

Annual Report

Highlights from 2024

The University of Pennsylvania's Office of Environmental Health & Radiation Safety (EHRS) promotes health, safety, and environmental protection in teaching, research, health care, and administrative activities by providing essential services, guidance, and compliance support.

www.ehrs.upenn.edu

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WELCOME

We at Environmental Health & Radiation Safety (EHRS) are pleased to share our annual report for CY 2024, celebrating the impact of small and large accomplishments and mission-critical daily tasks our office undertakes. Another year marks tremendous research progress at Penn toward discovering and administering treatments for cancer and other serious illnesses, establishing more efficient ways to support our society with critical resources, progressing our processing of data through artificial intelligence, and countless other programs committed to improving our world. Our team is proud to support the clinical, research, instructional, and essential functions of the Penn community.

In this report, we highlight statistics associated with trainings, hazardous materials and waste handling, and 24/7 emergency response, as well as support programs for clinicians, researchers, students, faculty, and staff. We interface among all spheres of the Penn community. We consult on construction projects, medical protocols, research workflows, and safety concerns. As an office of around 55 people, we have the great privilege to:

- facilitate radiation use for 83 clinical spaces ranging from X-rays to oncology floors,
- manage around 850 labs using chemical, biological, and radiological hazards,
- support around 23,000 students and around 40,000 staff, including clinicians, researchers, tradespeople, animal care staff, librarians, housekeeping and dining services staff, and administrative staff,
- foster ongoing positive relationships with 50+ compliance and regulatory entities on the local, state, and federal level,
- oversee safety operations at all locations in the University City campus region as well as facilities at New Bolton Center, Morris Arboretum and hospitals within a 40-50 mile radius as far as Doylestown, New Jersey, and Chester County.

The scope of our team's work touches every member of the Penn community and is responsible for much of the behind-the scenes functions that make Penn a global leader in medicine, technology, business, science, and beyond. The EHRS team is proud to be a regional and national leader in environmental health and radiation safety. We are grateful for your enthusiastic and ongoing support of the life-saving, mission-critical, and wide-ranging work that EHRS provides.

Sincerely,

Maureen O'Leary, Ph.D. MBA, CBSP

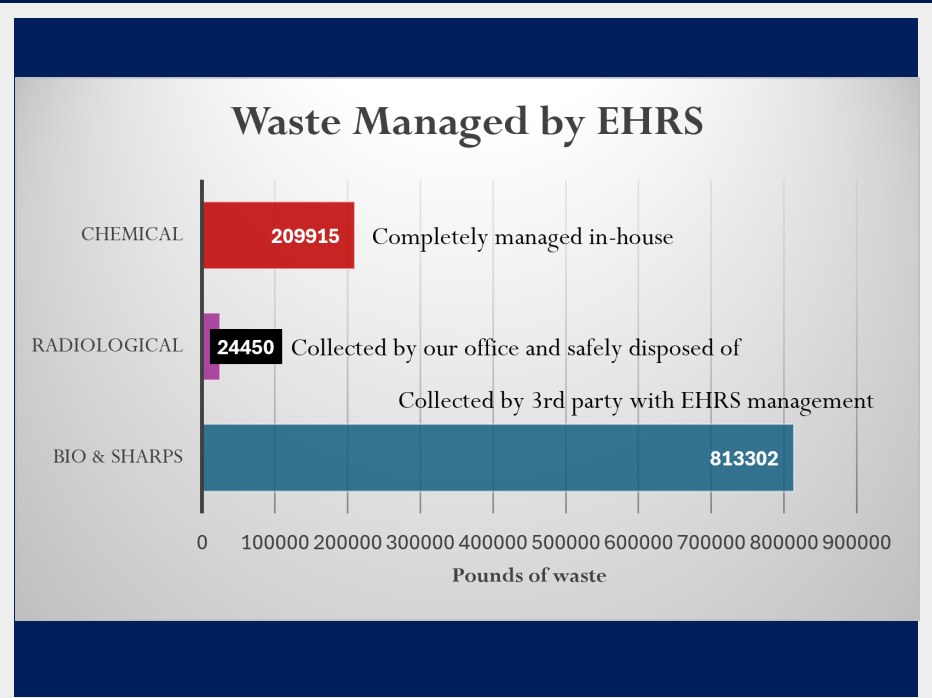
Associate Vice Provost for Research and Executive Director

