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Engineering & Scientific Consulting

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### Professional Profile

Dr. Pietari specializes in environmental release reconstruction and environmental forensics for source identification, apportionment of environmental liability and harm, and cost allocation. Her cost allocation experience includes evaluation of allocation criteria, and development of cost allocation models. She applies chemical fingerprinting, fate and transport analyses and historical reconstruction to evaluate and quantify contributions from sources to contaminated sites. She is an expert in the fate and transport of chlorinated solvents (e.g., tetrachloroethene (PCE) and trichloroethene (TCE)), polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, polychlorinated biphenyls (PCBs), and legacy pesticides. Further, she evaluates the effectiveness of remedies for groundwater and sediment sites, and has expertise in the analytical chemistry of polychlorinated biphenyls (PCBs), application of innovative field analytical methods, and biological treatment and transformation of pollutants, water, and wastewater.

Dr. Pietari's consulting assignments involve contaminants in various environmental media, including soil, groundwater, and sediments, in varied settings from urban sediment mega-sites to residential properties. She has conducted environmental forensic evaluations, including chemical fingerprinting and chemical release reconstruction, of contaminant sources in sediments and groundwater, such as manufactured gas plants (MGPs), refineries, and petroleum terminals, and at sites affected by chlorinated solvents. In addition, she has significant litigation support experience.

### Academic Credentials & Professional Honors

Ph.D., Environmental Engineering and Science, University of Washington, 2002

M.S.E., Environmental Engineering and Science, University of Washington, 1999

M.S.E., Environmental Biotechnology, Tampere University of Technology, Finland, 1996

### Licenses and Certifications

Licensed Professional Engineer, Massachusetts, #52683

OSHA 40-hour HAZWOPER Certification

### Prior Experience

Chemist Postdoctoral Fellow, U.S. EPA Region 5, 2007-2008

Research Scientist, CIRES, University of Colorado, 2005-2006

Project Scientist, Floyd Snider Inc., 2002-2003

## Professional Affiliations

American Chemical Society

Water Environment Federation

New England Water Environment Association

International Society for Environmental Forensics

Society of Environmental Toxicology and Chemistry

Society of Industrial Archeology American Society for Testing and Materials

## Languages

Finnish

French

Swedish

## Publications

O'Reilly KO, Ahn S, Pietari J, Boehm PD. Use of receptor models to evaluate sources of PAHs in sediments. *Polycyclic Aromatic Compounds* 2015; 35(1):41-56.

Shields WJ, Saba T, Boehm PD, Pietari J. Congeners: A Forensics Analysis. In: *Introduction to Environmental Forensic*. Murphy BL, Morrison RD (eds), pp. 347-393, 2015.

O'Reilly KO, Pietari J, Boehm PD. Author's reply to Van Metre and Mahler (2014). *Integrated Environmental Assessment and Management* 2014; 10(4): 489-491.

O'Reilly KO, Pietari J, Boehm PD. Author's reply. *Integrated Environmental Assessment and Management* 2014; 10(3): 325-326.

Shields WJ, Ahn S, Pietari J, Robrock K, Royer L. Atmospheric fate and behavior of POPs. Chapter 6. In: *Environmental Forensics for Persistent Organic Pollutants*. O'Sullivan W, Sandau C (eds), Chennai: Elsevier, pp. 199-290, 2014.

O'Reilly KO, Pietari J, Boehm PD. Parsing pyrogenic PAHs: Forensic chemistry, receptor models, and source control policy. *Integrated Environmental Assessment and Management* 2014; 10(2): 279-285.

Hlouchova K, Rudolph J, Pietari JM, Behlen LS, Copley SD. Pentachlorophenol hydroxylase, a poorly functioning enzyme required for degradation of pentachlorophenol by *spingobium chlorophenicum*. *Biochemistry* 2012 May; 51(18):3848-3860.

O'Reilly, K, Pietari, J. Boehm P. Forensic assessment of refined tar-based sealers as a source of polycyclic aromatic hydrocarbons (PAHs) in urban sediments. *Environmental Forensics* 2012; 13:185-196.

