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NOVEMBER
13-17

RemPlex 2023 Global Summit

DISCOVERY HALL

PACIFIC NORTHWEST NATIONAL LABORATORY
RICHLAND, WASHINGTON

The Center for the Remediation of Complex Sites (RemPlex) presents the 2023 Global Summit on Environmental Remediation, organized in cooperation with the International Atomic Energy Agency (IAEA).

The RemPlex Global Summit is an international forum on the challenges, barriers, and innovative solutions for successful remediation and long-term stewardship of contaminated sites.

The RemPlex Summit brings together participants from government, industry, and research institutions to discuss remediation challenges and to collaborate on the application of both proven and innovative solutions.

Program at a Glance

Monday, November 13

Historic Hanford Site Tour

Tuesday, November 14

8:00 a.m. – 9:00 a.m.

Opening Session

- RemPlex Global Summit Opening Remarks
- Pacific Northwest National Laboratory Opening Remarks
- Department of Energy Remarks
- Hanford Virtual Tour

9:00 a.m. – Noon

Case Study: The Use of Geophysics to Support Site Characterization, Remedy Implementation, and Monitor Performance at the Hanford Site

Noon – 1:00 p.m.

Catered Lunch Program: Managing Leakage to Ground from an Aging Nuclear Waste Storage Facility—a UK Perspective from the Sellafield Site, by John Henagan, Contaminated Land Specialist

1:00 p.m. – 5:00 p.m.

Technical Sessions 1-3

- Technical Session 1: Environmental Management and Stewardship Innovations
- Technical Session 2: Artificial Intelligence/ Machine Learning-Empowered Digitization of Environmental Systems
- Technical Session 3: Innovative Characterization and Monitoring Technologies and Methodologies

5:00 p.m. – 7:00 p.m.

Welcome Reception and Poster Session

Wednesday, November 15

8:00 a.m. – 9:00 a.m.

Opening Session: Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Panel Discussion

9:00 a.m. – Noon

Case Study: Moab UMTRA Project: Progress Toward Closure at a Complex Groundwater Site

Noon – 1:00 p.m.

Catered Lunch Program: Moving Science into Practice: Applying Science and Technology to Sustainably Manage Former Uranium Mill Tailings Sites in the United States, by Mark Kautsky, Department of Energy, Office of Legacy Management

1:00 p.m. – 5:00 p.m.

Technical Sessions 4-6

- Technical Session 4: Emerging Remediation Technologies
- Technical Session 5: Environmental Data Management, Analysis, and Visualization
- Technical Session 6: Critical Minerals (including Rare Earth Elements): The Promise, Challenge, and Environmental Risk

5:30 p.m. – 7:00 p.m.

Social Gathering (light appetizers provided)
Iconic Brewing: 2470 Henderson Loop
Richland WA, 99354

Thursday, November 16

8:00 a.m. – 9:00 a.m.

Opening Session

- Looking Ahead to the Future: The Role for RemPlex
- Integrating Sustainability and Circularity Concepts in the Determination of End-States in Decommissioning and Environmental Remediation

9:00 a.m. – Noon

Case Study: Delivering Nuclear Site Cleanup in the United Kingdom

Noon – 1:00 p.m.

Catered Lunch Program: Technology as an Opportunity, by Rodrigo Rimando, Department of Energy, Office of Environmental Management

1:00 p.m. – 5:00 p.m.

Technical Sessions 7-9

- Technical Session 7: Ensuring Sustainability and Resiliency of Remediation Projects
- Technical Session 8: Multiscale Modeling in Porous Media: Theory to Applications
- Technical Session 9: Autonomous Measurements and Remote Sensing across Scales

Case Studies

Tuesday, November 14

9:00 a.m. – Noon

The Use of Geophysics to Support Site Characterization, Remedy Implementation, and Monitor Performance at the Hanford Site

