February 11, 2022

Jonathan Edwards, Director, Office of Radiation and Indoor Air
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

RE: Docket ID No. EPA-HQ-OAR-2021-0276

Dear Mr. Edwards,

The Organization of Agreement States (OAS) Executive Board (Board) appreciates the opportunity to comment Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Revision 2. The Board offers our support for the comments submitted to us from the New Jersey Department of Environmental Protection, the comments are as follows:

Thank you to the MARSSIM team for their dedication in continuing to improve the product. Regulators are still eagerly awaiting guidance for subsurface contamination.

(1) Do the revisions to MARSSIM provide greater clarity while maintaining a practical and implementable approach to performing environmental radiological surveys of surface soil and building surfaces?

Most definitely.

(3) Does MARSSIM Revision 2 provide useful examples and descriptions of approaches to implementing surveys and the statistics by which they are interpreted?

Yes, much better than Revision 1.

(4) Is the information in MARSSIM Revision 2 understandable and presented in a logical sequence? How can the presentation of material be modified to improve the understandability of the manual?

The information is more understandable than Revision 1. Can checklists be included that capture all of the nuances? Some important information is imbedded within the text, for example when the standard deviation of the background reference area is greater than the estimated standard deviation, the larger one should be used to determine the relative shift. There are many others. Typically, users don't read the whole manual beginning to end.

There is a lot of flipping back and forth. If MARSSIM will be printed, consider a better binding.

With the removal of Excel functions previously provided in Appendix I of Revision 1, recommendations for software confirmed to perform calculations in accordance with guidance should be suggested. Testing should confirm that calculations are conducted in accordance with guidance for examples such as dealing

with tied ranks and "less than" reported values, multiple EMCs, and calculations for multiple radionuclides present in background. Training on this software should be integrated into MARSSIM training sessions.

Page xxvi: Defines SADA as Visual Sample Plan and Spatial Analysis and Decision Assistance. Visual Sample Plan (VSP) should have its own acronym.

Page xxxv: The table of conversions is much appreciated.

Page 1-6 Line 1: Suggest another bullet for unique site-specific cases that require a modified approach. Some TENORM contaminated sites in New Jersey are over 200 acres, so the following wording is suggested to add to the list:

Sites with large areas of TENORM contamination where a 2000 m^2 Class 1 survey unit size would be impractical and/or cost prohibitive. Larger survey unit sizes (and subsequently larger unsampled areas) might be reasonable when the contaminant is readily detectable by walk/drive-over scans, for example.

Page 2-5, Line 17: Add geological to the list of similar characteristics. This is especially important for TENORM sites.

Page 2-12, Line 23: Should the authors specify that where remediation is planned, the standard deviation be estimated from preliminary *post-remedial* survey data?

Page 2-21, Figure 2.5: "The Historical Site Assessment Portion of the Radiation Survey and Site Investigation Process", this figure asks: "Does Site Possibly Contain Residual Radioactive Material in Excess of Natural Background or Fallout Levels?" If the answer is yes, it directs the user to "Document Findings Supporting Non-Impacted Classification" and then "Decision to Release Area". The yes and no arrows should be switched.

Page 2-29, Line 23: Saying that the burden of proof is not on the individual designing the survey is misleading. They still must design an adequate FSS, obtain approval from the regulator for the selection of alpha/beta decision levels and standard deviation, and provide all the necessary documentation after the survey is complete. Also, there is a lot of new jargon introduced here without much background. Maybe refer the reader to a graphical representation of what alpha, beta, and power mean.

Page 2-44, Line 4-6: Could the authors elaborate on how to factor in the effects of the compositing technique when calculating measurement method uncertainty and detection capability and in the determination of areas of elevated radioactive material? That would really be helpful.

Page 4-2, Line 6: "The sum of the ratios for all radionuclides in the mixture should not exceed 1." This can be one of the most debated statements in MARSSIM. Please include a discussion on what exactly that means. Consultants try to argue that the sum of the ratios can be rounded. For example, 1.3 can be rounded to 1, which regulators must point out is not acceptable. However, is 1.0001 acceptable and should significant figures play a role? Regulators spend a lot of time debating this issue and a discussion in MARSSIM would be appreciated, here or in section 4.4, or both.

