

NORTH CAROLINA PER- AND POLYFLUOROALKYL SUBSTANCES TESTING (PFAST) NETWORK

Quarterly Progress Report (#10) submitted to the North Carolina General Assembly Environmental Review Commission, the NC Department of Environmental Quality, the NC Department of Health and Human Services, and the US Environmental Protection Agency (Region 4)

January 1, 2021



1.0 INTRODUCTION

The North Carolina General Assembly (NCGA), in the passing of Session Law (SL) 2018-5, Sections 13.1.(g), directed the North Carolina Policy Collaboratory (Collaboratory) to *“identify faculty expertise, technology, and instrumentation, including mass spectrometers, located within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T University, Duke University, and other public and private institutions, and coordinate these faculty and resources to conduct nontargeted analysis for PFAS, including GenX, at all public water supply surface water intakes and one public water supply well selected by each municipal water system that operates groundwater wells for public drinking water supplies as identified by the Department of Environmental Quality, to establish a water quality baseline for all sampling sites. The Collaboratory, in consultation with the participating institutions of higher education, shall establish a protocol for the baseline testing required by this subsection, as well as a protocol for periodic retesting of the municipal intakes and additional public water supply wells.”* The term ‘PFAS’, listed above, refers to Per- and Polyfluoroalkyl Substances and the study is referred to herein as the NC PFAS Testing Network or PFAST Network. For reference, all provisions passed by the NCGA in Section 13 of Session Law 2018-5 [related to this project] are included in Appendix I of this report.

The PFAST Network was funded by an appropriation from the NCGA. Section 13.1.(i) of SL 2018-5 states, *“Five million thirteen thousand dollars (\$5,013,000) of the funds appropriated in this act for the 2018-2019 fiscal year to the Board of Governors of The University of North Carolina shall be allocated to the Collaboratory to manage and implement the requirements of this section, which shall include distribution to the Collaboratory and participating institutions of higher education (i) to cover costs incurred as a result of activities conducted pursuant to this section, (ii) for acquisition or modification of essential scientific instruments, or (iii) for payments of costs for sample collection and analysis, training or hiring of research staff and other personnel, method development activities, and data management, including dissemination of relevant data to stakeholders. No overhead shall be taken from these funds from the participating institutions that receive any portion of these funds. Funds appropriated by this section shall not revert but shall remain available for nonrecurring expenses.”*

In addition to the water sampling identified above, additional study parameters are mandated in Section 13.1.(l), which states, *“The Collaboratory shall identify faculty expertise within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, and use technology and instrumentation existing throughout the institutions to conduct the following research (i) develop quantitative models to predict which private wells are most at risk of contamination from the discharge of PFAS, including GenX; (ii) test the performance of relevant technologies in removing such compounds; and (iii) study the air emissions and atmospheric deposition of PFAS, including GenX. In addition, Collaboratory may, using relevant faculty expertise, technology, and instrumentation existing throughout institutions identified, evaluate other research opportunities and conduct such research for improved water quality sampling and analyses techniques, data interpretation, and potential mitigation measures that may be necessary, with respect to the discharge of PFAS, including GenX.”*

Furthermore, on November 6, 2019, the NCGA enacted Session Law 2019-241 wherein Section 7.(a) the NC Policy Collaboratory was directed to “*create an inventory of aqueous film-forming foam (AFFF) used or stored by fire departments in North Carolina operated, managed, or overseen by units of local government, including those located at or serving airports*” (Appendix II). It is well known that some older formulations of AFFF contain legacy PFAS such as the 8-carbon chain perfluoroalkyl octane sulfonate (PFOS) and shorter chain fluorinated components including the 6-carbon perfluoroalkyl hexane sulfonate (PFHxS). This project aims to “*develop a proposal for identifying and collecting AFFF that is expired or no longer needed*” and to provide “*recommendations on which State agency or agencies could oversee such a collection effort and cost estimates on this collection, stockpiling, and disposal.*” At the discretion of the Collaboratory, the Firefighting Foam Inventory project was assigned to UNC Chapel Hill assistant professor Wanda Bodnar who serves as the Scientific Program Analyst for the NC PFAS Testing Network.

