

# ROSALIND A. SCHOOF

**PhD, DABT, Fellow ATS  
Principal**

Dr. Rosalind Schoof is a board certified toxicologist with more than 35 years' experience assessing human health effects and exposures from chemical substances in a variety of settings, such as contaminated sites, commercial/ industrial/agricultural/residential projects, product uses, dietary exposures and general home and community exposures. Her projects have included numerous formal health risk assessments conducted under various US and international regulatory settings, as well as regulatory, research and litigation projects. Dr. Schoof has directed evaluations of chemical toxicity, derivation of risk-based exposure levels, health risk assessments for cancer and noncancer end points and multimedia exposure assessments.

Dr. Schoof is an internationally recognized expert on evaluation of arsenic and metals in the environment and in the diet, and on the bioavailability of metals from soil with over 35 peer-reviewed publications. She has served on numerous peer review panels for US agencies and Canadian ministries, on several National Research Council committees, and the US Department of Defense Strategic Environmental Research and Development Program (SERDP) Science Advisory Board. Prior to her consulting career, Dr. Schoof worked for a pharmaceutical company conducting safety assessments for new drugs, and designing and directing toxicity studies. She also worked in the Office of Toxic Substances at USEPA.



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## **EDUCATION**

1982

**PhD, Toxicology**

University of Cincinnati, Cincinnati, OH, United States

1975

**BA, Molecular Biology**

Wellesley College, Wellesley, MA, United States

## **CREDENTIALS**

### **Registrations and Certifications**

- Diplomate, American Board of Toxicology (certified in 1986; recertified in 1991, 1996, 2001, 2006, 2011, 2016, and 2021)
- Fellow, Academy of Toxicological Sciences

### **Professional Affiliations and Activities**

- Society of Toxicology
- International Society for Exposure Science

## PROJECTS

### Exposure Studies and Risk Assessment for Mine and Smelter Sites

- Probabilistic Risk Assessments at mine/smelter sites, Arizona (2020-present). Directed probabilistic risk assessment for arsenic exposure at multiple sites in Arizona potentially affected by mine tailings or smelter emissions.
- Lead Bioavailability Soil Amendment Study (2017-present). Directed a study of the effectiveness of multiple soil amendments in reducing the bioavailability of soil lead. The study was a collaborative research project among a mining company, EPA and Tribal scientists with a laboratory phase at a university and a field study at a site in western Washington State.
- Risk Assessment for Copper Refinery Site, Montana USA (2014-present). Oversaw a work plan and multipathway human health risk assessment for a community adjacent to a former copper refinery. Lead and arsenic were the constituents of potential concern investigated in the risk assessment. Exposures via contact with soil and house dust were calculated based on soil and dust samples collected from residential and commercial properties. Site-specific soil bioavailability data was applied in estimating exposures, and soil contact was not assumed to occur during the portion of the year when ground was frozen and snow-covered. Calculation of preliminary remediation goals for residential and commercial properties was performed. Ongoing work addresses additional operable units.
- Coal Mining Water Quality Assessment in British Columbia (2014-2021). Provided human health risk assessment support for the Elk Valley Water Quality Plan (EVWQP) conducted under an order from the British Columbia Ministry of Environment. The EVWQP is an area-based management plan to address current water quality trends for selenium, cadmium, nitrate, and sulphate and calcite formation. Two successive health risk evaluations were prepared with oversight from advisory groups including Provincial, Federal and First Nations representatives.
- Evaluation of Historical Mining Activity and Blood Lead Levels, Montana USA (2012-present). For more than a decade, blood lead samples have been collected and analyzed by public health programs in a Montana community where mining and mineral processing activities have occurred for more than a century. For the Phase 1 study, an electronic database was compiled from health department paper records that includes over 6600 records for infants, children and pregnant women. The study focused on over 3,500 records for Butte children 12 to 60 months old for the period from 2003 through 2010. A reference population was created by considering the comparability of prominent risk factors between the Butte dataset and a national blood lead database. Comparisons with the reference population and assessment of variations in blood lead levels across neighborhoods guided the assessment of ongoing remediation and lead abatement activities. Study results were published in a peer-reviewed journal. A Phase 2 study extended the analysis of blood lead data through 2017, and planning has begun for a phase 3 study.
- Evaluation of Smelter Wastes in a River and Reservoir, Washington USA (2006-present). Assisted with planning for site investigation, exposure study and human health risk assessment of slag and other smelter wastes present in a large reservoir. Participated in coordination with two tribes and state and federal agencies. Continue to provide input to ongoing site investigations and risk analyses.
- Voluntary Cleanup of Mining Site, Colorado USA (2020-present). Provided analyses of potential lead exposures to inform development of soil action levels, interacted with regulators and participated in public meetings.
- Biomonitoring Study in Former Smelter Community, Montana USA (2012-2014). Directed a blood lead and urine arsenic biomonitoring study at a former copper smelter site in Montana. The study included more than 100 participants who filled out a questionnaire designed to collect relevant demographic information and to identify additional sources of lead or arsenic exposure. Individual results were provided to participants, and a report on community-wide results was prepared.

- Arsenic Inhalation/Smelter Risk Assessment, Namibia (2016). Evaluated health risks for inhalation of airborne arsenic by communities living in the vicinity of an operating copper smelter. Applied unique approaches for consideration of formal and informal residential areas. Due to lack of country-specific guidance, utilized Canadian, South African, and other international guidelines.
- Urine Arsenic Biomonitoring Before and After Remediation in a Mining Community, Arizona USA (2011-2012). Directed a urine arsenic biomonitoring study in a small mining community in Arizona. The study was conducted in two phases, before and after completion of residential yard soil removal activities. Results were provided confidentially to individual participants and community-wide results were shared at a public meeting.
- Risk Assessments for Deloro Mine Site, Ontario (2010-2011). On behalf of the Ontario Ministry of Environment, directed human health risk assessment updates for onsite and offsite exposures to arsenic and metals. Primary populations of concern included on-site workers and trespassers and off-site recreational visitors. Calculation of preliminary remediation goals was performed for both on- and off-site portions of the study area.
- Evaluation of Risks at Former Uranium Mine, Alaska USA (2009-2011). Assisted with planning for site investigation and human health risk assessment of metals, radionuclides and radon from waste rock. Participated in meetings with state, federal and Native community representatives.
- Evaluation of Metal Risks from an Operating Lead and Zinc Smelter, British Columbia (1990s-2014). Multiple risk assessment projects. Analysis of metal uptake into home-grown produce. Oversaw multipathway probabilistic risk assessment for exposures to arsenic, cadmium and other metals in a community with an operating lead and zinc smelter. Conducted earlier phases of the risk assessment on behalf of a community stakeholder group. Presented plans and results to stakeholders and government representatives.
- Metal Smelter Risk Assessment, South America (2005-2008). Directed assessment of current and future risks from sulfur dioxide, particulates, lead and other metals from an operating smelter in support of an extension of an operating agreement. The study included collection of outdoor dust, indoor dust, soil and drinking water. Air modeling and a diet study were conducted by collaborators. Exposures of children to lead were assessed using a probabilistic exposure model that was modified to predict recently collected blood lead data. The adult lead model was also modified to better reflect site conditions. Presented findings at public meetings attended by thousands of residents and workers. Update conducted after three years confirmed model predictions.
- Former Copper Mining Site Risk Assessment, Nevada USA (2002-2020). Multiple risk assessment projects. Directed study plans of risk assessments for potential exposures to metals and radionuclides from tailings and other wastes at a former copper mining site with multiple operable units being evaluated under CERCLA. Participated in coordination with tribes and other local stakeholders.
- Former Uranium Mine Cleanup Negotiations, Washington USA (2005). Provided comments on validity of a baseline human health risk assessment and rationale for cleanup plans for metals and radionuclides at a former uranium.
- Risk Assessment for Voluntary Cleanup of Mining Site, Colorado USA (2005). Directed an assessment of risks from residential and recreational exposures to lead for a community affected by historic mining activities. The risk assessment was part of a site investigation under the 1994 Colorado Voluntary Cleanup and Redevelopment Act. Directed studies of the relative bioavailability and mineralogy of lead in site soils. Presented plans at community meetings and participated in negotiations with state agency staff.

- Blood Lead Exposure Study for Mining Site, Colorado USA (2006-2007). Conducted a comprehensive community-wide blood lead and environmental monitoring study. The study was conducted in two phases. The study objectives were to further characterize current blood lead levels and identify factors influencing exposures, and understand seasonal fluctuations in blood lead levels in order to characterize the potential contribution of the soil contact exposure pathway to blood lead levels. High participation rates (67 percent and 63 percent of all eligible households for Phases I and II, respectively) and the high rate of re-participation (82 percent) for the Phase II sampling event ensured that the measured levels of lead in blood and environmental media were representative of exposures to residents. Yard soil data had been previously collected from all yards. During the blood lead study, house dust and drinking water samples were collected and paint lead measurements were taken. A questionnaire was administered to gather demographic information and to identify additional possible sources of exposure.
- Metal Processing Site Risk and Bioavailability Support, Utah USA (2002-2004). Provided human health risk assessment support for evaluation of lead and arsenic in soils at a former mineral processing site in Utah. The site is currently a wildlife refuge. Recreational exposures onsite and exposures in an adjacent residential area were evaluated. *In vitro* bioavailability studies and mineralogical evaluations of lead and arsenic were conducted, and results used in the site risk assessment.
- Mining Site Risk Assessment California USA (2002). Conducted a preliminary human health risk assessment evaluating metals in sediments, surface water, and other media downstream of a copper and sulfur mine site in California. Exposure scenarios included both recreational and Native American activities.
- Historic Copper Mine Site, Montana USA. Evaluated potential exposures and risks posed by elemental mercury, lead and arsenic in basements of homes built on a former historic copper mine site in Montana. Potential exposures to lead, arsenic and mercury in attic dust, indoor dust in living areas and in soils was also evaluated.
- Former Copper Smelter Site, Washington USA. Assembled and summarized literature related to assessment of exposures to arsenic in soil for negotiations and legal action related to a former smelter site in Washington State. Attended stakeholder meetings and made presentations on arsenic toxicity and risk assessment. Reviewed and commented on state documents. Prepared affidavit addressing issues related to arsenic toxicity and risk assessment.
- Zinc Smelter Risk Assessment and Bioavailability Research Program, Oklahoma USA (1994). Managed human health risk assessment tasks for the work plan, remedial investigation and feasibility study of cadmium, lead and arsenic in soil at a former zinc smelter site in Bartlesville, Oklahoma. Planned for collection of site-specific data to fill gaps in USEPA's baseline human health risk assessment, including paired soil and indoor dust samples, "hot spot" delineation, and a bioavailability study of cadmium and lead in soil. Directed development of revised remediation goals for arsenic, cadmium and lead using site specific data and wrote position papers supporting the recommended goals. Consideration of reduced bioavailability from soil and reduced toxicity in the presence of zinc resulted in soil cadmium cleanup levels of 100 and 200 mg/kg for residential and occupational land use, respectively. A lead cleanup level for occupational areas was derived using an adult lead exposure model. Monte Carlo analyses were used to document protectiveness of cadmium and arsenic cleanup levels. Presented plans and results to USEPA and state staff, and at public meetings. Assisted in negotiating cleanup levels for cadmium, lead and arsenic that subsequently reduced remediation scope and cost by \$50 million.

- Mining and Smelting Site Strategic Risk Assessment Support USA (1990-1998). Over an eight-year period, managed a multi-site general risk assessment support contract for mining and smelting sites throughout the Rocky Mountain region. In addition to providing risk assessment support for specific sites, responsibilities included ensuring that risk assessment strategies and positions were consistent from site to site and that risk assessment strategies were coordinated with litigation strategies. Identified pivotal sources of uncertainty affecting risk estimates for many sites, and helped design and conduct research to support more realistic assessments of risks. Presentations were regularly made to USEPA and state staff on behalf of the client.
- Copper Mine Site Risk Assessment Program, Montana USA. Managed preparation of a series of position papers describing the proper methods for evaluating exposures to lead and arsenic from mining wastes in soils, groundwater and surface water in Butte, Montana. Soil issues included evaluation of the uncertainties associated with USEPA's oral carcinogenicity assessment for arsenic, bioavailability of lead and arsenic in soils, and discussion of appropriate ways to apply the uptake biokinetic model and community blood-lead studies to assessments of lead exposures. Prepared documents describing the proper methods to evaluate risks from groundwater and surface water contaminated with arsenic, lead, cadmium and other metals released as mining by-products at several operable units. Comments were also prepared on baseline risk assessments and preliminary remedial goals from USEPA and state agencies.
- Reservoir Sediment Risk Evaluation, Montana USA. Assisted in preparing a document describing the proper methods of evaluating human health risks associated with recreational exposures to arsenic, cadmium and lead in sediments at a reservoir in Montana.
- Lead Mining District Risk Evaluations, Colorado USA. Advised client of best methods for assessing lead exposures at a historic mining site in the Rocky Mountains. Described available data and appropriate methods for comparing the bioavailability of lead from soil, slag, mining wastes and tailings. Critiques were provided for community blood lead studies and the application of the uptake biokinetic model to assess lead exposures at the site.
- Risk-Based Cleanup Goals for a Barium Ore Site, California USA. Provided strategic guidance and senior review for development of risk-based preliminary remediation goals for barium in soil at a former ore processing plant in Modesto, California, that was expected to be redeveloped as an industrial or recreational park.
- Risk Assessment for Voluntary Cleanup of Mining Site, Colorado USA. Directed the development of risk assessment strategy for a mining site being addressed by the client under the 1994 Colorado Voluntary Cleanup and Redevelopment Act. Chemicals evaluated included arsenic, lead and manganese. Extensive background investigations were conducted.
- Lead Smelter Risk Evaluations, Utah USA. Provided risk assessment support for agency negotiations, site investigation strategy and document review for several smelter sites in the Salt Lake Valley. Evaluated risks associated with arsenic, cadmium and lead in soil and slag, considering residential and occupational exposures. Provided comments on USEPA risk assessment and represented the client in meetings with the agency. Designed and directed a study of lead bioavailability in rats, in which site soils containing lead were added to the rat diet.

#### **Risk Assessment of Manufacturing, Landfill and Waste Combustion Sites**

- Soil Arsenic Bioavailability (2022-2023). Advised a client on soil arsenic bioaccessibility testing and calculation of action levels.

- Pesticide Manufacturing Facility Evaluation, New York USA (1995-2020). Directed health risk assessments and development of risk-based cleanup levels for arsenic in offsite soils for multiple operable units near a former arsenical pesticide manufacturing facility in New York. Offsite areas included a public school complex. Made multiple presentations of client's position to the New York State Department of Environmental Conservation RCRA staff and the New York State Department of Health staff. Made presentations to public advisory groups for the facility and at school board and community meetings.
- Pesticide Testing Facility, Florida USA (2010-2015). Directed development of a system for prioritizing chemicals for sampling at pesticide testing facility used to test a variety of pesticides used for agricultural, horticultural, and silvacultural purposes. Scientific information about the environmental and toxicological properties of these chemicals was obtained to support development of a comprehensive remediation plan for the site. Using chemical property and toxicity information, pared a list of more than 400 chemicals, including unnamed test products, to approximately 30 for a targeted soil investigation.
- Prudhoe Bay RCRA Site Investigation, Alaska USA (2012). Provided peer review of human health risk assessment documents and other documents related to investigation of several subunits within the Prudhoe Bay RCRA site. Documents included several conceptual site reports and the human health and ecological risk assessment for unexcavated inactive production reserve pits, a barium bioavailability soil sampling report, a consolidated background report, and a preliminary review of the interim measures system evaluation including the hydrologic conditions at the site (specifically those hydrologic conditions which may impact fate and transport and the chemical source characterization), as well as the preliminary review and evaluation of the adequacy of a remedial system installed at the site in the 1980s.
- Soil Mercury Exposure Analyses. Supported analyses of role of soil mercury speciation and bioavailability in moderating potential mercury exposures near a former battery manufacturing site in New York.
- PAH Risks at Former Coal Gasification Site. Provided human health risk support to a city parks department evaluating risks from residual PAHs in soil.
- Risk Evaluation for West Virginia Brownfield (Landfill) Site. Directed evaluations of human health and ecological risks associated with sediment and soil affected by releases from an historic landfill along the Kanawha River in Nitro, West Virginia. Risk assessments were used to support a voluntary cleanup application so that the site could be redeveloped as a boat ramp park. Presented findings at city council meetings and a meeting of the citizen's advisory group.
- Brownfield Human Health Risk Assessment, South Charleston, West Virginia. Performed evaluations of risks associated with soils, groundwater and a river affected by chlorinated organic compounds released from a former carbon tetrachloride production facility. The risk evaluations were conducted in accordance with the tiered system established by the state for the voluntary remediation program. Focus of the evaluation was on assessing potential risks from exposures to volatile chlorinated organic compounds that were infiltrating a planned new commercial buildings as parcels are put up for sale and utility and construction trenches. USEPA's latest versions (2001) of the Johnson & Ettinger advanced building infiltration via groundwater and soil models were used to evaluate potential impacts to indoor air in future buildings. Participated in stakeholder meetings and public briefings regarding assessments of potential site risks before and after redevelopment.
- Human Health Risk Assessment for a Wood Treating Facility, Minnesota. Oversaw an extensive human health risk assessment for a confidential wood treating facility in Minnesota that included traditional tribal lifeways of Native Americans living in the community. Chemicals of potential concern included PCBs, carcinogenic PAHs, pentachlorophenol and dioxins/furans.



- Brownfield Redevelopment Risks. Provided human health risk support to a midwestern city environmental department for several redevelopment properties with possible arsenic and lead contamination. Activities included evaluation of background concentrations and human health risk assessment.
- Chemical Distribution Facility Risk Communication, New Jersey. Prepared fact sheets for a chemical distribution facility with chlorinated volatile organic chemicals present in soil and groundwater. Fact sheets were distributed to neighboring businesses as part of an indemnity and access agreement. Preparation of fact sheets required reviewing site data, evaluating vapor intrusion modeling, identifying chemicals of potential concern, researching chemical toxicity, and determining the nature of potential exposures and likelihood of these exposures being of concern.
- Brownfield Redevelopment Vapor Intrusion Risk Assessment, California. For large industrial/commercial Brownfield redevelopment project in California, Conducted an indoor air risk assessment using the Johnson & Ettinger model to assess risks from chlorinated solvents in soil and groundwater. Presented findings to potential purchaser and to state regulators.
- Hazardous Waste Combustor Risk Assessment Work Plan, Idaho. Managed preparation of human health risk assessment work plans for a planned hazardous waste combustor at a phosphorous production facility in Idaho. Project included extensive negotiations with USEPA and tribal representatives, as well as intensive coordination with the engineering design team.
- Evaluation of Nickel Carcinogenicity. Critically evaluated the potential carcinogenicity of different forms of nickel present at a former steel mill site.
- Mercury Bioavailability Research and Risk Analysis, New Jersey. Provided guidance for risk assessment strategy at a former manufacturing site in New Jersey with mercury and dioxin contamination. Guided the design of studies of mercury bioavailability from soil, and prepared a comprehensive report presenting the results and justifying the selected approach for submittal to the state. Directed study of evaluating mercury vapor release from soil. Assisted in a comparison of dioxin data with regional background values.
- Assessment of Soil Arsenic Background and Risks, Illinois. Provided support in assessing potential risks associated with arsenic in the soil in residential areas surrounding an operating glass factory in Illinois. Prepared a presentation for the Illinois EPA and Department of Health, and developed statistically defensible sampling plans to compare site concentrations to background. Prepared a comprehensive report proposing an innovative approach to identifying safe arsenic concentrations in soil for submittal to the state.
- Pesticide Manufacturing Facility, Texas. Prepared an exposure pathway analysis for a former pesticide manufacturing facility in Texas with elevated concentrations of arsenic in soil, interior dust, groundwater, surface water and lake sediments. Assisted in designing a soil sampling plan for site investigations overseen by the Texas Natural Resources Conservation Commission.
- Evaluation of Vapor Intrusion from Groundwater, Minnesota. Provided support in assessing potential exposures of residents and workers at a site in Minnesota to chlorinated volatile hydrocarbons in a groundwater plume. The chemicals evaluated include vinyl chloride, 1-dichloroethene, trichloroethene and tetrachloroethene. Exposure pathways include infiltration from groundwater into basement air.
- Risk Evaluation of Chromium in Groundwater, Montana. Directed a screening-level evaluation of human health and ecological risks associated with chromium (VI) in a golf course pond and ditch in Montana. Evaluated transport and fate of chromium in a groundwater plume, and potential impacts to a nearby river. Efforts supported a response action based on natural attenuation, with groundwater monitoring and a continuation of existing institutional controls on groundwater and land use.

- Navy Site Risk Assessment Support. Provided strategic guidance for risk assessment efforts for several Navy facilities. Participated in stakeholder meetings and reviewed draft documents.
- Wood Treatment Site Risk Evaluations, Butte, Montana. Managed preparation of documents describing the proper methods of evaluating human health and ecological risks from PCP, PAH and dioxin contamination at a pole-treating plant in Butte, Montana. Assessed risks from exposures to soil, groundwater, surface water and air.
- Bulk Fuel Terminal Risk Evaluation, Seattle, Washington. Provided senior review for a project to develop risk-based cleanup levels for a former bulk fuel terminal in Seattle, Washington.
- Bulk Fuel Facility Risk Evaluation, Kirkland, Washington. Provided senior review for the development of soil and groundwater cleanup levels for a former bulk fuel facility, currently being used as a municipal park, in Kirkland, Washington. Cleanup standards were developed using Washington State's Model Toxics Control Act Method B. Substances included petroleum constituents such as BTEX and PAH compounds.
- Gas Station Risk Evaluation, Seattle, Washington. Provided senior review for development of soil cleanup levels, using Washington State's Model Toxics Control Act Method B, for a former gas station in Seattle, Washington.
- Risk Evaluation for Petroleum Transfer Station, Alaska. Assisted in preparing a work plan and risk assessment that included development of cleanup levels for benzene-contaminated groundwater from leakage of petroleum products at a transfer station in Alaska. Groundwater was demonstrated to be unsuitable as a domestic water source, and the need for remediation was based on potential exposures to volatile chemicals transferred into homes from the basement or ground level.
- Navy Facility Risk Evaluations, Washington. Served as project manager for USEPA technical enforcement support oversight activities at several US Navy NPL sites in Washington State. Provided human health risk assessment guidance, and coordinated review of all aspects of remedial investigation work plans and reports. Contaminants included chlorinated hydrocarbons, solvents, metals and fuels. Primary exposure pathways included groundwater, surface water and marine organisms exposed to contaminated sediments.
- Municipal Incinerator Risk Assessment, Seattle, Washington. For the City of Seattle Solid Waste Utility, performed public health and risk analysis for a municipal incinerator as part of an EIS on waste reduction, recycling and disposal alternatives. Assessed risks from stack emissions of metals, dioxins and other organic compounds. Presented methods and results to local, state, and federal officials, environmental groups, the public and a peer review committee.
- Hazardous Waste Incinerator Risk Evaluation, Florida. Directed human health and ecological risk assessment support activities for a private client opposing the permit application for a hazardous waste incinerator in Polk County, Florida. Critiqued a risk assessment submitted to the state in support of the permit for the incinerator.
- Hazardous Waste Incinerator Risk Evaluation, New Jersey. Performed a preliminary risk assessment for the development of a hazardous waste incinerator in New Jersey.
- Hazardous Waste Incinerator Risk Assessment Peer Evaluation, Kentucky. Provided extensive peer review comments on methods and results of a risk assessment on a hazardous waste incinerator in Kentucky.
- Municipal Incinerator Risk Analyses, Washington. Developed procedures and preliminary assessments for a municipal incinerator planned by a Native American tribe in Washington State.
- Petroleum Refinery RCRA Risk Assessment, Colorado. Prepared a human and environmental assessment work plan for a RCRA facility investigation of a petroleum refinery. Key contaminants included BTEX, PAHs and chlorinated hydrocarbons.



