NRC Overview Presentation

Second Annual Subsurface Investigations Workshop

May 11, 2022

Tom Aird, NRC Office of Nuclear Regulatory Research

U.S.NRC
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Protecting People and the Environment

Workshop Motivation

- Reactor sites are being rapidly decommissioned instead of entering SAFSTOR
- Many complex decommissioning sites are expected to contain areas of residual radioactivity in subsurface soils and building structures
- These complex sites will need to be investigated/surveyed and a determination made as to the need for subsurface remediation and a final decision made on license termination

Today's Agenda

Time	Topic	Speaker
12:00 pm	**Logistics and Welcome**	NRC: Brett Klukan Jane Marshall
12:10 pm	**Opening Remarks** #1 NRC Opening Remarks #2 NEI Opening Remarks	NRC: Tom Aird Cynthia Barr NEI: Bruce Montgomery
12:40 pm	**Overview Presentations** #3 *Methodologies for Optimization of Survey Design* #4 *Statistical Methods for Subsurface Surveys to Support Decommissioning*	SC&A: Carl Gogolak PNNL: Deborah Fagan Jennifer Huckett
1:20 pm	**Discussion Period A**	All
2:00 pm	Break	
2:10 pm	#5 *Utilizing the Nuclear Energy Institute (NEI) 07-07 Industry Groundwater Protection Initiative as a Foundation for Addressing Subsurface Site Assessments* #6 *Subsurface Basement Modeling and Survey Methods*	RSCS: Matt Darois Eric Darois
2:50 pm	**Discussion Period B**	All
3:20 pm	#7 *US DOE Challenges with Subsurface Investigation and Site-Specific Case Study*	DOE: Amanda Anderson Brian Harcek
3:40 pm	#8 *Using Electrical Resistivity Tomography (ERT) and Other Geophysical Methods to Non-Invasively Inform Subsurface Investigations Related to Decommissioning*	PNNL: Tim Johnson Fred Day-Lewis
4:00 pm	Break	
4:10 pm	#9 *Lessons Learned Identified during Independent Verification Activities*	ORAU/ORISE: David King
4:30 pm	**Discussion Period C**	All
5:00 pm	Adjourn	

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Last Year's Public Workshop… July 14 & 15, 2021

RES/NMSS held a public workshop on the technical basis for guidance on conducting and evaluating surveys of residual radioactivity in the subsurface soils of licensee sites. The NRC began to address this problem in NUREG/CR 7021, "A Subsurface Decision Model for Supporting Environmental Compliance," issued January 2012.

