

PFAS Road Map













Year: 2021

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Executive Summary

Since discovering PFOA in Bennington and North Bennington in 2016, the Vermont Department of Environmental Conservation (DEC) has partnered with other state and federal agencies to clean up existing per- and polyfluoroalkyl substances (PFAS) and mitigate current and future exposures.

The Department has taken the following important actions:

	Adopted a drinking water standard (MCL) of 20 parts per trillion (ppt) for 5 PFAS. Required drinking water systems to test for PFAS. Worked with systems above the standard to provide safe drinking water to residents.
	Adopted groundwater and cleanup standards of 20 ppt for 5 PFAS.
	Reached agreement with Saint-Gobain Performance Plastics on drinking water remediation in Bennington and North Bennington.
	Conducted a study to determine the PFAS ambient concentrations in soils at various locations around the state.
	Conducted a firefighting foam takeback effort, which collected approximately 2,150 gallons of AFFF concentrate from 38 fire departments around the state.
	Initiated litigation against PFAS manufacturers, principally 3M and DuPont.
	Developed a statewide investigation of potential conveyors of PFAS, including wastewater treatment facilities/publicly owned treatment works (POTWs), industrial sources, land application sites, and landfills.
	Finalized a surface water quality standard development plan .
	Responding to PFAS contamination in multiple sites around the state.
	Adopted new Solid Waste Rules that require PFAS testing for biosolids and for soils, groundwater and crops at land application sites.
	Required the state's one operating landfill to evaluate two onsite and two offsite treatment methods for PFAS in landfill leachate.
	Engaged Vermonters in a public process to evaluate regulating PFAS as a class.

The Department will continue to engage Vermonters on the following next steps:

1. Determine next steps with regards to landfill leachate;
2. Continue to evaluate biosolids and septage application site data and collaborate with Agency of Agriculture to determine if additional protections are warranted;
3. Engage with ongoing efforts by the federal government that seek to obtain information about PFAS-containing products;
4. Develop and implement subsequent phases in statewide investigation;
5. Evaluate standards as new technical and scientific information becomes available;
6. Finalize Vermont's strategy to include PFAS monitoring in direct discharge and pretreatment industrial wastewater permits; and
7. Focus on reducing PFAS before it gets into the waste stream and POTW effluent and biosolids via pretreatment and pollution prevention efforts.

Details on State of Vermont Actions to Address PFAS

The following summaries of the State of Vermont's actions to address PFAS contamination and to protect Vermonters and the environment reflect Vermont's regional and national leadership to address these emerging contaminants.

Providing Drinking Water that Meet State MCLs

In response to the contamination of private wells in Bennington and North Bennington discovered in 2016, the Vermont Department of Health (VDH) issued health-based standards for two PFAS compounds, PFOA and PFOS, to guide drinking water remediation efforts. Since that time, the VDH has updated those standards to include three additional PFAS compounds. In 2019, the Vermont General Assembly passed and the Governor signed into law Act 21 that directs DEC to use the health advisory level as an interim drinking water standard and to develop a final standard, known as a Maximum Contaminant Level (MCL). [DEC adopted rules](#) in February 2020 to regulate 5 PFAS compounds in all public drinking water systems.

As part of Act 21, public water systems around the state began testing for the presence of PFAS. The following systems tested above standards:

- Killington Mountain School
- Thetford Academy
- Mount Holly School
- Killington Village Inn
- Fiddlehead Condominiums

Some systems had elevated levels in 2019 but did not exceed the MCL; other systems had levels that at one time were below the MCL but have since exceeded the MCL or were required to

sample due to nearby elevated levels of PFAS. The following systems have since exceeded the MCL:

- Kids in the Country
- Leicester Central School
- Chalet Killington

DEC has worked with each of these systems to implement a Do Not Drink notice, implement interim solutions, and develop long-term solutions to permanently address PFAS contamination. As part the State Fiscal Year 2021 Budget and Capital Bills, DEC advocated for and received funding for a Contaminants of Emerging Concern Contingency Fund to address these and future systems. The available funding is expected to be exhausted by the initial systems. Additional funding should be allocated to ensure Vermont communities have a source of funding to address future challenges.

