ANNUAL REPORT

Massachusetts Toxics Use Reduction Program

FISCAL YEAR 2021

Massachusetts
Toxics Use Reduction

Report Submitted to:

The Governor of the Commonwealth of Massachusetts
The Commonwealth of Massachusetts House of Representatives
The Commonwealth of Massachusetts Senate

Prepared by the Office of Technical Assistance and Technology in collaboration with the Toxics Use Reduction Institute and the Massachusetts Department of Environmental Protection
December 2022

TURA Agencies

Massachusetts Department of Environmental Protection (MassDEP)
One Winter Street, Boston, MA 02108
(617) 292-5500
https://www.mass.gov/guides/massdep-toxics-use-reduction-program

Certifies Toxics Use Reduction (TUR) Planners, receives and reviews toxics use reports submitted by companies, provides guidance, takes enforcement actions, and collects chemical use data and makes it available to the public.

Office of Technical Assistance & Technology (OTA)
100 Cambridge Street, Suite 900, Boston, MA 02114
(617) 626-1060
www.mass.gov/eea/ota

A non-regulatory agency within the Executive Office of Energy and Environmental Affairs that provides free, confidential, on-site technical and compliance consultations to Massachusetts businesses and institutions.

Toxics Use Reduction Institute (TURI)
126 John Street Suite 14, Lowell, MA 01854
(978) 934-3275
https://www.turi.org/

Provides education, training, and grants for Massachusetts industry and communities; sponsors research and demonstration sites on safer materials and technologies; provides laboratory and library services and policy analyses; and manages the TURA Science Advisory Board.

Contents

Executive Summary

The Toxics Use Reduction Act (TURA) Program works with Massachusetts businesses and communities to reduce the use of toxic chemicals while investigating and promoting the adoption of safer alternatives. This work helps to protect human health and the environment, making Massachusetts a safer place to live and work while improving the competitiveness of Massachusetts businesses.

In Fiscal Year 2021 (FY21), the TURA program's work included grants, technical and lab assistance for businesses, educational materials, the ongoing oversight of toxics use reduction reporting and planner certification, and toxics use reduction policy activities.

Activities Related to the COVID-19 Pandemic

In light of the ongoing COVID-19 pandemic, the TURA partner agencies continued to adapt to remote operations. The Toxics Use Reduction Institute (TURI) shifted resources to focus on identifying safer cleaners and disinfectants, providing virtual trainings, upgrading chemical assessment tools, and educating businesses and the public about effective safer COVID-related cleaning options. The Office of Technical Assistance and Technology (OTA) created a virtual site-visit program to continue providing technical assistance to Massachusetts businesses. The Massachusetts Department of Environmental Protection (MassDEP), delayed the TUR Plan deadline from July 2020 to November 2020 in response to the effects of COVID on business and industry.

Toxics Use Reduction Grants

TURI supported projects by providing grants to enable the adoption of safer cleaning and disinfectant products and practices in businesses, schools and homes; the adoption of safer solvents in manufacturing and dry cleaning; and building awareness of toxics and safer alternatives in personal care products for Black women.

Technical Assistance and Lab Services for Massachusetts Businesses

OTA personnel worked closely with 26 Massachusetts facilities and provided recommendations related to regulations, pollution prevention, energy efficiency, and water conservation.

The TURI laboratory provided free services to manufacturers of medical devices, liquid cooling systems, vacuums & kitchen appliances, architectural signs, oils & lubricants, specialty chemicals, and industrial cutting tools, among others.

Educational Materials

TURI published a number of new resources, including an alternatives assessment report for the brewing industry; videos and case studies on Massachusetts businesses that have implemented toxics use reduction initiatives; and publications focused on natural grass as a substitute for artificial turf playing fields. TURI staff responded to a variety of inquiries about chemicals and products from individuals, businesses, state and municipal agencies, and others.

To assist companies in identifying and eliminating per-and polyfluoroalkyl substances (PFAS) in their operations, OTA created and distributed a supplier notification letter template for businesses to use to determine whether any PFAS listed under the Toxics Release Inventory were in use in their facilities. OTA also began developing industry-specific surveys aimed at finding common applications of PFAS in industry.

Toxics Use Reduction Reporting and Planner Certification

MassDEP processed approximately 1,300 chemical use reports from 410 facilities. 132 Toxics Use Reduction Planners are currently certified as having the training and expertise needed to review and approve toxics use reduction plans.

Toxics Use Reduction Policy Activities

Effective January 1, 2021, pursuant to EPCRA Section 313 and MGL 21I section 9(A), 172 per- and polyfluoroalkyl substances (PFAS) were added to the list of reportable substances in 301 CMR 41.00 (Toxic or Hazardous Substance List) following their inclusion in the Toxics Release Inventory (TRI).

Following the SAB's June 2020 recommendation to list a category of PFAS Not Otherwise Listed, defined as "those PFAS that contain a perfluoroalkyl moiety with three or more carbons (e.g., $–C_nF2_n–$, n ≥ 3; or CF3-$C_nF2_n–$, n≥2) or a perfluoroalkylether moiety with two or more carbons (e.g., $–C_nF2_nOC_mF2_m–$ or $–C_nF2_nOC_mF_m–$, n and m ≥ 1)," a policy analysis was prepared and presented to the Advisory Committee and the Administrative Council at multiple meetings in FY21.

The Science Advisory Board (SAB) reviewed quaternary ammonium compounds (QACs) and, in May 2021, recommended adding certain QACs—DDAC (5 CAS numbers) and ADBAC (19 CAS numbers)—to the TURA list. Late in FY21, in response to a petition, the SAB also began reviewing multi- and single-walled carbon nanotubes and carbon nanofibers.

Toxics Use Reduction in Massachusetts

Today, Massachusetts is significantly cleaner and safer because of the environmental initiatives required by the Toxics Use Reduction Act (TURA).

The 1989 legislation and the Toxics Use Reduction (TUR) Program has won awards from Harvard University's John F. Kennedy School of Government and the National Pollution Prevention Roundtable, has been recognized by independent research organizations such as the World Watch Institute, and has become a national model for toxics use reduction.

TURA's cornerstone principle is that the best mechanism for pollution reduction and prevention of human and environmental toxics exposures is to address the root cause: the decision to use toxics in the first place. Facilities subject to TURA (TURA filers) are required to track and report the amounts of toxic chemicals used and generated as waste each year. This provides public information on the use and waste of covered toxic chemicals. In addition, every other year, TURA filers analyze whether it is in their best interest to adopt toxics use reduction techniques to use fewer pounds of toxic chemicals per unit of product produced.

Because the biennial Toxics Use Reduction Plans are designed to reveal cost savings opportunities, they lead to voluntary reductions in toxic chemical use, which lead to reductions in worker exposures, hazardous releases, and the generation of toxic wastes.

The resulting efficiencies, financial savings, product improvements, and improved environmental performance all work together to support the competitive position of Massachusetts businesses. Public data demonstrating progress by TURA filers is available through 2019.

Progress by TURA Filers

In 2019, the following chemical quantities were reported:

- Chemical use: 466 million pounds
- Byproduct generation: 65 million pounds
- Shipped-in product: 237 million pounds
- On-site releases: 2 million pounds
- Transfers off-site: 30 million pounds

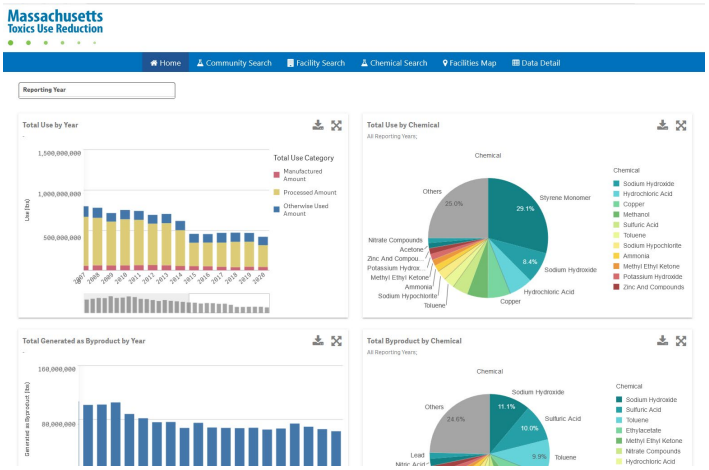
From 2007 to 2019, when adjusting for production, 2007 Core Group facilities achieved the following reductions:

- reduced toxic chemical use by 59%
- reduced toxic byproducts by 40%
- reduced toxics shipped in product by 39%
- reduced on-site releases of toxics to the environment by 73%
- reduced transfers of toxics off-site for further waste management by 17%

The 2007 "Core Group" includes all industry categories and chemicals that were subject to TURA reporting in 2007 and remained subject to reporting in 2019 at the same reporting threshold. This Core Group is used to measure progress from 2007 to 2019.

