MARSSIM Revision 2

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DOE co-representative to MARSSIM Workgroup

Presentation to the ERAD

Document Overview

Four Federal Agency Members

- Department of Defense (Air Force, Army, and Navy representatives)
- Department of Energy
- Environmental Protection Agency
- Nuclear Regulatory Commission

State Observers

Document Overview

Family of Three Multi-Agency Documents

- MARSSIM – Published 1997, Updated 2001
- MARLAP – Published 2004
- MARSAME – Published 2009

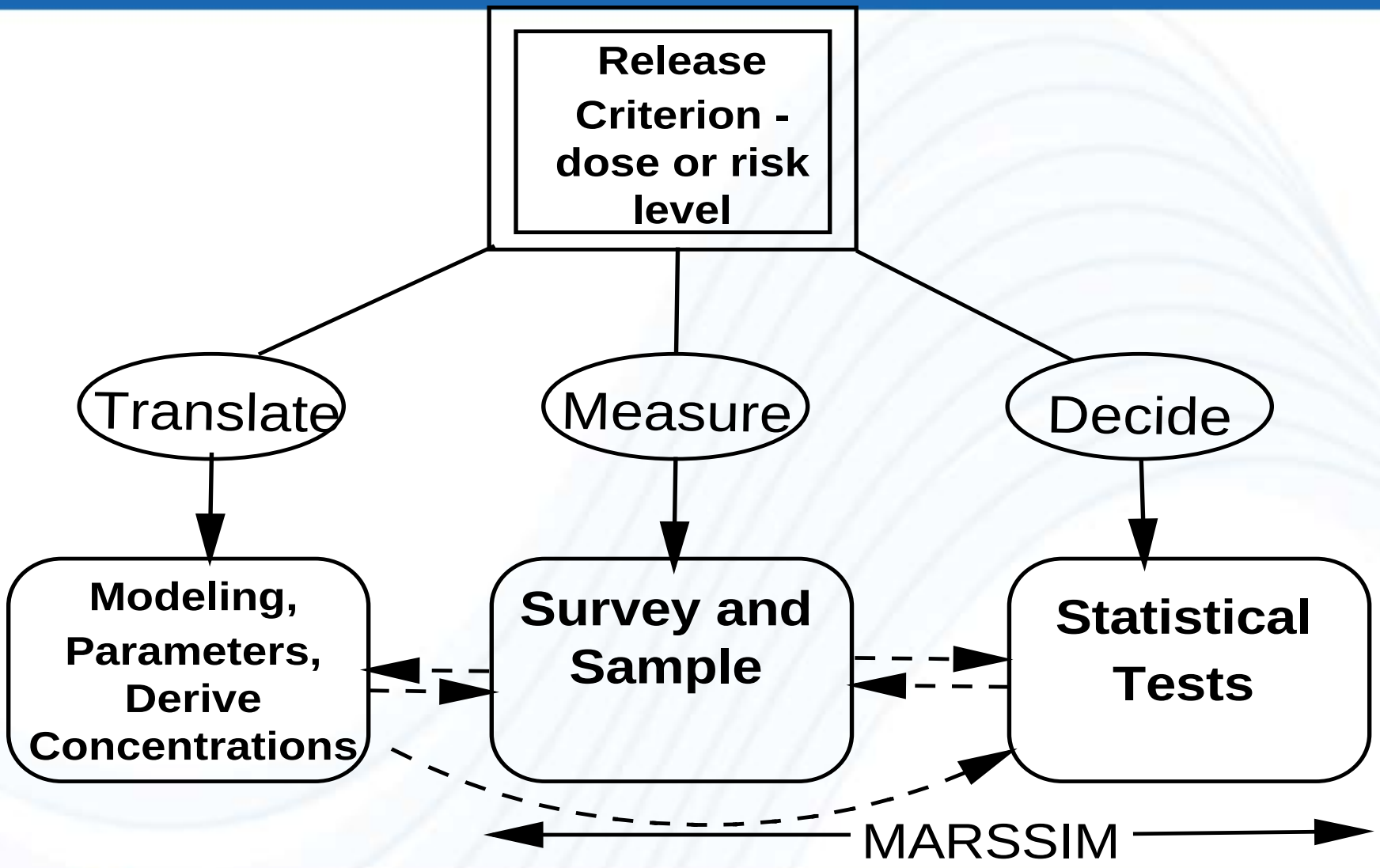
Technical Documents - Not Policy

Document Overview

MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual)