At complex nuclear sites like the Hanford Site, there is a need for cost-effective and innovative methods to support site characterization, remedy implementation, and monitor performance. Current technologies to support these objectives rely on borehole drilling and sampling. The information provided by these technologies is high-resolution and high-quality, but sparsely distributed in space; thus, interpolation is required to fill information gaps between boreholes, creating significant uncertainty. This case study focuses on the use of geophysical technologies to supplement borehole information on the Hanford Site by imaging between these locations, thereby reducing uncertainty. The Hanford Site has a decades-long history of using geophysical methods to support a variety of site objectives, including environmental management. Our presenters will provide a historical perspective on the use of geophysics on the Hanford Site, how borehole geophysics has played a role in development of the site conceptual model, and finally on recent geophysical applications in field and laboratory settings. The aims of this case study are to (1) introduce and share novel ways that geophysical technologies are being used at the Hanford Site to supplement borehole information, and (2) demonstrate technology developments that could benefit characterization of other complex remediation sites around the globe.

Wednesday, November 15

9:00 a.m. – Noon

Moab UMTRA Project: Progress Toward Closure at a Complex Groundwater Site

The Department of Energy, Office of Environmental Management (DOE-EM) Moab site is the location of a former uranium ore-processing facility, which is now undergoing work as the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project to address the mill tailings and contamination in the underlying groundwater. Located in the state of Utah next to the Colorado River, the site spans 480 acres, of which the mill tailings pile covers 130 acres. The 16 million tons of uranium mill tailings are in the process of being relocated off-site to an engineered disposal cell at Crescent Junction, Utah. The groundwater has both uranium and ammonia contaminant plumes. In fiscal year 2023, a team of Network of National Laboratories for Environmental Management and Stewardship (NNLEMS), DOE, and Moab contractor staff conducted a review of technology approaches for the site, resulting in a set of actionable recommendations. This case study will present information on the history of the site, the complexities of the hydrogeology and contaminant plumes, the risk and environmental protection issues, and proposed solutions for making progress toward transition of the site to long-term stewardship under the DOE Office of Legacy Management.

Thursday, November 16

9:00 a.m. – Noon

Delivering Nuclear Site Cleanup in the United Kingdom

The Nuclear Decommissioning Authority (NDA) is responsible for the decommissioning and cleanup of legacy nuclear sites in the United Kingdom (UK). Its mission is to complete the cleanup of UK legacy nuclear sites and release them for beneficial reuse. This mission is complex, involving hundreds of facilities across 17 sites across the UK; it is expected to take over 100 years to complete and is estimated to cost in excess of £120 billion to deliver. This session will share some of the experience and learning that has been accumulated in the UK, which is now informing the NDA's national approach to delivering the remediation and cleanup of its sites.

Technical Sessions

Tuesday, November 14 | 1:00 p.m. | click on session number for the link

	Technical Session 1: Environmental Management and Stewardship Innovations	**Technical Session 2:** Artificial Intelligence/ Machine Learning-Empowered Digitization of Environmental Systems	**Technical Session 3:** Innovative Characterization and Monitoring Technologies and Methodologies
	Room: Horizon C	**Room: Horizon D/E**	**Room: Vista**
1:05 p.m. – 1:25 p.m.	**Using Chernobyl Data for the Source Zone Assessment, Stewardship, and Remediation: 1. Groundwater Monitoring in the Near-Field Chernobyl Exclusion Zone,** Dmitri Bugai, Institute of Geological Sciences, Kyiv, Ukraine	**Survey Unit Selection for Sample Representativeness in Site Contamination Studies,** Narmadha Mohankumar, Pacific Northwest National Laboratory	**Fiber Optic Distributed Sensing as a Window on Subsurface Flow,** Matthew Becker, California State University Long Beach
1:25 p.m. – 1:45 p.m.	**Using Chornobyl Data for the Source Zone Assessment, Stewardship, and Remediation: 2. Radioactive Contamination of Groundwater in the Vicinity of the Destroyed 4th Unit of the Chornobyl NPP,** Mykola Panasiuk, Institute for Safety Problems of Nuclear Power Plants of the National Academy of Sciences of Ukraine	**Data Analytics for Climate Change Impact,** Satyarth Praveen, Lawrence Berkeley National Laboratory	
1:45 p.m. – 2:05 p.m.	**Using Chernobyl Data for the Source Zone Assessment, Stewardship, and Remediation: 3. Monitoring and Modeling of the Closure of the Chernobyl NPP's Cooling Pond,** Boris Faybishenko, Lawrence Berkeley National Laboratory	**Physics-Informed Surrogate Modeling for Supporting Climate Resilience at Groundwater Contamination Sites,** Lijing Wang, Lawrence Berkeley National Laboratory	**Building Reliable Groundwater Transport Models at Contaminated Sites Using Cross-Borehole Electrical Monitoring,** Léa Lévy, Lund University
2:05 p.m. – 2:25 p.m.	Open Discussion	**Long-Term Groundwater Monitoring Using LSTM Algorithm for Anomaly Detection,** Jayesh Soni, Florida International University	**Spectral Induced Polarization Monitoring of Carbon-Based Remediation in DNAPL-Contaminated Groundwater,** Angelos Almpanis, Western University, Canada