Environmental Health & Radiation Safety



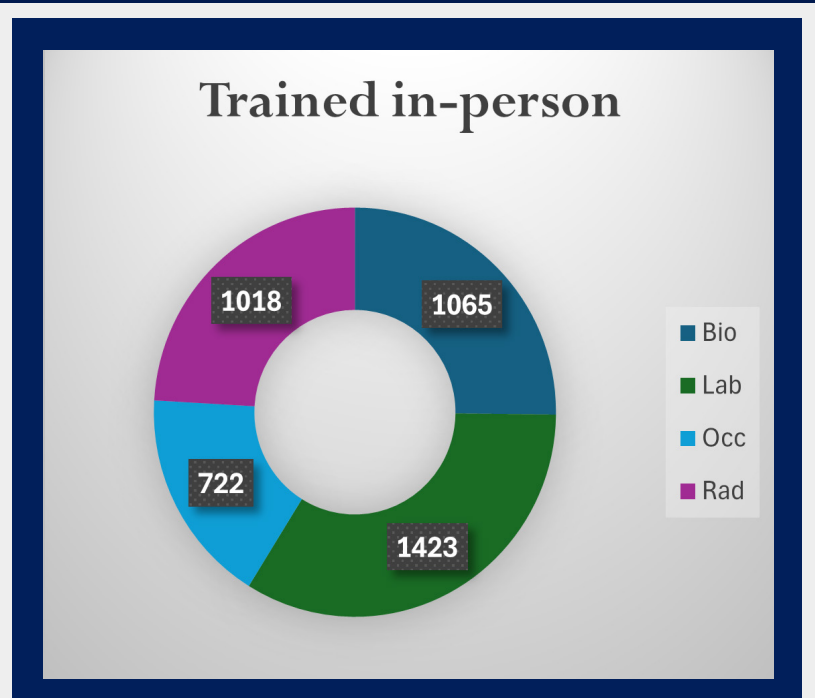
EHRS By the Numbers

Our 55 EHRS team members support the University’s research and clinical enterprise and serve as global leaders in health & safety. Here is a look at what that means:



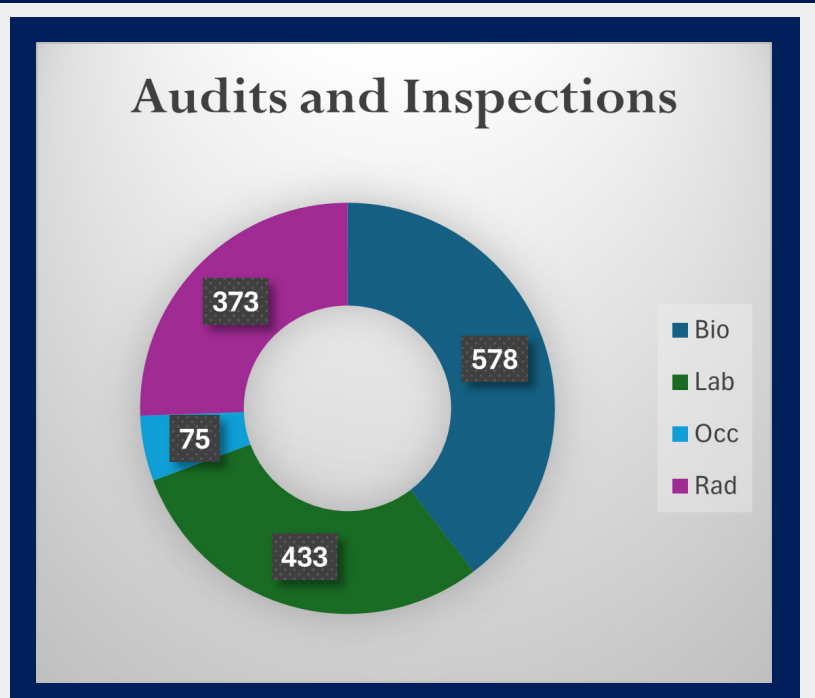
Our in-house team provides complete waste disposal services of chemical wastes, having handled **209,915 lbs of waste in 2024**. EHRS also manages 3rd party disposal of sharps and regulated medical waste and radiological waste. **EHRS managed disposal of 1,047,667 lbs of waste in 2024.**

Sustainable & safe waste disposal



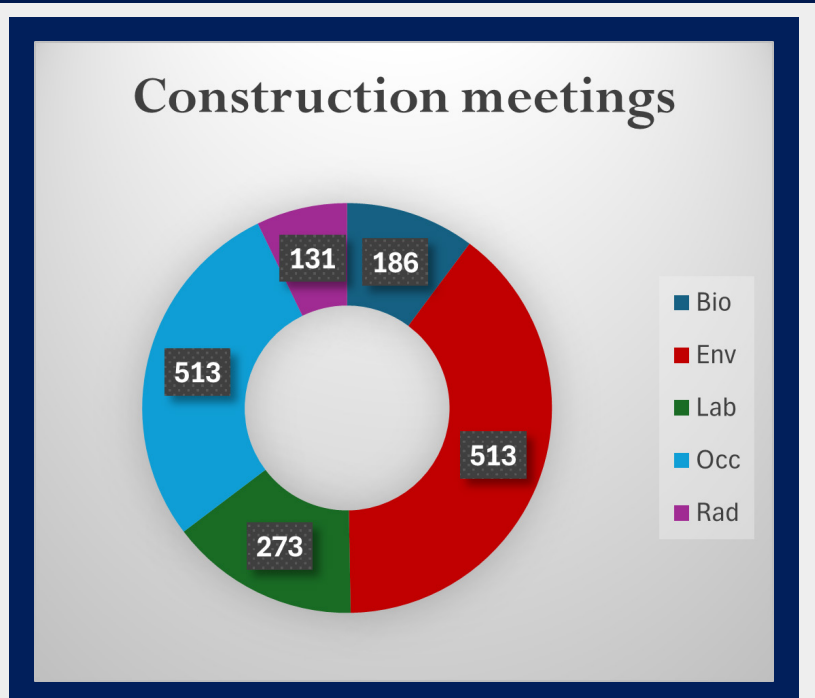
EHRS commits to ongoing trainings on general and specialized topics, including **20,860 people trained online**. With **4,228 people trained in-person**, we can specialize trainings and engage directly with safety questions, preventing future incidents in our community.