- Covers real property (surface soils and building surfaces)
- Provides defensible and rigorous surveys for cleanup, especially final status surveys
- Uses a graded approach starting with a historical site assessment
- Based on the Data Quality Objectives (DQO) process

MARSSIM Surveys



Planned Revisions

MARSSIM not updated since 2001

- Mostly errata and typos corrected before that date

Planned Revisions

1. Include measurement quality objectives (MQOs) and measurement uncertainty
2. Expand measurement methods to include scan-only surveys
3. Update survey instrumentation information
4. Include scenario B (“assumed to meet the criteria until proven otherwise”)
5. Increase emphasis on regulator interface during survey design

Planned Revisions

6. Improve description of the lower bound of the gray region (LBGR)
7. Update and use consistent terms and language
8. Expand information on survey requirements for areas of elevated activity
9. Include information on survey requirements for discrete radioactive particles
10. Use of MARSSIM with UMTRCA requirements
11. Evaluation of measurement uncertainty and selection of measurement methods
12. Include an appendix on Ranked Set Sampling for hard-to-detect radionuclides

Planned Revisions

Include measurement quality objectives (MQOs) and measurement uncertainty

- MARSAME and MARLAP in line with the state of the science regarding MQOs and measurement uncertainty
- Complies with current guidance from ISO and NIST

Guide to the Expression of Uncertainty in Measurement

First edition 1995
ISBN 92-67-10188-9

Printed in Switzerland

NIST Technical Note 1297
1994 Edition

Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results

Barry N. Taylor and Chris E. Kuyatt

Physics Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001

(Supercedes NIST Technical Note 1297, January 1993)

September 1994

Planned Revisions

Expand measurement methods to include scan-only surveys

- MARSSIM written with the current (~1995) measurement technology in mind
- The state of radiation instrumentation improved
- MARSAME includes additional flexibility to take that into account

Planned Revisions

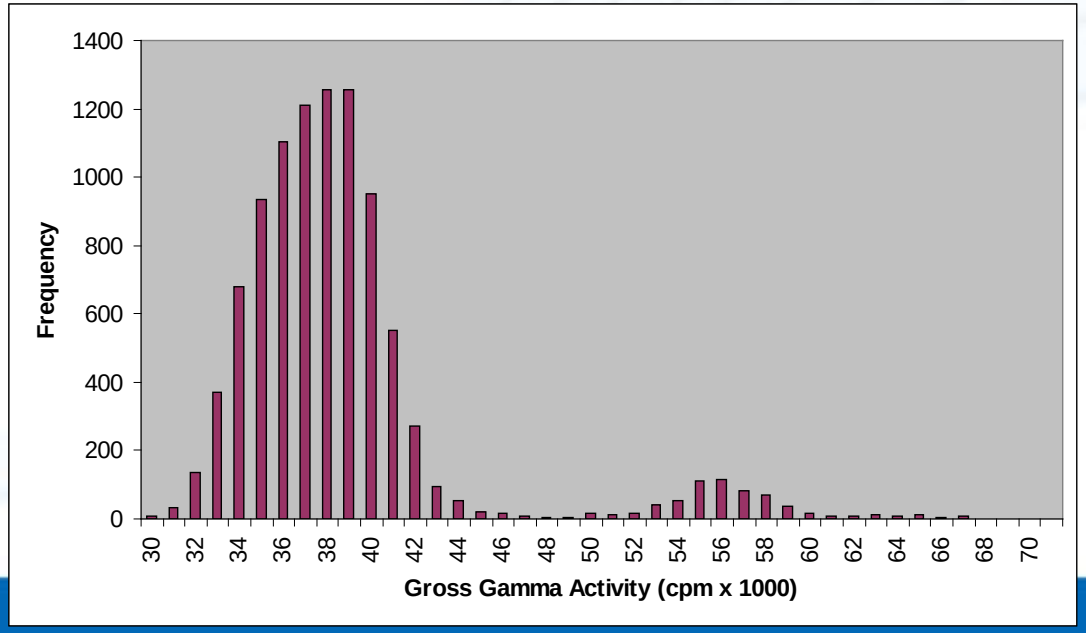
Update survey instrumentation information

