

**Laurie Benton, Ph.D., L.G.**  
**Managing Scientist**

**Professional Profile**

Dr. Laurie Benton is a Managing Scientist in Exponent's Environmental Sciences practice. She has more than 15 years experience in the earth sciences, principally in the areas of geochemistry, environmental science, and geology. Her areas of interest include contaminant transport and fate, chemical fingerprinting, and data management associated with complex environmental litigation.

Dr. Benton has extensive experience in both historical research and data analysis/interpretation focusing on the transport and fate of organic compounds and metals in the environment. She has participated in the acquisition of environmental data through pre-sampling planning activities, installation of monitoring and pumping wells, groundwater and soil sampling, data validation, and database management.

Dr. Benton has conducted environmental forensic studies at mining and smelting sites, landfills, wood treatment facilities, and former manufactured gas plants. She has expertise in the environmental chemistry of lead, thallium, dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and methyl tertiary-butyl ether (MTBE). Frequently, these analyses have been used in legal proceedings to evaluate cost allocation, insurance coverage, property damage, and personal injury claims.

**Academic Credentials and Professional Honors**

Ph.D., Geosciences, University of Tulsa, 1997  
M.S., Geochemistry, New Mexico Institute of Mining and Technology, 1991  
A.B., Dartmouth College (highest honors), 1987

Phi Beta Kappa, 1997

**Licenses and Certifications**

Licensed Geologist, Washington, #1253

## **Publications**

Benton L, Shields WJ, Edwards M. Commentary on O'Connor and Sabarsula (2005): Background dioxins in house dusts (*Environmental Forensics* 6(3):238–287). *Environmental Forensics* 2007; 8:295–298.

Shields WJ, Tondeur Y, Benton L, Edwards MR. Chapter 14, Dioxins and Furans. In: *Environmental Forensics: Contaminant Specific Guide*, R. Morrison and B. Murphy (eds), Academic Press, New York, 576 pp, 2005.

Benton LD, Ryan JG, Savov LP. Lithium abundance and isotope systematics of forearc serpentinites, Conical Seamount, Mariana forearc: Insights into the mechanics of slab-mantle exchange during subduction. *Geochem. Geophys. Geosys.* 5, Q08J12, doi:10.1029/2004GC000708, 2004.

Williams P, Benton L, Sheehan P. The risk of MTBE relative to other VOCs in public drinking water in California. *Risk Analysis* 2004; 24(3):621–634.

Williams P, Benton L, Sheehan P. MTBE in California's drinking water: a comparison of groundwater versus surface water sources. *Env Forens* 2003; 4(3):175–189.

Tomascak PB, Widom E, Benton LD, Goldstein SL, Ryan JG. The control of lithium budgets in island arcs, *Earth Planet. Sci. Lett* 2002; 196:227–238.

Williams P, Benton LJ, Warmerdam J, Sheehan P. Comparative risk analysis of six volatile organic compounds in California drinking water. *Environ. Sci. Technol* 2002; 36(22):4721–4728.

Benton LD, Ryan JG, Tera F. Boron isotope systematics of slab fluids as inferred from a serpentine seamount, Mariana forearc. *Earth Planet. Sci. Lett* 2001; 187:273–282.

Norman DI, Benton LD, Albinson T. Calculation of  $f(\text{O}_2)$  and  $f(\text{S}_2)$  of ore fluids, and pressure of mineralization from fluid inclusion gas analysis for the Fresnillo, Colorada, and Sombrerete Pb–Zn–Ag deposits, Mexico, in Pagel, M., Leroy, J.L. (eds.), *Source, transport and deposition of metals*: Rotterdam, A.A. Balkema, p. 209–212, 1991.

## **Abstracts and Presentations**

Benton L, Shields WJ, Edwards, M. What's in the dust? The answer is in the details. Air & Waste Management Association, PNWIS 2006: Healthy Communities Using Science-Based Solutions for Sustainability, Victoria, BC, November 8–10, 2006.

Benton LD, Ginevan ME, Edwards MR. Chemical fingerprinting of dioxins using a similarity index. AEHS 16<sup>th</sup> Annual Meeting and West Cost Conference on Soils, Sediments and Water, San Diego, March 13–16, 2006.

Benton LD, Edwards MR. Source identification of dioxin near wood treatment plants. Air & Waste Management Association, PNWIS 2005: International Perspectives on Environmental Management, Blaine, WA. November 8–11, 2005.

Ginevan M, Edwards M, Benton L. Statistical tools for the analysis of PCB and dioxin profile data. Platform presentation at the SETAC 26<sup>th</sup> Annual Meeting in North America, Baltimore, MD, 2005.

Ryan JG, Savov IP, Benton LD. B, Li, and Be insights into forearcs, arcs and beyond. Eos, Trans. AGU 83, Spring Meeting Supplement, Abstract V51D-06, 2002.

Benton LD, Tera F. Lithium isotope systematics of the Marianas revisited. Goldschmidt 2000, Journal of Conference Abstracts 2000; 5(2):210.

Benton LD, Savov I, Ryan JG. Recycling of subducted lithium in forearcs: insights from a serpentine seamount. Eos, Trans. AGU 80, Spring Meeting Supplement, Abstract V21B-07, 1999.

Benton LD, Tomascak PB, Helz RT. A study of boron isotopes in Kilauea Iki lava lake, Hawaii. Eos, Trans. AGU 80, Fall Meeting Supplement, Abstract V52B-06, 1999.

