virgin trichloroethylene (TCE), a degreasing solvent. A Phase I environmental assessment, performed by another consultant, recommended soil borings to determine whether the container had leaked, thereby potentially impacting the local soil and shallow ground water. A Phase II investigation was conducted resulting in several soil borings and the installation of ground water monitoring wells. Subsequent to this Phase II investigation, the client retained ERM to evaluate site remediation alternatives regarding the impact to soil and ground water.

ERM's Approach

In accordance with Wisconsin Administrative Code ("WAC") Chapter 700 requirements and state guidance documents, ERM prepared a Remedial Action Options Evaluation (the "RAOE") to address on-site contamination.

During the RAOE, ERM evaluated site conditions and proposed to the client additional investigations to determine the lateral extent of the contamination. Based upon this investigation, ERM concluded that a separate source for chlorinated solvent contamination was located near the up-gradient boundary of the site, that this was the primary source of contamination on the Client's property. Therefore, ERM recommended that the Client not proceed with remediation until the upgradient source was properly addressed by the adjacent property owners.

ERM conducted a natural attenuation assessment to estimate biodegradation rates and demonstrate that contaminants were naturally degrading at a rate that would diminish the contamination within a reasonable amount of time. Eight quarters of ground water samples were collected and analyzed for TCE and its degradation products, and biodegradation parameters. ERM conducted hydraulic conductivity testing of the unconsolidated units. Using this information, ERM was able to demonstrate that ground water within the facility's property boundary was decreasing and that concentrations of TCE and its degradation products will eventually meet Enforcement Standards on site.

Results

Biannual ground water monitoring was conducted for two years. WDNR accepted this sampling frequency, and agreed with ERM's approach that an off-site source was the primary contributor to soil and ground water contamination at the site. Currently, natural attenuation is the remedial option for TCE and its degradation products in soil and ground water, as the WDNR adoptes a "no-action" approach to both on-site and off-site contaminant sources. The project is now in the long term monitoring phase of the ground water remediation.

Confidential Client
Site Remediation and Property Redevelopment

Janesville, Wisconsin

Situation

This manufacturer formerly owned and operated an electronics factory adjacent to the Rock River. ERM was involved remediating soil and ground water contamination that resulted from an accidental spill in 1979 spent chlorinated solvents from one of their degreasing operations. In 1993, they voluntarily elected to investigate and remediate the affected soil and ground water under the direction of the Wisconsin Department of Natural Resources (WDNR). During the remediation efforts, the client decided to shut down the facility and sell the property. ERM assisted the client with the environmental aspects of the decommissioning and sale of the facility.

ERM's Approach

ERM served as the client's technical representative and ensured that: (1) the site investigation and remedial action satisfied the State and Federal requirements, (2) their environmental liability, cost, and safety interests were protected throughout these activities, (3) the interaction between the potential purchaser (City of Janesville) and the WDNR resulted in a reasonable conclusion. ERM involvement included:

a) Performing a site investigation that resulted in defining the nature and extent of the soil and ground water contamination as well as the hydrogeologic characteristics of the site.

b) Developing site-specific risk-based soil clean-up objectives that are protective of human health and the environment, but less stringent than the State's generic standards.

c) Designing a tiered approach to the site remediation that limits active remediation to the unsaturated soil and ground water hot spots and utilizes natural attenuation to address the less contaminated portion of the plume.

d) Evaluating the technical and economic feasibility of several remedial options suitable for the site contamination and assisting the client in selecting the most efficient and cost effective option: a combination of ground water air sparging, and soil vapor extraction, and natural attenuation.

e) Designed and implempted the selected remedial action which utilized horizontal vapor extraction wells that extended beneath the facility. Construction of the remediation system involved preparing the bid documents and evaluating the bids for the remediation equipment and construction activities.

f) Operating, maintaining, monitoring and adjusting the remedial system during operation.

g) Confirming completion of the remediation and obtaining site closure from the WDNR.

h) Directing proper characterization and disposal of remediation wastes.

i) Assisting the client with other building decommissioning activities (industrial waste management, asbestos management, security).

j) Utilized a good relationship with the WDNR to help ease the requirements of the City of Janesville during drafting of the property sale agreement.

ERM's innovative design for this system included installing: (1) several +200-foot long horizontal soil vapor extraction wells situated at a depth of 3.5 feet beneath the existing manufacturing building, and (2) a 37-foot deep vertical ground water sparging well.

Results

ERM's professional and technical assistance helped this client develop a good working relationship with the WDNR, resulting in significant flexibility with regard to the project schedule, groundwater clean-up and the administrative requirements for hazardous soils management. Additionally, ERM's technical expertise and innovative design allowed the client to: (1) select from a range of suitable remedial options with differing cash flow requirements, (2) use the results of a full-scale pilot test to reduce the number of soil vapor extraction wells in the final system design by 50 percent, (3) minimize disruption of the facility's continued operation, (4) explore business opportunities that resulted in remediation cost savings, and (5) complete the shutdown, decommissioning, and eventual sale of the property.

The property is now owned by the City of Janesville and is adjacent to a recreational trail.

Confidential Manufacturer

Sub-Slab Vapor Removal Systems

Van Wert, Ohio

Background

ERM was contracted by a confidential manufacturer to conduct environmental investigations at a manufacturing facility in Van Wert, Ohio. Results of soil sampling activities indicated the presence of chlorinated in soils and groundwater underneath the facility and surrounding area. The primary compound detected was TCE, which was used as a degreasing agent in former manufacturing operations.

ERM conducted a Risk Assessment that identified the risk for potential inhalation of vapors from subsurface soils that might volatilize to indoor air at the facility. Calculations showed that potential risks in the portion of the main building underlain by VO- impacted soils were above health-based standards for commercial/industrial workers This result provided the basis for ERM's risk-driven remediation program to address subsurface VOCs at the facility.

Role

In response to the risk assessment results, ERM designed and installed a remediation system to remove VOC soil gases from beneath the floor in a portion of the main plant and exhaust these gases to the atmosphere. The installed system comprised eight vertical collection points along the east wall of the press area in the main plant building. connected to a main collection point suspended below the roof that discharged through an explosion proof upflow exhaust fan. The collection points were sealed at grade level to reduce air infiltration from within the structure to the extraction points in order to maximize the air removed from below the floor slab. Valves and sample ports were provided to allow for adjustment of the airflow from each collection point.

Subsequent soil sampling indicated that soils containing elevated levels of TCE and other chlorinated VOCs were located underneath the floor of two ancillary buildings located north of the main plant building. Soil vapor samples were obtained from underneath the floor slab, and these samples exceeded USEPA screening levels for workers published in the 2002 USEPA Vapor Intrusion guidance manual. ERM installed a second vapor withdrawal system to remove the vapors from underneath these buildings as well.

The sub-slab soil vapor extraction system consists of seven collection laterals composed of perforated HDPE pipe. The collection laterals were installed from outside the buildings under the existing floor slab by the use of horizontal boring techniques. The headers converge into an 8" HDPE pipe and are directed into an explosion-proof exhaust blower placed on a concrete pad at the northeast end of the west building. The blower is designed to create negative air pressure under the slab in order to intercept air contaminants before emanating through into the buildings. The exhaust is directed through an 8" HDPE pipe stack, which rises along the top of the west building roof and five feet vertically above the roof's peak.

Benefits and Results

ERM conducted monitoring operations of both ventilation systems by installing pressure monitoring probes through the floor slabs. Results of monitoring activities document that the systems are maintaining a negative pressure underneath the floor slabs in their target operations area, which eliminates the potential worker exposure issue from volatilization of VOCs from soils into the indoor air of the facility.

REDOX TECH, LLC

"Providing Innovative In Situ Soil and Groundwater Treatment"

Case Study for Soil Blending with ABC^{+}
Treatment of Chlorinated Alkenes

Redox Tech utilized in situ soil blending to treat high-density, low permeability soil and groundwater that were impacted with chlorinated alkenes. Redox Tech blended Anaerobic BioChem (ABC®) plus zero valent iron formula for the reductive approach. ABC+ is a mixture of Anaerobic BioChem (ABC®) and zero valent iron (ZVI). ABC® is a patented mixture of lactates, fatty acids, and a phosphate buffer. ABC® contains soluble lactic acid as well as slow- and long-term releasing components. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for microbial growth.