Technical Sessions

Tuesday, November 14: CONTINUED			
2:25 p.m. – 2:45 p.m.	Open Discussion Continued	**Leveraging a Data-Driven Approach for Optimizing Pump-and-Treat Well Network Operations,** Xuehang Song, Pacific Northwest National Laboratory	Open Discussion
2:45 p.m. – 3:15 p.m.	Posters and Vendor Exhibit	Posters and Vendor Exhibit	Posters and Vendor Exhibit
3:15 p.m. – 3:35 p.m.	**Technical Support for the Long-Term Stewardship of a Uranium-Contaminated Wetland,** Daniel Kaplan, University of Georgia	**Efficient Super-Resolution of Near-Surface Climate Modeling Using the Fourier Neural Operator**, Peishi Jiang, Pacific Northwest National Laboratory	**NMR Logging Technologies for High-Resolution Site Characterization and Monitoring of Environmental Remediation,** Dave Walsh, Vista Clara Inc.
3:35 p.m. – 3:55 p.m.	**Phosphate Amendments for Treatment of U and Tc-99 in the Hanford Site's Central Plateau,** Hilary Emerson, Pacific Northwest National Laboratory	**Machine Learning Analysis of Western U.S. Fire Impacts on Hailstorms in the Central U.S.,** Xinming Lin, Pacific Northwest National Laboratory	**Locating Undocumented Orphaned Oil and Gas Wells with Cost Effective UAVs,** Sina Saneiyan, University of Oklahoma
3:55 p.m. – 4:15 p.m.	**Determination of Site End-States for Complex Sites in the UK,** Vicky Newling, Quintessa Limited	**Generative AI for Environmental Data Synthesis, Generation, and Augmentation,** Z. Jason Hou, Pacific Northwest National Laboratory	**Using Digital Twinning to Plan Environmental Characterization and Remediation,** David Yuke, Canadian Nuclear Laboratories
4:15 p.m. – 4:35 p.m.	**Challenges in Transition from Cleanup to Long-Term Stewardship at Sites,** Emerald Laija, United States Environmental Protection Agency	**Group Discussion: Challenges and Opportunities in AI/ML-Empowered Digitization of Environmental Systems,** Panelists and conference participants	**Scene-Data Fusion Applications in the Chernobyl Exclusion Zone,** Jake Hecla, UC Berkeley
4:35 p.m. – 5:00 p.m.	Open Discussion and Closing Remarks		Open Discussion and Closing Remarks

