

# ENVIRONMENTAL MANAGEMENT

*Providing scientifically defensible solutions for challenges in nuclear waste management, complex environmental remediation, and the environmental effects of energy development.*

## PRIORITIES

Reduce risks to the startup and operations of first-of-a-kind radioactive waste processing facilities

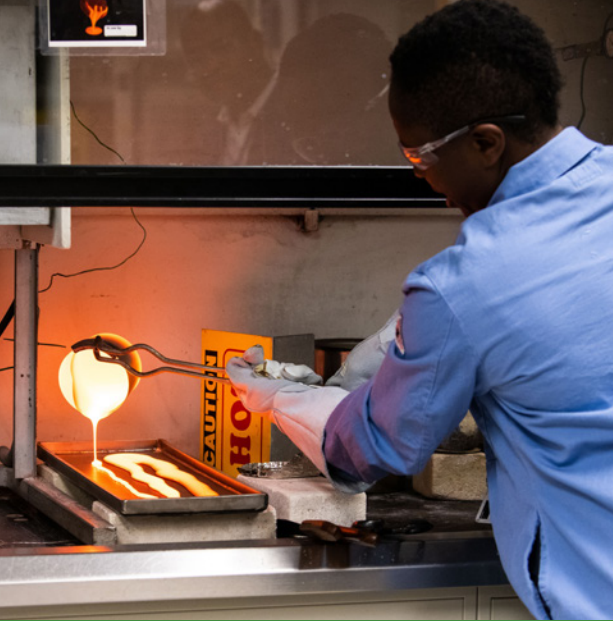
Enable waste processing improvements to increase efficiency and reduce mission lifecycle costs

Provide independent technical bases for near- and long-term cleanup decisions

Identify and address technical gaps to reduce environmental risks

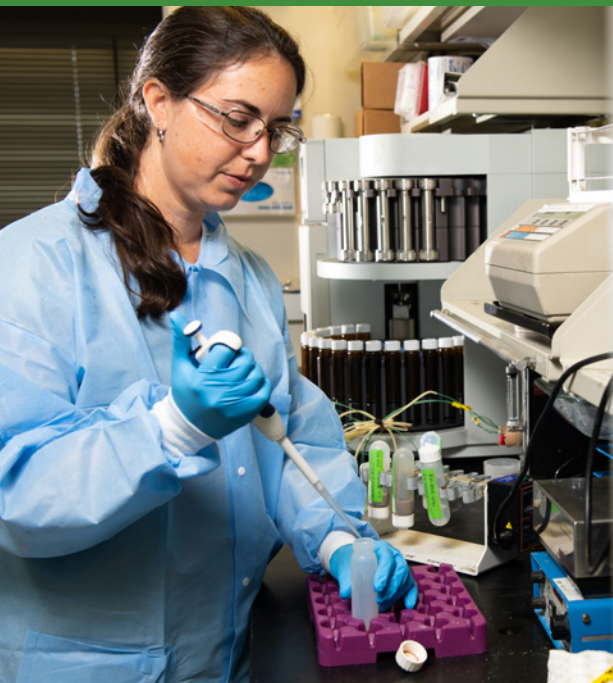
Deliver engineering solutions for remediation of complex sites

Identify adaptive management approaches to achieve end states and site closure



## MISSION

We are committed to restoring the environment for a cleaner future. We provide impactful, risk-informed scientific and technical results to safely complete cleanup of the environmental legacy from nuclear weapons development and government-sponsored nuclear energy research, and other complex environmental challenges for future energy development.



## WHAT WE DO

Rooted in a broad understanding of complex systems, our innovations provide crucial science-based and risk-informed solutions to national and international waste management and environmental remediation challenges. We also apply this environmental expertise to challenges in energy development in support of federal and state agencies, industry partners, and tribal nations.

Our strategically focused research, analyses, and technological contributions are saving the nation billions of dollars through cost avoidance, while also reducing the risks and time frames for cleanup of legacy waste. Pacific Northwest National Laboratory has helped advance the Hanford Site environmental management mission since the 1960s. Our historical knowledge and unique scientific and technical expertise—including chemical and nuclear processing, systems integration, environmental remediation, and site stewardship—are foundational to the successful cleanup of legacy waste at Hanford and similar complex sites. We manage and support over 100 projects annually across multiple sponsors, including the U.S. Department of Energy and DOE Site contractors in priority mission areas.

