

Nai-chia Luke, PhD

Associate/Senior Human Health and Ecological Risk Assessor

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Dr. Luke has over 30 years of experience in directing, managing, and performing environmental projects with emphasis on ecological and human health risk assessments, vapor intrusion, and data quality. She has also provided senior technical direction and review of remedial investigation/feasibility studies (RI/FS), terrestrial ecology, analytical chemistry, and aquatic sciences, including aquatic toxicity testing. Recently, she has also been actively involved with nanomaterials and nanotechnology.

Her work has included ecological surveys, environmental impact statements, vapor intrusion/indoor air evaluations, baseline human health risk assessments, screening level and baseline ecological risk assessments, development of risk-based remediation goals, negotiation of cleanup goals with regulatory agencies, litigation support, and community planning and relations. Projects that she has performed are for a variety of programs including federal and state Superfund, RCRA, Brownfields, and state voluntary cleanup program. The contaminants evaluated include chlorinated solvents, pesticides, polychlorinated biphenyls (PCBs), dioxins/furans, metals, nitroaromatic explosives, and radiological contaminants. She has received numerous commendations from clients for high quality work completed under an expedited schedule and within budget.

Dr. Luke was actively involved in ecological risk assessment before EPA published guidance in 1997. She served as a member of American Society of Testing and Material (ASTM) E50.04.05 subcommittee to develop the *Guide for Risk-Based Corrective Action to Protect Ecological Resources*. She also chaired and organized several sessions at various professional conferences on the development of ecological risk assessment. In addition, she has contributed to natural resource damage assessment and environmental impact statements at sites in New Jersey, New York, Tennessee, Colorado, and California.

Dr. Luke has been an invited panel review member for USEPA's basic research on human health risk assessment and a peer reviewer for *Human & Ecological Risk Assessment, an International Journal* and *Environmental Toxicology and Chemistry, an International Journal*. In addition, she was an invited speaker at the Modern Engineering Technology Seminar, a high-level government sponsored environmental conference held in Taipei, Taiwan. In 2008, she organized and chaired a conference entitled *Nanotechnology: Identifying Hazards and Evaluating Risks*. In 2009, she was invited to be a grant reviewer for the Connecticut Sea Grant College Program by the University of Connecticut. The program intends to fund research aimed at fostering the sustainable use and conservation of coastal and marine resources for the benefit of the environment and current and future generations of area residents. The proposals she reviewed focused on the bioavailability of nanoparticles in aquatic organisms.

Dr. Luke has published and presented 40 papers on human health and ecological risk assessments, data quality, vapor intrusion, and nanotechnology. Since 2008, she serves a 3-year

team as a board member of Hudson-Delaware Chapter of Society of Environmental Toxicology and Chemistry.

Experience

Camp Dresser & McKee Inc., Edison, NJ – 2004 to Present. Toxicologist/Senior Risk Assessor. Directing and managing human health and ecological risk assessments, vapor intrusion, and data quality projects for the entire company. In addition, she serves as the lead of risk assessors for the entire company.

Groundwater and Environmental Services, Inc., Wall, NJ, 2002-2004. Responsible for marketing and business development for the commercial industrial and government business. Developed business development and marketing strategy, statement of qualifications, proposals, and marketing materials. Established risk assessment and data quality business units and conducted client presentations and sales meetings. Her technical expertise and marketing skills had brought in several projects and expanded the business line for the company.

IT Corporation, Somerset, NJ – 1990 to 2002 – Program Manager/National Practice leader for Risk Assessment. In addition to being the national practice leader for risk assessment for the entire company, she also directed and managed a group of 34 ecologists, risk assessors, and environmental scientists, providing services from environmental impact statements/environmental assessments, field avian, aquatic, mammal, and vegetation surveys, to air quality, and risk assessments. Under her direction, services also included aquatic toxicity laboratory.

