

**Mark W. Johns, Ph.D., P.G., L.G.**  
**Principal Scientist**

**Professional Profile**

Dr. Mark W. Johns is a Principal Scientist in Exponent's Environmental Sciences practice. Dr. Johns specializes in the evaluation of transport and fate of environmental pollutants, remediation, and cost allocation and apportionment. He has been the principal investigator on numerous remedial investigations and feasibility studies and has an extensive background in site remediation and cleanup. Dr. Johns has over 24 years of experience in the fields of geology, groundwater, and geological oceanography. He has been responsible for the technical direction of several large CERCLA-, TSCA-, and RCRA-related environmental studies pertaining to heavy metals, dioxins, PCBs, hydrocarbons, and chlorinated solvents. These studies have involved mine sites, petrochemical facilities, refineries, pipelines, and manufacturing sites throughout the U.S., South America, Australia, Europe, and the Middle East.

Dr. Johns has assisted clients with evaluations of remedial approaches and costs, and the influence of various site conditions. He has developed and applied innovative cost analysis tools using Monte Carlo uncertainty simulations to evaluate a range of probabilities and sensitivities involved in decision analysis, risk, and business planning purposes (i.e., litigation and insurance coverage).

Dr. Johns serves as an expert witness in environmental transport and fate and has provided expert testimony, reports, and declarations on the origin, fate, and transport of pollutants and the appropriateness of remedial cleanup and associated costs in soils, sediments, surface water, and groundwater. He has also provided expert assistance in evaluating compliance with the National Contingency Plan (NCP) and the allocation and appropriateness of remediation costs at a variety of sites.

**Academic Credentials and Professional Honors**

Ph.D., Geological Oceanography, Texas A&M University, 1985  
B.S., Geological Oceanography, University of Washington, 1977

**Licenses and Certifications**

Licensed Geologist/Hydrogeologist, Washington, LG-1262 (2002)  
Registered Professional Geologist, Wyoming, PG-3237 (1999)  
Licensed Professional Geoscientist, Texas, License No. 3221 (2003)

40-Hour Hazardous Waste Operations and Emergency Response – Level A, HAZWOPER, 1986; 8-Hour HAZWOPER Managers and Supervisor Training; 8-Hour OSHA Annual Refresher, 2007; Advanced Health and Safety for Hazardous Waste Site Management, 1987; Registered Washington State Department of Ecology Underground Storage Tank Program, 1990

Division of Environmental Geosciences Charter Member (304092), 1993–present  
American Association of Petroleum Geologists (AAPG, 304092), 1981–present

## **Publications**

Krishnan PK, Freeman B, Johns M. Development of a risk based corrective action program for Kuwait environmental remediation project. Paper presented at the Kuwait Waste Management Conference and Exhibition, Kuwait, April 7–9, 2008.

Mackay CE, Johns M, Salatas JH, Bessinger B, Perri M. Stochastic probability modeling to predict the environmental stability of nanoparticles in aqueous suspension. *Integrated Environmental Assessment and Management*, 2005.

Johns MW, Hickey G, Rice JA. Native revegetation of the middle section of the Provo River, Utah, 1999–2004—A work in progress. *Proceedings Society for Ecological Restoration*, 16<sup>th</sup> Annual Conference, Victoria, British Columbia, Canada, August 24–26, 2004.

Johns MW. Geotechnical properties of Mississippi River Delta sediments utilizing in-situ pressure sampling techniques. *Handbook of Geophysical Exploration at Sea, Second Edition: Hydrocarbons*, 1992.

Dunn DA, Biart BNM, Johns MW. Physical properties data, deep sea drilling project leg 93, sites 603, 604, and 605. Initial reports of the deep sea drilling project. Appendix I, XCIII(1). U.S. General Printing Office, 1987.

Johns MW. Consolidation and permeability characteristics of sediments from Deep Sea Driling Project Leg 93, Sites 603 and 604. Initial reports of the deep sea drilling project, Vol. XCIII. U.S. General Printing Office, 1987.

Prior DB, Bornhold BD, Johns MW. An actively transporting sand Channel B preliminary report. *Journal of Geology* 1986; 14:581–584.

The Geotechnical Consortium, (member). Geotechnical properties of Northwest Pacific pelagic clays; deep sea drilling project, Hole 576A. Initial Reports of the Deep Sea Drilling Project, 1986.

Johns MW. Consolidation and permeability characteristics of Japan Trench and Nankai Trough sediments from DSDP leg 87, sites 582, 583, and 584. Initial reports of the deep sea drilling project, Vol. LXXXVII. U.S. General Printing Office, 1985.

Johns MW. Geotechnical properties of Mississippi River Delta sediments utilizing in-situ pressure sampling techniques, Ph.D. Dissertation, Texas A&M University, College Station, TX, 1985. 102 pp.

Johns MW, Prior DB, Bornhold BD, Coleman JM, Bryant WR. Geo-technical aspects of a submarine slope failure, Kitimat, British Columbia. *Geotechnology* 1985; 6(3):243–279.

Johns MW, Bryant WR, Dunlap WA. Geotechnical properties of Mississippi River Delta sediments utilizing in-situ pressure sampling techniques. Final Report by Texas A&M University, submitted to Minerals Management Service, Metairie, LA. Contract No. 14-08-0001-G-709, 1985. 101 pp.

Leg 93 Scientific Party, Member. DSDP Site 603: First deep (1000-m) penetration of the continental rise along the passive margin of eastern North America. *Journal of Geology* 1985; (13):392–396.

Leg 93 Scientific Party, Member. Kretazisch-kanozoische stratigraphie und paleoenvironment-entwicklung am kontinentalhub vor dem ostlichen Nordamerika. *Journal of Geology* 1985; A75:237–259.

Prior DB, Bornhold BD, Johns MW. Depositional characteristics of a submarine debris flow. *Journal of Geology* 1984; (92):707–727.

Johns MW, Taylor E, Bryant WR. Geotechnical sampling and testing of gas-charged marine sediments at in-situ pressures. *Geo-Marine Letters* 1983; 2(3–4):231–236.

## **Presentations**

Johns M, Beckmann D. Subsea monitoring and analytical results: Subsea dispersed oil, MC252 Deepwater Horizon release. Poster presented at the International Oil Spill Conference (IOSC) for Oil Fate and Transport, Measurements and Modelling Section, Portland, OR, May 23–26, 2011.

Johns M, Edwards M, Atlas R, Harney J, Thompson T. Weathering of MC252 Oil in the water column of the Gulf of Mexico from May through September 2010: Fluorometry, dissolved oxygen, and quantitative chemistry evaluation. Poster presented at the Society of Environmental Toxicology and Chemistry (SETAC) North America Gulf Oil Spill Focus Topic Meeting, Pensacola Beach, FL, April 26–28, 2011.

Johns M, Beckmann D. Deepwater dispersant use and evaluation of subsea monitoring and analytical laboratory results for the MC252 Spill. Poster presented at the Society of Environmental Toxicology and Chemistry (SETAC) Annual Meeting, Portland, OR, November 10, 2010.

O'Reilly K, Boehm P, Johns M. Technical approaches for apportioning liability and allocating environmental costs. Exponent Webinar, December 10, 2008.

Mackay C, Johns M, Salatas J, Bessinger B. Stochastic probability modeling to predict the environmental stability of nanoparticles in aqueous suspension. Society of Environmental Toxicology and Chemistry, 2005 poster session. Abstract reference No. MAC-1117-829575.

Johns M. Transport Chicago: Case study, Port of Chicago (3-part series). Invited presentation to Brownfield Redevelopment Environmental Issues; Making Democracy Work Speakers' Series, League of Women Voters of Chicago, 2003. (Also presented on CAN TV, Chicago.)

Johns MW. Potential environmental conditions associated with submerged floating tunnels. American Underground Construction Association, 1st U.S. workshop on submerged floating tunnels. Invited presenter and chair for environmental issues, Seattle, WA, May 18–19, 2002.

Johns MW. Salmon in the Northwest. Conference completed and approved by Washington State Bar by the seminar Group, October 19 and 20, 2001.