Risks managed through proactive training



Maintaining compliance with numerous regulatory agencies and accrediting organizations requires regular visits to our spaces, providing individualized feedback. **EHRS conducted 1,459 audits and inspections** in CY 2024, providing relevant guidance and support.

Hands-on oversight



Our team has consulted on a **combined 1829 construction meetings** in CY 2024 in support of Facilities and Real Estate Services (FRES) projects surrounding new buildings, renovations of laboratories, as well as shielding needs associated with radiological clinical spaces.

Critical specialized space planning



Our web site attracts people from the Americas to Asia, Europe, and Australia, seeking out safety information for their needs. Our **fact sheets and SOPS alone were accessed 51,797 and 22,972 times**, respectively.

Responsible Waste Disposal

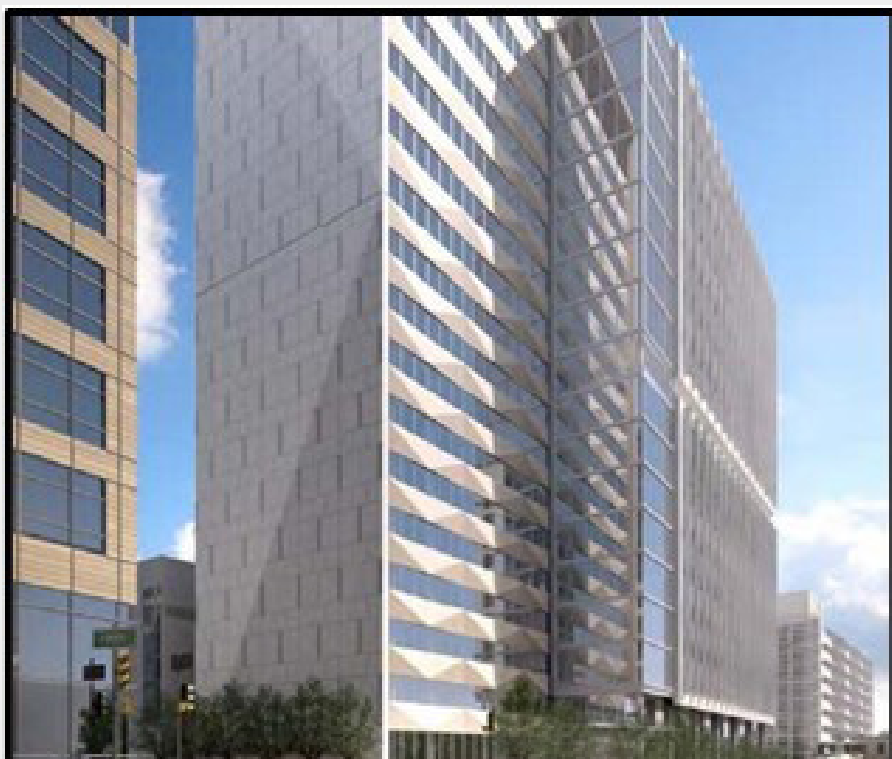
Proactive Safety Trainings

Audits and Inspections

Prevention by Design

BIOLOGICAL SAFETY

Securing the highest standards of biosafety for new and established labs



3600 Civic Center Boulevard Overbuild

The 3600 Civic Center Boulevard Overbuild project is **adding seven floors of research space** for the Perelman School of Medicine (PSOM). In addition to laboratory research spaces, this project includes construction of a vivarium and a biosafety level three (BSL-3) containment laboratory.

EHRS Biosafety contributed with construction meetings, facility walkthroughs, as well as program meetings with faculty. Special care in coordinating between the PSOM Project Team and other stakeholders was critical in the construction, commissioning, and verification activities for the BSL-3 laboratory. The latter part of 2024 transitioned responsibilities to commissioning activities and move scheduling meetings with PSOM leadership. Project goals include completion of commissioning during the first quarter of 2025, including ongoing permitting work, and occupancy in the Fall of 2025 and Spring of 2026.



Biosafety and Biosecurity Month Award

The biosafety team celebrated Biosafety and Biosecurity Month by hosting several informational tables to promote safety practices throughout the campus during October 2023 and 2024. **The team set up tables in the lobbies of 9 buildings in 5 schools across campus** (Perelman School of Medicine, Penn Dental Medicine, School of Veterinary Medicine, School of Arts and Sciences, and the School of Engineering and Applied Sciences) to ensure important biosafety information reaches a wide audience. **The team leader was recognized in an award** presented at the Biosafety and Biosecurity Conference hosted by the Association for Biosafety and Biosecurity in Phoenix, AZ.

