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Mark Johns, Ph.D., P.G., L.H.G.

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Professional Profile

Dr. Johns specializes in the 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 30 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, poly and perfluoroalkyl substances (PFAS), 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).

As an expert witness in environmental transport and fate, Dr. Johns 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 Clean Water Act (CWA), National Contingency Plan (NCP), and the allocation and appropriateness of remediation costs at a variety of sites.

Academic Credentials & Professional Honors

Ph.D., Geological Oceanography, Texas A&M University, 1985

B.S., Geological Oceanography, University of Washington, 1977

Licenses and Certifications

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER)

8-Hour HAZWOPER Managers and Supervisor Training

8-Hour HAZWOPER Annual Refresher

Bar Association Member

Division of Environmental Geosciences Charter Member

Advanced Health and Safety for Hazardous Waste Site Management

Licensed Geologist (WA)

Licensed Professional Geologist (WY)

Licensed Professional Geoscientist (LA)

Licensed Professional Geoscientist (TX)

Registered Washington State Department of Ecology Underground Storage Tank Program

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

Professional Affiliations

Freestone Council of the Big Hole River Foundation (charter member)

American Association of Petroleum Geologists (AAPG)

Society of Petroleum Engineers

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 2006 Jul 2(3):293-298.

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, 16th 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, pp.

351-401, 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. Active sand transport along a fjord bottom channel, Bute Inlet, British Columbia. 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.

Van Hinte JE, Wise SW, Biart BNM, Covington JM, Dunn DA, Haggerty JA, Johns MW, Meyers PA, Moullade MR, Muza JP, Ogg JG, Okamura M, Sarti M, von Rad U. Deep-sea drilling on the upper continental rise off New Jersey, DSDP Sites 604 and 605. Geology 1985 June; 13:397-400.

Leg 93 Scientific Party, Member. Kretazisch-kanozoische stratigraphie und paleoenvironment-entwicklung am kontinentalfub 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

Geiselbrecht, A. McKay, A., King,, M., Patmont, C., Brunkhorst, G., Gardner, R., Johns, M., and Baker, L. Large-Scale MNR and Enhanced MNR Remedy in Western Port Angeles Harbor. Platform accepted at the Battelle Eleventh International Conference on the Remediation and Management of Contaminated Sediments.

Alfarra E, Johns M, Freeman, B. GCC HSE Regulatory Workshop: After EPL: Managing Environmental Compliance in Kuwait. Workshop presentation regarding the Environmental Protection Law (EPL) 43/2014 at the Radisson BLU Hotel Kuwait. December 4, 2018.

Johns M, Edwards, M, Atlas, R, Duncan, B, Harney, J, Thompson, T. Evaluation of relationships among fluorescence, dissolved oxygen, and analytical chemistry measurements of the water column as indicators of MC252 oil in the Gulf of Mexico. Poster presented at the Society of Environmental Toxicology and Chemistry (SETAC) Annual Meeting, November 13−17, 2011.

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.

Project Experience

Provided expert testimony regarding the status of insurance coverage, drilling and completion activities on the USA 153-95-1A-7 well pad in the Williston Basin region outside Charlson, North Dakota, McKenzie County, North Dakota. A well pad fire engulfed 3 of 4 onsite wells that resulted in losses on the pad and environmental contamination on and off the pad. Multiple insurance policies and master service agreements were involved in the evaluation.

Evaluated remedial activities and costs associated with the Taylor Way and Alexander Avenue Fill Area (TWAAFA) Potter Parcel located in the Tacoma Tideflats on the peninsula between the Hylebos Waterway to the northeast and the Blair Waterway.

Provided expert testimony for the contaminated site located in Port Angeles Harbor, WA. Work included evaluation of remedial activities and future costs on the near-shore upland site formerly occupied by a paper mill. Allocation of future costs was considered based on former ownership, contaminants and contamination history.

Reviewed soil and groundwater contamination at Jeff's Auto, Seattle, WA. Provided an expert report on the allocation of remedial activities based on contamination resulting from three ownership periods.

Evaluated waste handling practices for a major university hospital system. Federal, State and local regulations were reviewed to support the development of a site inspection checklist. Site-specific inspections were performed and a GAP analysis was prepared for waste handling practices at all facilities.

Provided an expert report after reviewing the data room documentation pertaining to the share sale and purchase agreement for offshore production assets including a 500-km pipeline from a gas production field in the east Timor Sea to a liquified natural gas facility in Darwin, Australia. This international arbitration case revolved around the disclosure of data and reports pertaining to the location and amount of mercury contamination in the under sea pipeline. This was an international arbitration case heard in Brisbane Australia (SIAC Arbitration No. 143 of 2021).

Assisted with preparation for mediation regarding an electronics manufacturing site in Los Angeles County that had chlorinated solvent contamination in soils, soil vapor, and groundwater. Evaluated existing site conditions and potential remedial activities necessary at the site.

International arbitration case evaluating the environmental conditions prior to and after the sale and purchase of oilfield assets located in northwestern (Block X) and southwestern (Block 58) Peru. Evaluated thousands of due diligence documents related to allegations that contaminated assets were not disclosed at the time of the sale. This was an international arbitration case heard in London (ICC Case Reference 26212/SPN).

Evaluated the potential impacts to surface water of nearby streams from mercury loading and temperature changes resulting from the proposed Donlin Gold Mine located in southwest Alaska. The proposed Donlin project is in the historic Kuskokwim Gold Belt of Southwest Alaska, 10 miles north of the village of Crooked Creek.

Evaluated the impacts of a release of hydrochloric acid (HCl) onto soils at a hydraulic fracturing well pad. Provided expert testimony related to soil characteristics, testing, and analysis, as well as the

reasonableness and necessity of the modes and costs for the remediation and disposal of the soil following the acid release.

Evaluated the global presence of naturally occurring lead and arsenic in crustal rocks and soils. This project looked at the uptake of lead and arsenic by a variety of spice plants ground in regions around the world. The information was used to evaluate the California Prop. 65 labeling issue and definition of “naturally occurring.”

Provided a sitewide analysis and regulatory review related to a styrene vapor release that occurred in 2020 in Visakhapatnam, India. The work included a regulatory review of the statues and laws of India as related to international standards. In addition, assisted with support and development of sampling work plans to meet future data needs. Data fitness was evaluated and that included data normalization, quality assurance/quality control measures, review to confirm data were suitable for intended purposes.