Treatment of chlorinated volatile organic compounds by Zero Valent Iron (ZVI) has been proven and widely accepted as an effective in situ remediation technology of chlorinated solvents such as TCE. The addition of zero valent iron to the ABC® mixture provides a number of advantages for enhanced reductive dechlorination (EDR). The ZVI will provide an immediate reduction. The ABC® will provide short-term and long-term nutrients to anaerobic growth, which also assists to create a reducing environment. In addition, the corrosion of iron metal yields ferrous iron and hydrogen, both of which are possible reducing agents. The hydrogen gas produced is also an excellent energy source for a wide variety of anaerobic bacteria.

Delivery of ABC+ was completed with our proprietary in situ blending process. Redox Tech blended over 10,000 tons of soil in 8 working days with our proprietary blending process. Approximately 33,000 pounds of ABC+ was added to the saturated soil and groundwater. The treatment area (source reduction area) was approximately 20,000 square feet (attached figure), and the treatment interval was approximately 2 feet to 10 feet below land surface. The lower treatment depth was the top of bedrock. Approximately the top 2 feet of soil was stockpiled from the treatment area and returned after blending.

Prior to treatment, one soil sample was collected in each of the source reduction areas. The post treatment samples where collected after the blending was completed in essentially the same location. The table below provides the treatment results 6 months after the blending was completed (the first sampling period). The goal of the treatment was to reduce total VOCs by a factor of 10 so that an MNA approach could be implemented for the entire plume. The goal was exceeded as reductions of over 100 times were achieved at both wells.

	Source 1		Source 2	
Analyte	Pre	Post	Pre	Post
PCE	**138000**	**5420**	**12,000**	**0**
TCE	**10500**	**3090**	**944**	**1.93**
1,2 DCE	**14923**	**15651**	**825.02**	**610**
VC	**134**	**940**	**9.50**	**168**

200 QUADE DRIVE CARY NORTH CAROLINA 27513 Ph. 919.678.0140 F. 919.678.0150
WWW.REDOX-TECH.COM E-MAIL: HASELOW@REDOX-TECH.COM

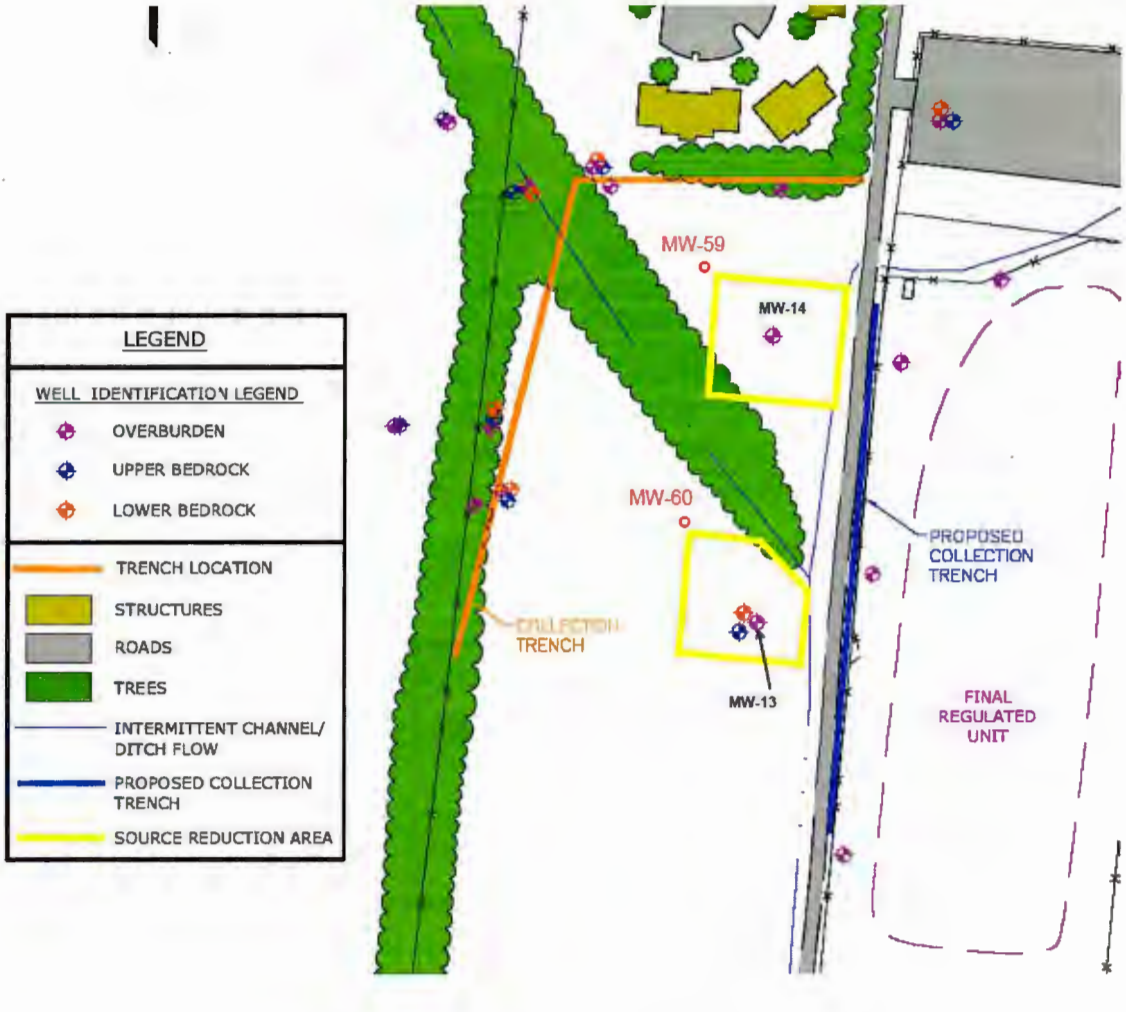
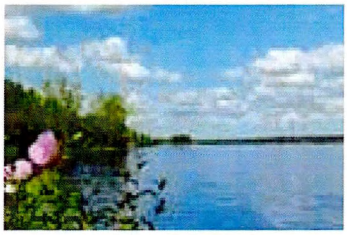
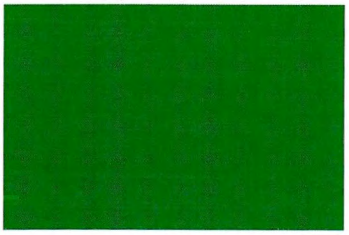


Figure 1. Blending Areas for Chlorinated Solvents

Burdick Automotive

Excavation and *In Situ* Treatment to Remediate Gasoline-Impacted Soil for Regulatory Closure
Onondaga County, New York





Background

Environmental Resources Management (ERM) was contracted to conduct soil remediation activities at a former Burdick Automotive facility located near Syracuse, New York. The property, used by Burdick for more than 20 years for retail automotive sales, is a former gasoline service station. When Burdick sought to sell the property, a site investigation conducted by the buyer documented the presence of gasoline-impacted soil. Burdick then retained ERM to conduct an investigation and to implement a soil remediation program to address gasoline-impacted soil in two identified source areas both above and below the groundwater table. The primary goals of the soil remediation program were to remediate the two source areas and to improve groundwater quality.

Role

The remediation program developed and implemented by ERM comprises soil excavation in combination with *in situ* chemical oxidation (ISCO) and enhanced biodegradation to treat residual petroleum compounds. Remediation activities were performed according to the Remedial Action Work Plan (RAWP) developed for the site by ERM and approved by the New York State Department of Environmental Conservation (NYSDEC).

Excavation and disposal - Excavated soils and material were field-screened for evidence of contamination. A total of 550 tons of gasoline-affected soil in the unsaturated zone was excavated, transported, and disposed of off site as non-hazardous solid waste at a NYSDEC-permitted disposal facility.

ISCO Treatment and Enhanced Bioremediation - Affected soil in the saturated zone in both excavation areas was remediated in place. Because dissolved oxygen (DO) readings measured prior to site remediation activities indicated that aerobic biodegradation of gasoline residuals was either not occurring or was occurring at a very slow rate, ERM implemented an *in situ* chemical oxidation program using calcium peroxide to enhance aerobic biodegradation of residual petroleum compounds in soil.

Approximately 250 tons of affected soil below the groundwater table were remediated in place using soil mixing techniques to effectively deliver calcium peroxide into a two-foot thickness of soil below the floors of the excavated areas.

Confirmatory Soil Sampling and Groundwater Monitoring – A confirmation soil sampling program and a post-remediation groundwater sampling program were implemented to document concentrations of volatile organic compounds associated with gasoline.

Benefits

ERM successfully implemented a soil excavation and *in situ* treatment program for the site. ERM estimates that more than 450 gallons of adsorbed gasoline were recovered from the site through soil excavation. DO readings after mixing and applying calcium peroxide into the bottom of the excavated areas have increased and VOC concentrations in groundwater have rapidly decreased, suggesting that aerobic biodegradation of gasoline residuals is progressing.

