PO Box 422 ■ Tamworth, NH 03886-0422
www.nebiosolids.org

nebra
North East Biosolids & Residuals Association
Cooperatively promoting the environmentally sound recycling of biosolids and other residuals

phone 603-323-7654
fax 603-323-7666
info@nebiosolids.org

Fact Sheet & Talking Points – Perfluorinated Substances in Biosolids

v.2 March 30, 2017

Having followed the development of public and environmental regulatory concerns regarding PFOA, PFOS, and other perfluorinated alkyl substances (PFASs) in New England and New York in 2016, NEBRA and the region's biosolids professionals are taking proactive measures to:

1. *Learn more about these ubiquitous chemicals;*
2. *Further assess their presence, fate, & potential impacts through biosolids applications to soils;*
3. *Determine what, if any, additional information is needed;*
4. *If necessary, develop a research program to address these needs; and*
5. *As necessary, identify and take practical steps that can help reduce any potential risks, even as further evaluation proceeds.*

Background

- ***Biosolids recycling to soils is a common, environmentally beneficial practice.*** Biosolids have been widely used on farms and other lands across North America for decades. Sixty percent (60%) of U. S. wastewater solids are applied to soils, enhancing soil health, recycling nutrients, sequestering carbon, and providing a productive use for a material that every community has to manage. (Wastewater treatment is a vital public service, and it creates solids that have to be managed.) Seattle, San Francisco, Los Angeles, Denver, Chicago, Boston, and hundreds of similar and smaller communities recycle their biosolids to soils. Most major land grant universities have studied biosolids use on soils and accept the practice, finding little risk when used according to regulations. Every U. S. state and Canadian province allows biosolids use on soils. U. S. EPA, USDA, and U. S. FDA all support biosolids recycling. Thousands of research publications over 45+ years and two major reviews by the National Academy of Sciences have found biosolids use on soils presents "negligible risk."
- ***Biosolids reflect what is in our daily lives.*** PFASs are in biosolids because they pass through people and are in our homes & businesses, throughout our built environment. The chemistry of biosolids is a reflection of the chemistry of our daily lives.
- ***A family of common chemicals:*** Perfluorinated alkyl substances (PFAS) are commonly used synthetic chemicals that are unusually persistent in the environment and have been found in trace concentrations around the globe, in all kinds of media and biota.
- ***Human exposure is mostly through the interior environments in which we live,*** where carpets, furniture, household dust and air, cooking tools, outdoor clothing, fire-fighting foams, and other products cause exposure. Most humans tested have some of these chemicals in their blood (PFOA and PFOS in particular), in low parts per billion (ppb), because of regular exposure in the environments of modern life. Drinking PFAS-contaminated water is another major route of exposure.

