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Engineering & Scientific Consulting

Richard Richter, Ph.D., P.E.

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Professional Profile

Dr. Richter is a registered civil engineer with more than 40 years of environmental experience, specializing in the environmental fate and transport of hazardous substances and applied environmental chemistry. He has used this expertise to identify sources of contamination and to estimate both indoor and outdoor exposure concentrations used in assessing retrospective, current and prospective risks. Dr. Richter is an expert in the areas of source identification, exposure reconstruction and assessment, chemical fate and transport, and risk assessment as well as water and wastewater treatment, regulatory compliance, and site characterization and remediation.

Dr. Richter has managed numerous site investigations, risk assessments, and remedial actions involving property transfer assessments, hazardous waste facilities, and underground storage tanks. He has particular experience involving PCBs, PAHs, dioxins, heavy metals, petroleum hydrocarbons, especially benzene, chlorinated solvents (PCE, TCE, TCA), 1,4-dioxane, and asbestos. Dr. Richter's regulatory experience includes interactions with personnel at EPA, the California EPA (DTSC, OEHHA, SWRCB), and several California regional air pollution districts and water quality control boards. He has served on several national and local peer review committees regarding direct and indirect exposures to air toxics. From 2006 to 2011, Dr. Richter has taught the computer modeling class "Environmental Applications of Air, Water and GIS Programs" at the University of California, Irvine, Extension. From 1990 to 1999, Dr. Richter taught the graduate class "Hazardous Waste Remediation" at U.C., Irvine. From 1985 to 1988, he taught the graduate class "Advanced Wastewater Treatment" at the University of Southern California. From 1978 to 1983, he was an assistant professor of civil and environmental engineering at Washington State University, where he taught undergraduate and graduate classes and conducted research involving heavy metals and chlorinated solvents.

Academic Credentials & Professional Honors

Ph.D., Environmental Science, University of Notre Dame, 1978

M.S., Environmental Science, University of Notre Dame, 1974

B.S., Mechanical Engineering, University of Notre Dame, 1970

Sigma Xi, Research Society of North America

Prior Experience

Principal Engineer, McLaren-Hart, 1992-1998

Regional Director of Engineering & Geology, ENSR Corp., 1990-1992

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Manager of Engineering & Geology, ENSR Corp., 1988-1990

Senior Engineer, Mittelhauser Corp., 1986-1987

Senior Project Engineer, Boyle Engineering Corp., 1983-1986

Assistant Professor, Civil & Environmental Engineering, Washington State University, 1978-1983

Systems Analyst/Computer Modeler, Sargent & Lundy, 1971-1973

Publications

Richter, RO, Kerger, BD, Hoyt, S, Fedoruk, MJ. Total aromatic content in petroleum solvents modifies headspace benzene vapor concentrations: Implications for exposure assessments. J Human Ecological Risk Assessment 2013: 19:374-384.

Richter RO, Finley BL, Paustenbach DJ, Williams PRD, Sheehan PJ. An evaluation of short-term exposures of mechanics to asbestos during automotive and truck brake cleaning and machining activities (1970-1990). J Expo Sci Environ Epidemiol 2009; 19:458-474.

Finley BL, Richter RO, Mowat FS, Mlynarek S, Paustenbach DJ, Warmerdam JL, Sheehan PJ. Cumulative asbestos exposure for U.S. automobile mechanics involved in brake repair (circa 1950s-2000). J Expo Sci Environ Epidemiol 2007; 17:644-655.

Richter RO, Sheehan PJ, Bouse E. Potential environmental impact of mercury emissions from Portland cement kilns. IEEE Cement Industry Technical Conference Record 2005.

Paustenbach DJ, Richter RO, Finley BL, Sheehan PJ. An evaluation of the historical exposures of mechanics to asbestos in brake dust. J Appl Occup Environ Hyg 2003; 18:786-804.

Kerger BD, Richter RO, Corbett GE. Scientific approaches to address personal injury claims involving rare cancers: Case studies involving pesticide exposures. Proceedings, Annual Meeting of the Society for Risk Analysis, Washington, DC, 1997.

Dodge DG, Kerger BD, Corbett GE, Schmidt C, Richter RO. Characterization of product-specific exposure potential from occupational use of sealants. Proceedings, Annual Meeting of the International Society for Exposure Analysis, 1997.