Johns MW. Fate and transport of contaminants in groundwater. Invited Presenter for Subsurface Transport and Fate of Contaminants (GHYD-403) Seminar, for the Northwest Environmental Training Center, May 9–10, 2001.

Johns MW. South America—grappling with hazardous waste. Invited Speaker for the Going Global Track, South America-Grappling with Hazardous Waste, Project Permitting and Politics in South America, of the HazWaste World Superfund XVIII, Washington, D.C., December 2–4, 1997.

Johns MW, Bigham GN, Dole SE. Emerging trends in remedial investigation/feasibility studies. Presented at the Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. Conference, February 23–26, 1987.

Johns MW. Dangerous and hazardous waste characteristics. Guest Speaker at the Industrial Hazardous Waste Management and Pollution Prevention Training Course, Buenos Aires, Argentina, July 15–18, 1996 (USETI Course No. 96-013).

Johns MW. Characteristics of dangerous and hazardous wastes. Invited Speaker for Dangerous/Hazardous Waste section of the University of Concepción International Conference on Solid, Urban, Hazardous, and Dangerous Waste, Concepción, Chile, April 18–19, 1996.

Johns MW. Workshop Developer, Moderator, and Invited Speaker for U.S. Army Corps of Engineers Soil Vapor Extraction (SVE) Workshop, Tacoma, WA, May 24–25, 1994.

## **Prior Experience**

Principal, AMEC Earth and Environmental, Inc., 1999–2003

Independent Consultant, 1998–2000

General Manager Latin American Operations, Radian International LLC (formerly Dow Environmental Inc., Dow Environmental Overseas Management Corporation, DEOMCO), 1994–1998

Manager, Environmental Sciences, AWD Technologies, Inc and Dow Environmental Inc., 1993–1994

Principal Scientist, Seacor, 1992–1993

Program Manager, PTI Environmental Services, 1987–1992

Senior Geologist, Tetra Tech, 1985–1987

Independent Geological/Oceanographic Consultant, 1981–1985

## **Project Experience**

Evaluated the proposed total maximum daily loads (TMDLs) for toxic pollutants in the Dominguez Channel and Greater Los Angeles and Long Beach Harbor waters Implementation Plan. Provided comments to the California Regional Water Quality Control Board, Los Angeles, California, regarding environmental and dredging issues.

Performed environmental baseline and evaluation of environmentally sensitive areas for a major refinery upgrade at the Refineria ISLA Curacao B.V. located in Willemstad, Curacao. New project upgrades involved the development of processes and equipment to reduce atmospheric emissions and improve air quality at the 250,000 BOPD facility. Reviewed site documentation regarding environmental and social due diligence on behalf of the client in preparation for development of documentation for international lending institutions. Identified areas and analyzed mitigation options to protect the areas from any environmental and safety impacts that will be required for the environmental impact assessment (EIA) and the environmental monitoring plan of the project.

Provided expert analysis and report regarding potential historic remediation activities and associated costs for the PCS Nitrogen site in Charleston, South Carolina. Evaluated the probability that Ross Development Corporation (Ross) would have been liable for remedial actions at the site, whether remedial costs could have been reasonably estimated, and the costs of those remedial actions at the time Ross knew of its liability.

Performed international regulatory review and analysis for mine sites located throughout the world. Tasks included reviewing water quality drivers for various regulatory actions that are occurring. This included collecting and evaluating water quality regulations or standards that are applicable to inorganic constituents (i.e., arsenic, cadmium, copper, lead, zinc) in the western United States, parts of South America (Chile and Peru), Canada, Mexico, and Australia. These data were used to evaluate current mine site facility permit and/or general regulatory requirements for pre-treatment of mining wastewater prior to discharge and provide an overview of enforcement activities. An assessment of the regulatory climate, including types of requirements, frequency of evaluation, and enforcement actions was conducted.

Provided an evaluation of contaminant apportionment, transport, and fate from the Grand Chenier Gas Plant and Separation Stations located near Grand Chenier in Cameron Parish, Louisiana. The Grand Chenier Gas Plant operations provided on-shore facilities for the production and separation of liquids from the gas production facilities located offshore. The various facilities had elevated levels of NORM, metals, and TPH.

Retained as expert for the *Joseph A. Pakootas, et al. v. Teck Cominco Metals Ltd.* case to provide an evaluation of the divisibility of the harm arising from metals contamination at the Columbia River site and opine on whether reasonable scientific evidence was present to support that division and apportionment. Reviewed data for inorganic metals contributions to the Columbia River system including landslide, background, and anthropogenic sources.

Performed data analysis for the MC252 Deepwater Horizon oil spill. Analyses focused on water analyses in the deep water of the Gulf of Mexico. As part of the MC252 oil spill response action, BP initiated a program of adding dispersants at the well head. The Submerged Monitoring Unit was established to evaluate and track subsea dispersed oil using two vessels equipped with conductivity, temperature, and depth (CTD); dissolved oxygen; fluorometry; and deep water collection capabilities in addition to detailed quantitative chemistry. Field fluorometry measurements were used to track the location of the subsea dispersed oil in real time and water chemistry samples were collected and analyzed to quantify the field measurements.

Performed environmental and social due diligence and review for a major refinery upgrade at the Cartagena Refinery (Rificar, S.A.) in Cartagena, Colombia. Project upgrade involved development of a 165,000 BOPD facility to international standards. Reviewed site documentation regarding environmental and social due diligence on behalf of international lending institutions.

Retained as expert on behalf of the Official Committee of the Unsecured Creditors of ASARCO LLC Bankruptcy case in the US Bankruptcy Court for the Southern District of Texas, Corpus Christi Division. Prepared expert reports pertaining to multiple mining, milling, and refining sites located across the United States. Reviewed multiple cost assessments provided by the debtors, including NCP issues pertaining to the remediation at various sites and cost estimation methods following ASTM standards and using Monte Carlo analyses. Case included \$6.5 billion in environmental claims for approximately 75 sites in 19 states (AL, AR, AZ, CA, CO, ID, IL, IN, KS, MO, MT, NE, NJ, NM, OH, OK, TX, UT, WA) and Canada for the integrated copper mining, smelting, and refining company.

Retained to provide expert review of remedial actions and contracting mechanism used for remediation of property adjacent to a railroad shop complex in Livingston, Montana. The plaintiffs were seeking monetary damages from the defendant for conditions resulting from site maintenance operations at the railroad shop complex. Site groundwater, surface water, and soil were contaminated with chlorinated solvents, hydrocarbons, metals, and asbestos.

Retained to perform a study to quantify emissions sources at Kuwait Oil Company (KOC) operations in the South Kuwait and West Kuwait fields and evaluate potential health risks from

these emissions on Ali Sabah As Salem and Sabah Al-Ahmad Future City residential areas. The objective of the assessment was to determine whether there was a risk to residents in the existing city and future city from constituents in air emissions from the KOC South and West fields. The assessment was developed using air dispersion modeling results based on AERMOD modeling wherein estimates of the concentration of particulate matter (PM10), carbon monoxide (CO), carbon dioxide (CO2), methane (CH4), nitrogen dioxide (NO2), nitrogen oxides (NOx), non-methane hydrocarbons (NMHC), and sulfur dioxide (SO2) were compared to the corresponding ambient air standards or air quality guidelines in Kuwait (Environmental Requirements and Standards in the State of Kuwait, 1996) and the United States (U.S.) (National Ambient Air Quality Standards).

Compared the Kuwait Environment Public Authority's (KEPA) Regulatory chapters and appendices to similar United States (US) laws and their applicability to the petroleum and petrochemical industry of Kuwait. The purpose of the review was to provide process modifications to the industry that would result in improved environmental performance by the oil industry.

Retained to evaluate cost and liabilities associated with multiple petroleum facility remediations for sites located throughout the country.

Provided expert report to address issues concerning the investigation, remedy selection, and costs associated with a 3,000 gallon heating oil fuel spill on the Western Asphalt property in Jacksonville, Illinois.

Provided expert litigation support to addresses fate and transport of contaminants, remedy selections, and cost allocation at the Intalco Aluminum Smelter Site, Ferndale, Washington. Site consisted of an aluminum processing facility with several landfills and dumps that contained process wastes including spent potliner, anodes, brick, and other process wastes. Contaminants included cyanide, PCBs, and metals.

