UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 25, 2022

MEMORANDUM TO: Christopher A. McKenney, Chief
Risk and Technical Analysis Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

FROM: Cynthia S. Barr, Senior Risk Analyst
CBarr Signed by Barr, Cynthia on 05/25/22
Risk and Technical Analysis Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SUMMARY OF MAY 11, 2022, 2ND ANNUAL SUBSURFACE INVESTIGATIONS WORKSHOP

On May 11, 2022, the U.S. Nuclear Regulatory Commission (NRC) held a public meeting via Microsoft Teams to obtain feedback on a contractor produced technical white paper, which will be considered in developing interim subsurface investigations guidance later in 2022 or early 2023. The meeting notice and detailed meeting agenda are available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession Nos. ML22130A050 and ML22126A171, respectively. Presentations are available in ADAMS at ML22117A070.

Approximately 130 stakeholders participated in the public meeting. A list of attendees is found in Enclosure 1 (those listed by phone number only are not included in the list). Several Agreement States attended including representatives from California (CA), New Jersey (NJ), New York (NY), Vermont (VT), Washington (WA), Wisconsin (WI), and Texas (TX). Representatives from Nuclear Energy Institute and Electric Power Research Institute also participated in the workshop. Attendees and speakers from other Federal agencies included the United States (U.S.) Army Corp of Engineers, U.S. Department of Energy (DOE), and U.S. Environmental Protection Agency. Attendees and speakers from DOE National Labs included Argonne, Pacific Northwest; and Oak Ridge; and Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education. Commercial representatives included Energy Solutions, Exelon, Holtec, Southern California Edison, South Texas Project, among others. The full transcript of the meeting is available at Accession No. ML22145A019.

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During the public meeting, NRC staff provided a summary of recent changes to its guidance in the area of subsurface guidance and guidance gaps that are being addressed in future interim guidance to be issued for public comment, as well as research efforts to address these gaps. In the first Session A, contractor presentations discussed proposed methodologies for subsurface survey design and data analysis, as well as advantages and disadvantages of various approaches. Feedback was sought on a number of key areas as listed in discussion questions provided in the detailed agenda ML22126A171. Session B included presentations on the Nuclear Energy Institute (NEI) groundwater protection initiative, NEI-07-07, and technical considerations for survey and dose modeling associated with reactor substructures. The third Session C, presented case studies involving subsurface residual radioactivity and lessons learned, and innovative technologies for non-invasive characterization of the subsurface. A table summarizing key findings from the workshop is provided in Enclosure 2.

Enclosures:
As stated

**Attendee List**

| Name | Name |
|---|---|
| Abdu Naser Shhub | Madison, Gordon S. |
| Abu-Eid, Boby | Marshall, Jane |
| Aird, Thomas | McGrath, Rich |
| Allen, Gross | McKenney, Chris |
| Anderson, Amanda | Mellon, Andrea L |
| Anderson, Shaun | Metz, Brian |
| Aunan, Megan M | Miller, Bryan |
| Barley, Bill | Montgomery, Bruce |
| Barr, Cynthia | Norman, Kerstun |
| Berta, Lisa | Obiri, Moses Y |
| Bland, Stewart | O'Brien, Edwin |
| Boudart, Jan | O'Neil, Tara |
| Busch, Robert G Jr | Oneill, Francis |
| Caponi, Louis | Parks, Leah |
| Cardarelli, Ron | Parrott, Jack |
| Carey, Riley | Paulson, Mark D |
| Chojnicki, Kirsten N | Pfabe, John |
| Conway, Kimberly | Pinkston, Karen |
| Darois, Eric | Poston-Brown, Martha |
| Darois, Matthew | Power, Joseph |
| D'Arrigo, Diane | Quach, Kevin |
| “Dave” | Randall, Dale B. |
| Day-Lewis, Frederick D | Resnikoff, Marvin |
| Diaz, Aaron A | “Ron” |
| Dillard, Cortney | Rowberry, Kris |
| Dinunzio, Nicholas P | Ruedig, Liz |
| Eckert, Timothy | Salley, MarkHenry |
| Eckhoff, Nick | Schneider, Deborah |
| Evans, Robert | Schneider, Ira |
| Everett, Ed | Schwartzman, Adam |
| Fagan, Deborah K | Sewell, Sandra J |
| Fauver, David | Shannon, Dan J. |
| Fedors, Randall | Sherman, Conrad |
| Ferrigno, Greg | Snyder, Amy |
| Gamboa, Yaneth | Stasney, Bryony E |
| Gogolak, Carl | Stewart, Robert |
| Goldin, Eric | Taverna, Andrew |
| Goodman, Jenny | Thaggard, Mark |
| Gray, Dara | Tiruneh, Nebiyu |
| Gunter, Paul | Tran, Frank |
| Hammond, Arthur L. | Van Noordennen, Gerard P. |
| Harcek, Brian | Vaughan, Ray |
| Harris, Willie | Vitkus, Tim |
| Hasson, Emily | Von Till, Bill |
| Holmes, Aimee E | Wagner, Katie A |
| Huckett, Jennifer C | Walker, Kalene |
| Huff, Gary R. | Walter, Toby |
| Jablonowski, Eugene | Warner, Katherine |

Jacob, Richard E
Johnson, Timothy C
Joyce, Jess
Kasey McGinty (Guest)
Kelley, Robert
King, David
Klukan, Brett
Koenick, Stephen
Koriko, Seun
Lampert, Mary
LePoire, David J.
Loehrke, Luther S
Maddalo, Kristin
Warren, Barbara
Watson, Bruce
Weller, Zachary D
Wellman, Dawn M
Wesley O'Brien
White, Jason
Williams, Sean
Williamson, Tom
Wittich, Walter
“Yongki”
Yu, Charley
Zoller, Scott G.

**Table 1 Summary of Workshop Presentations, Discussion, and Key Findings**

| Session | Presentations | Summary |
|---|---|---|
| Welcome and Opening Remarks | Jane Marshall | Jane Marshall, Director of Division of Decommissioning, Uranium Recovery and Waste Programs, welcomed the approximately 100 workshop participants who joined the Teams meeting from the outset and indicated that the U.S. Nuclear Regulatory Commission (NRC) will continue to host the workshop if interest and productive discussion continues. Jane discussed NRC's outreach activities and efforts to work with its stakeholders to improve the decommissioning process, including completion of a number of decommissioning guidance documents (e.g., NUREG-1757, Volume 2, Rev. 2). NRC will continue its outreach efforts with another public meeting planned in the fall of 2022 to discuss discrete radioactive particles. The "What's New in Decommissioning" web site will be updated to include information about future opportunities for public participation, as well as updates on guidance development and issuance. |
| | Tom Aird | Tom Aird provided a presentation highlighting research to support development of subsurface investigations guidance. Tom provided Information about last year's subsurface soil surveys workshop. Tom also went over the workshop agenda. |
| | Cynthia Barr | Cynthia Barr gave a presentation on currently available subsurface guidance, key guidance gaps, and plans for issuance of additional interim guidance to address those gaps. |
| | Bruce Montgomery | Bruce Montgomery, Nuclear Energy Institute (NEI), made remarks regarding the need for additional guidance in key areas that support accelerated decommissioning to allow for unrestricted use of the sites. A statement was made regarding the need to develop practical approaches that were portable and field implementable. NEI plans to develop NEI-22-01 to standardize the format and content of information to be submitted to NRC (e.g., final status survey data) to support license termination and shortened decommissioning timelines. |
| | Questions on Opening Remarks | • NEI asked if NUREG-1757, Volume 2, Rev. 2 would be issued separate from interim guidance.<br>○ NRC responded that NUREG-1757, Volume 2, Rev. 2, would be issued |