Dodge DG, Kerger BD, Corbett GE, Richter RO. Empirical estimation of plausible upper bound product exposures for litigation. Proceedings, Annual Meeting of the Society for Risk Analysis, 1997.

Kerger BD, Richter RO, Chute SM, Dodge DG, Overman SK, Liang J, Finley BL, Paustenbach DJ. Refined exposure assessment for ingestion of tapwater contaminated with hexavalent chromium: Considerations of exogenous and endogenous reducing agents. J Expo Anal Environ Epidemiol 1996; 6(2):163-179.

Finley BL, Kerger BD, Dodge DG, Meyers SM, Richter RO, Paustenbach DJ. Assessment of airborne hexavalent chromium in the home following use of contaminated tap water. J Expo Anal Environ Epidemiol 1996; 6(2):229-245.

Chute S, Dodge DG, Richter R, Kerger BD. Filling data gaps for accurate exposure assessment of chromium(VI) compounds in drinking water: A case study on aerosols and reduction capacity in beverages. Proceedings, Annual Meeting of the Society for Risk Analysis, 1995.

Theis TL, Richter RO. Chemical speciation of heavy metals in power plant ash pond leachate. Environ Sci Technol. 1979; 13:219.

Richter RO. Chemical speciation of fly ash leachate in the underlying soil/water system with emphasis on the adsorption of nickel by oxides. Dissertation, University of Notre Dame, Notre Dame, IN, 1978.

Theis TL, Richter RO. Chemical speciation of heavy metals in power plant ash pond leachate. Proceedings, 33rd Annual Purdue Industrial Waste Conference, 1978.

Irvine RL, Richter RO. Comparative evaluation of sequencing batch reacters. J Env Eng Div Am Soc Civil Engr 1978; 104:503.

Irvine RL, Fox TP, Richter RO. Investigation of fill and batch periods of sequencing batch biological reactors. Water Res 1977; 11:713

Theis TL, Wirth JL, Richter RO, Marley JJ. Characteristics of heavy metals in fly ash-soil environments. Proceedings, 31st Annual Purdue Industrial Waste Conference, 1976.

Irvine RL, Richter RO. Computer simulation and design of sequencing batch biological reactors. Proceedings, 31st Annual Purdue Industrial Waste Conference, 1976.

Irvine RL, Richter RO, Fox TP. Batch treatment for industrial wastes. Proceedings, 30th Annual Purdue Industrial Waste Conference, 1975.

Cardamone MM, Garber G, Leonard PC, McCabe PJ, Richter RO. St. Joseph County subdivision regulations: A proposed ordinance for control of subdivision and development of land. Master's special project, supported by EPA, 1974.

Book Chapters

Richter RO, Sheehan PJ. Modeling of health risks associated with combustion facility emissions. In: Air Quality Modeling—Theories, Methodologies, Computational Techniques, and Available Data Bases and Software, Volume II. Zannetti P (ed), Air & Waste Management Association and EnviroComp Institute, 2005.

Richter RO, Theis TL. Nickel speciation in a soil/water system. pp. 189-202. In: Nickel in the Environment. Nriagu JO (ed), J. Wiley and Sons, New York, NY, 9180.

Theis TL, Richter RO. Adsorption reactions of nickel species at oxide surfaces. pp. 73-96. In: Particulates in Water: Characterization, Fate, Effects and Removal. Adv. Chem. Ser., 189. Kavanaugh MC, Leckie JO (eds), American Chemical Society, Washington, DC, 1980.

Reports

Richter RO. Adsorption of trichloroethylene by soils from dilute aqueous systems. AFOSR/SCEEE Summer Faculty Research Program, U.S. Air Force Technical Report, 1981.

Presentations

Turnham P, Richter RO, Griffin JR. Estimating indoor air exposure concentrations of biodegradable VOCs using API's "BioVapor Spreadsheet Model." Society of Risk Analysis Annual Meeting, San Francisco, CA, 2012.

Richter RO, Schulman LL, DesAutels CG. Estimating exposure concentrations for trench workers from

vapors emanating from soils and groundwater using computational fluid dynamics modeling. Society of Risk Analysis Annual Meeting, San Francisco, CA, 2012.

Kerger, BD, Richter, RO, Hoyt, S, Fedoruk, MJ. Total aromatic content in petroleum solvents modifies headspace benzene vapor concentrations: Implications for exposure assessments. Society of Toxicology Annual Meeting, San Francisco, CA, 2012.