https://www.nrc.gov/docs/ML2130/ML21300A378.pdf


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RIL 2021-12

PROCEEDINGS OF THE SUBSURFACE SOIL SURVEYS PUBLIC WORKSHOP

July 14–15, 2021

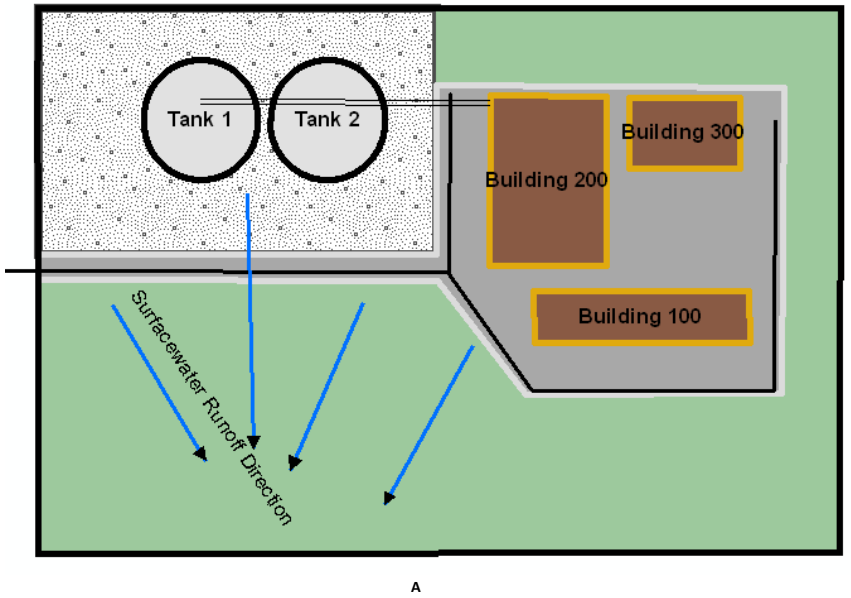
Date Published: October 2021

U.S. Nuclear Regulatory Commission
Rockville, MD 20852

Prior or Existing NRC Guidance

- **NUREG/CR-7021 (January 2012)**
  - –A Subsurface Decision Model for Supporting Environmental Compliance
- **NUREG-1757, Volume 2, Revision 1 (2006)**
  - –Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria (Appendix G)
  - –Volume 2, Revision 2 was issued as a draft report for comment and contains updated guidance on subsurface surveys in Appendix G and J
- **NUREG-1575, Revision 1 (2000)**
  - –Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) contains guidance on final status surveys for surface residual radioactivity

Previous and Potential New Approaches



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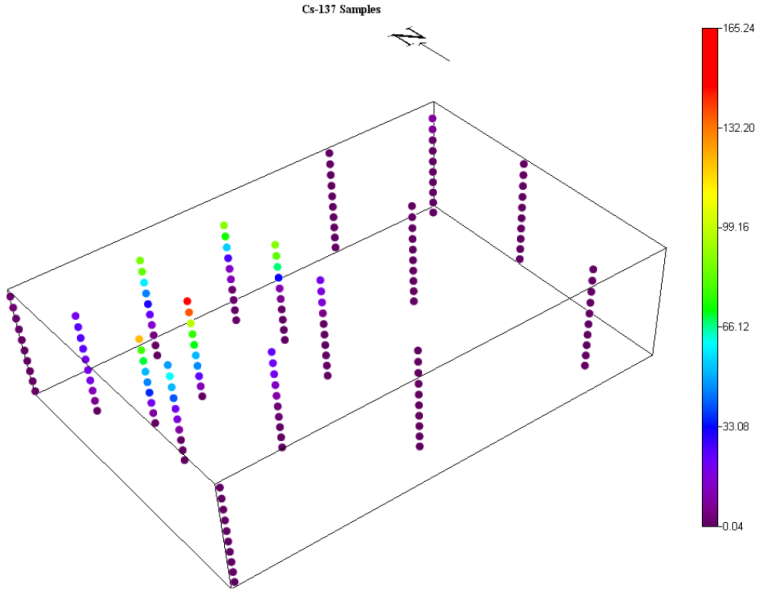

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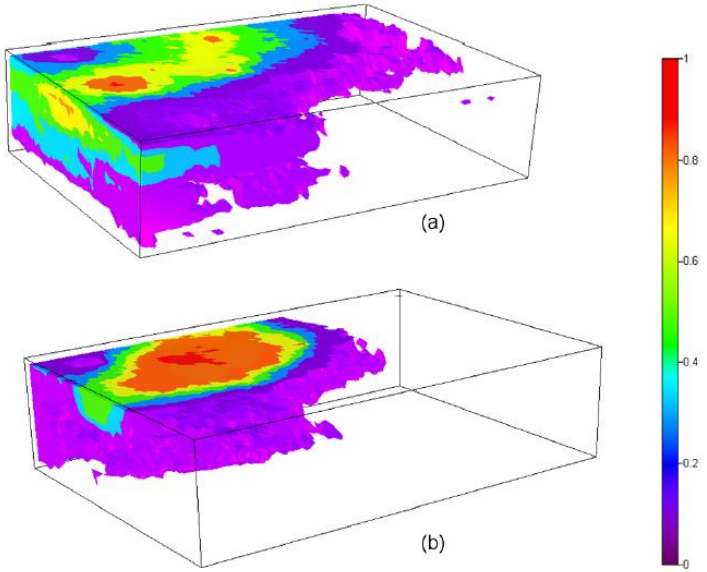


C

Sequence

(A) *Identify Potential Areas where Residual Radioactivity could be Present* → **(B)** *Visualize Initial Borehole Sampling Results* → **(C)** *Interpolate Data and Determine Probability of Exceeding a Threshold following Scoping (top) and Create a more Refined Map following Characterization (bottom)*

Source: NUREG/CR-7021

Research Focus Areas

- ✓ Derived Concentration Guideline Levels for subsurface
- ✓ Stages of the Subsurface Decision Framework
- ✓ Geospatial Modeling Tools
- ✓ Geospatial and Statistical Methods
- ✓ Assessing Background and Use of MARSSIM Alternative Scenario B
- ✓ Evaluations of Large Soil Excavations and Soil Reuse
- ✓ Treatment of Uncertainty and Data Sufficiency
- ✓ Possible Treatment of Subsurface Elevated Areas and Hot Spots