Reviewed operational aspects of remediation and remedial systems applied at the 3M manufacturing facility in Decatur Alabama. Provided expert testimony related to standard of care for the 3M facility wastewater treatment plant (WWTP), including sludge application, applicable environmental regulations, environmental fate and transport of PFAS chemicals, and treatment of PFAS chemicals.

Provided expert testimony regarding the evaluation of the nature of certain soils and soil borings and samples collected on the former Ecology Control Industries, Inc. (ECI) property and adjacent residential properties located in Torrance, California. The properties are located in a former drainage pathway emanating from the former Montrose pesticide (DDT) manufacturing plant located in Torrance, where construction of a water conveyance system and extensive filling resulted in significant contamination from offsite sources.

Provided assessment of operation and disposal practices at a tannery in Michigan for potential per- and polyfluoroalkyl substances (PFAS) groundwater contamination. Compared tannery practices to state (primarily Part 201) and federal (RCRA, Comprehensive Environmental Response, Compensation and Liability Act of 1980 [CERCLA], CWA) requirements. Evaluated state of the knowledge for overall disposal practices and PFAS-related waste disposal at various times throughout the approximate 100-year history of the facility.

Evaluated PFAS compounds in the drinking water supply wells at Lake Elmo, MN. Reviewed local geology and groundwater flow conditions.

Retained to provide expert testimony at the International Dispute Resolution Centre in London, England regarding the Barakah Nuclear Power Plant in Abu Dhabi. This arbitration focused on engineering and environmental contractual issues associated with the construction of the plant. The environmental work included evaluating environmental tasks as related to the Abu Dhabi regulations for Construction Environmental Monitoring Plans (CEMP) and assessing which party was responsible for the completion of this work. This was an international arbitration case heard in London (LCIA Arbitration No. 163527).

Reviewed and evaluated historic operations at a major steel plant on the south shore of Lake Michigan. This major integrated steel plant covers over 4,000 acres with multiple facilities and solid waste management units within the site. Evaluated the reasonableness and necessity of costs to resolve insurance liabilities for costs associated with sitewide remedial efforts under CWA Consent Decrees, RCRA Corrective Action Orders and NRD Consent Decrees. Work involved evaluation of extensive permitted fill along the shores of Lake Michigan.

Retained to evaluate fate and transport of perchloroethylene and daughter products at a large, former industrial laundry facility site in Seattle, WA. Evaluated timing, release, and movement of PCE throughout the area and the reasonableness of remedial costs.

Evaluated site remedial actions and costs for soil remediation of formaldehyde, petroleum hydrocarbon, arsenic and pH at a cement plant in Renton, WA. Assisted with the evaluation of reasonableness of the remedial actions and the costs for those remedial actions.

Evaluated per- and polyfluoroalkyl substances (PFAS) remediation at the Oakdale, Woodbury and Cottage Grove landfills in Minnesota. The migration of PFAS is highly dependent on the structure of the compounds (i.e., length of fluoroalkyl chain and functional group structure) as well as the properties of the solid material through which they are transported. Evaluated groundwater fate and transport and groundwater remedial actions. Provided expert opinion on the remedial programs that were implemented at three landfills and opined on the state of the art for landfills from the 1950s to present.

Evaluated best management practices for erosion control on a gas pipeline construction project west of Atlanta, Georgia. The work was based on the Manual for Erosion and Sediment Control in Georgia 2016. The pipeline owner directed erosion control measures that were implemented by the pipeline contractor. During construction a series of heavy rain events resulted in lost time because of site erosion control failures.

Evaluated the extent of former zinc smelter emissions impacts on a nearby urban environment. Compared urban background from the potential past impacts from to direct emissions.

Evaluated the fate and transport of petroleum contamination in soil and groundwater from multiple sites resulting in a comingled plume. Assisted the client with the voluntary cleanup program (VCP) in Washington State.

Requested to evaluate the cause of a large slab on grade building underwent considerable settlement after construction. The initial evaluation looked at nearby public water supply well withdrawal. LiDAR was used to evaluate the potential occurrence of site wide subsidence issues. These were ruled out and an evaluation of the original geotechnical calculations was undertaken. This resulted in uncovering errors in the original settlement calculations.

Provided expert testimony regarding the status of insurance coverage, drilling and completion activities on the Eisenbarth well Pad in the Marcellus shale region outside Clarington in Monroe County southwestern Pennsylvania. There was a massive well pad fire that resulted in losses on the pad and environmental contamination on and off the pad. Multiple insurance policies were involved in the evaluation.

Evaluated the factors that result in delta loss for a major river system. Factors included loss due to damming, mass wasting, erosion, growth faults, fluid withdrawal, isostasy and sea-level rise.

Evaluated groundwater contamination, fate and transport for sulfolane at the North Pole refinery site outside Fairbanks, AK. Sulfolane is used in the refining process of crude oil to produce gasoline.

Provided remedial cost analysis for mine site remediation at a site in Arizona. Work included sensitivity analysis for various scenarios pending determination of State of Federal control of the site.

Evaluated oilfield history and development for the Ecuadorean oil fields in the Amazonian portion of the country.

Retained for evaluation of fate and transport of perchloroethylene at a large, former industrial laundry facility site. Evaluated timing, release, and movement of PCE throughout the area.

Retained to provide analysis and report of owner, operator, generator, arranger, and broker relationship with regards to NCP compliance and liability for wastes sent to a treatment facility that ultimately became the U.S. Oil Recovery Superfund site in Houston, TX.

Provided expert opinion on groundwater flow in the area of the 2014 Oso Landslide. This included evaluation of well data, field observations, photogrammetry, geographic information system (GIS), LiDAR, and forest cover.

Retained to provide geologic and groundwater analyses of a property on Anderson Island Washington. Included evaluation of groundwater resources in glacial geology and a claimed illegal timber harvest.

Evaluated biodiversity issues for an energy company in foreign action brought by non-governmental entities seeking many billions in damages allegedly caused by past energy exploration and production. Primarily focused on evaluating claims of ecological loss and natural resource damages for a region-wide soil, surface, and groundwater cleanup.