> ***"The solution we worked with [the TURA program] on … is both scalable and sustainable – consistent with our needs and mission."***
>
> Matthew Meisel, Chief Financial Officer, Little Leaf Farms

In FY21, TURI designed a new interface to give the public access to the TURA data. Users can search for information on chemical use, byproduct and releases reported under TURA for the last 30 years. Specifically, users can view information in their community or by certain industrial codes.



A partial screen shot of the new TURAData interface

FY21 Project Highlights

Pandemic-Related Activities

The TURA agencies shifted many projects to virtual workspaces upon the onset of the COVID-19 pandemic. Remote work continued throughout FY21 for all three administering agencies.

TURI continued to identify and test safer cleaners and disinfectants in response to ongoing questions about products effective against the COVID-19 virus. Lab staff also continued to conduct disinfection research in partnership with UMass Lowell Associate Professor Nancy Goodyear, a clinical microbiologist with expertise in safer disinfection. TURI created and delivered webinars on safer cleaning and disinfection to public and private audiences, updated website resources and chemical comparison tools, and funded community groups to disseminate information to schools and to the public.

TURI hosted continuing education conferences, held TUR demonstration events, and managed press and legislative outreach via virtual platforms.

Because OTA had been required to suspend in-person site visits starting in March 2020, OTA staff had developed a protocol to ensure the quality and consistency of virtual technical assistance visits, and a guidance document to prepare companies for virtual site visits. OTA began outreach to companies late in FY20 to conduct "dry run" virtual assistance visits to pilot-test and refine these documents. The first of these visits was conducted in July 2020. Based on these "dry run" visits, OTA made minor modifications to its protocols and guidance document, and continued to offer virtual assistance to companies for the remainder of FY21.

OTA and TURI also participated in the Toxic Reduction Task Force to develop recommendations on safer cleaning and disinfection for Massachusetts facilities and contracts. These activities are further detailed beginning on page 16.

In order to provide TURA filers with needed time to prepare their TURA Plans and submit their Plan Summaries, MassDEP extended the deadline for submissions from July 1, 2020, to November 1, 2020.

Meetings of public bodies, including the TURA Administrative Council, Advisory Committee, and Science Advisory Board, continued to be held remotely throughout FY21, consistent with An Act Extending Certain COVID-19 Measures Adopted During the State of Emergency. This Act included an extension, until July 15, 2022, of the remote meeting provisions of Governor Baker's March 12, 2020, Executive Order resulting from the outbreak of the COVID pandemic.

Per- and Polyfluoroalkyl Substances

TURA Program staff continued their activities on per-and polyfluoroalkyl substances.

TURA List Updates: Effective January 1, 2021, pursuant to EPCRA Section 313 and MGL 21I, section 9(A), 172 per- and polyfluoroalkyl substances (PFAS) were added to the list of reportable substances in 301 CMR 41.00 (Toxic or Hazardous Substance List) following their inclusion in the Toxics Release Inventory (TRI).

Following the Science Advisory Board's June 2020 recommendation to list a category of Certain PFAS Not Otherwise Listed, defined as "those PFAS that contain a perfluoroalkyl moiety with three or more carbons (e.g., –CnF2n–, n ≥ 3; or CF3-CnF2n–, n≥2) or a perfluoroalkylether moiety with two or more carbons (e.g., –CnF2nOCmF2m– or –CnF2nOCmFm–, n and m ≥ 1)," TURI prepared a policy analysis and presentations for the Advisory Committee and Administrative Council, conferred with OTA and MassDEP, and recommended that a category be added to the TURA list, a process that was finalized in FY22.

Education: TURA Program staff developed several resources for companies seeking to reduce or eliminate PFAS in their facilities, including a supplier notification letter that facilities can use to communicate with suppliers about notification requirements under the Toxics Release Inventory and requesting information about any of the 172 listed PFAS in products. Program staff also conducted public presentations on PFAS source reduction, including webinars sponsored by the Massachusetts Environmental Health Association (MEHA) and Northeast Waste Management Officials Association (NEWMOA).

Surveys: Early in FY21, OTA identified four target industries where PFAS are commonly used (metal finishing, paper, coatings, and textiles) and conducted research on common PFAS applications in those industries. OTA began developing surveys about different products and raw materials that often contain PFAS, and processes where products containing PFAS are commonly used, with the goal of helping companies identify PFAS sources in their operations to help them reduce or eliminate it. During FY21, OTA produced a draft survey for the paper industry and began working on a survey for metal finishing companies. While developing these surveys, OTA collaborated with several other state environmental agencies, including the Michigan Department of Environment, Great

Lakes, and Energy; the Minnesota Technical Assistance Program; the Vermont Department of Environmental Conservation, and the Washington Department of Ecology.

Safer alternatives work: TURI and OTA assisted companies seeking to reduce their use of PFAS with identifying safer alternatives. One such company, having approached OTA and TURI for such assistance, received a TURI research grant to engage in a research collaboration with a UMass Lowell professor.

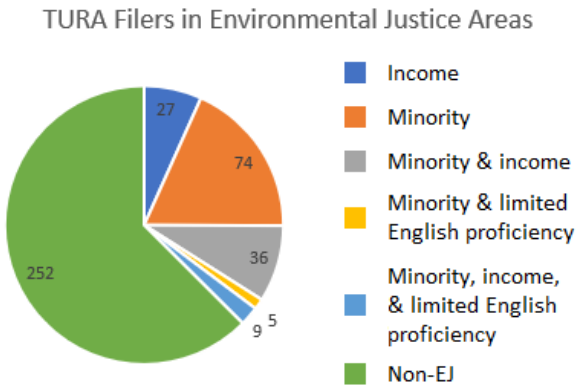
Drinking water protection: The persistence of PFAS and the expense and difficulty of remediation underscores the importance of source reduction. In FY21, OTA undertook a new collaboration in partnership with the Massachusetts Water Resources Authority (MWRA), the MassDEP Surface Water Discharge and Wastewater Residuals programs, the United States Environmental Protection Agency (EPA) Region 1, and local wastewater treatment facilities (WWTFs). The purpose of this work was to identify facilities located upstream from Drinking Water Protection Areas, especially in industries that fall within the TURA Program purview where PFAS are likely to be used, to assist these facilities with identifying and eliminating sources of PFAS in their operations. Local WWTFs, who already had relationships with Significant Industrials Users in their areas, conducted initial outreach to introduce OTA. Following this introduction, individual OTA staff contacted these facilities to offer information about PFAS, provide tools and resources, and offer tailored technical assistance.

Environmental Justice

Environmental justice (EJ) is based on the principle that all people have a right to be protected from environmental hazards and to live in and enjoy a clean and healthful environment regardless of race, color, national origin, income, or English language proficiency. A focus on environmental justice is necessary because not all communities are, or have historically been, equally protected from environmental health hazards. Environmental justice populations are populations that are especially vulnerable to environmental hazards.

To promote environmental justice across Massachusetts, the Executive Office of Energy and Environmental Affairs (EEA) has convened an Environmental Justice Task Force. This Task Force, comprising representatives from each EEA agency, is developing a Secretariat-wide EJ Strategy in accordance with the requirements of EEA's Environmental Justice Policy. The EJ Strategy directs EEA agencies to codify the key actions they are undertaking, or plan to undertake, to integrate environmental justice into their work.

Over a third of TURA-filing facilities are located within EJ areas. OTA has been conducting outreach to facilities located in EJ areas, as well as to municipalities and community groups to encourage these entities to refer businesses to OTA for assistance. During FY21, OTA continued this outreach, and began codifying its key actions for promoting environmental justice and supporting clients in integrating environmental justice principles into their toxics use reduction activities.



A chart depicting the numbers of TURA filers located in environmental justice (EJ) and non-EJ areas. Criteria defining EJ areas are broken out.

