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STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION
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July 7, 1997

Mr. David Meyer
Rules and Directives Branch
Division of Administrative Services
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Meyer:

We appreciate the opportunity to provide comments on the draft Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). The staff of the Environmental Radiation Section reviewed the draft, and their comments are attached.

The Washington Department of Health, Division of Radiation Protection has been involved in the cleanup of a variety of radioactively contaminated sites and at the present time is involved in oversight of the cleanup of the Hanford site. We have followed the development of cleanup standards by the U.S. Nuclear Regulatory Commission and the U.S. Environmental Protection Agency and are particularly interested in the monitoring that is needed to verify that cleanup standards have been met. The MARSSIM provides a methodology that should provide uniformity in the approach to monitoring of cleanup, and we are pleased that this multi-agency document has been prepared.

If you have any questions regarding the comments, please do not hesitate to contact Dick Jaquish of this office at (509) 377-3818.

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Sincerely,

I&P11 Guides/Manuals

DMcBaugh

Debra McBaugh, Head
Environmental Radiation Section

NRC Requested Review Questions

1. *Does MARSSIM provide a practical and implementable approach to performing rad surveys?*

The MARSSIM appears to be a well organized and practical approach to monitoring needed for cleanup. It provides flexibility that will allow it to be applied to a variety of cleanup situations.

2. *Is the MARSSIM technically accurate?*

For the most part, yes the document is accurate. A few analytical procedures (i.e., using gamma analysis to determine U-235 results) are questionable.

3. *Is the MARSSIM a benefit not currently available and what is its value compared to other currently available alternatives?*

Its value is that much of the survey and investigation information is brought together in one place (or at least references to it). Since many cleanup activities will involve hazardous chemicals as well as radioactivity, it is appropriate that MARSSIM uses a format that is compatible with CERCLA and RCRA. In the QA section, it falls short in not giving better detail on how to determine what QA is required.

4. *What are the costs associated with the MARSSIM compared to available alternates?*

It is difficult to determine what costs will be associated with MARSSIM versus other alternatives.

5. *Is the information presented in the MARSSIM understandable and presented in a logical manner?*

The document appears to be compiled by several authors. This makes the document difficult to read, adds redundancies and results in material not being presented in a logical manner. A strong editorial hand would correct this.

A graphical representation of the cleanup process showing the application of remedial goals would be useful in MARSSIM. As an example, The EPA *Statistical Methods for Evaluating the Attainment of Cleanup Standards Volume 3: Reference-Based Standards for Soils and Solid Media* on page 2-4 pictorially represents cleanup in comparison to a remedial goal in a visual manner.

Detailed Comments

Chapter 1: Introduction

Line 22, Suggest changing from "addresses the need to have" to "provides".

Line 51, Here and in other locations it refers to surface soil. What depth is considered surface soil? It is not unusual to have downward migration of radionuclides. It limits the applicability of this document to limit it to surface soil.

Chapter 2: Overview of the Radiation survey and Site Investigation Process

Section 2.3.4 The discussion of types of errors is fuzzy. The statement that "Adequate planning should eliminate or minimize known sources of uncertainty." is overstated. Uncertainty can be minimized but not eliminated.

Chapter 3: Historical Site Assessment

At the Hanford site, the cleanup is managed through the Tri-Party Agreement consisting of the Washington Department of Ecology, the U.S. Environmental Protection Agency, and the U.S. Department of Energy. The current approach to site assessment is to use what is called the "observational approach". The Record of Decision for the USDOE 100 Area describes the Observational Approach as follows: "The Observational Approach relies on information from historical process operations including historical liquid effluent discharges from 1944 to 1969, and information from limited field investigations on the nature and extent of contamination, combined with a "characterize and remediate in one step" methodology. This latter methodology consists of contingency planning prior to site excavation and field screening for contaminants at sites where remedial action and cleanup goals have been selected. Remediation proceeds until it can be determined through a combination of field screening and confirmational sampling that cleanup goals have been achieved".