Retained to provide analysis and apportionment of surface water and sediment contributions to the historical Kahala drainage system near Honolulu, Hawaii. Evaluation included review of drainage canals and direct piping throughout the watershed, requirements of the Clean Water Act (CWA), and best management practices (BMPs) in the watershed.

Retained to assess contaminant and solids runoff from area surrounding Kaelepulu Pond in Kailua, Hawaii. Included evaluation of Clean Water Act (CWA) requirements, stormwater BMPs, pond sediments, and the drainage system associated with the pond. Focuses on sediment and nutrient loading that resulted from grading activities at an adjacent construction site. Soil and nutrient loss from the site was estimated using the universal soil loss equation (USLE) and field data collected during storm events. Contributions of sediment and nutrients to Kaelepulu Pond from the construction site were evaluated with regard to sediment and nutrient loading from the greater watershed area. Comprehensive evaluation of site BMPs included comparison of the BMP plan to measures implemented in the field and an assessment of BMP successes and failures during substantial rainfall events. Case settled in mediation.

Provided expert testimony pertaining to fingerprinting, fate, and transport in groundwater, surface water, and sediments of paper-mill wastes containing dioxins and furans from the San Jacinto River Waste Pits. These pits are located in the San Jacinto River just north of I-10 in Houston, Texas, and contain waste from a paper-mill operation dating to the mid-1960s. Evaluation also included analysis of fate, transport, and fingerprinting of dioxins and furans in the Houston Ship Channel and Galveston Bay; effects of scour, flooding, and subsidence on chemical migration pathways in the system; and physical properties of dikes and waste materials.

Retained to analyze timing and occurrence of hazardous materials release to a property in Waianae, Hawaii. Property owner leased a 10-acre parcel to a third party for farming purposes. Unbeknownst to the owner, the parcel was then sub-leased for disposal of hazardous materials by several additional parties. Disposed materials included used batteries, sandblast material, used autos, painting wastes, etc. Several burn pits were located on the property. The site became known to the EPA criminal investigation division and was subsequently cleaned up under an emergency removal action.

Prepared expert report pertaining to concentration and distribution of metals, NCP compliance with regards to the conceptual site model and remedial investigation/feasibility study (RI/FS) activities, the EPA remedy selection process and regulations, and the NPL listing resulting from chat and tailings distributions in the Old Lead Belt of St. Francois County, Missouri. Included evaluation and status of all Superfund sites listed on the NPL. The Big River Mine Tailings site consists of seven separate mine chat and tailings piles. The chat and tailings deposits are waste materials produced by the extraction, beneficiation, and processing of minerals at this site. Chat deposits include sand- to gravel-sized material resulting from the crushing, grinding, and dry separation of the ore material. Tailings deposits include sand- and silt-sized material produced by the wet-washing or flotation separation of the ore material.

Retained to provide expert opinion on allocation of future dredging costs for in-water sediment contamination sampled at Salmon Bay Marina in Seattle, Washington. Evaluated contaminant distribution and sources for a formerly leased parcel of marina space. Owners claimed contamination at the dockside

facility was the sole responsibility of the lessee, although several sources of contaminants are present throughout the larger Salmon Bay. Work also included mediation concerning the cost of potential upland contamination (April 8, 2014).

Prepared expert report regarding soil and groundwater remedial actions (and associated costs) implemented at Kings Plaza Shopping Center after July 6, 2006, to address a discharge of No. 2 heating oil associated with the underground storage tank system located in the area referred to as Operable Unit 1. Kings Plaza Shopping Center is located in Brooklyn, New York.

Prepared detailed work plan attachment and negotiated with Washington State Department of Ecology (Ecology) for an Administrative Order to conduct an RI/FS for the Western Port Angeles Harbor focused on filling data gaps for dioxins, PCBs, wood waste, metals, and sediment bioassays. Contamination resulted from decades of industrial activities, including paper production, sawmills, plywood mills, and associated forestry industries in the harbor area. Ongoing work includes quality assurance/quality control (QA/QC) oversight, database management, and creation/maintenance of a document repository for the RI/FS completed in 2014.

Provided expert opinion on a $250-million CERCLA cost recovery action against the United States based on government involvement at a Cold War-era rocket manufacturing facility in southern California. Work included evaluation of NCP compliance and remedial actions in shallow and deep groundwater pertaining to TCE and perchlorate contamination.

Provided review and evaluation of cleanup action occurring at the PlusPetrol crude pipeline spill sites near Villa Trompeteros, Peru. Verified the areal extent of environmental impacts in each zone via visual inspection, reviewed actual or planned remedial activities in the field, and recommended any additional or more appropriate remedial measures than those observed in the field or planned according to available documentation. In addition, provided comments and recommendations on the following: general technical approach and competence of response, remediation, and restoration actions; status of regulatory compliance with existing permits and regulatory guidance; proportionality of response in relation to scope of impacts; cost effectiveness of response in terms of efficiency relative to standard practice, preferred alternatives, or resources utilized; and projected timetable for response, including sequencing and duration of activities.

Estimated remediation costs for contingent environmental liability accrual purposes. Performed feasibility-level remediation cost estimate for a historical ash landfill on the site of an industrial facility. Estimated costs for various remediation options for the ash landfill associated with a paper production facility. Prepared estimates of onsite ash volumes and costs using RACER software associated with removal and offsite disposal versus an in-place grade-and-cap plan.

Retained as inter-creditor environmental agent during construction period of the Cartagena Refinery (Reficar, S.A.) in Cartagena, Colombia. Responsible for evaluation and reporting of site environmental and social conditions during the $5.18-billion refinery and upgrade project, reporting directly to the Ex-Im Bank and other international senior lenders. Expansion increased refinery capacity from 78,000 to 160,000 barrels per day.

Performed environmental and social due diligence (ESDD) evaluation for the Cartagena Refinery (Reficar, S.A.) in Cartagena, Colombia. Prepared the ESDD report for Ex-Im bank and a group of international lenders to review and include in loan documentation.

Evaluated 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 studies and evaluation of environmentally sensitive areas for a major refinery upgrade at the Refineria ISLA Curacao B.V., located in Willemstad, Curacao. Project upgrades involved 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 (ESDD) on behalf of the client in preparation for development of documentation for international lending institutions. Identified areas and analyzed mitigation options to protect those areas from any environmental and safety impacts that will be required for the project's environmental impact assessment (EIA) and environmental monitoring plan.

