PFAS - A BASIC REVIEW

Due to the widespread use of PFAS and resulting releases, a broad range of these substances have been detected in the environment, wildlife, and humans. The widespread detection of PFAS coupled with its toxicological concerns have heightened concern resulting in a rapidly evolving PFAS regulatory landscape. This landscape poses potential liabilities for businesses such as industrial sites, water supply companies and landfills to name a few. The real issue is how PFAS will be regulated and what are the potential liabilities and expected impacts. This paper reviews the PFAS issues, their historical uses, potential impacts on users, and discusses what businesses can expect with this ever evolving concern.

WHAT ARE PFAS?

In summary, per- and polyfluoroalkyl substances (commonly called PFAS) are a large family of complex, man-made chemicals (close to 5,000). First synthesized in the laboratory in 1938, PFAS chemicals were easily modified to produce new compounds with certain desired properties. PFAS's chemical and thermal stability, in addition to its hydrophobic and lipophobic nature made them useful in countless commercial and industrial applications, resulting in the production of thousands of PFAS compounds and widespread use. For example, various species of PFAS added in trace amounts to products will reduce surface tension, make materials heat-resistant, reduce friction, etc. The very properties that made these chemicals an industrial success, allow PFAS to persist in the environment and travel long distances in groundwater and air without losing their toxicity, potentially impacting areas well beyond the release area.

Due to PFAS' ubiquitous use and unique ability to persist in the environment they have been detected in low concentrations throughout the environment and within humans and animals. These detections have raised health concerns since several health effects have been linked to PFAS exposure through direct contact or ingestion of food and water, including: developmental delays, liver and kidney problems, cancer, and impacts on the immune system and other organs. PFAS have also been linked to increased cholesterol and pregnancy-induced hypertension.

To further complicate the PFAS issue, regulatory focus was initially on PFOA and PFOS, two of the most commonly used PFAS, leading to a voluntary production phase out by US manufacturers by 2012. However, due to the phase out, chemical manufacturers have developed PFOA and PFOS replacements, commonly referred to as "short chain" PFAS. These replacements are very similar molecularly, potentially just as toxic, but also can combine in the environment, opening entirely new concerns.

PFAS REGULATORY DEVELOPMENT

For discussion purposes, the EPA has been addressing PFAS since at least 2002 starting initially with several use restrictions that led to a voluntary phase out noted above. In addition, the EPA issued a lifetime health advisory of 70 ppt for PFOA and PFOS in drinking water, a PFAS action plan to evaluate toxicity information, developed clean-up guidance, and evaluated if PFAS belong on the CERCLA list of Hazardous Substances. Most recently in February 2020, EPA issued a preliminary determination to regulate PFOA and PFOS in drinking water. This was the first concrete step the EPA has taken to create a nationwide Maximum Contaminant Level (MCL). The MCL is defined as the maximum permissible level of a contaminant in water that is delivered to any user of a public water system. The MCL will also be used as the regulatory target for permitting, compliance, enforcement, and monitoring and assessing the quality of the state's waters.

Since EPA has not finalized a federal MCL and many states feel that EPA's actions dealing with these contaminants are slow and insufficient they have initiated their own actions to regulate PFAS. These include requiring sampling of drinking water supplies, creating notifications, and establishing soil and groundwater standards. As expected, there are wide spread differences in which PFAS compounds are addressed and how they are regulated. In fact over 20 states have promulgated various standards. A review of state's proposed and promulgated PFAS regulations indicate the following trends:

1. States are typically focusing on PFOA and PFOS; however the implementation is highly variable based on the allowed concentrations, regulated media (groundwater, private drinking water wells, soil, etc.) and enforceability (action levels, clean-up levels, MCLs etc.). For example, California proposes regulation of PFAS and PFOS while Texas proposes 16 compounds (PFAS and PFOS plus others). Further, New Hampshire has an ambient groundwater quality standard of 70 parts per trillion (ppt) for POA and PFOS, while Texas has Protective Concentration Levels of 290 ppt for PFOA and 560 ppt for PFOS.
2. State actions so far have been in a race to develop and propose the lowest drinking water MCLs. For example, New Jersey started the trend with an MCL of 13 ppt for PFOS and PFNA and 14 ppt for PFOA. New York then promulgated a MCL of 10 ppt

for PFOA and PFOS and 1ppb for 1,4-dioxane in August 2020. Most recently Michigan proposed an MCL of 8 ppt for PFOA.