Post-remediation analytical data indicate that the primary goals of the soil remediation program have been achieved: The source areas have been remediated to the extent practicable and have achieved applicable standards, criteria, and guidance established for the site in the RAWP. *The NYSDEC has determined that additional remediation is unwarranted, and the site has attained regulatory closure.*

Minnesota Air National Guard

Environmental Restoration Program, Site 3
In Situ Bioremediation Using Edible Emulsified Oil
Duluth, Minnesota

Background

Site 3, Defense Property Disposal Office Storage Area "C", is approximately five acres of paved storage areas, woodland, grassy area and roadways. Site 3 was used from 1965 to 1980 to store petroleum, oils and lubricants, solvents, and various chemicals. TCE, 1,1-DCA, 1,1-DCE, PCE, and VC are the primary COCs at the Site, originating in the former drum storage area. Site geology consists of fill and interbedded fine sand and silt (glacial till). The depth to groundwater ranges from approximately one to 10 ft bgs. Saturated thickness (water table to top of bedrock) is about 10 ft. The client's former consultant conducted remedial investigation activities after which ERM began the feasibility assessment of both chemical and biological reduction as potential remediation technologies for groundwater at the base.

ERM's Approach

Based on the limited existing geochemical data, the site appeared well-suited for anaerobic reductive dechlorination, due to the presence of naturally reducing conditions. ERM conducted a series of laboratory microcosm studies using emulsified edible oil (EEO) to evaluate potential degradation efficiency. Results of the microcosm studies showed that the introduction of a carbon and electron source resulted in the degradation of 400 ug/L TCE and 200 ug/L 1,1,1-TCA within 26 weeks suggesting that enhanced in situ bioremediation (EISB) under reducing conditions could be implemented successfully.

Using microcosm and detailed hydrogeochemical characterization data for the treatment area, ERM designed a pilot test consisting of a single injection of 5.1% EEO mixed with water from a nearby fire hydrant. The amendment solution would be injected into 13 direct-push injection points. The injection points were spaced 10 feet apart in an oblong grid. The injection rate and distribution was supplemented through used of a WaveFront pressure pulse rig. A control point with temporary groundwater sampling points located at 5, 10 and 15 feet from the initial injection location were installed to assess the concentration and distribution of the amendment solution under regular direct injection conditions and under augmented pressure pulse conditions.

ERM conducted the EISB pilot-scale test to collect site-specific information regarding remediation parameters for scale-up to eventual full-scale application of EISB. Specifically, the following remedial parameters were evaluated:

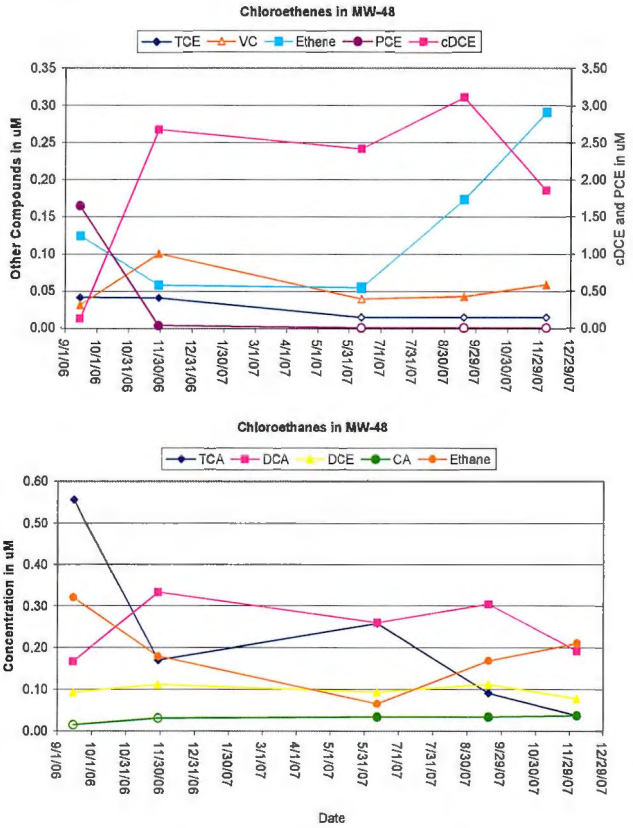
- Degradation of the Site COCs;
- Effectiveness of the amendment delivery method; and
- Radius of influence of the pilot-scale injection program.

ERM initiated pilot test field activities at ERP Site 3 in September 2006, and monitoring was conducted through December 2007.

Pilot test monitoring was comprised of a Site 3 baseline groundwater sampling round followed by periodic groundwater sampling conducted at MW-44, MW-45 and MW-48. The baseline sampling round included monitoring locations both up and down gradient of the pilot test area. The first round of post-injection monitoring was performed 10 weeks later, followed by four (quarterly) groundwater sampling events conducted over the next 12 months.

Results

The pilot test results showed that the injection of EEO was successful in creating reducing conditions and enhancing the biodegradation of chloroethanes and chlorethenes within the pilot test area. The reduction of sulfate and the increase in dissolved iron shows that anaerobic and reducing conditions were reached within the pilot test area. From the groundwater data, it is evident that where EEO was not present, biodegradation did not occur.



The following conclusions were drawn from the pilot test monitoring data:

- Over the 16-month pilot test degradation of TCE to below the 5 ug/L standard; continued degradation of daughter products is expected due to the longevity of the EEO within the pilot test area;
- The production of ethene during the pilot test confirms that bioaugmentation is not necessary in Site 3 groundwater.
- Finally, the results of the EEO distribution testing showed that the use of pressure pulse technology did not detectably increase the radius of influence of the injections.

Results and Benefits

- Full-scale implementation of EISB is recommended at ERP Site 3. Use of the pressure-pulse technology for future injections is not necessary; however, a manifold of amendment delivery lines with use of an amendment metering pump should be used to reduce the injection period.
- A manifold injection system will allow several points to be completed at once, reducing the time needed to cover the entire plume area.
- The TOC data show that sufficient organic carbon concentrations remained in Site 3 groundwater after 16 months and that the 5.1% EEO dosage will likely be sufficient for the full-scale effort.

Remedial Design and Oversight

Confidential Client, Michigan

Situation

Historic dry cleaning operations at the Michigan site resulted in releases of dry cleaning solvents to the ground in an adjacent alley. Releases were believed to have occurred from a dumpster in which spent dry cleaning filters were placed. Contamination resulted in listing of the site on the Michigan Department of Environmental Quality's "Part 201" list of contaminated sites. Perchloroethylene (PCE) was the primary contaminant of concern at the site.

ERM's Approach

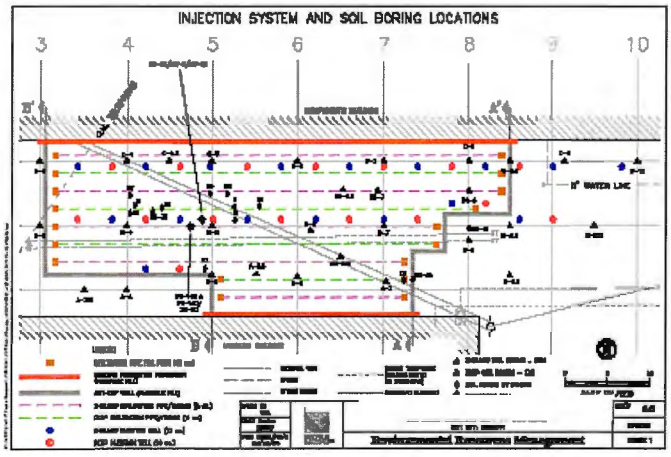
In-situ chemical oxidation (ISCO) was selected as the preferred cleanup option for the client's site. ERM designed and implemented the ISCO plan for the site. Preliminary tasks included compiling and evaluating geologic and hydrogeologic data, contaminant distribution data, and potential migration pathways. A pilot feasibility study was performed to evaluate the most effective oxidant and the required dosing. Sodium persulfate was selected as the optimum chemical oxidant. Catalysts were added to the oxidant solution to boost the oxidation rate and effectiveness. A buffered form of sodium persulfate was used to reduce the potential for oxidant effects on adjacent building foundations.