Hong, S, Kalmes, R, Posson, M, Richter, RO, Fedoruk, MF. Formaldehyde exposure associated with use of professional keratin hair-smoothing products. Society of Toxicology 51st Annual Meeting, San Francisco, CA, 2012.

Fedoruk MJ, Bronstein R, Richter R, Hong S. Monitoring Aspergillus fumigatus species in tertiary care hospital using real-time PCR and culture-based assays. Society of Toxicology 49th Annual Meeting, Salt Lake City, UT, March 2010.

Richter RO Smith E, Avendt R. Establishing a site-specific soil cleanup level for 1,4-Dioxane. AEHS Conference, San Diego, CA, March 2008.

Richter RO, Kerger BD, Hoyt S, Fedoruk MJ. Influence of hydrocarbon composition on benzene vapor emissions in mixed products. International Society for Exposure Assessment, Durham, NC, October 2007.

Fedoruk MJ, Kerger BD, Bronstein R, Richter RO. Airborne dust exposure assessment for automotive body shop work involving resin fillers and abrasives. Platform presentation at the Annual Meeting of the Society of Toxicology, Charlotte, NC, 2007.

Goswami E, Malzahn D, Richter R, Sheehan P. Simulation and modeling techniques to reconstruct historical benzene exposures. Society for Risk Analysis Meeting, Baltimore, MD, December 2006.

Richter, RO, Kerger BD, Leung HW, Paustenbach DJ. Implications for age-dependent half lives of dioxins on assessment of breast milk dose and body burden. Toxicol Sci 2006; 90(1):117, Abstract No. 570.

Fedoruk MJ, Richter RO, Bronstein R, Kerger BD. Modeling residential exposure to xylenes and ethylbenzene from window sealant application. International Society for Exposure Assessment, Tucson, AZ, 2005.

Fedoruk MJ, Smalstig T, Richter RO, Bronstein R, Kerger BD. Modeling residential exposure to xylenes and ethylbenzene from window sealant application based on laboratory mass flux measurements. International Society for Exposure Analysis 15th Annual Meeting, Proceedings Abstract Book, p. 173, 2005.

Richter RO, Sheehan PJ, Bouse E. Potential environmental impact of mercury emissions from Portland cement kilns. Honorable Mention Award. IEEE Cement Industry Technical Conference, Kansas City, MO, 2005.

Sheehan P, Brorby G, Kalmes R, Mowat F, Richter R, Finley B. Characterization of the cumulative exposures of U.S. automobile mechanics. American Industrial Hygiene Conference and Expo, Anaheim, CA, May 23-26, 2005.

Fedoruk MJ, Smalstig T, Tran J, Shum M, Richter RO, Bronstein R, Kerger BD. Diesel-related benzene exposures during refueling operations at two grocery distribution centers. Society of Toxicology 2005 Annual Meeting, March 6-10, 2005, New Orleans, LA, 2005.

Finley B, Mowat F, Richter R, Brorby G, Craven V, Sheehan P. Evaluation of proposed threshold doses for chrysotile exposure and respiratory disease. Society of Toxicology 2005 Annual Meeting, New Orleans, LA, March 6-10, 2005.

Richter RO, Finley BL, Paustenbach DJ, Williams P, Sheehan PJ. Short-term asbestos exposures associated with vehicle brake cleaning and machining activities from 1970 to 1990. International Society for Exposure Assessment, Philadelphia, PA, 2004.

Paustenbach DJ, Richter RO, Finley BL, Williams P, Sheehan PJ. Evaluating asbestos exposures associated with vehicle brake cleaning and machining activities using short-term and TWA measurements. Society for Risk Analysis, Palm Springs, CA, 2004.

Finley B, Richter R, Mowat F, Mlynarek S, Paustenbach DJ, Warmerdam J, Sheehan P. Cumulative occupational asbestos exposures of U.S. brake mechanics. Society for Risk Analysis, Palm Springs, CA, 2004.

Richter RO, Paustenbach DJ, Sheehan PJ. An evaluation of historical exposures of mechanics to asbestos from brake repairs. Society for Risk Analysis, Baltimore, MD, 2003.

Finley BL, Richter RO, Lu ET, Brorby GP, Sheehan PJ. Environmental and occupational health hazards associated with the presence of asbestos in brake linings and pads (1900 to present): A State of the Art Review. Society of Automotive Engineers, Hollywood, FL, 2003.