3. It is expected that regulatory action will start with a drinking water MCL which will impact drinking water supplies. In turn, once the MCL is promulgated, the MCL will be used to develop groundwater and surface water limits which will have the potential to impact WWTP and industrial facility discharge limits and clean-up standards at contaminated sites.

EVALUATION OF PFAS USERS AND POTENTIAL SOURCES

Due to PFAS's widespread use, multiple release pathways, persistence in the environment, and laboratory detection limits in the part per trillion ranges, it is not surprising that PFAS are commonly detected at trace levels in drinking water, soil and ground water. Consequently, it is important that a facility's current and historical processes and potential use of PFAS be understood to evaluate if a specific site is a potential source of PFAS and its potential liabilities. For example, if PFAS are detected at a site, the question is - Is the site a source or an "innocent by-stander" impacted by releases from PFAS sources potentially miles away due to atmospheric deposition or migration through ground or surface water? To make this determination, the following assessment must be completed:

- Historical use of PFAS at the site and area facilities;
- Area's hydrogeology to determine if the site and area of detection are hydrogeologically connected; and
- Determination whether the detected PFAS result from a single source or multiple sources.

A review of the area's hydrogeology and PFAS tracing are beyond the scope of this article, therefore we will focus on developing an understanding if a site potentially used/stored PFAS. Based on our experience in conducting site investigations, understanding of industrial and manufacturing processes, and literature review, a summary of facilities that have a potential for PFAS use and release to the environment due to their on-site processes, use or applications of PFAS-containing materials, or material and waste management practices is listed in Table 1 and summarized below. Keep in mind, this is only a summary and a detailed review of a facility must be completed to determine if a facility is a potential source. The potential release pathways are dependent on how the product is delivered, stored, handled, and used (e.g., sprayed as coating vs. added to a bath as a wetting agent) and the facility's overall environmental management program.

Industrial Facilities

Primary PFAS manufacturing facilities include those where PFAS-containing products were synthesized and made into products or chemical feedstocks. Air emissions, wastewater discharges and spills from these primary facilities can be of concern. Within this category are companies that manufacture aqueous film-forming foam (AFFF) and PFOS and PFOA, including but not limited to: 3M Company, Tyco Fire Products LP, Chemguard, Inc., Buckeye Fire Equipment Company, Kidde-Fenwal, Inc., National Foam, Inc., E.I. du Pont de Nemours & Company, and the Chemours Company.

Secondary manufacturing facilities may use PFAS-based materials produced at primary manufacturing facilities as part of their industrial processes, including facilities that do the following:

- Formulate products containing PFAS to enhance a product's ability to resist fire and repel oil, stains, grease and water. Examples include facilities that manufacture adhesives, surfaces coatings, cosmetics, paints, varnishes, and oils that could contain PFAS. Depending on the facility's process, PFAS could be released via air emissions, wastewater discharge, spills, or the intended use of products, such as AFFF.
- Use PFAS-containing materials, such as coatings, surfactants, and wetting agents in their process. Typical uses include facilities that apply water-proof or oil resistant coatings to fabric and paper; wetting agents and surfactants added to baths in the semi-conductor and metal plating industry; foam suppressants in the plating industry; and Teflon-coated guidewires produced by the medical device industry.

Other Operations

AFFF Fire Fighting Foam, which were used at most military installations, airports, petroleum refineries and some fire departments, can be significant sources of PFAS based on the use and storage. Typical release scenarios include the use of AFFF Fire Fighting Foam to suppress fires at airports, military bases, or used by local fire departments to suppress chemical fires.