| Session | Presentations | Summary |
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| | | separately this summer. Interim subsurface guidance will be developed late this year or early next year for public comment. A meeting will be held to discuss comments on the interim guidance, and final guidance will be incorporated into Rev. 3.<br>• Randall Fedors, NRC, inquired about the timing of issuance of NEI-22-01.<br>○ NEI responded that the targeted date is November 2022 for issuance with plans to meet with NRC before then to go over scope/content of NEI-22-01. |
| Session A Overview Presentations | Carl Gogolak *Methodologies for Optimization of Survey Design* | Carl Gogolak presented information regarding related subsurface technical reports including NUREG/CR-7021 "A Subsurface Decision Model for Supporting Environmental Compliance," and the Electric Power Research Institute report "Guidance for Using Geostatistics in Developing a Site Final Status Survey Program for Plant Decommissioning." Carl described two features in the Spatial Analysis and Decision Assistance software code used for survey design: Bayesian Ellipgrid, recommended for initial survey design based on geometrical considerations, and Markov Bayes cokriging, recommended for secondary survey design. Both approaches use prior information from either historical site assessment, expert judgment, or other soft data. Finally, Carl discussed variogram fitting approaches and considerations. |
| | Deborah Fagan/ Jennifer Huckett *Statistical Methods for Subsurface Surveys to Support Decommissioning* | Jennifer Huckett and Deborah Fagan provided a presentation focused on data sources and processing, data quality assessment, and analyses to support final compliance/release decision-making. Information on Visual Sample Plan functionality was provided in last year's workshop (with video and presentations on NRC's web site). Deborah Fagan alluded to Carl's presentation on methods to determine sample locations that might be more appropriate for the characterization phase including use of Bayesian Elipgrid, and Markov Bayes. Deborah discussed data inputs to use these methods, and the types of soft data (geophysical data) that may be used. A stratified sampling design was recommended. Layers could be based on either risk or geophysical model output. Geostatistical methods could be used to obtain uncertainty estimates that would inform sample locations. Issues associated with lack of consideration of spatial correlation, |

| Session | Presentations | Summary |
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| | | even for surface problems, which could lead to higher Type II decision errors (e.g., failure to release clean site in Scenario A) was also discussed. |
| | Discussion Period A | • Several comments were made regarding the need for practical approaches. Because most sites do not need to use these complex subsurface methods, the guidance should be clear on when a site would need to enter this space and when it did not.<br>• A question was raised about use of geostatistical methods for fractured bedrock and lensing/fluvial environments.<br>  ○ A response was provided by Fred Day-Lewis that both indicator geostatistical simulation as well as discrete fracture networks have been used but are challenging to implement.<br>• Robert Stewart discussed his dissertation work that looked at multiple size elevated areas/sizes and brought together methods to inform sample and remedial designs and which are complemented by approaches such as check and cover to determine optimal number of samples.<br>• A question was raised about how rank set sampling could be used for subsurface problems (e.g., scan data may be used for surface problems to bin data).<br>  ○ Pacific Northwest National Laboratory indicated geophysical data could be used with rank set sampling in subsurface.<br>• A question was raised by a member of the public about consideration of severe erosion.<br>  ○ NRC responded that the uncovering of buried residual radioactivity from both human and natural processes would need to be considered, as well as the risk of transport of radioactivity offsite (e.g., transport of eroded material in surface water).<br>• NRC staff indicated its interest in obtaining feedback on the types/sizes of elevated areas in the subsurface that would need to be considered and whether the likelihood of exposure should be considered given the residual radioactivity may be present at significant depths below grade where it is less likely that a member of the public would be |

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| | | exposed. This is in contrast to residual radioactivity at the surface where a member of the public could more easily be exposed. The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) paradigm considers scan surveys to detect elevated areas between sampling locations to protect from these elevated areas. However, elevated areas may be treated differently for the subsurface. Clean-up levels for a small volume of residual radioactivity that may be brought to the surface (e.g., cuttings from drilling a small diameter residential well), may be developed, but then how should the likelihood be considered?<br>○ Robert Stewart indicated that a probability-based approach to encountering a hot spot could be used. |
| Session B Industry Presentations | Matt Darois *Utilizing the Nuclear Energy Institute (NEI) 07-07 Industry Groundwater Protection Initiative as a Foundation for Addressing Subsurface Site Assessments* | Matt Darois provided a presentation on NEI-07-07 groundwater protection initiative that begins before decommissioning and provides the support, including hard and soft data, that can be leveraged to support decommissioning. Matt discussed the U.S. Environmental Protection Agency's TRIAD approach, including systematic planning, dynamic work strategies, and real-time measurements, which drives characterization, data driven decision-making, and development of site conceptual models. Matt spent some time discussing what a hydrogeologic conceptual model (HCM) is and the questions it answers (e.g., materials, flow directions, quality, fate and transport mechanisms, changes in behavior over time [sources/sinks], boundary conditions, and hydraulic barriers). Matt stressed the importance of being able to explain the HCM and anthropogenic and natural processes that affect the HCM (e.g., structures affecting natural groundwater flow gradients/directions). Matt discussed use of the HCM to drive groundwater monitoring, support risk assessment, and the need for iterative updates to the Conceptual Site Model (CSM). Part of the NEI-07-07 initiative is to evaluate Structures, Systems and Components and work permits with licensed material with a credible pathway to groundwater including spent fuel pools, buried tanks and pipes, joints, and associated mitigative measures. NEI-07-07 provides a mechanism for risk ranking of SSCs. Geographic information system software, building |