Provided expert analysis and report regarding potential historical remediation activities and associated cost estimation methods following ASTM standards for PCS Nitrogen site in Charleston, South Carolina. Evaluated 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 that Ross knew of its liability. Evaluated cost analysis with respect to NCP compliance for RI/FS issues regarding soil, sediment, and groundwater contamination.

Performed international regulatory review and analysis for mine sites located throughout the world. Tasks included reviewing surface and groundwater quality drivers for various regulatory actions. Included collecting and evaluating water quality regulations or standards 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 to provide an overview of enforcement activities. Conducted assessments of regulatory climates, including types of requirements, frequency of evaluation, and enforcement actions.

Evaluated contaminant apportionment, transport, and fate from the Grand Chenier Gas Plant and Separation Stations located near Grand Chenier in Cameron Parish, Louisiana. Grand Chenier Gas Plant operations provided onshore 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 in soil, sediment, and groundwater.

Retained as expert for the Joseph A. Pakootas, et al. v. Teck Cominco Metals Ltd. case to study the divisibility of the harm arising from metals contamination at the Columbia River site and to 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 focusing 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 field measurements.

Performed environmental and social due diligence ESDD and review for a major refinery upgrade at the Cartagena Refinery (Reficar, S.A.) in Cartagena, Colombia. Project upgrade involved development of a 165,000-BOPD facility to international standards. Reviewed site documentation regarding ESDD 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 U.S. 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 debtors, including NCP issues pertaining to soil, sediment, and surface and groundwater 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, and WA) and Canada for the integrated copper mining, smelting, and refining company.

Retained to provide expert review of the remedial actions and contracting mechanism used for remediation of property adjacent to a railroad shop complex in Livingston, Montana. 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.

Directed the development of new liquid and solid waste regulations for the State of Kuwait. Compared the existing state of water and waste management regulations in Kuwait to the standards and regulations in the United States (CERCLA, RCRA, CWA), the European Union (EU Water/Waste Framework Directives), Canada (Canada Water Act, CEPA), and the Gulf Cooperation Council states (GCC). Reviewed numerical standards, internal organizational hierarchy, and the interactions between regulatory agencies and the regulated community. Prepared and presented multiple reports for members of the Kuwait Environment Public Authority (KEPA) and lead international team meetings.

Retained 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. Developed assessment to determine whether there was risk to residents in the existing city and future city from constituents in air emissions from the KOC South and West fields 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 U.S. National Ambient Air Quality Standards.

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

Retained to evaluate costs and liabilities associated with multiple petroleum facility remediations for sites located throughout the United States.

Provided expert report to address issues concerning investigation, remedy selection, and costs associated with site soil and groundwater contamination resulting from a 3,000-gallon heating-oil spill on Western Asphalt property in Jacksonville, Illinois.

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

Provided litigation support by evaluating facilities that produced 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (Agent Orange). Evaluation included review of sources of sediment contamination in a major east coast U.S. estuarine system. This work involved review of all source input to the river system including industrial, municipal, and private waste streams. Sites included municipal wastewater treatment plants, landfills, chemical, industrial and manufacturing plants that occupied the region for over a hundred years.

Provided expert ligation support to address remedy selections, cost allocation, and contaminant contributions at the Hard Chrome Products site in California. The site was located adjacent to a former

aircraft parts manufacturing facility purchased by the Los Angeles Unified School District (LAUSD). Groundwater and surface soil were contaminated with chromium and trichloroethylene (TCE) that resulted from their use in the manufacturing process.

Prepared site evaluation strategy as it pertained to other potential litigants in the Port Angeles Harbor watershed and the Puget Sound Initiative evaluation of the Port Angeles Harbor, 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 (SAP) 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. Work included evaluation of all petroleum and natural gas wells throughout the region.

Provided expert opinion on remediation costs and allocation to parties resulting from 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. Soil contamination and groundwater flows and volumes were evaluated throughout the mine site.

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 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 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 homes and businesses were constructed in the vicinity of the ditch.

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 in groundwater associated with this near lakeshore site; 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 produced plumes of non-aqueous 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 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. Site soil, groundwater, and sediments were evaluated.

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. 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. State and federal government were seeking cost recovery in excess of $40 million. Site contamination consisted of approximately 73,000 yd3 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.

Served as project manager for evaluation of refinery storage tank failures that resulted from Hurricane Katrina at two facilities in Buras and Port Fourchon, Louisiana. Prepared an assessment of the oil spill, the nature and extent of resulting contamination, and its effects on ecological receptors. Work included 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. Evaluated the sources of the water and prepared an expert report that presented 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. 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 arsenic, cadmium, lead, and zinc sources 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 seven-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 and groundwater beneath the containment structure. Provided cost estimates for probable cleanup scenarios.

Retained to provide expert testimony regarding cost apportionment for remedial action activities in the Port of Everett Harbor, Washington. Evaluation included review of site RI/FS documentation, remedial

action activities, construction, dredging, transport-and-fate analysis, and post-action monitoring. Contaminants of concern (COCs) included PCBs, PAHs, metals, and hydrocarbons and deleterious waste.

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

Served as invited advisory board member and expert for the California Childhood Lead Poisoning Prevention (CLPP) program 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. Worked on 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. Project also included allocation of prior consultant costs related to offsite remediation of soil, sediment, and groundwater. 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 approach and validating the expertise behind the established estimates.

Prepared focused feasibility study for remediation of Reach 4 of the Shelly Ditch in Crawfordsville, Indiana. Site consists of PCB-contaminated sediments and floodplain deposits along a small stream emanating from a former brake manufacturing plant. Evaluation considered human health and ecological risk to develop practical options. 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 successful remediation of floodplain sediments and closure of the site in 2008. The project was completed on budget and schedule.

Retained by outside counsel to review and assess the emergency response to an event at the Plutonium Reclamation Facility and the emergency response plan (ERP) 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. Included critique of the emergency response to the incident and the applicable portions of the ERP with regard to whether the response was timely, appropriate, and protective and assessment of the plan and response with regard to improvements that could be made during future Emergency Responses.