Is this observational approach compatible with the MARSSIM recommendations?

Chapters 4, 5, 6: No comments

Chapter 7: Sampling and Preparation for Laboratory Measurements.

The MARSSIM does a good job of pointing out that planning is a necessary step of a successful survey or investigation. It is especially important that the decision makers work with the planning team to identify the data needs for the task being performed and then work with the chemists to make sure that the data quality objectives can be met.

7.3 describes six criteria to be used in selecting a radioanalytical laboratory. While the criteria are good, there is no guidance for determining if the laboratory satisfies the criteria. For instance, Criterion 3 asks if the laboratory has intercomparison results and requires the lab to provide a summary of it. Guidance is needed for determining if the results are acceptable. To merely participate in an intercomparison without regard to performance is not satisfactory.

7.4.2.1 explains surface soil sampling and defines surface soil as the top six inches. This is the depth used for radium and uranium analysis at uranium millsites, but the top one inch is more common for other environmental samples. The paragraph discusses the "cookie-cutter" method which is used for one-inch depth and not for six. The issue of what to do about rocks in the sample is not discussed. Often, when looking for contamination, the fine soil is desired and rocks above a certain size are discarded.

7.4.2.2 describes one reason for subsurface soil sampling, which is to locate and determine the vertical extent of the contamination. We know from our initial cleanup at Hanford, that the question isn't always to determine the extent of the contamination, but rather to assess the contamination at a preset depth, consistent with the dose assessment needs. This section also needs to discuss sample size fractions. What size fraction to analyze depends on the question to be answered. If the vertical extent of the contamination is to determined, then the fine soil fraction is needed.

For both the surface and subsurface soil sampling, specific methods for splitting the sample should be given or referenced.

7.4.3 Add a note reminding the sampler to remove borehole water prior to sampling.

7.4.4 MARSSIM falls short of telling the investigator how long air samples should be held prior to gross alpha, beta analyses. There is a reference to DOE document which gives additional pitfalls and precautions. Unless they are too numerous, list them.

7.5 Change title to "Sample Preservation and Sample Preparation." The title will then more accurately follow the flow of sample treatment.

Tc-99 may be lost by treatment with high temperature.

The final sentence on page 7.14 talks about the potential bias by selecting samples that can be safely handled or legally shipped to support laboratories. While this is true, this point should be covered under the section on selecting appropriate samples and should be a point covered during communication between decision makers, samplers and chemists. The bias is not necessarily analytical. It is rather a sampling constraint.

7.5.2 The investigator is cautioned against using an oxidizing agent for sample preservation when iodine is a constituent of interest. This is true if iodine is to be separated, but not if analysis is by gamma counting.

Table 7.2 gives typical measurement sensitivities for lab procedures. It is not referenced in the text. We suggest changing the "approximate measurement sensitivity" (awkward language) to the more typical "limit of detection." Also add a column which highlights the limitation of a particular analytical technique for a given isotope.

U-235 should not be determined by gamma analysis. In water, Ra-226, Bi-214 will not be in equilibrium, and so the LLD for radium will be greater than 10 pCi/l. It is not reasonable to have an LLD of 1 pCi/l for gross alpha and gross beta. Alpha will more likely be 2 pCi/l and beta will be at least 5 pCi/l.
Plutonium 239 and 240 cannot be separated by customary lab equipment and thus should be represented as Pu-239/240.

The detection limit for tritium for a 30 minute count is generally in the range of 500-600 pCi/l; not the lower value of 300 pCi/l, as stated.

CHAPTER 8: INTERPRETATION OF SURVEY RESULTS

Section 8.3.1 The EPA, in *Methods for Evaluating the Attainment of Cleanup Standards Volume 1: Soils and Solid Media*, recommends using the null hypothesis that the site remains contaminated at levels greater than the remedial goal. However, the EPA in *Statistical Methods for Evaluating the Attainment of Cleanup Standards Volume 3: Reference-Based Standards for Soils and Solid*

Media, specifically challenges this hypothesis as unreasonable and recommends using the traditional null hypothesis, which assumes the cleanup standard has been achieved. The EPA further supports the use of the traditional null hypothesis in *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Part A.* WDOH recommends that the traditional null hypothesis be utilized following cleanup actions.