O'Reilly, K, Pietari, J, Boehm P. Comment on &laquo; PAH underfoot : Contaminated dust from coal-tar sealcoated pavement is widespread in the U.S. &raquo;. Environmental Science and Technology 2011; 45:3185-3186.

O'Reilly KT, Pietari J, Boehm P. A review of PAHs: Polycyclic aromatic hydrocarbons in stormwater and urban sediments. Stormwater 2010;11(6):10-21.

Gu AZ, Stensel HD, Pietari JMH, Strand SE. Vinyl bromide as a surrogate for determining vinyl chloride reductive dechlorination potential. Environmental Science and Technology 2003; 37:4410-4416.

Ferguson JF, Pietari JMH. Anaerobic transformations and bioremediation of chlorinated solvents. Environmental Pollution 2000; 107:209-215.

### **Published Abstracts and Conference Proceedings**

O'Reilly K, Brown J, Pietari J, Boehm P. Establishing the chemical footprint of potential injury from petroleum product releases at fuel terminals. Promoting the Science of Spill Response, International Oil Spill Conference Proceedings, 2011.

Shields WJ, Tondeur Y, Hart J, Edwards MR, Benton LD, Pietari J. PCDD/F fingerprinting with 17 congeners — What about the other 193? Dioxin 2010, 30th International Symposium on Halogenated Persistent Organic Pollutants, San Antonio, TX, 2010.

Pietari J, Whipple W. Interlaboratory comparison study of measurement of polychlorinated biphenyl (PCB) congeners from sediment samples with high resolution (HRMS) and low resolution mass spectrometry (LRMS). Proceedings, National Environmental Monitoring Conference, pp. 37-40, Washington, DC, 2008.

### **Presentations**

O'Reilly K, Pietari JMH. A Case Against Using Food Web Models to Set Sediment Remedial Goals. Ninth International Conference on Remediation and Management of Contaminated Sediments. New Orleans, Louisiana; January 9-12, 2017.

Boehm, P., Saba, T, Pietari JMH, Johnson N, Schierz PA. Gowanus Canal Is Not Just a PAH Site: PCBs and Metals Are Very Significant Drivers. Ninth International Conference on Remediation and Management of Contaminated Sediments. New Orleans, Louisiana; January 9-12, 2017.

Pietari JMH, O'Reilly K, Kamath R, Shea D. Incorporating bioavailability in risk calculations for petroleum impacted soils and sediments. The Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, California; May 22-26, 2016.

Boehm P, Pietari JMH, O'Reilly K, Ahn S. Tools for source apportionment: receptor models and their applications. The 31st Annual International Conference on Soils, Sediments, Water and Energy. University of Massachusetts, Amherst, M, October 19-22, 2015.

Boehm P, Pietari JMH, Ahn S. Application of ensemble environmental forensics to PAH source attribution. International Network of Environmental Forensics Conference. Toronto, Canada, August 3-6, 2015.

Aldea M, Edwards M, Pietari J, Boehm P. Cautions on the treatment of non-detect results for environmental forensics. International Network of Environmental Forensics Conference. Toronto, Canada, August 3-6, 2015.

Boehm, P, Pietari JMH, Ahn S. Application of ensemble environmental forensics to PAH source attribution. 8th International Conference on Remediation and Management of Contaminated Sediments.

New Orleans, LA, January 12-15, 2015.

Pietari JMH, Sparacio T, Shields W. Reconstructing historical chemical releases using industrial archaeology. Society for Industrial Archeology, 43rd Annual Conference, Portland, ME, May 17, 2014.

Pietari J, Ahn S, O'Reilly K, Boehm P. Parsing pyrogenic PAHs — Urban background or refined tar products? The Annual International Conference on Soils, Sediments, Water and Energy, University of Massachusetts, Amherst, MA, October 21-24, 2013.

Pietari J, Hoelen T. Field measurement of total petroleum hydrocarbons from crude oil contaminated site. National Environmental Monitoring Conference. Washington DC, August 6-9, 2012.

O'Reilly K, Pietari J, Boehm, P. 2012. Use of alkyl polycyclic aromatic hydrocarbon data in evaluating the contribution of pavement sealers to urban sediments. SETAC North America 33rd Annual Meeting, November 11-15.