- Underground Storage Tank Evaluation, Alaska. For the Alaska Department of Environmental Conservation (as subcontractor, determined technical requirements and critically reviewed risk assessment and proposed groundwater cleanup levels for a gasoline leak from an underground storage tank. Provided guidance for risk management strategy.
- Hazardous Waste Site Risk Assessments, Oregon. For the Oregon Department of Environmental Quality, provided strategic guidance and senior review for two risk assessments on a hazardous waste site, including a baseline risk assessment conducted for a former wood-treatment facility that used PCP, creosote, and arsenical fungicides and a screening-level human health risk assessment for a hazardous waste site located in a unique desert environment. Key issues evaluated at the wood-treating facility included uncertainties in the slope factor for PCDDs and PCDFs and the comparative risks associated with consumption of fish and crayfish from reference locations. Potential contaminants of concern at the desert site included PCDDs and PCDFs, chlorinated phenoxy herbicides, lead, TCE and benzene.
- Chloralkali Manufacturing Site Risks, New York. Provided senior review and guidance for an assessment of risks associated with mercury and PCBs in fish in Onondaga Lake. The impact of a former chloralkali facility on site risks was evaluated in comparison to the impacts of other sources in Onondaga and other comparable lakes.
- Munitions Facility Risk Evaluations, Oregon. Provided human health risk assessment guidance and work plan review for CERCLA and RCRA investigations of a federal facility in Oregon contaminated with munitions.
- Bioavailability of Metals in Refinery Soil, New Jersey. Provided strategic guidance and senior review for an evaluation of the bioavailability of arsenic, beryllium and lead from soil at an operating refinery in New Jersey.
- Manufacturing Facility Risk Assessment, Ohio. Provided senior review for human health risk assessment components of an expedited RI/FS for an alloy and chemical production facility in Ohio that has produced both radiological and chemical wastes. Tasks include designing and implementing the baseline risk assessment for an operating facility, and participating in the selection of cleanup levels and remedial actions. Primary chemicals of concern include arsenic, chromium, vanadium and the radionuclide decay chains of thorium-232 and uranium-238.
- Pulp Mill Risk Assessment, Alaska. Provided senior review of human health risk assessment issues for an RI/FS of marine areas potentially affected by releases from a pulp mill. Reviewed a work plan to identify potential human health risks associated with exposure to substances in sediments that may bioaccumulate to fish. Key issues include identifying appropriate background concentrations of PCDDs/PCDFs in fish and shellfish in the region and at other US locations and selecting representative fish consumption rates for use in the risk assessment.
- Assessment of Mercury Risks for Instrument Manufacturing Site, Rochester, New York. Provided senior review for the development of alternative cleanup levels for mercury in site soils using site-specific bioavailability data from a former instrument manufacturing facility in Rochester, New York.
- Manufacturing Facility Risk Assessment, California. Provided technical review for a comprehensive baseline human health risk assessment for a former manufacturing facility in southern California. More than 30 chemicals of potential health concern were detected in soil, groundwater, or ambient air, including BTEX, nitro, phenolic and chlorinated organic compounds.
- Military Installation Risk Assessment, San Francisco, California. Provided strategic guidance and senior review for multipathway human health and ecological risk assessments for a military installation, which comprised 11 major study areas and more than 40 individual sites. The risk assessments were used to support the selection of sites to be considered in the feasibility study and for the development of preliminary soil cleanup levels. Chemicals of concern included metals, volatile organic compounds, PAHs, PCBs and pesticides.

- Appliance Manufacturing Site Risk Assessment, Ohio. Assisted in the development of an approach used to assess human health risks from lead in soil and sediment at a television manufacturing facility.

#### **Community and Product Risk and Exposure Assessments**

- Lead in Water Fountains (2022-2023). Advised a company about testing and interpretation of results of tests for lead in drinking water fountains in a manufacturing facility.
- Assessment of Plastic Aquaculture Gear (2021-present). Provided a technical memorandum and updates to a summary of studies of microplastics in seafood and the sources, potential addition of microplastics to the marine environment via degradation and fragmentation of plastic farm gear, and potential leaching of harmful substances from aquaculture gear and microplastics.
- Assessment of Polyfluoroalkyl Substances (PFAS) in Plumbing Products (2020-2022). Advised on testing of potential for PFAS leaching from fixtures.
- Assessment of Polyfluoroalkyl Substances (PFAS) in Ski Wax (2020). Supported response to USEPA Toxic Substances Control Act action related to imported ski waxes alleged to contain PFAS compounds.
- Lead and Copper in Hotel Drinking Water (2019-2020). Evaluated if the sampling methodology used to test drinking water sources at a hotel in Canada were consistent with the latest version of the Guidelines for Canadian Drinking Water Quality (GCDWQ) for lead and copper, and if the results were below the health-based guideline for both parameters and the aesthetic guideline for copper.
- Lead Paint Release from TV Towers (2018). Directed an investigation of potential impacts of lead paint release from cleaning of TV towers in a residential neighborhood under EPA emergency response.
- Assessment of Mercury in Soils (2017-2018). Evaluated potential human health risks posed by naturally-occurring mercury at a residential development in northern California. Mercury speciation and relative bioavailability were assessed. Potential risks to on-site residents and construction/maintenance workers were assessed using both default and site-specific exposure parameters taking into account site-specific conditions and exposure pathways.
- Assessment of Cadmium in Oysters (2017). Prepared a response to a Proposition 65 claim that cadmium concentrations in smoked oysters should trigger a "Prop 65" warning label. Cadmium was naturally present in the oysters. Claim was settled favourably.
- Assessment of Plastic Aquaculture Gear (2017). The Monterey Bay Aquarium Seafood Watch Program issued an updated evaluation of farmed pacific geoduck in December 2016. Prepared an analysis showing that many of the concerns raised regarding plastic debris and microplastics are not likely to be associated with geoduck aquaculture gear and practices.
- Copper in Drinking Water (2016). Provided advice to condominium association in southern California regarding copper in drinking water.
- Arsenic Trioxide Product Stewardship and Safety Analysis (2015). Preliminary evaluation of regulatory, safety and public perception issues associated with sale of arsenic trioxide for use in pesticides and wood preservatives.
- Assessment of Arsenic in Geoduck Clams (2013-2014). Assisted Washington State shellfish growers in responding to a Chinese ban on imports of geoducks asserted to have elevated arsenic concentrations.
- Risks of PAH in Coal Tar Products (2010). Provided critical review of study of influence of coal tar sealcoat on house dust PAH concentrations.

- Asbestos Exposure and Risk Evaluation for Sediment/Soil, Swift Creek WA. Conducted an analysis on behalf of the county in support of wetland delineation for a creek that transported naturally occurring asbestos and was subject to flooding/dredging events. Reviewed and critiqued USEPA sampling and risk evaluation. Key issues that affected interpretation of risk were related to the type of analysis performed in comparison with those used to develop the standards.
- Risk Assessment of Arsenic in Gravel Products. Directed probabilistic risk assessment for potential exposures to arsenic in gravel used for road construction and landscaping.
- USDA Evaluation of Cadmium in Oysters, U.S. Pacific Coast (2008). Collaborated with a multidisciplinary team to evaluate potential risks associated with subsistence-level consumption of oysters collected in the Pacific Northwest. This project involved evaluation of federal and international tolerance limits for cadmium in oysters, shellfish ingestion rates for tribal and general populations, and bioavailability of cadmium in oysters.
- Evaluation of Dioxin Exposures from Dredged Material Disposal, Puget Sound, Washington. Provided comments for ports on an USEPA/US Army Corps of Engineers analysis of potential exposures to polychlorinated dibenzo-p-dioxins and dibenzofurans in seafood affected by dredged material disposal in Puget Sound.
- Risks of Residual Petroleum, Suquamish, Washington. Provided oversight for evaluation of potential exposures to residual petroleum at a tribal beach affected by a recent oil spill. Exposures due to consuming shellfish, harvesting aquatic vegetation, and performing other activities at the impacted beach were assessed. Shellfish bed reopening criteria were evaluated. A statistical comparison of oil-impacted and reference location shellfish tissue and sediment data was conducted.
- Evaluation of Arsenic in Fish. Performed a literature review and analysis of inorganic arsenic in seafood, with recommendations regarding the assumed fraction of total arsenic that is inorganic. Also supported an analysis of arsenic uptake in fish. Both studies were published.
- Dietary Intake of Arsenic. Directed the first U.S. market basket survey of inorganic arsenic in the diet. Findings were published.
- Risks of Herbicide Application to Lakes, Washington. For Washington State Department of Ecology, updated and revised a human health risk assessment for an EIS on the application of herbicides to Washington lakes.
- School Property Pesticide Evaluation, New York. For a New York State school district, evaluated potential exposures of students to pesticide residues in athletic field soils. Arsenic was of primary concern. Also evaluated potential association of lymphoma cases to pesticides detected in soil.
- School Property Evaluation, New York. On behalf of a school board in New York State, critically evaluated a state investigation of contamination at a high school built on a former industrial site. Presented findings at a public meeting of a citizen's advisory committee.
- Methylmercury Exposure Study, Nome, Alaska. For the Norton Sound Health Cooperative, participated in planning and design of a study of methylmercury concentrations in hair of native Alaskans subsisting on fish and sea mammals in Nome, Alaska.
- Risks of Road Fill, Alaska. Assisted the Alaska Department of Transportation as a subcontractor in a preliminary assessment of risks from metals and pesticides in fill material used during the construction of a road in Alaska.