These hour-long events provided researchers the opportunity to engage with the biosafety team, ask questions, try out a waste sorting game and a glove removal challenge. EHRS fosters a culture of safety by creating activities that are simultaneously educational, engaging, and enjoyable to make researchers feel comfortable asking questions and sharing their concerns.



More Sustainable Regulated Medical Waste and Infectious Sharps Disposal

Members of the EHRS team participated in a team coordinated through Penn Procurement to evaluate and select a new vendor for Penn's Regulated Medical Waste (RMW) and Infectious Sharps disposal needs. Throughout the Fall of 2024, the team reviewed, interviewed, and conducted site visits to evaluate four infectious waste removal vendors.

At the end of 2024, we welcomed Advant-Edge Solutions of Middle Atlantic, Inc as Penn's new infectious waste hauler, replacing Sharps Medical Waste Services (Curtis Bay). Importantly, selecting a new vendor to provide RMW removal services allowed the institution to transition from processing waste using an incinerator to newer technology utilizing ozone treatment to inactivate the waste before disposal. **This technological transition serves to reduce Penn's carbon footprint for RMW disposal by 97%** and provides a positive contribution to Penn's sustainability initiatives.



Biological Safety Statistics

813,302	Pounds of regulated medical and sharps waste disposal managed
1,572	Material Transfer Agreement reviews
1,240	IACUC (Institutional Animal Care and Use Committee) protocol reviews
1,217	Biosafety cabinets managed
1,108	Compliance files reviewed
1,065	Individuals trained in specialty in-person trainings
810	Biosafety consultations and outreach
699	Biological agent registration reviews
186	Project & construction consultation meetings
61	Animal hazard briefings

Institutional Compliance Committees

Institutional compliance takes time and effort. Attendance at meetings and processing of documents **conservatively includes 990 hours of effort annually for this single program component.**

ENVIRONMENTAL PROGRAMS

Ensuring environmental compliance, emergency response, and waste management across Penn’s campuses



Above: Pennovation Works Lab Building recently completed 19 months of rigorous reviews and revisions to finalize air permitting with the City of Philadelphia’s Air Management Department.

Environmental Oversight

The construction of the Ott Center for Track & Field necessitated the critical oversight of our team. Their expertise was pivotal in the **analysis and offsite disposal of 2,332 tons of contaminated soils** that required excavation to safeguard the health and safety of our campus community.

EHRS played a crucial role in **ensuring regulatory compliance during the construction projects at Civic Center Blvd, Amy Gutman Hall, Fagin Hall, and the acquisition of the Translational Research Laboratories**. These buildings required permitting and compliance tasks for multiple new air emission sources, including diesel emergency generators, fire pumps, and natural gas boilers. This meticulous oversight not only ensured adherence to the Clean Air Act but also reinforced Penn’s commitment to maintaining a safe and environmentally responsible campus.



Controlled Substances Disposal

Our Environmental Programs team successfully organized two major events aimed at ensuring the safe and compliant disposal of unwanted and expired Drug Enforcement Administration (DEA) - controlled substances within our research community. These efforts resulted in the **processing and transfer of over 900 containers of controlled drugs for proper disposal**.

Shipping of Dangerous Goods

In a collaborative effort, EHRS plays a vital role in training and assisting our reserach and clinical communities with the complex task of shipping regulated materials both domestically and internationally. This specialized expertise ensures strict compliance with stringent regulations, facilitating the safe and efficient transport of critical research materials. **In 2024, over 7,600 shipments of research materials were successfully dispatched**, include chemical compounds, biological materials, and radiological isotopes. These shipments support a wide range of research directions from pharmaceutical development to advancements in battery technology.



Chemical Waste Management

The EHRS chemical management team plays a critical role in mantaining compliance with federal regulations. In 2024, the team collected **50,721 containers of chemical waste and gas cylinders**, transporting them to our on-campus facility for processing - **a 22% increase from 2023!** The team **consolidated over 14,000 gallons of solvents and other liquid waste** from 5-gallon carboys and reagent-sized bottles into 55-gallon drums. These flammable solvents were recycled as fuel source. This consolidation maximizes packaging efficiency and significantly reduces our overall waste disposal costs.

In 2024, our team **directly processed 96% of the chemical waste generated** by university labs within University City and our multiple off-site locations, including New Bolton Center in Kennett Square. This includes collection, identification, transport, and storage pending disposal of **50,721 containers of chemical waste**. These shipments were comprised of over 1,100 shipping containers ranging in size from handheld boxes to 55-gallon drums and yard boxes. Maintaining chemical waste management in-house means increased engagement to help researchers with complicated waste streams and safe and efficient waste disposal.