ROUSSEL BIO Corporation, Lincoln Park, NJ – 1988 – 1990. Associate Director for environmental, toxicology, and regulatory affairs of a manufacturer of non-agricultural pesticide company. Managed regulatory affairs, conducted environmental fate and effect and animal testing programs, and prepared registration submissions to EPA, FDA and French regulatory agency. Designed and implemented first quality assurance unit which guaranteed compliance with good laboratory program (GLP) requirements of EPA, FDA and OECD.

American Cyanamid Company, Princeton, NJ – 1976 – 1988. Program Manager/Administrator, Toxicology. Responsible for coordinating all activities required to obtain registration of new pesticides and required re-registration of existing commercial products. Functions included were toxicology studies, environmental fate and effects, residue and metabolism studies, formulation, analytical chemistry, and field studies. Responsible for eighteen successful registration submissions for three herbicides and two insecticides involving eight major corps. In addition, planned and designed the testing program to secure approval for a product in China, incorporated knowledge of local customs; consequently, two products were approved and are currently being marketed. In addition, also managed toxicology and environmental fate and effect programs in support of obtaining registration from EPA, FDA and various international countries. Wrote protocols, negotiated contracts with outside laboratories, monitored and audited studies, inspected labs and reviewed GLP for EPA, FDA, and OECD compliance. Managed more than 100 projects per year and an annual \$4.5 million budget.

Examples of Projects

U.S. EPA Region 2: Hiteman Leather Superfund Site, NY. Conducted ecological reconnaissance at the site which was contaminated with chromium from former tannery operations. Completed and prepared a comprehensive baseline ecological risk assessment (BERA) which emphasizes an

evaluation of potential impacts to biota in a wetland on site and aquatic biota in an adjacent river. For the BERA crayfish, vegetation, earthworms, small mammals, and wetland and river sediments for toxicity testing were collected. Food chain modeling was completed to evaluate site-specific risks to several groups of ecological receptors (representing different levels of the food chain and different habitats at the site). The report was prepared and completed at an expedited schedule and under the budget. Furthermore only minimum and minor comments were received from EPA and the state agency. The BERA showed a potential for risk to receptors exposed to soil and wetland and river sediment from antimony, chromium, and hexavalent chromium. Information in the BERA was used to develop preliminary remedial goals for use in the FS.

In addition, she provided a technical review for the human health risk assessment for the site and developed risk-based cleanup levels for contaminated in soils that directly reflected the future users of the site. Worked with project geologists, hydrologists, and engineers to develop site-specific conditions and information (e.g., geology and land use) to determine the exposure parameters for recreational users such as ingestion rate, exposure time, exposure frequency, exposure duration, and body weight. Dr. Luke then calculated the specific target cleanup goals for each contaminant of concern for the site.

U.S. EPA Region 2: Mercury Refining Superfund Site, NY. Serve as task manager for the ecological risk assessment. The site has visible mercury in soil below pavement at this active facility and mercury contamination is also present in a creek that runs adjacent to the site. Completed the baseline ecological risk assessment (BERA) under an aggressive schedule. This BERA emphasizes an evaluation of potential impacts to biota in a stream adjacent to the site. Food chain modeling was prepared to evaluate site-specific risks to several groups of ecological receptors (representing different levels of the food chain and different habitats at the site). Again, this BERA was completed under the budget and received minimum and minor comments were received from EPA and the state agency.

