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Division of Freedom of Information
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Washington, D.C. 20555-0001

This letter provides comments on Draft NUREG-1575 "MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL". Answers to the questions posed in the Notice are provided as follows:

1) Does the MARSSIM provide a practical and implementable approach to performing radiation surveys and site investigations? Are there any major drawbacks to the proposed methods?

Answer: The MARSSIM provides excellent references to a broad spectrum of methodologies which might apply in simple cases of surface contaminations, but not for "subsurface soil, building materials, groundwater, etc." (ref. Chapter 2, lines 66-67). This is a severe limitation, since decommissioning experience has shown that contaminations are seldom a simple surface phenomenon. Thus the manual's usefulness is limited.

2) Is the MARSSIM technically accurate?

Answer: In terms of specific numerical errors, I found only that in Chapter 6, lines 929-947, a value of 12 millirem per hour is given for a net count rate of 1,050 CPM for a 2x2 NaI detector. This is in error, as the actual dose rate would be in the order of 3 microrem per hour. Additional technical concerns are identified as follows:

Chapter 6, lines 102-104 - Despite the discussion in Section 4.3.2 (pg 4-4 through 4-5) on the effectiveness of surrogate measurement techniques, the statement is made here in Section 6 that scans should be conducted for all radiations potentially present (alpha, beta, low-energy X and gamma radiations). The wording should be changed to be consistent with use of surrogates. I would suggest the wording: "Scans are conducted for radiations which would be indicative of all radionuclides potentially present, based on the operational history and surfaces to be surveyed. Surrogate nuclides should be utilized where appropriate (see Section 4.3.2). Documenting scanning results..." As discussed in Section 4.3.2, surrogate ratios should be confirmed by a relatively small number of direct measurements or samples.

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Chapter 6, lines 262,279 and 293-294 - This section provides good discussion of fluence rate conversion to nuclide concentrations and surface depositions, but misses the opportunity to discuss fluence rate to dose rate conversion. This is a general shortcoming of the MARSSIM, because the emphasis throughout is to use the DCGL's in preference to dose, even though dose is the actual performance standard. While the DCGL concept is important for radionuclides which are important internal dose contributors, the concept is not important for the radionuclides which provide significant contributions of dose in the case of nuclear power licensees, where 90% or more of the dose is external from Co-60, Cs-137 and perhaps Eu-152 or Ag-110m in some special circumstances.

Chapter 6, lines 352-353 - this includes a brief statement that special analysis routines may be required to convert *In Situ* data to exposure rates, but this mention is only in passing. Considerably more emphasis should be given to spectral analyses in dose calculations, because this is the only technique which can directly differentiate contribution of dose from non-natural residual contamination from dose due to natural gamma emitters.

Chapter 6, lines 933-936 - Two steps are defined. First, conversion of count rate to exposure rate, and second, exposure rate to contamination level. For radionuclides such as Co-60 where human exposure is primarily due to the external radiation mode, conversion to surface or volume concentration is unnecessary. One must not forget that the acceptance parameter is dose. Residual concentrations are only a means to estimate dose where modes other than external exposure are important. Unnecessary conversions only add additional uncertainties.

Chapter 7, Lines 555-557 - Counting of a smear filter stack as discussed here is an appropriate technique if appropriate calibration factors are applied. However, the reference to gross G-M counting implies beta analysis, and this would be ineffective for a large stack of smears since significant beta absorption would occur. Stack assay should be limited to gamma counting, and then only if a gamma is a detectable component and useful as a surrogate for any non-gamma emitters present.

Chapter 7, lines 504-678 - This chapter differs significantly from the other sections of this manual in its general nature. For example, other than the smear stack technique discussed in Section 7.6.1, no screening methods are covered which would substitute low cost analyses for expensive laboratory techniques. A screening method available for transuranic alpha emitters which can avoid very expensive chemical separations followed by alpha spectroscopy, for example, is use of the surrogate gamma emitter (59 KeV) ^{241}Am to screen for the transuranic series. (Ref. Fong and Alvarez, Health

Physics, February 1997, Vol 72, No.2, pp 286-317, English, Burdette and Kessler, ANS Transactions, Vol 71, Nov. 13-17, 1994, pg 627). These references describe both *In Situ* and laboratory use of ^{241}Am as a surrogate for other transuranics in decommissioning projects. This and other such modern techniques should be added.

Appendix H, lines 480-481 - The description of detector use is too narrow, limited to an unshielded detector used for soil analysis. I suggest the sentence beginning "The detector is typically..." be replaced with the following:

> "A columnated detector typically is positioned at a distance from a surface to provide multichannel spectral data for a defined surface area."

Appendix H, line 496 - The low end value of 60 kev for a P-type detector should be changed to 58 keV or lower (it is given as 50 keV on line 215 of Appendix H). The P-type detector is well documented for *In Situ* measurement of Am-241 at 59 keV.

Appendix H, line 678 - When combined with personnel dosimetry service TLD use, cost are significantly below the $100 to $500 per measurement quoted here, and much closer to the $25 to $125 listed in Table H.3, page H-65. It is not clear why the costs are different in these two locations.

Question 3) Does MARSSIM provide benefits that are not available using current methods? What is the value of MARSSIM in comparison with other currently available alternatives?

Answer: MARSSIM is a compilation of methods and procedures generally available in the literature. It provides no new or unique methods, but does a fairly good job of bringing the various methods together into a single reference volume for survey and analysis of surface contaminations.

Question 4) What are the costs associated with the MARSSIM in comparison with other currently available alternatives?

Answer: This questions implies either that MARSSIM would be required for use by a regulatory agency, or would be chosen for sole use by a licensee. Since the MARSSIM covers only the minimal case of surface contaminations, such a course of action would not be logical. Since MARSSIM covers no new ground from a technical basis, and implements survey methodology predominantly based upon DCGL's rather than dose, there is little reason to implement the MARSSIM for anything but a reference document.

Question 5) Is the information in the MARSSIM understandable and presented in a logical sequence? How can the presentation of material be modified to improve understandability of the manual?

Answer: The manual tends to be quite redundant from section to section due to the stated goal that each section be useful without reliance on the full manual. Consequently, some aspects are described in many chapters. However, the bountiful use of acronyms still requires the reader to turn constantly to the acronym listing (where the spelled out term is presented), then to the glossary for a definition of the term. The glossary does not define all the acronyms, so the index must be used to search out a page that one may find the associated definition. This process makes for very cumbersome reading. It would help greatly if the acronyms were spelled out and defined in each chapter.

The concept of the Derived Concentration Guideline Level for Elevated Measurement Comparison ($DCGL_{EMC}$) is a critical concept to MARSSIM methodologies, yet no basis is given for deriving the area dose factors which are necessary for determining $DCGL_{EMC}$. Tables 5.6 and 5.7 (Chapter 5, lines 826-847) provide only examples of the area factors and advises the user to "consult regulatory guidance to determine area factors to be used for compliance demonstration". No reference to guidance is provided. A user would need considerably more information on the basis for area dose factors within MARSSIM before the concept could be put to practical use.

Thank you for the opportunity to comment on this manual. If I may be of further help, please feel free to contact me by telephone at (616) 547-8348.

Very truly yours,

Robert A. English

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No. Pages: 5, including this cover

Message: Attached are comments on the MARSSIM Manual, Draft NUREG-1575 "MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL"