

Gasoline Forensics: Source Identification for Low Level Groundwater Contamination

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Groundwater standards for use under Part XV.1 of the Environmental Protection Act, administered by the Ontario government, stipulate the maximum levels of total petroleum hydrocarbons (F1 -F4) allowed to meet generic site condition standards. Nine (9) Tables based on various generic site conditions are provided which may be applied to a Site depending on the drift thickness, proximity to surface water bodies, soil texture, and water usage with the surrounding area (potable or non-potable). Depending upon which Table is applicable to a subject Site, F1 concentrations between 420 – 750 ug/L and F2 concentrations of 150 ug/L in groundwater are posted as the criteria. Exceedance of either of these values generally requires further delineation followed by remediation or risk assessment. These low levels provide analytical challenges in determining sources of gasoline ($n-C_4 - n-C_{12}$). This is particularly true in urban settings where multiple sources of gasoline may exist. Source delineation is critical in determining the source and assigning liability for remediation. Several analytical methods have been postulated for the forensic identification of low levels of gasoline found in groundwater. These will be discussed; however, they have been considered non-satisfactory considering a possible litigation outcome. We present a method using large volume groundwater sample collection (>4L), followed by ethylene tetrafluoroethylene (ETFE) net extraction and passive headspace analysis for determining sources of gasoline. All analyses are performed using gas chromatography/scanning mass spectrometry.

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Dr. Birkholz has over forty years of practical experience in analytical chemistry, research, environmental and human toxicology, and business. Major industrial clients, include: transportation, oil and gas, petrochemical, mining, waste management, and pulp and paper. He has proven a valuable resource to industry, governments, consultants, educational institutions, health care professionals, and the legal profession; offering expertise in sampling, chemical analyses, data interpretation, toxicology, industrial problem solving, and forensic analyses. Dr. Birkholz is currently an adjunct professor with the University of Alberta in Edmonton (Faculty of Pharmacy and Pharmaceutical Sciences). He has given numerous oral presentations at national and international conferences and has over 37 publications and is currently a member of the oil spill identification network of experts within the Bonn Agreement (Bonn-OSINET).