Environmental Programs Statistics

- 209,915** Pounds of chemical hazardous waste collected, processed, and disposed of in-house
- 50,721** Containers of chemical waste and gas cylinders collected for disposal
- 7,600** Shipments of research materials sent
- 1,200** Communications addressing chemical hazards and disposal inquiries
- 128** Incidents and odor complaints investigated
- 85** Environmental permits or licenses managed

Emergency Response

Our team responds to numerous incidents and alarms on campus, including chemical spills, fires, injuries, and indoor air quality concerns. Careful expertise and swift action are vital in ensuring the safety and well-being of our campus community. EHRS has multiple team members on-call 24/7 and 365 days a year to support emergency responses in the Penn community. We also work with partners to prepare for emergencies, such as tabletop exercises (right).



LABORATORY SAFETY & INDUSTRIAL HYGIENE (IH)

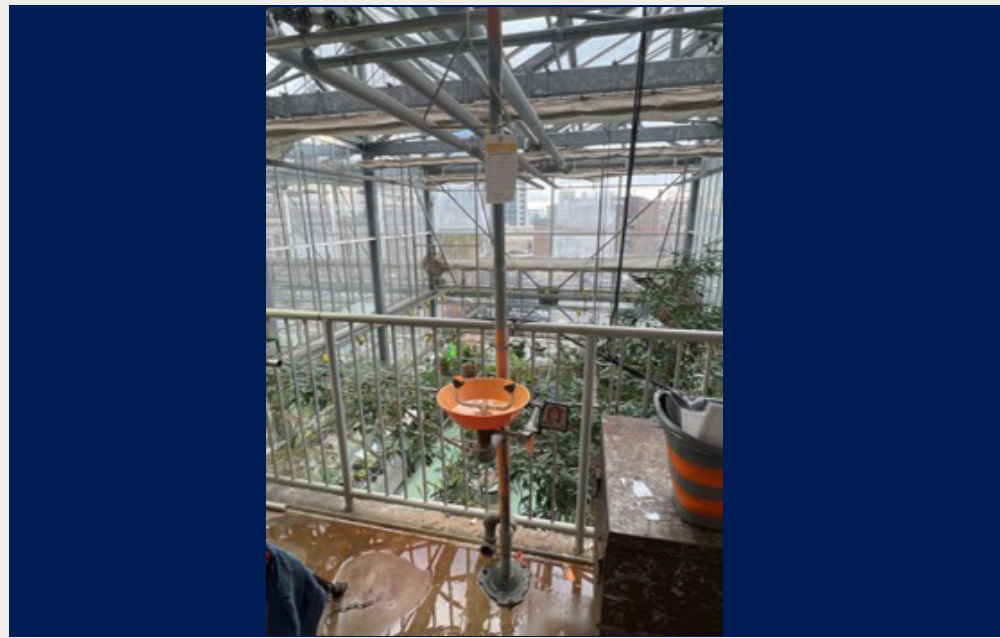
Evaluating and controlling exposures to chemical and physical agents



Pre-ASHRAE fume hood testing in the new VLEST building where **61 hoods were tested and evaluated. Lab Safety tests or oversees testing of 1,617 fume hoods** with 1,215 of them on main campus while others are in New Bolton Center, Pennovation and in Health System labs.

Vagelos Laboratory for Energy Science and Technology (VLEST)

Our team provided the newly opened state-of-the-art VLEST building project with guidance for potential safety issues identified during planning and construction, consulting on appropriate ventilation and chemical storage, as well as identifying new protocols for materials handling and transport in a new space. VLEST introduces a cooperative research space for both SAS and SEAS faculty studying energy science. The **movement of 6,819 chemicals was overseen by our team, ensuring all federal, state, and local regulations were observed.** EHRS also consulted on emergency irrigation systems, roof fall protection, and permitting.



Shower and Eyewash Program (SEW)

The new SEW program, funded jointly by EHRS and Facilities and Real Estate Services (FRES), involves inspections of eyewashes, capturing data on flow rate, flow pattern, hands-free mechanisms, water temperature, location, and signage. EHRS student workers performed tests and maintained the inventory, having completed **1,956 eyewash tests** in 7 months. Of those, **40% required service from plumbers**, including identifying 189 plumbing leaks, 12 eyewashes with dangerously hot water, and issues such as incorrect installation in new buildings and overpressurization! The SEW program highlights our commitment to partnerships, resulting in broad-ranging benefits.

Industrial Hygiene (IH) Sampling

The IH group conducted 30 sampling events totaling 137 samples for chemicals, such as dichloromethane, formaldehyde, isofluorane, and ethylene oxide. This testing informs researcher safety for those who work with these chemicals. A significant future initiative heavily dependent on sampling involves ensuring compliance with new EPA regulations about work with dichloromethane.