Technical Sessions

Wednesday, November 15 | 1:00 p.m. | click on session number for the link

	Technical Session 4: Emerging Remediation Technologies	**Technical Session 5:** Environmental Data Management, Analysis, and Visualization	**Technical Session 6:** Critical Minerals (including Rare Earth Elements): The Promise, Challenge, and Environmental Risk
	Room: Horizon C	**Room: Horizon D/E**	**Room: Vista**
1:05 p.m. – 1:25 p.m.	**In Situ Biomineralisation for Sellafield Groundwater Radionuclide Remediation,** Callum Robinson, The University of Manchester	**Evaluating an Existing Data Management System,** Samantha Bennett, ddms, Inc.	**Critical Raw Materials; European Perspectives and Solutions Including Environmental Impact,** Stephané Pepin, ENA
1:25 p.m. – 1:45 p.m.	**The SURRI Project: Developing New Technologies for Risk Management and Critical Element Recovery at Legacy Uranium Production Sites,** Andrew Cundy, University of Southampton (UK)	**Statistical Methods for Subsurface Decommissioning,** Jennifer Huckett, Pacific Northwest National Laboratory	**Unconventional Sources of Critical Minerals: Opportunities for Recovery from Mined Materials in the Copper and Gold Mining Environment,** Jeff Gillow, Arcadis
1:45 p.m. – 2:05 p.m.	**Synthesis and Characterization of Functionalized Organoclays for Use in a Radioactive Waste Repository,** Carolyn Pearce, Pacific Northwest National Laboratory	**Leveraging Data-Driven Decision-Making in a Large-Scale Field Study Simulating a Biological Agent Incident,** Michael Pirhalla, United States Environmental Protection Agency	**Recovering Critical Minerals from Phosphate Fertilizers Could Reduce their Accumulated Concentration Levels in Agricultural Soils,** Chandra Tummala, Wayne State University
2:05 p.m. – 2:25 p.m.	**Technical Support for Monitored Natural Attenuation of a Uranium, Thorium, and Mercury Contaminated Wetland along the Savannah River,** USA Daniel Kaplan, University of Georgia	**An Extensive Industrial Hygiene Data Analysis and Visualization (IDAV) Toolset,** Hongfei Hou, Pacific Northwest National Laboratory	**Selective Separation and Extraction of Rare Earth Elements (REEs) from Acidic Solutions by Using Novel N, N, N′, N′-tetra-octyl diglycolamide (TODGA) Grafted Organosilica Media,** Venkata Sai Praneeth Doranadula, Department of Civil and Environmental Engineering, Wayne State University
2:25 p.m. – 2:45 p.m.	Open Discussion	Open Discussion	**Radio and Chemo Toxicity from Exposure to Uranium and Related Metals: A Case Study of Mrima Hill,** Pamella Kageliza Kilavi, Technical University of Kenya/University of Nairobi

Technical Sessions

Wednesday, November 15: CONTINUED			
2:45 p.m. – 3:15 p.m.	Posters and Vendor Exhibit	Posters and Vendor Exhibit	Posters and Vendor Exhibit
3:15 p.m. – 3:35 p.m.	**One Resin to Rule Them All: Hybrid Resins Simultaneously Remove Multiple Contaminants from Groundwater,** Jacqueline Hager, Pacific Northwest National Laboratory	**An Open-Source Information Model and Associated Cyberinfrastructure for Effective Environmental Management and Analytics,** Roelof Versteeg, Subsurface Insights	**Challenges and Opportunities to Promote Circularity in Mining** Horst Monken-Fernandes, International Atomic Energy Agency
3:35 p.m. – 3:55 p.m.	**The Chemistry of Ra-226 and Other Contaminants in a Historically Contaminated River Bank: Lessons Learned on Kd and the Importance to Check Potential Precipitation Reactions,** Nathalie Impens, Belgian Nuclear Research Centre	**A Tool to Assess Environmental Remediation Response to CO_2 Leakage,** Eusebius J Kutsienyo, Pacific Northwest National Laboratory	**Critical Minerals and TENORM; How Do Permitting Reform and Executive Branch Actions Address Radioactivity?** Philip Egidi, U.S. Environmental Protection Agency
3:55 p.m. – 4:15 p.m.	**Influence of Co-Contaminants on the Effectiveness of Ammonia Gas Treatment of Uranium Contamination in Vadose Zone Sediments,** Jim Szecsody, Pacific Northwest National Laboratory	**Principal Component Analysis (PCA) to Compute Major Directions for 3D Spatial Analysis,** Swasti Saxena, Pacific Northwest National Laboratory	**Panel Discussion: Promises, Challenges, and Risks in the Search for Critical Materials, Natalie Byrd, University of Manchester, Rob Wiegers, IBR Consult/ENA,** Natalie Byrd, University of Manchester, Rob Wiegers, IBR Consult/ENA, and Philip Egidi, U.S. Environmental Protection Agency
4:15 p.m. – 4:35 p.m.	**Formation of Mineralogical Interfaces as Radionuclide Repositories,** Grant Douglas, Commonwealth Scientific Industrial Research Organisation	**Geoframework Models: A Force Multiplier,** Tollef Winslow, Central Plateau Cleanup Company	
4:35 p.m. – 5:00 p.m.	Open Discussion and Closing Remarks	Open Discussion and Closing Remarks	