2.0 REPORTING REQUIREMENTS

Section 13.1.(h) of SL 2018-5 states, “*Beginning October 1, 2018, the Collaboratory shall report no less than quarterly to the Environmental Review Commission, the Department of Environmental Quality, and the Department of Health and Human Services on all activities conducted pursuant to this section, including any findings and recommendations for any steps the Department of Environmental Quality, the Department of Health and Human Services, the General Assembly, or any other unit of government should take in order to address the impacts of PFAS, including GenX, on surface water and groundwater quality, as well as air quality in the State.*” In addition, Section 13.1(g) states, “*No later than December 1, 2019, Collaboratory shall report the results of such sampling by identifying chemical families detected at each intake to the Environmental Review Commission, the Department of Environmental Quality, the Department of Health and Human Services, and the United States Environmental Protection Agency.*”

Subsequently, two additional laws were passed that included sections pertaining to changes in the reporting requirements. Senate Bill 433 was ratified by the NCGA and adopted November 6, 2019 as Session Law 2019-241. Section 7.(d) contains a revision to the original language from Section 13.1(g) of SL 2018-5, extending the deadline for submission of the Collaboratory’s PFAST Network final report to October 15, 2020. Data and recommendations from the Collaboratory Firefighting Foam inventory project will also be included in the Network’s final report. Section 8.(a) of Session Law 2020-74 (House Bill 308) effective July 1, 2020, further extended the final report deadline to April 15, 2021. The legislative language from Section 7 of SL 2019-241 and Section 8 of SL 2020-74 are provided for reference in Appendix II and III, respectively. Extensions were granted (without additional appropriations) to ensure sufficient time for completing comprehensive data analysis and interpretation and to enable additional sample collections during different seasons.

This tenth and final progress update fulfills the initial NCGA requirement for submission of quarterly progress reports and summarizes the work carried out since October 1, 2020. A final report with findings and recommendations will be submitted by the Collaboratory to the NCGA Environmental Review Commission, NC Department of Environmental Quality, NC Department of Health and Human Services, and US EPA (Region 4) no later than April 15, 2021.

3.0 QUARTERLY PROGRESS UPDATE

The COVID-19 pandemic has impacted the remaining sample collections and laboratory experiments and has prevented in-person meetings since March of 2020. Academic labs are operating at reduced capacities, and the Network researchers are holding and attending all meetings virtually. During this past quarter from October 1, through December 31, 2020, researchers have been working to finish their assessments of baseline levels of PFAS in North Carolina public drinking water supplies, private wells, wastewater (influent and effluent), landfill leachates, rainwater and ambient air (gas and particle phases). Additional areas being investigated include: the presence and impacts of PFAS in ecologically relevant animal species such as alligators and different species of fish; effects of soil composition on uptake and distribution of PFAS in crop plants; and effects of PFAS exposure on the immune response, pregnancy, and development.

The Network **Communications** team and the **Data Science and Management** team have been working with the research teams to share preliminary (pending publication) results with various stakeholders. The Communications team wrapped up their fall virtual seminar series with 3 webinars that included presentations from Network researchers and stakeholders. Panelists provided insights and answered questions related to: PFAS Sources and Contamination Reduction (Oct. 9th); PFAS in Plants and Fish (Oct. 23rd); and PFAS and Health: How Toxic are PFAS? (Nov. 6th). The seminars drew a lot of interest with over 150 attendees. The promotional flyers are included in Appendix IV of this report, and links to the recorded sessions are available on the Resources page of the PFAST Network [website](#). Researchers also participated in an on-line public forum sponsored by the North Carolina Coastal Federation and their partners on October 22, 2020. This event had 213 attendees including 3 news outlets and several elected officials. A copy of the agenda is included as Appendix V of this report. The much anticipated DataHub is nearing completion and roll-out; the team has been updating some of the data visualization features based on feedback from the beta testers.

Brief progress updates provided by PFAST Network research teams are described below.

PFAS Water Sampling and Analysis

- Round 2 sampling will resume in January and is expected to be completed by the end of February 2021. Sample collection kits and instructions are being mailed to drinking water providers for them to supply samples of untreated [drinking] water back to the analytical labs. Targeted and nontargeted analysis will be performed weekly as samples are received back from the water system operators.
- Total fluorine analysis via Adsorbable Organic Fluorine (AOF) measurements has been completed by Dr. Mei Sun's group for all Round 1 water samples including ~10% replicates. The AOF levels of most samples were below the limit of quantitation (LOQ) of 400 ng/L (parts per trillion). Several samples containing high levels of AOF (but low summed targeted PFAS) will be further analyzed by non-targeted analysis to identify the species of the organic fluorine in the sample. The team has prepared a manuscript for submission to a peer-reviewed scientific journal in which they detail the updated and validated AOF method and its application in analyzing water samples with potential PFAS contamination.