Page 4-6, Line 3: Can horizontal and vertical be added before extent? Here and wherever extent is used in describing characterization surveys. MARSSIM focuses on surface soil, but it should be made clearer that MARSSIM can apply if there is subsurface contamination that will be remediated, leaving the assessed "surface" at depth. Some readers may think that if they have subsurface contamination that MARSSIM should not be used. Only one sentence was found that explained this.

Page 4-8, Line 27: The language should be revised to match that from Appendix B: “Sites that qualify for simplified decommissioning procedures are those where radioactive materials have been used or stored only in the form of non-leaking, sealed sources; short half-life radioactive materials (e.g., t1/2 ≤ 120 days) that have since decayed to insignificant quantities; small quantities exempted or not requiring a specific license from a regulatory authority; or combinations of the above.”

Page 4-12 Line 21: More guidance on what constitutes "sound evidence" or a "well-established" correlation would be appreciated.

Page 4-11 Line 25: Suggest reconsidering language including deletion of the text “When properly justified to and accepted by the regulatory agency, no $DCGL_{EMC}$ requirement may be needed at all.” The calculation of an *a priori* $DCGL_{EMC}$ is required to assess sample spacing and whether MDC_{scan} is adequate. The *a posteriori* $DCGL_{EMC}$ has been used successfully and should not be discounted early in the guidance. When elevated measurements arise, it is a fairly simple approach that has been used to both release survey units and determine if additional remedial effort may be meaningful. Detecting an EMC in sampling that was not identified by the scan also speaks to the validity of scan implementation.

Page 4-19, Line 38: Gross activity measurements—typically gross alpha or beta concentrations—can be made, especially on surfaces. Is there any benefit at all to gross alpha or even gross beta measurements on soil surfaces? If not, suggest inserting “building” before “surfaces.”

Page 4-21, Line 10: An example of a Class 2 survey unit – locations where radioactive materials were present in an unsealed form. Is this a typo? Should unsealed be sealed? If it is not a typo, then there should be a bounding statement included such as short-lived or in concentrations below the $DCGL_w$. Also, a discussion on leak test documentation could be a contributor to classification for sealed sources.

Page 4-21, Line 18: What percentage constitutes a small fraction of the $DCGL_w$? A small fraction of the $DCGL_w$ is defined later as 10% when referencing background levels on line 31 of p. 4-24. Would it be the same when determining a Class 3 area designation?

Page 4-43, Line 14: More guidance is needed on what is considered adequate screening for bio-uptake. Some sites in NJ have hundreds of acres of cleared trees/scrubs. It would be valuable if Federal partners can provide/reference a model procedure/process.

Page 4-53, Line 6: Explain why 1.96 is added. Some readers may not understand this. Reference to Table 6.6? Anytime a formula is provided, all inputs should be defined.

Page 4-53, Line 8: What correlation coefficient would be acceptable to validate the relationship between radionuclides? At the least, a range of acceptable values with qualifications would be appreciated.

Page 5-6, Line 9: After “(Section 4.5)” add “or material specific backgrounds are necessary for field instrumentation.”

Page 5-6, Line 45: This is an important statement about judgement samples. It may be missed unless it is somewhere in a checklist.

Page 5-9, Example 1: Adjust DCGLs based on survey findings (the DCGLs initially selected may not be appropriate for the site). This should be discussed in the text, as this is the first time this was mentioned. Some might think that because the levels are higher, that the DCGLs could be higher. Replace “the DCGLs

initially selected may not be appropriate for the site" with "parameters used in DCGL development are not consistent with site conditions/observations."

Page 5-37, Line 4: It appears as though MARSSIM gives no guidance on the determination of $DCGL_{EMC}$s and leaves it completely up to the regulator. The paragraph starting on line 15 is not adequate. Appendix O should be referenced here as it explains the problems with the Area Factor approach, yet still provides guidance. Providing direct references to other documents which discuss ways to address EMCs, such as NUREG-1757, would be beneficial in the main text, as well.

Page 5-39, Example 7: There is a typo in the abbreviations of the table where it says EMC means Elevated Minimum Concentration. It should be Elevated Measurement Comparison.