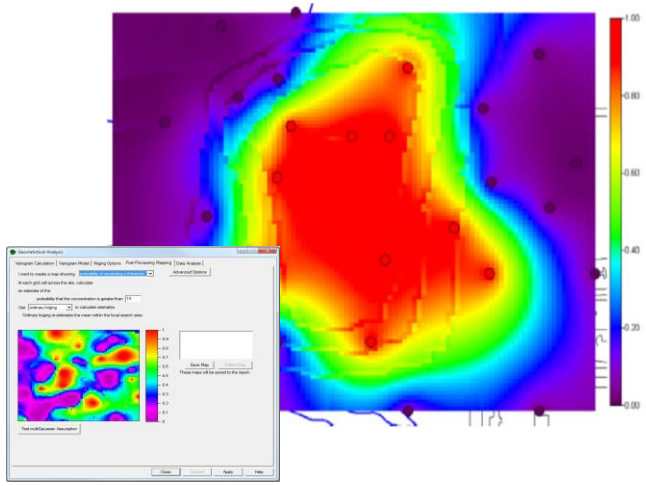
** Please see draft white paper "Subsurface Surveys and Characterization"… attached to this meeting's public meeting notice on NRC website. Reference: ML22088A219 **

Proposed Methodologies for Subsurface Survey Design and Data Analysis

--supporting remedial and license termination decision making--

Subsurface Survey Sampling Design

- Bayesian ELLIPGRID
- Markov Bayes and Cokriging
- Other??



Objective: add and test these (or other) statistical sampling techniques with existing subsurface modeling tools

Subsurface Modeling Tools/Software

- SADA
- Visual Sampling Plan (VSP)

Figures: NUREG/CR-7021

Contact Information

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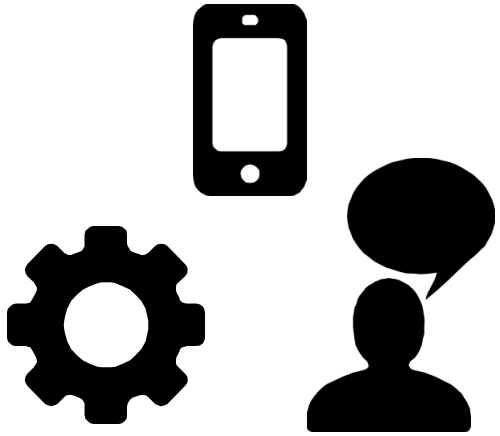


Subsurface Guidance Development

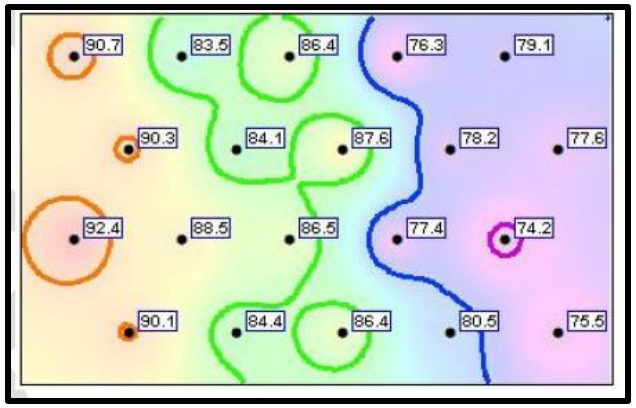
Cynthia Barr, Senior Risk Analyst, Office of Nuclear Material Safety and Safeguards
Division of Decommissioning, Uranium Recovery, and Waste Programs

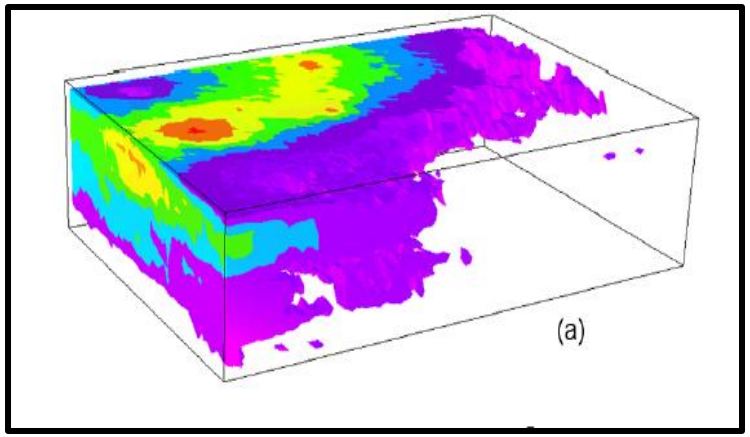
Presentation at the 2nd Annual Subsurface Soils Workshop
May 11, 2022

Current Technical Information and Guidance

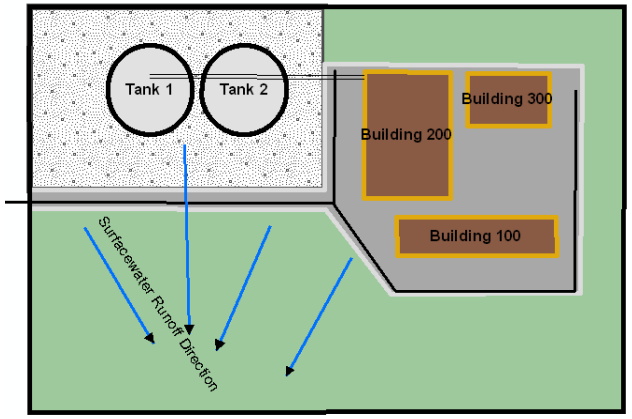
NUREG/CR-7021, *A Subsurface Decision Model for Supporting Environmental Compliance*

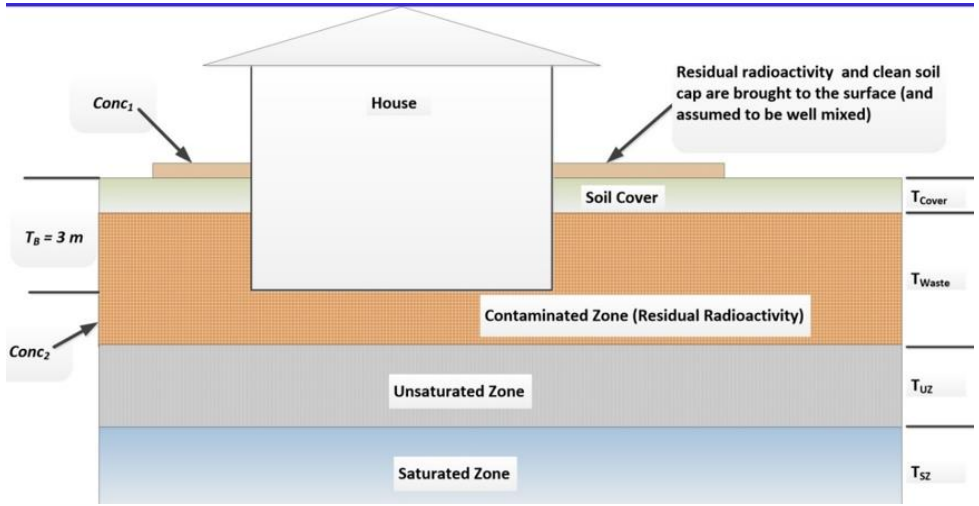
Draft NUREG-1575, Rev. 2, Multi-Agency Radiation Survey and Site Investigation Manual (or MARSSIM--used for surface soils and building surfaces only)