- Method development was completed for suspect screening and nontargeted analysis on the high resolution mass spectrometer (Agilent qTOF) at NC State University. Seven samples were prioritized for analysis based on having high organic fluorine concentration detected by AOF as compared to low total PFAS concentration from targeted mass spectrometric analysis. Six additional samples were prioritized for analysis based on having (relatively) low AOF concentration compared to high total PFAS by targeted analysis. The remaining samples will be similarly prioritized according to discrepancy between AOF and targeted mass spec concentrations and then analyzed beginning January 2021.
- Preliminary results were presented at the Society of Environmental Toxicology and Chemistry (SETAC) North America 41st Annual Meeting, on-line November 15-19, 2020:
 - “Analytical and Site Assessment Tools to Understand the Fate and Transport of PFAS at Contaminated Sites”, oral presentation
Noelle DeStefano*, Abigail Joyce, Yuling Han, Mei Sun, Nancy Lee Alexander, Lee Ferguson and Detlef Knappe.
 - “Analytical Strategies to Close the Fluorine Mass Balance for PFAS in North Carolina Drinking Water Sources”, poster presentation
Abigail Joyce*, Noelle DeStefano, Detlef Knappe and Lee Ferguson.

Private Well Risk Modeling

- In October 2020, the group led by David Genereux at NC State University carried out new research field work that had been greatly delayed by the pandemic. They measured groundwater flow rates and collected groundwater samples for analysis of PFAS and age-dating tracers at 20 locations surrounding the Fayetteville Works site, to better establish the relationship between the age of groundwater and its PFAS concentration, and to help forecast the rate of PFAS flushing from the groundwater system.
- They also began a new collaboration with Duke researcher Heather Stapleton on PFAS concentration and export in the Cape Fear River watershed over the past two years. The collaboration is spearheaded by NC State post-doctoral researcher Marie-Amelie Pétré, and also involves Dr. Genereux and faculty members in Civil Construction and Environmental Engineering at NC State (Detlef Knappe and Dan Obenour). Data from the Cape Fear Public Utility Authority and from Dr. Stapleton are being analyzed to quantify river export of PFAS in the Haw River upstream of Lake Jordan and in the Cape Fear River near Wilmington.
- The team re-submitted a paper to the scientific journal *Environmental Science & Technology (ES&T)* in which they report rates of PFAS discharge from groundwater to streams in the area around the Fayetteville Works. They also had two conference presentations:
 - “Per- and polyfluoroalkyl substance (PFAS) transport from groundwater to streams near a PFAS manufacturing facility in North Carolina”, oral presentation at the Geological Society of America Annual Meeting, 25-28 October 2020.
M.A. Pétré*, L. Koropecj-Cox, S. Duboscq, D.P. Genereux, D.R.U. Knappe, T.E. Gilmore, and Z.R. Hopkins.

- “³H/³He groundwater ages and discharge of PFAS from groundwater to a coastal plain stream in North Carolina”, oral presentation at the American Geophysical Union Fall Meeting, 1-17 December 2020.
S. Duboscq*, D.P. Genereux, T.E. Gilmore, M.A. Pétré, D.K. Solomon, D.R.U. Knappe, Z.R. Hopkins and N.J. DeStefano.
- The group at UNC Chapel Hill led by Adjunct Professor Jacqueline MacDonald Gibson had a manuscript accepted for publication in the *Journal of Hazardous Materials*:
 - “Predicting the risk of GenX contamination in private well water using a machine-learned Bayesian network model”
Contributing authors: Javad Roostaei, Sarah Colley, Riley Mulhern, Andrew May, and Jacqueline MacDonald Gibson.

PFAS Removal Performance Testing

- Experiments with ion exchange resins were conducted by Mei Sun’s group at UNC Charlotte to evaluate the effect of major anions in water, including chloride, sulfate, and nitrate, on the performance of PFAS-specific resin (PFA694E) and regenerable resin (IRA910). The team also set up and started rapid small-scale column tests with PFA694E for removing PFAS from groundwater.
- Electrochemical mineralization of GenX was tested using the BDD-iii reactor with boron doped diamond anode and titanium cathode (current density of 20 mA/cm²). In 6 hours, 47% GenX mineralization was achieved (compared to 80% for PFOA).
- Mei Sun’s lab also evaluated the effectiveness of replacing the current absorption solution (methanol + water) with a PFOA solution in a 20 mA/cm² PFOA degradation test. This would be helpful in setting up a continuous reactor where the reservoir of PFAS sample serves as the absorption solution. Only 60% fluorine mass balance was achieved however, so it was concluded that a PFOA solution cannot replace the current absorption solution.
- A new continuous reactor was designed in AutoCAD 3D, and prototypes of this reactor were 3D-printed using PLA (polylactic acid) material. The new continuous reactor and the original polypropylene reactor are being CNC-machined to ensure material compatibility and water tightness. GenX degradation tests will be conducted using the new continuous reactor setup at 1, 5, and 10 mA/cm² for a duration of 24 h. Once the optimal current density and duration are determined, electrochemical degradation of AFFF samples will be investigated.

