UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
U.S. ARMY	)	Docket No. 40-8838-MLA
	)	
(Jefferson Proving Ground Site)	)	

PREFILED TESTIMONY OF DALE CONDRA

Under penalty of perjury, I, Dale Condra, declare as follows: I attest that the factual statements herein are true and correct to the best of my knowledge, information, and belief; and the opinions expressed herein are based on my best professional judgment.

Q.1. Please state your name.

A.1. Dale Condra.

Q.2. Have you provided testimony previously in this case?

A.2. Yes, this testimony is in addition to my previous testimony in this case. In my previous testimony, I provided my professional qualifications, discussed general issues, and responded to the initial testimonies of STV witnesses. This testimony will now focus specifically on responding to issues raised in the rebuttal testimonies of the STV witnesses.

Q.3. Have you reviewed the rebuttal testimonies of the STV witnesses?

A.3. Yes, I reviewed the rebuttal testimonies of Dr. Henshel, Mr. Norris, and Mr. Pastorick.

Q.4. What is your response to Dr. Henshel's statement in A.37 that the deer are contaminated with DU and her assertion that you acknowledged that there are problems with the data?

A.4. First, my testimony did not mention a comparison of DU concentrations in the deer samples.

Second, my testimony did not mention that I considered the deer to be contaminated with DU. My testimony did mention the ratios of U-238 to U-234. I was not saying that DU was detected in the samples. In fact, my testimony was, "I see no evidence that would lead anyone to conclude that DU has been detected in the deer tissue samples."

Also, I said that "While the data may not be statistically equal..." I did not say the data was not statistically equal. At that point, I was using my professional experience to evaluate the data and I had not performed a statistical evaluation of the data. I have since evaluated the data using the equation recommended in Chapter 18 on page 14 of MARLAP. Using the equation below which incorporates the uncertainties of each measurement, the Z_{Rep} values for the individual uranium isotopes for each matrix are within the warning limit of ± 2 as stated in MARLAP.

$$Z_{Rep} = \frac{X_1 - X_2}{\sqrt{U_c^2(X_1) + U_c^2(X_2)}}$$

Z_{Rep} = the warning (±2) and the control (±3) acceptance criteria of the replicate analyses
X_1 = concentration of the first sample
X_2 = concentration of the second sample
$U_c^2(X_1)$ = square of the combined standard uncertainties of X_1
$U_c^2(X_2)$ = square of the combined standard uncertainties of X_2

One simply cannot evaluate radioanalytical results without taking into account the uncertainties associated with each measurement. This is reason the experts who wrote MARLAP adopted and recommend the use of this equation. Even with this equation there are caveats that apply including but not limited to the following:

- Certain samples will exhibit higher variability because of their matrix, or the proximity of their analyte concentration to ambient background, as discussed previously. Consideration should be given to cases where a matrix requires the development and implementation of a specific acceptance criterion.

- Laboratory subsampling - subsampling techniques produced two dissimilar aliquants from one sample and the original and duplicate are not the same. An analyst should be careful to ensure that the sample is thoroughly homogenized before subsampling.
- Matrix - Sample constituents interfere with preparation chemistry, e.g., coprecipitation of interfering non-target radionuclides from sample or excessive dissolved solids.
- Counting statistics - Sample activity is so low that small statistical variations in background cause disproportionate responses.

These caveats would also apply to the duplicate evaluation equation in the FSP.

Q.5. How do you respond to Dr. Henshel's statement in A.36 and A.37 that there is no true background sample for this sample set?

A.5. I am not knowledgeable about the movement of deer. But, using the assumption that all of the deer taken for this study were in all of the areas at one time or another prior to collection, I would still conclude that the samples do not indicate the presence of DU. The concentration and uncertainties of uranium in the different types of samples are very low or even below the detection limits of the procedures used in this study with no indication of DU being present. Yet, the STV witnesses continue to refer to DU contaminated deer. The reported uncertainties bring doubt to my mind as to whether or not one could say positively that uranium is even present in some of these samples. In my opinion, the data from the analyses of the deer samples meets the definition of "background radiation" Dr. Henshel quotes from NUREG-1757. Whether these deer are background deer or not, there is no indication of DU in the samples.