Benton LB, Haggerty JA, Ryan JG. Boron and lithium geochemistry of unconsolidated serpentines from the Mariana and Izu-Bonin Forearcs: Implications for the origin and evolution of serpentine seamount fluids. Eos, Trans. AGU 76, Fall Meeting Supplement, Abstract V51B-11, 1995.

Benton LD, Turin HJ, Wilcox BP, Gotti NL. In-situ field measurements of saturated and unsaturated conductivity; studies of soil and volcanic tuff. GSA Annual Meeting, Abstracts with Programs 26, 1994.

### **Prior Experience**

National Science Foundation Post-Doctoral Fellow, Department of Terrestrial Magnetism, Carnegie Institution of Washington, 1998–2000  
Geochemist, Gardere & Wynne, 1997–1998  
Graduate Research Assistant, Los Alamos National Laboratory, Summer 1994  
Scientist I & II, Geraghty & Miller, 1989, 1991–1992

### **Project Experience**

#### *Heavy Metals*

For several mining companies, served as project manager for source allocation study of lead in residential yards at the Tar Creek Superfund site. Reconstructed historical deposition of lead from fugitive dust from chat piles and tailings ponds by modeling emission, dispersion, and deposition of lead-containing particles over 80 or more years. Calibrated model with site-specific soil transect data.

For a military base in southern California, participated in evaluating the transport and fate of thallium in dust from a landfill. Key analyses included worst-case-scenario modeling of thallium concentrations in air and soil using a detailed history of excavation and landfill activities and soil data from multiple sources.

For a former smelter owner in Washington, participated in the reconstruction of historical releases and aerial deposition of lead from stack and building emissions, and fugitive dust from a secondary lead smelter in Seattle. Modeling was used to estimate soil lead concentrations attributable to the smelter. Key research identified process upsets that had been documented but not compiled during routine ambient monitoring by state and local air agencies.

#### *Polychlorinated Dibenzop-Dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)*

For a wood treatment site in Mississippi, participated in the evaluation of potential sources of dioxins and furans regarding a toxic tort claim. Evaluation compared offsite residential soil and house dust to onsite soils and stack emissions using multiple techniques, including congener profile comparisons, principal component analyses, regression analyses, and comparison of selected ion current profiles.

For a chemical manufacturer, served as project manager and participated in assessing potential sources of dioxins and furans near a former organic chemical manufacturing site in West Virginia. Evaluation also included analysis of the area-wide variability of dioxin and furan concentrations in residential soil and house dust.

#### *Hydrogeology/Fate and Transport*

For ChevronTexaco, participated in the evaluation of spilled oil and produced water related to oil exploration and production in the Sacha field in the Amazon basin region of Ecuador for a toxic tort claim. Analysis included timing of release, transport pathways, and environmental fate.

For a storage and distribution terminal in Michigan, participated in the evaluation of a groundwater treatment system. Analysis assessed the timing and volume of releases at the site and was used by the testifying expert from Exponent for allocation and apportionment of contamination and remediation costs.

For a mining company in Idaho, participated in the assessment of waters infiltrating into and draining out of underground mine workings. At the site, contaminated mine drainage was mixing with fresh waters downstream, thereby increasing the volume of water reaching the treatment facility. Analysis traced flow through underground workings to discharges above ground, enabling testifying expert to calculate volumes of actual mine discharge vs. the volume of water being treated.

For an electric utility in Washington, participated in the assessment of offsite operations and potential contaminant releases to groundwater near the site of a former manufactured gas plant (MGP), coal-fired power plant, iron foundry, wood treatment facility, and railroad terminal in

downtown Seattle. Analysis was used to assist testifying expert in evaluating the source of PAHs and appropriateness of remedial action at the site.

For a major chemical company, played a key role in preparing detailed histories of industrial sites in Lake Charles, Louisiana. Research consisted of developing profiles of individual sites, including inputs, processes, and outputs, with additional scrutiny on possible discharges to water. Evaluation also included analysis of possible undocumented contaminant outputs based on process chemistry.

Participated in the assessment of MTBE and other chemicals in groundwater and surface water in California. Analysis was used to determine the detection frequency and concentrations of contaminants using the California Water Quality Database, in order to analyze the potential risk to public health.

Served as team leader and geologist on field efforts involving groundwater and soil sampling, and installation of monitoring and pumping wells, at gas stations and industrial facilities in Alabama, Tennessee, and Washington.

#### *Spatial and Data Analysis*

For several mining companies, managed and participated in developing a computer-based tool for viewing user-defined site data. Tool was designed to accommodate research needs of attorneys preparing for litigation by integrating sample data, maps, photographs, and relevant documents for interactive viewing.

For a former facility owner in Massachusetts, evaluated PAH transport and fate in a river draining into Boston Harbor. The timing of contamination was constrained by reconstructing the dredging and filling history of the river using bathymetric surveys, dredging permits, and sampling reports.

For a transformer manufacturing plant in Georgia, coordinated the spatial analysis of polychlorinated biphenyl (PCB)-contaminated sediment in a stream system as part of a property damage litigation project. The analysis used tax records, existing reports, and geographic information systems (GIS) to evaluate the appropriateness of previous sampling events.

For the former owners of a zinc smelter in West Virginia, assisted in the evaluation of arsenic, cadmium, lead, and zinc in soils near the former facility. Variations in soil metals concentrations were evaluated at scales ranging from regional to individual residences from which potential sources were considered.

For a major home products company, assisted with design and preparation of automated data summarization for risk ranking analysis in preparation for REACH. Analysis included the evaluation of product, formula, and raw material information, in addition to manufacturing suppliers.