In fall 2020, OTA hired a paid Environmental Justice intern to identify potential business and community partners and develop outreach and educational materials, including the following project, related to environmental justice. The intern's work also included an internal reflection process for OTA concerning its environmental justice work, including interviewing and surveying staff and leading team discussions on EJ issues.

During this time, TURI worked with a capstone student in the UML Public Health program, who undertook a project to connect TURA facilities to environmental justice census blocks and examining the use of higher-hazard toxics in Massachusetts environmental justice communities.

On January 20, 2021, the TURA Program's environmental justice interns presented to TURA program staff about their respective work and about the overall integration of environmental justice principles into the work of the entire TURA Program.

Grant Projects

Each year, TURI allocates grants to Massachusetts businesses, community groups, municipalities, and industry-academic research partnerships to further the development, implementation, and dissemination of toxics use reduction strategies.

In FY21, TURI awarded $144,500 in grants to reduce the use of chemical solvents and pesticides, find safer cleaners and disinfectants, and educate workers and the public about toxics in safer cleaning and personal care products. The projects addressed areas including manufacturing, family gyms, food systems, dry cleaning, pharmaceutical production, housecleaning, and schools. See Appendix I for complete details on the grant projects.

Industry Grants

- **Steel Art Company, Inc. (Norwood),** a designer and manufacturer of architectural-quality signage, worked with the TURI Lab to find a safer substitute to n-propyl bromide.

Small Business Grants

- **Family Martial Arts Center (Leominster and Fitchburg)** re-opened their karate studios during the pandemic using safer cleaning and disinfecting systems and products.
- **Grove Hall Cleaners (Dorchester)** eliminated the use of perchloroethylene by switching to Professional Wet Cleaning.
- **Wellspring Harvest Corporation (Springfield),** an urban hydroponic greenhouse that grows lettuce, tomatoes and cucumbers, eliminated the use of pesticides by installing a misting system to control the growth of powdery mildew infestations on crops.

Academic Research Grants

- **Assistant Professor Wan-Ting Chen of Plastics Engineering at UMass Lowell partnered with Johnson Matthey (North Andover and Devens),** a manufacturer of active pharmaceutical ingredients and intermediates, to find safer alternatives to methylene chloride.

Community Grants

- **The Brazilian Women's Group (Brighton)** trained Brazilian domestic workers and other Portuguese-speaking women about how to make and use safer cleaning products.
- **The Clean Water Fund (Boston)** trained house cleaners, custodians, teachers and members of environmental justice communities about how to choose safer cleaning and disinfecting products amid the coronavirus pandemic.
- **Informed Green Solutions (Deerfield)** developed and shared information with schools about how the coronavirus spreads and the appropriate ways to choose and use safer cleaning and disinfecting products.
- **Silent Spring Institute (Newton)** shared information with Black women about how to select personal care and cleaning products that don't contain toxics, such as phthalates, parabens, phenols and antimicrobials.

Confidential Technical Assistance

OTA provides Massachusetts businesses with free, non-regulatory, and confidential assistance for toxics use reduction, energy and water conservation, regulatory compliance, and waste reduction. The technical assistance providers aim to help businesses save money while improving public and worker health through reducing toxics and conserving resources. OTA also holds trainings and produces content to inform toxics users about safer alternatives, toxics use reduction techniques, best practices, technologies, and environmental compliance topics.

During FY21, OTA worked closely with 26 Massachusetts facilities and provided recommendations related to regulations, pollution prevention, toxics use reduction, energy efficiency, and water conservation. Forty-six percent of those facilities were directly located in or within one half-mile of an environmental justice community (12 out of 26). OTA's work promoting environmental justice is discussed in greater detail on page 10.

All consultations with OTA technical assistance providers are bound by statutory confidentiality, unless waived by the company for case study development, special recognition, or other purposes. Confidentiality ensures that companies can form and maintain long-term partnerships with OTA. Through these relationships, OTA's technical assistance providers are able to help companies discover opportunities to reduce their use of toxic or hazardous materials and achieve cost savings in the process.

Technical assistance usually consists of a site visit, report delivery with recommendations based on the facility's needs and interests, and email and phone communications to discuss and assist with the implementation of recommendations. To maximize the benefit to the company, for each visit, a team of technical assistance providers is selected based on the company's stated needs and interests.

Susan Tilford, Ph.D., Applications Chemist at Stainless Steel Coatings, Inc. described OTA's assistance this way: "Jack Illingworth, Environmental Analyst, and Jim Cain, Environmental Engineer, of the Massachusetts Office of Technical Assistance (OTA) provided staff at Stainless Steel Coatings, Inc. with valuable assistance applying for a Category 3 Permit for Hazardous Materials Processing. They assured that we were familiar with the pertinent regulations and provided us with a Compliance Guide. Jack and Jim devoted ample time to thoroughly understand our processes while taking a virtual tour of our production facility since COVID protocols prohibited a site visit. The OTA overview and checklists for conducting a Process Hazards Analysis (PHA) were clearer and more informative than any document we found online. They carefully reviewed our PHA and the permit's supporting materials prior to the submission of the package to the local fire department. Thanks to the OTA's guidance, the permit was granted without modification. While working with us on the hazards permit, Jack and Jim also recommended pump technology we'll need for future process equipment and provided guidance on flammable storage and spray booth installation. For years, we have called on the OTA as an invaluable resource for information and knowledge to improve our production and safety practices. As our business continues to grow and new regulations take effect, we will surely turn anew to the OTA for its assistance."

Paul Watson, Ph.D., Environmental Regulatory Compliance Engineer at OFS Fitel, said, "In my role, I am expected to have knowledge on environmental regulations and to keep our facility in compliance with all applicable regulations. I believe the saying, 'you don't know what you don't know' is important to keep in mind when it comes to compliance with regulations. We have viewed the OTA as an important part of our internal self-audit system to stay abreast of regulations and help us with the "you don't know what you don't know". We appreciate being able to work with them while keeping conversations confidential, as this allows us to openly discuss any topic with them. I appreciate the time and attention that the OTA staff dedicates to help me with questions and topics regarding MassDEP and EPA regulations. Recently the OTA assisted our facility to understand and investigate possible PFAS sources…. Their no cost service is also great [and] eliminates the concern of spending when resources are tight. The OTA is like having a good friend you can trust and is there for you to talk to about all things regulatory."

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Paul Watson, Environmental Regulatory Compliance Engineer, OFS Fitel

Laboratory and Library Services

Laboratory Services

TURI's laboratory continues to provide free testing services to Massachusetts companies looking for safer cleaning alternatives. In FY21, the lab tested the performance of safer cleaning alternatives for nine Massachusetts businesses, primarily in the manufacturing industry, but also in the healthcare, agricultural, and public service sectors. The lab also provided technical support for three school districts on COVID-19 topics.

Additionally, the lab helped increase the available options for safer cleaning products by working on 30 fee-for-service testing projects for formulators of cleaning products. These projects were part of the companies' efforts to have products certified for Green Seal, EPA Safer Choice or UL Ecologo. Of these, two companies were from Massachusetts.

In FY21, TURI worked on updating its Cleanersolutions database of 25 years of lab test results, as well as the companion Pollution Prevention Options Analysis (P2OASys) tool, a web-based analysis tool that facilitates assessment of the relative hazards of chemical ingredients in household and industrial cleaners.

The lab continued to offer services to industry and the Commonwealth in janitorial cleaning. As the COVID-19 pandemic continued through FY21, lab staff worked extensively to train public and private organizations about safer cleaning and disinfecting. These activities included webinars, presentations, interviews, and publications as well as research on cleaning equipment and processes.

Additionally, lab staff and students, in conjunction with Dr. Nancy Goodyear of UMass Lowell, continued disinfection research and product testing to identify safer alternatives effective against COVID-19.

Library and Information Services

TURI maintains a library of monographs, periodicals, dissertations, as well as web-based materials related to toxics use reduction and pollution prevention. TURI staff also respond directly to information requests from businesses, state and municipal agencies, nongovernmental organizations, and individuals. During FY21, information requests included dozens of queries covering a variety of topics, including safer cleaners and disinfectants, particularly those effective against the coronavirus; artificial turf and organic grass; flame retardants; halogenated solvents; PFAS; TURA chemical reporting and planning; and the history of TURA and early pollution prevention programs.