Provided litigation support with the evaluation of facilities that produced 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (agent orange). The evaluation included review of sediment contamination of sediments in an estuarine system.

Provided expert litigation support to addresses remedy selections, cost allocation, and contributions at the Hard Chrome Products site. The Hard Chrome site was located adjacent to a former aircraft parts manufacturing facility that was purchased by the Los Angeles Unified School District (LAUSD). Groundwater and surface soil was contaminated with chromium and tetrachloroethylene (TCE) plume(s) that resulted from use in the manufacturing process.

Prepared site evaluation strategy as it pertained to the other potential litigants in the Port Angeles Harbor watershed and the Puget Sound Initiative evaluation of the Port Angeles Harbor. The evaluation focused on dioxins, PCBs, wood waste, and metals contamination resulting from decades of industrial activities, including paper production, sawmills, plywood mills, and associated forestry industries in the harbor area. Prepared sampling and analysis plan

for evaluation of sediments in the Port Angeles Harbor for dioxin, PCBs, metals, and other contaminants. Work included collection and analysis of both surface grab and core samples.

Provided consulting assistance with fate and transport analysis of crude oil spills in the Amazonia region of eastern Ecuador.

Provided expert opinion on the cost of remediation and allocation to parties resulting from the deposition of mine spoils and waste at the Magnet Cove barite mine in Magnet Cove, Arkansas. Former underground and open-pit spoils and waste rock were placed adjacent to the mine. Subsequent to mine closure in 1977, the pit lake filled with acidic water that required treatment.

Developed conceptual site model for remediation of dioxin-contaminated sediments in the eastern swale area of a former plywood mill located in Eureka, California. In 2006, Humboldt Bay was added to the U.S. Environmental Protection Agency's nationwide list of impaired waterways during the State Water Board meeting. Prepared remedial action plan and mediation documentation in anticipation of litigation.

Provided oversight in the preparation of a cleanup action plan (CAP) to address lead contamination at a site in Pauma Valley, California, in accordance with the County of San Diego Department of Environmental Health (DEH) 2003 Site Assessment and Mitigation (SAM) Manual. The Site was unknowingly affected by lead during and after polypropylene recycling activities that took place on the site during 1979–1980.

Assisted with the evaluation of arsenic-rich sediments contained in the buried Bingham Magna Ditch, Utah. Historical use of the ditch resulted in enrichment of the sediments with arsenic and other metals. Subsequently, the ditch was buried, and construction of homes and businesses occurred in the vicinity of the ditch.

Provided litigation support with the evaluation of facilities that produced 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (Agent Orange). The evaluation included review of by-product production and loss of dioxin from the production plants.

Provided expert testimony regarding proposed remedial actions, cost allocation, and transport and fate analysis, with source identification of PCBs, hydrocarbons, dioxin, and heavy metal contamination from the Central Waterfront Landfill, located on Bellingham Bay, Washington. Work included evaluation of groundwater, geology, and geologic oceanography.

Provided expert testimony at deposition and trial regarding cost allocation and apportionment; transport and fate of gasoline, diesel, and lead; remedial system performance; and groundwater flow characterization for the Ferrysburg, Michigan, storage and distribution terminal. The site consisted of 27 acres on which a bulk storage terminal (capacity 13.5 million gallons) and transfer facility were located. Truck loading activities resulted in plumes of nonaqueous-phase liquid (NAPL) and dissolved product that required remediation. This was accomplished by installing a pump-and-treat system with a skimmer. Property ownership changed hands, and new spills resulted in a commingled plume.

Reviewed the remedial investigation and prepared comments for the Rayonier Mill site in Port Angeles, Washington. The site is located on the shore of Port Angeles Harbor, on the Strait of Juan de Fuca, and was operated between 1930 and 1997 using the acid sulfite process to produce dissolving-grade pulps from wood chips.

Provided litigation support for the evaluation of potential remedial and primary restoration costs for the Grand Calumet River and Indiana Harbor and Canal along Lake Michigan. The area is affected by several industrial activities, including steel mills, oil refineries, wastewater treatment plants, petrochemical plants, and others. The remedial cost analysis included evaluation of dredging, capping, and natural recovery. Also included was the analysis of primary restoration costs associated with the non-remediated areas of the site.

Provided expert declaration and was retained to provide expert testimony regarding NCP compliance for the long-standing McColl Superfund Site remediation project in Fullerton, California. The State and federal government were seeking cost recovery in excess of \$40 million. Site contamination consisted of approximately 73,000 cubic yards of acid sludges and tars that had been placed in pits and ponds on the site in the 1940s. Remedial measures were implemented in several phases, such as waste incineration, thermal treatment, in-situ solidification, and capping.

Serving as project manager for refinery storage tank failures as a result of Hurricane Katrina at two facilities in Buras and Port Fourchon, Louisiana. Preparing an assessment of the oil spill, the nature, and extent of resulting contamination, and its effects on ecological receptors. Work includes an evaluation of the storm surge and root cause of material failures.

Provided expert declaration regarding groundwater and surface water controls for the Bunker Hill Mine in Kellogg, Idaho. EPA prepared a Record of Decision (1992) for a non-populated area of the site that included treatment and removal controls and associated costs for solid wastes, surface water, and groundwater. This included area mine-water treatment by collection and treatment of waters that infiltrated from above the Kellogg Tunnel level, as well as the deeper mine water that was required to be maintained at the level of the Coeur d'Alene River. The various sources of mine water had considerably different quantities and concentrations of heavy metals. The sources of the water were evaluated, and an expert report was prepared that presented the load distributions and estimated treatment costs for each source.

Provided senior direction for the application of a multidisciplinary ecological risk assessment of the effects of fugitive dust from the Red Dog Mine, haul road, and port in evaluating potential mine closure scenarios. The risk assessment modules included evaluating the effects of potential metals concentrations on sensitive tundra habitats and subsistence foods. The 29-square-mile permitted mine area was divided into zones in which different closure scenarios could be applied; then ecological risks were evaluated by area.

Provided senior oversight for the evaluation of sources of arsenic, cadmium, lead, and zinc in the vicinity of a historical zinc smelter.

Provided senior direction for development of a framework to assess arsenic and lead concentrations throughout a residential community. Arsenic and lead associated with the site

resulted from mining and mill tailings from historical copper mining and smelting. Residential concentrations were compared to national cleanup criteria developed for various national sites.

Retained to provide expert testimony regarding probable remedial activities and associated costs for PCB-contaminated sediments in Convair Lagoon, San Diego, California. Evaluated source control and recontamination of an existing cap for the 7-acre site. Potential remedial actions included complete removal to thin-layer capping with monitored natural recovery, after implementation of source-control measures.

Provided opinions and litigation support for the evaluation of a 40,000-gallon diesel fuel spill into a containment system that failed. The failure resulted in the net loss of approximately 30,000 gallons of fuel to the soil beneath the containment structure. Provided cost estimates for probable cleanup scenarios.

Retained to provide expert testimony regarding cost apportionment for costs resulting from remedial action activities in the Everett Harbor, Washington. The evaluation included review of site RI/FS documentation, remedial action activities, construction, dredging, transport-and-fate analysis, and post-action monitoring. Contaminants of concern include PCBs, PAHs, metals, and hydrocarbons and deleterious waste.

Retained to provide expert testimony regarding cost apportionment for all costs resulting from remedial activities in the Thea Foss Waterway, Tacoma, Washington. The evaluation includes review of site RI/FS documentation, remedial action activities, construction, dredging, transport-and-fate analysis, and post-action monitoring. Contaminants of concern are PCBs, PAHs, metals, and hydrocarbons.

Served as an invited advisory board member and expert for the California Childhood Lead Poisoning Prevention Program (CLPP) evaluation of sources, fate, and transport of lead in the environment in California. The California Department of Health Services (CDHS) established a fee allocation to fund the program in 1991, based primarily on the amount of lead consumed by the gasoline and architectural coating industries in California between 1929 and 1986. The California Supreme Court ruled in 1997 that the fee would not be considered a tax, so long as the basis for apportioning the fee bore a reasonable relationship to the fee payer's contribution to the burden addressed by CDHS's CLPP program. Was a member of the expert team that conducted an independent analysis for a major petroleum company of the appropriateness of the current fee allocation. This team reviewed source, fate-and-transport, epidemiology, and toxicology reports for California cases. Trial was held in California Superior Court in December 2007.

