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PFAS in Ground Water - What Is It? How Bad Is It?

By Charles Rich

Per- and polyfluoroalkyl substances (PFAS) are a unique class of 'emerging' drinking water contaminants that have been found to widely occur in groundwater, streams, and lakes. They are a family of synthetic compounds containing thousands of chemicals formed from carbon chains with fluorine attached to these chains. This "carbon-fluorine" bond is the strongest chemical bond in nature. PFAS compounds are chemically stable and persistent and do not hydrolyze, photolyze, or biodegrade.

These chemical compounds have a wide range of industrial uses and commercial product applications and are found in many, many, consumer products. Due to their high solubilities and toxicological characteristics, PFAS compounds have fast become the focus of environmental agencies and breaking-news headlines, causing a heightened health concern from the public-at-large, and especially within residential areas.

EPA has issued (May 2015) a 'lifetime health advisory' for drinking water for perfluroroctane sulfonate (PFOS) and perfluorocotanioic acid (PFOA) at orders-of-magnitude lower than those set for other groundwater contaminants: 0.07 micrograms per liter (ug/L) or 70 ng/L (ppt). Only a few years earlier, EPA's guidance

level for PFAS was slightly less stringent at 400 ppt, then 200 ppt -- indicating the growing seriousness of this issue. As of this writing, still only twelve States have some sort of water 'standard' for specific PFAS compounds at the State level - having either drinking water and/or groundwater limitation standards, health advisories, or a guidance level. And although there are not yet any Maximum Contaminant Levels (MCLs) for 'emerging contaminants' here in New York, we do expect some compound-specific MCLs to be issued within the immediate future (Ed. Note: W. Ottaway, NYSDEC).

PFAS groundwater and soil contamination occurs through the utilization of aqueous film forming foams such as fire-fighting (to suppress gasoline fires) and/or at fire-training facilities; at airports and petroleum storage terminals; from metal plating & finishing process-

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Remedial Action for a Real Estate Transaction

By Richard Izzo

CA RICH recently completed a cleanup at a dry cleaning establishment located in a shopping center owned by our Client here on Long Island. The cleanup involved a bit of sleuthing as well as coordination between the Owner, the County Health Department, a lender and a prospective buyer.

The prospective buyer commissioned a Phase I and Phase II Assessment of the Property which turned up some low levels of groundwater contamination and high levels of sub-slab soil vapor impacted by dry cleaning-related solvents (Perchloroethylene and Trichloroethylene, or PCE and TCE) beneath the dry cleaner. This was a bit of a surprise because the dry

cleaner had switched over to "wet cleaning" methods a few years earlier and, as such, had not used the solvents detected in the sub-slab vapor in some time.

The buyer requested that the owner address the problem before moving forward with the purchase, and thus the purchase was delayed

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causing some financing issues for the owner who had to secure additional funds. Consequently, a third party lender became involved in the scope and cost for the cleanup.

The Owner hired CA RICH to conduct a thorough investigation under the auspices of the County Health Department. Our ensuing investigation included soil, groundwater and sub-slab vapor testing as well as inspection and testing of all of the on-site storm drains and septic leaching pools.

The investigation resulted in the confirmation of elevated levels of PCE and TCE in sub-slab vapor beneath the dry cleaner, but very little in the way of groundwater impacts and virtually clean soils beneath the dry cleaner floor. However, elevated levels of PCE and TCE were detected in sediments from a storm drain and leaching pool adjacent to the dry cleaner – an indication that these contaminated structures were the source of the vapors beneath the dry cleaner floor.

CA RICH remediated the two drainage structures impacted by solvents and a handful more containing parking lot runoff-related contaminants. End point sampling confirmed contaminant concentrations in all remaining sediments to be below County cleanup guidelines.

The removal of impacted sediments from the two drainage structures left only the issue of the residual sub-slab vapors, and the County Health Department required that a sub-slab depressurization (SSD) system be installed to protect the indoor air quality within the dry cleaner and an adjacent commercial office space.

In the meantime, the lender required CA RICH to provide a detailed cost estimate for system design, installation and start-up and required the owner to place twice the estimated amount in escrow as a condition for providing financing. The escrow funds were then used to pay for system design, installation and start-up. In addition, the prospective buyer and their consultant required a detailed estimate of costs and timing for the system from start-up through decommissioning including operations, maintenance, testing and energy consumption.

CA RICH performed a pilot test including the installation of three suction-pit-type vents through the floor slab within the dry cleaner along with six temporary vacuum monitoring points. The vents were then individually and collectively activated using a Fantech "radon" fan and also a 2.5 hp regenerative blower to determine the amount of vacuum necessary to achieve the minimum vacuum required by the County at each monitoring point. The system was then designed using the data from the pilot test and a work plan was submitted to the County for review and approval.

Following receipt of approval from the County, the three SSD vents were manifolded together and piped to a 2.5 hp blower located in a small shed behind the dry cleaner. Exhaust from the blower was conveyed to a stack extending several feet above the roof of the building.

System design/installation included completion of an Air Quality Impact Assessment (AQIA) and registration of the system with the New York State Department of Environmental Conservation (NYSDEC) Region 1 Division of Air. Based upon the results of the AQIA, no pretreatment of the air effluent was deemed necessary.

As of the date of this writing, the system is currently up and running, required reporting including a Final Engineering Report and Site Management Plan (detailing operation & maintenance and termination criteria) has been submitted and a conditional "no further action" letter is pending from the County Health Department, which will allow the sale of the Property to proceed.

(PFAS… Continued from page 1)

es, electronics, where there is the land application or disposal of municipal biosolids; in effluent from sewage treatment plants; and within landfill leachate emanating from landfills receiving wastes as early as the 1950s.