U.S. EPA Region 6: Molycorp Questa Mine Site, New Mexico. Served as task manager for the Molycorp Mine Site Project after the client (EPA) expressed dissatisfaction with CDM's performance. This Superfund site consists of (1) a 3000-acre mine and mill, (2) a 2-square mile tailing facility located in adjacent alluvial valley, and (3) a 9-mile tailing pipeline connects the mine and tailing facility. Immediately adjacent to the southern site boundary is the Red River, a local cold-water fishery, that originates to the east of the mine site flowing west to the Rio Grande River to west of the site. CDM provides oversight of potential responsible party's (PRP's) RI/FS, but CDM performed a baseline health risk assessment and a baseline ecological risk assessment. The vast and complicate site setting and involvement of PRP, stackholders, and regulatory agencies present tremendous challenges to CDM. She orchestrated a team of ten including risk assessors, statisticians, data managers, and engineers from five offices to evaluate more than 600,000 data points using cutting-edge statistics (spatial analysis) and customized handling of censored (non-detect) data prior to EPA's release of ProUCL version 4. Due to the volume of data, automated work books were also developed. Both human health and ecological risk assessments were completed under an aggressive schedule. She was able to turn the project around within 10 minths, receiving EPA's highest rating (4 - outstanding) from previous "2". EPA commented "CDM risk assessment leader assigned to oversee the work was instrumental in CDM's improved performance" and "risk assessment activities was considered of very high quality and technically sound".

U.S. EPA Region 2: Montclair/West Orange and Glen Ridge Radium Sites, NJ. Conducted a vegetation survey at a residence prior to the initiation of remediation. Prepared an ecological reconnaissance report to the woods adjacent to the CDM's trailer compound, the report included a vegetation restoration plan for the trailer compound. In addition, also performed data quality evaluation of the analytical data.

U.S. EPA Region 2: Lawrence Aviation Industries Site, Port Jefferson, NY. Serves as senior technical reviewer for both human health and ecological risk assessments. The site is contaminated with metals, PCBs, and chlorinated VOCs. Indoor air concentrations using the Johnson and Ettinger model and site-specific soil characteristics were estimated. Human health risks associated with residential indoor air inhalation were evaluated. Incorporated site-specific information such as fate and transport, geology, hydrogeology, and used less conservative assumptions for the ecological risk assessment resulting in reduction of number of chemicals of potential concern from 30 or 50 to 2 which allows risk manager to focus on the real issues at the site. Both human health and ecological risk assessments received minor comments from the client and state agency.

Brookhaven National Laboratory, Upton, NY. Served as a Senior Technical Advisor for a \$15 million RI/FS in addition to directing risk assessments and data quality management tasks. The primary contaminants of concern at Operable Unit 5 included cesium, strontium, VOCs, and metals. Sediment was the most contaminated environmental medium. Risk assessments included chemical and radiological human health and ecological risk assessments. Developed a comprehensive data quality program, resulting in a cost saving of \$300,000. This data quality program was adopted by the client for other operable units. Ecological risk assessment was determined to be the driver for remediation efforts. Sediment toxicity tests (including chironomid growth test and reproduction test), AVS/SEM, bioaccumulation studies, and fish tissue analyses were conducted. Sediment cleanup levels that were two orders of magnitude higher than existing regulatory standards were negotiated with regulatory agencies, resulting in a significant reduction in cost (\$100 million) of the remediation. Received a highest quality award from the Management. Also received commendations from EPA and DOE for a high quality of RI reports. In addition, prepared Proposed Remedial Action Plan for OU 3.

Passaic River Flood Protection Project, U.S. Army Corps of Engineers (USACE), Kearny Point, NJ. Provided a senior review on preliminary risk screening analyses for 179 potential hazardous, toxic, and radiological waste (HTRW) sites. The objectives of the project were to evaluate the impact of groundwater and existing HTRW on design and construction of the flood protection tunnel and the impact of the project on HTRW and groundwater. The data assembled from record searches, field investigations, and groundwater model were evaluated for potential human health risks during and after construction of the project.

Brookhaven National Laboratory, Upton, NY. Managed a three-year basic ordering agreement contract for data validation. Parameters included chemical and radiological compounds and wet chemistry. Data usability was also performed for radiological chemicals in the site-wide groundwater. Environmental media included groundwater, sediment, surface water, surface and subsurface soil, and fish tissue. The \$450,000 contract was renewed for another three years.