Page 6-3, Line 24: Should be "performed" not "performing"

Page 8-6, Line 18-19: Missing a word after 8.1c such as "and" or "which"

Page 8-11, Line 16: "When a number of elevated areas are present, techniques can be used to evaluate the cumulative risk of the elevated areas dependent on the distribution of the elevated areas in the survey unit." This should be explained further or reference the section where it is explained.

Page 8-16, Line 11, footnote 4: This should point to an illustrative example such as a survey planned with screening criteria which then proceeds to a site-specific assessment of a particular area. Add "with the regulator's approval"

Page 8-17, Line 5: Fix the font.

Page 8-20, Line 5: Replace "mean" with "median".

Page 8-21, Line 13: Indicate how one determines the LBGR, just for review.

Page 8-30, Line 15, since the quantile test is required for Scenario B, should there be a step 7 in this example and a reference to Section 8.4.3?

Page 8-46, Line 17: "The EMC is intended to flag potential failures in the remediation process. This should not be considered the primary means to identify whether a survey unit meets the release criteria." These two sentences should be italicized, bold, or both. It is unclear whether this means that there shouldn't be multiple EMCs in every survey unit. While we agree that EMCs should not immediately preclude release of a survey unit, they also should not be numerous or large.

Page 8-46, Line 24: States "An individual elevated measurement on a systematic grid could conceivably represent an area four times as large as the systematic grid area used to define the $DCGL_{EMC}$." This is only accurate for a square grid. With a triangular grid suggested, it would be an area six times larger than the *a priori* $DCGL_{EMC}$.

We suggest including here a revision to Figure 5.5 (page 6 of this letter) from MARSSIM Revision 1 to display a triangular grid, and EML location (red circle) and depiction of the difference between an *a priori* (blues shading) and *a posteriori* EMC area (red shading). It should also be noted that if the figure is used, the 15 m dimension should be revised to 14.72 m.