Celebrating the launch of the Climate and Sustainability Action Plan 4.0 in November 2024

Green Labs Program

2024 marked the first full year of a formal Green Labs program at Penn that is housed in EHRS and also reports to the FRES sustainability office. The **2024 Freezer Challenge successfully saved 53.2 kWh per day with the participation of 14 labs.** The Ultra-Low Temperature (ULT) Freezer Rebate Program saw the replacement of 18 older inefficient units, purchase of 16 new energy-efficient units and recycling of 5 units no longer needed. An ongoing inventory of ULT freezers has thus far identified 166 units where labs were informed about proper maintenance intended to minimize energy waste. We piloted the “Shut the Sash” fume hood challenge to better learn fume hood use habits to minimize energy usage. Green Labs also participated in outreach events such as Vendor Expos, tabling and outreach about the Green Labs program, as well as an EHRS-led safety quiz event and Green Chemistry Workshop.



Laboratory Safety & Industrial Hygiene Statistics

- 150,656 Chemical inventory containers managed
- 25,925 Chemical containers entered or removed from system
- 7,684 Trainings administered
- 799 Laboratory audits
- 571 People in hearing conservation program
- 379 Class 3B and 4 lasers managed
- 242 Respirator fit tests completed
- 95 Hazard control plan reviews
- 43 Ergonomic assessments completed

Construction and Renovation Projects

Project reviews include ventilation, chemical storage, environmental monitoring systems, infrastructure requirements for specific laboratory equipment and materials, and emergency irrigation equipment. The **Lab Safety & IH group attended 276 project-related meetings** in 2024. Additional support involves code reviews, review of equipment manuals and chemical inventories, and calculations for oxygen and gas alarms.

OCCUPATIONAL SAFETY

Collaborating with the Penn community to maintain a healthful and safe place to work and learn



Incident Reporting System and Database

EHRS completed development and commenced rollout of a campus-wide incident reporting and investigation database. **In 2024, there were hundreds of worker’s compensation cases resulting in thousands of lost or restricted workdays and significant medical costs.** The campus reporting system provides EHRS with more leading indicators which allow us to more efficiently target resources and be more proactive in reducing injury and illness. **Our in-house development of the system saved tens of thousands of dollars in development and annual licensing fees.** It also directly benefits our schools, including the School of Veterinary Medicine, where our team has assisted by providing customized reports for tracking patient-specific medical and medication data.



Large Animal Veterinary Safety

In 2024, there were **several large-animal related incidents** at New Bolton Center (NBC) resulting in hundreds of lost or restricted workdays and significant medical costs. The Occupational Safety group has been working diligently to reduce the number and severity of large animal-related injuries. We have completed in-depth task hazard assessments and have worked with the NBC team to develop safer work practices, ensuring appropriate supervision and training, and the incorporation of personal protective equipment. EHRS coordinated funds from the Office of Risk Management and Insurance to **acquire specialized helmets and protective vests.**

Water Feature Maintenance & Testing

Our team developed a **maintenance and testing program for 12 water features** on the main campus, collaborating with FRES. The program helps ensure the water in the features is safe for humans, pets, and wildlife.

Facilities & Real Estate Services (FRES) Support

Our team developed a Health & Safety Guidelines section to the Penn FRES Design Guidelines and Policies web page. **Resources for Design Professionals & Construction Management** was created to provide health and safety information during the initial planning phase of construction and renovation projects. Early involvement of EHRS results in cost savings requiring less corrections and work disruption once the project is underway or after the space is commissioned and occupied. Construction/renovation contractors submitted **56 site-specific safety plans** for review and approval by EHRS. The plans outline potential hazards and how to mitigate them prior to construction, ultimately providing an extra safeguard for the project.



Above: CPR training for FRES coordinated by EHRS

Our ongoing review of the FRES Safe Card Program allows FRES employees to easily submit safety concerns for investigation and hazard mitigation. FRES employees submitted **107 SAFE Card cases in 2024**, and 81 were closed out by the end of the year. Additionally, we have developed an onboarding procedure for new FRES employees to ensure appropriate trainings and any necessary medical evaluations are in place.

Occupational Safety Statistics

- 1,340 Roof fall protection anchors inspected
- 900 Individuals trained
- 513 Project & construction consultation meetings
- 213 Workers compensation investigations conducted
- 100 Indoor air quality studies completed
- 89 Asbestos abatement projects managed
- 75 Makerspace and shop audits
- 21 Specialized in-person training sessions

Focus on Student Safety

The Occupational Safety team completed health and safety assessments for the **Penn Electric Racing Team**, as well as consulted with **senior design students about developing a custom 3D printing system.** Our team also provides ongoing support to the **Weitzman School of Design Fabrication Lab** and **Autonomous Robotics Laboratory.**

RADIATION SAFETY

Partnering with research and clinical faculty, staff, and students to manage risks associated with radiation use