## KEY PROJECTS

- Tank Integrity and Life Extension
- Tank Waste Processing and Flowsheet Maturation
- Advanced Glass and Optimization Program
- Deep Vadose Zone – Applied Field Research Initiative
- Environmental Remediation – Adaptive Site Management
- Ecological Assessment and Restoration
- Radiation Dosimetry and Calibration

## FACILITIES & EQUIPMENT

Radiochemical  
Processing Laboratory

Wasteform  
Development Laboratory

Radiological Exposures  
and Metrology Laboratory

Applied Subsurface  
Science and  
Characterization  
Laboratory

PNNL-Sequim marine  
research facilities

Computational and  
Applied Geophysical and  
Geomechanics Laboratory

Radioactive Waste  
Test Platform

Process Development  
Laboratory High Bay

Tank Integrity  
Qualification Platform



### Environmental Remediation

- Adaptive Site Management
- Geophysical Monitoring
- Remediation Science and Systems
- Subsurface Science and Modeling



### Radiation Measurement

- Calibrations
- Dosimetry
- Irradiation Sciences
- Materials in Extreme Environments



### Waste Processing

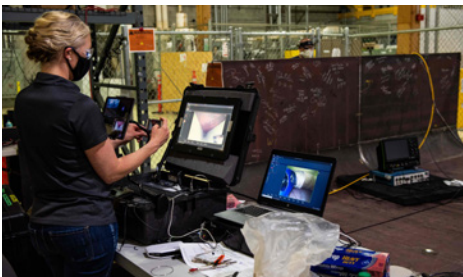
- Fluid Dynamics and Scaling
- Tank Waste Chemistry
- Wasteform Development
- Safety Basis



### Environmental Effects of Energy Development

- Risk and Decision Sciences
- Sensors and Predictive Modeling
- Data Collection and Analysis
- Technology Development

## ACCOMPLISHMENTS



### Tank Integrity and Life Extension

Extending the life of underground waste storage tanks—and avoiding hundreds of millions of dollars in replacement costs—through advanced nondestructive evaluation sensing, robotic crawler deployment, and data analytics with machine learning to detect and interpret flaws under the tank bottoms.

---



### Waste Processing Operations

Establishing the baseline for tank waste treatment. This includes the original vitrification process and ongoing R&D for filtration, radiochemical separations, glass formulations, secondary waste treatment, and wasteform disposal—all using state-of-the-art experimental methods and integrated test platforms.

---



### Tank Safety Basis

Evaluating the safety basis of underground waste storage tanks by developing science-based solutions for chemical hazards, including “burping,” vapors, and deep sludge mixing. Assessing tank dome structural integrity to enable greater storage capacity and the safe installation of access ports for waste retrieval equipment—to support long-term use of existing tanks.

---

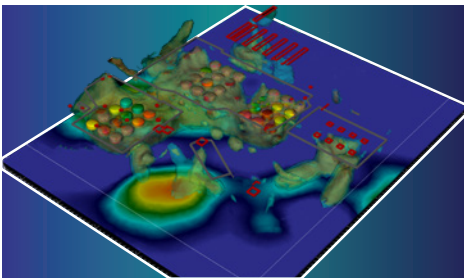


### Environmental Effects of Energy Development

Informing natural resource management with deep expertise in animal behavior in riverine and in coastal environments, wetlands habitat health, experimental data collection and analysis, modeling, and sensor development for freshwater, estuarine, coastal, and offshore regions.

---

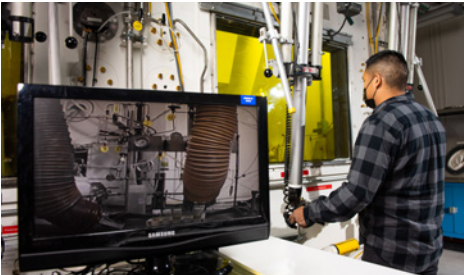
## ACCOMPLISHMENTS



### Remediation of Complex Sites

Providing international leadership in the development, maturation, and deployment of advanced technologies to solve complex issues in the contaminated subsurface environment—stemming from our support of soil and groundwater remediation in Hanford’s Columbia River corridor and Central Plateau deep vadose zone.

---



### Flowsheet Optimization

Supporting efforts to increase Direct Feed Low-Activity Waste (DFLAW) operational flexibility at Hanford’s Waste Treatment and Immobilization Plant. This includes resolving the long-term, waste loading challenges associated with glass waste forms and providing glass standards to support analysis during waste qualification activities.

---



### Tank-Side Cesium Removal

Testing DFLAW radioactive waste streams directly led to improvements in the Tank Side Cesium Removal design. Operators now know to expect a difference in cesium loading behavior on the ion exchange columns with different tank feeds, and are better prepared for the waste settling and melting steps.

---

## CONTACTS

### Tom Brouns

Manager | Environmental Management Sector  
Energy & Environment Directorate  
(509) 372-6265 | [tom.brouns@pnnl.gov](mailto:tom.brouns@pnnl.gov)

### David Peeler

Deputy Manager | Environmental Management Sector  
Energy & Environment Directorate  
(509) 372-6225 | [david.peeler@pnnl.gov](mailto:david.peeler@pnnl.gov)

---

## ABOUT PNNL

Pacific Northwest National Laboratory advances the frontiers of knowledge, taking on some of the world’s greatest science and technology challenges. Distinctive strengths in chemistry, Earth sciences, biology, and data science are central to our scientific discovery mission. PNNL’s research lays a foundation for innovations that advance sustainable energy through decarbonization and energy storage and enhance national security through nuclear materials and threat analyses.