Retained to develop remediation cost projections for two large remediation projects related to the Raybestos facility in Crawfordsville, Indiana, and to present and defend those estimates at trial. The project also included allocation of prior Exponent costs related to offsite remediation. Developed a probabilistic cost estimate for application to past and future site remediation costs. The Superior Court for the State of Indiana ruled (October 30, 2006), awarding Raybestos 100% of the cost estimates and allocation, accepting the cost methodology and approach, and recognizing the expertise in these matters.

Prepared a focused feasibility study for the remediation of Reach 4 of the Shelly Ditch in Crawfordsville, Indiana. The site consists of PCB-contaminated sediments and floodplain deposits along a small stream emanating from a former brake manufacturing plant. The evaluation considered human health and ecological risk to develop practical options. The preferred alternative included evaluation of hot-spot removal, with monitored natural recovery in inaccessible areas. Provided remedial scenario development and most probable cost analysis for the client. Designated as the Site Manager in the Administrative Order on Consent (AOC) and oversaw the successful remediation of the floodplain sediments and closure of the site in 2008. The project was completed on budget and schedule.

Provided litigation support to outside counsel to review and assess the emergency response to an event at the Plutonium Reclamation Facility and to review and assess the emergency response plan for the Plutonium Finishing Plant (which included the Plutonium Reclamation Facility) at the Hanford Nuclear Site, being operated under contract from the Department of Energy. Specifically, the assignment included a critique of the emergency response to the incident and the applicable portions of the emergency response plan with regard to whether the response was timely, appropriate, and protective. Additionally, the assignment included an assessment of the plan and response with regard to improvements that could be made during future Emergency Responses.

Estimated the probability of costs for each of six different remedial alternatives using Monte Carlo methods in cost allocation negotiations among PRPs of a site with PCB sediment contamination at Upriver Dam in Spokane, Washington. Remedial alternatives included monitored natural attenuation, capping, and dredging options. In the Monte Carlo approach, a probability distribution that describes the uncertainty of values, rather than a single best-guess value, was considered for each cost element in the remedial option. Evaluated individual remedial alternatives for probability of occurrence, and calculated a weighted mean value for different scenarios bounded by 90th percentile upper limits as compared to an expected-mean-value (50th percentile) calculation.

Provided an expert declaration to help understand an “incentivized” contracting mechanism used for remediation of property adjacent to a railroad shop complex in Montana. The plaintiffs were seeking monetary damages from the defendant for conditions resulting from site maintenance operations at the railroad shop complex. Site groundwater, surface water, and soil were contaminated as a result of the Livingston Railyard and the surrounding area, where hazardous or deleterious substances have been deposited, stored, disposed, or otherwise come to be located.

Managed the team that evaluated dense, nonaqueous-phase liquid (DNAPL) transport from the Manufactured Gas and Coking site to the Island End River (Massachusetts) sediments. This included a forensic analysis of the PAH source and deposition areas. PAHs were evaluated successfully using cluster analysis. Remedial cost apportionment was applied using the results of the PAH analysis.

Performed a site due diligence evaluation and cost analysis for the construction of a hotel and spa in the Deer Valley Ski Resort (Utah) on the site of a former mine waste-rock pile that contained heavy metals. Work included evaluation of potential human and ecological impacts resulting from construction activities on the waste rock.

Managed the team that provided expert analysis of the most likely probable risk scenario for a contaminated barrel-reconditioning site. This information was used to develop a cost cap insurance policy for the site. A site-specific air dispersion model was developed for three scenarios: normal surface conditions, furnace operations, and an upset condition. Resultant hazardous air pollutants were modeled, and a human health risk calculation was applied. The site operations included barrel reconditioning by furnace treatment, followed by sand blasting, then interior and exterior painting with heat treating. Over a period of years, neighbors filed numerous complaints about poor air quality resulting from the operations. During an upset condition, the downwind neighborhood was subjected to a noxious plume. This resulted in the filing of a lawsuit by more than 500 plaintiffs.

Provided litigation support to a large metals recycling company regarding remediation of certain areas of uplands and sediment in the East Waterway of the Duwamish River in Seattle, Washington. Evaluated fate and transport of chemicals of concern (PCBs, metals, PAHs) from the uplands site to the waterway at Harbor Island, as well as the proposed dredging. Reviewed cost allocation and environmental issues relating to the company's possible link to a PCB hot spot.

Reviewed existing site investigation and remediation documentation as part of litigation support in a case involving a former metals fabrication facility site on the Duwamish River in Seattle, Washington. The site had been purchased and was being redeveloped by a large metals recycling company. Prepared GIS-based, time-sequential contaminant mapping and evaluated the extent of preexisting contamination, then combined that information with a cost analysis review. Contaminants included inorganic compounds, chlorinated solvents, and petroleum products. Site evaluation included all upland source areas, former dredge fill sites, an underground petroleum pipeline, and former rail lines.

Provided litigation support to a marine ship dismantling company that formerly operated on the Hylebos Waterway in Tacoma, Washington, a part of the Commencement Bay Nearshore/Tideflats Superfund Site. This work included a cost evaluation of natural resource damages, potential restoration options, and remedial actions. Contaminants included hydrocarbons, PCBs, metals, PAHs, and deleterious wastes. Cost apportionment was evaluated with respect to contaminants present in the sediments.

Retained by the Kasper (1977) Irrevocable Trust to provide expert analysis and litigation support regarding costs associated with the development of a remedial investigation/feasibility study (RI/FS) at the American Drive-In Cleaners site in Levittown, New York. NYSDEC had taken more than 13 years to develop the RI/FS and final Record of Decision for the site. In addition, excessive costs associated with oversight and management of the site by NYSDEC and EPA had accrued, and the remedial selection process had resulted in a solution for which costs would exceed \$5 million.

Directed the development of a sampling and analysis program for evaluation of the sediments along canals and waterways associated with a major refinery in Argentina, where a high degree of hydrocarbon contamination in the water at a nearby yacht club was resulting in a bloom of *Microcystis aeruginosa* (cyanobacteria, with hepatoxins). The plan included the evaluation of Ce-137 and Pb-210 radio-dating techniques, combined with geochemical fingerprinting, to apportion the site remediation/restoration responsibilities.

Retained to provide expert opinion in support of the Port of Bellingham's case against its insurers. Issues included the ownership, presence, fate, and transport of contaminants from four separate sites located along the waterfront of Bellingham Bay in Bellingham, Washington. The sites consisted of former landfills, wood-treating facilities, and sawmills. Reviewed extensive technical reports and cost analyses for data compiled for each site. Findings and opinions were presented in an expert declaration that reviewed the fate and transport of metals, PCBs, PAHs, and dioxins.

Project manager for the development and installation of an ArcIMS system for the Port of Seattle. The system was designed to provide quasi-real-time facilities information for all buildings and levels during reconstruction of the airport. The system also provided environmental data views for development of the Third Runway.

Retained by Gordon and Polscer, LLP to provide litigation support pertaining to the Summitville Mine Superfund Site in Rio Grande County, Colorado. The site is a former gold and copper mine that operated since the 1870s and was added to the EPA NPL in 1994. Reported findings and opinions on general description of various contaminants, conditions, and operable units being investigated or remediated; the nature of the costs expended on each investigation and/or remediation; and the segregation of project costs between those generally deemed to be a cost of doing business in the mining industry and those that can be attributed to unanticipated remediation costs.

Served as Project Manager for the investigation and removal of approximately 30,000 yd<sup>3</sup> of potentially contaminated soil and asphalt material at the Terminal 18 site on Harbor Island, Washington. Designed and prepared a sampling and analysis plan (SAP) in an expedited fashion (less than 1 week). A volume of approximately 25,000 yd<sup>3</sup> of asphalt material was designated for recycling, resulting in a significant cost savings. Approximately, 5,000 yd<sup>3</sup> of soil required disposal at a non-hazardous landfill, and only 150 yd<sup>3</sup> required disposal at a designated hazardous landfill. All material was removed from the site prior to the redevelopment deadline, thus avoiding significant fines and costs associated with disposal at a hazardous waste landfill.