Kane Driscoll S, Ahn S, Pietari J, Burgess R. Procedures for derivation of site-specific equilibrium partitioning sediment benchmarks for the protection of benthic organisms: nonionic organics. SETAC North America 32nd Annual Meeting, November 13-17, 2011.

O'Reilly K, Pietari J, Boehm, P. Managing risks: will banning pavement sealers have the desired effect? SETAC North America 32nd Annual Meeting, November 13-17, 2011.

Pietari J, O'Reilly K, Boehm P. Environmental forensics for PAH source management: Pavement sealants and sediments. 6th International Conference on Remediation of Contaminated Sediments, New Orleans, LA, February 7-11, 2011.

Pietari J, O'Reilly K. Remediation and restoration of contaminated sediments: Who is going to pay? 6th International Conference on Remediation of Contaminated Sediments, New Orleans, LA, February 7-11, 2011.

Boehm PD, Brown JS, Cook LL, O'Reilly K, Pietari J. Determination of the petroleum and PAH footprint in sediments from fuel terminal releases. 6th International Conference on Remediation of Contaminated Sediments, New Orleans, LA, February 7-11, 2011.

O'Reilly KT, Pietari J, Boehm P. Assessing the contribution of coal tar sealants to the polycyclic aromatic hydrocarbons of urban sediments: A forensic chemist's perspective. SETAC National Meeting, November 2010.

O'Reilly KT, Brown J, Boehm P, Cook L, Pietari J. Identifying the chemical footprint of petroleum fuel terminal releases in urban settings. SETAC National Meeting, November 2010.

Shields WJ, Pietari J. Historic reconstruction of contaminant releases at military shipyards during World War II. Abstract 547, Society of Environmental Toxicology and Chemistry North America 31st Annual Meeting, Portland, OR, 2010.

Whipple WJ, Wroble A, Pietari J. Interlaboratory comparison study of the measurement of Polychlorinated Biphenyl (PCB) congeners from sediment samples with High Resolution (HRMS) and Low Resolution Mass Spectrometry (LRMS). PITTCON Conference & Expo, Orlando, FL February 28-March 5, 2010.

Whipple W, Pietari J, Wroble A. Interlaboratory study of polychlorinated biphenyl congeners from sediment samples with high-resolution and low-resolution mass spectrometry. The Annual International Conference on Soils, Sediments, Water and Energy, University of Massachusetts, Amherst, MA, October 19-22, 2009.

Pietari JMH, Bigham G. Recent advances in microbial source tracking methods for environmental forensic evaluation of fecal pollution. International Network of Environmental Forensics Conference, Calgary, Alberta, Canada, August 31-September 2, 2009.

Wroble A, Pietari J, O'Keefe J, Hamlett PP, Santacroce G, Oliveira T, Wilding S, Revell D, Whipple W. Interlaboratory comparison study of measurement of polychlorinated biphenyl (PCB) congeners from sediment samples with high resolution (HRMS) and low resolution mass spectrometry (LRMS). 238th ACS National Meeting, Washington, DC, August 16-20, 2009.

O'Reilly K, Pietari J, Thorsen W, Hoelen T. Using decision support tools to evaluate TPH field test kits. 19th Annual AEHS West Coast Conference on Soils, Sediments, and Water, San Diego, CA, March 11, 2009.

Pietari J, Wroble A, Whipple WJ. Interlaboratory comparison study of measurement of polychlorinated biphenyl (PCB) congeners from sediment samples with high resolution (HRMS) and low resolution mass spectrometry (LRMS). National Environmental Monitoring Conference, Washington DC, August 10-16, 2008.

Pietari J, Whipple W. Interlaboratory comparison of performance based methods for PCB congener analysis from sediments. Oral presentation, US EPA Laboratory Technical Information Group Meeting Denver, CO, April 7-11, 2008.

Pietari J, Whipple W. PCB method development work in Region 5. Poster presentation, US EPA Laboratory Technical Information Group Meeting, Chicago, IL, May 1-3, 2007.