When a water system's PFAS results indicate elevated levels of PFAS but the levels are below the MCL, they are required to sample more frequently. Because of this there are other systems on a watch list. DEC has seen [PFAS levels vary](#), meaning there likely will be more public drinking water systems to experience elevated PFAS levels than those identified above.

DEC provides two individual points of contact per impacted public drinking water system, one from the public drinking water program and one from the hazardous sites program. These staff work closely with the systems to provide individual attention and assist them in complying with all the applicable regulations.

DEC also contracted with a consulting engineer to develop a PFAS Response Plan, which can be a guide to affected drinking water systems. This guide identifies some of the key steps in the process to address elevated PFAS levels, weighs treatment options and provides cost estimates, and gives technical design information to help systems and their consultants quickly respond to contamination.

Next Steps:

- *The Department will continue to work with all water suppliers to comply with testing requirements and ensure impacted systems can provide drinking water that meet State MCLs to their users, and*
- *The Department has put forward a proposal for additional funding for the Contaminants of Emerging Concern Fund through the SFY 2022-2023 Capital Bill.*

Investigating and Remediating Sites Contaminated by PFAS

In 2016 the DEC initiated an investigation into potential perfluoroalkyl substances (PFAS) contamination from two former Teflon fabric-coating facilities located in Bennington and North Bennington as well as a wire coating facility in Pownal. These investigations led to the discovery of widespread contamination in drinking water wells. These findings led the state to identify and investigate other potential industrial sources of PFAS, including wire coating facilities, semi-conductor manufacturers, battery manufacturers, electroplating facilities, carwashes, and tanneries.

In addition to manufacturing sources the DEC also investigated locations where firefighting foam, known as Aqueous Film-Forming Foam (AFFF), was known to have been used and where one of the PFAS compounds of concern is Perfluorooctanesulfonic acid (PFOS). At the Southern Vermont Airport in Clarendon, the DEC tested for 21 PFAS compounds and detected PFAS in 25 out of 77 wells. Ongoing remediation at the Air National Guard Facility at the Burlington International Airport discovered significant PFAS contamination to soils and groundwater at the facility. The PFAS contamination has also been detected in a downgradient agricultural well at an active dairy farm. Additional investigation detected PFAS contamination in the nearby Winooski River. The DEC also learned that many Vermont fire departments still had stocks of PFOS-containing AFFF, so the DEC in partnership with the Department of Public Safety initiated a firefighting foam takeback program. PFAS contamination was also found at the Vermont Fire Training facility in Pittsford.

The DEC has also conducted sampling at solid waste management facilities, including one operating lined landfill and several closed lined and unlined landfills. This sampling confirmed the presence of PFAS compounds in landfill leachate and in groundwater at all of these facilities.

In addition to conducting testing at solid waste management facilities, the DEC investigated PFAS contamination at several wastewater treatment facilities (WWTF), including ones that receive leachate from Vermont landfills. PFAS concentrations were measured at all WWTFs with concentrations being the highest at those facilities that accept landfill leachate.

Next Steps:

- *The Department will continue to identify and remediate PFAS contamination sources statewide.*

Identifying and Characterizing PFAS Sources and Potential Contaminated Sites Statewide

The statewide work done to date to identify and characterize PFAS contamination has identified many areas of concern. This has included industrial sources such as Teflon fabric coating facilities, wire coating facilities, semi-conductor manufacturers, battery manufacturers, electroplating facilities, carwashes, and tanneries. PFAS contamination has also been detected in our waste streams including landfills, landfill leachate, WWTFs, and biosolids. Lastly PFAS has been measured in many [household items discarded in the landfill](#) such as mattresses, furniture, textiles, carpeting, and clothing.

Despite the extensive investigation work completed to date, the DEC believes there is the potential to identify additional locations where PFAS has been released to the environment. For example, the DEC would benefit from additional research directed at identifying additional industries and businesses that used PFAS in its products. In addition, there are many household products that may contain PFAS. Establishing a better understanding of the uses of PFAS will allow the DEC to develop further testing strategies to address any harm that these products have caused to public health or the environment.