Estimated probability of costs for each of six different remedial alternatives using Monte Carlo methods in cost allocation negotiations among potentially responsible parties (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 expert declaration to help understand an "incentivized" contracting mechanism used for remediation of property adjacent to a railroad shop complex in Montana. Plaintiffs sought monetary damages 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, non-aqueous phase liquid (DNAPL) transport from the Manufactured Gas and Coking site to the Island End River (Massachusetts) through site soils and groundwater into sediments adjacent to the site. Included forensic analysis of the PAH source and deposition areas. Evaluated PAHs successfully using cluster analysis; applied remedial cost apportionment using PAH analysis results.

Performed 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. 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. Developed site-specific air dispersion model for three scenarios: normal surface conditions, furnace operations, and an upset condition. Modeled resultant hazardous air pollutants and applied a human health risk calculation. 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. Included a cost evaluation of natural resource damages, potential restoration options, and remedial actions. Contaminants included hydrocarbons, PCBs, metals, PAHs, and deleterious wastes. Evaluated cost apportionment with respect to contaminants present in sediments.

Retained by the Kasper (1977) Irrevocable Trust to provide expert analysis of groundwater contamination and litigation support regarding costs associated with the development of a RI/FS at the American Drive-In Cleaners perchloroethylene 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. Contamination resulted from leaky drainage tiles and was spread in the groundwater by nearby groundwater pumping wells. 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 development of a (SAP) for evaluation of 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 Microsystis aeruginosa (cyanobacteria with hepatoxins). Included evaluation of Ce-137 and Pb-210 radio-dating techniques combined with geochemical fingerprinting to apportion 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. Sites consisted of former landfills, wood-treating facilities, and sawmills. Reviewed extensive technical reports and cost analyses for data compiled for each site. Presented findings and opinions 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. A former gold and copper mine that operated since the 1870s, the site 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 investigation and removal of approximately 30,000 yd3 of potentially contaminated soil and asphalt material at the Terminal 18 site on Harbor Island, Washington. Designed and prepared an SAP in an expedited fashion (less than one week). A volume of approximately 25,000 yd3 of asphalt material was designated for recycling, resulting in a significant cost savings. Approximately, 5,000 yd3 of soil required disposal at a non-hazardous landfill, and only 150 yd3 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 site assessment and evaluation of historical upland and sediment disposal practices along the Tacoma waterfront for a confidential client. 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 an (SAP) 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 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). 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 program timelines to meet permitting and SEPA environmental deadlines for a very compressed schedule prior to initiation of new Model Toxics Control Act (MTCA) regulations. Redevelopment values are estimated to be $200 million for phased development of condominiums, restaurants, and businesses throughout the site.

Served as program manager for development of corporate-wide risk management and emergency response planning studies for a major software company. Performed 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 ERP. The plan evaluated potential natural and human-caused disasters from the individual, building, and corporate-wide viewpoints. 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. Project was highly successful and supported by management. Included development of building-specific ERPs, online training tools, quick reference documents for each office, building signage, drills, and cross-organizational ERPs.

Retained by attorneys to provide oversight for 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 site soils and groundwater. 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. 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. Evaluated 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 sampling, and generated the final report.

Managed 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 determined 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 SAP and QAPP, performed 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 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 constructed to dispose wash water from laundry facilities at the laboratory was contaminated with perchloroethylene and particles of low-level radiation. Conducted insitu vitrification 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 evaluation of near-surface sediments in the vicinity of Totem Marina, a pleasure boat and yacht marina (Commencement Bay, Washington) with haulout facilities, upland dry storage, and marine sales and service, on behalf of a potential purchaser. Prepared SAP and QAPP, performed 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 yd3 of potentially contaminated soil. Soil was disposed of at a commercial topsoil facility near Maple Valley, Washington. Because these soils were not sampled prior to removal from the CERCLA site and 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. 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). Environmental site assessment included collection of sediment, soil, sludge, groundwater, and surface water samples throughout the 686,000-ft2 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. Study area consisted of 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. Work plans detailed 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 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. Sites included waste-rock dumps, milling, processing, and hard-rock shaft locations and varied dramatically in slope, aspect, elevation, erosion potential, topsoil, water retention capacity, etc. These areas were redeveloped as home sites.

Served as site operations manager and implemented restoration and revegetation activities to return native species to a man-made, highly disturbed lake structure. 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. Several innovative techniques ensured 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. 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. 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 development of an SAP for investigation of DNAPL contamination at a petrochemical facility in Altona, Victoria, Australia. DNAPL wastes had been placed in landfills on the site and consisted of chlorinated solvents with PCBs and dioxins. Site geology consisted of clays and silts but the flow of groundwater was complicated by the presence of a fractured basalt aquifer in the subsurface.

Served as a program manager for extensive site groundwater 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. Performed a site investigation and remedial actions analysis to determine necessary remediation system. Evaluated several remedial options, including incineration, thermal desorption, in situ fixation, slurry wall and cap, groundwater treatment, landfill, and no action. In late 1996, site remediation was initiated using in situ fixation and soil stabilization. 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 analysis of wastewater source characterization for a chemical plant in Aratu, Brazil. Evaluated all sources of water in the plant to prepare a design and cost basis for the proposed plant wastewater treatment system upgrade. Included preparation of all Phase I design package and project control materials. Construction of the wastewater plant upgrade and control project was completed in 1997.

Managed environmental impact analysis on a 4-hectare property located in the Capital Federal District of Buenos Aires, Argentina. Performed work as a preliminary response to using the property for development of a solid, sludge, and liquid waste treatment facility 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. Prepared Phase I and III design package materials 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 general manager in the application of a detailed EIA on a 50-hectare former pharmaceutical manufacturing facility located in Buenos Aires, Argentina, in accordance with Argentine Law 24.051. Investigation results indicated remedial actions were necessary. Work included 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 EIA 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 EIA 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. Investigations results indicated 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. Designed a cut-off wall and water treatment system to contain the groundwater contaminant plume within the site boundaries during feasibility study analysis. Evaluated remedial costs with respect to the total facility operational costs.

Directed site remediation for a service station in Buenos Aires, Argentina. Included 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 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 determined the necessary remediation system. Evaluated several remedial options, 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 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 RFI work plan for sediments, soil, and groundwater investigations at The Dow Chemical Company in Freeport, Texas (Blocks A-41/A-42). Site investigation included evaluation of three separate groundwater aquifers contaminated with two distinct DNAPLs (primarily EDC wastes with PCBs and dioxins in excess of 40,000,000 gallons). 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. Prepared both human and ecological risk assessments in an integrated, proactive approach.