Performed a site assessment and evaluation of historical upland and sediment disposal practices along the Tacoma waterfront for a confidential client. The work focused on evaluating pyrogenic versus petrogenic PAHs and included evaluation of coal and refined petroleum hydrocarbon distribution across the site. Cost analysis included review of solid waste disposal costs.

Developed and implemented a sampling and analysis plan for the Sandy Hook (New Jersey) Maintenance Dredge and Beach Nourishment Project. The objectives of the project were to restore adequate depth in a privately maintained navigation channel leading to the Sandy Hook Yacht Club Estates Marina, restore and stabilize the Sandy Hook beach, and provide the potential for surf smelt and sand lance habitat. The maintenance dredging permit was obtained from the U.S. Army Corps of Engineers. The channel sediments were sampled and analyzed and found suitable for dredging and placement onto the Sandy Hook beach as a habitat enhancement project.

Provided expert declaration and expert testimony for the case of Morrison Knudsen Citation and Notice No. 30304540, No. 01 W0158 with the State of Washington Board of Industrial Insurance Appeals. Reviewed extensive data sets for metals concentrations and distributions in site soil and worker personal air monitoring equipment. Applied a Roesner's sequential procedure for determination of probable outliers with a successful outcome.

Prepared an expert report and provided expert testimony for potential wetland impact from vehicle emissions and stormwater runoff at the Aegis Assisted Living site in Shoreline, Washington. Neighbors challenged the original delineation studies, and subsequent SEPA evaluations during construction activities (File No. 2000-0821). The court was unable to find any analysis of consequential impacts of vehicles using the services—for example, potential adverse impacts of auto traffic, exhaust, oil spillage, and contamination—within the 1-ft buffer of the stream (Thornton Creek) and the 50-ft buffer of the wetlands. Retained to provide expert opinion on the relative impacts to the wetland environment.

Served as project manager for the Brownfield redevelopment of a 50-acre former construction debris landfill parcel on the north end of Lake Washington (Seattle area). Contaminants included asbestos-containing materials, arsenic, and petroleum hydrocarbons in soils and groundwater located throughout the site. Regulatory guidelines were developed for all media, based on the most appropriate site data as applied to both human and ecological receptors. Designed the program timelines to meet the permitting and SEPA environmental deadlines for a very compressed schedule prior to the initiation of the new MTCA regulations. Redevelopment values are estimated to be \$200 million for the phased development of condominiums, restaurants, and businesses throughout the site.

Served as program manager for the development of corporate-wide risk management and emergency response planning studies for a major software company. Performed a post-mortem analysis of the Nisqually earthquake and 9/11, using a cross-group emergency management team that included Security, Real Estate and Facilities, Internet Technology Group, Risk Management, Human Resources, Public Relations, and Legal & Corporate Affairs. This team worked together to develop the corporate-wide Puget Sound emergency response plan (ERP). The plan evaluated potential natural and man-caused disasters from the individual, building, and corporate-wide viewpoints. It included implementation at 75 building locations, affecting 40,000 employees. The efforts complemented other measures that corporate security was implementing to increase the safety and security of the Puget Sound locations. This project was highly successful and was supported by management. The work included development of building-specific ERPs, online training tools, quick reference documents for each office, building signage, drills, and cross-organizational ERPs.

Retained by Bankston & McCollum to provide oversight for the investigation and sampling activities, potential remedial costs, and litigation support at the North 60° Petro site in Whitehorse, Yukon Territory. Prepared a comprehensive report detailing contaminant distributions throughout the site. The site was used as part of the Canol Project, which included a large oil refinery built as part of the World War II defense strategy by the U.S. Army Corps of Engineers. The project also involved the development of the Norman Wells oilfields and construction of several sections of crude-oil pipeline to the refinery in 1944.

Served as project manager for the Haug Channel Homeowners Association step-wise sediment evaluation prior to initiation of potential dredging activities at this shore-side community at the southern end of Fairweather Bay in Hunts Point, Washington. Performed an evaluation of existing sediment conditions (surficial and at depth), comparing the results to local use standards, sediment management standards (SMSs), and Puget Sound Dredged Disposal Analysis (PSDDA) protocols in anticipation of dredging activities. Prepared the SAP and quality assurance project plan (QAPP), performed the sampling, and generated the final report.

Managed the drilling, water sampling, pump testing, and modeling of aquifer characteristics for two wells at the Cama Beach and Lime Kiln Point State Parks. Lime Kiln Point State Park is located on San Juan Island, where existing wells had exhibited saltwater intrusion. A new 5-in. water well was installed to 560 ft in difficult basalt geology. Cama Beach State Park is located on Camano Island, Washington, and required a new 6-in. well. Sampled both wells to determine requirements for potable water. Twenty-four-hour pump tests were used to determine aquifer characteristics.

Served as project manager and evaluated existing sediment conditions (surficial and at depth), comparing the results to SMS and PSDDA protocols in anticipation of constructing a reinforced concrete haulout for Delta Marine Industries, Inc. Prepared the SAP and QAPP, performed the sampling, and generated the final report. Following successful negotiation of a joint aquatic resources permit application (JARPA) with the U.S. Army Corps of Engineers and the Washington State Department of Ecology (Ecology), the Delta Marine boatlift, as planned, was constructed in 2000. Ecology's response letter reported a No Further Action decision and commended the high quality of the report.

Managed geological evaluation for an *in situ* vitrification project at Los Alamos National Laboratory Radiological Waste. A drain field that was constructed to dispose wash water from laundry facilities at the laboratory was contaminated with particles of low-level radiation. *In-situ* vitrification was conducted, as a field scale pilot study, using a small scaled test module to determine how to reduce radiological contamination of the contaminated soil water contained within the drain/septic field.

Managed an evaluation of near-surface sediments in the vicinity of Totem Marina, a pleasure boat and yacht marina (Commencement Bay, Washington) with haul-out facilities, upland dry storage, and marine sales and service, on behalf of a potential purchaser. Prepared the SAP and QAPP, performed the sampling, and generated the final report.

Served as project manager for a criminal investigation directed by EPA Region 10 as a result of the removal from a CERCLA site of 660 yd<sup>3</sup> of potentially contaminated soil. The soil was disposed at a commercial topsoil facility near Maple Valley, Washington. Because these soils were not sampled prior to removal from the CERCLA site, and were placed at an offsite facility without proper manifesting, the Criminal Investigation Divisions of EPA and Ecology monitored all site investigation activities conducted at the offsite facility. Detailed sampling and analysis resulted in location of the suspected soil and determination that it was below regulatory levels. This case resulted in no criminal actions.

Served as principal investigator providing expert guidance for the evaluation of the former Matsushita Semi-Conductor of America Facility in Puyallup, Washington, prior to transfer of the property to Microchip Corporation (\$80 million). The environmental site assessment included collection of sediment, soil, sludge, groundwater, and surface water samples throughout the 686,000-ft<sup>2</sup> cleanroom facility and 92-acre campus. The plant consisted of three main building areas equipped with state-of-the-art clean rooms and air emission and wastewater treatment facilities, and was surrounded by parking and delivery drives.

Participated in the Calcasieu Estuary Study as a project manager. The study area consisted of the surface water, sediments, and related wetlands and wetland soil of Bayou d'Inde, Bayou Verdine, the Calcasieu River, and the Calcasieu Ship Channel from the saltwater barrier to the northern end of Moss Lake near Lake Charles, Louisiana. Led the team in developing an integrated RI/FS and NRDA work plan and submitted it to EPA, the Louisiana Department of Environmental Quality, NOAA, and the U.S. Fish and Wildlife Service for review and comment. The statement of work represented one of the only cases in which the RI/FS and NRDA processes have been fully integrated. The work plans detailed the processes used to develop all field sampling protocols and integrate the evaluation of remedial and restoration alternatives for chlorinated solvents, dioxins, PCBs, PAHs.