Education and Training

Demonstration Events

TURI organizes industry demonstration events to highlight the efforts of facilities that have reduced their use of toxic chemicals and the TUR Planners that have helped in the process. During FY21, TURI organized three virtual demonstration events: River Street Metal Finishing, Morgan Advanced Materials, and CD Aero. River Street Metal Finishing installed a new acid purification system to reduce its use of sulfuric acid. Morgan Advanced Materials, a manufacturer of ceramic feedthroughs for the medical and aerospace industries, switched to a water-based cleaning system, eliminating the use of trichloroethylene (TCE). CD Aero, a manufacturer of electronic capacitors, also switched to an aqueous cleaning process, eliminating its use of n-propyl bromide.

Toxics Use Reduction Planner Continuing Education Conferences

TURI offers semi-annual Continuing Education conferences for TUR Planners to ensure that they have the most up-to-date information on chemical hazards, alternatives, and opportunities. The conferences allow planners to improve their skills and maintain their certifications. Due to the pandemic, both FY21 conferences were hosted online. At the fall 2020 conference, topics included safer cleaning and disinfection for businesses, the new TURAData website, successful TUR implementation stories and economic evaluation of TUR alternatives. The spring 2021 conference offered sessions on materials accounting, alternative planning, EU REACH implementation, and energy conservation tools, as well as a keynote presentation on the intersection of TUR and environmental justice.

Other Conferences and Workshops

OTA staff participate in various committees and Advisory boards, such as the MA Department of Public Health's Occupational Health Surveillance Program (OHSP), the MA State Emergency Response Commission (SERC), The New England Consortium (TNEC), and the NH Department of Environmental Services Biosolids Improvement Workgroup. OTA's participation in these bodies allows the TURA Program to interact with like-minded agencies, collaborate with public health peers, and ensure that toxics use reduction is incorporated into other state programs.

TURA Program staff also collaborate across state lines with other state environmental technical assistance providers and environmental agencies, as well as with the United States Environmental Protection Agency, to stay abreast of emerging issues and changes in state and federal environmental policy. These interstate projects include work with the Interstate Chemical Clearinghouse (IC2) and the Northeast Waste Management Officials' Association (NEWMOA). OTA also held a joint staff meeting with the Washington State Department of Ecology toxics reduction assistance team to enable the two programs to share resources and learn from one another.

In June 2020, OTA staff also began a collaboration with the Pacific Northwest Pollution Prevention Resource Center (PPRC) to develop resources for virtual site visits to companies. This partnership continued into FY21 and furthered OTA's efforts to develop virtual alternatives to its traditional in-person site visits. OTA also co-sponsored two events related to remote technical assistance:

- In partnership with PPRC and EPA, OTA co-sponsored a webinar aimed at technical service providers about best practices for offering remote technical assistance.
- In partnership with the Massachusetts Department of Labor Standards, OTA co-sponsored a webinar aimed at Massachusetts companies about what to expect during OTA and DLS remote technical assistance visits.

OTA offers Chemical Safety and Climate Change Resiliency presentations with the goal of assisting companies and first responders in how to use OTA services to reduce risks of severe weather-related chemical or industrial accidents:

- On May 10, 2021, The New England Consortium hosted a Climate Change Resiliency and Chemical Safety Training. OTA delivered a presentation at this workshop entitled "OTA Chemical Safety & Climate Change Resiliency Services."

Per- and polyfluoroalkyl substances (PFAS) contamination is a high-priority topic for OTA and the TURA Program. On June 24, 2021, the Massachusetts Environmental Health Association hosted a workshop on PFAS entitled "PFAS: An Upstream Approach," at which OTA delivered a presentation entitled "Removing the Handle from the PFAS Pump" about source reduction activities for per-and polyfluoroalkyl substances (PFAS).

Toxics Use Reporting and Planner Certification

Toxics Use Reporting

Each July 1, large-quantity toxics users in TURA-covered industry sectors submit an annual report to MassDEP including data on each TURA-listed chemical used in above-threshold amounts during the previous calendar year. These reports supplement the federal Toxics Release Inventory (TRI) reports that must be submitted on the same date to document the quantities of chemicals released to the environment or shipped offsite to be managed as waste. The TURA report documents the quantities of chemicals used, processed, or manufactured.

In FY21, MassDEP processed approximately 1,300 chemical use reports from 410 facilities. MassDEP continues to update their guidance documents and data systems to improve the information received from TURA filers.

Managing the reporting process involves:

- assisting filers with the reporting process
- checking reports for accuracy and compliance
- following up on chemical use report and plan summary anomalies
- identifying facilities that failed to submit required reports, plan summaries, and fees
- taking enforcement actions as necessary
- processing fees

Toxics Use Reduction Planner Certification

In even-numbered calendar years, large quantity toxic users (those manufacturing or processing at least 25,000 pounds per year, or otherwise using 10,000 pounds per year, of TURA-listed substances) must prepare a Toxics Use Reduction Plan or update an existing plan and analyze whether there are changes that can be made to their production processes that would reduce toxics use, waste, and production costs sufficiently to be in the company's interest to adopt. These TUR Plans must be reviewed and approved by a MassDEP-certified Toxics Use Reduction Planner (TUR Planner).

Facilities that have completed a plan and two updates are given the option, every other planning cycle, to substitute a Resource Conservation Plan, which includes an analysis of the facility's water or electricity usage, generation of solid waste, or use of non-TURA-reportable toxic substances. These Resource Conservation Plans must be reviewed and approved by a MassDEP-certified TUR Planner that has also been specifically certified to aid in the preparation of Resource Conservation Plans. Alternatively, the business may incorporate TUR planning into its existing Environmental Management System (EMS). The EMS Progress Reports must also be reviewed and approved by a MassDEP-certified TUR Planner who is qualified to review EMS.

TUR Planners can be approved as General Practice TUR Planners, who can review and approve plans developed by any facility, or Limited Practice TUR Planners, who are allowed to review and approve plans at their place of employment only. General Practice TUR Planners are required to take the TUR Planner Certification Course offered by TURI and pass an exam managed by MassDEP.

As of the end of FY21, there were 132 MassDEP certified TUR Planners, including:

- 92 General Practice Planners
- 40 Limited Practice Planners

In FY21, MassDEP reviewed the qualifications of 55 TUR Planners. Due to the COVID-19 pandemic, the TUR Planner Certification Course and the TUR Planner Exam were not offered in FY21.

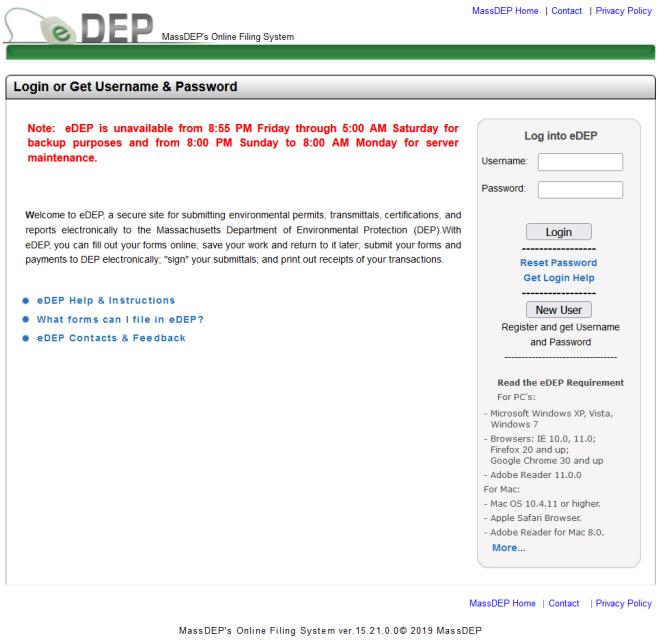
Toxics Use Reduction Planner Continuing Education Credit Approval

TUR Planners can maintain certification by attending certain TURA program training and education events that offer TUR Planning continuing education credits. Other organizations may request approval from MassDEP to offer TUR Planner continuing education credits for their workshops and events. During FY20, MassDEP approved 10 courses offered by non-TURA program organizations for continuing education credit.

TURA Enforcement and Data Analysis

TURA Compliance Training and Outreach

MassDEP worked with OTA and TURI to provide four TURA Reporting and Planning Training sessions during FY21. Due to the pandemic, eight online training segments were recorded and made available for TUR Planners and Facilities to view. The training modules focus on the various elements of TUR Reporting via the eDEP Online Filing Platform and on TUR Planner certification.