ERM prepared all design/bidding documents, and managed remedial construction of this $0.3 million dollar remediation project. ERM negotiated cost-effective alternatives into the design. The final remedy consisted of the following:

- Prepared a remediation and performance monitoring plan for Michigan Department of Environmental Quality review/approval.
- Performed a utility survey to identify and evaluate the integrity of underground utilities in the remediation area. Incompatible/damaged utilities were repaired or relocated outside the remediation area as needed.
- Managed construction of the subsurface oxidant delivery system. The oxidant delivery system consisted of a network of approximately 35 injection wells and 7 horizontal infiltration trenches.
- Performed a targeted excavation of certain "hot spots." Approximately 200 tons of soil was managed at a hazardous waste landfill.
- Injected approximately 10,000 pounds of sodium persulfate into the remediation area.
- Performed follow-up soil and groundwater monitoring to evaluate the effectiveness of remedial activities.

Results

Injection of the oxidant solution into the tight/clayey subsurface soils was accomplished as planned. ERM successfully treated the majority of soils in-situ to below the remedial objectives. Follow-up activities include limited excavation and installation of a vapor mitigation system beneath the site building.



Appendix C
ERM Terms and Conditions

1. Definitions. In these General Terms and Conditions (the "Terms"), the following definitions apply:
   1.1 "Claims" means any and all liabilities, claims, suits, losses, damages, fines, penalties and costs, including reasonable attorney's fees and other legal fees and disbursements;
   1.2 "Client" means the party entering into the Contract with ERM, directly or through a representative;
   1.3 "Contract" means the Proposal and the Terms, as either may be modified or supplemented in writing in accordance with Sections 17.4 and 18;
   1.4 "ERM" means the ERM company providing Services;
   1.5 "Party" means ERM or Client, as indicated by the context;
   1.6 "Proposal" means the document(s) issued by ERM, that reference or are accompanied by these Terms, in which ERM describes and offers to perform Services for Client;
   1.7 "Services" means the work performed or to be performed by ERM pursuant to the Proposal, and includes all ERM work product; and
   1.8 "Site" means any site upon which or in relation to which Services may be performed.
2. Proposal. The Proposal is firm for 30 days from its date. Unless expressly stated otherwise in the Proposal, the fees, costs and schedules in the Proposal constitute ERM's estimated probable cost and time for Services. The estimated probable cost is not a guaranteed maximum or not-to-exceed price. ERM shall inform Client if it determines at any time that a material change to the nature, time or extent of Services is required or advisable. No material change will be made without Client's consent except pursuant to Section 3.
3. Force Majeure; Emergencies. ERM's price and schedule are subject to equitable adjustments for delays caused by Client's failure to provide any required approval or suitable Site access or by occurrences or circumstances beyond ERM's reasonable control, such as fires, floods, earthquakes, strikes, riots, war, terrorism, threat of terrorism, acts of God, acts or regulations of a governmental agency, emergency, security measure or other circumstances, including, without limitation, unusual weather conditions ("Force Majeure"). If ERM determines in its sole discretion, based on circumstances surrounding the Services, that the health or safety of its personnel or its subcontractors' personnel is or may be at risk in performing Services, such circumstances will constitute a Force Majeure, and ERM will have the right to take any measure it deems necessary to protect personnel at Client's expense. If it is impracticable for ERM to obtain authorization from Client in an emergency affecting the health or safety of persons, the environment, or property, ERM may, at its discretion, act to prevent threatened damage, injury or loss at Client's expense.
4. Labor Rates.
   4.1 For Services charged on a time-and-material or cost-reimbursable basis, labor, costs and expenses will be billed to Client as indicated in the Proposal or in schedules attached to the Terms. ERM labor rates apply to (i) full-time, part-time, temporary and seconded employees of ERM and its affiliates, (ii) temporary employees whose direct compensation is paid by a temporary staffing agency and (iii) staff consultants.
   4.2 Labor rates stated in the Proposal or in attached schedules are subject to periodic adjustment by ERM. If labor rates are not stated in the Proposal, ERM's standard labor rates at the time of Services apply.
   4.3 If Services covered by the Proposal are subject to taxes or fees (except income taxes), such costs will be charged to and reimbursed by Client. A handling and administrative charge will be added to all third-party expenses.
5. Invoices and Payment. Within 5 business days of Client's delivery to ERM of a signed acceptance of the Proposal, Client will pay the amount stated in the Proposal as ERM's initial retainer for fees and expenses. Except as otherwise specified in the Proposal, Client will pay each invoice within 30 days of its date. All fees quoted are exclusive of goods and services, sales, value added or similar taxes and any other taxes that are specific to the transactions or payments arising from the Services, which will be charged separately. Vendor and subcontractor costs will be invoiced at those parties' standard or negotiated rates, plus mark-ups as provided in the Proposal. Client will reimburse reasonable, documented expenses incurred by ERM in performance of the Services. Certain vendors and subcontractors offer ERM trade or volume discounts, rebates or other special pricing arrangements that may not be passed through to Client or reflected in invoices. Client must make all payments in United States or Canadian currency, as invoiced, by direct transfer to the ERM bank account identified in the invoice. Client is not entitled for any reason to make any deduction or withhold any sum by way of set-off from the amounts payable to ERM. Interest will be charged on unpaid balances beginning 30 days from the invoice date at the lesser of 1.5% per month or the maximum rate permissible under law. ERM will apply payments first to any accrued interest, then to unpaid balances. Upon 2 business days' notice, ERM may suspend Services without liability until all past due amounts, including accrued interest, have been paid in full. If ERM takes legal action to enforce payment and prevails, Client shall reimburse ERM for all collection and legal costs. Client shall pay ERM for Services rendered regardless of whether Services are intended in whole or in part to benefit a third party.
6. Termination. The Contract may be terminated for cause and ERM's performance of the Services stopped by written notice from either Party (i) upon breach by the other Party of a material obligation under the Contract, (ii) if the other Party goes into bankruptcy, is liquidated or is otherwise unable to pay its debts as they become due or (iii) if the other Party resolves to appoint or has appointed for it an administrator, receiver or other similar officer for any part of the Party's business, property or assets. Any termination for cause will be effective only if the terminated Party is given (a) at least 10 calendar days' written notice of termination, (b) opportunity for consultation with the terminating Party before the termination date if breach is claimed, and (c) reasonable opportunity to cure the breach to the extent it can be cured. The foregoing notwithstanding, if Client fails to pay any invoice within 2 business days of its due date, ERM may terminate the Contract and stop performance of the Services immediately upon dispatch of notice to Client. Client may terminate the Contract for its convenience upon 2 business days' written notice to ERM, in which event Client shall pay all fees and expenses for Services accrued to the termination date and ERM's reasonable costs resulting from termination, including, without limitation, demobilization costs, as detailed in a final invoice. This section does not limit ERM's rights to seek recovery for Claims resulting from a breach by Client.
7. Insurance.
   7.1 ERM shall maintain policies of insurance for the following types of coverage, each with a limit of liability of US$1,000,000 (except for Workers' Compensation or equivalent coverage): Workers' Compensation or equivalent coverage as required under applicable statute; Employer's Liability; Comprehensive General Liability; Comprehensive Automobile Liability; Professional Errors and Omissions and Contractor's Pollution Liability.
   7.2 Upon written agreement of the Parties, ERM may procure and maintain additional insurance coverage or increased policy limits at Client's expense.
8. Indemnification.
   8.1 ERM shall indemnify Client, its affiliates and their respective directors, officers and employees (individually, a "Client Indemnitee" and collectively, "Client Indemnitees") from and against Claims arising out of the Contract, to the extent Claims are caused by the negligence or willful misconduct of ERM. The foregoing does not include Client's attorney's fees or other legal fees based on breach of Section 9.1.
   8.2 Client shall indemnify ERM, its affiliates and their respective directors, officers, employees and contractors (individually, an "ERM Indemnitee" and collectively, "ERM Indemnitees") from and against Claims arising out of the Contract, to the extent Claims are caused by the negligence or willful misconduct of Client.
   8.3 No ERM Indemnitee will be liable to a Client Indemnitee or any third party for the creation, existence or release of any type of hazardous or toxic waste, material, chemical, compound or substance, or any other type of environmental hazard, contamination or pollution, whether latent or patent, or the violation of any law or regulation relating thereto, existing at a Site prior to commencement of the Services ("Pre-Existing Condition"), and Client shall indemnify and defend ERM Indemnitees from Claims sustained in connection with a Pre-Existing Condition except to the extent the Pre-Existing Condition is exacerbated by the negligence or willful misconduct of an ERM Indemnitee.
9. Standard of Care; Limitation of Liability.
   9.1 ERM shall exercise the degree of care and skill ordinarily exercised under similar circumstances at the same time by experienced professionals performing substantially similar services at the same or similar locality as the Site. ERM MAKES NO REPRESENTATIONS, WARRANTIES OR CONDITIONS OTHER THAN THOSE EXPRESSLY SET FORTH HEREIN. ANY IMPLIED REPRESENTATIONS, WARRANTIES AND CONDITIONS ARE DISCLAIMED.
   9.2 If Services include (i) estimating the cost or potential cost of remediation, (ii) estimating the cost of compliance, or (iii) assessing the type, concentration, nature or quantity of any substance, waste or condition at, on or in a Site or structure, , ERM will prepare such estimate or assessment based upon the information provided by Client or a third party, ERM's experience and, in some instances, the application of a method for estimating or assessing conditions based on representative or random sampling or inspection. Due to the nature of such Services, including, without limitation, the potential for the estimate or assessment to be based on incomplete or inaccurate information or anomalous samples, ERM does not represent, warrant or guarantee the accuracy of any such estimate or assessment.
   9.3 IN NO EVENT WILL A CLIENT INDEMNITEE BE LIABLE TO AN ERM INDEMNITEE OR AN ERM INDEMNITEE BE LIABLE TO A CLIENT INDEMNITEE, OR ANYONE CLAIMING BY, THROUGH OR UNDER A CLIENT INDEMNITEE OR ERM INDEMNITEE, INCLUDING, WITHOUT LIMITATION, INSURERS, FOR ANY LOST, DELAYED OR DIMINISHED PROFITS, REVENUES, BUSINESS OPPORTUNITIES OR PRODUCTION OR FOR ANY INCIDENTAL, COLLATERAL, SPECIAL, INDIRECT, PUNITIVE, EXEMPLARY, FINANCIAL, CONSEQUENTIAL OR ECONOMIC LOSSES OR DAMAGES OF ANY KIND OR NATURE WHATSOEVER, HOWEVER CAUSED, REGARDLESS OF WHETHER THE CLIENT INDEMNITEE OR ERM INDEMNITEE, AS APPLICABLE, KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH LOSSES OR DAMAGES.
   9.4 IN NO EVENT WILL AN ERM INDEMNITEE BE LIABLE TO A CLIENT INDEMNITEE OR ANYONE CLAIMING BY, THROUGH OR UNDER IT, INCLUDING WITHOUT LIMITATION, INSURERS, FOR ANY AMOUNT IN EXCESS OF US$250,000 IN THE AGGREGATE. TO THE MAXIMUM EXTENT PERMITTED BY LAW, ERM WILL HAVE NO LIABILITY IF CLIENT FAILS TO INITIATE LEGAL PROCEEDINGS