## Regulatory and Research Projects

- Alabama Ambient Water Quality Criteria for Arsenic (2021). In support of the Alabama Mining Association's comments on proposed revisions to the Alabama Department of Environmental Management's arsenic water quality criteria for human health, provided comments on the assumed bioconcentration factor (BCF) used to predict fish tissue arsenic concentrations from water concentrations, a proposed adjustment to reflect the fraction of total arsenic in fish that is inorganic (i.e., the inorganic fraction), and updated information on arsenic toxicity.
- Regulation of Plastic Aquaculture Gear (2016-2017). Provided comments on a proposal by the City of Bainbridge, WA to ban plastic aquaculture gear and comments on the City submittal for a Shoreline Master Program Limited Amendment for aquaculture that proposes a ban on the use of non-biodegradable plastics in aquaculture operations. Comments addressed allegations of chemical and microplastic release from aquaculture gear.
- Soil PAH and PCB Relative Bioavailability (2016). Conducted a review of the relative bioavailability of PAHs and PCBs in soil for the Danish Environmental Protection Agency.
- Factors Affecting Exposure to Mercury in Fish (2016). Prepared review of factors affecting fish mercury exposure, including fish consumption, fraction of total mercury that is methylmercury, impacts of cooking on mercury concentration, and other factors. Confidential client.
- Fish Mercury Bioavailability (2015). Prepared review and analysis of factors affecting the bioaccessibility of mercury in fish, including variability by fish species, impacts of cooking, and of other foods. Confidential client.
- Health Canada Bioavailability Guidance (2010-2011 and 2014). Developed comprehensive Guidance on Consideration of Oral Bioavailability of Chemicals in Soil for Use in Human Health Risk Assessment, and provided peer review for final streamlined guidance document. Focused on metals including arsenic, cadmium, chromium, lead, mercury, and nickel.
- Mercury Emissions (2011). Prepared comments on USEPA's December 2011 Technical Support Document: National Scale Mercury Risk Assessment Supporting the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units, focusing on assumptions about methylmercury uptake into fish and fish consumption rates, on behalf of Southern Company.
- Fish Consumption Rates (2011). Submitted comments on Washington Department of Ecology draft report titled Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington, dated September 2011, on behalf of the Pacific Coast Shellfish Growers Association.
- Arsenic Ambient Water Quality Criteria (2011-2012). Made presentations, gave testimony and submitted comments in support of increases in the Maine ambient water quality criteria (AWQC) for inorganic arsenic (health protection) to 1.2 µg/L for water and organisms and to 2.8 µg /L for organisms only, and to increase the arsenic screening standard for the agronomic utilization of sewage sludge (biosolids) from 10 mg/kg to 34 mg/kg, on behalf of the Arsenic Legislation Coalition.
- Dermal Absorption of Chemicals in Soil and Sediment (2011-2012). Directed preparation of a report to address uncertainties in dermal absorption of contaminants from soil and sediments. Health Canada may use the report in a protocol for development of sediment quality guidelines and in guidance being developed for evaluation of human health risks associated with exposure to contaminated sediments, on behalf of Health Canada.
- Provided peer review comments on the selection and derivation of bioaccessibility and bioavailability values for inorganic lead in the Draft Revised Health Canada Human Health Soil Quality Guidelines (2011), on behalf of Health Canada.

- SERDP Soil PAH Bioavailability Project. Participated in Department of Defense (DoD) Strategic Environmental Research and Development Program funded research project on PAH interactions with soil and effects on bioaccessibility and bioavailability to humans.
- SERDP Soil Metal Bioavailability Project. Participated in DoD Strategic Environmental Research and Development Program funded research project on soil metal bioaccessibility and bioavailability to humans.
- Bioavailability White Paper. Directed the development of a white paper for the Ontario Ministry of Environment on the use of oral bioavailability adjustments in a human health risk assessment. Peer-reviewed literature was critically reviewed and synthesized. The resulting white paper provides a background for use of bioavailability studies, site-specific and chemical-specific concerns, use of soil amendments to reduce bioavailability, methods for conducting in vitro and in vivo bioavailability studies, and other factors to consider when applying relative bioavailability adjustments in risk assessment.
- Arsenic Bioaccumulation and Speciation in Seafood. Conducted a literature review and prepared a document supporting USEPA re-evaluation of the ambient water quality criterion (AWQC) for human health effects of arsenic. Calculated AWQC using studies on bioconcentration factors and arsenic speciation acquired from the literature review. Directed the development of manuscripts evaluating bioaccumulation and speciation of arsenic in seafood.
- Regulatory Comment, California. Submitted comments on a California draft public health goal for arsenic in drinking water.
- New Facility Air Permit Support, Washington. On behalf of private developer, derived a risk-based acceptable new source impact level (ASIL) for use in evaluating predicted air releases of 1,3-butadiene from a proposed recreational facility in Washington.
- Department of Defense Bioavailability Field Guide. Updated a Department of the Navy Field Guide for use by Department of Defense project managers in evaluating the bioavailability of metals in soil to both ecological and human receptors at contaminated sites. Also contributed major sections of the original Field Guide.
- TPH Standards Guidance Review, West Virginia. Critically reviewed draft supplemental guidance on the development of total petroleum hydrocarbons risk-based standards for the West Virginia Department of Environmental Protection. Verified the applicability of analytical methods and TPH carbon range fractions proposed and evaluated appropriateness of toxicity factors developed in the guidance. Provided review comments in context of the TPH Criteria Working Group guidance documents and Massachusetts TPH risk policy.
- Metal Bioavailability Research Program. Managed a bioavailability research program of arsenic and lead in soils contaminated by mining and smelting wastes. Findings demonstrated the reduced absorption of these metals from soils. Mineralogic analyses and in vitro screening studies were used to help interpret the results of animal studies. Research results have been published in peer-reviewed journals and have been cited by USEPA in support of precedent-setting changes in risk assessment assumptions that resulted in much higher cleanup levels.
- Taiwanese Dietary Arsenic Research Project. Directed the investigation of inorganic arsenic intake in the diet of people living in areas of Taiwan that have elevated arsenic concentrations in artesian well water. Samples of rice and yams collected in Taiwan showed that arsenic intake from the Taiwanese diet was much higher than previously assumed, suggesting that USEPA's toxicity values might overestimate arsenic toxicity.
- US Dietary Arsenic Research Project. Directed an investigation of dietary arsenic intake in the US. A market basket survey of 40 commodities demonstrated the presence of inorganic arsenic as a normal occurrence in the American diet.

- Copper Smelter Risk Assessment Research Program, Montana. Provided strategic risk assessment support during an eight year period for the evaluation of four operable units at a former copper smelter site in Anaconda, Montana. A research program was developed to fully characterize potential risks associated with arsenic, cadmium, and lead in soil and waste materials from copper smelting operations. Participated in the review of work plans and data interpretation by a working group of client and USEPA staff and consultants. An epidemiology study demonstrated that current exposures were negligible, and studies of arsenic bioavailability and soil ingestion provided support for site-specific assumptions. Soil arsenic cleanup levels of 250, 500 and 1,000 mg/kg for residential, industrial and recreational areas, respectively, were adopted based on the application of these site-specific studies in the human health risk assessments for the site.
- Regulatory Comment. For an industry association, directed the preparation of comments on the Proposed Rule on the Bevill Exclusion for Mining Wastes. Critiqued USEPA's assessment of damages to human health and the environment caused by land-based units, and concluded that most of the damages cited by USEPA are only of historical relevance and do not reflect current mining practices. Also critiqued the use of the toxicity characteristic leaching procedure as a means of measuring the toxicity of mineral processing wastes, and concluded that it is an overly aggressive and unrealistic test for evaluating these materials.
- Sub-title D Municipal Landfill Permitting, New Mexico. For client attempting to site a subtitle D municipal landfill, prepared an affidavit rebutting assertions regarding potential adverse health effects of such landfills. Affidavit was submitted to the docket for the permit hearing and resulted in withdrawal of the allegations.
- Evaluation of Ocean Disposal of Dioxin-Containing Sediments, Grays Harbor, Washington. For the US Army Corps of Engineers, performed a risk assessment for ocean disposal of dioxin-contaminated sediments from Grays Harbor, Washington. Evaluated potential exposures to dioxins in Dungeness crabs that might contact contaminated sediments in an ocean disposal site for dredged materials. Evaluation included derivation of site-specific crab consumption values and crab life cycle evaluation.
- PCB Risk Assessment Sensitivity Analysis. Directed a PCB risk assessment sensitivity analysis project. Identifying those components of risk assessment methodology that have the greatest influence on PCB cleanup levels.
- EIS Health Impact Analysis, Washington. For the Washington State Department of Ecology, evaluated the potential human health impacts of cleanup alternatives for an EIS for State Model Toxics Control Act. Participated in developing the risk-based alternative.

#### **Litigation Projects**

- PFAS Multidistrict Litigation (confidential, protective order) (2022). Provided expert reports and deposition testimony in Re: Aqueous Film Forming Foams Products Liability Litigation, multidistrict litigation No. 2:18-MN-2873-RMG, U.S. District Court for the District of South Carolina, Charleston Division.
- Coal Combustion Residuals Insurance Litigation (confidential, protective order) (2022). Provided expert reports and deposition testimony in AEP Generation Resources Inc., et al. v. AG Insurance SA/NV et al., Case No. 18CV004317, in the Court of Common Pleas, General Division, Franklin County, Ohio.
- Lead Personal Injury Litigation (2022). Provided expert reports and trial testimony in the matter of Sanders vs. Mount Isa Mines Ltd before the Supreme Court of Queensland, Australia (Registry: Brisbane, Proceeding No.: 7608/11).
- Municipal Solid Waste Litigation (confidential) (2021). Provided opinions related to potential exposures to metals in ash produced by solid waste incineration.



- Lead Paint Personal Injury Litigation (confidential) (2021). Provided expert opinions for a case alleging harm to a child from lead paint in a rental property. Case settled.
- International Arbitration (confidential) (2014 and 2020). Provided expert opinions related to exposure to metals released by a smelter in South America.
- PCB Tort Litigation (2018-2021). Providing expert opinions regarding PCB exposures in a school. Bard et al. v. Monsanto et al. Case No. 18-2-00001-7. Superior Court of Washington for King County.
- Coal Ash Basin Litigation (2020). Provided an expert rebuttal report and deposition testimony regarding historical knowledge of toxicity and health risks associated with coal ash basins at 14 coal-fired electricity generating plants in the matter of 17-CVS-5594, Duke Energy Carolinas, LLC and Duke Energy Progress, LLC v. AG Insurance SA/NV et al., in the Superior Court Division of the North Carolina General Court of Justice. Case settled.
- Coal Ash Basin Litigation (2019). Began developing expert opinions regarding possible health risks for various scenarios for managing coal ash basins. Duke Energy Carolinas LLC v. State of North Carolina ex rel. North Carolina Department of Environmental Quality, et al. Case Nos. 19 EHR 2398, 19 EHR 2399, 19 EHR 2401, 19 EHR 2403, 19 EHR 2404, 19 EHR 2406, North Carolina Office of Administrative Hearings. Case settled.
- Cleaning Fluid Exposure Litigation (2018). Provided expert report regarding exposures to chemical mixtures in cleaning fluid added to a water bottle. Teepe and Teepe v. State of Washington Department of Corrections, Anthony Anfinson. Case No. 17-2-00470-8. Superior Court of the State of Washington in and for Walla Walla.
- Concrete Sealant Fume Litigation (2018). Provided expert opinions regarding exposure and toxicity of odorant chemicals released from driveway sealant product. Kaiser Foundation Health Plan v. Quality Design/Build Inc. Case No. 16-1-0987-05 JHC and Kobayashi v. Quality Design/Build Inc. Case No. 16-1-0985-05 KKS in the Circuit Court of the First Circuit, State of Hawaii. Cases settled.
- Lead Exposure Litigation (2016-2020). Provided expert opinions regarding lead exposures in Flint to Michigan Attorney General's Office. Multiple cases.
- Lead Paint Complaint (2017). For the defense, provided an expert report and testimony at an evidentiary hearing about peeling lead paint on an elevated subway line in Queens, NY. Dudley Stewart, et al. vs. the Metropolitan Transit Authority, et al. Case No. 17-CV-03060 (RJD). U.S. District Court Eastern District of New York. December 2017. Case settled.
- Coal Ash Basin Litigation (2017-2018). Provided an expert report and deposition testimony regarding any health risks that might be associated with the coal ash basin at the Mayo Steam Station coal-fired electricity generating plant in Person County, NC. Roanoke River Basin Association vs. Duke Energy Progress LLC. Case No. 1:16-cv-607. U.S. District Court for the Middle District of North Carolina.
- Coal Ash Basin Litigation (2017-2018). Provided an expert report and deposition testimony regarding any health risks that might be associated with the coal ash basin at the Roxboro Steam Station coal-fired electricity generating plant in Person County, NC. Roanoke River Basin Association vs. Duke Energy Progress LLC. Case No. 1:17-cv-452. U.S. District Court for the Middle District of North Carolina.
- Mine Operations Litigation (confidential) (2017). In connection with an investigation of a spill of leach solution from a high altitude gold mine in South America, prepared an assessment of potential downstream health risks.