Next Steps:

- *The Department will continue to coordinate with other state agencies, other state governments, and the USEPA to identify and investigate potential sources of PFAS and impacts on human health and the environment.*

Monitoring Surface Waters and Adopting Water Quality Standards for PFAS

In February 2020, ANR released the report, [Deriving Ambient Water Quality Standards for the Emerging Chemicals of Concern: Per- and Polyfluoroalkyl Substances](#) (PFAS). The report describes the framework ANR uses to establish surface water quality standards, and how this framework may apply to the development of state-specific water quality standards to protect both human health and aquatic life from PFAS. Developing water quality standards for PFAS would represent ANR's first undertaking to establish water quality standards for a group of chemical contaminants that currently are not included in the Environmental Protection Agency's (EPA) Clean Water Act Section 304(a) National Recommended Water Quality Criteria.

Review of applicable toxicity studies required for the five Vermont regulated PFAS indicates that there are ecological toxicity data gaps that would be necessary to meet EPA's Minimum Data Requirements for establishing criteria for freshwater aquatic organisms, which includes at least one species of freshwater animal in at least eight (8) different families. The current ecological toxicity data gaps would impede development of aquatic biota criteria development

for these compounds. Gaps in PFAS aquatic toxicity data are a national issue, and significant resources would be required of Vermont to address these data gaps independently.

The report outlines anticipated challenges, data gaps, and costs associated with developing Vermont-specific standards in the absence of EPA established PFAS criteria. To establish a numeric water quality standard for the Vermont-regulated PFAS, ANR would need to develop significant toxicity data for several of the Vermont-regulated PFAS (PFHxS, PFHpA, and PFNA) and develop bioaccumulation factors for all Vermont-regulated PFAS. The State of Vermont does not currently have the resources to conduct these types of scientific and technical analyses that are normally provided by EPA. The estimated costs and time associated with developing underlying ecological toxicity data and bioaccumulation data are significant, ranging from \$2.8 million to \$5.9 million and estimated time of 3 – 8 years for the agency to develop.

The [EPA Action Plan for PFAS](#) includes research to support development of ambient water quality criteria for aquatic life for PFOA and PFOS by 2022. Once EPA criteria are developed, they could be incorporated into the Vermont Water Quality Standards. Given the tremendous resources required to derive water quality criteria for PFAS, and absent sufficient resources available to Vermont, EPA should lead this effort.

The State has sufficient data to establish fish consumption advisories for Vermont-regulated PFAS. Fish consumption advisories have been used in the past with other contaminants of concern to limit exposure to known contaminants. ANR will use data gathered through monitoring efforts to issue advisories when the data warrants.

Next Steps:

- *As noted below, the Department, in coordination with other state environmental agencies, will support EPA efforts to conduct the necessary research to derive and adopt aquatic life use criteria for PFAS by 2022, as described in the EPA Action Plan for PFAS, for consideration by Vermont prior to adopting a criteria pollutant in the Vermont Water Quality Standards;*
- *The Department will continue to monitor surface waters for PFAS;*
- *The Department will continue to review studies available through USEPA (i.e., USEPA's ECOTOX Knowledgebase) and elsewhere to evaluate whether there is sufficient information to develop a Vermont Water Quality Standard; and*
- *The Department will conduct fish contaminant monitoring and issue fish consumption advisories when the data warrants.*

Characterizing and Monitoring Biosolids and Septage Land Application

The DEC has conducted extensive sampling and testing of biosolids since PFAS contamination was first discovered in Bennington in 2016. Initial testing for PFOA and PFOS at the Bennington WWTF revealed PFAS contamination in influent to, effluent from, and sludge generated by the WWTF. In 2018, DEC investigated PFAS contamination at six WWTFs that receive leachate from Vermont landfills. Results of this testing showed PFAS contamination was detected in the part per trillion (ppt; ng/L) range in wastewater influent and effluent and in the part per billion (ppb; µg/kg) range in sludge/biosolids.