A screenshot of MassDEP's online filing system

Enforcement

MassDEP administers the regulatory components of the TURA program and supports the work of the other TURA agencies with data and policy analysis, strategic planning, training outreach, and education.

During FY20, MassDEP inspected 36 TURA filers and screened another 16 facilities to determine if they were subject to TURA. Due to COVID-19 inspection restrictions, fewer inspections were conducted in FY21. These inspections and screenings resulted in:

- 1 Notice of Non-Compliance (NON) for failure to submit complete or timely TURA reports or for failure to comply with reporting or planning requirements
- 1 Administrative Consent Order with Penalty for failure to file a Toxics Use Report and a Toxics Use Fee Worksheet for reporting years 2015 through 2018

In FY21, MassDEP did not send out formal Requests for Information to TURA facilities to evaluate compliance, due to business interruptions caused by the COVID-19 pandemic.

Fee Revenue

TURA-regulated facilities must pay annual fees unless they have obtained a financial hardship waiver. There were no fee-waiver requests in FY21. MassDEP collected:

- $2,585,600 in annual fees
- $10,485 in statutory late fees
- $7,525 in fees from TUR Planners who applied for the DEP's certification or recertification

Appendix VI contains FY21 expenditure information.

Data Analysis

MassDEP manages the TURA data and information releases on the reported chemical use data and toxics use reduction progress.

The most recent data available are derived from the 2019 calendar year reports that were due on November 1, 2020. Four hundred forty-nine facilities submitted 1,378 individual chemical reports on 127 different chemicals.

Toxics Policy

Administrative Council on Toxics Use Reduction

The TURA Administrative Council coordinates toxics management statewide and is responsible for making decisions about the TURA Toxic or Hazardous Substances List. The Administrative Council is chaired by the Secretary of the Executive Office of Energy and Environmental Affairs and includes representatives from five additional state agencies.

Fiscal Year 2021 Council Members

- Secretary Kathleen Theoharides, Executive Office of Energy and Environmental Affairs (Chair)
  Designee: Daniel Sieger, Undersecretary of Environmental Affairs (July 2020–May 2021); Beth Card, Undersecretary of Environmental Affairs (May 2021–June 2021)
- Commissioner Martin Suuberg, Department of Environmental Protection
  Designee: Greg Cooper, Director, Hazardous and Solid Waste Division, Bureau of Air and Waste
- Commissioner Monica Bharel (July 2020–May 2021) and Interim Commissioner Margret Cooke (May 2021–June 2021), Department of Public Health
  Designee: Marc Nascarella, Director of Toxicology
- Secretary Rosalin Acosta, Executive Office of Labor and Workforce Development
  Designee: Michael Flanagan, Manager, Department of Labor Standards Safety and Health Programs
- Secretary Tom Turco, Executive Office of Public Safety and Security
  Designee: Jennifer Hoyt, Chief Fire Protection Engineer
- Secretary Michael Kennealy, Executive Office of Housing and Economic Development
  Designee: Edward Palleschi, Undersecretary for the Office of Consumer Affairs and Business Regulation

Updates to TURA Toxic or Hazardous Substance List: Per- and Polyfluoroalkyl Substances (PFAS)

Effective January 1, 2021, pursuant to EPCRA Section 313 and MGL 21I, section 9(A), 172 per- and polyfluoroalkyl substances (PFAS) were added to the list of reportable substances in 301 CMR 41.00 (Toxic or Hazardous Substance List) following their inclusion in the Toxics Release Inventory (TRI). Tracking of these chemicals by Massachusetts filers began on January 1, 2021, and initial reporting to MassDEP was due by July 1, 2022.

In June 2020, the Science Advisory Board had made a recommendation to list a category of PFAS Not Otherwise Listed, defined as "those PFAS that contain a perfluoroalkyl moiety with three or more carbons (e.g., $–C_nF2_n–$, n ≥ 3; or CF3-$C_nF2_n–$, n≥2) or a perfluoroalkylether moiety with two or more carbons (e.g., $–C_nF2_nOC_mF2_m–$ or $–C_nF2_nOC_mF_m–$, n and m ≥ 1)." TURI prepared a policy analysis and presentations for the Advisory Committee and Administrative Council, conferred with OTA and MassDEP, and recommended that a category be added to the TURA list. The policy analysis includes sections on expected filers in Massachusetts; alternatives available; other state, federal, and international regulations; and expected impact on the TURA Program. Meetings of the Advisory Committee and Administrative Council during FY21 discussed these issues, and the regulatory process to list this category proceeded in FY22.

Formation of the TURA Program Strengthening Ad Hoc Committee

In FY20, the chair of the TURA Administrative Council outlined a proposal for an Ad Hoc Committee of the TURA Advisory Committee. The Ad Hoc Committee, open to all Advisory Committee members, would also include additional TURA stakeholders. The objective of the TURA Program Strengthening Ad Hoc Committee was to review and strengthen the effectiveness and value of TURA program activities to Massachusetts businesses while ensuring ongoing progress in reducing the use of toxics in the Commonwealth and increasing the adoption of safer materials.

Nominees for the Ad Hoc Committee were proposed and designated in the February 2020 Administrative Council meeting. The Ad Hoc Committee met for the first time in November 2020 for an orientation to the TURA Program. Throughout the remainder of FY21, the Ad Hoc Committee held four additional meetings to discuss the topics of compliance and enforcement; alternative planning options for TURA filers; ensuring the quality of TUR plans and planners; and the TURA List of Toxic or Hazardous Substances. The final meeting of the Ad Hoc Committee, concerning TURA fees, was held in FY22. Concluding the Ad Hoc Committee's meetings, program staff would then summarize its discussions and present the proceedings to the Advisory Committee and the Administrative Council.

TURA Program Strengthening Ad Hoc Committee Members

- Larry Boise, Franklin Paint
- Lauren Bradford, Cabot Corporation
- Tom Estabrook, The New England Consortium (TNEC)
- Wendy Heiger-Bernays, BU School of Public Health
- Andy Irwin, Irwin Engineers
- Bill Judd, Industrial Compliance Group
- Jay Kaufman, Beacon Leadership Collaborative
- Terry McCormack, Umicore Electrical Materials, Inc
- Mark Monique, The Savogran Company
- Elise Pechter, MA Dept. of Public Health
- Jim Reger, Massachusetts Asphalt & Aggregate Paving Association
- Rick Reibstein, Former TURA Program Staff/BU School of Public Health
- Robert Rio, Associated Industries of Massachusetts
- Katherine Robertson, Massachusetts Chemistry and Technology Alliance (MCTA)
- Cora Roelofs, UMass Lowell
- Mark Rossi, Clean Production Action
- Elizabeth Saunders, Clean Water Action
- Lucy Servidio, Capaccio Environmental Engineering
- Laura Spark, Clean Water Action
- Jodi Sugerman-Brozan, MassCOSH
- Matthew Taylor, Dupont

Members of the Advisory Committee to the Administrative Council on Toxics Use Reduction

A multi-stakeholder Advisory Committee provides input to the Administrative Council. The Committee includes representation of large and small businesses, labor, environmental and health advocacy, and others. FY21 members were:

- Robert Audlee, Stainless Steel Coatings;
- Karen Blood, Hollingsworth & Vose;
- Lawrence Boise, Franklin Paint;
- Kathryn Flannery, Massachusetts Department of Labor Standards;
- Andrew Goldberg or Jillian Riley, Attorney General's Office;
- William Judd, Industrial Compliance Group;
- Mark Monique, The Savogran Company;
- Mark Rossi, Clean Production Action;
- Kari Sasportas, Lexington Office of Public Health;
- Elizabeth Saunders, Clean Water Action;
- Lucy Servidio, Capaccio Environmental Engineering;
- Jodi Sugarman-Brozan, Massachusetts Coalition for Occupational Safety & Health (MassCOSH); and,
- Rebecca Weidman, Massachusetts Water Resources Authority.