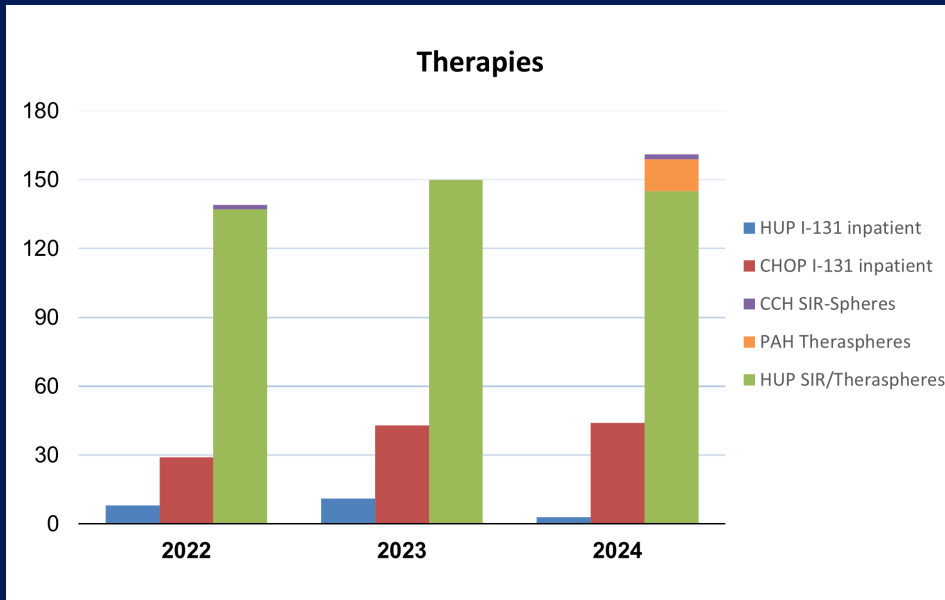
Emergency Response Training & Drills

EHRS has partnered with Philadelphia Police Department for training opportunities:

- Crime Scene Investigations for Hazardous Environments
- Preventative Radiological Nuclear Detection (PRND) Backpack Operations for Primary Screener
- PRND Secondary Screener/Radio-Isotope Identification Device
- Hospital Radiological First Receivers: Detecting Radiological Contamination

We conducted **alarm response training at the National Security Complex in Oak Ridge, TN For Penn Police, Philadelphia Police, and Philadelphia Fire & Hazmat.**

We have worked with local Emergency Response teams to complete enhancements to the radiological emergency response plan.



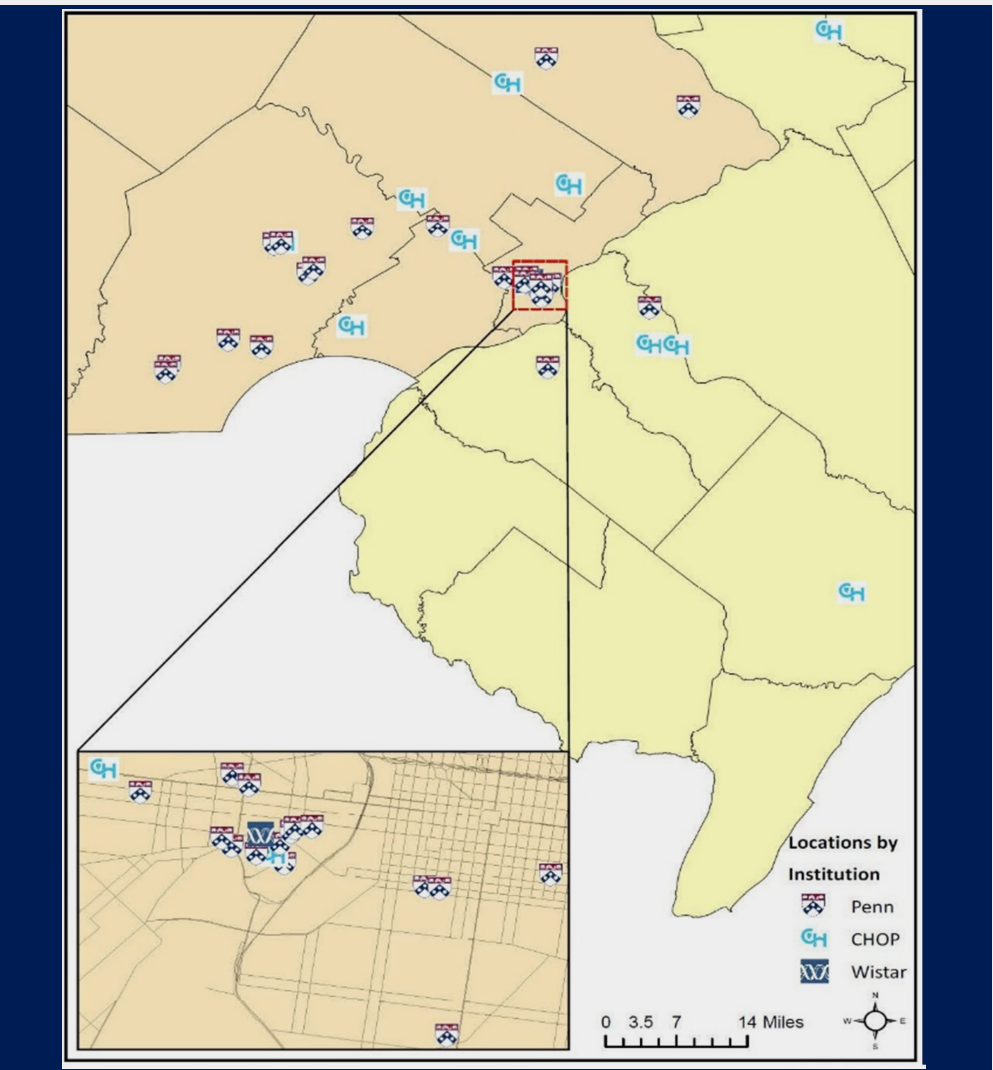
Outpatient therapy administrations of radiopharmaceuticals such as Lu-177 Lutathera, Lu-177 Pluvicto, Ra-223 Xofigo, and I-131 NaI and MIBG, are performed in individual Nuclear Medicine departments.