WITHIN 12 MONTHS OF PERFORMANCE OF THE SERVICES. CLIENT RELEASES ERM INDEMNITEES FROM ANY DAMAGES SUSTAINED BY CLIENT IN EXCESS OF THE AMOUNT STATED IN THIS SECTION 9.4, AND, TO THE MAXIMUM EXTENT PERMITTED BY LAW, FROM ANY CLAIM THAT IS THE SUBJECT OF PROCEEDINGS NOT INITIATED WITHIN THE TIME FRAME STATED IN THIS SECTION 9.4.

9.5 The provisions of this Section 9 will (i) apply to the fullest extent allowed by law whether liability is claimed or found to be based in contract (including breach of warranty or contract), tort (including negligence or negligent misrepresentation), equity, strict liability or otherwise, and (ii) survive the completion of Services and the expiration, cancellation or termination of the Contract. The provisions of Sections 9.3 and 9.4 will be enforceable as a separate agreement if necessary.

9.6 Client acknowledges and agrees that the price for Services set forth in the Proposal, subject to adjustment pursuant to the Contract, has been negotiated in consideration of the Parties' agreement to limit certain of ERM's liabilities. Accordingly, Client acknowledges and agrees that the provisions of this Section 9 satisfy any requirement of reasonableness under any law applicable to the Contract and to any Claims relating to, or arising in connection with, the Contract.

10. Containment and Disposal. If any hazardous or toxic waste, material, chemical, compound or substance or any waste regulated by local, state, provincial or federal law, including, without limitation, any sampling materials such as drill cuttings and fluids or asbestos (the "Waste") are encountered by ERM or result from ERM's performance, ERM will appropriately containerize the Waste and either (i) leave the containerized Waste on Site for proper disposal by Client or (ii) using a manifest signed by Client as generator, assist with transportation of Waste to a location selected by Client for disposal. Client acknowledges that at no time does ERM assume authority over the transportation or disposal of, or title to, or the risk of loss associated with, the Waste. Client agrees to indemnify and defend ERM Indemnitees from any and all Claims (including, without limitation, any liability derived from any local, state, provincial or federal "Superfund" law) in any way related to ERM's assistance with the storage, transportation or disposal of the Waste, except to the extent such Claims result from ERM's gross negligence or willful misconduct.

11. Client Responsibilities.

11.1 Client must provide all reasonable assistance required by ERM in connection with Services, including, without limitation, any assistance specified in the Proposal. In particular, Client will provide ERM with the following, as applicable:

Reasonable ingress to and egress from the Site for ERM and its subcontractors and their respective personnel, equipment and vehicles, including but not limited to obtaining any consents or easements and complying with their terms.

Clean, secure and unobstructed space at the Site for ERM's and its subcontractors' equipment and vehicles.

Specifications (including, without limitation, facility schematics, Site schematics, engineering drawings and plot plans) detailing the construction of underground and aboveground facilities located at the Site that pertain to ERM's scope of work or are necessary to enable ERM to perform the Services.

Approval of each specific location for boring, drilling, excavation or other intrusive work and identification of concealed or underground utilities, structures, obstructions, obstacles or sensitive conditions before ERM commences work at the location. If Client does not identify the location of the concealed and underground items or approve each location of intrusive work, Client shall indemnify and defend ERM against any harm or injury arising out of or related to contact with such hazards.

Client's selection of any hazardous waste transporter and disposal facility and Client's arrangements for execution of the waste generator portion of any bill of lading, waste manifest, waste profile and related documents.

All information related to the Services or subject matter thereof in Client's possession, custody or control reasonably required by ERM.

11.2 ERM has the right to rely, without independent investigation or inquiry, on the accuracy and completeness of all information provided by, on behalf of, or at the request of Client or any governmental agency to ERM or any ERM subcontractor. Client agrees to review all Proposals, designs, schematics, drawings, specifications, reports and other deliverables prepared by ERM for the accuracy and completeness of factual information provided by or on behalf of Client for inclusion and to provide ERM with any further information within Client's possession that may affect the accuracy or completeness of Services.

11.3 Full payment for Services is a condition precedent to Client's rights in ERM work product. If Services involve electronic data files that are maintained by or for Client, Client is responsible for maintaining backup copies of such files.

11.4 Unless otherwise expressly agreed in writing by the parties, Client is responsible for Site security.

11.5 As to any dispute involving Client or the subject matter of the Services in which ERM is either not a named party or not at fault, Client shall pay ERM for any reasonable attorneys fees, other legal fees and expenses, and other costs incurred and the time of ERM's personnel spent in responding, defending or participating, including but not limited to all such costs and time of ERM or its personnel when called or subpoenaed for depositions, examinations, appearances or document production.

11.6 During the period of performance and for one year thereafter, Client will not target and then hire any ERM professional based on their performance of Services for Client. Without limiting any damages or other remedies, immediately upon any breach of the foregoing, Client will pay ERM an amount equal to 50% of the ERM professional's ending annual salary with ERM.

12. Use of Name. Client authorizes ERM to use Client's name and a general description of the Services and subject matter thereof as a reference for prospective clients and projects.

13. No Third Party Reliance. Except as provided in Section 17.1, the Contract does not, and is not intended to, grant to any person other than ERM and Client any benefit, right or remedy hereunder. Unless otherwise expressly agreed by ERM in writing, Client will not provide ERM's work product to any third party, and no third party will have the right to rely on the Services or ERM's work product. Services are performed solely for the purposes stated in the Proposal. Client's modification of Services, or use of Services for any other purpose, is at Client's sole risk. If a court determines, notwithstanding this Section 13, that a third party has the right to rely on Services, to the fullest extent allowable under applicable law, such reliance is subject to the limitations included in the Contract. Client agrees to indemnify, hold harmless and defend ERM Indemnitees against Claims resulting from a Client Indemnitee directly or indirectly providing ERM work product to a third party absent ERM's prior express written consent.

14. Severability. Each provision of these Terms is distinct and severable from the others. If one or more provisions is or becomes invalid, unlawful or unenforceable in whole or in part, the validity, lawfulness and enforceability of the remaining provisions (and of the same provision to the extent enforceable) will not be impaired, and the Parties agree to substitute a provision as similar to the offending provision as possible without its being invalid, unlawful or unenforceable.