In 2019, DEC continued with a broader PFAS investigation at twenty-five WWTFs in Vermont, including testing of all biosolids (i.e., sludge meeting pollutant limits and treated for pathogens prior to recycling to the land) produced in Vermont. PFAS was detected in all influent, effluent, and solids samples from these facilities with PFAS in sludges and biosolids averaging 83 ppb (sum of 24 PFAS compounds analyzed) across the facilities tested.

With the observation of PFAS contamination in biosolids from Vermont WWTFs, DEC then conducted soil and groundwater testing at four agricultural sites permitted for the land application of biosolids and stabilized septage during the late summer/early fall of 2019. In addition, any water supplies within ¼ mile of these sites were tested for PFAS.

Based on results from initial testing at land application sites, Vermont DEC directed all land application permittees (18 permittees at the time) to conduct soil and groundwater testing at all permitted sites. Testing began in late 2019 and continued through 2020. Average concentrations of total PFAS in soil across 23 unique land application sites was 16 ppb. Groundwater testing results varied, with approximately 20% of all (downgradient) monitoring wells tested indicating PFAS exceeding the Vermont groundwater enforcement standard. Permittees with sites associated with PFAS above the groundwater enforcement standard were directed to halt land application, retest groundwater to confirm results, and identify and test any water supplies within a quarter mile of the site. PFAS testing of drinking water supplies adjacent to these sites confirmed no detections at or above the groundwater enforcement standard to date from land application.

In response to discovering PFAS in biosolids and in soils and groundwater at land application sites, DEC is:

1. maintaining land application prohibitions for those sites with confirmed groundwater standard exceedances and working with these permittees to develop site-specific corrective action plans via the Groundwater Protection Rule and Strategy;
2. implementing additional institutional controls over biosolids management in Vermont via updated Solid Waste Rules (10/31/2020) that include PFAS monitoring requirements for all importers of biosolids to Vermont and for all permittees generating biosolids in

Vermont for distribution or land application, including routine testing for soils, groundwater, and crops at land application sites;

3. focusing on reducing PFAS before it gets into the waste stream via pretreatment and pollution prevention efforts. Specifically, in 2020, DEC was awarded two grants to address PFAS before it enters a POTW and contaminates effluent and biosolids quality (see “**Addressing PFAS Before it Gets into the Waste Stream**” section of this report); and
4. coordinating with the Agency of Agriculture, Food & Markets (VAAFAM) to identify any potential adverse PFAS-impacts to agriculture and the food supply resulting from land application of biosolids and septage. To date, DEC testing has shown that no animal drinking water has reached or exceeded the groundwater enforcement standard at land application sites. Because of this, VAAFAM has been focusing on risks in the soil-to-crop-to-animal pathway. Limited data exists on the movement of PFAS compounds in agricultural commodities, including animal feed and forage, and the risks they may pose. There are no federal standards for agricultural soil or animal feed and forage; several states have developed relevant guidance values and the VAAFAM has been working with those states.

VAAFAM staff are meeting with the farmers who grow animal feed and forage on the permitted land application sites to better understand each farm’s cropping and feeding practices and to assess the agricultural risk. Many different sizes of farms and cultivation practices have been identified on these sites. At this time, based on soil PFOS-levels and farm-specific variables, VAAFAM has recommended two permitted sites not be used to grow animal feed and forage. Several sites are still being evaluated.

In 2021, VAAFAM plans to start sampling retail milk and agricultural commodities, for PFAS-compounds, as funding allows. VAAFAM will also evaluate the potential impacts from PFAS of materials that are produced with biosolids and other residuals.