Occidental Chemical Company, Niagara Falls, NY. Provided technical review of the Environmental Impact Statements (EIS) for an incinerator and a thermal destructive unit for the remediation of the Love Canal site and other Occidental Chemical company associated site. The

EIS was prepared according to the NYSDEC State Environmental Quality Review Act (SEQRA) guidelines. A state-of-the-art cumulative impact assessment was negotiated with the NYSDEC in response to new EPA guidance. Incorporating EPA guidance into existing NYSDEC SEQRA regulations was in an infantile stage at the onset of this project. The project team developed protocols that set precedence for NYSDEC policy. An expedited response to meet ACO deadlines results in a letter of commendation from the client.

Burlington Township Solid Waste Facility, Burlington County, NJ. Performed a human health and provided a senior review of environmental inventory and a medical program for the construction of a co-composting facility at this site as part of Environmental and Health Impact Statement. The environmental inventory included identification of development constraints on site such as wetlands, highly permeable soils, location of impermeable clays and historic resources. Also reviewed a comprehensive air quality analysis report for the proposed co-composting facility.

Hüls Company, Stony Point, NY. Managed human health and ecological risk assessments to support a RI/FS concerning groundwater contaminated via leaking underground storage tanks. A habitat assessment was also performed for the project received a commendation of excellence from the New York State Department of Environmental Conservation's Fish and Wildlife Division.

Petroleum Terminal, Bayonne, NJ. Served as a risk assessor for human health and assessed ecological risk at this facility. The major contaminants were petroleum and the surface and subsurface soil were the environmental concern. Successfully negotiated remediation cleanup levels with the New Jersey Department of Environmental Protection.

Insurance Client, Piscataway, NJ. Assessed the damage to the wildlife, vegetation, and aquatic organisms, and coordinated bird rescue effort for a rapid response to an oil spill which occurred in a river by a park.

Professional Activities/Memberships

American Standards of Testing and Materials
Society of Environmental Toxicology and Chemistry
Society of Quality Assurance
Society for Risk Analysis
Society of Toxicology

Publications and Presentations

Luke, N. 2009. *Nanotechnology: Current Status on Safety and Regulatory Issues*. Presented at the Hudson-Delaware Chapter of the Society of Environmental Toxicology and Chemistry annual spring conference, April 23-24, Bear Mountain, NY.

Julias, C. and N. Luke. 2009. *Inhalation Risk Assessment for Bike Riders*. Presented at the Hudson-Delaware Chapter of the Society of Environmental Toxicology and Chemistry annual spring conference, April 23-24, Bear Mountain, NY.

Kirchner, S. and N. Luke. 2009. Presented the short course entitled *Chemistry, Analysis, and Toxicity Equivalence of PCBs, Dioxins, and Furans*. Presented at the Hudson-Delaware Chapter

of the Society of Environmental Toxicology and Chemistry annual spring conference, April 23-24, Bear Mountain, NY.

Liu, C, D. Keil, and N. Luke. 2008. *Bioavailability Adjustment of Risk-Based Soil Cleanup Levels*. Presented at the Society of Toxicology national annual conference, March 16 – 20, Seattle, WA.

Marcum, T., C. Julias, and N. Luke. 2008. *Microbial Risk Assessment: Overview*. Presented at the Society for Risk Analysis national annual conference, December 7-10, Boston, MA.

Luke, N. 2008. *Nanotechnology and Nanotoxicology: Challenges*. Presented at the Society of Environmental Chemistry and Toxicology national annual conference, November 16-20, Tampa, Florida.

Liu, C. and N. Luke. 2008. *Utilization of Oral Bioavailability in Risk Assessment*. Presented at the Society of Environmental Chemistry and Toxicology national annual conference, November 16-20, Tampa, Florida.

Luke, N., C. Nace, D. Klerides, and S. Badalamenti. 2008. *Refinement of Chemicals of Potential Concern in Ecological Risk Assessment*. Presented at the Joint Services Environmental Management national conference, May 5-8, Denver, CO.

2008. Invited to chair a technical session at the Joint Services Environmental Services national conference, May 5-8, Denver, CO.