Members of the Science Advisory Board

The Science Advisory Board works with TURI to provide a sound scientific basis for program decisions and includes members from a variety of scientific backgrounds. Members' organizational affiliations are listed, but members serve as individuals, bringing their diverse expertise to the board; they do not represent their organizations. FY21 members were:

- Amy Cannon, Beyond Benign
- Lisa Cashins, MA Department of Labor Standards
- Robin Dodson (Vice Chair), Silent Spring Institute
- Christy Foran, Rand Corporation
- Rich Gurney, Simmons University
- Wendy Heiger-Bernays, BU School of Public Health
- Denise Kmetzo, Collaborative Risk Solutions
- Heather Lynch, Cardno ChemRisk
- Helen Poynton, UMass Boston
- Christine Rioux, Interdisciplinary health scientist
- David Williams (Chair), Massachusetts Department of Public Health

Science Advisory Board

In FY21, the Science Advisory Board held six meetings, completed a recommendation on quaternary ammonium compounds and began a review of carbon nanotubes and fibers.

Quaternary Ammonium Compounds (QACs) are common disinfectants for which use has increased during the pandemic. Health effects from QACs include asthma, respiratory and dermal sensitization, and irritation and additionally, they persist in the environment. To accomplish this work, TURI developed detailed health and environmental safety summaries for two groupings of QACs. These documents summarized information available on these chemicals, including the results of a detailed review of existing peer reviewed literature and information submitted by stakeholders and Science Advisory Board members. These

environmental health and safety summaries, as well as over 50 scientific studies, were used by the Board as the basis for its review. At the conclusion of this review, the SAB recommended listing DDAC (5 CAS numbers) and ADBAC (19 CAS numbers) quaternary ammonium compounds. Additionally, TURI developed a QAC fact sheet for potential users.

In June 2020, the TURA Program received a petition to list carbon nanotubes and fibers. In FY21, the Science Advisory Board began its review of the science related to these materials. In FY21 TURI and the SAB reviewed over 50 scientific studies to work toward making a recommendation on these substances. This work will continue in FY22.

Massachusetts Toxics Reduction Task Force

Toxics Reduction Task Force Identifies Chemicals of Concern in Products: To facilitate implementation of EO 515, the Toxics Reduction Task Force (TRTF) was established in 2009 with oversight and leadership by the Operational Services Division (OSD) and OTA. The TRTF includes staff from OSD and OTA and the Department of Public Health (DPH), the Department of Labor Standards (DLS), the Toxics Use Reduction Institute (TURI) and the Department of Environmental Protection (DEP). The TRTF remains a technical advisory group to help the Commonwealth's Environmentally Preferable Products (EPP) Procurement Program identify additional toxics in products on statewide contracts and explore safer and healthier options. The goals and objectives of the TRTF are to select priority focus areas for reduction in toxic substances in products or services. During FY21, the TRTF continued to facilitate discussions and provide feedback on safer disinfection practices and products and discussed per- and poly-fluoroalkyl substances (PFAS).

Safer sanitizing and disinfection during the COVID-19 pandemic: For much of FY21, the TRTF consulted on issues related to safer sanitizing and disinfection products due to concerns with surface and aerosol transmission of the SARS-CoV-2 virus, which causes COVID-19. This prompted high demand for sanitizers and disinfectant world-wide, resulting in supply chain issues. OSD made the decision to broaden the FAC85 Environmentally Preferable Cleaning Products, Program, Equipment, and Supplies Statewide Contract, which specified only "safer" active ingredients[1] for sanitizers and disinfectants, to include non-EPP product offerings (such as quaternary ammonium compounds and chlorine-based products) in order to ensure public entities had access to these needed products. The US Environmental Protection Agency (EPA) developed a list of products that kill the Coronavirus (SARS-CoV-2) known as *List N: Disinfectants for Use Against SARS-CoV-2*[2], and OSD allowed products from this list to be sold on the OSD statewide contracts. As the supply chains have stabilized for sanitizers and disinfectants, the waiver was removed when the Massachusetts State of Emergency was lifted on June 15, 2021. This required vendors on the FAC85 contract to return to selling only products meeting the required specifications allowing only "safer" active ingredients (e.g., hydrogen peroxide, citric acid).

During FY21, members of the TRTF worked on several fronts to provide guidance to buyers on safer cleaning, verifying safer disinfectants, and navigating application equipment and devices.

- **Environmentally Preferable Options:** OSD statewide contract buyers were encouraged to seek environmentally preferable options whenever possible. Members of the TRTF worked to identify products on List N containing safer active ingredients. TURI added these products to their website and continues to update this list, and the OSD publicized this work in their *Buy the Way* newsletter.
- **Product Application Equipment:** The TRTF also worked with OSD to navigate issues related to application equipment such as sprayers and foggers, as buyers were looking for ways to dispense the disinfectants quickly, especially in large areas. The TRTF provided information to OSD to respond to questions from buyers concerning allowable application methods.
- **Devices With Claims to Kill SARS-CoV-2:** OSD received many requests to add devices with claims to kill the virus, such as ultraviolet, aqueous ozone, and some air purifiers. The TRTF directed OSD to the EPA guidance and recommended that OSD ask whether a device has an *EPA Establishment Number* on the label, require the manufacturer to substantiate claims per the EPA Pesticide Device Guidance, and require the manufacturer to provide documentation that a device works against SARS-CoV-2 or a Surrogate Virus.
- **Vendor Safer Cleaning and Disinfecting Webinar:** While surface transmission was later determined to play only a minimal role in Sars-CoV-2 transmission, early in the pandemic, surface transmission had not been ruled out as a substantial mode of transmission, and the TRTF spent much time consulting on its prevention. The TRTF consulted on and were panelists in a TURI-funded webinar with Informed Green Solutions on safer cleaning and disinfecting, which introduced strategies for choosing safer products, reviewed federal regulations related to the use of antimicrobials, and discussed issues

with selecting and using products in application equipment, among other important topics.

Per- and poly-fluoroalkyl substances (PFAS): PFAS may be found in products in statewide contracts, including firefighting foam and gear, compostable dishware, cleaning products, personal care products, clothing, furniture/textiles, carpet/rug, non-slip additives for industrial applications or other surfactant property processing aids. The TRTF discussed these products and agreed to work with the OSD EPP Program to develop a fact sheet in FY22 listing products available in statewide contracts without PFAS that would be provided to buyers. In addition:

- **Firefighting Foam:** The TRTF provided information to the OSD EPP Program recommending they require bidders of firefighting foam to also offer third party certified options of GreenScreen Certified™ for Firefighting Foam. This option requires manufacturers to disclose all intentionally added chemicals in the product, requires analytic testing to ensure products are free from Per- and Polyfluoroalkyl Substances (PFAS), and prohibits over 2,000 other chemicals of high concern.
- **Firefighting Gear:** Currently, there is no PFAS-free firefighting gear available on statewide contract. The National Fire Protection Association (NFPA) 1971 Standard, Section 8.62 requires a light degradation resistance test for "moisture barrier materials," the middle layer of the three layers comprising firefighting turnout gear. This specific requirement has prevented PFAS-free moisture barriers from being sold. In 2021, NFPA accepted comments on whether to revise this requirement. OSD submitted a comment to the NFPA that if PFAS-free firefighting gear were made available in the marketplace, they would be made available on the statewide contracts. In July 2021, the NFPA Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment voted against the amendment to eliminate the current requirement that ensures the presence of PFAS in firefighter turnout gear, and in August 2021 rejected an appeal to change the amendments, expressing concern that removing the test without understanding how removal will affect the moisture barrier could inherently be a serious risk to firefighter safety.[17] There continues to be no PFAS free firefighting gear on statewide contract for this reason.

Flame Retardants: On January 1, 2021, Governor Baker signed the Acts of 2020, Chapter 261, adding a new Section 28 to Chapter 21A of the Massachusetts General Laws which regulate 11 flame retardants in 5 categories of consumer goods (the Act) and restrict each of the flame retardants to no more than 1,000 ppm in any component of the product, excluding all intentionally added flame retardants.[18] The new law defines covered products that include bedding, carpeting, children's products, residential upholstered furniture, and window treatments. Although this new regulation impacts manufacturers, OSD will continue to communicate these regulatory changes in bids and to statewide contract vendors.

APPENDICES

Appendix I: Grants

Annual TURA Program Grants

Each year, TURI allocates grants to Massachusetts businesses, community groups, municipalities, and industry-academic research partnerships to further the development, implementation, and dissemination of toxics use reduction strategies.

In FY21, TURI awarded approximately $144,500 in grants to reduce the use of chemical solvents and pesticides, find safer cleaners and disinfectants, and educate workers and the public about toxics in safer cleaning and personal care products.

