RAS 14514

Army Barta Exh. # 2

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of US ARMY (JEFFERSON PROVING GROUND)
Docket No. 40-8838-ML Official Exhibit No. ARMY EXH. # 2
OFFERED by: Applicant/Licensee Intervenor _____
NRC Staff Other _____
IDENTIFIED on _____ Witness/Panel _____
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk _____

Pre-filed Testimony of Army Witness
Michael L. Barta

TEMPLATE = SECY-028

SECY-02

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judges:

Alan S. Rosenthal, Chair
Dr. Paul B. Abramson
Dr. Richard F. Cole

In the Matter of	)	Docket No. 40-8838-MLA
	)	
U.S. ARMY	)	ASLBP No. 00-776-04-MLA
	)	
(Jefferson Proving Ground Site)	)	August 14, 2007
	)	

TESTIMONY OF MICHAEL L. BARTA
ON STV CONTENTION B-1
BASIS ITEMS "n" AND "o"
SUBJECTS: Environmental and Ecological Risk; Ecological Sampling

I. WITNESS BACKGROUND

Michael L. Barta ("MLB")

Q1. Please state your full name.

A1. (MLB) My name is Michael L. Barta.

Q2. By whom are you employed and what is your position?

A2. (MLB) I work as a Senior Ecological Risk Assessor for Science Applications International Corporation (SAIC) in their Memphis office. Currently, I serve as the lead ecological risk assessor at Army sites in Illinois and Arkansas and Air Force sites in New Jersey and Texas. I also serve as the project manager/deputy program manager for range condition assessments at Navy

testing and training ranges in Virginia and California. These assessments evaluate the potential for munitions constituents to migrate off-range. In addition to these responsibilities, I provide technical support and serve as the deputy project manager for SAIC on the planned decommissioning of Jefferson Proving Ground's (JPG's) U.S. Nuclear Regulatory Commission (NRC) materials license.

Q3. Please summarize your professional and educational qualifications.

A3. (MLB) My professional and educational experience is summarized in the résumé attached to this testimony as Exhibit MLB #1. Briefly summarized, I have been practicing ecological risk assessment (ERA) for more than 15 years. During this time, I was the lead scientist on 26 ERAs and provided technical support on an additional 22 ERAs. I have experience designing and executing biological field studies for ERAs at Army installations such as Picatinny Arsenal and Savanna Army Depot. I have been providing technical support to the Army's JPG facility since early 2004. I designed the recent deer sampling study at JPG and assisted with the deer collection.

My academic credentials include a B.A., B.S., and M.S. in Zoology, with an emphasis on environmental toxicology while in graduate school. I have published and presented 9 technical papers at national technical meetings. I am a member of the Society of Environmental Toxicology and Chemistry and Sigma Xi.

Q4. What is the purpose of your testimony?

A4. (MBL) The purpose of my testimony is to address, on behalf of the Army, Basis Items "n" and "o" submitted by Save The Valley ("STV") as part of its Contention B-1 in these proceedings.

In its Contention B-1, STV asserts that:

"As filed, the FSP is not properly designed to obtain all of the verifiable data required for reliable dose modeling and accurate assessment of the effects on exposure pathways of meteorological, geological, hydrological, animal, and human features specific to the JPG site and its surrounding area."

STV provided 18 supporting bases for their contention, lettered "a" through "r."

The purpose of my testimony is to provide evidence and expert opinion pertaining to the assertions made in Basis Items "n" and "o."