Managed installation of soil vapor extraction system at the Well 12A Superfund Site in Tacoma, Washington. The system operates through 22 wells at a maximum 3,000 ft3 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 hot soil gas for particulates, then cooling the gas and extracting 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, using a combination of model packages (VENTING, MOTRANS, MODFLOW). Used 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) at The Dow Chemical Company Plant A facility in Freeport, Texas, in the Brazos River Harbor area adjacent to the Intracoastal Waterway. 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 RCRA corrective measures study (CMS) for soil and groundwater investigation at The Dow Chemical Company in Pittsburg, California. Site investigation included evaluation of shallow groundwater aquifers contaminated with arsenic, chromium, and lead, resulting in potential contamination of bay sediments. Complex San Francisco Bay site stratigraphy required extensive evaluation of the groundwater regime. Preparatory work included statistical evaluation of soil and groundwater contaminant levels prior to evaluating in-place closure. Prepared cost analyses for appropriate waste management units.

Managed 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 development of dual train stripping tower treatment system.

Assisted legal counsel in 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 detailed analysis on the chemical and physical hazards present at the site and documented remedial and physical cleanup actions. Ultimate site use included recovery of forest products, residential homes, public facilities, and a proposed golf course.

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

Managed 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 site investigation, performed sediment sampling, and documented findings in support of litigation for the Cedar River Delta in Lake Washington near Renton, Washington. Designed program to evaluate PCB and metals concentrations for the shallow, nearshore, lacustrine sediments. Contaminants resulted from multiple industrial activities associated with 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 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 work plan to provide data of sufficient quality and quantity to evaluate remedial options and support human health risk assessment. Prepared reports in a limited time period to avert a probable enforcement order by Ecology (State of Washington). 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 MTCA -based site assessment and investigation for the Port of Seattle at the former Coast Guard Facility along Salmon Bay in Seattle, Washington. Included installation of site-wide groundwater wells, soil sampling, storm drain sediment sampling, and aquatic sediment sampling. Integrated data into a conceptual model of fate and transport of site contaminants based on former industrial practices at the site. Information collected at the site was integrated into an ecological and human health risk assessment 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 in the sensitive estuarine environment adjacent to Grays Harbor, Washington. Prepared written materials and assessments prior to litigation. The bankruptcy court allowed the property to be abandoned, allowing 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. 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 program manager for Phase I and II underground storage tank site investigations for a major oil company. 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 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. Developed Washington State MTCA cleanup standards based on human and ecological health.

Prepared soil investigation and hydrogeologic study plans for RI/FS at the Alkali Lake site in eastern Oregon. The site was used for storage and disposal of chemical wastes. It 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 full-scale flue dust waste treatability and metals recycling evaluation, including column leaching tests, batch tests, and pre- and post-treatment chemical analyses. Results allowed the client to decide against proceeding with this flue dust treatment alternative because of 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-mi2 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 . Integrated data into an ArcInfo ® GIS for rapid review and analysis, including evaluation of potential offsite transport of specific contaminants in surface soils using physiographic conditions and the modified USLE, 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 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 EE/CA for two smelter sites near Anaconda, Montana. Prepared work and site safety plans while coordinating field work.

Evaluated distribution and regulatory implications of mine tailings throughout a former mill in New Mexico. 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 work plan preparation for site remedial investigation of air, contaminant sources, soils, surface water, groundwater, geology, hydrostratigraphy, and public health at Smelter Hill, Anaconda, Montana.

Prepared 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 and DNAPL flow paths to the Willamette River, and PCP and PAH contamination in the uplands and river sediments.

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

Prepared 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. Site is 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 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. 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 site geophysical and geohydrologic 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 a workplan for sediment sampling 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 siting analysis for dredge disposal materials collected in San Francisco and Oakland Bays. Included evaluation of upland, nearshore, and deep-water disposal options for dredge materials. Used standards of analysis, environmental impact, and site characteristics to evaluate the relative impact of disposal at each site.

Wrote 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 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-mi2 site in Butte, Montana. Developed 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-mi2 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 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 sediment sampling efforts in the Gulf of Mexico, southern California, Alaska, and the Puget Sound for feasibility studies and petroleum hydrocarbon exploration and distribution and mapping.

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

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. Surveys included reflection and refraction profiling designed to evaluate near-surface potential geohazards and deep structural and stratigraphic sequences. Designed and evaluated geophysical borehole programs, including sonic velocity, resistivity, gamma ray, induction, and spontaneous potential.

Deposition & Trial Testimony

Petro-Hunt, LLC v Midessa Consulting, LLC and King Pinn Well Service, LLC, District Court of Dallas County, Texas, Cause No. DC-23-10054. Expert report submitted on November 12, 2025. Deposition on November 14, 2025.

Port of Tacoma v. Burlington Environmental, LLC, United States District Court for the Western District of Washington, Case No. 2:23-cv-01244-BJR. Expert report submitted on April 28, 2025. Deposition on July 1, 2025.

Nippon Paper Industries USA Co. Ltd. v. Georgia-Pacific, LLC, Cause No. 3:22-cv-05743-LK in United States District Court Western District of Washington at Tacoma, Washington. Expert report submitted on July 2, 2024. Rebuttal report August 16, 2022. Mediation on February 13, 2025.

5450 Sandpoint Way N.E., LLC, Plaintiff v. ExxonMobil Oil Corporation, Defendant. In the United States District Court for the Western District of Washington at Seattle. Cause No. 2:23-CV-01244-BJR. Expert report submitted on December 16, 2024. Rebuttal report submitted on January 15, 2025. Deposition on February 18, 2025. Trial testimony on December 10-11, 2025.

In the Matter of an Arbitration under the 2016 Arbitration Rules of Singapore International Arbitration Centre between: Phillips International Investments Inc and ConocoPhillips Company v Santos KOTN Tty Ltd and Santos Limited. SIAC Arbitration No. 143 of 2021. Expert report submitted on August 17, 2022. Joint expert statement report submitted on November 28, 2022.

International Court of Arbitration International Chamber of Commerce Between: (1) CNPC E&D Holdings Coöperatief U.A. 2) CNODC Internationakl Holding Limited, Claimants and Petrobras de Valores International de Espana S.L., (2) Petrobras International Braspetro B.V., (3) Petroleo Brasileiero S.A. - Petrobras, Respondents. Expert report submitted on June 1, 2022. Rejoinder report submitted on February 3, 2023. Joint expert report submitted on March 17, 2017. Testimony in tribunal May 4 and 5, 2023.

Crimson Exploration Operating, Inc. Plaintiff, v. Cudd Pumping Services, Inc., Defendant. In the District Court of Pecos County, Texas. 83rd Judicial District. Cause No. P-8064-83-CV. Expert report submitted on March 30, 2022.

Orutsararmiut Native Council v. Alaska Department of Environmental Conservation and Donlin Gold LLC. OAH No. 20-0536-DEC. Before the Alaska Office of Administrative Hearings on Referral from the Commissioner of Environmental Conservation. Expert report submitted on March 31, 2022.

Tommy Lindsey, Lanette Lindsey and Larry Watkins, individually, and on behalf of a class of persons similarly situated v. 3M Company, Dyneon, L.L.C. and Daikin America, Inc., In the United States District Court Northern District of Alabama Northeastern Division Case No. 5:15-cv-01750-MHH). Expert report submitted on April 7, 2020.

United States of America and State of California v. Montrose Chemical Corporation of California, et al. United States District Court Central District of California Western Division Case No. 2:90-cv-03122-DOC-GJS. Expert report submitted on March 13, 2020. Deposition on July 31, 2020. Declaration on September 24, 2020.

Kurt Kapp, individually and as parent and natural guardian of J.K. a minor, Adam Kapp v. Wolverine World Wide, Inc. and the 3M Company (f/k/a Minnesota Mining and Manufacturing Co.). State of Michigan in the Circuit Court for the County of Kent Case No 18-08616-NI. Expert report submitted on October 15, 2019.

Seth O. McNaughton, Individually and as Personal Representative of the Estate of baby McNaughton, deceased, Tobyn E. McNaughton, Individually and as Next Friend of J.M., a minor, v. Wolverine World

Wide, Inc. and 3M Company (f/k/a Minnesota Mining and Manufacturing Co.). State of Michigan in the Circuit Court for the County of Kent Case No 18-00086-CZ. Expert report submitted on September 6, 2019.

Andrew C. Debski and Bethany J. Debski v. Wolverine World Wide, Inc. and 3M Company (f/k/a Minnesota Mining and Manufacturing Co.). State of Michigan in the Circuit Court for the County of Kent Case No 18-00055-CZ. Expert report submitted on September 6, 2019.

Certain Underwriters at Lloyd's London, et al. v. United States Steel Corporation, et al., Court of Common of Common Pleas Allegheny County Commonwealth of Pennsylvania, Cause No. GD-12-00409. Expert report submitted on September 28, 2018. Rebuttal report submitted on December 20, 2018. Deposition on March 12, 2019. Rebuttal report submitted on January 3, 2024.

In the Matter of an Arbitration Pursuant to the LCIA Arbitration Rules Between: (1) Hyundai Engineering & Construction Co. Limited, (2) Samsung C&T Corporation (together in JOINT VENTURE), claimants and Korea Electric Power Corporation, respondent. Disclosed on February 18, 2018. Joint expert report submitted on August 8, 2018. Tribunal Testimony July 4, 2018, International Dispute Resolution Centre, London, England. Individual expert report submitted on September 28, 2018. Tribunal Testimony November 23, 2018, International Dispute Resolution Centre, London, England.

Washington Builders LLC, a Washington limited liability company, Block 79 LLC, a Washington limited liability company, and City Investors XI L.L.C., a Washington limited liability company, Plaintiffs, v. 700 Dexter, LLC, a Delaware limited liability company, American Linen Supply Co., a Washington corporation, Frontier Environmental Management LLC, a Delaware limited liability company, and BMR-DEXTER LLC, a Delaware limited liability company, Defendants. Superior Court of Washington for King County, Case No.16-2-30634-9 SEA. Expert report submitted on June 1, 2018. Rebuttal report submitted on June 29, 2018. Deposition on August 8, 2018.

Zurich American Insurance Co. Plaintiff v. Statoil USA Onshore Properties Inc., Ironshore Specialty Insurance Co. Defendants v. certain Underwriters Subscribing to OEE Policy NRG 475535-9-02, certain Underwriters Subscribing to Energy Package Policy B1263EG0062313, certain Underwriters Subscribing to Energy Package Policy B1263EG0062314, Third-Party Defendants v. American Guarantee and Liab. Ins. Co., Intervenor. In the District Court of Harris County, Texas 234th Judicial District. Expert report submitted on February 16, 2018. Deposition on May 16, 2018. Affidavit on June 14, 2014.

State of Minnesota, by its Attorney General, Lori Swanson, its Commissioner of Pollution Control, Paul Aasen, and its Commissioner of Natural Resources, Tom Landwehr, Plaintiff vs. 3M Company, Defendant. District Court, Fourth Judicial District. Court File No. 27-CV- l 0-28862. Expert report submitted October 27, 2017. Deposition on November 13, 2017. Affidavit on January 3, 2018.

Tim Ward, et al. v. Snohomish County, et al.; Gregory Regelbrugge, et al. v. State of Washington, Grandy Lake Forest Associates, LLC, and Snohomish County; and Randi Lester et al. v. Snohomish County et al., Superior Court of the State of Washington, Case NO. 14-2-18401-8 SEA. Expert report submitted on June 1, 2015. Declaration submitted on September 4, 2015. Supplemental expert report submitted January 22, 2016. Deposition on April 5, 2016. Second supplemental report submitted on June 28, 2016. Declaration submitted on July 22, 2016. Second deposition on September 20, 2016.

MEMC Pasadena, Inc. v. Goodgames Industrial Solutions, LLC., United States District Court Southern District of Texas Houston Division, Civil Action No. 4:13-00599. Expert report submitted on April 3, 2015. Deposition on November 18, 2015.

Enchanted Lake Residents Association, a Hawaii nonprofit corporation, Plaintiff, v. G & GB Development Company Ltd., a Hawaii profit corporation; Delta Construction Corporation, a Hawaii profit corporation; and John Does 1-10; Jane Does 1-10; Doe Corporations 1-10; Doe Partnerships 1-10; Doe Entities 1-10; and Doe Governmental Units 1-10, Defendants. Civil No. 12-1-3064-12 V L. Expert report for mediation submitted on July 8, 2015. Mediation on July 20, 2015.