Safer Solvents for Manufacturers and Dry Cleaners

- Assistant Professor Wan-Ting (Grace) Chen of Plastics Engineering at UMass Lowell partnered with Johnson Matthey, a manufacturer of active pharmaceutical ingredients and intermediates with facilities located in North Andover and Devens. The goal of the research project was to find safer alternatives to methylene chloride, a toxic chemical used in reaction and purification processes. The researchers planned to identify safer alternative solvents, screen the alternatives for health and safety considerations and test the performance of selected solvents.
- Grove Hall Cleaners of Dorchester aimed to eliminate the use of perchloroethylene, a solvent classified as a probable human carcinogen by the International Agency for Research on Cancer. The dry cleaner switched to Professional Wet Cleaning, which allows for “dry-clean-only” clothes to be effectively washed with water and detergents in computer-controlled machines and finished with tensioning and pressing equipment.
- Steel Art Company, Inc. of Norwood, a designer and manufacturer of architectural-quality signage, worked with the TURI Lab to find a safer substitute to n-propyl bromide, a higher hazard substance that’s used to clean aluminum, stainless steel and brass parts. The TURI Lab evaluated the effectiveness of safer options, and then Steel Art selected their preferred chemistry and purchased compatible equipment.

Safer Cleaning and Disinfection

- The Brazilian Women’s Group of Brighton trained Brazilian domestic workers and other Portuguese-speaking women about how to make and use safer cleaning products. The project team is also sharing information about how to minimize coronavirus impacts in their local community, where 75 percent of Brazilian women work as domestic or essential workers. They are also reaching out to nannies, elder care workers and childcare providers.
- The Clean Water Fund located in Boston trained house cleaners, custodians, teachers and members of environmental justice communities about how to choose safer cleaning and disinfecting products amid the coronavirus. Through workshops, online trainings and social media, the project team shared information about hazardous chemicals in cleaners and disinfectants that are linked to asthma, respiratory irritation and other health impacts. The grant partners – MassCOSH, the Resilient Sisterhood Project, Vida Verde Women’s Co-op of the Brazilian Women’s Group, and the American Federation of Teachers/Massachusetts Chapter – hosted workshops to protect vulnerable groups from harmful exposure to toxics in cleaners and disinfectants.
- Family Martial Arts Center of Leominster and Fitchburg re-opened their karate studios during the pandemic using safer cleaning and disinfecting products. The small business purchased three steam vapor units to clean and disinfect a 6,500 square foot space and electrolyzed water systems to disinfect the front door, restroom and front desk areas. By using this new equipment, the facility eliminated the use of bleach and quaternary ammonium compounds-based disinfectants, both of which can cause respiratory and other health issues.
- Informed Green Solutions of Deerfield developed and shared information with schools about how the coronavirus spreads and the appropriate ways to choose and use safer cleaning and disinfecting products. By learning how to integrate effective control systems into operational systems, schools minimize the need for expensive janitorial services that use hazardous products. A handbook and other training materials are being shared via webinars and websites.

- Silent Spring Institute of Newton shared information with Black women about how to select personal care and cleaning products that don't contain toxics, such as phthalates, parabens, phenols and antimicrobials. Studies show that women of color have higher total amount of toxic chemicals in their bodies compared to white women. Led by the Silent Spring Institute in partnership with the Resilient Sisterhood Project, the project aimed to identify and reduce chemical exposures that may contribute to endocrine disruption, asthma, diabetes, and cancer, diseases that put Black women at an increased risk of severe illness from COVID-19. The project team hosted virtual workshops, surveyed women about product usage using an online application and launched a social media campaign about safer alternatives.

Food Systems and Processing

- Wellspring Harvest Corporation of Springfield, an urban hydroponic greenhouse that grows lettuce, tomatoes and cucumbers, eliminated the use of pesticides by closely managing humidity levels to control the growth of powdery mildew infestations on crops. The small business installed a misting system to ensure that relative humidity does not drop below 50 percent. The extremely fine mist evaporates without wetting plants, thus preventing conditions for mildew growth while raising humidity to prevent spores from spreading.

Appendix II: Selected Events and Workshops

TURA Program Workshops

Each year the TURA program agencies hold workshops to provide continuing education for Toxics Use Reduction Planners, regulatory guidance and updates, and tools and resources for businesses to enhance their ability to implement pollution prevention. Some of these workshops and events are described in greater detail in the main report.

Note: This list does not include events led by TURI grantees.

Workshops and Training Events:

- TURA fall Continuing Education conference, online, October 27 and November 5, 2020.
- TURA spring Continuing Education conference, online, April 6, 8, and 13, 2021.
- Workshops introducing students to toxics use reduction in manufacturing, in partnership with MassMEP and Lowell Project Learn, given as part of Manufacturing Month to Lowell High School students, online, October 15, 2020.

Demonstration Events:

- CD Aero virtual demonstration event, online, May 13, 2021.
- Morgan Advanced Materials virtual demonstration event, online, September 10, 2020.
- River Street Metal Finishing virtual demonstration event, online, July 23, 2020.

Appendix III: Selected Publications

TURA Program Publications

The TURA program produces, curates and updates informational fact sheets on chemicals, technologies and pollution prevention techniques, case studies, regulatory guidance, and reports.

Reports, Journal Articles, Case Studies, and Fact Sheets

- "Assessment of Alternatives to Cleaners and Sanitizers for the Brewing Industry," TURI, July 2020. Available at https://www.turi.org/TURI_Publications/TURI_Reports/Assessment_of_Alternatives_to_Cleaners_and_Sanitizers_for_the_Brewing_Industry
- "Building an Organic Maintenance Program for Athletic Fields: Guidance from Experts and Experienced Communities," TURI, April 2021. Available at https://www.turi.org/content/download/13543/206640/file/Factsheet.BuildinganOrganicMaintenanceProgramforAthleticFields.April2021.pdf
- "Fat Moon Shines with Safer Alternatives," TURI, September 2020. Available at https://www.turi.org/TURI_Publications/Case_Studies/Food_and_Beverage/Fat_Moon_Mushrooms_replaces_bleach_with_safer_sanitizer._2020
- Lu, T., Reimonn, G., Morose, G., Yu, E., and Chen, W., "Removing Acrylic Conformal Coating with Safer Solvents for Re-Manufacturing Electronics," *Polymers* 2021, 13(6), March 18, 2021, p. 937. Available at https://www.mdpi.com/2073-4360/13/6/937
- Nallar, M., Tenaglia, N., Morose, G., and Wong, H., "Safer Solvent Blends for Food, Dye, and Environmental Analyses Using Reversed-Phase High Performance Liquid Chromatography," *Chromatographia* 84, 769-780, June 18, 2021. Available at https://link.springer.com/article/10.1007/s10337-021-04061-8
- "Morgan Advanced Materials Triumphs over TCE," TURI, September 2020. Available at https://www.turi.org/content/download/13307/204154/file/Casestudy.Morgan+Advanced+Materials.Sepember2020.pdf
- "Natural Grass Playing Field Case Study: Marblehead, MA," TURI, revised November 2020. Available at https://www.turi.org/TURI_Publications/Case_Studies/Organic_Grass_Playing_Fields/Natural_Grass_Playing_Field_Case_Study_Marblehead_MA
- "Natural Grass Playing Field Case Study: Martha's Vineyard, MA," TURI, December 2020. Available at https://www.turi.org/content/download/13432/205432/file/Natural+Grass+Playing+Field+Case+Study+MV+MA.Dec2020.pdf
- "Natural Grass Playing Fields: Selected Case Studies from Southwest Pennsylvania," TURI, April 2021. Available at www.turi.org/content/download/13555/206776/file/Casestudy.OrganicGrassSWPenn.April2021.pdf
- Perkins, K., Munguia, N., Ellenbecker, M., Moure-Eraso, R., and Velazquez, L., "COVID-19 pandemic lessons to facilitate future engagement in the global climate crisis," *Journal of Cleaner Production*, vol. 290, March 25, 2021. Available at https://www.sciencedirect.com/science/article/pii/S0959652620352227
- "River Street Metal Finishing Filters Acid to Reduce Chemical Use," TURI, February 2021. Available at https://www.turi.org/TURI_Publications/Case_Studies/Metal_Finishing_and_Plating/River_Street_Metal_Finishing_filters_acid_to_reduce_chemical_use
- "The TURI Cleaning Laboratory Verifies Cleanliness for Umicore," TURI, September 2020. Available at https://www.turi.org/content/download/13319/204246/file/Casestudy.Umicore_Electrical_Materials.June2021.pdf
- "Workshop Auto Minimizes Use of Hazardous Chemicals," TURI, March 2021. Available at https://www.turi.org/TURI_Publications/Case_Studies/Autobody_and_Auto_Repair/Workshop_Auto_Minimizes_Use_of_Hazardous_Chemicals