Richter RO, Warmerdam J. Recommendations for improving the indirect risk assessment process. Society for Risk Analysis, New Orleans, LA, 2002.

Richter RO, Schmidt CE. Assessing realistic risk to indoor occupants from subsurface VOC contamination. Air & Waste Management Assoc., Symposium on Air Quality Measurement Methods and Technology, San Francisco, CA, 2002.

Madl A, Warmerdam J, Sun B, Finley B, Richter R. Contribution of individual truck operations to ambient diesel particulate matter (DPM) concentrations: Implications for risk assessment and management. Presentation at the Annual Meeting for the Society of Toxicology, 2001.

Richter RO. Peer review, the scientific method, and other mysteries under Kelly-Frye and Daubert. American Bar Association, Tort and Insurance Practice Section, La Jolla, CA, 1999.

Richter RO, Paustenbach DJ. Evaluation of the U.S. EPA's "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities," with Emphasis on PCDD/PCDFs. Presentation at Dioxin '99 Congress, Venice, Italy, 1999.

Richter R, Suder D, Kerger BD. Use of odor threshold data and shower air modeling to determine allowable limits of methyl-tertiary butyl ether (MTBE) in drinking water. Annual Meeting for the Society of Toxicology, 1998.

Paustenbach DJ, Richter RO, Suder D, Corbett GE, Flahive TP, Kerger BD. Comparison of measured and model-estimated indoor concentrations of airborne chloroform from use of residential tap water. Annual Meeting for the Society of Toxicology, 1998.

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Richter R, Gaynor KJ, Ryer-Powder J, Ferguson E. Effects on risk: Sensitivity analysis of parameters used for determining risk of hazardous waste combustion facilities. Annual Meeting for the Society of Toxicology, 1998.

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Kerger BD, Richter RO, Corbett GE. Scientific approaches to address personal injury claims involving rare cancers: Case studies involving pesticide exposures. Proceedings, Annual Meeting of the Society for Risk Analysis, 1997.

Ghirelli RP, Amini H, Kerger BD, Hillman A, Richter RO. MTBE water contamination: Key considerations for remediation, risk assessment, and risk management. Pacific Conference on Chemistry and Spectroscopy, American Chemical Society, Society for Applied Spectroscopy, Irvine, CA, 1997.

Kerger BD, Dodge DG, Richter RO. Key considerations for risk assessment and risk management of methyl-tertiary butyl ether (MTBE) regarding leaking underground fuel tanks. Toxicologist 36(1):283. Abstract Issue of Fundamental and Applied Toxicology, 1997.

Richter RO, Kerger BD, Suder D. Key considerations for assessment of chromium(VI) exposures and risks from cooling tower aerosols. Toxicologist 36(1):336. Abstract Issue of Fundamental and Applied Toxicology, 1997.

Richter RO, Harrington N, Curry C, El-Sururi S, Price P, Kerger B. Comparison of risk estimates derived from standardized point estimates, traditional Monte Carlo analysis, and micro-exposure analysis for the domestic use of trichloroethylene impacted groundwater. Society of Toxicologists National Meeting, Anaheim, CA, 1996. Abstract published in Toxicologist 30(1):115 (award for outstanding presentation in risk assessment).

Dodge DG, Clark JJ, Kerger BD, Richter RO, Finley BL, Paustenbach DJ. Assessment of airborne hexavalent chromium in the home following use of contaminated tapwater. Society of Toxicologists National Meeting, Anaheim, CA, 1996. Abstract published in Toxicologist 30(1):117-118.

El-Sururi SM, Richter RO, Cunningham JA. Effects of site-specific parameters on risk estimates due to vapor migration through the vadose zone. Society of Toxicologists National Meeting, Anaheim, CA, 1996. Abstract published in Toxicologist 30(1):101.

Richter RO, Kerger BD, Cunningham J, Paustenbach DJ. Exposure modeling and validation studies for aerosols: A case study of dioxin exposure during roadside weed abatement with 2,4,5 T. Society of Toxicologists National Meeting, Baltimore, MD, 1995. Abstract published in Toxicologist 15(1):62-63.