Air Emissions and Atmospheric Deposition

- Team members attended the American Geophysical Union (AGU) Fall Virtual Meeting held December 1-17, 2020 and presented a poster:
 - “Atmospheric Flux of Legacy and Emerging Per- and Polyfluoroalkyl Substances (PFAS) through Wet and Dry Deposition at Wilmington North Carolina”.
Contributing authors: Megumi S. Shimizu*, Rachael Mott, Ariel Potter, Jennifer Harfmann, Brooks Avery, Robert J. Kieber, Ralph N. Mead, Stephen Andrew Skrabal, Joan D. Willey, Barbara J. Turpin, Jiaqi Zhou, and Karsten Baumann.
- The group led by Ralph Mead at UNC Wilmington submitted a manuscript to the scientific

journal *Environmental Science & Technology (ES&T) Letters* and are currently working on revisions based on reviewer comments:

- “Atmospheric deposition and annual flux of legacy perfluoroalkyl substances and replacement perfluoroalkyl ether carboxylic acids in Wilmington NC, USA”
Contributing authors: Megumi S. Shimizu, Rachael Mott, Ariel Potter, Jiaqi Zhou, Karsten Baumann, Jason D. Surratt, Barbara Turpin, G. Brooks Avery, Jennifer Harfmann, Robert J. Kieber, Ralph N. Mead, Stephen A. Skrabal, and Joan D. Willey.
- The group at UNC Chapel Hill led by Barbara Turpin submitted a manuscript to the scientific journal *Environmental Processes and Impacts* describing their workflow and results from targeted analysis of PFAS in atmospheric samples:
 - “PFOS Dominates PFAS Composition in Ambient Fine Particulate Matter (PM_{2.5}) Collected Across North Carolina Nearly 20 Years After the End of Its US Production”
Contributing authors: Jiaqi Zhou, Karsten Baumann, Ralph N. Mead, Steven A. Skrabal, Robert J. Kieber, Gene B. Avery, Megumi Shimizu, Jamie C. DeWitt, Mei Sun, Wanda Bodnar, Zhenfa Zhang, Leonard B. Collins, Jason D. Surratt, and Barbara J. Turpin.

Other Applied Research Opportunities:

Novel PFAS Inputs into the environment: landfill leachates and wastewater treatment:

- All analytical and sample preparation issues were resolved in November. Morton Barlaz’s group has completed extraction of all landfill leachate samples, and they are now awaiting analysis at NC State University’s analytical lab (METRIC). They completed extractions of wastewater samples in December and METRIC personnel expect to finish the analytical work by the end of January 2021.

Novel PFAS Inputs into the environment: PFAS bioaccumulation and distribution in crop plants

- Owen Duckworth and his group at NC State University had two presentations in which they shared results from their evaluation of GenX and PFAS contaminant uptake by food plants and the effects of soil composition on uptake:
 - “GenX and PFAS uptake by food plants”, oral presentation at the PFAS Testing Network Seminar, October 23, 2020.
O.W. Duckworth*, Y. Li, Y. Xhu, W.W. Broome, and D. Knappe.
 - “Per- and Polyfluoroalkyl Substance Uptake By Lettuce from Contaminated Soil”, oral presentation at the American Society of Agronomy (ASA), Crop Science Society of America (CSSA) & Soil Science Society of America (SSSA) International Annual Meeting, November 9-13, 2020.
O.W. Duckworth*, Y. Li, Y. Xhu, W.W. Broome, and D. Knappe.
- Owen Duckworth and Detlef Knappe are Co-investigators on a new grant from the North Carolina Department of Justice:
 - “Occurrence and Fate of Per- and Polyfluoroalkyl Substances (PFAS) in North Carolina Agricultural Systems”
PI: Kulezsa; Co-PIs: Knappe, Duckworth, Amoozegar; Total funds: \$242,021

Health effects following exposure: mouse model of immunotoxicity:

- Jamie DeWitt’s group at East Carolina University finished most of the planned animal studies with: PFMOAA (and repeat); PFMOBA; PFMOPrA; Nafion Byproduct 2 (and repeat); and a mixture of PFMOAA with Nafion Byproduct 2 (repeat still needed). They had planned to evaluate six individual PFAS and one mixture but due to the need to repeat PFMOAA and Nafion Byproduct 2, they were only able to assess four PFAS and a mixture while still performing the scheduled number of studies. The repeat and mixtures studies were supported by funds from a Brody Brothers Endowment award. The team is now getting ready to start on “Phase II” of their 2020 funding from the Collaboratory to address additional PFAS found in NC.
- The group had two panel presentations at the virtual Society of Environmental Toxicology and Chemistry (SETAC) North America 41st Annual Meeting, November 15-19, 2020:
 - “Descriptive toxicological and immunotoxicological findings of PFAS of concern in North Carolina Waters”, Tracey Woodlief*, Qing Hu, Jeffery Ayala, Mark Ibrahim, and Jamie DeWitt.
 - “Does exposure to per- and polyfluoroalkyl substances found in the Cape Fear River of North Carolina induce Immunotoxicity?” Emma Tobin*, Jeffery Ayala, Mark Ibrahim, Tracey Woodlief, and Jamie DeWitt.
- Dr. DeWitt was invited to speak at a large number of events in the last quarter of 2020 :
 - “Forever Chemicals.” Tell me about it Tuesdays, Sound Rivers Science Series. Virtual Talk.
 - “Why Uncovering Immunotoxicological Impacts of Understudied PFAS are Public Health Protective.” PharmTox Seminar, Michigan State University, Virtual Seminar.
 - “Let’s not forget about the T in the PBMT of PFAS: An Overview of what we know about PFAS Toxicity.” EHSC 8030 Environmental Health Science, College of Public Health, University of Georgia, Virtual Seminar.
 - “What can Science tell us about Potential Health Effects of PFAS found in NC: Why Understanding Effects of PFAS on the Immune System is Important.” PFAST Network Webinar.
 - “PFAS 101: A 10-minute Primer on Per- and Polyfluoroalkyl Substances.” NAS Virtual Workshop on Federal Government Human Health PFAS Research.
 - “Immune Investigations of some of the Understudied PFAS found in the Cape Fear River.” NC Coastal Federation Emerging Contaminants in North Carolina Waters, Virtual Seminar.
 - “Immunotoxicological Evaluation of Understudied Per- and Polyfluoroalkyl Substances found in North Carolina.” WVU Microbiology & Women in Biomedical Science Seminar, Virtual Seminar.
 - “PFAS: Why Immune Effects are Relevant Points of Departure for these Multisystem Toxicants.” M-LEEaD Virtual Mini-Symposium on Per- and Polyfluoroalkyl Substances (PFAS): Exposure, Toxicity, and Policy at the University of Michigan, Virtual Seminar.
 - “Why Uncovering Immunotoxic Outcomes of PFAS can be a Health Protective Strategy.” Department of Environmental Medicine, NIEHS Environmental Health Sciences Center Seminar Series, University of Rochester, Virtual Seminar.

APPENDIX I

LEGISLATIVE LANGUAGE PASSED BY THE NORTH CAROLINA GENERAL ASSEMBLY

(Session Law 2018-5, Sections 13.1.(f) - (l), effective June 12, 2018)

FUNDING TO ADDRESS PER- AND POLY-FLUOROALKYL SUBSTANCES, INCLUDING GENX/USE OF EXPERTISE AND TECHNOLOGY AVAILABLE IN INSTITUTIONS OF HIGHER EDUCATION LOCATED WITHIN THE STATE

SECTION 13.1.(f) The General Assembly finds that (i) per- and poly-fluoroalkyl substances (PFAS), including the chemical known as "GenX" (CAS registry number 62037-80-3 or 13252-13-6), are present in multiple watersheds in the State, and impair drinking water and (ii) these contaminants have been discovered largely through academic research not through systematic water quality monitoring programs operated by the Department of Environmental Quality or other State or federal agencies. The General Assembly finds that the profound, extensive, and nationally recognized faculty expertise, technology, and instrumentation existing within the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions of higher education located throughout the State should be maximally utilized to address the occurrence of PFAS, including GenX, in drinking waterresources.

SECTION 13.1.(g) The North Carolina Policy Collaboratory at the University of North Carolina at Chapel Hill (Collaboratory) shall identify faculty expertise, technology, and instrumentation, including mass spectrometers, located within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, and coordinate these faculty and resources to conduct nontargeted analysis for PFAS, including GenX, at all public water supply surface water intakes and one public water supply well selected by each municipal water system that operates groundwater wells for public drinking water supplies as identified by the Department of Environmental Quality, to establish a water quality baseline for all sampling sites. The Collaboratory, in consultation with the participating institutions of higher education, shall establish a protocol for the baseline testing required by this subsection, as well as a protocol for periodic retesting of the municipal intakes and additional public water supply wells. No later than December 1, 2019, Collaboratory shall report the results of such sampling by identifying chemical families detected at each intake to the Environmental Review Commission, the Department of Environmental Quality, the Department of Health and Human Services, and the United States Environmental Protection Agency.

SECTION 13.1.(h) Beginning October 1, 2018, the Collaboratory shall report no less than quarterly to the Environmental Review Commission, the Department of Environmental Quality, and the Department of Health and Human Services on all activities conducted pursuant to this section, including any findings and recommendations for any steps the Department of Environmental Quality, the Department of Health and Human Services, the General Assembly, or any other unit of government should take in order to address the impacts of PFAS, including GenX, on surface water and groundwater quality, as well as air quality in the State.