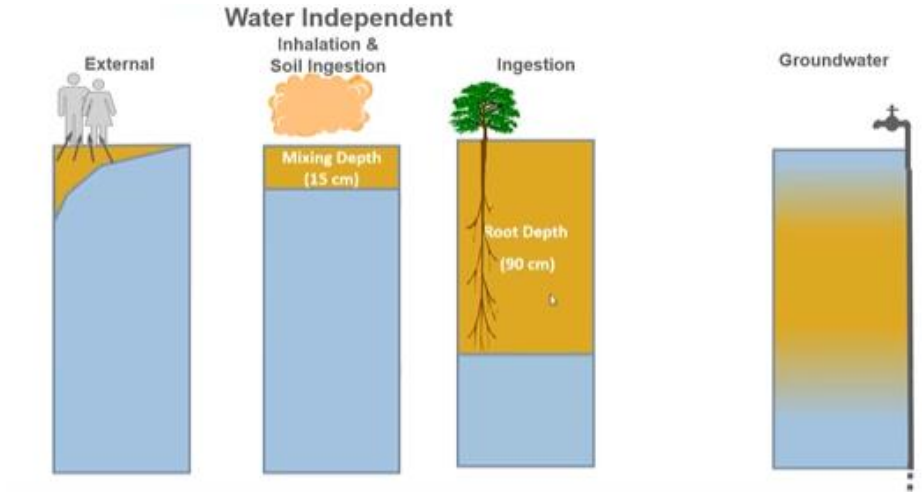




Draft NUREG-1757, Volume 2, Rev. 2, , *Consolidated Decommissioning Guidance: Characterization, Survey and Determination of Radiological Criteria*





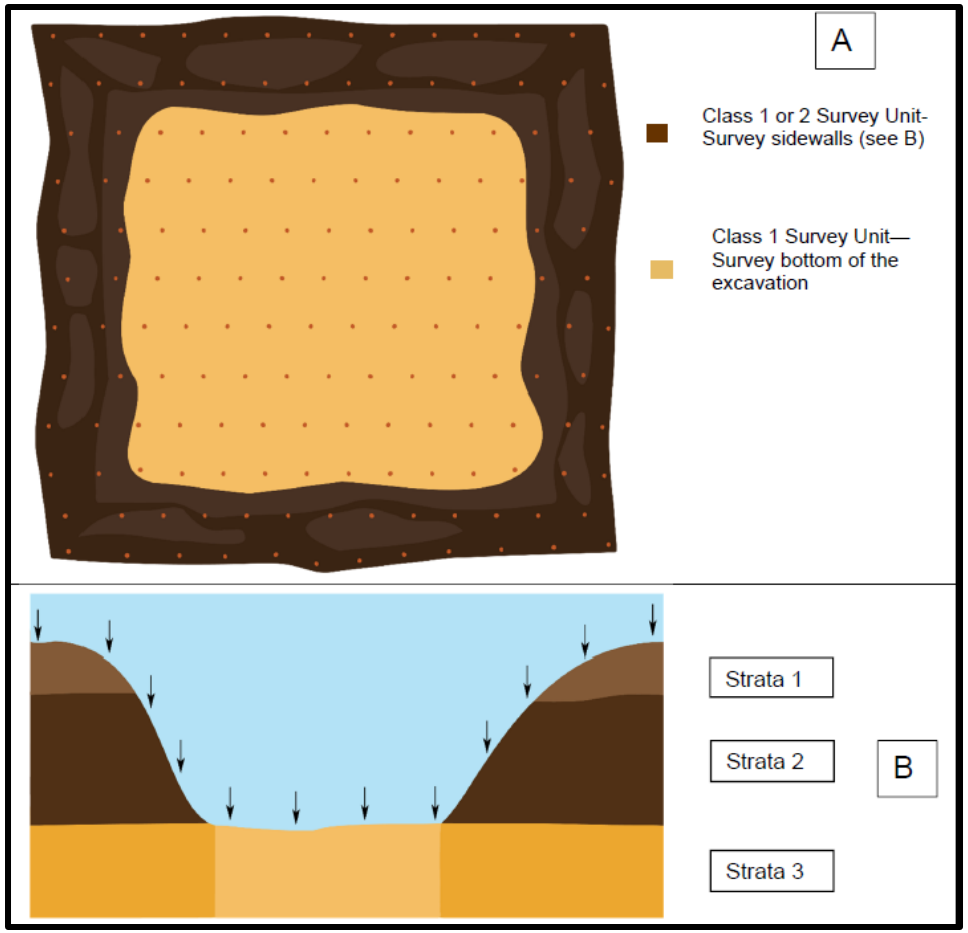


Major Changes to NUREG-1757, Vol. 2, Rev. 2

- Dose modeling updates
  - Dose modeling considerations and exposure scenarios for buried residual radioactivity (Appendix J)
  - Development of subsurface DCGLs (Appendix G)
  - Consideration of cumulative dose from multiple sources including surface and subsurface soils (Appendix G)
  - Radiological survey and dose modeling integration (Appendix G)