- Chapter 6 on Field Surveys
- Appendix H on Survey Instrumentation

Planned Revisions

Include scenario B ("assumed to meet the criteria until proven otherwise")

- MARSAME allows the use of Scenario B
- Already used in some states for MARSSIM



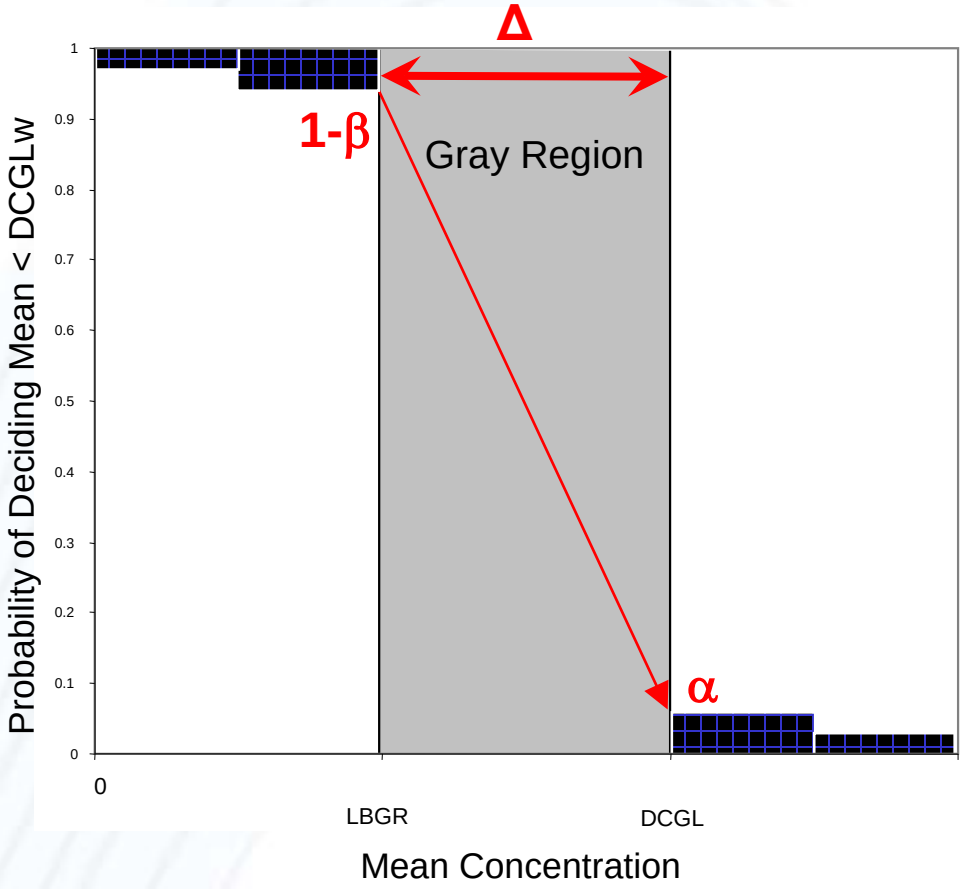
Planned Revisions

Increased emphasis on regulator interaction during survey design

Planned Revisions

Improve description of the lower bound of the gray region (LBGR)