Pietari JMH, Herwig RP, Ferguson JF. Enrichment and characterization of PCE or cDCE dechlorinating microcosms with T-RFLP and PCR. Poster presentation, Superfund Basic Research Program Annual Meeting, Tucson, AZ, November 3-6, 2002.

Pietari JMH, Herwig RP, Ferguson JF. Characterization of a microaerophilic and psychrotrophic tetrachloroethene to cis-1,2-dichloroethene dechlorinating bacterium, strain JPD-1. Poster presentation, 102nd General meeting, American Society for Microbiology, Salt Lake City, UT, May 19-23, 2002.

Pietari JMH, Herwig RP, Ferguson JF. Characterization of tetrachloroethene (PCE) and cis-1,2-dichloroethene (cDCE) dechlorinating cultures with terminal restriction fragment length polymorphism (T-RFLP) analysis. Poster presentation, 6th International Symposium, In Situ and On-Site Bioremediation, San Diego, CA, June 4-7, 2001.

Vuoriranta P, Pietari J, Soini S, Salkinoja-Salonen M, Puhakka J. Biological activated carbon filtration of drinking water: Effects of ozonation and temperature on NOM removal. Poster presentation, 4th International Symposium on Environmental Biotechnology, Noordwijkerhout, the Netherlands, April 10-12, 2000.

Pietari JMH, Herwig RP, McLarnan JL, Ferguson JF. Characterization of an anaerobic PCE or TCE to cis-1,2-DCE dechlorinating psychrotrophic enrichment. Poster presentation, 99th General Meeting, American Society for Microbiology, Chicago, IL, May 30-June 3, 1999.

Pietari JMH, Ferguson JF. Characterization of a psychrotrophic TCE dechlorinating culture and comparison with a mesophilic culture. Oral presentation, 5th International Symposium, In Situ and On-Site Bioremediation, San Diego, CA, April 19-22, 1999.

## Project Experience

### Cost Allocation

Prepared a cost allocation model for support of allocation of liability and costs of contamination by PAHs, PCBs and metals in an urban waterway with a complex and long industrial history and multiple parties involved. Used extensive historical records to develop a model to allocate costs associated with remedial design.

For a potentially responsible party in a Superfund sediment mega-site, assisted with development of technical arguments in support of cost allocation. Reviewed historical information in addition to chemical fingerprinting data in the context of the sediment proposed remedy.

Managed a complex project on forensic investigation to support cost allocation for a Superfund site consisting of former lumber yard with wood treatment operations and a former manufactured gas plant (MGP) adjacent to a lake. Conducted and coordinated analyses for a multiple-lines-of-evidence approach, including the use of multiple apportionment models (e.g., chemical mass balance [CMB] model, least squares mixing model) in addition to other forensic tools, such as principal component analysis (PCA), to provide reasonable contribution estimates for PAHs in the lake sediments, which were used as part of the proposed cost allocation. Additionally, provided support for trial and depositions, including preparing for depositions, responding to motions, and developing trial demonstratives.

Provided consulting support for allocation of future remedial costs at a coal-fired power plant where process water managed in onsite ponds had resulted in groundwater impacts. Researched the operational and ownership histories, including contracts between operating parties, of the ponds where process water was managed to determine the responsibilities for the closure of the ponds.

### **Petroleum and Polycyclic Aromatic Hydrocarbons**

As part of a team of experts, evaluated the applicability of CERCLA's petroleum exclusion to a former refinery that had been remediated under CERCLA, to determine whether remediation was required or if the observed site impacts were due to other parties' activities. Compiled and analyzed all chemical data collected from the site and analyzed background samples and performed detailed evaluation of forensic samples. Most of the site impacts addressed under CERCLA were either petroleum excluded — that is, related to petroleum or petroleum products associated with historical railroad operations — or were below cleanup levels.

Provided litigation support during trial preparation and during the trial for a case involving a natural resource damage assessment (NRDA) of two former petroleum refineries. As part of the effort, provided quick-turnaround responses to questions and requests from the attorneys.

Conducted chemical fingerprinting analyses and historical research to identify PAH sources to a redevelopment site with observed NAPL and PAH impacts, which was located proximal to a former MGP that had operated only for a brief period in the early 1900s. Used PCA and information obtained from Sanborn maps and historical newspaper articles to determine that PAH sources distinct from the MGP had impacted the site, including two former wood pipe manufacturers.