- Shoreline Development Permit State Appeal, Washington (2016). Provided testimony before the Thurston County Hearing Examiner at a hearing appealing the determination of mitigated non-significance in the request of Chang Mook Sohn for substantial shoreline development permit for an intertidal geoduck aquaculture operation. Testimony addressed claims asserted by Appellants' experts regarding potential for adverse impacts of plastic gear used in geoduck aquaculture, including potential release of microplastics. Project No. 2014108800. October 2016.
- Appeal of Permit for Control of *Zostera Japonica* on Commercial Clam Beds, Washington (2015). Provided testimony at a hearing appealing the issuance of a NPDES and state waste discharge general permit (October 2015). Testimony addressed claims asserted by Appellants' experts regarding potential for adverse toxicological and environmental impacts of spraying the herbicide imazamox on Japanese eelgrass beds. Pollution Control Hearings Board, Case reference PCHB No. 14-047. "Coalition to Protect Puget Sound, Ross P. Barkhurst, Robert Kavanaugh v. Ecology and Willapa-Grays Harbor Oyster Growers Association."
- Shoreline Development Permit State Appeal, Washington (2015). Provided testimony at a hearing appealing the issuance of the Shoreline Development Permit (SD5-13) (March 2015). Testimony addressed claims asserted by Appellants' experts regarding potential for adverse impacts of plastic gear used in geoduck aquaculture, including potential release of microplastics. Shorelines Hearings Board, State of Washington, Case reference SHB No. 14-024. "Coalition to Protect Puget Sound Habitat vs. Pierce County, Taylor Shellfish and Seattle Shellfish."
- Former Shooting Range Litigation, California (2013). For the defense, provided expert opinions at deposition related to potential lead exposures at a former shooting range. Otay Land Company vs. U.E. Limited, L.P. Superior Court of the State of California, Case No.: GIC869480 and Case No.: 37 - 2009 -0010197 6-CU-OR-CTL [Consolidated for all purposes] in and for the County of San Diego. March 2013.
- Provided consultant and expert witness services related to alleged coal tar sealant exposure for the matter of Joseph L. Hatchell vs. SealMaster, Inc., Tony Shelley and SealMaxx, Inc. State of South Carolina, County of Darlington Common Pleas Court. 2013-2014.
- Clean Water Act Violations. Provided expert opinions and trial testimony related to potential chlorine gas exposures for the defense (Federal Public Defender) in US v. Patrick Dooley, Case No. CR11-252MJP, US District Court, Western District of Washington at Seattle. January 2012.
- Shoreline Development Permit State Appeal, Washington. Provided testimony at a hearing appealing county determination of nonsignificance for a shoreline substantial development application for a shellfish-geoduck farm (March 1, 2012). Testimony addressed claims asserted by Appellants' experts regarding the toxicity of metals in polyvinyl chloride (PVC) tubing used in geoduck aquaculture. Shorelines Hearings Board, State of Washington, Case reference SHB No. 11-019. "Coalition to Protect Puget Sound Habitat and Case Inlet Association vs. Pierce County and Longbranch Shellfish LLC." 2012.
- Shoreline Development Permit County Appeal, Washington. Provided expert report and testimony at a hearing appealing county determination of nonsignificance for a shoreline substantial development application for a shellfish-geoduck farm (March 2011). Report and testimony addressed claims asserted by Appellants' experts regarding the toxicity of metals in polyvinyl chloride (PVC) tubing used in geoduck aquaculture. Pierce County Hearing Examiner case reference SD\_22-06\688646, "Coalition to Protect Puget Sound Habitat vs. Longbranch Shellfish LLC." 2011.
- Evaluation of Coke Plant Emissions. Provided expert report regarding the potential for increased health risks due to SO<sub>2</sub> and PM<sub>2.5</sub> among residents and employees of the city of Monroe due to air emissions from the Middletown Coke Company Plant. Ohio Environmental Review and Appeals Commission. Robert D. Snook Natural Resources Defense Council et al., City of Monroe, Ohio v. Chris Korleski, Middletown Coke Company, Inc., SunCoke Energy, Inc. Case Nos. ERAC 096432-8. 2011.

- Indoor Air Quality. Provided a declaration in support of motion to strike opposing expert's declaration related to a residential indoor air quality evaluation in April Norton Rauch v. Ballard Leary Phase II, LP, BRCP/CPI Leary LLC, YOTM LLC, No. 09-2-21126-4 SEA in the Superior Court of the State of Washington, King County. 2011.
- Worker Compensation Case, Washington. Provided expert opinions and deposition for the defense for an appeal to the Board of Industrial Insurance Appeals regarding alleged solvent exposures and toxic solvent encephalopathy and Alzheimer's disease. Claim No. SB-29840. 2010.
- Insurance Cost Recovery Litigation, Multiple Sites. Provided expert opinions and deposition regarding historical knowledge of arsenic toxicity in a case related to remediation of arsenical pesticide production/formulation facilities. U.S. Borax Inc. v. Royal Indemnity Company, et al. Case settled. 2009.
- Provided expert opinion (report and declaration) regarding plaintiff's allegations of adverse health effects resulting from releases of arsenic and other chemicals from the FMC Corporation Plant in Middleport, New York. Lewis, et al. v. FMC Corporation. Civil Docket No.: 1:04-CV-00331-WMS. United States District Court Western District of New York. 2007.
- Mining and Smelting Site Litigation, Idaho. Provided expert report for the defense regarding class action allegations of proposed medical-monitoring classes related to lead exposures identified in the Second Amended Class Action Complaint ("Complaint") for Baugh v. Asarco. Case No. CV 02-00131. Certification denied. 2004.
- Mining Site Litigation, Oklahoma. Provided expert opinions and deposition for the defense regarding lead exposures in an historic zinc mining district. Betty Jean Cole, et al. Plaintiffs, vs. ASARCO Incorporated, et al., Defendants; The Doe Run Resources Corporation, Third Party Plaintiff, vs. United States of America, Third Party Defendant. United States District Court for the Northern District of Oklahoma. Case No. 03-CV-327-H(C). Class certification ruling resolution unknown. 2004.
- Copper Chromated Arsenic Litigation, Indiana. Provided expert opinions for the defense regarding copper chromated arsenic (CCA) exposures from a residential deck. James R. Hayden and Jamie F. Hayden, Husband and Wife, v. Menard, Inc. et al. Case No. 1:03-cv-1400-DFH-TAB. Case settled. 2005.
- Roxarsone Litigation, Arkansas. Provided expert opinions and deposition for the defense regarding exposures to roxarsone from poultry operations. Court sustained defendants' motion for summary judgment. Mary E. Green, et al. v. AlphaPharma Inc., et al. Case No. CIV-03-2150-2. Circuit Court of Washington County, Arkansas. 2005-2006.
- Asbestos Litigation, Washington. Provided expert opinions and deposition for the plaintiffs regarding exposures to asbestos-containing dusts by apartment tenants occupying a multiunit residential building during a large-scale plumbing renovation that occurred in the absence of asbestos control measures. Franklin Albano; et al. v. Scott Real Estate Investments, Inc., et al. Superior Court for the State of Washington in and for King County. No. 04-2-12469-7 SEA. Case settled. 2006.
- Residential Mold Litigation, Washington. Provided expert opinions for the defense regarding mold exposures in a tenant/landlord dispute. Helms v. Sharma. Snohomish County Superior Court. Case No. 03-2-06536-4. Case settled. 2005.
- Copper Mining District Releases, Utah USA. Prepared deposition describing limitations of potential adverse effects associated with lead and arsenic in a riverbed near a residential area downstream of a mining site in Utah. Deposed by US Department of Justice and USEPA attorneys, and testified for an alternative dispute resolution. 1990s.

- Vapor Intrusion Litigation, Seattle, Washington. Named as testifying expert and prepared for deposition in litigation related to potential impacts of infiltration of vapors from volatile chemicals in groundwater into a business adjacent to a waste chemical processing facility. Conducted an in-depth review of baseline risk assessment, inhalation pathway assessment, and state health consultation prepared for site; evaluating building vapor intrusion modeling; critically assessing USEPA's Johnson and Ettinger model; assessing potential employee exposures; and researching toxicity assessments of chlorinated volatile organic chemicals and benzene. Compiled list of technical questions to be asked of opposing expert. 1990s.
- Pesticide Manufacturing Facility Releases, Texas. Made a presentation to a district attorney and investigators conducting a manslaughter investigation related to chemical releases from a pesticide manufacturing facility in Texas. 1990s.

## CAREER

2010-Present

**Ramboll US Consulting, Inc./ENVIRON US Corp., Seattle, Washington**

Principal

2002-2010

**Integral Consulting, Inc., Mercer Island and Seattle, Washington**

Principal

2000-2002

**Gradient Corporation, Mercer Island, Washington**

Principal

1988-2000

**PTI/Exponent, Bellevue, Washington**

Principal and Senior Toxicologist

1987-1988

**Environmental Toxicology International, Seattle, Washington**

Senior Toxicologist

1982-1987

**Ortho Pharmaceutical Corporation (Drug Safety Evaluation), Raritan, New Jersey**

Toxicologist

1975-1977

**US Environmental Protection Agency (Office of Toxic Substances), Washington, DC**

Chemist

## PEER-REVIEWED PUBLICATIONS AND BOOK CHAPTERS

Schoof RA, Van Landingham C, Bailey A. 2022. Assessing the Impact of a Residential Metals Abatement Program on Child Blood Lead levels in Butte, MT. Society for Mining, Metallurgy and Exploration (SME) journal.

Van Landingham, C., Fuller, W.G., Schoof, R.A. 2020. The effect of confounding variables in studies of lead exposure and IQ. Crit Rev Tox. DOI: 10.1080/10408444.2020.1842851.