STV's Basis Item "n" states:

"In order to really do a site-specific environmental and human health risk assessment, understanding the fate and transport (F&T) of DU within the JPG ecosystem is critical. In order to develop such a model, standard eco-risk-associated field sampling practices specify samples from different parts of the ecosystem within the same approximate period of time and definitely within the same field season in order to identify the distribution of the contaminant (DU) at that time. Further it is best to take multiple samples from these different locations over time. Thus, to truly model F&T within the JPG ecosystem (which is NOT the Yuma or Aberdeen Proving Ground ecosystem), a particular sample taken at a particular time should include all media and relevant biota and each of these media and biota should be sampled on multiple occasions. Ideally, samples should also be taken under different types of field conditions, as appropriate for the changes that occur at the site of concern. For example, at a site that floods, as JPG does, samples should be taken from all media and biota at high flow (flood season) and low flow. Similarly, in a seasonal environment like JPG, samples should be taken from all media and biota in different seasons. When reproduction is seasonal for the biota of potential concern, seasonal sampling is of special concern. See, e.g., , *G.W. Suter II,* et al., *Ecological Risk Assessment for Contaminated Sites, CRC Press [Lewis Publishers], Boca Raton, FL (2000), esp. at 77. Thus, the much more limited sampling described in section 6.3 of the FSP is deficient for purposes of adequate site characterization."*

II. OVERVIEW

Issues Raised by Basis Item "n" to STV Contention B-1

Q5. What is your understanding of the technical issues raised by Basis Item "n" of STV's Contention B-1?

A5. (MLB) In its license amendment application, the Army is seeking an alternate schedule to perform site characterization work for the submission of a decommissioning plan for JPG. STV's Basis Item "n" raises the issue of whether an ecological risk assessment (ERA) or a comprehensive research study is necessary for decommissioning at JPG. STV asserts that the license amendment should not be approved unless the Army is required to perform such an ERA or comprehensive research study.

Q6. Do you agree with the assertion in STV Contention B-1, Basis Item "n", that the Army's application for an alternate decommissioning schedule should not be approved unless an ERA or a comprehensive research study is a condition to the approval of the license amendment?

A6. (MLB) No.

Q7. What is the basis for your disagreement?

A7. (MLB) STV cites a leading authority (Suter 2000) in the ecological risk assessment field. Although some of the principles discussed in Suter (2000) could be applied at JPG ***if*** the objective were to complete an ERA or a comprehensive research study, there is no regulatory requirement nor any need to conduct such an extensive sampling program to collect the data necessary for decommissioning at JPG. The JPG site characterization program is in support of the NRC's decommissioning process as required by 10 Code of Federal Regulations (CFR) Part 20 et seq. Suter's suggestions do not specifically apply to the type of site characterization necessary for a restricted use NRC decommissioning.

Furthermore, an ERA is neither planned for by the Army nor required by NRC. NUREG 1757 (NRC 2006) specifies that Group 6 sites (Restricted Use) need to evaluate residual radiation doses to humans based on the use restriction and if the restrictions fail. In order to meet this requirement, the Field Sampling Plan (FSP) (SAIC 2005a) specifies additional abiotic data that will be collected to update the RESidual RADioactivity (RESRAD) model. There are no requirements in NUREG 1757 (NRC 2006) to collect biological data as model

inputs or to evaluate risks to the biota themselves. The Environmental Assessment to be prepared by NRC will address ecological and human health risks from the perspective of the National Environmental Policy Act (NEPA).

III. Discussion

Environmental and Ecological Risk

Q8. Did you participate in the design of the biological or biota sampling to be conducted at JPG as part of the Army's site characterization?

A8. (MLB) Yes.

Q9. Please describe the analytical bases for the design of the biota sampling to be conducted at JPG.

A9. (MLB) The biota sampling program proposed in the FSP (SAIC 2005a) and Addendum 1 (SAIC 2005b) was designed to respond to requests from the NRC as well as align with the Army's approach to conduct the sampling in a step-wise or phased manner. As a result, deer were proposed for sampling first (see also the response to FSP Comment "o" below) because NRC had indicated a concern from the exposure of hunters to depleted uranium (DU) through the ingestion of deer tissue collected at JPG. The biota sampling plan was reviewed by NRC as required by the Army's license and regulations guiding license termination and decommissioning as specified in 10 CFR Part 20 et seq.

Based on the deer sampling results, which indicated that DU was not present in the deer tissues, no additional deer sampling is warranted. Other biota were proposed for collection only if DU was detected in the deer tissues. NRC, after review of the FSP (SAIC 2005a), FSP Addendum 1 (SAIC 2005b), and Deer Tissue Sampling Report (SAIC 2006), did not request the collection of more deer or other biota.

