

Comments on UCR SATES Final DSR
Email dated Thursday, May 16, 2024
Sent by Robert Tan to Rob Orr

- Appendix F (*Linear Mixed Models Statistical Output*) and Tables 5.1, 5.2, and 5.4

COMMENT: Appendix F does not contain all of the statistical output that was tabulated in Tables 5.1, 5.2, and 5.4. It appears to be missing the R-output for the simple mixed linear models discussed on page 4-12. Additionally, the values reported for parameter estimates, t-values and p-values within these Tables do not consistently match those in the statistical output that is contained in Appendix F. It is unclear which are the true values.

Ramboll response:

An incorrect version of Appendix F was included. It has now been updated. Additionally, the previously missing statistical output for Table 5-2 is now included.

Updating the appendix by re-running the models in R resulted in a few very minor discrepancies with the values presented in table 5-1 and the results for mineralizable nitrogen and total carbon in table 5-2. We modified the tables accordingly so that all values presented in the appendix and in the tables are consistent and accurate.

- page 4-12: *Therefore, a simplified linear mixed effects model for each analyte with treatment as a predictor and test plot as a random effect was built.*

COMMENT: It is unclear from the way the models are presented in the text, whether the “simplified” linear mixed models are the same as those described on page 4-11 (see previous comment) or are different models. Further clarification distinguishing the two sets of models is suggested. It does not appear that the “simplified” models are reported in Appendix F and therefore the results presented in Table 5-2 cannot be verified. Was application of these models limited to the data in Table 5-2?

Ramboll response:

We have tried to clarify the distinction between these sets of models. The relevant sentences in section 4.5.1.2 now read:

*“Therefore, a linear mixed effects model for each of these other analytes was built with a simplified model structure compared. In these models, **treatment** and **test plot** as a random effect were included, but not **days since application** or the interaction term between **treatment** and **days since application** as in the models for the main outcomes of interest described above in section 4.5.1.1.”*

Additionally, the previously missing statistical output underlying table 5-2 is now included.

- page 5.1: *The statistical results for analysis of lead and arsenic are summarized in Table 5-1, and the full statistical printout from R for the linear mixed effects models is provided in Appendix F.*

COMMENT: Estimates for the effects of treatment presented in Table 5-1 do not match the estimates provided in Appendix F. For example, for arsenic IVBA (pH 1.5) the estimate for phosphate treatment is reported as 9.07 in Table 5-1, and 9.27 in Appendix A (page 2). For lead IVBA (pH 1.5) the estimate for phosphate treatment is reported as -0.0711 in Table 5-1 and 0.6096 in Appendix F (page 6). Additionally, the t-value and P-values in Table 5.1 do not consistently match those listed in Appendix F. For example, for arsenic IVBA (pH 1.5) the t-value is reported as -1.66 and P as 0.10 for “Phosphate:Days since application”, however Appendix F reports them as -0.674 and 0.502119, respectively.

Ramboll response:

An incorrect version of Appendix F was included (which reported values using the compost treatment as a basis for comparison, not the control treatment). The appendix has been updated and values now match the tables.

- page 5-2: *In contrast, the phosphate-amended subplot soils showed increased mobility and bioaccessibility of arsenic, as demonstrated by the statistically significant increases in SPLP arsenic concentrations (Figure 5-3, Table 5-1) and IVBA arsenic (Figures 5-27 and 5- 28, Table 5 1) when compared to control subplot soils. Although these differences are statistically significant, total arsenic concentrations were similar across the subplots treated with the soil amendment and control subplots such that there are no additional concerns about risks to human or environmental health caused by application of the soil amendments.*

COMMENT: This reads as if there is no additional concern about risk because the total arsenic concentrations were similar, when it is the RBA-adjusted concentrations that determine risk. A more accurate statement is that there is no additional concern about risk because the total arsenic levels are sufficiently low, that even with the increase in RBA (predicted from the increase in IVBA), the arsenic risk would be below the concern level established in the HHRA.

This conclusion applies to the exposure units at this site. However, based on Figure 5-27, phosphate treatment increased the mean arsenic IVBA from approximately 22-23% in the control plot to 32-33% (ME1, ME2), an increase of ~145%. A more general conclusion from this result is that phosphate treatments should not be undertaken without considering the potential for the treatment to increase soil arsenic RBA and health risk from the soil ingestion.

Ramboll response:

We’ve now edited the text to remove the statement “...total arsenic concentrations were similar across the subplots...” and instead state:

These differences are statistically significant, confirming that phosphate treatments should not be undertaken at sites with both arsenic and lead without considering the potential for the treatment

to increase soil arsenic relative bioavailability and health risk from the soil ingestion. At this site, there is no additional concern about risk to human health because total arsenic levels are sufficiently low that even with elevated IVBA (and increased relative bioavailability), the arsenic risk is below the concern level established in the human health risk assessment.

- page 87: *Figure 5–27. IVBA Arsenic (extracted at pH 1.5) in Soil Samples*

COMMENT: Please add a footnote or other clarification to better understand what the filled circles versus the shaded circles signify in the legends for Figures 5-27A and 5-29A.

Ramboll response:

These points represent extreme values. We've added a note to the legend that states: Extreme values (1.5 times the interquartile range below the first quartile or above the third quartile of the data)

These points were on most of the A figures, so for consistency, they were added throughout except for figures 5-2 and 5-3 where this note is not applicable.

Note that the y-axis labels for figures 5-27 through 5-30 had the incorrect units, they have now been corrected to %IVBA.