Liu S., D. Keil, and N. Luke. 2008. *Bioavailability Adjustment of Risk-Based Soil Cleanup Levels*. Presented at the Society of Toxicology national annual conference, March 16-21, Seattle, WA.

2008. Organized and chaired a technical symposium entitled *Nanotechnology: Identifying Hazards and Evaluating Risks*. Rutgers University, March 4, Piscataway, NJ.

Luke, N. and C. Julias. 2007. *Recent Regulatory Development on Evaluation of Non-Detects*. Presented at the Society of Toxicology and Environmental Chemistry annual national conference, November 11-15, Milwaukee, WI.

Luke, N. R. Luke, C. Julias, and J. Mayo. 2006. *Comparison of Statistical Methods in Evaluating Non-Detects in Risk Assessment*. Presented at the Society for Risk Analysis national annual conference. November 3-7. Baltimore, MD.

Luke, N. and S. Schofield. 2006. *Project Planning for Indoor Air Vapor Intrusion*. Presentation at Joint Services Environmental Management Conference and Exposition, March 20-23, Denver, CO.

Luke, N, G. Chen, M. Olsen, S. Kirchner, and J. Mayo, 2005. *Evaluation of Non-Detects in Risk Assessment*, presented at the Society for Risk Analysis national annual conference, December 4-7, Orlando, FL.

Luke, N. and J. Mayo, 2005. *Data Quality in Ecological Risk Assessment*, presented at the Hudson Valley Chapter, Society of Environmental Toxicology and Chemistry annual spring conference, April 28 and 29, New Brunswick, NJ.

Luke, N., 2000. *Ecological Risk Assessment in Risk Management Decision Making*, The Modern Engineering Technology Year 2000, Taiwan Environmental Protection (2000): 135-145.

Luke, N., L. Long, P. Amin, S. Muffler, and D. Boyadjian. 2000. *Health Risk Assessment for a Former Army Ammunitions Plant*, presented at the Society of Toxicology's 39th Annual Meeting, March 19-22, Philadelphia, PA.

Long, L. and N. Luke, 1999. *A Faster, Less Expensive Way to Estimate Human Health Risk*, presented at the Society for Risk Analysis national annual conference, December 5-8, 1999, Atlanta, GA.

Luke, N. and M. Watt, 1998. *Data Quality for Ecological Risk Assessment*, presented at the Society of Environmental Toxicology and Chemistry's 19th national annual conference, November 15-19, Charlotte, NC.

Costello-Walker, C., C. Menzie, M. Kangas, N. Luke, B. Suedel, M. Swindoll, A. Meyer, C. Montgomery, and R. Hull. 1998. *Comparative Analysis of Ecological Risk Assessment Guidance as Part of the ASTM Risk-Based Corrective Action Ecological Risk Assessment Standard*. Presented at the Society of Environmental Toxicology and Chemistry's 19th annual conference, November 15-19, Charlotte, NC.

Duh, D., W.H. Medeiros, M. Ali, M. Watt, and N. Luke. 1998 *Mercury Contaminated Sediments: Evaluation of Environmental and Human Health Risks*, presented at the Society of Environmental Toxicology and Chemistry's 19th annual conference, November 15-19, Charlotte, NC.

Luke, N., 1998. *Ecological Risk Assessment, Application of Ecological Risk Assessment to Air Pollution, and Ecological Effects of Air Pollution*, Session Chair for three sessions, Air and Waste Management Association's 91st annual conference, June 14-18, San Diego, CA.

Meyers-Schone, L. and N. Luke. 1998. *The Ecological Risk Assessment Process: An Overview*, presented at the Air and Waste Management Association's 91st annual conference, June 14-18, San Diego, CA.

Duh, D. and N. Luke. 1998. *Focusing an Ecological Risk Assessment on the Real Concerns*," presented at the Air and Waste Management Association's 91st annual conference, June 14-18, San Diego, CA.

