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PFAS AND YOUR BUSINESS: REMEDIATING PFAS IMPACTS

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EPA's PFAS Strategic Roadmap identifies several avenues for organizations that have historically used or currently use PFAS to remediate these compounds or remove them from waste streams or drinking water. While there are viable technologies to support these actions, detailed evaluations are needed to optimize their deployment.

Bryan Cave Leighton Paisner ("BCLP") and Burns & McDonnell have co-authored a series of three articles to help businesses translate the general statements in the Roadmap into a practical list of next steps that can be implemented to identify and mitigate PFAS regulatory risk. You can find links to the prior articles here, and here.

As your business considers taking future actions in an evolving regulatory landscape, this article offers information regarding:

- Proposed federal regulations that could require businesses to remediate PFAS substances;
- The latest in remediation technologies, approaches, and efficacy; and
- The importance of considering proactive PFAS investigation and remediation.

I. FEDERAL LAWS COULD REQUIRE PFAS REMEDIATION

There are two federal laws that could serve as an impetus for businesses to remediate PFAS substances in the near future: (1) the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"); and (2) the Resource Conservation and Recovery Act ("RCRA").

While this article is focused on federal laws and regulations, it is important to note that several states are already requiring the investigation and remediation of PFAS impacts under state law.

A. CERCLA

EPA has confirmed that it will issue a final rule in the summer of 2023 designating PFOA and PFOS as "Hazardous Substances" pursuant to CERCLA. See BCLP's Client Alert for additional details. The final rule will have significant impacts on industries that have interacted with these two PFAS

compounds and any other PFAS compounds that are subsequently added to the CERCLA "Hazardous Substances" list. These impacts include the following:

- **Site Investigation and Remediation**. Significantly, EPA will have the ability to order the investigation and remediation of sites that are impacted by PFOA and PFOS and any other PFAS compounds that are subsequently added under CERCLA. This means that the risk and cost of PFAS remediation will soon be a national challenge for businesses that own(ed) or operate(d) facilities that used this chemistry.

- **Due Diligence.** Entities that are considering purchasing property or other transactions may want to evaluate their potential CERCLA liability resulting from the historic or ongoing presence of PFAS-contaminated CERCLA waste.

- **Cost Recovery and Contribution Claims.** EPA or other agencies could also seek cost recovery or contributions for their costs incurred for the remediation of the PFAS compounds that are listed as "Hazardous Substances" under CERCLA. Similarly, businesses that are forced to pay for cleanup actions will probably bring contribution claims to apportion the remediation costs between responsible parties.

- **Site Reopeners.** EPA will have the ability to reopen sites that have already been remediated for other compounds if there is a concern that there may be PFAS impacts as well. EPA has already started requiring some responsible parties to add PFAS assessments to their 5-year reviews for sites that have previously approved remedies for other contaminants of concern.

B. RCRA

In October of 2021, four PFAS substances (PFOA, PFOS, PFBS, and GenX) were proposed to be listed as "Hazardous Constituents" under RCRA. As with CERCLA, these actions under RCRA will have significant impacts on businesses, including the following:

- **Due Diligence.** Similarly, entities that are considering purchasing property or other transactions may want to evaluate their potential RCRA liability resulting from the historic or ongoing presence of PFAS-contaminated RCRA waste.

- **Increased Waste Management Costs**. If PFAS substances are defined as "Hazardous Constituents" and a business generates RCRA wastes that contains those compounds, the business will have to comply with RCRA's characterization, recordkeeping, and disposal requirements for that waste.

- **Site Investigation and Remediation**. Sites that have historically received waste containing PFAS may face RCRA investigation and remediation actions once that waste is classified as hazardous.

II. REMEDIATION TECHNOLOGIES

Given the current need and level of investment required for research and development of PFAS treatment technologies, the toolbox of potential remediation treatment approaches is expanding, and the efficacy of innovative options is slowly improving. The stable nature of PFAS and the energies required to destroy these chemicals has slowed the development of in situ remedial technologies. In situ remediation of PFAS in groundwater is generally limited to sequestering PFAS through the subsurface application of colloidal activated carbon, although other amendments have been deployed on a much more limited scale. Once deployed in the subsurface, typically through an injection technology, activated carbon particles coat the native aquifer materials adsorbing the PFAS and removing them from solution. This technology quickly reduces the potential for migration and exposure to PFAS; however, the PFAS are sequestered, not destroyed. While this provides a means to control and reduce the migration of PFAS in the subsurface, the long-term performance of these treatments has yet to be demonstrated.