SECTION 13.1.(i) Five million thirteen thousand dollars (\$5,013,000) of the funds appropriated in this act for the 2018-2019 fiscal year to the Board of Governors of The University of North Carolina shall be allocated to the Collaboratory to manage and implement the requirements of this section, which shall include distribution to the Collaboratory and participating institutions of higher education (i) to cover costs incurred as a result of activities conducted pursuant to this section, (ii) for acquisition or modification of essential scientific instruments, or (iii) for payments of costs for sample collection and analysis, training or hiring of research staff and other personnel, method development activities, and data management, including dissemination of relevant data to stakeholders. No overhead shall be taken from these funds from the participating institutions that receive any portion of these funds. Funds appropriated by this section shall not revert but shall remain available for nonrecurring expenses.

SECTION 13.1.(j) The Collaboratory should pursue relevant public and private funding opportunities that may be available to address the impacts of PFAS, including GenX, on surface water and groundwater quality, as well as air quality, in order to leverage funds appropriated by this section, or any other funds provided to the Collaboratory, including the Challenge Grant authorized in Section 27.5 of S.L. 2016-94, as amended by Section 10.4(a) of S.L. 2017-57.

SECTION 13.1.(k) In the event that the United States Environmental Protection Agency no longer provides access to its analytical instrumentation at no cost to the State for water quality sampling analysis related to per- and poly-fluoroalkyl substances (PFAS), including the chemical known as "GenX" (CAS registry number 62037-80-3 or 13252-13-6), or if the Department of Environmental Quality determines that such analysis is not being performed in a sufficiently timely manner, the Collaboratory shall coordinate such analysis in the most cost-effective manner using relevant faculty expertise, technology, and instrumentation, including mass spectrometers, existing throughout institutions of higher education located throughout the State, until such time as the Department of Environmental Quality is able to perform such analysis with instrumentation acquired pursuant to subsection (q) of this section. The Collaboratory, in consultation with the Department and relevant experts across institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, shall establish a protocol for delivery of such samples taken by the Department to the entity designated to perform analysis of the samples, chain of custody protocols, and other matters to ensure proper handling and processing of the samples, which protocols shall be subject to approval by the United States Environmental Protection Agency, if such approval is required pursuant to authority delegated from the United States Environmental Protection Agency to the Department to administer federal environmental law.

SECTION 13.1.(l) The Collaboratory shall identify faculty expertise within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, and use technology and instrumentation existing throughout the institutions to conduct the following research (i) develop quantitative models to predict which private wells are most at risk of contamination from the discharge of PFAS, including GenX; (ii) test the performance of relevant technologies in removing such compounds; and (iii) study the air emissions and atmospheric deposition of PFAS, including GenX. In addition, Collaboratory may, using relevant faculty expertise, technology, and instrumentation existing throughout institutions identified, evaluate other research opportunities and conduct such research for improved water quality sampling and analyses techniques, data interpretation, and potential mitigation measures that may be necessary, with respect to the discharge of PFAS, including GenX.

APPENDIX II

LEGISLATIVE LANGUAGE PASSED BY THE NORTH CAROLINA GENERAL ASSEMBLY

(Session Law 2019-241, Sections 7.(a) - (d), effective Nov. 6, 2019)

GENERAL ASSEMBLY OF NORTH CAROLINA SESSION 2019

SESSION LAW 2019-241 SENATE BILL 433

AN ACT TO MAKE VARIOUS CHANGES TO THE STATUTES GOVERNING THE DEPARTMENT OF NATURAL AND CULTURAL RESOURCES AND TO REMOVE CERTAIN LANDS FROM THE STATE NATURE AND HISTORIC PRESERVE, AS RECOMMENDED BY THE DEPARTMENT; TO AMEND CERTAIN REPORTS OF THE NORTH CAROLINA POLICY COLLABORATORY TO THE GENERAL ASSEMBLY; TO CLARIFY CERTAIN APPROPRIATIONS IN THE 2018 HURRICANE FLORENCE DISASTER RECOVERY ACT; TO CORRECT AN EFFECTIVE DATE; TO REPEAL AND REPLACE AN ACT PROVIDING FOR EMERGENCY OPERATING FUNDS FOR UTILITIES; TO ADJUST FOR INFLATION THE THRESHOLD FOR DEPARTMENT OF ADMINISTRATION APPROVAL OF STATE LEASES; AND TO CLARIFY AND AMEND THE SEPTIC TANK SITE SUITABILITY DETERMINATION PROCESS.