Q.6. In order to minimize confusion, was there DU in 2006 deer samples?

A.6. No. I evaluated the data and there are no results from any of the deer samples that indicate the presence of DU.

Q.7. Was there DU in 2005 deer samples?

A.7. No. I evaluated the data and there are no results from any of the deer samples that indicate the presence of DU.

Q.8. Was there DU in deer samples prior to 1997?

A.8. No. I evaluated the data and there are no results from any of the deer samples that indicate the presence of DU.

Q.9. What is your response to Dr. Henshel's testimony in A.14 where she discussed duplicate sample analysis?

A.9. The evaluation of the duplicates without considering the associated uncertainties, especially on samples with concentrations at or below the detection limit of the procedure, goes against the recommendation of MARLAP in Chapter 18. Even if one used the RPD equation to evaluate the results from the duplicate analyses, the same caveats that apply to the MARLAP equation I used in my answer to Q.4 apply to the RPD equation. I state again, and I believe that MARLAP supports my statement, that one cannot evaluate radioanalytical data without considering the uncertainties that are part of that data.

Q.10. In A.20, Dr. Henshel refers to a DU contaminated deer from the 1996 SEG report. What is your response to this?

A.10. In the 1996 deer sample data I reviewed in the report, Deer Tissue Sampling Results; Depleted Uranium Impact Area Site Characterization, Jefferson Proving Ground Madison, Indiana, August 2006, Final, Table E-2, there were no uncertainties reported for the individual results. This fact prevents me from generating a U238/U234 ratio that would include the uncertainty. Standard radioanalytical methodology is to always include the uncertainties of the measurements. However, for this response, the U238/U234 ratios I calculated are as follows:

DU Impact Area Liver U238/U234 = 0.032/0.051= 0.63 (The ratio would have to be statistically greater than 1 to indicate DU.)

DU Impact Area Kidney U238/U234 = 0.039/0.091= 0.43 (The ratio would have to be statistically greater than 1 to indicate DU.)

DU Impact Area Bone U238/U234 = 0.142/0.221= 0.64 (The ratio would have to be statistically greater than 1 to indicate DU.)

While having the uncertainties associated with these measurements would clarify the U238/U234 ratios, I believe having the uncertainties would only solidify the conclusion that DU has not been detected in the deer samples.

Rebuttal to STV's Prefiled Testimony of Mr. Norris

Q.11. In A.023, Mr. Norris stated,

> **Anagnostopoulos and Staff witness Condra have testified that while increasing mass (but not necessarily sample size) and count time reduces analytical uncertainties, there is very limited gain that can be achieved using standard procedures at commercial labs. It seems reasonable, then, that for the DU site characterization program, that alternative methods, laboratory, and/or custom, nonstandard procedures be used to allow DU to be detected and quantified.**

What is your response?

A.11. First, Mr. Norris has misstated what I testified to about the effect of mass on analytical uncertainties. I did not say that the mass reduces analytical uncertainties. Increasing mass would not likely reduce analytical uncertainties.

Secondly, Mr. Norris seems to be implying that DU cannot be detected or quantified by the protocols and procedure set forth in the site characterization program. DU can be detected and quantified by methods presently being used in commercial and government laboratories, whether that method is HR-ICP-MS or alpha spectroscopy. I have reviewed DU data in the following two reports sent to the NRC with respect to water and soil samples: Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground Summary of Results for April 10-13, 2006 Sampling Event Final and Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground Summary of Results for May 23-26, 2005 Sampling Event Final. After reviewing the soil and surface water samples, I cannot conclude that DU is present. I have also reviewed the report sent to the NRC with respect to the deer tissue data, Deer Tissue Sampling

Results; Depleted Uranium Impact Area Site Characterization Jefferson Proving Ground, Madison, Indiana Final. When reviewing the data from the deer samples analysis, I did not reach the conclusion the DU was detected in any of the deer samples that were analyzed. I am confident that the alpha spectroscopy method used on soil, water, and deer tissue sample would be able to detect DU, if it is present in a sample.

Q.12. In A.023 on page 43, Mr. Norris references "Depleted Uranium in Bosnia and Herzegovina – Post-Conflict Environmental Assessment" (UNEP, 2003) as a document that demonstrates that DU can be distinguished from natural uranium in the same sample. What is your assessment of this report concerning the determination of DU and natural uranium in a particular matrix?