PFAS - A BASIC REVIEW

Waste Management facilities, such as landfills, can be sources of PFAS because they are the ultimate repositories for PFAS-contaminated industrial wastes, wastewater treatment plant sewage sludge, and environmental remediation waste. Landfills are also depositories of consumer and industrial wastes containing PFAS, such as goods treated with hydrophobic, stain-resistant coatings. The types and concentrations of PFAS vary greatly among landfills due to difference in the waste streams, operational history, various physical properties and characteristics, and the environmental setting. Although municipal solid waste facilities will likely contain PFAS due to their presence in many consumer products, they usually have lower concentrations than landfills that accept industrial waste. Given the production timeline of PFAS, industrial, commercial, and consumer products and wastes disposed since the 1950s are potential sources of PFAS releases to the environment. As PFAS manufacturing processes and formulations changed over time, the resulting type and composition of waste streams also changed.

Wastewater Treatment Plant (WWTP) sludge may contain PFAS since the WWTPs have the potential to concentrate PFAS discharged from industrial facilities that use PFAS containing products. Interestingly, studies have suggested that the presence of WWTPs make it more likely that groundwater and surface water are impacted by PFAS since the WWTP's discharge to the groundwater or surface will likely contain PFAS.

Consumer Products may contain PFAS that are released to the environment via use and discharge to septic systems and WWTPs. For example, car cleaning agents, waxes and polishes, ski waxes, pesticides and household cleaning products (carpet spot cleaners, alkaline cleaners, shampoos, floor polish, and dishwashing liquids) may contain PFAS.

The key to understanding if a site is a source or an innocent bystander is to understand the site's PFAS uses and approach the issue of PFAS not as an issue limited to the subject site, but as an area wide issue. For example, sampling strategies may need to account for air releases in the area or releases from domestic septic systems. It is important to note that facilities may in fact be receiving PFAS tainted water from their water supplier that is discharged to their on-site septic system that in-turn releases PFAS to on-site groundwater. Additionally when interpreting laboratory results it is important to understand what species of PFAS were detected and how they interact in the environment.

Liability Concerns for Industry

This is a relatively new environmental concern, therefore the potential liability for industry is still unclear. However, it is likely one's potential liability will be directly related to the facility's manufacture, formulation or use of PFAS containing materials. For example, it appears clear that primary industries that manufactured aqueous film-forming foam (AFFF) and PFOS and PFOA are already in hot water and facing litigation throughout the country. For example:

- Minnesota sued 3M in 2010, alleging that the company's production of PFAS chemicals damaged drinking water and natural resources in the southeast Twin Cities metro area. The lawsuit was settled in February 2018 for $850 million.
- 3,550 plaintiffs from the mid-Ohio Valley in West Virginia filed suit alleging that 210 occurrences of kidney cancer, 70 occurrences of testicular cancer, and 1,430 occurrences of thyroid disease were linked to chemical exposure. The plaintiffs settled with DuPont and the Chemours Company for $921 million.
- Daikin America Inc. and 3M were sued over chemicals the companies used in the production process at their Decatur, Alabama facilities. The West Morgan-East Lawrence Water Authority settled with Daikin for $4 million.
- New York filed a complaint against manufacturers of AFFF in June 2018, alleging groundwater contamination in Newburgh, New Windsor, Suffolk County, Plattsburgh, and Rome, N.Y.

But what about the secondary manufacturers, that formulate PFA containing products or use PFAS containing products? Their potential liability is not as clear. However, what has become clear over time is that industries, other than primary manufacturers of PFAS, face at least three areas of concern:

1. if PFAS is detected within groundwater in the vicinity of their operations,
2. if PFAS are detected within a receiving POTWs sludge and
3. regulatory reopener provisions.

PFAS Detected in Drinking Water - Several states (i.e. New York, New Jersey) have adopted legally enforceable Maximum

PFAS - A BASIC REVIEW

Contaminant Levels (MCLs) for PFAS, with more states expected to follow suit. Once a PFAS MCL is established, drinking water systems will be required to sample for the presence of PFAS. Based on our experience there is high probability that PFAS will be detected within the drinking water. For example, New York State promulgated a MCL of ten parts per trillion for PFOA and PFOS. Therefore, each water supply system in NY will be required to collect samples for PFOA and PFOS. The justification for the rule, as published in the New York State Register, indicated the NYSDEC expects concentrations of one or both of those compounds to be detected at concentrations over the MCL in 21% of water supplies state wide. Once samples are detected in drinking water supplies, an investigation may be triggered to determine the source of the detected compounds. It is expected that the investigation will consist of identifying potential sources of PFAS and requesting identified facilities to conduct an investigation and demonstrate that they are not a contributor.