Because the focus of the decommissioning is the protection of human health, there is no need to collect any biota data except those associated with potential human consumption. The property north of the firing line, including the DU Impact Area, became Big Oaks National Wildlife Refuge (NWR) in 2000.

There are no agricultural scenarios at the refuge from which human receptors could be exposed. Hunting is permitted only for deer, turkey and, most recently, squirrel in the refuge. Deer were selected for sampling in response to an NRC request (NRC 2004). Approximately 400 to 800 deer are harvested per year, whereas the number of turkey harvested each year is approximately 50. The squirrel harvest is limited by days allowable to hunt squirrel rather than a specific harvest limit. Although turkey and squirrel have not been analyzed for the presence of DU in tissues, there is no compelling reason to believe that DU uptake would be any greater than in deer. More importantly, I would expect that the mass of turkey meat or squirrel meat consumed per individual hunter would be less than for deer. Thus, the potential for exposure to DU, if present in tissues, would be greatest through deer consumption.

Q10. Why is no further biota sampling planned at JPG?

A10. (MLB) The Army has already collected recent samples from one of the only three receptors (deer, turkey and squirrel) that could be a potential ingestion harm to human receptors in the refuge. In addition, the receptor sampled, deer, is the most likely concern to human health via the ingestion pathway. Given the absence of DU in any of the deer tissue sampling results (SAIC 2006), there is little reason to believe that consumption of turkey or squirrel would be a concern to public health from exposure to DU. No other biota need to be sampled.

I should add that access to the DU Impact Area is restricted, so hunting does not occur there. Rather, hunters would have to capture deer and/or turkey/squirrel in hunting areas outside the DU Impact Area that were exposed to DU while in or potentially adjacent to the Impact Area. This helps to limit the exposure of hunters to deer and/or turkey/squirrel ever exposed to DU.

Q11. Are you familiar with the testimony offered by Diane Henshel in this hearing?

A11. (MLB) Yes, I have reviewed her written testimony dated July 20, 2007.

Q12. Do you agree or disagree with her opinions and conclusions regarding assessment of environmental and ecological risk?

A12. (MLB) I disagree.

Q13. What is the basis of your disagreement?

A13. (MLB) In essence, Ms. Henshel's testimony concerning biota contends that the current sampling program for biota under the FSP is deficient in meeting the eventual requirement for the Army to submit an effective decommissioning plan in 2011. At first, she relies on general sampling procedures to assert her case. While some of her recommendations would have merit if the Army were conducting an ERA or biological research study, there are no regulatory requirements in 10 Code of Federal Regulations (CFR) Part 20 et seq. to conduct the extensive biota sampling she deems is required. Her requests seem to come from a personal or professional desire to absolutely identify every potential pathway for DU to move through biota, no matter how minor, as well as a failure to understand the decommissioning process. By contrast, the Army carefully designed and carried out the work according to NRC stewardship objectives for decommissioning. The result is that there is sufficient quantity and quality of data to proceed with the necessary decisions in the decommissioning process.

Ms. Henshel, in an attempt to discredit the biota sampling plan in general and the deer sampling plan in particular, then presents an uncomplimentary critique of the quality and usefulness of the Deer Tissue Sampling Study. In brief, she suggests that the study was ill-conceived and poorly executed. Ms. Henshel's suppositions could logically follow from a poor understanding of the NRC and Army mandates and legally based stewardships for decommissioning. She has interpreted those mandates incorrectly and, therefore, the conclusions that she reaches are incorrect.

She relies on errors in facts as well as in errors in data use and interpretation. Furthermore, she implies that the Army has either withheld information or willfully avoided collecting information that could be damaging to the Army. This is just not true as my continuing testimony will show.