Chute S, Dodge DG, Richter R Kerger, BD. Filling data gaps for accurate exposure assessment of chromium(VI) compounds in drinking water: A case study on aerosols and reduction capacity in beverages. Proceedings, Annual Meeting of the Society for Risk Analysis, December 3-6, 1995.

Richter RO. Effects of organics on the adsorption of nickel by hydrous oxides. 185th American Chemical Society National Meeting, Seattle, WA, 1983.

Richter RO. Sorption reactions involving chlorinated aliphatic hydrocarbons and soils in aqueous systems. 186th American Chemical Society National Meeting, Washington, DC, 1983.

Theis TL, Richter RO, Martin MH. A unified approach to soil/solution interactions through the application of equilibrium principles. Presented at the 52nd Annual Conference-Water Pollution Control Federation, Houston, TX, 1979.

Richter RO, Theis TL. Applications of chemical modeling using REDEQL2 to the speciation and adsorption of heavy metals in fly ash leachates. 176th American Chemical Society National Meeting, Miami, FL, 1978.

Richter RO, Theis TL. Adsorption reactions of nickel species at oxide surfaces. 175th American Chemical Society National Meeting, Anaheim, CA, 1978.

Project Experience

Chemical Fate and Transport

Estimated historical exposures to airborne asbestos from the breaking of asbestos-cement pipes using AERMOD. Identified sources of polychlorinated biphenyls (PCBs) in soils and sediments at a former lumber mill in Montana. The investigation included the analysis of PCB data and the identification of possible sources and pathways for contamination of a cooling pond and surrounding soils based on historical photos, drawings, and PCB use patterns. Evaluated the possibility of contaminating groundwater aquifers with BTEX from the storage of natural gas in abandoned oil fields in southern California. The project included analysis of soil and soil vapor data at the well head and groundwater data in the surrounding area. Identified sources of polychlorinated biphenyls (PCBs) at a former transformer manufacturing facility in California. The investigation included the identification of possible sources and pathways based on PCB data, drawings, and PCB use patterns, including paints and sealants.

Identified specific sources of polychlorinated biphenyls (PCBs) in soils and sediments at a former wire manufacturing facility on the Hudson River. The investigation included: analysis of PCB data, soil/groundwater characteristics, and tidal affects; identification of possible PCB sources and pathways based on historical photos, drawings, and PCB use patterns; and physical and chemical testing of underground pipe lines. Identified sources of gasoline free product and PCE in groundwater at a site involving multiple possible parties based on historical use data, chemical fingerprinting (including ROST data), and groundwater/soil characteristics. Modeled methyl tertiary butyl ether (MTBE) migration in surface water, including potential impacts on drinking water supplies due to MTBE entering a large reservoir after a pipeline release. Wrote and used models for the diffusion of volatile organic compound (VOC) vapors from groundwater through the vadose zone and into buildings for several risk assessments and exposure analyses. Developed indoor air model for evaluating impacts after the application of insecticides to carpets and crawl spaces. Evaluated potential migration of petroleum hydrocarbons from numerous underground storage tanks. Modeled groundwater transport of chemicals in support of cost recovery actions for sites with multiple sources. Designed and conducted experiments to establish likely airborne concentrations involving past exposures at home and in the workplace to volatile organic compounds, especially benzene, and heavy metals, including hexavalent chromium. Wrote air dispersion computer program for modeling atmospheric dispersion of emissions from power plants. Used model to evaluate possible chemical exposures for fossil-fueled and nuclear power plant siting studies. Performed doctoral research regarding the groundwater chemistry and migration of heavy metals (nickel, cadmium, lead, chromium, arsenic, mercury, and copper) leached from fly ash disposal ponds at a coal-fired power plant. Led an evaluation of chemical migration of petroleum hydrocarbons at the Chevron Marine Terminal in Los Angeles, California. Involved use of tidally influenced flow model to estimate exit concentrations of BTEX and PAH compounds into the Los Angeles Harbor. Worked with the Los Angeles Regional Water Quality Control Board. Researched the adsorption and desorption of TCE from soils in groundwater systems for the U.S. Air Force Office of Scientific Research. Taught graduate and undergraduate environmental engineering classes in water chemistry and chemical fate and transport modeling at Washington State University. Developed and directed research regarding the migration of priority pollutants in groundwater.