15. Governing Law; Forum. The Contract is governed by the substantive laws of the jurisdiction in which ERM is formed (the "Jurisdiction"). The Jurisdiction's courts have exclusive jurisdiction and venue over all disputes arising out of the Contract, and the Jurisdiction is deemed to be the place of performance for all obligations under the Contract. The Parties waive any objection to the Jurisdiction's courts on grounds of inconvenient forum or otherwise.

16. Interpretation. Words in the singular include the plural and vice versa. Section captions are for convenience only and do not affect the meaning or construction of the Terms. A reference to a specific item as included within a general category does not exclude items of a similar nature, unless expressly stated otherwise. If any provision of the Terms is inconsistent with the Proposal, the Terms prevail.

17. Miscellaneous.

17.1 Other Parties. If Client engages ERM to provide Services on behalf of or for the benefit of another party (a "Client Party"), Client represents and warrants to ERM, as a material inducement to enter the Contract, that it has the authority to bind the Client Party to the Contract and that Client's signature on, or acceptance of, the Proposal does bind the Client Party. The limitation of liability in Section 9.4 applies jointly, not severally, to Client Indemnitees, any Client Party and any third party as provided in Section 13. If ERM in its sole discretion agrees in writing to Client's request that ERM seek payment from the Client Party, Client will nevertheless retain primary responsibility for payment for Services.

17.2 Law Firms. If Client engages a law firm, or if a law firm or other representative signs the Proposal or other documents or otherwise instructs ERM to take or refrain from taking any action, ERM is entitled to assume that the law firm or other representative has authority to so instruct ERM. If the law firm or other representative may or will rely on Services, its rights will be limited to those granted to Client in the Contract.

17.3 Entire Agreement. Upon Client's acceptance of the Proposal, the Contract constitutes the entire understanding between the Parties and the full and final expression of such understanding, and supercedes all prior and contemporaneous agreements, representations or conditions, express or implied, oral or written.

17.4 Waiver; Amendment. A provision of the Contract may be waived, deleted or modified only by a document signed by the Parties stating their intent to modify the Contract.

17.5 Survival. Sections 5, 8, 9, 10, 11, 13, 14, 15, 16 and 17 and all provisions of the Contract that by their nature would usually be construed to survive an expiration or termination shall survive the expiration or termination of the Contract.

17.6 Printed Forms. Client may use its forms and agreements to administer any agreement between ERM and Client, but such use is for convenience only, and any provision therein that conflicts with the Contract is void.

17.7 Notices. Notices hereunder will be given to the persons identified in the Proposal by any of the following: personal delivery; registered or certified mail, return receipt requested and postage prepaid; internationally recognized overnight courier, all fees prepaid; facsimile; or email.

17.8 Relationship of Parties. The Contract does not give either Party the authority to act as an agent or partner of the other Party, or to bind or commit the other Party to any

obligations. Nothing contained in the Contract shall be construed as creating a partnership, joint venture, agency, trust or other association of any kind.

18. Additional Terms. Additional provisions governing ERM's performance of Services, if attached to these Terms by ERM, are made part of the Contract.

19. Language. I hereby confirm and agree that this Contract and all documents relating hereto be drafted in English. *Je confirme avoir accepté que la présente entente de même que tous les documents s'y rattachant soient rédigés en anglais.*

Appendix D
Technical and Feasibility Evaluation Of Remedial Alternatives

Table 1- EXPI

Remedial Option	Option Description	Application		Accepted by WDNR	Further Evaluate Technology	Comments
Treatment Alternatives						
Enhanced in situ Bioremediation	Enhanced in situ Bioremediation	In place treatment utilizing indigenous bacteria in aerobic or anaerobic degradation of the site contaminants. *In situ* treatment achieved by injecting nutrients (and/or carbon amendment if anaerobic) and/or oxygen (if aerobic) to enhance the degradation.	ach is (1) bacteria (if urface lity to ria by on source time in the idants.	YES	YES	Locally high concentrations will likely require several follow-up injections to prevent stalling of the biologic reductive dechlorination processes.
Enhanced in situ Bioremediation with Zero Valent Iron	Enhanced in situ Bioremediation	In place treatment utilizing indigenous bacteria in aerobic or anaerobic degradation of the site contaminants. *In situ* treatment achieved by injecting nutrients (and/or carbon amendment if anaerobic) and/or oxygen (if aerobic) to enhance the degradation. The addition of zero valent iron (ZVI) enables direct reduction of chlorinated volatile organic compounds (VOC) via abiotic reactions.	ach is: (1) bacteria (if urface lity to ria by on source time in the idants. Soil effects of ving ROs in , higher dily added hancing C	YES	YES	The addition of ZVI affords treatment of higher concentrations of PCE. Initial treatment of PCE that comes in contact with ZVI occurs soon after injection/mixing while anaerobic biological processes "ramp up". ERD via REDOX Tech's ABC+ ammendment emplaced via in situ soil mixing is ERMs preferred remedial technology for the Express Cleaners project.
Monitored Natural Attenuation	Monitored Natural Attenuation	Ground water monitoring to evaluate the decrease of CVOCs through the process of natural attenuation, taking advantage of the natural effects of the environment on contaminants.	logy is the vironmental acteria,	YES	YES (may be used after active remediation has occurred)	Current decreasing groundwater PCE concentration trends indicate that natural attenuation is occurring at the site and is an appropriate long-term remedial alternative at this site once source reduction is performed.
***In situ* Stripping**	Air Sparge and Vapor Extraction (VE)	*In situ* treatment of the adsorbed and dissolved contaminants by injecting air into subsurface saturated soils with the movement of air providing a means to strip contaminant to a vapor phase that could be captured by the VE system.	lowing nd distinct	YES	NO	This technology requires a vapor recovery system be maintained. Also, the thin perched aquifer would result in small radius of influence for each air injection point and the associated vapor extraction system. This will result in higher installation and O&M cost.
RF Heating	Radio-Frequency Heating	Radio frequency heating (RFH) uses electromagnetic energy in the radio frequency band to heat media. Like microwave heating, RFH generates heat at the molecular level from within the soil/bedrock volume, rather than via less efficient conduction or convection processes. RFH is particularly efficient at heating low permeability geologic media, such as clay, silt, till or bedrock. Vapor recovery may be required using this approach.	buildings nd utilities. chnology	YES	NO	High cost.
***In Situ* Chemical Oxidation (ISCO)**	Ozone	in situ treatment of the soils and groundwater with the injection of ozone below the water table and within the soil matrix. Vapor recovery would be a component of this treatment approach.	dsorbed and ts, provides change conditions.	YES	NO	High cost. As with air sparge, the treatment zone is too thin and would require closely spaced injection and recovery points.

Table 1- EXPRESS DRY CLEANERS, RACINE, WISCONSIN- SUMMARY OF POTENTIAL TREATMENT TECHNOLOGIES SATURATED ZONE (Above Till)