Evaluated the presence of impacts and timing of releases for a large, operating refinery in an insurance litigation case. During a short period of time, reviewed available documents prepared for various investigations, and evaluated the ground water data to determine the timing of the impacts. Assisted with report preparation and conducted a site visit.

For a major oil company, provided research support for a project to evaluate the feasibility of using earthworms and composting to remediate petroleum-contaminated soils. Collaborated with university research teams, who conducted laboratory and pilot-scale composting tests. Provided input to overall research goals and objectives, in addition to specific experiments.

Managed a multi-phase investigation to evaluate impacts of coal tar pitch handling in sediments adjacent to an urban port facility. Evaluated data from forensic chemical analyses for PAHs and TPH, and a

petrographic analysis using multiple forensic tools, such as principal component analysis (PCA), double-ratio plots and qualitative analysis of chemical fingerprints. Coordinated analyses involving atmospheric dispersion modeling and infiltration modeling to evaluate impacts of past handling practices to air and groundwater.

Designed and managed a sediment sample collection and chemical analysis effort to support a forensic evaluation of sources of polycyclic aromatic hydrocarbons (PAHs) in sediments adjacent to a bulk terminal in an urban harbor, which was a Superfund site. Analyzed the data using multiple environmental forensic tools, including qualitative, quantitative, and statistical methods, and presented results of the analysis to the client.

Screened and evaluated remedial alternatives for a residential condominium complex, which was impacted by vapor intrusion from residual petroleum contamination at the site. Performed a conceptual design of a soil vapor extraction system, groundwater pump-and-treat system, and in situ bioremediation system in support of cost evaluation for remediating the residual contamination.

Investigated the impact of a petroleum transfer facility's operations on adjacent river sediments by application of a variety of environmental forensic techniques. This project involved sediment sampling, coordination with the analytical laboratory, and data analysis of PAH, biomarker, and TPH data.

### **Chlorinated Solvents**

Managed and performed a comprehensive review of historical literature, spanning the mid-1940s to the late 1970s, on the status of knowledge regarding groundwater contamination by tetrachloroethene (PCE). Specifically, the focus was to understand what was known of dry cleaning facilities, and particularly separator water discharges from dry cleaning facilities, as potential sources of PCE to groundwater. More than 400 journal articles, government reports, and industry publications were reviewed and summarized as part of this effort.

Managed and conducted an environmental forensic study of potential sources of trichloroethene (TCE) detected beneath a former refinery property, where documents indicated that chlorinated solvents had never been used. The investigation included an evaluation of chemical trends for TCE, daughter products, and other co-occurring chlorinated solvents (e.g., 1,1,1-trichloroethane); an analysis of historical groundwater flow patterns and chlorinated solvent plumes, and evaluation of degradation patterns. The results were presented to a regulatory agency as part of negotiation on cost allocation.

Evaluated trends of TCE and its degradation products for groundwater in an aquifer beneath an industrial multi-party site with a large TCE plume to determine whether natural attenuation was occurring. As part of the study, estimated attenuation rates and times to reach cleanup goals for monitoring wells along the axis and cross gradient of the plume. The results indicated that natural attenuation was occurring throughout the TCE plume via biodegradation and other mechanisms, and that cleanup goals would be met with monitored natural attenuation alone sooner than anticipated.

Provided technical support for a client on remediation of PCE and TCE in groundwater beneath a building in which the client is a tenant. Evaluated work plans on the remediation of chlorinated solvents and advised client on the design of treatability studies and pilot tests for subsurface injections.

Conducted evaluation of results for two-phase pilot study on enhanced in situ biological (EISB) treatment of TCE. During the first phase, provided input for work plans, evaluated results and communicated finding to a client. In the second phase, worked collaboratively with consultant performing remediation and formulated a decision driven plan for conducting the second phase of the pilot.

Evaluated PCE discharges from a drycleaner. Reviewed historical records, remedial reports, and sewer inspection videos. As part of the evaluation, assessed the condition of the sewer to determine whether PCE discharges could have originated from sewers associated with the dry cleaning facility.

## **Polychlorinated Biphenyls**

In support of cost recovery, provided expertise on the use of PCBs in non-liquid applications for a project that investigated the use of PCBs in Navy operations during World Wars I and II. Used multiple industrial archeology tools including review of patents, contemporaneous literature and agency files to identify PCB uses during Navy operations and to evaluate the pathways to sediments.

Evaluated potential historical sources of PCBs to sediments in a marine bay impacted with various historical industrial sources. Identified several potential sources not considered previously, including shipbuilding and -breaking activities.

In support of cost allocation, determined the amount of PCBs that were disposed into a landfill, and subsequently released to a river as a result of historical landfill management practices. Provided assistance in preparation of expert and rebuttal reports.

Advised on the appropriate analytical strategy for determining the source and the degree of weathering of PCBs in caulk material.

In a litigation setting, provided expertise on detection and measurement of PCBs with mass spectrometric methods. The specific questions answered related to historical PCB mass spectrometric techniques, and effect of certain ionization techniques to sensitivity of detection.

Assisted with PCB fingerprinting using PCB congener and homolog data in principal component analysis to identify potential sources of PCBs into a large, industrialized urban Bay. In addition to the analyses, assisted in report preparation.

Evaluated PCB issues associated with a paper sludge landfill near a Midwestern lake. Evaluated the potential pathways and landfill management practices that could have impacted the release of PCBs into the lake. Assisted in preparation of expert and rebuttal reports.

Evaluated the fate of a PCB-containing transformer oil spill into a river. Applied environmental forensic techniques to evaluate the persistence of the mineral oil in the river and the fate of the PCBs in the vicinity and downstream of the spill.

## **Pesticides (DDT)**

Conducted an investigation of potential sources of dichloro-diphenyl-trichloroethane (DDT) in urban river sediments. Evaluated historical information regarding several facilities where DDT was previously manufactured, formulated or handled for pesticide application purposes. In addition to the historical information, utilizing DDT degradation patterns and information on by-products that were generated by other activities at the facilities, concluded that past DDT manufacturing and formulation activities were the major contributors to the sediments.

## **Product Stewardship**

Managed a project for calculating volatile organic carbon (VOC) emissions from a variety of coating and sealant materials using formulation records.

Prepared an environmental assessment for a client on plastic vacuum sealer bags in order to enhance the marketability of the product. The assessment included an in-depth evaluation of the environmental fate of the ingredients present in the bags. Co-authored a report that was submitted to the client.

Calculated the CO<sub>2</sub> footprint of an industrial waste treatment process for garments made of polyvinylalcohol (PVA) polymers by dissolution using hydrogen peroxide and heat.

Performed a third-party evaluation of the environmental transport, fate, and toxicities of degradation products of biodegradable and compostable plastics. Modeled environmental fate properties of various monomers with the EPI Suite™ program.

### **Wastewater and CSO Discharges**

Participated in designing an investigation on combined sewer overflows impacts in an urban canal. Provided expertise in chemical analytical methods, including coordinating with a laboratory to develop more sensitive methods for antimicrobial compounds, and in large volume sampling methods to characterize chemicals associated with suspended particulates. Additionally, conducted fingerprinting analyses and historical research in support of future cost allocation.

Reviewed historical documents and evaluated potential contribution of large pharmaceutical manufacturing facility to contamination in a lake, which is currently a Superfund site. The evaluated sources included direct discharges of process water and cooling water to creeks leading to the lake, discharges to municipal wastewater treatment plants, and prior use of zinc chromate as a corrosion inhibitor.

Calculated historical metal loadings from municipal and industrial wastewater treatment plants to a major river and evaluated their contribution to metal toxicity in a downstream lake. Loadings were calculated to more than 20 municipal wastewater treatment plants using discharge monitoring data. Additionally, the evaluation involved a comprehensive literature review.

Provided expertise and prepared an affidavit in determining whether effluent from a wastewater pretreatment process would inhibit nitrification in a POTW.

Prepared a white paper on the occurrence of sewer corrosion in concrete pipes, and the methods to evaluate sewer conditions, in support of a case involving failure of sewer pipes.