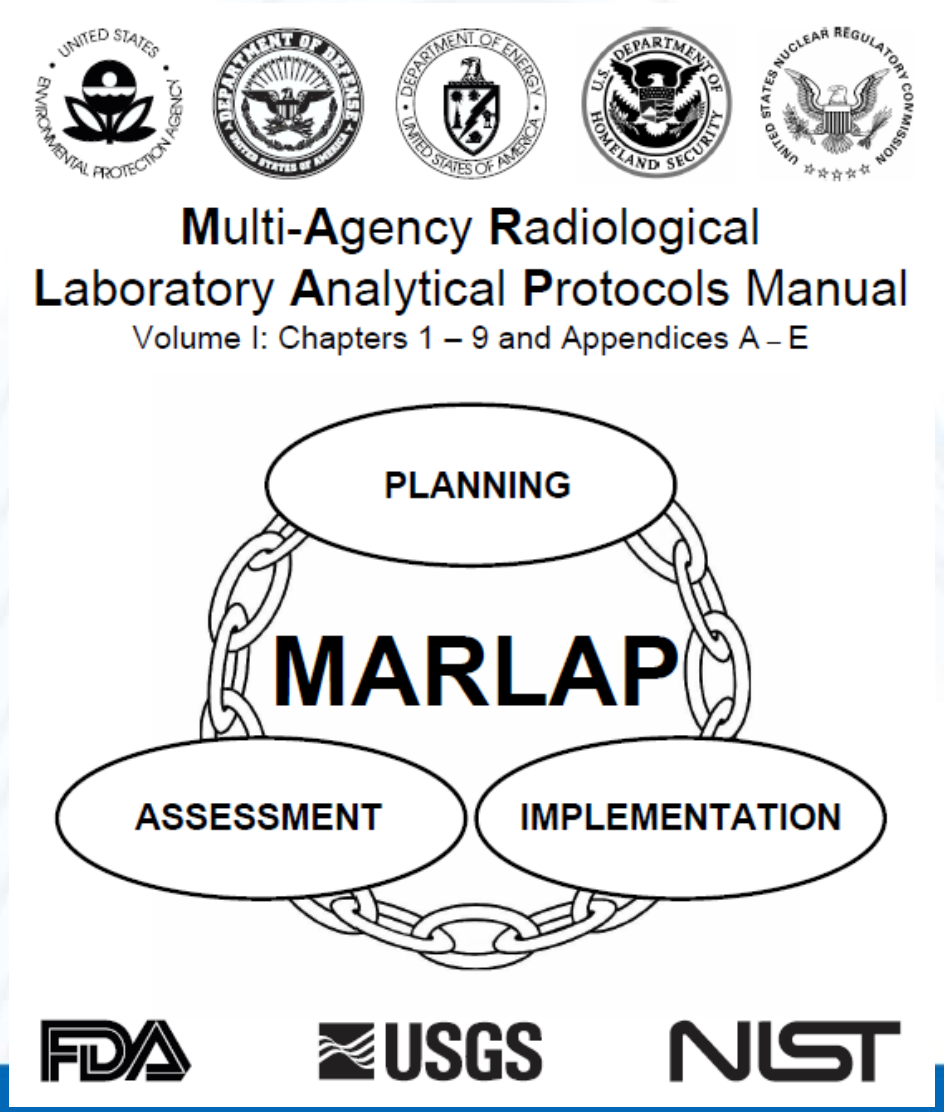
- Re-phrased from statistical language
- "represents a conservative estimate of the remaining residual radioactive material in the survey unit"



Planned Revisions

Update and use consistent terms and language

- User comments led to changes in some key terms for the issuance of MARLAP and MARSAME
- Continued evolution of terms



Planned Revisions

Expand information on survey requirements for areas of elevated activity

- Alter language to address concerns about the current hotspot procedure

$$\frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \cdots + \frac{C_i}{DCGL_i} + \cdots + \frac{C_n}{DCGL_n} \leq 1$$

Planned Revisions

Include information on survey requirements for discrete radioactive particles

- MARSSIM addresses areas of elevated activity
- Methodology becomes unwieldy at certain small sizes
- Modeling pathways are different for discrete radioactive particles