Served as the site operations manager for the United Park City Mines Company. Developed and implemented site restoration and revegetation plans for several high mountain (5,500 to 9,000 ft amsl) mine sites. The sites included waste-rock dumps, milling, processing, and hard-rock shaft locations. The sites varied dramatically in slope, aspect, elevation, erosion potential, topsoil, water retention capacity, etc. These areas were redeveloped as home sites.

Served as manager of site operations and implemented restoration and revegetation activities to return native species to a man-made, highly disturbed lake structure. This restoration work involved combining different aspects of environmental and landscape design to produce a natural habitat with native plants and sufficient fish habitat for a viable system. The effort included several innovative techniques to ensure that restoration activities resulted in a viable system and minimized additional disturbance. All landscape, native plantings, fish habitat, stream modification, and final contouring on the lake were performed prior to filling. Construction work included surveying, soil removal and placement, large structure and rock placement, dam spillway placement, erosion control measures (vegetative and geotextile), entrant stream modification, aeration (natural and solar powered), dock installation, irrigation (pressure-head driven, non-invasive), and native plantings (trees, shrubs, grasses, wildflowers, and forbs).

Technical reviewer and site expert for the evaluation of chlor-alkali plant operations and contaminant distributions in the site soil and groundwater around the Buna Petrochemical Refinery in Buna, Germany. Provided input into development of sampling programs and protocols for soil, groundwater, and sediments. Contaminants included chlorinated solvents, TCDD, vinyl chloride, and mercury. Reviewed and developed potential remedial scenarios and cost analysis.

Prepared the site uplands and sediment data collection and evaluation report in preparation for soil and sediment remediation at a former Union Carbide petrochemical plant at Homebush Bay, near Sydney, Australia. The site had produced Agent Orange (2,4-D and 2,4,5-T, dioxins) for use during the Vietnam War. Manufacturing processes and various spills had contaminated site-wide soil and nearshore sediments of the western bay shore. The report provided a basis for establishing cleanup goals with consideration of human health, ecological risk factors, and local regulations.

Provided technical input and oversight in the development of a sampling and analysis plan for the investigation of DNAPL contamination at a petrochemical facility in Altona, Victoria, Australia. The DNAPL wastes had been placed in landfills on the site and consisted of chlorinated solvents with PCBs and dioxins. The site geology consisted of clays and silts but was complicated by the presence of a fractured basalt aquifer in the subsurface.

Served as a program manager for an extensive site assessment and soil sampling program for evaluation and remediation of a 20-hectare former tank farm and refinery sludge storage area located at the Dock Sud industrial complex of Buenos Aires, Argentina. Heavy industry, including petroleum and chemical refining, paint pigment production, glass, coking, etc., used the immediate area surrounding the facility. The team performed a site investigation and remedial actions analysis to determine the necessary remediation system. Several remedial options were evaluated, including incineration, thermal desorption, *in situ* fixation, slurry wall and cap, groundwater treatment, landfill, and no action. In late 1996, the site remediation was initiated using in-situ fixation and soil stabilization. The team used multi-national and World National Health Organization analytical tools to develop remedial options and present the first judicially approved risk-based cleanup criteria for Argentina. Total estimated project value was \$5,200,000.

Supervised the analysis of the plant wastewater source characterization of a chemical plant in Aratu, Brazil. All sources of water in the plant were evaluated to prepare a design and cost basis for the proposed plant wastewater treatment system upgrade. The work included preparation of all Phase I design package and project control materials. The construction of the wastewater plant upgrade and control project was completed in 1997.

Served as the manager of an environmental impact analysis on a 4-hectare property located in the Capital Federal District of Buenos Aires, Argentina. Work was performed as a preliminary response to using the property for development of a solid, sludge, and liquid waste treatment facility. All work was performed in accordance with Argentine Law 24.051. The waste treatment plant was a centralized location for the treatment and handling of liquid waste products from service stations and ships. Phase I–III design package materials were prepared for the waste treatment plant to remediate ship and service-station waste products. This was the

first plant designed for the purpose of treating and recycling hazardous waste products in Argentina.

Served as the general manager in the application of a detailed environmental impact assessment on a 50-hectare former pharmaceutical manufacturing facility located in Buenos Aires, Argentina, in accordance with Argentine Law 24.051. The results of the investigation indicated that remedial actions were necessary. This work included the installation of a soil vapor extraction system to remediate acetone vapors using U.S. thermal oxidation equipment; the uncovering, decontamination, and removal of 11 underground storage tanks with combined capacity of over 575,000 liters; the performance of in-situ and ex-situ bioremediation of soil contaminated with kerosene through heavy fuel oil; the removal and repair of asbestos-containing materials; and the evaluation and maintenance of PCB-containing machinery. Ultimately, the site was sold. Those negotiating the sale used the environmental impact assessment and resultant remedial report to document and verify that environmental liabilities had been remediated and that value had been returned to the site.

Served as the general manager in the application of a detailed environmental impact assessment and feasibility study analysis for the purchase/sale of a 100-hectare former chlorine manufacturing facility located in Neuquen, Argentina, in accordance with Argentine Law 24.051. The results of the investigation indicated that remedial actions were required for a number of problem areas at the site. Mercury contamination was found at several locations where elemental mercury had contaminated the groundwater and soils beneath the site. This was compounded by the presence of vinyl chloride and dioxins. During the feasibility study analysis, a cut-off wall and water treatment system were designed to contain the groundwater contaminant plume within the site boundaries. Remedial costs were evaluated with respect to the total facility operational costs.

Directed the site remediation for a service station in Buenos Aires, Argentina. The remediation system included the installation of soil vapor extraction wells and the importation of thermal oxidizer equipment to treat soil vapors contaminated with gasoline, diesel, and kerosene at the site. All work complied with regulations established by the Dangerous Waste Law No. 24.051 of Argentina, and the Municipalidad de Buenos Aires.

Served as program manager and directed an extensive site assessment, soil sampling program, and groundwater monitoring network installation (100 samples, 48 borings, 12 wells, and 63 piezometers) at an ethylene dichloride waste management area at a chemical plant in Talcahuano, Chile (200 km south of Santiago). In the late 1970s and early 1980s, DNAPL (i.e., mixed chlorinated solvents, EDC, PCBs, vinyl chloride, dioxins) contamination was buried in shallow, near-surface pits. Site investigation and remedial action analyses were performed to determine the necessary remediation system. Several remedial options were evaluated, including incineration, thermal desorption, in-situ fixation, slurry wall and cap, groundwater treatment, landfill, and no action. In late 1995, the installation of a site groundwater containment system, slurry wall, and cap was approved and scheduled for construction in early 1996. Total estimated project value was \$5,400,000. Remedial activities included the installation of approximately 2 km of slurry wall to a nominal depth of 25 m, surface water drainage controls, constructed site cap (both soil and asphalt), irrigation system, and

groundwater control and treatment systems. The project was completed and the system was operational in early 1997.

Served as both project manager and geohydrologist while preparing the RFI work plan for sediments, soil, and groundwater investigations at The Dow Chemical Company in Freeport, Texas (Blocks A-41/A-42). The site investigation included the evaluation of three separate groundwater aquifers contaminated with two distinct DNAPLs (primarily EDC wastes with PCBs and dioxins in excess of 40,000,000 gal). The complex Gulf Coast site stratigraphy required extensive evaluation of the groundwater regime. Remedial options evaluation included placement of horizontal wells, interception trenches, large-bore DNAPL collection systems, and hydraulic barriers. Both human and ecological risk assessments were prepared in an integrated, proactive approach.

Managed the installation of a soil vapor extraction system at the Well 12A Superfund Site in Tacoma, Washington. The system operates through 22 wells at a maximum 3,000 ft<sup>3</sup> per minute, extracting VOCs and other chlorinated solvents from the subsurface. Constructed with the ability to control and monitor the soil gas extraction process from any configuration of the system, the gas treatment system involved filtering the hot soil gas for particulates, then cooling the gas and extracting the VOCs. The gas treatment system cycles were controlled with a programmable logic controller (PLC) system that determined valve opening and closure for each cycle. Responsible for constructing and optimizing the subsurface system, including input and calibration for a modular, 3-dimensional, finite-difference model. This was performed using a combination of model packages (VENTING, MOTRANS, MODFLOW). Used the flow model for assessment of conceptual design scenarios, estimation of capture zone and stagnation points, and evaluation of the capture zone with varying extraction rates and configurations.