CHAPTER 9: QUALITY ASSURANCE AND QUALITY CONTROL

The stated purpose of this section is to provide a framework and criteria for establishing a Quality Assurance Project Plan (QAPP). The criteria are not given. The minimum program should be outlined.

9.2.7, line 216: What are the criteria for non-conforming data?.

9.3, line 226: Control limits are NOT discussed per se in Section 9.4.6. What is discussed is what an out-of-control QC sample might indicate but not how to determine if a QC sample is out of control.

9.3.1, line 251-253: Add that the choice depends on whichever is more.

9.3.2.1 Spiking a matrix may not always provide accurate representation of a "real" sample (e.g., spiking vegetation or air).

line 276-278 does not give any guidance to determine what a sufficient number would be.

9.3.2.2, line 311: Daily calibration checks are NOT discussed in the named section.

9.3.3.1, line 329: There is not adequate guidance for determining the number of duplicates needed to assess accuracy of survey against DQO in QAPP.

9.3.4.1, line 359: Blanks also are used to assess background for laboratory counting equipment.

9.4: The description under project assessment and assessment of environmental data emphasizes making sure all the parts are complete (e.g., survey plan, chain of custody) with little emphasis on true interpretation of the data. What we have seen at Hanford are examples of people following the plan but not understanding

and reviewing environmental data. The importance of the data and what it means to the decision-maker is not discussed.

APPENDIX H. The presentation of the field and laboratory analysis equipment needs to be reformatted. It is not logical and often redundant, making it hard to read.

line 187: Electret ion chamber will also measure other natural products.

line 228: The text gives an example of the inconsistency in presentation. The theory of using this instrument is discussed under operation. There isn't enough information presented under operation to actually run a set of samples and so MARSSIM editor may want to change the operation section to theory and then reference good documents on operations.

Specificity/sensitivity is not always used to detail detection limits in all system descriptions. Consistency is needed. Also, in some cases, sample preparation is discussed. It would be better to include those comments with analysis and restrict the text in this section to description of the equipment.

lines 182, 304, 367 all discuss electret ion chambers. This is confusing. We realize that this is so because the authors are trying to discuss equipment for each mode of decay separately, but this redundancy causes more confusion than if the piece of equipment is discussed once. As presented, the data are inconsistent.

lines 467, 508 both present field applications of gamma spectroscopy. The information should be combined under one heading.

lines 152, 710 both discuss field uses of alpha track detectors. Combine the information.

line 998: List what can be typically analyzed by this system.

line .022-.028 discusses procedure and does not belong in this section.

line .064 The limitations of the system appears to be what is being discussed here.

line .073 Typical efficiencies are usually 20-40% (with window)

line .075 Typical background is more likely 0.8 cpm

line .178 Germanium detectors with MCA is discussed here. The title is inconsistent with the field applications of gamma spectroscopy. Perhaps all gamma spec should be combined and a section describing applications/limitations added.

line .206-.211 discusses procedure and should be moved to analysis section.

line .212-.217 is too general to provide much guidance. A list of typical isotopes of interest and LLDs should be given.

line 921 discusses ICP/MS and related equipment. If the instrument is presented, then an analytical procedure should be added to the analysis section.

APPENDIX I Section I.9: Power of the sign test. The equation requires further clarification as to the use of *k* in the formula. In summing the probabilities, equation I-6 appears to take the form of a binomial expansion. As such, one would expect *k* and *N* to be the same value, which is the actual number of measurements obtained, which is also the maximum value.

WASHINGTON STATE DEPARTMENT OF HEALTH

Division of Radiation Protection

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