Tu, J.W., Fuller, W., Feldpausch, A.M., Van Landingham, C., Schoof, R.A. 2020. Objective ranges of soil-to-dust transfer coefficients for lead-impacted sites. Environ Res 184: 109349. PMID: 32199320 DOI: 10.1016/j.envres.2020.109349.

- Feldpausch AM, Rodricks JV, Schoof RA, Weldon BA. 2018. Gastrointestinal tract development and its importance in toxicology. *Toxicology of the Gastrointestinal Tract*, Second Edition, Ed. Shayne Cox Gad. CRC Press. ISBN 9781138360167.
- Schoof RA & DeNike J. 2017. Microplastics in the context of regulation of commercial shellfish aquaculture operations. *Integrat Environ Assess Manage* 13:522–527.
- Schoof RA & Handziuk E. 2016. Arsenic speciation and bioavailability in vegetables. In *Arsenic Research and Global Sustainability*. Battacharya P, Vahter M, Jarsjö J, Kumpiene J, Ahmad A, Sparrenbom C, Jacks G, Donselaar E, Bundschuh J, and Naidu R. (eds). pp313-315. ISBN 978-1-138-02941-5.
- Schoof RA, Johnson DL, Handziuk ER, Van Landingham C, Feldpausch AM, Gallagher AE, Dell LD, Kephart A. 2016. Assessment of blood lead level declines in an area of historical mining with a holistic remediation and abatement program. *Environ Res* 150: 582–591.  
<http://dx.doi.org/10.1016/j.envres.2015.12.028>.
- Yager JW, Greene T, Schoof RA. 2015. Arsenic relative bioavailability from diet and airborne exposures: Implications for risk assessment. *Sci Tot Environ* 536:368–381.  
<http://dx.doi.org/10.1016/j.scitotenv.2015.05.141>.
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- Elert M, Bonnard R, Jones C, Schoof RA and Swartjes FA. 2011. Human exposure pathways. pp. 455–515. In: *Dealing with Contaminated Sites*. Swartjes FA (ed). Springer.
- Schoof RA. 2008. How will new USEPA guidance affect research on the bioavailability of metals in soil? (editorial). *Hum Ecol Risk Assess* 14:1–4.
- Lowney YW, Wester RC, Schoof RA, Cushing CA and Ruby MV. 2007. Dermal absorption of arsenic from soils as measured in the Rhesus monkey. *Toxicol Sciences* 100:381–392.
- Schoof RA and Yager JW. 2007. Variation of total and speciated arsenic in commonly consumed fish and seafood. *Hum Ecol Risk Assess* 13:946–965.
- Williams L, Schoof RA, Yager JW and Goodrich-Mahoney JW. 2006. Arsenic bioaccumulation in freshwater fishes. *Hum Ecol Risk Assess* 12(5):904–923.
- Schoof RA and Houkal D. 2005. The evolving science of chemical risk assessment for land applied biosolids. *J Environ Qual* 34:114–121.
- Kester GB, Brobst RB, Carpenter A, Chaney RL, Rubin AB, Schoof RA and Taylor DS. 2005. Risk characterization, assessment and management of organic pollutants in beneficially used residual products. *J Environ Qual* 34:80–90.
- Lowney YW, Ruby MV, Wester RC, Schoof RA, Holm SE, Hui XY, Barbadillo S and Maibach HI. 2005. Percutaneous absorption of arsenic from environmental media. *Toxicol Ind Health* 21:1–14.
- Schoof RA 2004. Bioavailability of soil-borne chemicals: Method development and validation. *Hum Ecol Risk Assess* 10:637–646.
- Wester RC, Xiaoying H, Barbadillo S, Maibach HI, Lowney YW, Schoof RA, Holm SE and Ruby MV, 2004. *In vivo* percutaneous absorption of arsenic from water and CCA-treated wood residue. *Toxicol Sciences* 79:287–295.
- Yost LJ, Tao S-H, Egan SK, Barraji LM, Smith KM, Tsuji JS, Lowney YW, Schoof RA and Rachman NJ. 2004. Estimation of dietary intake of inorganic arsenic in US children. *Hum Ecol Risk Assess* 10:473–483.
- Schoof RA, Tsuji JS, Benson R and Hook GC. 2004. Response to Byrd et al. (2004) comment on health effect levels for assessing childhood exposure to arsenic in soil. *Reg. Toxicol Pharmacol* 40:374–375.
- Tsuji JS, Benson R, Schoof RA and Hook GC. 2004. Response to additional support for derivation of an acute/subchronic reference level for arsenic. *Reg Toxicol Pharmacol* 40:372.

- Tsuji JS, Benson R, Schoof RA and Hook GC. 2004. Health effect levels for assessing childhood exposure to arsenic in soil. *Reg. Toxicol. Pharmacol.* 39(2):99-110.
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- Schoof RA, Yost LJ, Eickhoff J, Crecelius EA, Cragin DW, Meacher DM and Menzel DB. 1999. A market basket survey of inorganic arsenic in food. *Food Chem Toxicol* 37:839-846.
- Schoof RA, Eickhoff J, Yost LJ, Crecelius EA, Cragin DW, Meacher DM and Menzel DB. 1999. Dietary exposure to inorganic arsenic. pp. 81-88. In: *Proc. Third International Conference on Arsenic Exposure and Health Effects*. W.R. Chappell, C.O. Abernathy, and R.L. Calderon (eds). Elsevier Science Ltd.
- Schoof RA, Yost LJ, Crecelius E, Irgolic K, Guo H-R and Greene HL. 1998. Dietary arsenic intake in Taiwanese districts with elevated arsenic in drinking water. *Hum Ecol Risk Assess* 4(1):117-136.
- Yost LJ, Schoof RA and Aucoin R. 1998. Intake of inorganic arsenic in the North American diet. *Hum Ecol Risk Assess* 4(1):137-152.
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- Slayton TM, Beck BD, Reynolds KA, Chapnick SD, Valberg PA, Yost LJ, Schoof RA, Gauthier TD and Jones L. 1996. Issues in arsenic cancer risk assessment. *Environ Health Perspect* 104(10):1012-1013.
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- Schoof RA and Baxter CS. 1986. Topical application of a tumor promoter induces proliferation of an adherent cell population in murine spleen. *Int J Immunopharm* 8:455–462.
- Hahn DW, Heteyi N, Beck L, McGuire JL and Schoof RA. 1985. Pharmacology and toxicology studies with microencapsulated norgestimate as a long acting injectable contraceptive. *Adv Contraception* 2:235–236.
- Baxter CS, Schoof RA and Lawrence AT. 1984. Interaction of tumor promoting agents with immunofunctional cells *in vitro* and *in vivo*. International Agency for Research on Cancer Scientific Publications, No. 56.

#### **INVITED PRESENTATIONS/ PANELS/ PEER-REVIEWS/ AWARDS**

- 2021—Member of Interstate Technology & Regulatory Council (ITRC) team writing guidance on assessing environmental contamination by microplastics.
- 9/16 to 2020—Member of Strategic Environmental Research and Development Program (SERDP) Science Advisory Board. Appointment effective June 2017-June 2020. SERDP is one of two U.S. Department of Defense environmental research programs, harnessing the latest science and technology to improve DoD's environmental performance, reduce costs, and enhance and sustain mission capabilities. Activities included review of projects assessing polyfluorinated alkyl substance (PFAS) contamination and replacement firefighting foams, impacts of climate change on threatened and endangered species, unexploded ordinance, bilge water, waste management at field bases and other technology issues.
- 4/20—External peer review of a report summarizing an evaluation of the Integrated Exposure Uptake Biokinetic (IEUBK) Model (version 2.0) for U.S. Environmental Protection Agency (EPA), "Advancing Pb Exposure and Biokinetic Modeling for USEPA Regulatory Decisions and Site Assessments using Bunker Hill Mining and Metallurgical Complex Superfund Site Data".
- 12/06 to present—Human and Ecological Risk Assessment: Member editorial review board.
- 1/04 to present—Science Advisory Board for Contaminated Sites in British Columbia: Appointed member, Vancouver, BC.
- 07/19—Gave talk titled "Implications of the Threshold Approach for Food Safety Evaluation" in a workshop titled "Threshold-based Cancer Risk Assessment for Non-genotoxic Carcinogens: Inorganic Arsenic as a Case Study" at the Toxicology Forum conference in Alexandria, VA.
- 05/19—Gave keynote talk titled "Developing Oral Bioavailability Data for Health Risk Assessments" at the 15<sup>th</sup> International Conference on the Biogeochemistry of Trace Elements in Nanjing, China.
- 11/18—Gave talk titled "Assessing Soil Lead Exposures and Effectiveness of Remediation" at the BP 2018 Remediation Engineering & Technology Summit. Denver, CO.
- 10/18—Gave talk titled "Factors Affecting Mercury Exposure from Fish: Focus on Selenium/Mercury and Methylmercury/Total Mercury Ratios" at the Electric Power Research Institute Energy and Environment Program Fall Advisory Meeting. Denver, CO.
- 3/18—Gave talk titled "Factors Affecting Mercury Exposure from Fish" at the Electric Power Research Institute Energy and Environment Program Winter Advisory Meeting. Tampa, FL.
- 8/17—Gave talk titled "Factors Affecting Mercury Exposure from Fish" at the 13<sup>th</sup> International conference on Mercury as a Global Pollutant. Providence, RI.
- 9/17—Gave talk titled "Does plastic shellfish gear increase microplastic and chemical exposures?" at the annual meeting of the Pacific Coast Shellfish Growers' Association. Welches, OR.
- 1/17—Gave talk titled "Human health risk assessment for mercury at sediment sites" at a workshop of the Ninth International Conference on Remediation and Management of Contaminated Sediments, New Orleans.