PFAS Detected in WWTP Sludge - it is likely WWTP will be required to sample their sludge for the presence of PFAS for disposal purposes. Similar to above, if PFAS is detected within the sludge it is likely the WWTP will require contributing industrial facilities to sample their wastewater for the presence of PFAS. If PFAS are detected, the WWTP will likely require the industrial discharger to treat the wastewater for PFAS prior to discharge to the WWTP.

Reopener – Conservations with several states have determined that it is possible that states will utilize reopener provisions of clean-up agreements to require investigation for PFAS. In particular, NYS is in the process of reviewing sites and potentially reopening.

Business and Regulatory Concerns

The rapidly evolving federal and state PFAS regulatory landscape is creating uncertainty for businesses, particularly for those with operations in multiple jurisdictions. Given potential litigation and regulatory risks surrounding PFAS, corporations that are secondary manufacturers or that use PFAS containing products are wise to understand the potential business impacts of PFAS on their operations. Once PFAS drinking water and clean-up standards are promulgated the issues will only increase. Should a PFAS liability manifest itself; a company could be burdened with longstanding, expensive and high profile cleanup liability or litigation, which could affect its customers, community and agency relationships. Such companies could also suffer business interruptions, if regulators require product reformulation or impose new permitting obligations. Facilities need to keep an eye on include the following.

<u>On-site Use</u>

To be prepared, one needs to understand if and how PFAS were potentially used on-site (see section above). If it is determined that PFAS were used, then the facility needs to evaluate the potential for release and the potential pathways (air emissions, wastewater to WWTP, wastewater to septic, release PFAS containing material, etc.). One needs to keep in mind that due to PFAS's unique properties a comprehensive understanding of the types of PFAS used, how they were used and the area's hydrogeology needs to be completed to evaluate the potential for either on-site concerns or potential off-site impacts. A document review may be adequate to obtain an understanding of the potential for release. Sampling is always helpful, but not always necessary at this point.

<u>Detection in Nearby Water Supply Wells</u>

If PFAS is detected in nearby water supply wells, one needs to understand if the PFAS detected are consistent with or could have resulted from those used on-site, if there is the potential for release, potential release pathways, and if the site is hydrogeologically connected to the wellfield. For example, if PFAS is contained within a coating that is sprayed onto a product, it is possible PFAS were released via air emissions, spilled to the ground or entrained in water discharges. Next, one needs to review the detected PFAS against the materials used on-site, understand the areas hydrogeology to evaluate if the site is hydrogeologically connected to the water supply, and possibility understand area wide atmospheric releases.

<u>Detection in WWTP Sludge</u>

Due to the concerns surrounding PFAS, it is possible that WWTPs will be required to sample their sludge prior to disposal. If PFAS are detected in the WWTP sludge, it is likely the WWTP will look upstream at industrial dischargers and require them to complete PFAS sampling. If PFAS is detected then the WWTP will require the facility to complete PFAS sampling at a minimum and possibly install pre-treatment.

PFAS - A BASIC REVIEW

Impact on SEC Reporting/Liability Protection

The Securities Exchange Commission (SEC) regulations require the disclosure of environmental liabilities of traded companies through public filings. With increasing regulations for PFAS, it is expected that reporting for both environmental liabilities and costs, and environmental penalties will only increase. The evolving management of PFAS will increase corporate resources needed to identify, evaluate and manage liability associated with historic and current uses of these materials. Increased reporting will require the implementation of new inventory, use and disposal strategies. Many state regulations for PFAS are more stringent than federal regulations and therefore may require a specific PFAS liability strategy for each facility.

Impact on Property Transactions

As PFAS awareness has increased, these substances have taken their place alongside the more common contaminants, such as petroleum products, and fuels, PCBs, and chlorinated solvents, and should be considered by businesses that may be having an environmental assessment performed as part of a property purchase or sale. As of today, PFAS specifically is not listed in CERCLA as a hazardous substance. However, PFAS and related compounds are included on select state lists of compounds of concern (e.g. compounds with cleanup criteria developed by state agencies). Therefore, PFAs may be included as a hazardous substance for the purposes of a Phase I ESA. New York, New Jersey and Michigan and several other states have promulgated MCLs or cleanup criteria for PFAS (i.e. PFOA, PFOS).