| Session | Presentations | Summary |
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| | | information models, and digital twins developed during plant operations can be leveraged to support decommissioning. Trend data can be used to identify changes in hydrogeological parameters such as water levels which may provide important information for dose modeling, contaminant fate and transport, and groundwater monitoring. Natural and anthropogenic features, events, and processes (e.g., climate change, sea-level rise, saltwater intrusion, and dewatering), and associated changes in precipitation rates, erosion, groundwater flow directions and groundwater quality are also important considerations. |
| | Eric Darois<br>*Subsurface Basement Modeling and Survey Methods* | Eric Darois provided a historical perspective of survey and dose modeling of reactor basement substructures, including activities at the Connecticut Yankee, Yankee Rowe, and Maine Yankee nuclear power plants (NPPs), which were some of the first applications of the license termination rule and MARSSIM methodologies in the early to mid-2000s. Important differences between license termination for earlier versus later examples were provided. One significant difference was the lack of consideration of intrusion events that could bring radioactivity to the surface, which was applied in the Zion and La Crosse cases. Another significant difference was the treatment of the basement substructures as MARSSIM Class 1 areas, necessitating 100 percent scan surveys of the surfaces, leading to hundreds of measurements or more. Arguments were presented for a more conservative estimate of the total inventory using more practical characterization survey methods focusing on elevated areas, rather than using statistically based approaches laid out in MARSSIM coupled with 100 percent scan surveys of surfaces that would be back-filled, thereby limiting the potential exposure risk from these surfaces. Eric also noted that the likelihood of large-scale excavations of soils or building structures was low. For subsurface soils, 100 percent coverage is not possible or needed and geostatistical interpretation can be used to fill in data gaps due to the inability to scan. |
| | Discussion Period B | • A comment was made about the change in the monitoring program when the site transitions to decommissioning (e.g., objectives for |

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| | | monitoring during remediation to remove source area versus final status survey to demonstrate compliance with release criteria may be different).<br>○ A response was provided that the monitoring program does change following cessation of operations. For example, wells may be abandoned if they would restrict decommissioning activities or to prevent contamination of aquifers. New wells may be installed to monitor decommissioning activities among other reasons.<br>• A question was raised regarding Regulatory Guide 1.70 "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants", regarding the number of plants with active dewatering systems.<br>○ No direct response to the question was provided, but a comment was made that when plants enter decommissioning, if dewatering systems are turned off that it is important to understand how that affects groundwater flow directions and contaminant fate and transport to ensure that there are no unintended consequences.<br>• A question was raised about how groundwater contamination is considered and if found to be at unacceptable levels the types of groundwater remediation technologies that are available.<br>○ The risk from groundwater contamination would need to be considered and would be included in the assessment that release limits in Title 10 of the *Code of Federal Regulations* Part 20, Subpart E could be met (e.g., 0.25 mSv/yr for unrestricted release). Remedial technologies include pump and treat, permeable reactive barriers, nanotechnology, monitored natural attenuation and chemical injections. Performance monitoring would be needed to ensure that the remediation was effective and long-lasting to demonstrate compliance with release criteria. A comment was made that at reactor sites, source removal for relatively immobile radionuclides may be the most cost-effective option to eliminate |