A.12. I have read the referenced report and have the following comments. The two different analytical methods used by the laboratories performing the analyses for that project produced what appears to be high quality isotopic uranium data. I did not review the quality control data associated with the reported data. I reviewed the ratios of U-235 to U-238 from HR-ICP-MS and U-234 to U-238 from alpha spectroscopy. I believe those ratios are based on very good scientific data. I disagree with then using these ratios in a calculation method to determine the percent of DU in each sample. The mathematical method includes assumptions about the ratios of U-235/U-238 in natural uranium and DU as stated on page 155 of the report. "The ratio U-235/U-238 for natural and depleted U is assumed to be RU-nat = 0.00725 and RDU = 0.00200, respectively." The method assumes that there are no uncertainties associated with these ratios. This method also assumes, in my opinion, the DU has not interacted with the matrices with which it came in contact. In my professional opinion, generating data based on assumptions that cannot be quantified by the analysis of the sample is not good science. My original testimony was based on the analytical fact that the original results from any radiochemistry analysis represent the concentration and uncertainty of the analyte and individual

isotopes in question, in this case uranium, for a given sample. The data are then used to determine if the uranium isotopes have isotopic ratios that represent natural, depleted, or enriched uranium. I am not aware of an analytical method that quantifies natural uranium and DU in the same sample, without the use of mathematical calculations and assumptions. When the researchers finished their analysis and generated the data, they could draw informed conclusions from the data, but assumptions beyond that point regarding ratios of isotopes do not make a fact.

Q.13. On pages 41 and 42 in A.023, Mr. Norris presents U238/U234 ratios as support for the proposition that "...Big Creek contains DU in rising proportion to total Uranium...", and issues a challenge to say that DU is not present in the Spring 2006 water sample of Big Creek leaving the facility. What is your response to this testimony?

A.13. I have reviewed the radioanalytical data for the 16 surface water samples and 2 duplicate surface water samples that I could find that were collected from Big Creek. I also calculated the U238/U234 ratios and propagated the uncertainties of those ratios. Since Mr. Norris did not give the sample IDs from which he calculated the ratios, I cannot be absolutely certain that I am calculating my ratios from the same data. For the "spring 2005" sample, Mr. Norris states the ratio is 1.1. The ratio and uncertainty that I calculated from two surface waters from the spring of 2005 were 1.08 ± 0.86 for SW-DU-002 SAIC03 and 1.09 ± 0.77 for SW-DU-008 SAIC03. Neither sample is statistically above 1 and therefore not definitely identified as DU. I did not have the fall of 2005 data to review for this testimony. Without the data and the associated uncertainties, I cannot evaluate at this time, the 1.2 and 2.9 ratios of U238/U234 presented by Mr. Norris. For the "spring 2006", Mr. Norris states the ratio is 3.7. The ratio and uncertainty that I calculated was 3.7 ± 3.7 for SW-DU-002 SAIC05, not statistically above 1 and therefore not definitely identified as DU. If Mr. Norris and I are talking about the same data point, then I would not conclude that DU was positively identified in that sample.

Q.14. At the end of A.019, Mr. Norris reviews U238/U234 ratios to suggest that DU is in the creek water. What is your analysis of this testimony?

A.14. Mr. Norris' review of the U238/U234 consistently fails to mention the uncertainties that are associated with the data. Standard radiological methodology holds that radioanalytical data cannot be evaluated without taking into consideration the uncertainties. When I take into consideration the uncertainties of the ratios of the 16 surface water samples and 2 duplicate surface water samples taken from Big Creek (Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for April 10-13, 2006 Sampling Event, Final and Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for May 23-26, 2005 Sampling Event, FINAL). I cannot conclude from the results that DU is definitively present in Big Creek.

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PREFILED SUR-REBUTTAL TESTIMONY OF DALE CONDRA

I, Dale Condra, do declare under penalty of perjury that my statements in the foregoing testimony are true and correct to the best of my knowledge and belief.

Dale Condra

Executed at Oak Ridge, TN
This 25th day of September, 2007.