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Christopher M. Long, Sc.D., DABT

Principal

Dr. Long is an expert in the areas of exposure assessment and human health risk assessment, with particular expertise in indoor and outdoor air quality, inhalation toxicology, air monitoring, exposure modeling, and electric and magnetic fields (EMFs). He has assessed exposures and health risks associated with airborne particulates, such as diesel exhaust particulates, carbon black, coal ash, ambient sulfates and nitrates, asbestos, ambient ultrafines, engineered nanoparticles, metals (*e.g.*, hexavalent chromium, lead, arsenic), and bioaerosols, as well as with many gaseous criteria and hazardous air pollutants. Dr. Long directs Gradient's EMF services and has conducted numerous EMF assessments in support of permitting for proposed overhead and underground transmission line projects, electrical substation projects, electrical generation facility projects, and renewable energy projects (*e.g.*, offshore wind, solar, battery storage). His practice area also includes evaluating product safety, with specific expertise in airborne exposures. He is a board-certified toxicologist (DABT). Dr. Long has published more than 30 journal articles and book chapters in the areas of indoor and outdoor air pollution and exposure assessment. He is a member of the International Society of Exposure Science, the Air and Waste Management Association, and the American Chemical Society.

Areas of Expertise

- Inhalation Toxicology
- Human Health Risk Assessment
- Exposure Assessment
- Indoor/Outdoor Air Quality
- Electric & Magnetic Fields (EMFs)

Services

- Toxicology & Risk Sciences
- Exposure & Risk Assessment
- Occupational Health & Safety
- Air Quality Sciences
- Renewables
- Climate Change
- Environmental Justice

Education

- Sc.D., Environmental Health, Harvard School of Public Health
- M.S., Environmental Engineering, Massachusetts Institute of Technology
- A.B., Chemistry and Environmental Studies, Bowdoin College
- Diplomate, American Board of Toxicology

Selected Projects

Indoor Air and Cancer Cluster Evaluation: Conducted a comprehensive indoor air evaluation for an office, sampling for volatile organic compounds (VOCs), particulate matter (PM), and other air pollutants. Evaluated the incidence of cancer among current and past employees and developed public communication materials.

Analysis of Air Quality Data and Public Health Studies: Prepared a report providing an overview of the current science bearing on the potential community-level air quality impacts and public health risks associated with natural gas development activities in the Marcellus Shale region. Served as public health expert at local municipal hearings.

Transmission Line and Substation Electric and Magnetic Field (EMF) Assessments: Conducted modeling analyses of the EMF impacts of a variety of transmission line and substation projects involving both overhead and underground lines. Performed magnetic field monitoring studies. Served as EMF expert at regulatory hearings, open houses, and public meetings.

Offshore Wind Power Projects: To support the permitting of multiple offshore wind power projects, modeled EMF for both submarine and onshore export cables connecting the wind turbine generator arrays to the electrical grid system. Conducted EMF effects characterization for marine species and human health. Prepared reports for permitting filings and testified at regulatory hearings.

Inhalation Toxicity Assessment: Assessed relationship between occupational exposures to diesel engine exhaust and other substances (*e.g.*, creosote, silica dust, asbestos) and cancer risk among former railroad workers.

Selected Publications

Long, CM; Briggs, NL; Cochran, BA; Mims, DM. 2021. "Health-based evaluation of ambient air measurements of $PM_{2.5}$ and volatile organic compounds near a Marcellus shale unconventional natural gas well pad site and a school campus." *J. Expo. Sci. Environ. Epidemiol.* doi: 10.1038/s41370-021-00298-5.

Boomhower, SR; **Long, CM;** Li, W; Manidis, TD; Bhatia, A; Goodman, JE. 2021. "A review and analysis of personal and ambient $PM_{2.5}$ measurements: Implications for epidemiology studies." *Environ. Res.* 204(Pt B):112019. doi: 10.1016/j.envres.2021.112019.

Long, CM; Briggs, NL; Bamgbose, IA. 2019. "Synthesis and health-based evaluation of ambient air monitoring data for the Marcellus Shale region." *J. Air Waste Manag. Assoc.* 69(5):527-547. doi: 10.1080/10962247.2019.1572551.

Long, CM; Valberg, PA. 2018. "Low frequency magnetic fields: Potential environmental health impacts." In *Encyclopedia of Environmental Health*, 2nd Edition, Vol. 3. (Ed.: Nriagu, JO), Elsevier, Burlington.