Numerous raw materials and consumer products contain PFAS but many of these products do not necessarily indicate this on their product packaging. Examples of consumer products containing PFAS include toothpaste, dental floss, shampoos, post-it notepads, cleaning supplies, aluminum foil, etc. PFAS has also been measured in indoor dust because of its use in carpets, textiles, paint, upholstered furniture, stain/water repellants on clothing and in bedding materials, etc. Further information relative to industries utilizing PFAS is available at: https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management and at: www.fluorocouncil.com.

Biomonitoring studies estimate that >95% of us (U.S. population) have been exposed to PFAS and that we now have measurable concentrations of it in our blood. Of this disturbing finding, the largest portion of chronic human intake is likely from the direct or indirect ingestion of PFAS-contaminated foods and drinking water. Both PFOA & PFOS are linked to a multiplicity of adverse impacts such as hepatitis toxicity, reproductive & developmental toxicity, suppression of the human immune system, and some types of cancer. But on a more positive note, studies have shown only a very limited absorption of PFAS through the skin - so it appears that any routine exposures during showering, bathing, or swimming (pools) or wading, won't cause significant exposure to PFAS. However, importantly, as you read this, there is no global consensus on what the safe level of PFAS in soil or water should be.

Moreover, as environmental consultants, we don't have any commercially-available field screening methodologies that can consistently detect PFAS in water at levels less than 50 ppb, despite the fact that because of its widespread occurrence, agencies are now interested in PFAS at the difficult-to-detect lower parts per trillion level. EPA Method 537 is the PFAS chemical analytical method of choice (liquid chromatography/mass spectroscopy), and currently its the only 'regulated' analytical test method for PFAS. Sample analyses are slightly more expensive than for VOCs or SVOCs, and typical sample lab turnaround times can range from two to up to six weeks pending sample matrix, specified analytes, number of samples, QA/QC, etc.

To make matters even more challenging for environmental consultants interpreting the effects of PFAS in groundwater, there are a wide range of products commonly utilized during performance of standard remedial site investigations at Federal & State Superfund sites now known or suspected to possibly contain PFAS. For example, field materials to avoid during PFAS groundwater sampling and analysis include Teflon, Tyvek, Gore-Tex, waterproof markers, certain packaging, glass bottles, fluoropolymer tubing, chemical

blue ice packs, adhesives, aluminum foil, cosmetics, sunscreens, and insect repellants to name just a few. These materials if present, may cross-contaminate and interfere with sample integrity increasing the chance for resultant unintentional sample bias. Experienced groundwater consultants will want to emphasize the importance of stringent quality control procedures and protocols during diligent PFAS sampling to achieve reliable and reproducible water quality results.

Once PFAS contamination of soil and/or groundwater is accurately identified, mapped and understood, the problem becomes how to clean it up? Certain long-chain PFAS compounds are not effectively treated by conventional remediation technologies, or routine processing of sewage through municipal wastewater treatment plants. And many remedial methods used to treat hydrocarbon contamination threatening a municipal public supply well field, such as air stripping, air sparging, soil vapor extraction, and/or bioremediation, are found to be largely ineffective for removal of PFAS. Treatment technologies that are being employed with varying degrees of success include incineration; excavation and transport of PFAS-impacted soils or fill materials to a lined landfill; soil washing; soil solidification; and with respect to ground water: pumped well withdrawals within a PFAS plume with adsorption onto activated carbon or resins.

Given this recent awareness, we now recognize that our widespread use of PFAS in common consumer products, much like the discovery of PCBs in Arctic ice caps back in the 1970s, has sadly led to global exposure. Looking ahead, further understanding is needed related to health and environmental risk, and certainly for sensible risk management strategies. However, it is comforting to know that as of 2002, production of these chemicals has been largely discontinued.

What's new at CA RICH

Firm President, **Charles Rich** continues his work with Engineers Without Borders (EWB) as Hydrogeologist / Mentor to assist the EWB University of Delaware (EWB-UD) Travel Team and locals with water resource exploration and development desperately needed to provide potable water to southern Malawi, Africa. Charlie heads back to Africa in August to continue this important humanitarian work.

Vice President, **Richard Izzo** is completing two groundwater supply feasibility studies in Westchester and Dutchess Counties including hydrologic budgets and recommendations for exploratory drilling.

Senior Project Manager, **Jason Cooper** has just completed and submitted a NY State Brownfield Cleanup program (BCP) Application for a redevelopment-related cleanup in Far Rockaway, while Project Manager, **Tom Brown** is just starting one for a redevelopment in the Bronx.

Project Scientist, **Jessica Proscia,** is managing an on-going BCP cleanup in the Bronx including removal of fill materials containing hazardous levels of lead.

CA RICH would like to welcome two new key additions to our professional staff: Project Scientist, **David Klein** and Staff Scientist, **Sara George.** Both come with experience at other professional firms and are hitting the ground running assisting us with investigations and remedial action at several Sites in the NY metropolitan area. Welcome aboard David and Sara!

The firm extends our best wishes to **Ms. Stella Marzot** who is retiring after 20+ years of loyal and appreciated service here at CA RICH.

For more information about CA RICH or the ENVIRONMENTAL BULLETIN, please call (516) 576-8844 or write to:

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CA RICH CONSULTANTS, INC.

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The Company provides environmental consulting; Phase I & II Assessments; Compliance audits; Investigation; Remediation; Groundwater resource management; Storage tank, indoor air quality & hazardous waste management; Soil vapor intrusion mitigation; Brownfield redevelopment; Property acquisition; Sustainability, Expert testimony; Strategic thinking & dispute resolution; and all other professional services related to evolving regulations and client needs.

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