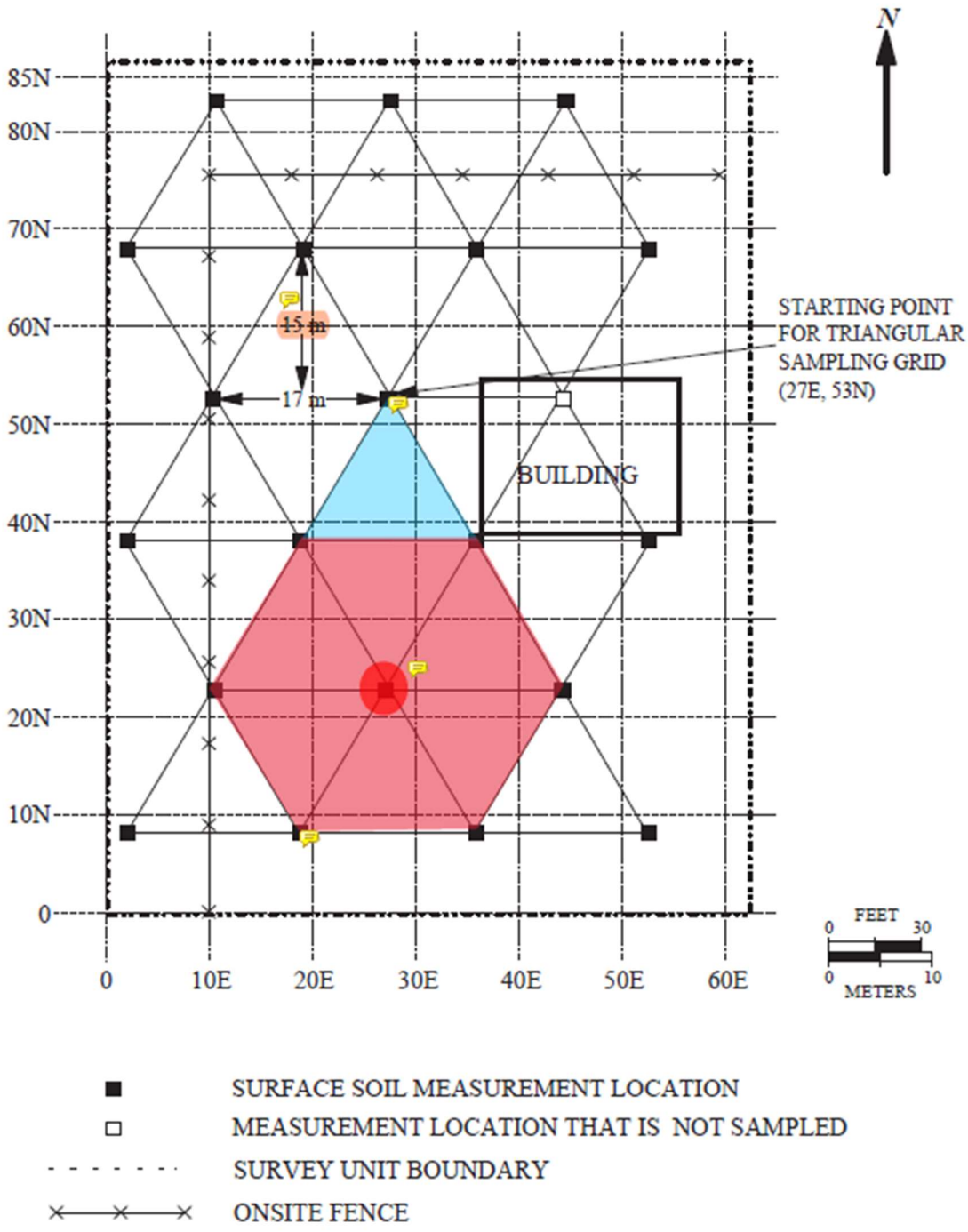

Figure 5.5 Example of a Random-Start Triangular Grid Measurement Pattern

Page 8-47, Line 21: It was assumed that Equation 8-4 considered the uncertainty of releasing a site with multiple elevated areas so that the overall dose would still meet the release criteria. To remedy the problem of a receptor being at multiple places at once, MARSSIM suggests determining the elevated area (primary area) that contributes the most to the total dose or risk. The assumptions used for determining the elevated area(s) that contribute the largest dose cannot be known before the property is developed, as it is dependent on the amount of time, distance and shielding to which a receptor would be subjected. A smaller, less elevated area may have a greater contribution to dose depending on the use of the site where the elevated area is located. Exact development plans are seldom known at this stage of the remediation process, so this approach may not reflect reality either.

Page 8-47 Equation 8-4: Questions presented to regulators regarding this equation include:

1. Should the mean concentration of the survey unit include a systematic grid sample which is the source of the EMC?
2. Can an expanded formula be provided to represent the scenario of multiple contaminants also present in background? While complicated, it is much more common than the typical Cs-137/Co-60 examples often referenced.

Ref-1: The list includes a few weblinks, which are very helpful to include. Consider maintaining weblinks on a companion webpage that could update locations of files, or perhaps provide all documents should the authors/publishers agree. This would enhance user access. The references include two versions of *Decommissioning Health Physics* by Abelquist, could the older references be checked for presence in the second edition?

Page C-16, Line 37: The table numbers in the text are different than the actual table names. C-1 should be the list of Agreement States and C-2 should be the list of states that regulate diffuse NORM.

Page D-27, Line 3: References Chapter 5 for area factors, but Chapter 5 never mentions them.

Page I-2 to I-3, Table I.2: Sample Sizes for Sign Test and *Table I.3: Sample Sizes for Wilcoxon Rank Sum Test* are presented in a different format than at Tables 5.2 and 5.3. While this may have been to present the sample numbers with fewer columns to prevent duplication, the tables as presented in Chapter 5 are easier to navigate with alpha and beta values clearly indicated in the top rows. Usually, the regulator will specify the alpha error and with Chapter 5 formatting the site has available options for varying beta clearly displayed next to one another.

Page I-10: Some suggestion for "many ties" should be defined. Is this a static number, percentage of overall samples (n), etc.? Analytical results should be presented in tests with the reported number of decimal places. Rounding unnecessarily is a common source of tied ranks.

Page M-1, Line 22: It would be helpful to reiterate the $DCGL_w$ in both cases, so one doesn't have to go back to Chapter 8.

Page GL-5: the new definition of contamination presented in this revision relates only to objects where the purpose of MARSSIM is to assess contaminated surfaces and land areas.

Once again, the Board appreciates this opportunity to comment. We are available should you have any questions or need clarifications to our responses.

Sincerely,

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