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| | | groundwater contamination. Links to the Consortium for Risk Evaluation with Stakeholder Participation web site for additional information on groundwater technologies was provided in the workshop chat.<br>• A comment was made that the HCM could be used to inform Bayesian approaches (e.g., direction of anisotropy such as the groundwater flow direction).<br>• A comment was made that the U.S. Geological Survey is studying sea-level rise.<br>• A comment was made that relatively cheap field instruments (versus lab instruments) can be used with geostatistical methods.<br>• With regard to the number of samples that would be needed for substructures, a response was provided that the number of samples would be based on the decision error, variability, how close you are to the release limit. Another comment was made that simple approaches should be used. Likely the bottom third of reactor building substructures is most contaminated based on the historical site assessment, and direct measurements should be able to focus on areas of elevated activity to provide a conservative assessment of the residual risk without applying complex MARSSIM statistical approaches.<br>• A question was raised about use of sodium polyacrylate to hold water in place.<br>• Another comment was made about addition of chemicals to sequester radionuclides in place.<br>• A comment was made that sometimes communities are not informed when there is contaminated water from historic practices. |
| Session C<br>Case Studies, Lessons Learned, and Innovative Characterization Technologies | Amanda Anderson/ Brian Harcek<br>*U.S. DOE Challenges with Subsurface Investigation and Site-Specific Case Study* | Amanda Anderson discussed the U.S. Department of Energy (DOE) Order 458.1 "Radiation Protection of the Public and Environment" for release of personal property such as materials and equipment (10 µSv/yr or 1 mrem/yr) and real property such as land and fixed structures (0.25 mSv/yr or 25 mrem/yr) and associated dose constraints. MARSSIM and MARSAME are used to perform surveys to support release of real and personal property. A case study was provided for a parcel of land at Los Alamos that was remediated and cleaned up |

| Session | Presentations | Summary |
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| | | under the American Reinvestment and Recovery Act of 2013 for transfer back to the county. In 2020, metal objects were discovered during excavation work of one area that was transferred to the county and commercial developers. Analysis of the material showed low levels of radioactive materials that did not pose a public health risk. DOE considered various exposure scenarios with the most limiting expected to be a construction worker excavating the site. Additional buried material (deeper than 6 ft below ground surface) was found in May 2020 suggesting that the material was from a different waste stream. Work was suspended and the new area fenced off and secured. The 10 μSv/yr (1 mrem/yr) dose constraint was used for release of discrete items (laboratory debris that was dug up), while the 0.25 mSv/yr (25 mrem/yr) dose constraint was used for release of the soils and land. The importance of the historical site assessment was stressed to ensure that areas with potential buried residual radioactivity are identified and appropriately assessed. |
| | Tim Johnson/ Fred Day-Lewis *Using Electrical Resistivity Tomography (ERT) and Other Geophysical Methods to Non-Invasively Inform Subsurface Investigations Related to Decommissioning* | Tim Johnson and Fred Day Lewis discussed geophysical methods used at DOE and U.S. Department of Defense sites. Fred discussed the geophysical toolbox and stressed that no single geophysical tool works at every site and often tools are used in conjunction to enhance interpretation and inform CSM development. Conventional hydrologic measurements are typically used for calibration and ground truthing of geophysical data. A table providing information on various technologies (e.g., seismic refraction and reflection, electrical resistivity (ER), ground penetrating radar, and electromagnetic (EM), conventional borehole logging), measured properties (e.g., depth to bedrock/water table, water content, porosity, salinity, lithology, transmissivity), and acquisition method (e.g., high resolution borehole, inexpensive/large area surface, and cross-hole imaging) was presented. Geophysical data can be used as conditioning data for geostatistical simulation as well. Fred also presented information on an Excel spreadsheet-based fractured rock geophysical toolbox selection tool provides information on the efficacy of various tools given a set of input parameters (e.g., site parameters: depth to bedrock, well spacing, |

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| | | casing material, ER of bedrock, groundwater conductivity; goals: fracture network, lithology, depth to bedrock, anisotropy, hydraulic properties). Tim discussed how ERT can be used on the surface to measure various subsurface properties influencing electrical conductivity (e.g., moisture content, porosity, conductivity, temperature, soil surface area, buried metal, anomalous conditions). Typically, contamination levels are not high enough to be picked up by ERT. A few examples were provided of use of ERT: (1) Columbia River water infiltration monitoring near source of uranium contamination from infiltration ponds and imaging of lithology (coarser gravel and cobbles and finer backfill material that had varying electrical conductivity), (2) 3D image around cooling water discharge pipes at an operating NPP that showed discharge from a line located above the piping, (3) B Tank Farm at Hanford showing elevated electrical conductivity from leaks and increasing moisture content/nitrate concentrations in the Vadose Zone, and (4) time lapse performance monitoring of remediation (coprecipitation of uranium via polyphosphate injections) near the Columbia River at Hanford. Fred also discussed time-domain electromagnetics (TDEM) which uses EM fields and a receiver loop to collect data over much larger areas compared to ERT, while still providing vary rapid (almost real-time) results. The advantage of TDEM is that it does not require coupling to the ground like ERT (i.e., it can be pulled by all-terrain vehicle or boat; or flown). |
| | David King<br>*Lessons Learned Identified during Independent Verification Activities* | David King presented on independent verification (IV) activities for the U.S. NRC, U.S. DOE, and U.S. Army Corps of Engineers and associated lessons learned from experience conducting hundreds of IV surveys. It was noted that many lessons learned could have been avoided if more thought and effort was put into the data quality objective (DQO) process and site-specific conditions were considered. Lesson learned 1 was related to a site where the licensee did not consider the potential for subsurface residual radioactivity due to migration of contaminants to the subsurface and appeared to challenge the need for measurement of radioactivity below the surface (surface is approximately top 15 cm of soil). Other lessons learned were related to rigidity of procedures to collect samples at |

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| | | specified depths for compositing rather than using survey information to inform sample locations (e.g., borehole gamma logging could identify elevated intervals in the borehole where a sample should be collected). In another example, surveyors were instructed to survey a site without listening to the audible detector response to identify elevated areas during initial and follow-up surveys. Coordinate locations for collection of additional samples based on post-processed data analysis were incorrect leading to missing elevated areas. In another lesson learned, the licensee used a 5 second averaging interval and identified zero elevated areas, while IV surveys using a 2-second averaging interval identified 13 elevated areas. In another lesson learned, a licensee collected a 2-ft core for compositing while the residual radioactivity was concentrated in the first few cm. Another lessons learned was related to the need for a site visit to ensure that sampling locations can be accessed or taken. David also provided recommendations for survey of hard to access or dangerous locations. Methods include placing detectors on poles/wheels/ booms/mechanical arms or use of in-situ gamma spectroscopy using a basket or sampling from a bucket. David also cautioned use of in-situ objective counting systems, which tends to average concentrations over an approximately 10 m bowl and limits the ability to detect elevated areas if elevated areas are found to be important during the DQO process. |
| | Discussion Period C | • One comment was made that lessons learned in many cases could be avoided with detailed procedures and planning. A follow-up comment suggested that in some cases the project team charges forward without thinking through things, and that IV is in many cases an afterthought. Consideration of IV requirements and needs by project directors is important.<br>• A question was raised about use of a liner when boreholes are used to prevent cross-contamination.<br>• A comment was made for the need for consensus guidance because using a case-by-case basis leads to differences in the way surveys are conducted and potentially inadequate assessments and potential |

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| | | release of sites with subsurface residual radioactivity.<br>• A question was raised about use of ERT near steel poles and fences. ERT can be used to identify leaks from piping, etc. However, TDEM tends to be problematic around especially high voltage power lines, railroad tracks, and steel fences. ERT can also only be used with PVC cased wells (no steel casing) or can be direct pushed into the subsurface.<br>• ERT is sensitive to saturation and specific conductivity/total dissolved solids, or different fluid phases such as non-aqueous phase liquids. But ERT is not sensitive to differences at the ppm concentration level.<br>• A comment was made that most work with ERT at NPPs is related to water leaks (non-contaminated) in subsurface piping rather than for contamination.<br>• There was discussion regarding the need for additional guidance on survey of reactor substructions. These substructures are not technically Class 1 MARSSIM survey units since they are located below grade in the subsurface. Eric Darois indicated that there is no need for 100 percent scanning and the survey should focus on elevated areas using walk-over surveys with gamma detectors, using direct measurements, and sampling to develop a conservative estimate of the total inventory. New technologies include gamma spectroscopy coupled with Light Detection and Ranging that can be used to detect elevated areas in lieu of 100 percent scan surveys.<br>• A comment was made regarding "reverse engineering" to get the result you want in probabilistic assessments, and lessons learned related to avoidance of negative results (i.e., incentive for not actively looking for potential problematic areas). |

Summary of May 11, 2022, 2nd Annual Subsurface Investigations Workshop DATE May 25, 2022

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