Major Changes to NUREG-1757, Vol. 2, Rev. 2

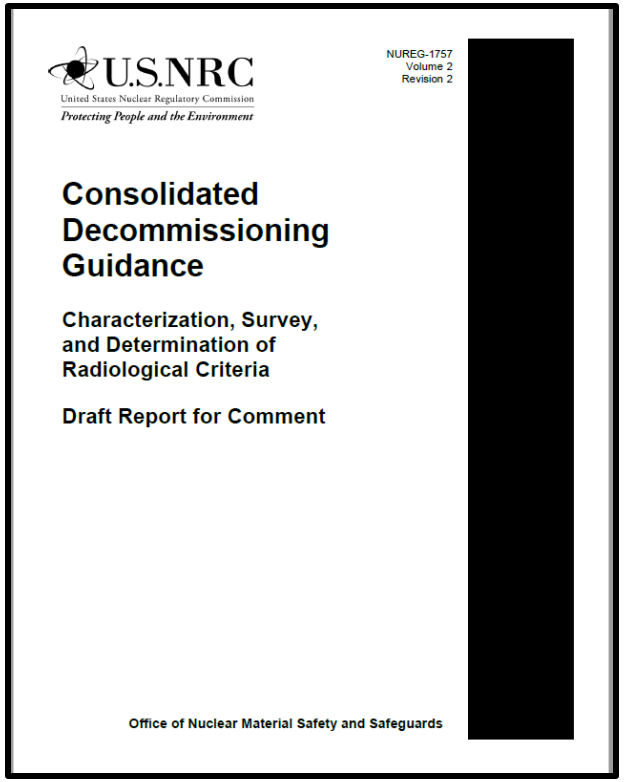
- Radiological surveys updates
  - Surveys of open excavations or substructures (Appendix G)
  - Surveys of soils/materials planned for reuse (Appendix G)
  - Use of composite sampling (Appendix O)