Remedial Option	Option Description	Application	Effectiveness (Ability to meet RO)	Implementability	Cost	Treatment Duration	Limitations	Advantages	Accepted by WDNR	Further Evaluate Technology	Comments
Treatment Alternatives											
Enhanced in situ Bioremediation	Enhanced in situ Bioremediation	In place treatment utilizing indigenous bacteria in aerobic or anaerobic degradation of the site contaminants. in situ treatment achieved by injecting nutrients (and/or carbon amendment if anaerobic) and/or oxygen (if aerobic) to enhance the degradation.	Highly effective in the treatment of dissolved phase CVOCs provided that the appropriate bacterial strains are available, the geochemistry is favorable and nutrients can be delivered effectively.	Technology could be implemented using readily available soil blending, drilling and injection equipment. Bacterial testing has not been completed at the Site. However, the presence of daughter products (TCE & DCE) indicate that degradation processes may be taking place. Confirmatory testing is required to demonstrate anaerobic conditions and that sufficient bacteria is present for metabolisis of CVOCs. Also, neutral to oxidizing conditions in un-impacted areas of the perched zone aquifer provide an environment for oxidation of vinyl chloride	The cost would require a mandatory field and laboratory evaluation of the presence of appropriate bacterial strains. Site evaluation would cost approximately $3,000 to implement and evaluate. The remedial cost would be driven by the large aerial extent of product related contamination. The highest percentage of cost is related to the drilling and injection process for delivery of nutrients. Cost range is $20 to $60 per cubic yard.	Duration of treatment is dependent on the presence and distribution of the needed strain of indigenous bacteria and the permeability of the soil. Possible to achieve ROs within 3 to 5 years, allowing for possible re-treatment of some areas to achieve RO.	The unknown permeability of the subsurface soils may locally inhibit the delivery of nutrients. Anaerobic degradation can generate methane as a byproduct; a consideration for the use of this technology includes providing a ventilation system in areas that are capped or covered.	The advantage of this approach is (1) the use of naturally occurring bacteria (if present) to degrade the subsurface contaminants and (2) the ability to enhance the growth of bacteria by injection of a nutrient or carbon source that have a longer residence time in the subsurface than chemical oxidants.	YES	YES	Locally high concentrations will likely require several follow-up injections to prevent stalling of the biologic reductive dechlorination processes.
Enhanced in situ Bioremediation with Zero Valent Iron	Enhanced in situ Bioremediation	In place treatment utilizing indigenous bacteria in aerobic or anaerobic degradation of the site contaminants. *In situ* treatment achieved by injecting nutrients (and/or carbon amendment if anaerobic) and/or oxygen (if aerobic) to enhance the degradation. The addition of zero valent iron (ZVI) enables direct reduction of chlorinated volatile organic compounds (VOC) via abiotic reactions.	Highly effective in the treatment of dissolved phase CVOCs provided that the appropriate bacterial strains are available, the geochemistry is favorable and nutrients can be delivered effectively. The addition of ZVI provides greater efficacy in treating high concentrations of CVOC than biologic amendments alone.	Technology could be implemented using readily available soil blending, drilling and injection equipment. Bacterial testing has not been completed at the Site. However, the presence of daughter products (TCE & DCE) indicate that degradation processes may be already taking place. Confirmatory testing is required to demonstrate anaerobic conditions and that sufficient bacteria is present for metabolisis of CVOCs. Also, neutral to oxidizing conditions in un-impacted areas of the perched zone aquifer provide an environment for oxidation of vinyl chloride.	The cost would require a mandatory field and laboratory evaluation of the presence of appropriate bacterial strains. Site evaluation would cost approximately $3,000 to implement and evaluate. The remedial cost would be driven by the large aerial extent of product related contamination. The highest percentage of cost is related to the drilling and injection process for delivery of nutrients. Cost range is $20 to $60 per cubic yard.	Duration of treatment is dependent on the presence and distribution of the needed strain of indigenous bacteria and the permeability of the soil. Possible to achieve ROs within 3 to 5 years, allowing for possible re-treatment of some areas to achieve RO. Treatment time if soil mixing is employed is shorter because "access" to contaminants within the soil pores is enhanced during mixing.	The unknown permeability of the subsurface soils may locally inhibit the delivery of nutrients. Anaerobic degradation can generate methane as a byproduct; a consideration for the use of this technology includes providing a ventilation system in areas that are capped or covered. Soil mixing will necessitate removal of barriers and allow methane venting.	The advantage of this approach is: (1) the use of naturally occurring bacteria (if present) to degrade the subsurface contaminants and (2) the ability to enhance the growth of bacteria by injection of a nutrient or carbon source that have a longer residence time in the subsurface than chemical oxidants. Soil mixing reduces the potential effects of "tight" soils and enable achieving ROs in less time than injection. Also, higher proportions of ZVI can be readily added during soil mixing, further enhancing mass reduction in high CVOC concentration areas.	YES	YES	The addition of ZVI affords treatment of higher concentrations of PCE. Initial treatment of PCE that comes in contact with ZVI occurs soon after injection/mixing while anaerobic biological processes "ramp up". ERD via REDOX Tech's ABC+ ammendment emplaced via in situ soil mixing is ERMs preferred remedial technology for the Express Cleaners project.
Monitored Natural Attenuation	Monitored Natural Attenuation	Ground water monitoring to evaluate the decrease of CVOCs through the process of natural attenuation, taking advantage of the natural effects of the environment on contaminants.	Effective in meeting remedial objectives in a reasonable amount of time.	Can be easily implemented through the existing monitoring well network and the long-term evaluation of chemical trends.	Cost is relatively low to implement but long-term monitoring may be costly if MNA does not provide sufficient evidence that CVOC concentrations are stable or decreasing over a reasonable amount of time.	Duration for MNA can extend over decades, depending upon conditions at the site.	MNA is limited to the natural ability for the subsurface environment to decrease concentrations over time.	The advantage of this technology is the use of naturally occurring environmental conditions (organic carbon, bacteria, etc.).	YES	YES (may be used after active remediation has occurred)	Current decreasing groundwater PCE concentration trends indicate that natural attenuation is occurring at the site and is an appropriate long-term remedial alternative at this site once source reduction is performed.
***In situ* Stripping**	Air Sparge and Vapor Extraction (VE)	*In situ* treatment of the adsorbed and dissolved contaminants by injecting air into subsurface saturated soils with the movement of air providing a means to strip contaminant to a vapor phase that could be captured by the VE system.	Effective in the treatment of CVOCs in saturated soil and groundwater provided that the soil permeability is sufficiently high and the treatment zone is sufficiently thick to yield an effective radius of influence.	The technology is implementable with readily available equipment and techniques. The sparge points can be installed as vertical points or horizontal wells.	The cost of the sparge system will be primarily driven by capital equipment, injection well installation, and subsurface piping installation costs. Cost range is $50 to $100 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Likely to achieve ROs within 1 to 2 years, allowing for 1 to 2 restarts.	Low permeability soils limit the horizontal and vertical movement of the injected air, which can translate to installation of additional injection points Also, preferential pathways can develop that result in incomplete treatment. Thin nature of saturated zone at Site may preclude the use of this technology.	This technology is flexible, allowing adjustment of air flow rates and treatment areas to focus on distinct zones based on site data.	YES	NO	This technology requires a vapor recovery system be maintained. Also, the thin perched aquifer would result in small radius of influence for each air injection point and the associated vapor extraction system. This will result in higher installation and O&M cost.
RF Heating	Radio-Frequency Heating	Radio frequency heating (RFH) uses electromagnetic energy in the radio frequency band to heat media. Like microwave heating, RFH generates heat at the molecular level from within the soil/bedrock volume, rather than via less efficient conduction or convection processes. RFH is particularly efficient at heating low permeability geologic media, such as clay, silt, till or bedrock. Vapor recovery may be required using this approach.	Effective in treatment of CVOCs (including dense nonaqueous phase liquids) in both the shallow vadose and saturated zones.	RF generator must be operated in accordance with OSHA and FCC requirements.	The cost of operating the full scale system ranges from $90.00 per cubic yard to $200.00 per cubic yard or more for high temperature systems working in a soil vapor extraction system. More cost effective when used in areas having large soil contaminant volumes.	Duration of treatment is dependent upon the intensity of the heating and depth to which it can be applied. Likely to achieve Ross within 1 year in vadose zone soils.	Cost limitations include lease costs for the RFH units and the number of probes/antennae required. Also may require the use of vapor extraction to contain volatilized constituents.	Can be deployed underneath buildings and among other obstacles and utilities. According to vendors, the technology requires no safety barriers	YES	NO	High cost.
***In Situ* Chemical Oxidation (ISCO)**	Ozone	in situ treatment of the soils and groundwater with the injection of ozone below the water table and within the soil matrix. Vapor recovery would be a component of this treatment approach.	Highly effective in the treatment of CVOCs regardless of whether the contaminant is adsorbed or dissolved provided that the soil permeability is sufficiently high and the treatment zone is sufficiently thick to yield an effective radius of influence.	The technology is implementable with readily available equipment and techniques. The technology would require a pilot test to assess the oxidant demand as well as vapor permeability of the site soils. The sparge system could be installed using either horizontal or vertical injection wells.	The cost of this technology is primarily driven by capital equipment, injection well installation, subsurface piping installation, results of the oxidant demand study (which determines the mass of ozone needed), and the operation and maintenance of the system. Cost range is $75 to $150 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Possible to achieve ROs within 1 to 2 years, allowing for 1 to 2 rounds of maintenance injections.	Permeability and thickness of the saturated soils will limit the horizontal and vertical movement of the injected ozone, which can translate to installation of additional injection points and or ability to capture the injected ozone.	Simultaneous treatment of adsorbed and dissolved phase contaminants, destructive technology, and provides flexibility (as with sparge) to change treatment area based on site conditions.	YES	NO	High cost. As with air sparge, the treatment zone is too thin and would require closely spaced injection and recovery points.