The General Assembly of North Carolina enacts:

COLLABORATORY/FIREFIGHTING FOAM

SECTION 7.(a) The North Carolina Policy Collaboratory at the University of North Carolina at Chapel Hill (Collaboratory) shall create an inventory of aqueous film-forming foam (AFFF) used or stored by fire departments in North Carolina operated, managed, or overseen by units of local government, including those located at or serving airports. This inventory shall include, at a minimum, the following:

- (1) The name and address of each fire department that owns or otherwise has on the premises of a fire station a firefighting vehicle that carries AFFF or a storage tank or other vessel for AFFF.
- (2) The volume, trade name, and CAS number of AFFF used by each department in 2018 for fighting fires or firefighter training.
- (3) The number of firefighting vehicles carrying AFFF and the volume of AFFF carried by each vehicle.
- (4) Each fire department's annual cost of acquiring AFFF and last known purchases of AFFF.
- (5) The volume, trade name, and CAS number of AFFF stored by each fire department or unit of local government for firefighting use and the portion of these AFFFs that are no longer utilized and could be removed from inventory for disposal.
- (6) Other data deemed relevant by the Collaboratory to establish a statewide inventory of AFFF used for fighting fires or firefighter training.

The Office of the State Fire Marshal of the Department of Insurance and all units of local government shall provide any assistance requested by the Collaboratory to acquire and compile the data required by this section.

SECTION 7.(b) The North Carolina Policy Collaboratory at the University of North Carolina at Chapel Hill (Collaboratory) shall develop a proposal for identifying and collecting AFFF that is expired or no longer needed or wanted by each fire department in North Carolina operated, managed, or overseen by units of local government, including those located at or serving airports. This proposal should include recommendations on which State agency or agencies could oversee such a collection effort and cost estimates on this collection, stockpiling, and disposal. The Department of Insurance Office of the State Fire Marshal, the Department of Environmental Quality, the Department of Health and Human Services, and the Department of Public Safety shall provide any assistance requested by the Collaboratory to acquire and compile the data required by this section.

SECTION 7.(c) The Collaboratory shall submit an interim report with the results of the studies required by subsections (a) and (b) of this section no later than April 1, 2020, and a final report no later than October 15, 2020, to the Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources and the Environmental Review Commission.

SECTION 7.(d) Section 13.1(g) of S.L. 2018-5 reads as rewritten:

"SECTION 13.1.(g) The North Carolina Policy Collaboratory at the University of North Carolina at Chapel Hill (Collaboratory) shall identify faculty expertise, technology, and instrumentation, including mass spectrometers, located within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, and coordinate these faculty and resources to conduct nontargeted analysis for PFAS, including GenX, at all public water supply surface water intakes and one public water supply well selected by each municipal water system that operates groundwater wells for public drinking water supplies as identified by the Department of Environmental Quality, to establish a water quality baseline for all sampling sites. The Collaboratory, in consultation with the participating institutions of higher education, shall establish a protocol for the baseline testing required by this subsection, as well as a protocol for periodic retesting of the municipal intakes and additional public water supply wells. No later than ~~December 1, 2019~~, October 15, 2020, the Collaboratory shall report the results of such sampling by identifying chemical families detected at each intake to the Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, the Environmental Review Commission, the Department of Environmental Quality, the Department of Health and Human Services, and the United States Environmental Protection Agency.

APPENDIX III

LEGISLATIVE LANGUAGE PASSED BY THE NORTH CAROLINA GENERAL ASSEMBLY

(Session Law 2020-74, Section 8.(a), effective July 1, 2020)

GENERAL ASSEMBLY OF NORTH CAROLINA SESSION 2019

SESSION LAW 2020-74 HOUSE BILL 308

AN ACT TO PROVIDE FURTHER REGULATORY RELIEF TO THE CITIZENS OF NORTH CAROLINA.

The General Assembly of North Carolina enacts:

COLLABORATORY REPORTING CHANGES

SECTION 8.(a) Section 13.1(g) of S.L. 2018-5, as amended by Section 7(d) of S.L. 2019-241, reads as rewritten:

"SECTION 13.1.(g) The North Carolina Policy Collaboratory at the University of North Carolina at Chapel Hill (Collaboratory) shall identify faculty expertise, technology, and instrumentation, including mass spectrometers, located within institutions of higher education in the State, including the Universities of North Carolina at Chapel Hill and Wilmington, North Carolina State University, North Carolina A&T State University, Duke University, and other public and private institutions, and coordinate these faculty and resources to conduct nontargeted analysis for PFAS, including GenX, at all public water supply surface water intakes and one public water supply well selected by each municipal water system that operates groundwater wells for public drinking water supplies as identified by the Department of Environmental Quality, to establish a water quality baseline for all sampling sites. The Collaboratory, in consultation with the participating institutions of higher education, shall establish a protocol for the baseline testing required by this subsection, as well as a protocol for periodic retesting of the municipal intakes and additional public water supply wells. No later than ~~October 15, 2020~~, April 15, 2021, the Collaboratory shall report the results of such sampling by identifying chemical families detected at each intake to the Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, the Environmental Review Commission, the Department of Environmental Quality, the Department of Health and Human Services, and the United States Environmental Protection Agency."