### **Coal Combustion Residuals and Products**

Provided technical consulting support for environmental issues at a coal-fired power plant, where process water managed in onsite ponds had resulted in groundwater impacts. The project involved both technical aspects and issues related to allocation of future remedial costs. As part of the overall project, managed groundwater quality evaluation, which included statistical analysis, preparation of trend graphs, and water chemistry balance analysis. Additionally, provided comments for client on several technical reports that included identification of potential source areas and closure of ponds.

Evaluated the impacts of EPA's proposed rules for disposal of coal combustion residuals (CCR) for the beneficial reuse of flue gas desulfurization gypsum (FGD). Reviewed metals data for FGD gypsum, and evaluated new analytical methods intended to be used in assessment of CCR disposal or reuse evaluations. Subsequently, collaborated to prepare comments that were submitted to EPA.

Assisted in preparation of white papers regarding the environmental fate and environmental and human health toxicity of arsenic and selenium in coal ash. Specifically, was responsible for the section on the chemistry and leaching characteristics of coal and coal ash.

Assisted in evaluation of the environmental impact of hospital incinerator bottom ash to a municipal solid waste landfill. Determined the effect of the ash on the pH of the leachate in the landfill, in addition to determining the effect of the ash on methane production and dechlorination of TCE.

### **Field Analysis and Sampling**

For a major oil company, provided support for a research project investigating impacts of oil weathering

on bioavailability and mobility of oil components using passive samplers. As part of the project, authored two documents for client's internal technology transfer purposes.

Collaborated with a research team consisting of major oil company representatives and universities to investigate and develop a method for TPH field screening using a hand-held instruments using infrared spectroscopy (near-IR and mid-IR). Performed a Demonstration of Method Applicability for a mid-IR instrument, in which the goal was to demonstrate to a regulatory agency that the mid-IR instrument provides effective and sufficient quality data for the purpose of screening soils. Three calibration models were evaluated and site-specific decision limits were established for the instrument allowing its use for field screening.

Managed a project evaluating the application of a variety of field test kits for remediation of contaminated sites. The goal was to investigate whether field test kits produce effective data that can support decisions during a remediation project. The project involved laboratory studies in collaboration with a university. A second-phase of the project investigated the applicability of the current field screening methods for soils impacted with crude oil, and a completion of guidance aimed for project managers.

Employed various decision support tools, such as spatial analysis and decision assistance (SADA) and ProUCL software, to re-evaluate results of EPA's TPH field test kit demonstration project to assess whether the field test kits supported the correct decisions. The application of the decision support tools demonstrated that TPH field test kits can produce effective data supporting the decisions required to remediate a contaminated site and suggested suitable test kits for a subsequent laboratory assessment.

For a major oil company, prepared an analytical assessment strategy to estimate a surface concentration of deposited mercury on refinery equipment, such as pipes and tanks. In particular, the goal was to establish guidelines on calculating defensible surface concentrations from hand-held x-ray fluorescence (XRF) data. A special case involved estimating surface concentrations for areas that are not fully accessible with the XRF device.

Managed, designed and compiled a field sampling manual for an international coal mining company. The sampling manual consisted of individual standard operating procedures for air, surface water, ground water, potable water and sewage sampling, which were prepared in manner that would be compatible with the company's environmental management system. As part of the project, prepared and delivered a 2-day training on the various procedures.

## **Other**

Serves as a part of a Water Environment Research Federation Issue Area team on Trace Organics in Biosolids. Team activities include evaluation of the research needs from the perspective of water utilities, preparation of requests for proposals, and review of final work products (on-going).

Serves as a member of the American Society for Testing and Materials Environmental Assessment, Risk Management and Corrective Action (E50). The committee activities include participation in the work group for sediment remediation guidance development (on-going).

Managed and conducted an inter-laboratory comparison study on analytical methods using mass spectrometry for PCB congener analysis. The goal of the study was to provide new analytical tools that would be cost effective and appropriate given individual project objectives. Further, developed analytical methods for PCB congener analysis using gas chromatography and low-resolution mass spectrometry using different ionization methods