Technical Sessions

Thursday, November 16 | 1:00 p.m. | click on session number for the link

	Technical Session 7: Ensuring Sustainability and Resiliency of Remediation Projects	**Technical Session 8:** Multiscale Modeling in Porous Media: Theory to Applications	**Technical Session 9:** Autonomous Measurements and Remote Sensing Across Scales
	Room: Horizon C	**Room: Horizon D/E**	**Room: Vista**
1:05 p.m. – 1:25 p.m.	**Ensuring Sustainability and Resiliency of Remediation Projects: Challenges for Long-Term Management at Complex Industrial, Nuclear, and Other Sites,** Andrew B. Cundy, University of Southampton, UK	**Turbulent Transport Across Sediment-Water Interface: Pore-Resolved Simulations and Upscaled Modeling,** Sourabh V. Apte, Oregon State University	**Michigan Radiological Unmanned Aerial Vehicle (UAV) Program,** Greg Gothard, Michigan Dept. of Environment, Great Lakes, and Energy
1:25 p.m. – 1:45 p.m.	**Sustainable Resilient Remediation of the Hajek Hch Site Using the Wetland+ System,** Miroslav Cernik, Technical University of Liberec	**Digital Twins from Microscope Image Data,** James E. McClure, Virginia Tech	**Comparison of UAV and Human Surveys for Decommissioning,** Amoret Bunn, Pacific Northwest National Laboratory
1:45 p.m. – 2:05 p.m.	**Vulnerability Assessment and Resilience Planning at Department of Energy Office of Environmental Management Sites,** David Werth, Savannah River National Laboratory	**Numerical Modeling of Heterogeneous Porous Media Burners Using Volume-Averaged Method,** Aniruddha Saha, Cornell University	**Drone-Based Phytoremediation Reconnaissance Using NDVI/NIR Multispectral Imagery at a Historical Waste Storage Landfill,** Clara Austin, AECOM
2:05 p.m. – 2:25 p.m.	**Site Remediation and Social Sustainability: A Case Study,** Federica Panzarella, KU Leuven and Belgian Nuclear Research Centre – SCK CEN	**Upscaling Reactions in Tissues with Deep Neural Networks for Closure,** Brian D. Wood, Oregon State University	**Drone Geophysics and Remote Sensing for Environmental Site Characterization: An Overview,** Ronald S. Bell, Drone Geoscience, LLC
2:25 p.m. – 2:45 p.m.	**Challenge for Sustainable Remediation of Large-Scale Terrestrial Contamination by the Fukushima Daiichi NPP Accident,** Tetsuo Yasutaka, National Institute of Advanced Industrial Science and Technology (AIST)	Open Discussion	Open Discussion