APPENDIX IV

NC PFAS TESTING NETWORK FALL 2020 VIRTUAL SEMINAR SERIES
Recordings available on NC PFAST Network website ([click here](#))

PFAS Testing Network Seminar Series: *PFAS in Drinking Water Sources*

Want to know the latest on PFAS in North Carolina water?



Detlef Knappe

Friday, September 18 | 10-11 AM

Join us for a discussion with network experts and representatives from riverkeepers, public utilities and NC DEQ.



Helena Mitsova

How to Join:

Zoom - ncsu.zoom.us/s/91030580423 |
 Or call in at +1 (646) 518-9805 | Meeting ID: 910 3058 0423



PFAS Testing Network Seminar Series: *PFAS and Contamination Reduction*

Want to know more about PFAS contamination in North Carolina?



Morton Barlaz

Friday, October 9 | 10-11 AM

Join us for a discussion with network experts and representatives from Cape Fear River Watch, National Institutes of Health and NC DEQ.



Mei Sun

How to Join:

Zoom - ncsu.zoom.us/s/95270108493 |
 Or call in at +1 (646) 518-9805 | Meeting ID: 952 7010 8493



PFAS Testing Network Seminar Series: *PFAS in Plants and Fish*

Want to know more about PFAS in North Carolina plants and aquatic animals?



Owen Duckworth

Friday, October 23 | 10-11 AM

Join us for a discussion with network experts and representatives from NC State Extension, and other stakeholders.



Scott Belcher

How to Join:

Zoom - [ncsu.zoom.us/s/96633071216](https://ncsu.zoom.us/j/96633071216) |
Or call in at +1 (646) 518-9805 | Meeting ID: 966 3307 1216



PFAS Testing Network Seminar Series: *How Toxic are PFAS?*

What can science tell us about potential health effects of PFAS found in NC?



Jamie DeWitt

Friday, November 6 | 10-11 AM

Join us for a discussion with network experts and representatives from NC Department of Health and Human Services and others.



Rebecca Fry

How to Join:

Zoom - [ncsu.zoom.us/s/98443700215](https://ncsu.zoom.us/j/98443700215) |
Or call in at +1 (646) 518-9805 | Meeting ID: 984 4370 0215



APPENDIX V

NC COASTAL FEDERATION VIRTUAL PUBLIC FORUM AGENDA



North Carolina
Coastal Federation
Working Together for a Healthy Coast

Emerging Contaminants in North Carolina Waters

October 22, 2020 10:00 am – 12:30 pm

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- | | |
|----------------|---|
| 10:00am | Welcome and opening remarks
<i>Kerri Allen, North Carolina Coastal Federation</i> |
| 10:05am | Overview of the N.C. PFAS Testing Network
<i>Dr. Jason Surratt, UNC Chapel Hill</i> |
| 10:15am | Update on PFAS Occurrence in North Carolina Drinking Water Sources
<i>Dr. Detlef Knappe, N.C. State University</i> |
| 10:40am | Atmospheric PFAS in North Carolina – Air and Deposition
<i>Dr. Megumi Shimizu, UNC Wilmington</i>
<i>Dr. Jiaqi Zhou, UNC Chapel Hill</i> |
| 11:00am | Comparing Residential Water Filters: What Works Best to Remove PFAS?
<i>Dr. Heather Stapleton, Duke University</i> |
| 11:20am | Immune Investigations of Some of the Understudied PFAS Found in the Cape Fear River
<i>Dr. Jamie DeWitt, East Carolina University</i> |
| 11:40am | NC DEQ: Monitoring and Control of PFAS in our Environment
<i>Sheila Holman, Assistant Secretary for Environment, NC DEQ</i> |
| 12:00pm | Addressing PFAS in Drinking Water: A Progress Report
<i>Carel Vandermeijden, Deputy Executive Director, CFPUA</i>
<i>Vaughn Hagerty, Public Information Officer, CFPUA</i> |
| 12:25pm | Closing remarks and recognition
<i>Tracy Skrabal, North Carolina Coastal Federation</i> |
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Each presentation will be followed by Q&A

- Please ask your questions by typing them into the “chat” feature on Zoom.
 - If possible, please specify which presenter your question is directed towards.
 - We realize not all questions will be addressed in the time allotted. We will archive questions and do our best to respond via email, after the event.
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If you're interested in learning more, subscribe to updates at nccoast.org/genx