Videos

- "Aerospace and Defense Industry Workgroup Finds Safer Alternatives to Hexavalent Chromium," TURI, October 2020. Available at https://www.turi.org/Our_Work/Research/Aerospace_and_Defense_Consortium_Finds_Safer_Alternatives_to_Hexavalent_Chromium
- "Aerospace and Defense Industry Workgroup Finds Safer Alternatives to Hexavalent Chromium," TURI, October 2020. Available at https://www.youtube.com/watch?v=tRCDVSnFSQ4
- "Cleaner Solutions Database Tutorials," set of seven videos, TURI, November 2020. Available at https://www.youtube.com/user/UMASSLowellTURI1/videos
- "Cleaning and Disinfecting Webinar for Vendors and Purchasers," TURI, May 2021. Available at https://www.youtube.com/watch?v=KFtnZIhOqb8
- "Dr. Warren Muir Talk," TURI, December 2020. Available at https://www.youtube.com/watch?v=wL1WIrazCXU
- "Finding Safer Solvents for Contact Adhesives," TURI, May 2021. Available at https://www.youtube.com/watch?v=DDAC_LnwYxI
- "Morgan Advanced Materials – Virtual Demonstration of TUR Project," TURI, September 2020. Available at https://www.youtube.com/watch?v=qywKdx0P-6M
- "Morgan Advanced Materials Eliminates Use of TCE," TURI, September 2020. https://www.turi.org/Our_Work/Training/Continuing_Education/Demonstration_Sites/Past_Demonstration_Events/Morgan_Advanced_Materials_Eliminates_the_Use_of_TCE
- "Per- and Polyfluoroalkyl Substances (PFAS): Introduction and Update," TURI, July 2020. Available at https://www.youtube.com/watch?v=B7f_mOSrg7s
- "River Street Metal Finishing – Virtual Demonstration of TUR Project," TURI, July 2020. Available at https://www.youtube.com/watch?v=6RP4m2jmFS8
- "River Street Metal Finishing Reduces Use of Sulfuric Acid," TURI, August 2020. Available at https://www.youtube.com/watch?v=yp4Db4Vh24M
- "Riverdale Mills – Virtual Demonstration of TUR Project," TURI, July 2020. Available at https://www.youtube.com/watch?v=2-eN_csJljI
- "Riverdale Mills Reduces Use of 3 Toxics in Wire Mesh Manufacturing Process," TURI, July 2020. Available at https://www.youtube.com/watch?v=QioENu8_4KA
- "Safer Cleaning and Disinfecting During the Pandemic," TURI, October 2020. Available at https://www.youtube.com/watch?v=yS_oakJb3fo
- "Safer Cleaning and Disinfecting in Schools," TURI, August 2020. Available at https://www.youtube.com/watch?v=dFjhXiGVZGY
- "So You Want to Open … Now What," TURI, August 2020. Available at https://www.youtube.com/watch?v=yX_DtUnpYWc
- "Three Massachusetts Communities Maintain Athletic Fields Organically," TURI, April 2021. Available at www.youtube.com/watch?v=Cmjv1qteLho
- "Virtual Demonstration of TUR Project – CD Aero," TURI, May 2021. Available at https://www.youtube.com/watch?v=y49mr3mSG3A
- "Visualizing the TURA Data" video resource, TURI, February 2021. Available at https://www.youtube.com/watch?v=zS6Ju9um3SE
- "What are Engineered Nanomaterials? Uses and Hazards," TURI, May 2021. Available at https://www.youtube.com/watch?v=TbqMVB0O4YA

Appendix IV: Selected Presentations and Webinars

About Presentations and Webinars

Throughout the year, TURA program staff present a wide variety of pollution prevention and regulatory topics to audiences at TURA program events and at events held by partner organizations. As presentations may have been repeated at multiple venues, this list includes both categories.

- Eliason, P., "TUR and Alternatives Assessments," Yale University Green Chemistry and Engineering class, February 7, 2021.
- Harriman, E., "PFAS Uses and Avoiding Regrettable Substitutes" webinar, NEWMOA PFAS webinar series, April 20, 2021.
- Harriman, E., "Prevention and Avoiding PFAS Regrettable Substitutes under MA TURA," Boston University School of Public Health Gijs van Seventer Environmental Health Seminar (via Zoom), September 11, 2020.
- Harriman, E., Massey, R. "Addressing PFAS Upstream: TURA Program Activities," Massachusetts Environmental Health Association webinar, June 24, 2021.
- Illingworth, J., Raschko, J. "OTA's Virtual Assistance Opportunities," webinar co-sponsored with Massachusetts Department of Labor Standards, February 10, 2021.
- Illingworth, J., Raschko, J. "Technical Assistance in the Time of COVID-19," training co-sponsored with Pacific Northwest Pollution Prevention Resource Group and EPA, November 23, 2020.
- Marshall, J,. "Leading By Example Disinfecting Information" webinar, September 15, 2020.
- Marshall, J., "Disinfection Chemistries and Devices" webinar, Pediatric Environmental Heath Specialty Units, November 6, 2020
- Marshall, J., "Safer Cleaning and Disinfecting During a Pandemic" legislative briefing (via Zoom), October 21, 2020.
- Marshall, J., Hwang, N, Cluver, A., "Disinfecting" webinar, Healthy Schools Network, August 28, 2020
- Marshall, J., Rose, L, Westinghouse, C, Wertz, K., "Safer Cleaning and Disinfecting for Schools" webinar, August 14, 2020.
- Massey, R., and Harriman, E., "Addressing PFAS Upstream: TURA Program Activities" webinar, Massachusetts Environmental Health Association, June 24, 2021.
- Massey, R., Harriman, E., Skogstrom, T. "Per- and Polyfluoroalkyl Substances (PFAS): Introduction and Update," legislative briefing on TURA Program PFAS work, July 14, 2020.
- Onasch, J., "Brewery Alternatives Assessment," National Pollution Prevention Roundtable P2U food & beverage session (via Zoom), October 29, 2020
- Pollard, L., guest speaker in "Selecting Athletic Turf You Can Feel Good About" webinar, Healthy Building Network, October 28, 2020.
- Raschko, J. "OTA Energy Assistance Services for Massachusetts Industries," TURI Continuing Education Conference, April 13, 2021.
- Skogstrom, T. "OTA Chemical Safety & Climate Change Resiliency Services," The New England Consortium training, May 10, 2021.
- Skogstrom, T. "Source Reduction: Removing the Handle from the PFAS Pump," Massachusetts Environmental Health Association webinar, June 24, 2021.
- Tenney, H., "Legislative Briefing on TURA Data" public webinar, February 9, 2021.
- Tenney, H., "PFAS Chemicals, Uses, and Compliance Obligations," Environmental Business Council (via Zoom), July 14, 2020.

Appendix V: TURA Program Revenue and Expenditures

Fiscal Year 2020 Revenues

TURA annual fees: $2,585,300
TURA statutory late fees:.....$10,500
TUR Planner fees: $7,500

Total revenues: $2,603,300

Fiscal Year 2020 Expenditures

OTA

Personnel costs: $625,200
Administrative costs: $7,500
Total: $632,800

DEP

Personnel costs: $424,200
Administrative costs: $6,200
Total: $430,400

TURI

Personnel (staff and students)[1]: $1,054,400
Education and training events[2]: $13,100
University research and laboratory support: $117,600
Grants to businesses, community groups, and municipalities: $131,000
Administrative costs: $32,700
Library and information support: $25,800
Communications, printing, website and educational outreach[3]: $139,800
Total: $1,514,400

Total expenditures: $2,577,600

[1]Personnel expenditures include $81,600 for research assistants working on industry grant and laboratory projects.

[2]TURI also collected $22,300 in training registration fees, which goes to support staff salaries and operating expenses.

[3] Communications expenditures in FY21 were higher than normal because of web-tool development costs.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