However, most states do not have PFAS standards or policies, which create uncertainty regarding the need to test for these substances and determining what actions to take if they are found. Regulatory enforcement among states varies as well, as most PFAS "standards" are only proposed action levels and not enforceable MCLs.. Without reference guidelines or standards, environmental professionals, buyers and sellers of real estate and businesses, and even regulators are challenged with assessing risk, drawing conclusions, formulating action plans, and making financial and business decisions regarding PFAS with no regulatory back-stop. There is no uniformity or consensus, even regarding the list of specific PFAS compounds that should be included in a standard laboratory analysis.

Addressing environmental concerns outside the scope of the ASTM Phase I process is not a novelty for environmental consultants. One of the most significant environmental concerns that have fallen outside of the ASTM Phase I scope, since its inception, is asbestos. Many environmental consultants address gaps in environmental due diligence by including the consideration of asbestos—or now, PFAS—as "non-scope considerations." Other tools that consultants can utilize to address environmental concerns that fall outside of the scope of the common Phase I process include flagging these issues, which might otherwise be identified in an ASTM Phase I as a Recognized Environmental Condition (REC), as "otherwise noteworthy conditions" or as "business environmental risks," under ASTM parlance.

Some environmental professionals have also managed PFAS concerns in environmental due diligence under an independent exercise that complements the ASTM process with a work deliverable to the client, sometimes in the form of a privileged communication, identifying the findings of the PFAS-specific evaluation. Also influencing this process is the growing, but often disparate, state regulation of PFAS in the form of groundwater and drinking water standards or limits. Many states are developing databases of sites with documented or suspected releases of PFAS, which is a valuable resource for environmental consultants performing due diligence. For example, California's State Water Resources Control Board (SWRCB) maintains an interactive map of all locations assessing PFAS under California's Statewide PFAS Investigation orders, and incudes links to available PFAS environmental data associated with these investigations.

The appetite for addressing PFAS in transactional environmental due diligence depends largely on the motivation of the parties to the deal:

- Buyers may be risk-averse and, in some cases, want to understand with a degree of certainty, the possible presence of PFAS.
- Many selling parties, in contrast, have no desire to be the trailblazer and identify PFAS, because their ownership status may make them legally responsible for the contamination.
- Lenders are typically risk-sensitive, particularly where their financing is secured by an interest in property that may be contaminated. To date, however, anecdotal experience shows that the lending community has been less alarmed by PFAS than might be expected, while other investment sources (venture funding and portfolio management companies) have

proven to be ahead of the PFAS curve.
- EHS Mangers/Corporate Real Estate need to eliminate surprises and be prepared for potential discovery of PFAS which could have significant financial impacts, or necessitate financial reporting.

How Should One Prepare

As outlined above it is becoming apparent that increased regulatory attention on users of PFAS chemicals is only a matter of time. Now is the time to take a proactive approach to define your risk and take steps to reduce it. The first step is to fully understand your business risk by conducting internal studies and auditing your operations. Be prepared with data and records rather than being blindsided. Evaluations should be completed at current and formerly owned/operated sites, and sites where waste was disposed and or wastewater was discharged. Evaluations should include:

- A detailed review of current operations to identify potential discharges of PFAS to the wastewater or air
- A review of historic operations performed at the facility, as well as identification of waste disposal areas and wastewater discharge locations
- A review of consent orders and other regulatory closure letters to identify possible reopeners
- A review of documentation associate with prior property transactions and historical insurance policies to identify if PFAS liability was addressed

Additional awareness regarding PFAS and the potential liability they can cause is becoming particularly important for those who are acquiring businesses and real estate. As further regulation is developed for these compounds, current unknown issues are likely to become future liabilities.

For Additional Information

If you would like to receive more information or make any inquiries, please contact Mark Wright, P.G., CSP, Project Manager at HRP Associates. Mr. Wright can be reach at mark.wright@hrpassociates.com or my phone at 518.877.7101 ext. 1415.