Luke, N. and M. Watt, 1998. *Critical Issues and Importance of Data Quality Management for Risk Assessment of a Remedial Investigation and Feasibility Study*, presented at the Society of Toxicology's 37th annual conference, March 1, Seattle, WA.

Luke, N., 1998. *Principles in Ecological Risk Assessment*, Trends in Risk and Remediation (1998).

Luke, N., 1997. *An Overview of Methodology and Approaches for Conducting Ecological Risk Assessment in the United States*, presented at the 1997 International Chinese Sustainable Development Conference, July 5, 1997, Los Angeles, CA.

Luke, N., C. I and S. Lin. 1997. *Environmental Issues from Taiwan*, presented at the Society of Environmental Toxicology and Chemistry's 18th Annual Meeting, November 16-20, 1997, San Francisco, California

Luke, N. 1997. Session Chair for *Ecological Aspects of Risk-Based Corrective Action* at the Air & Waste Management Association's 90 Annual Meeting, June 9-13, 1997, Toronto, Canada

Luke, N., R.S. Prann, B. L. Roberts and M. Watt. 1996. *Role of the Toxicologist in Project Management of a Remedial Investigation and Feasibility Study*. Presented at the Society of Toxicology, 35th Annual Meeting, March 10 -14, 1996, Anaheim, California

Prann, R.S., B.L. Roberts, D. Duh, D. Boyadjian and N. Luke. 1996, *Comparison of Human Health and Ecologically-based Remediation Goals for Nitroaromatic Explosives in Soil*. Presented at the Society of Toxicology, 35th Annual Meeting, March 10-14, 1996, Anaheim, California

Roberts, B.L., R.S. Prann and N. Luke. 1996. *Advantages of Dermal Exposure Assessment for Characterizing Occupational Risks to Soil and Water Contaminants*, presented at the Society of Toxicology, 35th Annual Meeting, March 10-14, 1996, Anaheim, California

Roberts, B.L., C.I., R.S. Prann, M. Watt and N. Luke. 1995, *Human Health Risk Assessment of the Sealand Restoration Inc., Superfund*. Presented at the Society of Toxicology, 34th Annual Meeting, February 5-9, 1995, Baltimore, Maryland

Prann, R.S., J. Tasca, A.R. Schnitz, M. Watt, C. Pfrommer and N. Luke. 1995. *Maximum Exposure Individual Screening Procedure for Multiple Emission Sources*, presented at the Society of Toxicology, 34th Annual Meeting, February 5-9, 1995, Baltimore, MD.

Schnitz, A.R., M.D. Hartmann, R.S. Prann, J.J. Tasca, P.J. Wang and N. Luke. 1992. *The Mattiace Petroleum Chemical Site. Superfund Site: A Human Health Risk Assessment Case Study*. *The Toxicologist*, page 355.

Luke, N., and G.B. Kinoshita. 1984, *Weed Control with AC 222,293 in Cereals*, *Weed Science Society of America*, page 102.

Kirkland, K., N. Luke and G.B. Kinoshita. 1983. *A new postemergence herbicide for cereals. Field Studies*. *Weed Science Society of America*, page 17.

Kneeshaw, P.G., G.B. Kinoshita and N. Luke. 1983. *Weed control in cereals with AC 222,293: Canadian Results*. *North Central Weed Control Conference Proceedings*, Vol. 38:76.

Busse, S.R., P.G. Kneeshaw and N. Luke. 1982. *Weed control in cereals with AC 222,293: U.S.* *North Central Weed Control Conference Proceedings*, Vol. 37:18.

Luke, N., and P. Eck. 1978. *Endogenous Gibberellin-like Activity in Cranberry at Different Stages of Development as Influenced by Nitrogen and Daminozide*. *J. Amer. Soc. Hort. Sci.* 103(2):250-252.

Luke, N., C. Chin and P. Eck. 1977. *Dialysis Extraction of Gibberellin-like Substances from Cranberry Tissue*. *Hort Science* 12:245-246.