Suppa Corp. and Raymond J. Suppa v. Association of Apartment Owners of the Kahala Beach, et al., and Association of Apartment Owners of the Kahala Beach v. Waialae Country Club; Kahala Hotel Investors, LLC et al. State of Hawaii, Circuit Court of the First Circuit, Civil No 06-1-1061-06 (VLC). Declaration on February 11, 2015.

Charlene Holt v. Haugen Logging, Inc., In the Pierce County Superior Court for the State of Washington, Case No 13-2-12445-4. Expert declaration submitted on December 30, 2014.

Megan White v. Fluor Corporation, et al., Missouri Circuit Court of the Twenty-Second Judicial Circuit (St. Louis City) Cause No 22052-9366, Division No. 17. Expert report submitted on July 14, 2014.

Harris County v. International Paper Company, et al., Harris County District Court Case No. 201176724; Dao Van Pho, et al. v. International Paper Company, et al., Harris County District Court Case No. 2012-39857; and Jim Harpster, et al. v. International Paper Company, et.al., Harris County District Court Case No. 2012-66308. Expert report submitted on August 16, 2013. Deposition on May 13-14, 2014. Trial testimony on October 31, 2014.

Teruya vs. Shaw, et al.; Civil No 10-00282 JMS KSC, United States District Court for the District of Hawaii. Mediation report submitted on May 15, 2014.

Charles A. Burnia, et al. v. Fluor Corporation, et al., Dustyn Dowd and Toby Marler et al. v. Fluor, Corporation, et al., Alicia Politte, et al. v. Fluor Corporation, et al. Cause Nos. 052-9605, 012-8639, 052-10299. Division No. 8, Missouri Circuit Court of the Twenty-Second Judicial Circuit, City of St. Louis. Expert report submitted on June 3, 2013. Deposition on June 13, 2013.

Charles A. Burnia, et al., minors, by and through their Next Friend, Melissa Burnia, Plaintiffs, Cause No. 052-9605 v. Fluor Corporation, et al. Division No. 8, Missouri Circuit Court of the Twenty-Second Judicial Circuit, City of St. Louis.

Dustyn Dowd, a minor, by and through his Next Friend, Lisa Dowd, and Toby Marler, a minor, by and through his Next Friend, Regina Marler, Cause No. 012-8639 v. Fluor Corporation, et al. Division No. 8, Missouri Circuit Court of the Twenty-Second Judicial Circuit, City of St. Louis.

Alicia R. Politte, et al., minor, by and through their Next Friend, Deana Chipman, Plaintiffs, Cause No. 052-1029 v. Fluor Corporation, et al. Division No. 8, Missouri Circuit Court of the Twenty-Second Judicial Circuit, City of St. Louis. Expert report submitted on June 3, 2013. Deposition June 13, 2013.

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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. Trial testimony on July 21, 2014.

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.

Supplemental report submitted on September 10, 2012. 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 testimony 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 defendant's motion for summary judgment, October 6, 2009.

Nelson v. BNSF (D. Mont. Nov. 7, 2007; CV-07-148-BLG-RFC-CSO); (2) Burley v. BNSF (D. Mont. Nov. 7, 2007; CV-07-147-BLG-RFC-CSO); and (3) Merideth v. BNSF ("Merideth") (D. Mont. Feb. 13, 2008; CV-08-30-BLG-RFC-CSO). Expert report for the BNSF Railway Company, Livingston, Montana, submitted on April 15, 2009. Rebuttal report submitted June 15, 2009. Deposition on August 7, 2009.

Raymond Howard and Phyllis Jean Howard, individuals and Western Asphalt, Inc. and Illinois Corporation, Plaintiffs, v. GTE Service Corp., a New York corporation, and EEI Holding Company, Inc. an Illinois corporation, d/b/a Sullivan Electric Company, Defendants. In the Circuit Court of the Seventh Judicial Circuit Morgan County, Illinois, Case No.: 00-L-8. Expert Report for the Western Asphalt Property, Jacksonville, Illinois submitted on December 12, 2008. Deposition on July 10, 2009.

State of California Department of Toxics Substances Control, and Hazardous Substances Account v. W. Daniel Isaacson, an individual; Donna Isaacson, an individual; Joseph Rothe, an individual; Andrew Wallet as Trustee for Elizabeth G. Murray Living Trust; Lorraine Idziak as Executor for Estate of Elizabeth G. Murray; DOES 1 through 10, inclusive. United States District Court, Central District of California, Case No. CV04-2145 DSF VBKx. Expert report, September 4, 2008; Rebuttal report submitted on August 15, 2008; Declaration submitted on October 20, 2008.

Humboldt Baykeeper et al v. Simpson Timber Company et al., United States District Court, Northern District of California, Case Number: 3:2006cv04188, July 6, 2006. Mediation hearings August 23-24, 2007.

Equilon Enterprises LLC dba Shell Oil Products US v. California State Board of Equalization and the California Department of Health Services. Superior Court of California, Sacramento County, Case No. 05AS02406, Judge Judy Holzer Hersher. Childhood Lead Poisoning Prevention Program. Expert report: Analysis of California Childhood Lead Poisoning Prevention Fee Allocation, October 2006. Deposition November 14, 2006. Trial December 12-21, 2007.

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March 9, 2007. Deposition May 10, 2007. Trial June 11-15, 2007.

United States of America v. Placer Mining Corp. (dba New Bunker Hill Mining Co.) and Robert Hopper, Docket No. 1097-173-CERCLA and 10-94-0223-CERCLA. Expert report May 3, 2006.

United States of America, et al. vs., Shell Oil Company, et al. (Shell Oil Company, Texaco, Inc., Atlantic Richfield Company, and Union Oil Company of California), Case No. CIV 91 0589 RJK. Expert declaration March 2006.

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Seattle Iron & Metals Corporation v. Crown Beverage Packaging et al., United States District Court, Western District of Washington at Seattle, Case No. No. C02-1158P. Expert declaration, August 2003. Supplement to Declaration February 9, 2004. Deposition April 6, 2004.

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