Technical Sessions

Thursday, November 16: CONTINUED			
2:45 p.m. – 3:15 p.m.	Posters and Vendor Exhibit	Posters and Vendor Exhibit	Posters and Vendor Exhibit
3:15 p.m. – 3:35 p.m.	**Environmental Remediation and Site Revitalization Planning at a Complex Nuclear Site Using a Multi-Attribute Prioritization Tool,** Luc Robitaille, Canadian Nuclear Laboratories	**AI-Augmented Drone Observation and Multiscale Modeling of Streambed Hydro-Biogeochemistry,** Yunxiang Chen, Pacific Northwest National Laboratory	**Autonomous Measurements and Remote Sensing across Scales: End to End Processing with Cloud-Based Framework for Remotely Sensed Data for Ongoing Site Monitoring,** Patrick Royer, Pacific Northwest National Laboratory
3:35 p.m. – 3:55 p.m.	**Broadening the Concepts of Justification and Optimization in Environmental Remediation by Incorporating Sustainability Principles in the Decision-Making Process,** Horst Monken-Fernandes, International Atomic Energy Agency	**Evaluation of Remedy Performance of the Uranium Plume in the 300 Area of Hanford Site,** Sunil Mehta, INTERA Inc.	**Applying a Drone Enabled Metal Detector to Scan the Subsurface for Buried Pipelines: Preliminary Results,** William Barkhouse, Drone Geoscience, LLC
3:55 p.m. – 4:15 p.m.	**Panel Discussion: Advancing Sustainability and Resiliency in Remediated Sites Worldwide,** Luc Robitaille, Canadian Nuclear Laboratories, Federica Panzarella, KU Leuven and Belgian Nuclear Research Centre – SCK CEN, and Eric Mielbrecht, EcoAdapt	**Evaluation of the Need for Three-Dimensional Contaminant Transport Modeling of the Hanford Central Plateau Vadose Zone,** Mart Oostrom, INTERA, Inc.	**Leveraging Aerial Robotics for Environmental Discovery**, Luke Placzek, Pacific Northwest National Laboratory
4:15 p.m. – 4:35 p.m.		**Modeling Evapotranspiration and Soil-Moisture Flow of a Modified RCRA Subtitle C Surface Barrier,** Fred Zhang, INTERA, Inc.	Open Discussion and Closing Remarks
4:35 p.m. – 5:00 p.m.		Open Discussion and Closing Remarks	

Training Workshops | 8:00 a.m. – Noon | Friday (in-person)

Developing Statistically Defensible Site Characterization Programs Using Visual Sample Plan

Visual Sample Plan (VSP) is a software tool that helps assure the right type, quality, and quantity of data are gathered to support confident decisions and provides statistical evaluations of the data with decision recommendations. VSP couples site, building, and sample location visualization capabilities with optimal sampling design and statistical analysis strategies. Developed with support from multiple U.S. federal agencies, VSP has more than 5,000 active users and is recommended by many regulators for defensible sampling design and statistical analysis. During this 4.5-hour hands-on workshop, you will learn the basics of how to use VSP to import or create a site map, select a statistical objective, enter parameters to set up a sampling plan, export planned sample locations, and import and analyze data. We will also cover the basic concepts of statistical sampling, systematic planning, and the data quality objectives process. To fully participate, bring a laptop and install VSP version 7.19 prior to the workshop.

Simulation Modeling of Contaminant Fate and Transport

Simulation of contaminant fate and transport plays an important role in the long-term stewardship of contaminated sites. Modeling tools help scientists and regulators to better understand the feasibility of remediation technologies and the potential risk to the environment. This 4-hour workshop presents two simulation tools developed at PNNL and employed to understand and predict the behavior of contaminants and the efficiency of the remediation technologies:

eSTOMP, a highly scalable coupled multiphase flow and multicomponent reactive transport model used to simulate subsurface flow and transport processes in a variety of applications, including contaminant remediation; and