Served as project manager for sediment dredging project associated with a dockside spill of ethylene dichloride (EDC). This work was performed at The Dow Chemical Company Plant A facility in Freeport, Texas, in the Brazos River Harbor area adjacent to the Intracoastal Waterway. The dense non-aqueous-phase liquid (DNAPL) was released while loading from dockside facilities to a barge. Dredging was implemented on an expedited schedule, and sediments were removed using a barge-mounted environmental clamshell dredge to barges for removal from the site. Both dockside and unloading facility worker health and safety were monitored continuously using both site-wide and personal air monitoring equipment. Site cleanup activities proceeded to completion on the expedited schedule with no health and safety issues.

Prepared a RCRA corrective measures study (CMS) for soil and groundwater investigation at The Dow Chemical Company in Pittsburgh, California. The site investigation included evaluation of shallow groundwater aquifers contaminated with arsenic, chromium, and lead, resulting in potential contamination of bay sediments. The complex San Francisco Bay site stratigraphy required extensive evaluation of the groundwater regime. Did preparatory work, including a statistical evaluation of soil and groundwater contaminant levels, prior to evaluating in-place closure. Cost analyses were prepared for appropriate waste management units.

Managed the RCRA facility investigation (RFI) that addressed the requirements noted in the RCRA Part B permit covering an inactive solvent recycling facility located outside Portland,

Oregon. Because the permit was issued jointly by the Hazardous and Solid Waste Division of the Oregon Department of Environmental Quality (ODEQ) and the Region 10 office of the U.S. Environmental Protection Agency, the entire facility was treated as a single solid waste management unit. The permit required an RFI to be performed on the entire facility. Indoor and outdoor drum storage areas had been used for storing spent chlorinated solvents prior to reclamation within the onsite distillation unit, or transport to offsite hazardous waste management facilities for disposal. Leaks and spills from these areas had resulted in a large chlorinated solvent plume in the local groundwater system.

Evaluated extensive chlorinated solvent groundwater plumes at two separate locations in Burbank/North Hollywood, California. Groundwater evaluation included regional geology, groundwater pumping, reinjection, and treatment. Assisted with development of dual train stripping tower treatment system.

Assisted legal counsel in the preparation and evaluation of historical use practices, data analysis, data interpretation, report preparation, and regulatory interaction for a 1,600-acre former dynamite production plant. Performed a detailed analysis on the chemical and physical hazards present at the site, and documented remedial and physical cleanup actions. Ultimate use of the site included recovery of forest products, residential homes, public facilities, and a proposed golf course.

Managed and prepared the evaluation of injecting treated groundwater into an existing, saturated aquifer at the Shell Refinery in Carson, California, south of Los Angeles. The work included characterization (both quality and quantity) of the proposed injection water and the injection zone. Assessed potential chemical interactions between native and injected fluids.

Managed the site investigation, performed soil sampling, and documented findings in support of litigation for a property in Woodinville, Washington. Onsite contaminants resulted from poor materials handling processes that occurred on the upgradient, adjacent property. As a direct result of the findings, the upgradient property owners assumed liability and costs associated with remediation of contaminants on the property.

Managed the site investigation, performed sediment sampling, and documented findings in support of litigation for the Cedar River Delta in Lake Washington near Renton, Washington. The program was designed to evaluate the PCB and metals concentrations for the shallow, nearshore, lacustrine sediments. Contaminants resulted from multiple industrial activities associated with the poor materials handling processes that occurred on the upgradient, adjacent property.

Evaluated chlorinated solvent groundwater plumes at two separate locations in Burbank/North Hollywood, California. Groundwater evaluation included regional geology, groundwater pumping, reinjection, and treatment.

Prepared an expedited RI/FS for multiple potentially liable parties (PLPs) at a site where free-phase gasoline was distributed in subsurface soil over a 20-acre area. Designed the work plan to provide data of sufficient quality and quantity to evaluate remedial options and support human health risk assessment. Reports were prepared in a limited time period to avert a probable

enforcement order by Ecology (State of Washington). Work included preparation of a multi-media work plan and human health risk evaluation that required substantial interaction with multiple PLPs and negotiation with Ecology.

Managed an MTCA-based site assessment and investigation for the Port of Seattle at the former Coast Guard Facility along Salmon Bay in Seattle, Washington. Work included the installation of site-wide groundwater wells, soil sampling, storm drain sediment sampling, and aquatic sediment sampling. Integrated the data into a conceptual model of fate and transport of contaminants at the site based on former industrial practices at the site. The information collected at the site was integrated into an ecological and human health risk assessment that was used to direct potential remedial alternatives.

Served on retainer for litigation in support of analysis of site contamination (soil, sediments, surface water, and groundwater) at a historical industrial complex and municipal landfill. The site was located in the sensitive estuarine environment adjacent to Grays Harbor, Washington.

Prepared written materials and assessments prior to litigation. To the client's satisfaction, the bankruptcy court allowed the property to be abandoned. This allowed the client to settle debt and remove one of the longest held bankruptcy cases in the U.S. 9th District Court.

Served as program manager for the closure of Class V injection wells under EPA Order on Consent at seven sites for a major oil company. Project involved substantial interaction with the client and Ecology, to initiate and maintain this program under rigorous MTCA regulatory and time constraints. This included work plan preparation, coordination of field and laboratory activities, data review and analysis, and closure report preparation. Field operations consisted of excavation and removal of the injection wells, hollow-stem auger soil boring, installation of monitoring wells, and environmental sampling.

Served as the program manager for Phase I and II underground storage tank site investigations for a major oil company. The work included installation, operation, and maintenance of groundwater treatment, vapor extraction, and air sparging systems; tank removal; and site closure at more than 50 sites.

Managed a site assessment work plan and sampling program for a former lumber mill and municipal landfill site in the estuarine environment near Grays Harbor, Washington. Coordinated all field work, including collection of soil, surface water, sediment, and subsurface samples for detailed metals and organic contaminant analyses. Based on human and ecological health, developed Washington State MTCA cleanup standards.

Prepared soil investigation and hydrogeologic study plans for the RI/FS at the Alkali Lake site in eastern Oregon. The site was used for storage and disposal of chemical wastes. The site is situated in a non-draining basin and was contaminated with process sludges that were stored in barrels at the site from the manufacturing of pesticide (2,4-D).

Performed a full-scale waste treatability evaluation, including column leaching tests, batch tests, and pre- and post-treatment chemical analyses. The results allowed the client to decide against

proceeding with this treatment alternative because of the unacceptable lead concentrations in the waste filter cake. The primary environmental matrix evaluated was flue dust.

Managed multiple RI/FSs and engineering evaluation/cost analyses (EE/CAs) to evaluate soils, air, vegetation, surface water, and groundwater at a 20-mi<sup>2</sup> former smelter site near Anaconda, Montana. Sampling included placement of 27 wells, collection of approximately 10,000 soil samples, analysis of surface drainage and erosion, installation of an air monitoring network, and conduct of phytotoxicity. Data were integrated into an ArcInfo<sup>®</sup> geographic information system for rapid review and analysis, including evaluation of potential offsite transport of specific contaminants in surface soils using physiographic conditions and the modified universal soil loss equation, groundwater modeling, kriged summarization of three-dimensional soil contaminant distributions, groundwater modeling, and statistical summarization of contaminant distributions for evaluation of human health risk and contaminant transport and fate. Extensive use of statistical methods provided the client with focused revision of the EPA-mandated sampling programs into manageable and cost-effective forms.

Managed, designed, and prepared a work plan and QAPP for a flue-dust reclamation pilot test to render RCRA waste less hazardous while reclaiming metals. Performed all test process sampling, QA/QC, and data analysis for the project report.

Served as the site data coordinator for natural resource damage assessment for a large CERCLA mine site in the western United States. Data included over 250,000 entries of soil, water, vegetation, and miscellaneous chemical information.

Managed an EE/CA for two smelter sites near Anaconda, Montana. Prepared work and site safety plans while coordinating field work.