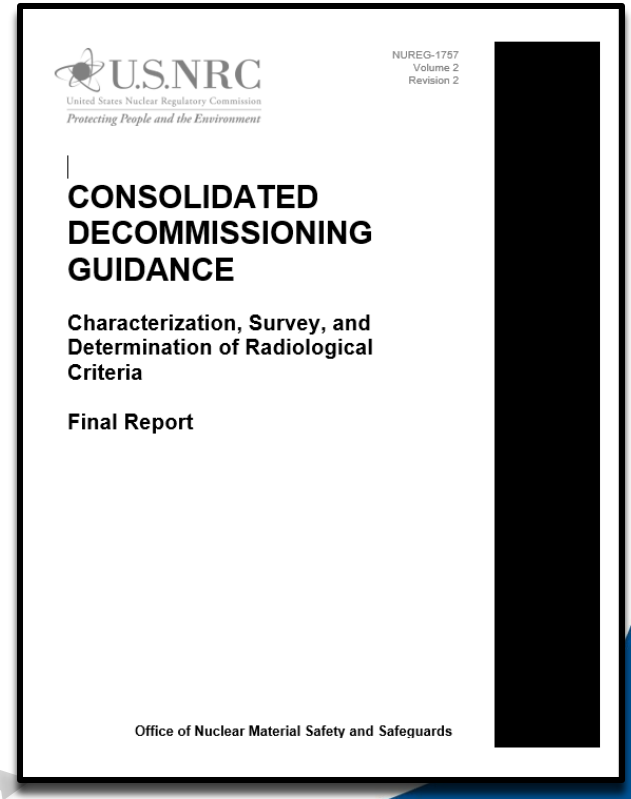


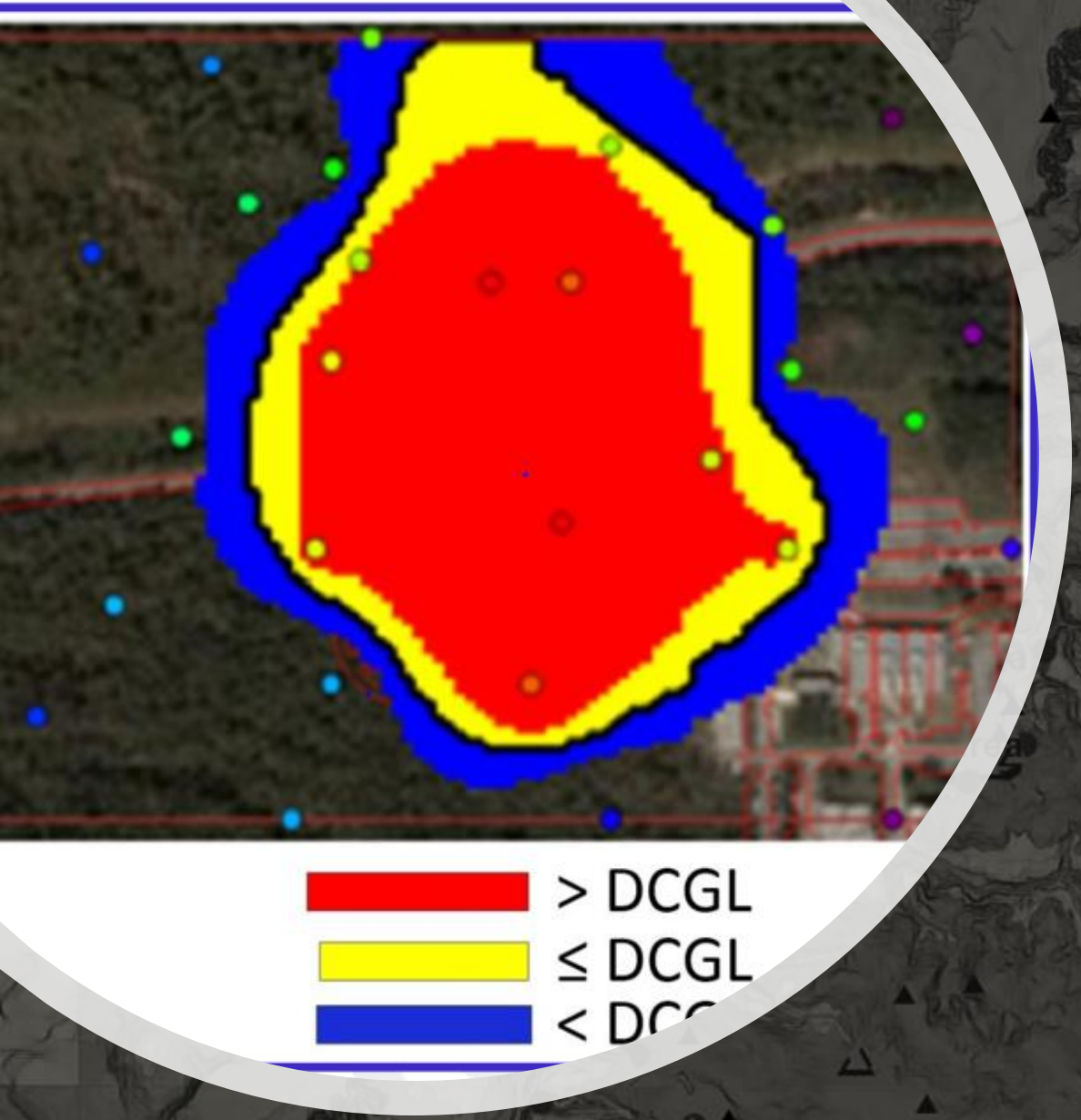
NUREG-1757, Volume 2, Rev. 2, Final Issuance

Volume 2, Rev. 2, issued for public comment December 2020

- Final publication is expected summer 2022
- Guidance was added to address comments on need for additional subsurface guidance, including first workshop findings
- Interim subsurface investigations guidance to be developed late 2022 or early 2023
- Interim guidance will be issued for public comment prior to finalization
- Interim guidance will be folded into the next revision of NUREG-1757, Volume 2 (Rev. 3)