- ***High enough exposures seem to have health impacts:*** Considerable research has demonstrated several health impacts in some animals, but not in others. Epidemiological studies of exposed human populations have found correlations between levels of PFASs in humans and several illnesses or disorders. However, researchers caution that causality is difficult to prove. Nonetheless, the evidence is enough that some researchers and regulatory agencies have been urging reduced use of these chemicals, especially those that are most persistent in the environment.
- ***Persistence is the core environmental concern with some PFASs:*** The more persistent compounds are some of the longer-chain members of this family of chemicals, such as PFOA (C8, because it is an 8-carbon chain) and PFOS. These two are the most studied.
- ***The highest level of concern is a legacy issue:*** PFOA and PFOS have been phased out, with some replaced by less persistent, shorter-chain PFASs (e.g. C6) that do not degrade to PFOA (C8). Therefore, this is somewhat a legacy issue today, and will be more so as time goes by. Levels of PFOA and PFOS have started to decline in various media including in human blood, and that trend is expected to continue, although only slowly through dispersal, dilution, and gradual degradation (the half-life in soils appears to average about 4 years). It is possible that landfills and certain other places may continue to leach older PFASs for some time.
- ***Current public and media attention is caused by drinking water impacts around industrial sites***. In this region, today's publicized concerns about PFASs are driven by findings in 2015-2016 of drinking water contaminated with elevated PFOA & PFOS near chemical factories (Hoosick Falls, NY; Bennington, VT; Merrimack, NH) and other sites (Pease Intl. Tradeport, NH) and states' efforts to mitigate human exposure to contaminated drinking water by providing alternative water sources to affected homes and businesses. State regulatory agencies are now evaluating other potential sources or sinks of PFASs.
- ***The core concern being expressed by regulatory officials regarding biosolids applications to soils is about leaching of PFAS to groundwater.*** See "core concern," below. There is widespread consensus that other possible human exposures and environmental impacts from biosolids – such as by inhalation, direct ingestion, or dermal exposure – present no significant risk, especially compared to other sources of exposure.
- ***The current drinking water advisory levels for PFOA and PFOS (e.g. EPA's 70 ppt) are very conservative*** and, when adopted, were exceeded by numerous drinking water systems. There are many common activities and factors that can contribute PFOA and PFOS in the tiny amounts needed to create exceedances of these very low advisory levels. For example, some sites where a fire has been fought with significant volumes of fight-fighting foams likely have groundwater below it that approaches or exceeds the advisory level for PFOS. Groundwater levels of PFAS are elevated beneath schools that have carefully washed their floors daily and discharge the washwater to septic systems.
- ***The potential risk of biosolids-borne PFAS impacts on groundwater is influenced by many factors***, including soil type, soil chemistry, organic matter content, climate, weather patterns, landscape factors, and more. More research is needed.
- ***Other organic residuals, such as food waste composts, contain PFASs and may also present similar risks***. Some cookware, food wrappers, microwave popcorn bags, other paper and cardboard products have PFAS coatings that impact such composts. However, as noted above, today's PFAS use does not include PFOA and PFOS.

What is the core concern?

The core concern is whether or not a biosolids product with typical, average levels of PFASs could, when land applied at typical rates, result in enough leaching of PFAS to (shallow) groundwater such that the level in the groundwater would exceed current health advisory levels for drinking water (e.g. EPA's 70 ppt for combined PFOA and PFOS). Biosolids and residuals use is just one of many areas of interest being looked at by groundwater and PFAS regulators at state regulatory agencies. They are also looking at landfills, industrial sites, air bases and other places where firefighting foams were used, and more in order to identify and, if necessary, address other potential sources of PFASs that could possibly affect drinking water quality.

Biosolids and other water quality professionals are collaborating with regulatory authorities in evaluating biosolids and other residuals and their application to soils in relation to PFASs. There is some published research on the topic already. Studies have found PFOA and PFOS in some biosolids, recycle paper mill residuals, and biosolids composts in the range of a few ppb to tens of ppb (average of 34 ppb in municipal biosolids per Venkatasen & Halden, 2013). Kitchen waste/yard waste composts have showed levels of total PFASs in the ~6 ppb range (Brandli, 2006). Some off-the-shelf commercial soil products show similar levels of PFAS. In the 2000s, there were a couple of sites in the U. S. where biosolids from wastewater treatment facilities receiving discharge from factories manufacturing PFASs had higher levels of PFASs, and repeated use of these biosolids led to elevated levels of some PFASs in groundwater. More research regarding typical, modern biosolids applications is needed. Older sites are no longer representative of today's reduced use of PFOA and PFOS.

What can biosolids managers do?