Evaluated the distribution and regulatory implications of mine tailings throughout a former mill in New Mexico. The regulatory evaluation included country-wide evaluation of disposal options and action levels for various metals contaminants. Prepared and reviewed fate and transport analysis of arsenic, cadmium, and lead in surface and groundwater. Some of the work included a statistical evaluation of the spatial distribution of surficial soil with respect to surface drainage patterns. Also analyzed regulations relating to potential cleanup standards and guidelines.

Managed preparation of a work plan for site remedial investigation of air, contaminant sources, soils, surface water, groundwater, geology, hydrostratigraphy, and public health at Smelter Hill, Anaconda, Montana.

Prepared the hydrologic assessment of contaminant transport from the 58-acre waterfront site inhabited by McCormick & Baxter Creosoting Co. between 1944 and 1991. Site work included evaluation of NAPL flow paths to the Willamette River, and PCP and PAH contamination in the uplands and river sediments.

Prepared a site geohydrologic evaluation for a RCRA site assessment and compliance monitoring evaluation at a hazardous waste site in Cody, Wyoming.

Prepared a soil, surface water, and geohydrologic analysis of a tidally influenced hazardous waste site (RCRA) at a timber treating facility near Olympia, Washington. Cascade Pole Co. wood treatment facilities operated at the site from 1957 to 1986. Similar site operations dated back to 1939. The site was located on Budd Inlet in Olympia, Washington, and the primary contaminants were creosote and pentachlorophenol.

Assisted in geologic and hydrostratigraphic evaluation of a site for a NOAA natural resource risk assessment project in Tampa Bay, Florida. Evaluated upland sites as potential contaminant source areas for estuarine sediments.

Prepared a site hydrological model and contaminant transport analysis for the tidally influenced 3,780-acre site located on the east side of Bainbridge Island, in Central Puget Sound, Kitsap County, Washington. The site consisted of an inactive 40-acre wood-treating facility adjacent to the 500-acre Eagle Harbor. From 1905 to 1988, wood-treating operations were conducted on the southeast shore, involving pressure treatment with creosote and pentachlorophenol.

Prepared a site geophysical investigation and reconnaissance survey work plan for a CERCLA mine site at Bunker Hill, Idaho. This included an evaluation of a series of valleys with very tight configurations and fill sediments for hydraulic connectivity.

Prepared sediment sampling protocols following PSDDA protocols. Using gravity coring devices and bucket samplers, collected Commencement Bay sediment samples. Prepared quantitative analytical results, integrated these results into the basin-wide database, and compared relative toxicity based on chemical mix.

Prepared a siting analysis for dredge disposal materials collected in San Francisco and Oakland Bays. The analysis included evaluation of upland, nearshore, and deep-water disposal options for the dredge materials. Used standards of analysis, environmental impact, and site characteristics to evaluate the relative impact of disposal at each site.

Wrote a technical memorandum pertaining to potential remedial technologies for in-situ amelioration of inorganic contamination. Also provided technical and cost reviews of soil solidification, deep soil mixing, and in-situ vitrification.

Prepared a site evaluation for potential natural resource damage claims at a metal plating/anodizing facility on Long Island, New York. Evaluated upland sites as potential contaminant source areas for estuarine sediment loading.

Managed field and laboratory investigation of trace-element contamination in surficial soils at an 8.5-mi<sup>2</sup> site in Butte, Montana. Prepared work plan and QA/QC project plan, performed statistical analysis of data, and prepared project reports. Performed sampling based on a statistical approach to minimize the total number of samples while maximizing the statistical significance of grouped samples. Sample groups included vegetable gardens, flower gardens, playgrounds, schools, private-residence yards, waste piles, street sweepings, vacant lots, and hockey rinks. Approximately 200 locations were sampled.

Coordinated preparation of a smelter RI/FS master investigation report, including fate and distribution of contaminants in all media. Performed geological and reconnaissance investigations for a 20-mi<sup>2</sup> site.

Coordinated preparation of the Mill Creek, Montana, RI/FS on a compressed time schedule. Primary responsibilities included evaluation of geology, hydrostratigraphy, and hydrology; field sampling for soils; planning and implementation of bench and pilot studies; and reconnaissance surveys.

Prepared maps and documented potential remedial action operable units within the Clark Fork River drainage in southwest Montana.

Managed the preparation of the Butte, Montana, RI/FS work plan, including public health impacts; air, soils, surface water, and groundwater site reconnaissance; historical mining practices; geologic background evaluation; and hydrological investigations.

Prepared statistical summaries and data organization for preparation of an endangerment assessment for Mill Creek, Montana.

Participated in field sampling efforts in the Gulf of Mexico, southern California, Alaska, and the Puget Sound for feasibility studies and petroleum hydrocarbon distribution and mapping.

Served as a field geologist for a deep, continuous-borehole geological and geo-physical logging operation in Loving County, Texas. This included local and regional stratigraphic correlation, aquifer definition, and subsurface geologic properties.

Served as project stratigrapher for numerous offshore hydrocarbon exploration cruises in Alaska and the U.S. West and Gulf Coasts. Coordinated real-time mapping activities of hydrocarbon potential. These surveys included reflection and refraction profiling designed to evaluate near-surface potential geohazards and deep structural and stratigraphic sequences. Also designed and evaluated geophysical borehole programs, including sonic velocity, resistivity, gamma ray, induction, and spontaneous potential.

### **Professional Affiliations**

- Freestone Council of the Big Hole River Foundation (charter member)
- American Association of Petroleum Geologists
- Society of Petroleum Engineers

### **Deposition and Trial**

*PCS Nitrogen, Inc., Plaintiff, v. Ross Development Corporation; T. Heyward Carter Jr.; Grayson G. Hanahan; William O. Hanahan, III; Katharyne H. Rike; Estate of G.L. Buist Rivers, Jr.; Mikell R. Scarborough; C. Cotesworth Pincney and T. Heyward Carter, as Co-Trustees of the Trust of William O. Hanahan Jr.; Anne Hanahan Blessing; Donald Buhrmaster, III; Eleanor W. Carter; Margaret H. Carter; Elizabeth H. Clark; Maria Grayson-Metaxas; Buist L. Hanahan; Elizabeth A. Hanahan; Francess G. Hanahan; Mary Ross Hanahan; Muriel R.*

*Hanahan; Roger Parke Hanahan, Jr.; Grayson C. Jackson; Oriana H. Kirby; and Jeanne Deforest Smith Hanahan, Defendants.* Case No. 2:09-CV-3171-MBS, First Amended Complaint in the United States District Court, District of South Carolina, Charleston Division. Expert report submitted on March 9, 2011.

*Joseph A. Pakootas, and individual and enrolled member of the Confederated Tribes of the Colville Reservation; Donald R. Michel, and individual and enrolled member of the Confederated Tribes of the Colville Reservation, Plaintiffs-Appellees and State of Washington Plaintiff/Intervener, v. Teck Cominco Metals, Ltd., a Canadian corporation, Defendant-Appellant.* Expert report submitted on January 14, 2011. Deposition on April 7, 2011.

*The United States Bankruptcy Court for the Southern District of Texas Corpus Christi Division, ASARCO LLC, et al., Debtor.* Case No. 05-21207, Chapter 11 (Jointly Administered). Expert Reports for Omaha Lead Site and Custodial Sites (2) on behalf of the Official Committee of Unsecured Creditors of ASARCO LLC, April 20–21, 2009. Supplemental expert reports for Omaha Lead Site and Custodial Sites (2) submitted on May 7, 2009. Deposition for Omaha Lead Site and Custodial Sites (2) May 8, 2009. Proffers for Omaha Lead Site and Custodial Sites (2) submitted on May 13, 2009. Trial May 18–19, 2009.

*INTALCO Aluminum Corporation v. Central National Insurance Company of Omaha, et al., Case No. 06-2-01842-3 In the Superior Court of the State of Washington in and for the County of Whatcom.* Expert report for the Intalco Aluminum Smelter Site, Ferndale, Washington and Expert report on Behalf of Century Indemnity Company submitted on June 12, 2009. Rebuttal submitted on July 10, 2009. Deposition on August 25, 2009. Declaration in support of Century defendants motion for summary judgment, October 6, 2009.

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