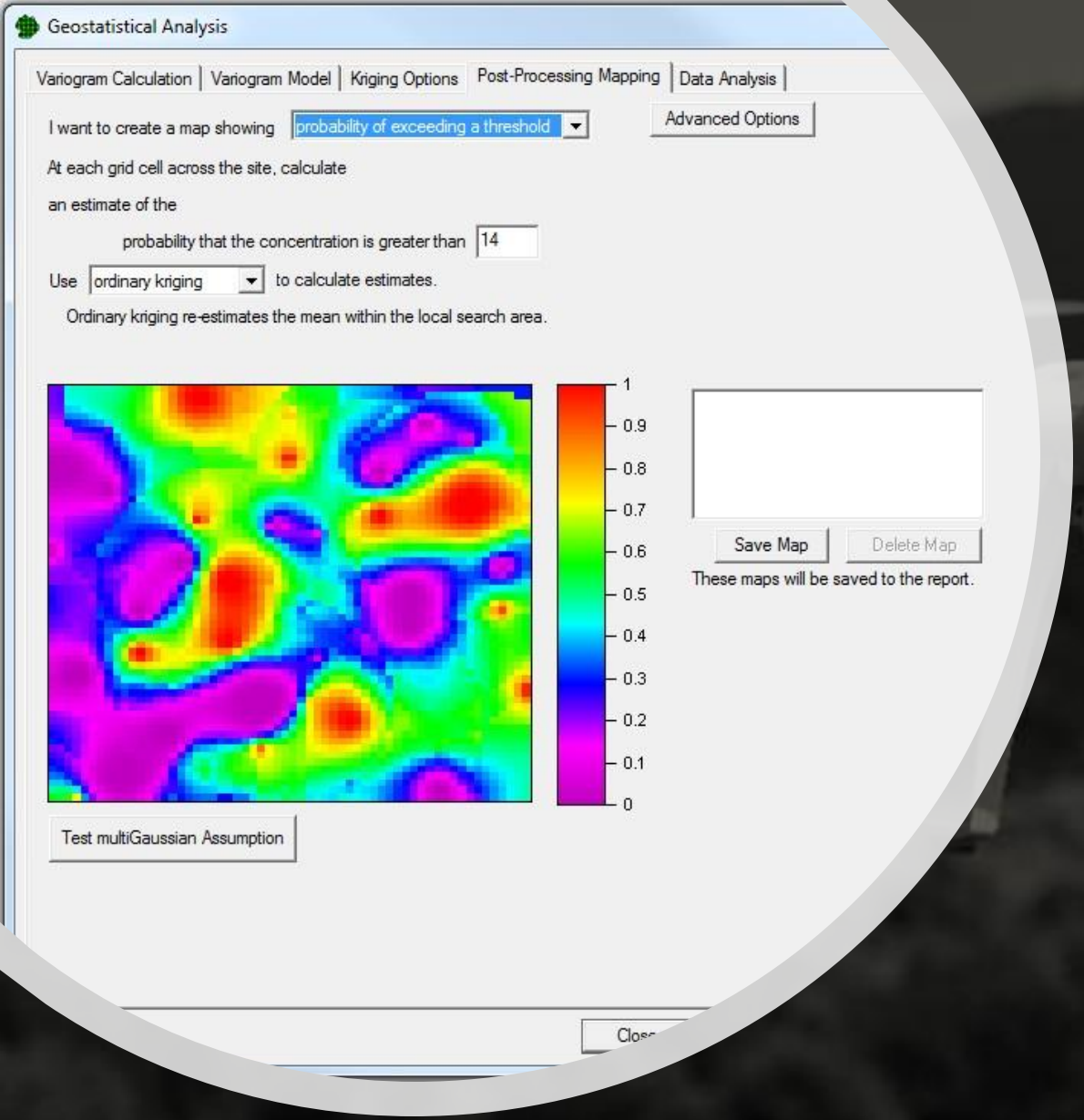






Guidance Gaps

- Development of derived concentration guidelines levels (DCGLs) or clean-up levels for subsurface residual radioactivity
- Evaluation of the importance of subsurface elevated areas and need for derivation of $DCGL_{EMCs}$
- Evaluation of geospatial data analysis and modeling tools including GIS and geostatistical tools
- Development of a technical approach for optimization of subsurface survey design, and to facilitate remedial and compliance decision-making
- Development of a technical approach for evaluation of soil excavations, basement substructures, and materials planned for reuse



Interim Subsurface Guidance Development and VSP Code Improvements

- Subsurface investigations interim guidance will consider
  - ✓ Need for update of current guidance
  - ✓ SC&A's technical white paper and proposed methodologies
  - ✓ PNNL's scoping of Visual Sample Plan tools
  - ✓ Other technical information
- Visual Sample Plan (VSP) computer code improvements
  - ✓ Data analysis tools for continuously collected data
  - ✓ Statistical test parameters and power calculations

Final thoughts

- Guidance is available on subsurface surveys and dose modeling to derive clean-up levels in NUREG-1757, Volume 2, Rev. 2
- Additional interim guidance is being developed
- Contracts to address remaining data gaps are being but in place (e.g., surveys of exposed surfaces in the subsurface)
- Please check out our What's New in Decommissioning web page to be kept informed of upcoming opportunities for public participation and release of future guidance documents

https://www.nrc.gov/waste/decommissioning/whats-new.html