- 2/16—Gave talk titled “Factors Affecting Fish Mercury Bioavailability” at the Electric Power Research Institute Winter Environment Program Advisory and Sector Council Meetings. Phoenix, AZ.
- 2016—Served as thesis examiner for R Lewatu Taga. Revised thesis titled “Development of in-vitro methods to predict bioavailability of arsenic, cadmium, copper, lead and zinc in mine wastes for human health risk assessment”, submitted for a degree of Doctor of Philosophy at the University of Queensland, Sustainable Minerals Institute, 2016.
- 11/14 to 2/15— External Peer Review of EPA’s Approach for Estimating Exposures and Incremental Health Effects due to Lead from Renovation, Repair, and Painting Activities in Public and Commercial Buildings. Served as one of 12 appointed peer reviewers.
- 11/13 to 7/14—Washington Department of Ecology PCB Chemical Action Plan Advisory Committee. Served on committee reviewing state-wide chemical action plan.
- 2014—Served as thesis examiner for R Lewatu Taga. Thesis titled “Development of in-vitro methods to predict bioavailability of arsenic, cadmium, copper, lead and zinc in mine wastes for human health risk assessment”, submitted for a degree of Doctor of Philosophy at the University of Queensland, Sustainable Minerals Institute, 2014.
- 2009 to 2013—Washington Department of Ecology MTCA Science Panel. Appointed member of Model Toxics Control Act Science Panel.
- 2013—International Society for Exposure Science meeting in Seattle, WA. Served on the organizing committee, including conducting reviews of session proposals and abstracts.
- 2013—Served as thesis examiner for J Zheng. Thesis titled “Lead from Mining and Mineral Processing Activities to the Community via the Air-dust Pathway: An Example from Mount Isa City Using Human Health Risk Assessment Approach”, submitted for a degree of Doctor of Philosophy at the University of Queensland, Sustainable Minerals Institute, December 2012.
- 10/12 – Gave an invited talk titled “Low Lead Level Exposures Today” at HB Lead Litigation Conference, New Orleans, October 2012.
- 9/12—Fish Mercury Bioavailability, (with a short arsenic detour). Electric Power Research Institute Fall Environment Program Advisory Meetings. P42 – Air Toxics Council Meeting. Milwaukee, WI.
- 7/12—Synergies of HIA and Ecosystem Services in International Development Projects. Co-organizer of session. Talk presented titled “Health Impact Assessment – A Key to Sustainable Development” at the World Congress on Risk in Sydney, Australia. Session co-chair.
- 3/12—Beyond Lead and Arsenic: How are other metals being addressed? Invited talk presented at workshop session titled “Assessing the Bioavailability and Risk from Metal-contaminated Soils and Dusts” at the 51st Meeting of the Society of Toxicology in San Francisco, CA.
- 2011—Served on thesis examination committee for W. Cutler. Thesis titled “Bioaccessible arsenic in soils of the Island of Hawaii. A dissertation submitted to the graduate division of the University of Hawai’i at Mānoa in partial fulfillment of the requirements for the degree of doctor of philosophy in geology and geophysics.
- 9/09—5th International Workshop on Chemical Bioavailability, Adelaide, Australia. Invited plenary lecture titled “Developing Oral Bioavailability Data for Risk Assessments: Method Development and Burden of Proof”.
- 1/06 to 1/09—Metals in the Human Environment Research Network (a Canadian university research consortium funded by the Canadian National Science and Engineering Research Council): Expert advisory panel member, Gatineau, Quebec.
- 1/09—National Research Council: Peer review of “Contaminated Water Supplies at Camp Lejeune—Assessing Potential Health Risks,” November 2008 Peer Review Copy.
- 10/08 to 6/09—DuPont-USEPA PFOA Peer Consultation Panel. Peer consultation on exposure assessment for perfluorooctanoic acid released from DuPont Washington Works facility.
- 1/07 to 07/08—National Research Council: Committee on Beryllium Alloy Exposures, Washington, DC.

- 10/07—Lifetime Achievement Award given by the Annual International Conference on Sediments Soils and Water under the auspices of the University of Massachusetts for significant contribution to a field of science or engineering, as assessed by the level and longevity of contributions, assumption of responsibilities, and volunteerism for charitable organizations and not-for-profit groups.
- 10/07—International Society for Exposure Analysis annual meeting: Co-organizer of symposium titled "Use of In Vitro Bioaccessibility/Relative Bioavailability Estimates in Regulatory Settings: What Is Needed?" and talk titled "Method development and the application of oral bioavailability data in US risk assessments," Durham, NC.
- 8/06 to 12/06—Toxicology for Excellence in Risk Assessment: Peer review panel member for review of the Sudbury Soils Study Human Health Risk Assessment, Sudbury, Ontario.
- 9/06—International Society for Exposure Analysis annual meeting: Invited speaker at symposium titled "Childhood exposures to bioavailable metals in soil and household dust in residential environments," talk titled "Method development and the application of oral bioavailability data in US risk assessments," Paris, France.
- 9/06—American Chemical Society annual meeting: Invited speaker at Agricultural & Food Chemistry Division symposium on Heavy Metals in Food, talk titled "Dietary intake of toxic forms of arsenic," San Francisco, CA.
- 9/06—Electric Power Research Institute: Invited speaker at Environment Sector meeting, talk titled "Critical evaluation of ambient water quality criterion for arsenic: bioaccumulation and speciation issues," Atlanta, GA.
- 11/05—University of Washington Department of Environmental Health seminar series: Invited lecture titled "Probabilistic lead model for an operating smelter in South America," Seattle, WA.
- 6/05—XIII International Conference on Heavy Metals in the Environment: Invited member of Arsenic Environmental Health Research Panel, talk titled "Arsenic speciation in commonly consumed organisms," Rio de Janeiro, Brazil.
- 6/04—Canadian National Science and Engineering Research Council: Research grant application site visit panel member, Guelph, Ontario.
- 3/04—Society of Toxicology annual meeting: Co-chair of risk assessment poster session, Baltimore, MD.
- 2/04—US Environmental Protection Agency: Peer review of Lead Bioavailability Technical Support Document.
- 1/04—Sustainable Land Application Conference: Invited lecture titled "The evolving science of chemical risk assessment as applied to land application of biosolids effluents and manures," Lake Buena Vista, FL.
- 8/02 to 3/04—National Research Council: Member of Subcommittee on Toxicological Risks to Deployed Military Personnel.
- 11/03—People to People Ambassador Program: Toxicology Delegation to China: Beijing, Guilin, and Shanghai.
- 4/03—US Environmental Protection Agency: Invited Speaker at workshop on bioavailability of metals in Tampa, FL. Gave talk on the role of bioavailability model validation in site-specific decision-making.
- 7/02—National Research Council: Peer review of "Bioavailability of contaminants in soils and sediments: Processes, tools and applications," Peer Review Copy.
- 8/02—US Environmental Protection Agency: Peer review of draft "Estimates of soil ingestion in children," by Cain et al.
- 6/02—Mealey's Emerging Toxic Tort Conference: Lecture titled "Up to date analysis of water contamination cases: The science," Pasadena, CA.
- 3/01 to 6/02—National Research Council: Appointment to Committee on Toxicants and Pathogens in Biosolids. Book issued titled Biosolids applied to land: advancing standards and practices. Participated in Congressional briefing of committee findings.

- 4/02—Center for Environmental & Occupational Risk Analysis and Management, College of Public Health, University of South Florida, Tampa: Lecture titled "Consideration of background exposures and bioavailability in designing arsenic biomonitoring studies."
- 3/02—Electric Power Research Institute Advisory committee meeting. Lecture titled "Arsenic exposure and risk: Public perception vs. likely exposure pathways."
- 10/01—Ontario Ministry of the Environment. Member of international peer review panel evaluating draft risk assessment for the Rodney Street community in Port Colborne, FL. Participated in media briefing and community open houses to explain role of peer review panel. Named by the Ontario Ministry of the Environment as a testifying expert for the executive review tribunal.
- 10/01—Contaminated Soils, Sediments and Water annual conference: Lecture titled "Methodological issues in assessing dermal absorption of chemicals" in Dermal Bioavailability session.
- 9/01—Northwest Biosolids Management Association annual conference: Keynote speech describing the National Research Council biosolids committee membership and charge.
- 4/01—US Environmental Protection Agency: Peer review of draft supplemental guidance for developing soil screening levels for Superfund sites.
- 3/01—Society of Toxicology annual meeting: Lecture on metal bioavailability in continuing education course on risk assessment of metals.
- 3/01—Society of Toxicology annual meeting: Co-chair of workshop on consideration of bioavailability in risk assessment.
- 2/01—Secretary of the Navy Environmental Awards FY 2000: Judge.
- 9/00—Agency for Toxic Substances and Disease Registry: Technical review of mercury releases from lithium enrichment at the Oak Ridge Y12 plant, July 1999.
- 9/00—US Environmental Protection Agency: Peer review of draft documentation for short-term arsenic toxicity value.
- 5/00—Agency for Toxic Substances and Disease Registry: Peer review of draft toxicity profile for creosote.
- 10/99—15th Annual International Conference on Contaminated Soils and Water (AEHS): Organized 3-hour workshop (taught with two colleagues) titled "Development of site-specific bioaccessibility and bioavailability data and their application to human health risk assessment." Co-organized and co-chaired technical session titled "Bioavailability of contaminants in soil," Amherst, Massachusetts, October 1999.
- 10/99—National Institute of Environmental Health Sciences Superfund Basic Research Program grant application review, special emphasis panel member, Research Triangle Park, North Carolina, October 1999.
- 7/99—ASCE-CSCE Environmental Engineering Conference: "Application of bioavailability to environmental cleanup settings: case studies," Norfolk, Virginia, July 1999.
- 5/99—Chemical Manufacturer's Association Exposure Assessment Workshop: Member of panel making recommendations regarding research projects CMA should fund in the area of dermal exposure assessment, Research Triangle Park, North Carolina, May 1999.
- 5/99—US Dept. of the Navy Remediation Innovation Technology Seminar series: One of four primary speakers for day long course. Topic was "The role of bioavailability in risk assessment," San Diego and San Francisco, California, Silverdale, Washington, Philadelphia, Pennsylvania, Charleston, South Carolina, and Honolulu, Hawaii, May 1999.
- 12/98—US Environmental Protection Agency workshop on issues associated with dermal exposure and uptake: Peer consultant reviewing draft risk assessment guidance, Bethesda, Maryland, December 1998.
- 12/98—National Environmental Policy Institute Conference-Bioavailability: Using what we know, learning what we need: "Why consider bioavailability in risk assessment?" Washington, D.C., December 1998.

- 8/98—US Environmental Protection Agency Modeling Lead Exposure and Bioavailability Workshop: "Interpreting *in vitro* bioavailability studies," Durham, North Carolina, August 1998.
- 7/98—Third International Conference on Arsenic Exposure and Health Effects: "A market basket survey of inorganic arsenic in food," San Diego, California, July 1998.
- 12/97—IBC's International Congress on Human Health Bioavailability: "Practical experience in developing/negotiating the use of bioavailability adjustments," Scottsdale, Arizona, December 1997.
- 9/96—US Environmental Protection Agency and US Department of Energy Mercury Speciation Workshop: "Biological models to predict soil mercury bioavailability to humans," Denver, Colorado, September 1996.
- 12/96—US Geological Survey Arsenic Workshop: "The role of bioavailability studies in deriving risk-based cleanup levels for arsenic in soil," Sutter Creek, California, December 1996.
- 3/96—NJDEP Interagency Risk Assessment Committee: "Assessing the oral bioavailability of metals in soil," Trenton, New Jersey, March 1996.
- 8/95—ATSDR Science Panel on the Bioavailability of Inorganic Mercury: Served as a member of an Agency for Toxic Substances and Disease Registry (ATSDR) expert science panel on the bioavailability of mercury in soil. Served as lead author on a manuscript reviewing methods and available data for assessing the oral absorption of various forms of inorganic mercury, Atlanta, Georgia, August 1995.
- 12/95—TNRCC Arsenic Symposium: Served as one of four invited experts at a 1-day symposium to brief toxicologists and project managers from the Texas Natural Resource Conservation Commission on the latest developments in assessing risks associated with arsenic in soil, Austin, Texas, December 1995.
- 1992—Oregon DEQ Cross Media Advisory Committee: Appointed by the Director of the Oregon Department of Environmental Quality (DEQ) to serve on an advisory committee that reviewed and commented on the methodology developed by DEQ to evaluate cross media regulatory impacts and develop a more integrated approach to the permit process. Also participated in technical subcommittee of toxicologists that provided detailed technical review of a comparative risk assessment model developed to rank chemical exposure and hazard to human and ecological receptors, Portland, Oregon, 1992–1993.