Next Steps:

- *The Department will issue/amend all Solid Waste Certifications permitting the production of biosolids and/or management of biosolids or septage via land application to include new PFAS testing requirements established in new Solid Waste Rules;*
- *The Department will create registry for importation of class A biosolids to Vermont, including PFAS testing requirements as established in the new Solid Waste Rules;*
- *The Department will coordinate with and support AAFM’s efforts to identify any potential adverse PFAS-impacts to agriculture and the food supply resulting from land application of biosolids and septage;*

- *The Department's Residuals and Wastewater Pretreatment Programs will collaborate via pollution prevention and pretreatment to reduce PFAS before it gets into the waste stream and impacts biosolids quality; and*
- *The Department will collaborate regionally and nationally to assess viability of current sludge management options (landfill, land application, incineration) and to find alternative management options.*

Evaluating Alternatives to Address PFAS from Landfill Leachate

Work throughout 2019 and into 2020 [analyzed PFAS concentrations within landfill leachate and at WWTFs that accept that leachate and at WWTFs that do not accept leachate](#). This work included repeat sampling events at these facilities to allow for better understanding of variability in concentrations. This work demonstrated that there are levels of PFAS in leachate that regularly exceed the drinking water and groundwater standards. Surface water sampling downstream of the wastewater treatment facility that accepts and discharges the highest volume of treated landfill leachate, reported no PFAS in concentrations above the detection limits.

Based on this work and with the understanding that leachate from all of Vermont's lined landfills will continue to require management into the future, the Department is committed to working with these facilities to determine appropriate next steps towards limiting the discharge of PFAS into the environment due to landfill leachate. Each landfill will be individually considered, and management options may include ongoing monitoring of leachate, wastewater treatment facility effluent, and receiving waters, restrictions on the management of sludges produced by wastewater treatment facilities accepting leachate, and the evaluation of treatment options at the landfill facilities that may allow for reductions in concentrations prior to leaving the facilities.

The Department required the NEWSVT landfill in Coventry to evaluate two onsite and two offsite leachate treatment options and [submit a report](#) to the Department detailing the findings of this evaluation. To evaluate the efficacy of that analysis, the Department hired Civil and Environmental Consultants to review the leachate treatment option study completed by NEWSVT. Their review concluded that the study was appropriate and well developed. They recommended that an additional technology (electrocoagulation-based system) be reviewed in future evaluations.

Next Step:

- *The Department will determine necessary actions for NEWSVT and all lined landfills in Vermont that produce leachate.*

Holding PFAS Manufacturers Accountable

The State of Vermont has initiated a major environmental action to protect Vermont's drinking water and natural resources by filing two lawsuits against 3M Company (3M) and E. I. du Pont de Nemours and Company (DuPont) and related DuPont companies for their manufacture and use of PFAS in consumer, household, and other commercial products, as well as industrial uses, and also in firefighting foam. The cases are currently in the discovery process. The lawsuits seek to make Vermont whole by making those responsible for PFAS contamination pay to remove their toxic chemicals from Vermont's groundwater and other resources.

Addressing PFAS Before it Gets into the Waste Stream

DEC is pursuing a pollution prevention approach to identify and reduce PFAS in the influent, effluent, and biosolids of WWTFs. Pollution prevention, or source reduction, are practices that identify and reduce, eliminate, or prevent pollution at its source, thereby reducing the amount of waste to control, treat, and dispose of, and the subsequent hazards posed to public health and the environment. Pollution prevention is critical as conventional wastewater treatment technologies do not effectively remove PFAS and engineering WWTFs to treat PFAS is very expensive and these costs should not be borne by municipalities or ratepayers in public facilities.

In 2021, DEC will work with municipalities to characterize residential, commercial, and industrial wastewater PFAS sources to WWTFs. DEC will consider its existing wastewater dataset (comprised of influent, effluent, and/or biosolids data from 19 WWTFs) to focus source identification work in municipalities with WWTFs with known PFAS contamination. Source identification and characterization will occur through representative monitoring throughout wastewater collection systems, and their residential, industrial, and commercial users. The findings of this investigation can inform a state-wide source reduction approach for implementation at other WWTFs. In addition, source characterization data may be used to identify reduction strategies for specific commercial and industrial users.

In parallel with the state-wide source identification work, DEC is conducting an EPA-funded pollution prevention project specifically for businesses within the metal finishing and aerospace industrial sectors. DEC is focusing targeted source reduction at these industrial sectors due to significant wastewater contamination identified in other states, such as Michigan, California, and Minnesota.