Planned Revisions

Use of MARSSIM with UMTRCA requirements

- UMTRCA includes specific averaging areas and concentrations

Planned Revisions

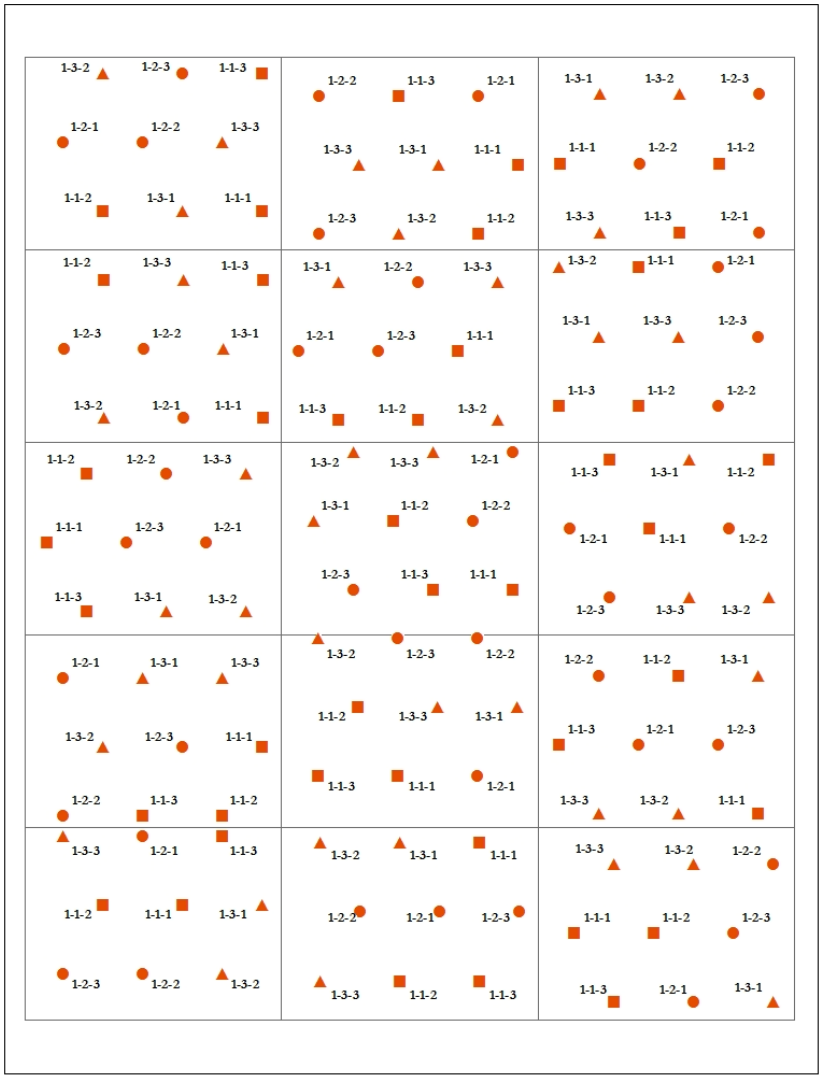
Evaluation of measurement uncertainty and selection of measurement methods

- Selecting a measurement method will ultimately impact survey costs and statistical power of the sampling design
- Measurements or samples used in the compliance decision are typically analyzed with a very high precision
  - High precision data may be cost or schedule prohibitive even when fewer samples may be required to demonstrate compliance
  - Less precise methods may initially be less expensive upfront but can result in the need for a larger sample population due to inherent additional measurement uncertainty

Planned Revisions

Include an appendix on Ranked Set Sampling for hard-to-detect radionuclides

- Including Ranked Set Sampling technique proposed by ORAU as an appendix



Next Steps

Updates on the MARSSIM Revisions will be posted to the MARSSIM Workgroup website: https://www.epa.gov/radiation/multi-agency-radiation-survey-and-site-investigation-manual-marssim.

Version for Internal Agency Review planned for 2016

- Final technical edit
- Figure generation

Interagency Review at DOE

Workgroup agreed on 60-day review period once documents are delivered by EPA

- AU-20 to coordinate with Program Offices and select SME's to review draft MARSSIM
- ~30-day internal review period
- AU & EM to consolidate and review comments

Questions