- ***Consider testing biosolids and residuals products for PFOA and PFOS*** so as to allow comparisons to typical biosolids and other residuals. However, before doing so, spend time designing a careful sampling program and determine, in advance, how the resulting data will be managed and reported, to be sure they are not misunderstood and are presented with appropriate context. Be sure to follow agreed-upon sampling and testing protocols and use reputable labs experienced with testing for these chemicals. NEBRA is working with state regulators to develop consensus on sampling and testing protocols and methods. Consider sending split samples and field blanks to different labs for quality assurance. Consider sharing results with NEBRA. NEBRA is compiling data for the region, without attribution, so no source of any particular data will be publicized.
- ***Consider testing of soils and groundwater around biosolids utilization sites.*** However, do so only in accordance with the cautions noted in the first bullet, above.
- ***Evaluate potential sources of PFASs in wastewater influent; sample and test.*** For example, landfill leachate may be a significant source and should be tested. Consider cutting off any sources that contribute elevated levels of PFASs; this is an easy way to reduce potential risk in the short term.
- ***Calculate cumulative application rates to determine potential soil levels.*** The very limited literature on leaching potential has suggested that, based on the most conservative assumptions, minimal risk is likely if the concentration of PFOA or PFOS in soil is no greater than 3 ppb. However, other modeling suggests a reasonable maximum acceptable level may

be as high as 140 ppb in soil. More research is needed, but this range of soil concentration values can serve as initial guidance for now.

- ***Apply all biosolids and residuals in accordance with the agronomic rate.*** This limits the total mass of any trace contaminant applied on any one site. Lower application rates and lower concentrations of PFASs in biosolids and residuals products present lower potential risk.
- ***Support research.*** NEBRA is working with others to develop a timely research response to address core concerns. This may begin with a workshop to assess the state of knowledge and refine the research goals. Questions to be addressed include:
    - There is conflicting information on how to test most accurately for these compounds. Method validation and standardization is needed (see first two bullets, above).
    - What factors affect leaching through soil? – type of soil, pH, organic matter, climate regime, soil texture, evapotranspiration, K_{oc} of each specific PFAS, etc.
    - Several different leaching models are being hastily applied by state regulators to assess potential groundwater impacts, and these models yield vastly different results, have not been validated, and may not be appropriate for assessing the potential leaching risk of PFASs.
    - Ultimately, field studies may be needed to confirm assumptions used in models and demonstrate whether or not there are potential any signficant impacts of typical biosolids applications on groundwater concentrations of PFAS.
    - Modeling and field studies can provide information for adjusting guidance regarding acceptable concentrations of PFAS in biosolids, setbacks, application rates, etc.
- ***Support efforts to reduce the use of PFASs, at least the longer-chain versions.*** Widespread use of any highly persistent chemical, such as PFOA, is a threat to biosolids quality and should be discouraged.
- ***Communicate with regulatory agencies.*** Every state in the U. S. accepts the use of biosolids products, recognizing their environmental value. Watch closely for state actions regarding regulatory standards for PFAS in drinking water. The U. S. EPA standard is a *health advisory* – not an enforcement standard. Advisories allow greater flexibility, and some states have already created technically impossible regulatory situations by adopting the same or lower PFAS concentrations in groundwater (not just drinking water) as enforceable standards. Because of how ubiquitous PFOA and PFOS are, Vermont's 20 ppt standard is likely exceeded in numerous groundwaters around the state, making enforcement impossible. In comparison, Australia recently confirmed drinking water quality *guidelines* of 5 pp*billion* and 0.5 pp*billion* for PFOA and PFOS + PFHxS, respectively. States should be advised to avoid adoption of the current U. S. EPA health advisory as an enforceable standard. There is *no consensus* on the level of potential risk to public health. These chemicals are ubiquitous, and enforcement of very low regulatory standards is likely unrealistic. It is drinking water and groundwater quality concerns that are driving concerns about application to soils of biosolids and other residuals.

Overreaction to PFAS concerns could result in reductions in the beneficial uses of biosolids and residuals, just when more efforts are being made to divert organics from landfills. The environmental, social, and economic benefits of recycling biosolids are large and significant.

See additional background information in NEBRA's Information Update; download it here: https://www.nebiosolids.org/resources/#/microconstituents/ *References and citations available upon request.*