Through this project, DEC will work with up to six businesses in the metal finishing sector to identify PFAS sources at their facilities and investigate and implement source reduction strategies to eliminate or minimize PFAS within their process wastewater discharges. Potential

source reduction strategies may include investigating products that are PFAS-free; identifying opportunities for optimization of chemical or product use to reduce PFAS loading; or potential changes to operations or maintenance practices to minimize or eliminate PFAS within process wastewater. Participating businesses will work with DEC in a cohort to share source identification and reduction findings, strengthen sector-wide capacity, develop and share solutions relevant to PFAS use and reduction in the sector, and create scalable and replicable models for other businesses in the sector to follow.

Next Steps:

- *The Department will work with municipalities to identify and characterize residential, commercial, and industrial PFAS sources to WWTFs;*
- *The Department will implement pollution prevention project with metal finishing businesses;*
- *The Department will use source identification findings to develop state-wide source reduction approach for implementation at Vermont WWTFs; and*
- *The Department will use source identification findings to scope source reduction strategies for residential, commercial, and industrial users.*

Evaluating Regulating PFAS as a Class

As directed by the General Assembly, the Department is currently undertaking a process to evaluate the regulation of PFAS as a class. The Department has released an advanced notice of proposed rulemaking, held a public meeting, and received comments.

Prior to releasing the advanced notice, a team of scientists from the Departments of Health and Environmental Conservation were assembled to evaluate the regulation of PFAS as a class. After a year of deliberation, research, and discussion the review team concluded the scientific studies and toxicological data necessary was not available and regulation of PFAS as a class was not feasible at this time. The State of Vermont does not have the resources to conduct the types of scientific and technical analyses that are normally provided by EPA or the World Health Organization to evaluate regulating PFAS as a class.

DEC is currently reviewing extensive public comments and will make a final decision as to whether to regulate PFAS as a class or further regulate a class or subclasses of PFAS pursuant to the requirements of Act 21. DEC will also continue to monitor evaluations occurring at the federal level and update policies as appropriate. The National Toxicology Program (NTP) will be evaluating over 100 PFAS and selecting “anchor” PFAS upon which to build classes or subclasses of PFAS based on structural similarities and potency of biological response. This work involves hundreds of NTP and EPA scientists, and reflects a level of effort and resources

that the State could not achieve. The Departments will closely monitor the work by the NTP and the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate PFAS as a class.

Next Steps:

- *The Department, in conjunction with environmental official from other New England States, will support EPA efforts to conduct the scientific and technical analyses necessary to evaluate regulating PFAS as a class, and*
- *The Department will closely monitor the work by the NTP and the ATSDR to evaluate PFAS as a class.*

Coordinated Call for Federal Action

The DEC is coordinating with environmental officials from the New England states to put out a collective call to address common PFAS concerns. This list reflects the needs of New England states generally and may not reflect needs in Vermont. It also reflects a minimum baseline of complimentary federal action and is not intended to foreclose or mitigate the need for protective state action. We look forward to working with the incoming Biden administration to address the following topic areas:

1. Address current and future PFAS use through the Lautenberg Chemical Safety Act updates to the Toxic Substances Control Act;
2. Expedite the Maximum Contaminant Level adoption process, including for a broader list of PFAS beyond PFOA and PFOS;
3. Designate PFAS chemicals as hazardous substances ;
4. Evaluate regulating PFAS as a class;
5. Expedite the development of toxicological profiles for additional PFAS compounds;
6. Expedite the research necessary to develop a PFAS surface water standard and fish consumption guidance values;
7. Expedite non-drinking water PFAS analytic methods;
8. Develop guidance of the use, management, and disposal/destruction of PFAS-containing firefighting foam;
9. Develop guidance on the disposal or destruction of PFAS compounds and PFAS-containing products and for the treatment of PFAS in environmental media;
10. Expedite risk assessment work for PFAS in biosolids; and
11. Recognize State-promulgated as applicable or relevant and appropriate requirements.