Cost Studies

Evaluated the technical approach and the incurred costs for the recovery of a 100+ million gallon per day wastewater treatment plant after the plant was inundated by a major flood. Evaluated potential liabilities associated with past disposal of hazardous wastes to numerous landfills. Developed a statistical distribution of possible costs based on cleanup costs for over 600 Superfund sites. Assisted several clients in establishing equitable buyouts at Superfund sites based on estimated total cleanup costs for site remediation and transactional costs for project management, attorneys, and agency oversight.

Agency Interaction

Provided detailed comments on California's vapor intrusion guidance on behalf of a large industrial client. Worked with the Los Angeles Regional Water Quality Control Board to establish the first soil cleanup level in California for 1,4-dioxane. Served as outside peer reviewer for EPA's Methodology for Assessing Health Risks Associated with Multiple Exposure Pathways to Combustor Emissions, the document that serves as the technical basis of the EPA's SLHHRA guidance. Co-author for American Industrial Health Council comments to EPA, Office of Solid Waste, draft incinerator guidance, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities-Peer Review Draft. In addition, provided additional comments on draft guidance to Mr. Jeff Yurk at EPA Region VI, primary author of the guidance. Served as external peer reviewer for EPA's Planning And Scoping The Initial National-Scale Air Toxics Screening Assessment: An Element Of The EPA National Air Toxics Program, the document that serves as the basis for the EPA's national screening risk assessment for air toxics throughout the United States. Served as a member of the Air Toxics Study Technical Review Group for the South Coast Air Quality Management District's Multiple Exposure Study (MATES-II). The two-year study consisted of a comprehensive monitoring program, an updated emissions inventory, local and basin-wide air dispersion modeling, and the estimation of associated risks for toxic air contaminants throughout the greater Los Angeles air basin. Led a California EPA-approved risk assessment for clean closure of property acquired by the Culver City Redevelopment Agency. The work was done under the voluntary cleanup program, part of California's "Brownfields" program. Represented clients in various agency negotiations and interactions, including California Regional Water Quality Control Boards, California Department of Toxic Substances Control, EPA Region 9, Los Angeles County Department of Public Works, and various county and city health and fire departments. Projects have included negotiation and approval of site investigation plans and reports, feasibility studies, risk assessments, RCRA closure, groundwater monitoring, and corrective action plans. Obtained California Regional Water Quality Control Board and California Department of Toxic Substances Control approval for innovative statistical approach for establishing background levels for clean closure of several RCRA waste management units at power plants. Served as an expert witness for the City of Orlando regarding the development of wastewater reuse injection standards by the Florida Department of Environmental Resources. Developed and negotiated a statistical monitoring program for the demonstration of advanced wastewater treatment compliance.

Site Investigations and Remediations

Provided technical oversight to the U.S. Department of Justice for the site investigation and remediation of aluminum dross contamination from a secondary smelting operation in Arizona. Prepared risk assessment, feasibility study, and remedial action plan for chlorinated VOCs (PCE, TCE, TCA, DCE) and 1,4-dioxane impacted soils and groundwater. Negotiated the first soil cleanup level in California for 1,4-dioxane. Provided technical assistance regarding investigation and remediation issues for the PRPs at the Stringfellow Superfund Site in California. Directed investigations, site characterizations, and remediations at more than 20 gasoline stations with underground storage tanks for ARCO Products Company in southern California. Evaluated regulatory compliance with Superfund NCP process involving cost recovery actions at the Gould Superfund Site in Portland, Oregon. Prepared a RCRA facility investigation plan for the evaluation of potential soil and groundwater contamination from five solid waste management units at a RCRA TSD facility. Directed leak detection investigations, site characterizations, and remediations for a Lockheed Aeronautical Systems Company facility with over 100 underground storage tanks in Burbank, California. Compiled a potentially responsible party summary report evaluating hydrogeologic conditions and contaminant assessment at a Southern Pacific Pipeline fuel tank farm in Phoenix, Arizona. Performed feasibility study for treatment of a TCE-contaminated water supply down gradient from a Superfund site. Performed numerous feasibility studies for the remediation of soil and groundwater contamination at hazardous waste and leaking underground storage tank sites. Developed closure plans for RCRA Part B permitted boiler sludge ponds at several Public Gas & Electric power plants, including an innovative statistical approach for decontamination to background. Certified complete closure of boiler acid wash surface impoundments at one facility. Managed and certified closure of two infiltration basins and two sludge basins at a zeolite production facility for Culligan. Managed the review and evaluation of site assessments, including a risk assessment for an 8,000-acre farm being considered

for purchase and subsequent residential/commercial development. Managed environmental assessments of 44 nationwide properties involved in property transfer between two banks. Designed a 3-year research plan for the Electric Power Research Institute regarding site assessments and remedial actions at former manufactured gas plant sites. Reviewed RCRA Part B permit applications for several major petrochemical plants and refineries as a subcontractor to EPA, including the review of TSD units, site hydrogeology, and groundwater monitoring plans. Served as certifying civil engineer for groundwater assessments and monitoring plans for RCRA Part B permits at several Public Gas & Electric power plants.