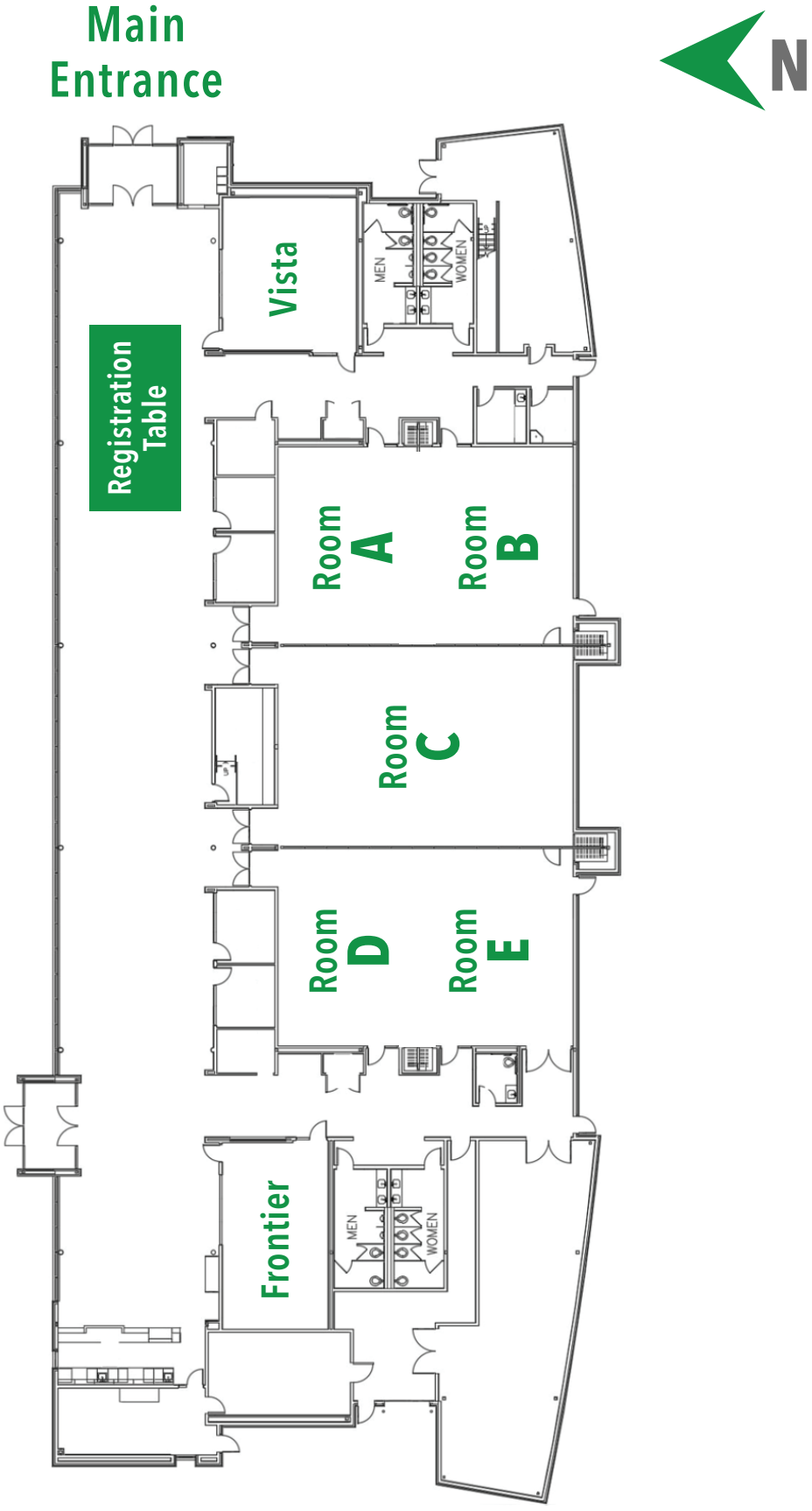
PFLOTRAN, a code used to simulate multiphase flow, heat transfer, biogeochemical transport, and electrical resistivity tomography (ERT) within the subsurface environment to study the impact of climate change on the Earth system environment, long-term radioactive waste repository performance assessment, and contaminant fate and transport.

In addition, participants will be introduced to artificial intelligence and machine learning-enabled model-data integration concepts. Attendees will be sent information in advance on how to access eSTOMP and PFLOTRAN.

Managing PFAS in the Subsurface: Fate & Transport and Remediation

The aim of this 3-hour workshop, organized by Dr. Charles Newell of GSI Environmental Inc., is to present the current state of science related to PFAS occurrence in the environment, toxicology, exposure pathways, fate and transport processes, remediation, and long-term management of PFAS-contaminated sites. Topics with special emphasis will include comparing PFAS to other conventional groundwater contaminants; what was learned from high-resolution characterization of PFAS sites; how to measure PFAS mass discharge from the unsaturated zone and saturated zone; status of ex situ and in situ PFAS remediation technologies (experimental, emerging, proven); potential scenarios for managing PFAS groundwater plumes; and two new PFAS management concepts: PFAS monitored retention and PFAS enhanced retention. The workshop is designed to allow ample time for questions and knowledge sharing from all participants.

Discovery Hall Map



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Click below for campus and building maps

PNNL CAMPUS MAP

DISCOVERY HALL MAP