Table 1- EXPRESS DRY CLEANERS, RACINE, WISCONSIN- SUMMARY OF POTENTIAL TREATMENT TECHNOLOGIES SATURATED ZONE (Above Till)

Remedial Option	Option Description	Application	Effectiveness (Ability to meet RO)	Implementability	Cost	Treatment Duration	Limitations	Advantages	Accepted by WDNR	Further Evaluate Technology	Comments
***In Situ* Chemical Oxidation (ISCO)**	Sodium Permanganate	*In situ* treatment of the adsorbed and dissolved contaminants with the injection of sodium permanganate both above and below the water table.	Highly effective in the treatment of site contaminants in the vadose zone and saturated area.	The technology is implementable with readily available equipment and techniques. Permanent injection wells could be installed either vertically or horizontally. Injection can also be implemented using direct-push technologies. Bench-scale testing of soil oxidant demand and field pilot study may be required to implement full-scale.	The cost of this technology is driven by the aerial extent and vertical thickness of the treatment area (s) on site (which translates to number of injection wells and pounds of oxidant to be delivered). Cost range is $50 to $75 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Possible to achieve ROs within 1 to 2 years, allowing for 1 to 2 rounds of maintenance injections.	Low permeability of the soils can inhibit delivery of the oxidant, and in the case of permanganate the soil oxidant demand will drive the mass of oxidant needed to treat the contaminants on site. Bench-scale testing of soil oxidant demand and field pilot study may be required to implement full-scale.	Destructive technology that can provide rapid, measurable, treatment.	YES	YES	Given the high PCE concentrations that are likely shielded within the soi matrix, multiple rounds of injection will likely be required. Precipitation of MnO2 in high PCE concentration areas may plug off soil pores. Also, the fill materials reportedly contain organics such as asphalt that make the oxidant demand uncertain.
***In Situ* Chemical Oxidation (ISCO)**	Sodium Persulfate	*In situ* treatment of the adsorbed and dissolved contaminants with the injection of sodium persulfate both above and below the water table. Requires an additive to "activate" the persulfate radical.	Highly effective in the treatment of site contaminants in the vadose zone and saturated area.	The technology is implementable with readily available equipment and techniques. The injection wells could be installed either vertically or horizontally. Injection can also be implemented using direct-push technologies. Bench-scale testing of soil oxidant demand and field pilot study may be required to implement full-scale.	The cost of this technology is driven by the aerial extent and vertical thickness of the treatment area (s) on site (which translates to number of injection wells and pounds of oxidant to be delivered). Cost range is $100 to $150 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Possible to achieve ROs within 1 to 2 year, allowing for 1 to 2 rounds of maintenance injections.	Low permeability soils can inhibit delivery of the oxidant, and the use of persulfate may require an activator such as caustic soda to achieve the RO. Bench-scale testing of soil oxidant demand and field pilot study may be required to implement full-scale. Target zone pH buffering may adversely affect the activation process.	Destructive technology that can provide rapid, measurable, treatment.	YES	NO	Higher cost than permanganate based ISCO. Some matrix materials can cause issues during the activation step. Potential for carbonate minerals in the sand at this site may interfere during activation. the oxidant demand of the fill is uncertain.
***In Situ* Chemical Oxidation (ISCO)**	Fenton's Reagent(Hydrogen Peroxide)	*In situ* treatment of the adsorbed and dissolved contaminants with the injection of Fenton's chemistry below the water table. Requires an additive to "activate" the peroxide.	Highly effective in the treatment of site contaminants in the vadose zone and saturated area.	The technology is implementable with readily available equipment and techniques. The injection wells could be installed either vertically or horizontally. Injection can also be implemented using direct-push technologies. Bench-scale testing of soil oxidant demand and field pilot study may be required to implement full-scale.	The cost of this technology is driven by the aerial extent and vertical thickness of the treatment area(s) on site (which translates to number of injection wells and pounds of oxidant to be delivered). Cost range is $100 to $150 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Possible to achieve ROs within 1 to 2 year, allowing for 1 to 2 rounds of maintenance injections.	Rapid decomposing of peroxide in some soil matrixes to due stability limitations. Careful monitoring of the process is needed to control boiling of the groundwater and rapid release rather than destruction of contaminants via steam stripping.	Destructive technology that can provide rapid, measurable, treatment.	NO	NO	
***In Situ* Chemical Reductive (ISCR) Technologies**	ISCR	*In situ* treatment of the adsorbed and dissolved phase contaminants with the injection of amendments to enhance the natural attenuation of the contaminants. This technology typically requires the presence of a naturally occurring material (Iron) within the treatment interval that can be readily activated via the addition of a reductant.	Effective in the treatment of the site contaminants in the oxygen-deficient saturated zone.	The technology is implementable with readily available equipment and techniques. The injection wells could be installed either vertically or horizontally. Bench scale testing would be required to identify if the site currently exhibits a reducing environment that can be augmented or enhanced.	The cost of this technology is driven by the aerial extent and vertical thickness of the treatment area(s) on site (which translates to number of injection wells and pounds of amendment to be delivered). Cost range is $45 to $100 per cubic yard.	Duration of treatment is dependent on the permeability of the soil. Likely to achieve ROs within 2 to 3 years, allowing for 1 to 2 rounds of maintenance injections.	Low permeability soils can inhibit delivery of the amendment, and the technology requires the presence of a reducing environment for effective implementation. Potential extend time to obtain the required regulatory review of work plans. May not be feasible due to shallow nature of contaminants on site.	Destructive technology with a long residence time.	Unknown	NO	Relatively new technology. Often requires native matrix material to contain mineral or other compounds that are readily reduced via the addition of reducing reagents.
Extraction	Pump and Treat Groundwater Gradient Control	Extraction of groundwater from single or multiple recovery wells to provide both removal of mass and gradient control of the contaminant plume.	Effective in containing the contaminant plume. Limited mass removal effectiveness, due to the expected low groundwater extraction rates.	Technology could be implemented using readily available groundwater extraction and treatment equipment.	The cost of this technology is driven by capital equipment, recovery well installation, subsurface piping installation, and operation and maintenance. O&M cost is highly dependant on the extent and duration of operation. O&M costs may be $20K/yr. Duration 20+ years.	Excess of 20 years, allowing for on-going operation of groundwater extraction system to achieve RO.	Low permeability soils will reduce the effective radius of influence of the extraction system, and the inorganics on site may cause fouling issues with an associated ex-situ treatment such as air stripping.	Low capital cost with a long history of regulatory acceptance.	YES	NO	High cost, long term O&M.
Extraction	ART in Well	Extraction of groundwater from single or multiple recovery wells with in-well treatment by stripping, venting, and recirculation.	Limited effectiveness, due to the expected low groundwater extraction rates as well as the high dissolved phase contaminant concentrations.	Technology could be implemented using readily available drilling and treatment equipment.	The cost of this technology is driven by capital equipment, recovery well installation, subsurface piping installation, and operation and maintenance. Cost range is unknown for horizontal wells.	Excess of 10 years, allowing for on-going operation of groundwater extraction system to achieve RO.	Low permeability soils will reduce the effective radius of influence of the ART system, and the inorganics on site may cause fouling issues with the in-well stripper and SVE components of the system.	Easily expandable and small footprint for equipment.	Unknown	NO	Perched aquifer at the site is too thin for this technology.

Natural Attenuation

1. Remedial Objective (RO): Removal of CVOCs in the areas of highest contaminant concentrations in the saturated zone (adsorbed and dissolved phase) to the extent practicable.

Appendix E
Certificate of Insurance Documentation

Environmental Resources Management

700 W. Virginia Street
Suite 601
Milwaukee, WI 53204
414-289-9505
414-289-9552 (fax)

ERM

August 17, 2011

Natalia Minkel-Dumit
Gonzales Saggio & Harlan LLP
225 East Michigan Street
Milwaukee, WI 53202

And

Nancy Ryan
Wisconsin Department of Natural Resources
2300 N. Dr. Martin Luther King, Jr. Drive
Milwaukee, WI 53212-3128

RE: Statement of Financial Responsibility for Insurance Deductible
Remedial Action Bid Proposal Submittal
Express Cleaners, 3941 North Main Street, Racine, WI
WDNR FID#252010000; BRRTS #02-52-547631

Dear Ms. Minkel-Dumit and Ms. Ryan:

This letter is being provided as documentation that Environmental Resources Management, Inc. (ERM) is financially capable of meeting our $250,000 insurance deductible obligation. If a valid claim is made against ERM's insurance for issues associated with future remedial actions by ERM at the above referenced Express Cleaners project, owned by the Ehrlich Family Limited Partnership (Ehrlich Family), ERM will be capable of meeting the insurance deductible obligation.

If you have any questions or require additional information, please feel free to contact me at (414) 289-9505.

Sincerely,

Rita Harvey
Treasurer & CFO