Radiopharmaceutical Therapies

Radiation Safety staff supports clinical staff administering radiopharmaceutical therapies by:

- providing temporary shielding and contamination control for treatment rooms,
- measuring patient and facility exposure rates
- collecting radioactive waste
- surveying and decontaminating rooms to ensure their release for unrestricted use
- training caregivers on how to safely support their loved ones post-therapy

EHRS facilitated the **administration of ~160 therapies in 2024.**



Our radiation safety team manages radiation use in 83 clinical and research spaces ranging from University City to hospitals and clinics as far as a 40-50 mile radius away.

Human Subjects Research Protocols

The Radiation Research Safety Committee (RRSC) reviews human research protocols submitted to Penn's Institutional Review Board (IRB) that involve the administration of radiation to subjects. **During 2024, 1,975 submissions were reviewed.** A new streamlined and expedited process was introduced for standard radiological studies with minimal radiation doses. Our staff additionally helped **review approximately 88 submissions to eIRB submissions from Children's Hospital of Philadelphia (CHOP).**

Radiation Safety Statistics

4,500

Workers badged for radiation exposure monitoring

4,220

Trainings completed

853

Energized equipment systems (e.g. X-ray, mammography, CT, fluoroscopy) managed

450

Institutional Animal Care and Use Committee (IACUC) protocols reviewed by radiation safety

373

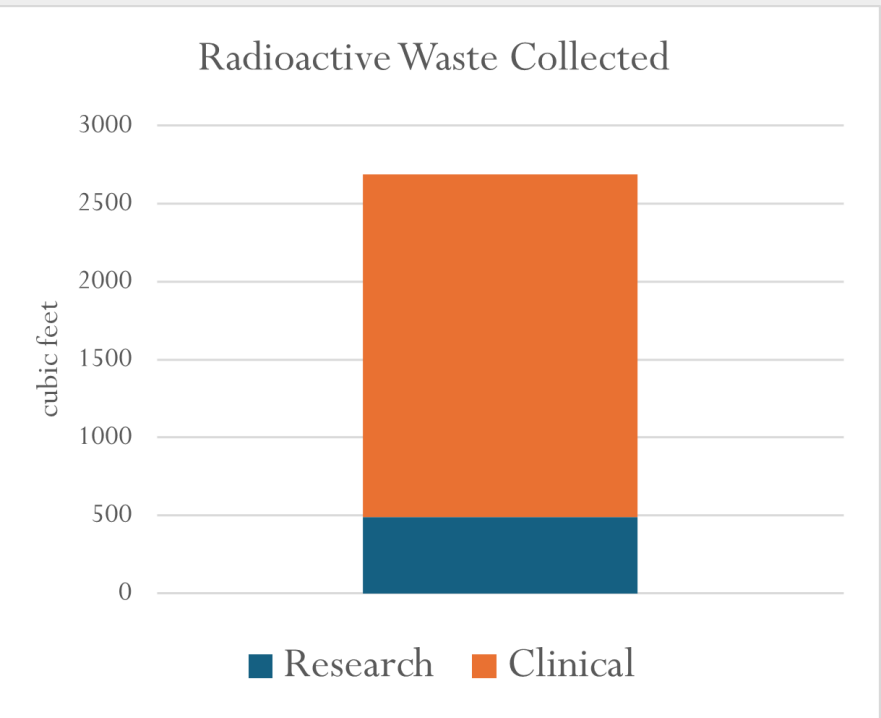
Lab audits for labs using radiation

267

Radioactive materials permits managed

57

Terminal lab radiation surveys conducted





Green Lab Workshop providing resources to researchers with help of EHRS staff and industrial partner



Fire Extinguisher training with Fire & Emergency Services



Safety Quizzo with Engineering creating engagement around safety



Large-group training with Facilities and Real Estate Services in hazard communication



Safety Fun House event with Penn Chemistry graduate students and staff gave hands-on opportunities to engage with safety



Professional opportunities close to home provided a great opportunity for EHRS leadership on display!

Left: Future Labs Live in Philadelphia



Regional meetings offered the chance to connect with partners closer to home.

Left: Mid-Atlantic Biological Safety Association Meeting in New York



Presenting and learning at the national level ensures Penn is at the forefront of global health and safety initiatives.

Left: American Society of Safety Professionals Meeting in Denver, CO

Leadership and Service in the Penn community and beyond