## PRESENTATIONS & POSTERS

- Bailey A, Schoof R, Tu J. 2023. Relevance of Lead Enrichment in Soil Particle Size Fractions for Assessing Exposure. *Toxicologist, Suppl Toxicol Sci* 192 (1), abstract #3833.
- Schoof RA, Van Landingham C, Bailey A. 2022. Assessing the Impact of a Residential Metals Abatement Program on Child Blood Lead levels in Butte, MT. Society for Mining, Metallurgy and Exploration (SME). Salt Lake City, UT. (presentation by A Bailey).
- Schoof RA. 2020. Dietary arsenic risk assessment and risk management. *Toxicologist, Suppl Toxicol Sci* 174 (1), abstract #2218.
- Van Landingham C, Schoof RA. 2020. Assessing the effectiveness of a residential metals abatement program (RMAP) using blood lead levels in children. *Toxicologist, Suppl Toxicol Sci* 174 (1), abstract #2847.
- Feldpausch A, Schoof RA. 2020. Proposal for use of *in vitro* bioaccessibility data when methods validated using animal models are unavailable. *Toxicologist, Suppl Toxicol Sci* 174 (1), abstract #1524.
- Schoof RA and Goodrich-Mahoney J. 2017. Factors affecting mercury exposure from fish. 13<sup>th</sup> International Conference on Mercury as a Global Pollutant. Providence, RI.
- Schoof RA and Handziuk E. 2016. Arsenic speciation and bioavailability in vegetables. 6th International Congress on Arsenic in the Environment (As2016): Arsenic Research and Global Sustainability, Stockholm, Sweden. June.



- Schoof RA. 2015. Children's blood lead levels in a mining community after 20 years of remediation activities. Society for Environmental Geochemistry and Health annual meeting, Arlington, TX. March.
- Yager JW, Greene T, Schoof R. 2015. Arsenic relative bioavailability from diet and airborne exposures: Implications for risk assessment. Society of Toxicology annual meeting, San Diego, CA.
- Schoof RA, Johnson DL, McConnell ER, Gallagher A, Van Landingham C, Feldpausch A and Dell L. 2014. Development of a Reference Dataset for Evaluation of Blood Lead Levels from Children in a Mining Community. International Society of Environmental Epidemiology annual meeting, Seattle, WA
- Schoof RA, Johnson DL, Feldpausch A, McConnell ER, Van Landingham C, Dell L, Das M and Gallagher A. 2014. Characterization of blood lead levels for children in a community affected by historical mining activities. Society of Toxicology annual meeting, Phoenix, Arizona.
- Goldsworthy B, Schoof R, Kaden D and Harris A. 2014. Hydraulic fracturing and human health concerns: Lessons from the US and Canada. Ecoforum Conference & Exhibition, Gold Coast, Australia.
- Goldsworthy B and Schoof R. 2013. Assessment of mutagenic carcinogens in Australia. CleanUp 2013 (hosted by the CRC for Contamination Assessment and Remediation of the Environment CRC CARE) in Melbourne (presentation by B. Goldsworthy).
- Schoof R, Kaden D and Harris A. 2013. Hydraulic fracturing: Human health concerns. Science Advisory Board for Contaminated Sites Third Annual Conference on Contaminated Sites. Vancouver, BC, Canada.
- Kaden DA, Harris A, Imse J, Travers M and Schoof R. 2012. Exposure and toxicity of chemicals resulting from natural gas extraction and fracturing. Poster presented at the 51st Meeting of the Society of Toxicology in San Francisco, California.
- Johnson D, Schoof R, Moore T, Harris C. 2012. Arsenic and lead biomonitoring studies as tools to assess long-term remedy protectiveness for former mining communities. International Society for Exposure Science in Seattle, WA (presentation by D. Johnson).
- Feldpausch A and Schoof R. 2012. Development of a residence-specific, health-based screening criterion for benzo(a)pyrene in settled house dust. International Society for Exposure Science in Seattle, WA (poster).
- Spalt E, Johnson D, Schoof R, Baker C and Tobin S. 2012. Tiered approach for chemical prioritization at a former pesticide testing site. International Society for Exposure Science in Seattle, WA (poster).
- Schoof R, Moore T, Harris C and Johnson D. 2012. The increasing importance of biomonitoring data to interpret changing risk estimates for legacy mining communities. USEPA Hardrock Mining Conference 2012: Advancing Solutions for a New Legacy. Denver, CO. Presentation.
- Schoof RA, Zieber P and Tolbert L. 2009. Probabilistic risk assessment of incremental risk between site and background arsenic in soil. Toxicol Sci 108(S-1) Abstract 844.
- Schoof R and Lorenzen E. 2009. Probabilistic lead risk assessment for a community with an operating smelter. Toxicol Sci 108(S-1) Abstract 843.
- Cárdenas A, Schoof R, Stupakoff I, Christy A, Cheney D. 2007. Risk Evaluation for Consumption of Cadmium in Pacific Northwest Oysters and International Maximum Limits. Poster presentation at Pacific Northwest Chapter of Society of Environmental Toxicology and Chemistry Conference, April 2007, Port Townsend, WA. DOI: 10.13140/RG.2.2.27784.21762.
- Bradley A, Cárdenas A, Curl c, and Schoof R. 2007. Developing and utilizing questionnaire data in building an exposure model for lead. Poster presentation at International Society for Exposure Analysis Annual Conference, Durham, NC.
- Zieber P, Cárdenas A, Schoof R and Ostrom T. 2006. Traditional tribal lifeways exposure scenario for an oiled beach in the Pacific Northwest. Poster presented at the Toxics in Puget Sound Forum, April 5, and the Pacific Northwest Society of Environmental Toxicology and Chemistry Conference, April 13-15, Port Townsend, Washington.
- Lowney YL, Ruby MV, Wester RC, Schoof RA, Holm SE and Maibach HI. 2005. Percutaneous absorption of arsenic from environmental media. Toxicol Sci 84(S-1) Abstract 2084:427.



- Schoof RA, Williams L and Yager JW. 2004. Arsenic speciation and bioaccumulation studies support higher ambient water quality criterion (AWQC). *Toxicol Sci* 78 (S-1) Abstract 728: 150
- Williams L, Schoof RA, Schuler A, Zieber P, Yager JW and Goodrich-Mahoney J. 2004. Arsenic bioaccumulation—implications of using a power function to estimate bioaccumulation factors. Society of Environmental Toxicology and Chemistry, Portland, Oregon.
- Kester GB, Brobst RB, Carpenter A, Chaney RL, Rubin AB, Schoof RA and Taylor D. 2004. Risk Characterization, Assessment, and Management of Organic Pollutants in Beneficially Used Residual Products. Sustainable Land Application Conference, Lake Buena Vista, Florida.
- Schoof RA. and Yost LJ. 2002. Estimation of inorganic arsenic intake from fish: Market basket vs. recreational catches. *Toxicol Sci* 66 (1-S) Abstract 1698: 347.
- Yost LJ, Schoof RA and Garry M. 2002. Estimation of dietary intake of inorganic arsenic in children. *Toxicol Sci* 66 (1-S) Abstract 1696: 346.
- Schoof RA and Tsuji JS. 2000. The role of outdoor dust in exposures to chemicals in soil: Case studies for arsenic. *Toxicol Sci* 54 (1-S) Abstract 1168: 249.
- Tsuji J, Schoof R and Hook G. 2000. Subchronic health effect levels for childhood exposure to arsenic. *Toxicol Sci* 54 (1-S) Abstract 346: 73.
- Ruby MV, Schoof RA and Carpenter MJ. 1999. Arsenic bioaccessibility and mineralogy from soils at a pesticide manufacturing facility, 15th Annual Conference on Contaminated Soils and Sediments, Amherst, Massachusetts.
- Menzel DB, Dillencourt MB, Meacher DM, Lee E, Bic LF, Schoof RA, Yost LJ, Farr CH and Cragin DW. 1999. Monte Carlo analysis of inorganic arsenic exposure in the US *Toxicol Sci* 48 (1-S) Abstract 1650:350.
- Evans CG and Schoof RA. 1998. Soil screening levels for cadmium should account for adult exposures and background exposures. *Toxicol Sci* 42 (1-S) Abstract 205:41.
- Schoof RA and Evans CG. 1998. Use of background arsenic exposure data to assess health significance of exposures to arsenic in soil. *Toxicol Sci* 42 (1-S) Abstract 1130:229.
- Smith JS, Moore ML and Schoof RA. 1997. Is mercury an environmental endocrine disruptor? Presented by RA Schoof at International Conference on Human Health Effects of Mercury Exposure, Torshavn, Faroe Islands.
- Schoof RA, and Yost LJ. 1996. Arsenic intake from the Taiwanese diet. *Toxicologist* 30(1) Abstract 251:49.
- Schoof RA and Freeman GB. 1995. Oral bioavailability of lead and cadmium in soil from a smelter site. The International Toxicologist. Abstract 86-P-15. Abstracts of the International Congress of Toxicology—VII, Seattle, Washington.
- Schoof RA, Freeman GB, Liao SC and Bergstrom PD. 1995. Determination of the oral bioavailability of soluble arsenic and arsenic in soil and house dust in Cynomolgus monkeys. *Toxicologist* 15(1) Abstract 712:134.
- Ruby MV, Davis A, Schoof R and Eberle S. 1995. Development of a physiologically based test to estimate lead bioavailability. *Toxicologist* 15(1) Abstract 718:135.
- Schoof RA., Pastorok RA and Gard NW. 1995. Assessing the oral bioavailability of metals in soil in terrestrial animals. The Second SETAC World Congress Conference, Vancouver, B.C., Canada.
- Schoof RA, Yost LJ, Beck B and Valberg P. 1994. Recalculation of the oral arsenic reference dose and cancer slope factor using revised assumptions of inorganic arsenic intake from food. *Toxicologist* 14(1) Abstract 51:36.
- Yost LJ, and Schoof RA. 1995. Risk assessment for arsenic in a marine outfall, including consideration of local seafood consumption rates and fractional intake. Book of Posters: Society for Environmental Geochemistry and Health Second International Conference on Arsenic Exposure and Health Effects, San Diego, California.

- Ruby MV, Schoof RA and Eberle S. 1995. Development of a physiologically based test to estimate arsenic bioavailability. Book of Posters: Society for Environmental Geochemistry and Health Second International Conference on Arsenic Exposure and Health Effects, San Diego, California.
- Schoof RA and Ruby MV. 1994. Prediction of soil arsenic bioavailability based on speciation and bioaccessibility data. Geological Society of America Annual Meeting, Seattle, Washington.
- Yost LJ, and Schoof RA. 1993. Implications of the methylation status of arsenic in home-grown vegetables for risk assessment. Book of Posters: Society for Environmental Geochemistry and Health International Conference on Arsenic Exposure and Health Effects, July 28, 1993, New Orleans, Louisiana.
- Schoof RA, Steele MJ, Petito Boyce C and Evans CG. 1993. Assessing the validity of lead bioavailability estimates from animal studies. *Toxicologist* 13(1) Abstract 478:141.
- Petito Boyce, C., Evans CG and Schoof RA. 1992. Impacts of recent developments in assessing toxicity and exposure on risk assessment for arsenic carcinogenicity. *Toxicologist* 12(1) Abstract 933:246.
- Schoof RA, Petito Boyce C, and Whittaker SG. 1992. Assessing the severity of carcinogenic health effects. *Toxicologist* 12(1) Abstract 290:94.
- Schoof RA and Baxter CS. 1982. Stimulation of Murine splenic lymphocytes after skin painting with a tumor promoter. *Toxicologist* 2(1) Abstract 322:91.