In situ remediation of PFAS contamination within the unsaturated zone (i.e., above the water table) has been implemented on a very limited scale using activated carbon and commercialized products consisting of modified clays and other adsorbents. The primary goal of this approach is to stabilize/immobilize the PFAS to prevent downward migration to groundwater.

Ex situ remedial approaches involve the removal of contaminated groundwater or soil for treatment and/or disposal. While liquid waste streams may be passed directly to a treatment facility, PFAS-impacted soils must be washed, processed to strip and recapture PFAS using thermal methods, or treated via incineration or smoldering. Commercially available technologies used to manage these wastes have primarily included conventional remedial approaches that consolidate PFAS using sportive media or reverse osmosis (“RO”). While effective in treating PFAS, these technologies are limited in that they produce a PFAS-containing waste byproduct that must then be managed. The following bullets points present a summary of the main ex situ treatment approaches for PFAS and recent developments that are driving the efficiency of PFAS treatment applications.

- **Adsorption**. Utilizes adsorptive media (e.g., granular activated carbon “(GAC”) or ion exchange (“IX”) resins) to remove PFAS from liquid streams. As PFAS-containing fluids are passed through vessels filled with these media, the PFAS are attracted to the media by physical and chemical forces. Once all of the adsorption sites are consumed, the media is replaced or regenerated and the process is continued. The presence of certain co-contaminants can affect the efficiency of these media by competing for PFAS adsorption sites; therefore, selecting compatible GAC or IX resin for each application is necessary to achieve optimum performance. Adsorptive solutions are well suited for large volumes that are relatively clean or have been pre-treated to remove competing contaminants. Technology advancements include the identification of new IX resins and media that are more selective for PFAS, limiting the interference of co-contaminants, developing media that can be efficiently regenerated, and extending the media lifespan.

- **Separation**. RO and nanofiltration are capable of physically separating PFAS by passing PFAS-containing liquids through an osmotic membrane. However, these technologies produce a brine reject stream that contains the concentrated PFAS removed from the treated water. While successful in reducing the volume of PFAS-containing fluids, the resulting brines still pose disposal challenges that have historically prevented the widespread use of membrane technologies to address PFAS-containing waste streams. Foam fractionation is a recently developed technology that separates PFAS from liquid wastes through the introduction of air. This approach provides greater concentration ratios (i.e., smaller volumes of concentrated PFAS waste streams) than traditional membrane technologies, is less energy intensive, and, in many applications, can reduce the volume of PFAS-containing concentrates to levels that become manageable.

- **Destruction**. In a perfect world, all PFAS treatment approaches would include a destructive step to destroy the PFAS and eliminate the long-term risks associated with the disposal and storage of these materials. While incineration was the default destructive solution for many years, recent scrutiny over the emissions and cost of incineration has caused many to move away from this approach. Certain states, and more recently EPA, have worked towards bans or restrictions on the incineration of PFAS. Recent developments of field-deployable treatment technologies capable of destroying PFAS are promising; however, these technologies are both expensive and energy intensive, and can only accommodate small volumes or batch treatment approaches, limiting their commercial application to date.

While there are clear developments being made across each of these treatment categories, combining them in a layered or sequential approach – sometimes referred to as a treatment-train approach - allows engineers to leverage technology-specific advantages and provide cost-efficient solutions for PFAS treatment. For example, advancements being made with separation technologies have resulted in greater reductions in the volume of a waste stream. By further reducing these volumes, applying destructive technologies that were not economically capable of treating the original waste stream become more viable. Such treatment-train approaches may provide organizations cost effective solutions that can also be optimized through further technology improvements, or altered should regulatory drivers require more stringent treatment goals in the future.

III. CONCLUSION

The message from federal and state governments is clear: the investigation and remediation of at least some PFAS compounds will inevitably be required and will be a regulatory priority over the next several years. This regulatory direction provides industries an opportunity to plan ahead and make strategic decisions regarding their management of PFAS, including consideration of remedial strategies and solutions in anticipation of future regulatory action. Businesses that take a proactive approach are likely to be better positioned to react to requirements resulting from these forthcoming regulations.

If you would like additional information regarding the PFAS Strategic Roadmap, or if you would like assistance in evaluating PFAS substances in any capacity, please contact Tom Lee and John Kindschuh at BCLP or Brian Hoye and John Hesemann at Burns & McDonnell.

RELATED CAPABILITIES

- PFAS

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