Risk Assessments

Managed several risk assessments regarding off-site exposures to emissions (diesel particulate matter) from trucking and excavation activities at gravel mining operations. Assessments used in the permitting process. Reviewed and evaluated published data on exposures to asbestos for brake mechanics, friction product workers, and roofing installers. Conducted numerous risk assessments for indoor air exposure due to migration of VOCs from soils and groundwater. Conducted Proposition 65 evaluation for facility emitting PCE. Modeled air dispersion of emissions and estimated off-site risks to assess compliance with regulations. Managed the final risk assessment for the Stringfellow Superfund site. The project was the first approved PRP effort after the lifting of EPA's ban on non-agency efforts. The project included the first use in EPA Region IX of Monte Carlo analysis for determining the statistical distribution of estimated risks based on the variations in exposure parameters. Led a joint groundwater risk assessment for the Del Amo and Montrose Superfund sites. Risks and hazards were estimated for onsite workers and off-site residents potentially exposed via ingestion, dermal contact, and inhalation during uses of potable water. Led human health and ecological risk assessments for three proposed hazardous waste incinerators in Louisiana. The assessments used EPA's latest guidance, which includes both direct and indirect exposure pathways. The chemicals of concern included dioxins/furans, heavy metals, VOCs, and SVOCs. The receptors included adult, child, and infant residents, farmers, and anglers. The pathways evaluated were inhalation and ingestion of soil, produce, drinking water, fish, beef, pork, poultry, eggs, and milk. Both EPA and the Louisiana Department of Environmental Quality used the reports as part of the permitting process. Conducted biological evaluations and ecological risk assessments for 3 proposed hazardous waste incinerators to be used by the U.S. Army. Located in Utah, Oregon, and Arkansas, the sites are for the destruction of chemical weapons. The major chemicals of concern are dioxins, mercury, and PCBs. The receptors modeled include endangered species such as the bald eagle, peregrine falcon, Columbia River salmon, and Florida panther. The Army used the reports as part of their permit applications under NEPA. Led a human and ecological risk assessment involving a recycling facility bordering the Los Angeles Harbor affected by metals, PAHs, and PCBs. Exposure scenarios included onsite occupational inhalation, ingestion, and dermal contact; offsite residential inhalation and dermal contact; and marine organism exposure due to dissolution of airborne particulates and leachate migration via groundwater. Risk-based cleanup levels accepted by California EPA's Los Angeles Regional Water Quality Control Board were several orders of magnitude higher than default values. First acceptance by the Los Angeles Regional Water Quality Control Board for the use of EPA's synthetic precipitation leachate procedure for setting soil cleanup levels protective of ecological receptors in the Harbor. Led a baseline risk assessment and developed health-based cleanup levels at the ARCO tank farm in Long Beach, California. Involved in modeling of petroleum hydrocarbon migration in groundwater and vadose zone. Used ISCST3 air dispersion model for estimating airborne concentrations of chemicals volatilizing from soil and groundwater.

Design

Designed a chemical feed system for the precipitation of phosphorus and biological nitrification/ denitrification for a 30-mgd municipal wastewater treatment plant for the Washington Suburban Sanitary Commission. Designed a trihalomethane (THM) removal study for the City of Fort Myers water treatment plant, including the use of oxidants, reverse osmosis, ultrafiltration, and air stripping. Designed chemical, physical, and biological treatment systems for numerous water and wastewater treatment plants. Evaluated the impact of RCRA regulatory changes on oil/water collection and treatment system, including

the feasibility of engineering options to surface impoundments, for a Texaco refinery. Designed heating, ventilating, and air conditioning systems for commercial and public buildings. Taught undergraduate and graduate courses in water and wastewater treatment design at Washington State University and University of Southern California.