Interestingly, while essentially claiming the sampling in the Deer Tissue Sampling Results Report (SAIC 2006) is useless due to the numerous alleged sampling flaws to the point that deer should be re-collected, she nonetheless erroneously states that the data "prove" that DU was present in the deer, doubly reinforcing the need for the Army to re-collect deer tissue and other biota in accordance with the FSP (SAIC 2005a) and FSP Addendum (SAIC 2005b). The data show no DU in deer as I will discuss in later testimony.

Q14. Do you agree or disagree with Ms. Henshel's statements, contained in her Answer 12, concerning the basic purpose of the biological characterization activities in the FSP?

A14. (MLB) I do not agree that the biological characterization activities must provide site-specific **input** data for any risk characterization activities at JPG. First, the deer tissue samples were collected in direct response to concerns raised by NRC in a Request for Additional Information (RAI). While my Answer A31 goes into greater detail concerning this RAI, the NRC was concerned that some modest increases in uranium from deer tissues compared to background levels could be a concern to hunters. These data were never intended for use as input data into the RESRAD model. Furthermore, the design of the Army's biota sampling plan is above and beyond that required in NUREG 1757 (NRC 2006), which does not require the collection of biota. The sampling design was reviewed by NRC as required by the Army's license and regulations guiding license termination and decommissioning as specified in 10 CFR Part 20 et seq. NRC, after review of the FSP (SAIC 2005a), FSP Addendum 1 (SAIC 2005b), and Deer Tissue Sampling Results Report (SAIC 2006), did not request the collection of more deer or other biota. As a result, STV criticizes the Army in many instances

for not providing data which it is not required to provide as part of the decommissioning process.

The abiotic data collected according to the FSP (SAIC 2005a) and subsequent addendum will be technically sufficient to revise the RESRAD model to determine if DU is a potential concern to public health. As a result, there is no benefit to be gained from the cost, effort, and potential schedule delays associated with collecting additional biota data.

Q15. In Ms. Henshel's Answer 14 she discusses various ways in which biological receptors transport DU. Do you have any additional comments on those pathways?

A15. (MLB) Yes, there are a number of **potential** pathways for DU to migrate from the DU Impact Area. However, how many of them are truly significant? The public is not permitted in the DU Impact Area. Thus, unless trespassing, DU has to migrate from the DU Impact Area in order for an exposure to occur. Although access is permitted in the Big Oaks NWR outside the DU Impact Area, there are restrictions and no one lives in the refuge. Thus, exposures are further limited.

How could off site exposure occur, regardless of the smallness of the exposure? There would seem to be four possibilities: via air inhalation, surface water and/or groundwater ingestion, or ingestion of wildlife. Air is not likely a significant exposure pathway as discussed in Harry Anagnostopoulos's testimony. To my knowledge, DU has not been detected in any potable wells at and nearby JPG; surface water is not used for general public consumption in this area. Lastly, deer, turkey, and squirrels are the only receptors allowed to be hunted at the refuge. We did not find evidence of DU in the deer and have no reason to suspect that turkey and squirrels would be a concern to the public either. Thus, there do not appear to be any major exposure pathways. Furthermore, the Army is collecting additional groundwater and surface water data as part of the FSP in and near the DU Impact Area (SAIC 2005a). If these

data indicate the presence of DU, then samples farther from the DU Impact might be collected.

Q16. In her Answer 16, Ms. Henshel discusses the importance of "bioaccumulation" in relation to the purposes of the FSP. Do you have any additional comments to add in this regard?

A16. (MLB) Yes. The bioaccumulation potential of other metals, referenced in her answer, is of no relevance to JPG. We are concerned with DU. Ms. Henshel did not provide a reference list so we could not review all of her supporting evidence but acknowledge that DU uptake can occur in some wildlife receptors.

Q17. In your opinion, based on your experience and the information available from JPG and the surrounding area, is bioaccumulation a significant concern in this decommissioning process?

A17. (MLB) No.

Q18. What is the basis for your opinion?

A18. (MLB) For animals and plants in the DU Impact Area, there could be chronic or long-term exposure to DU. However, the focus of this decommissioning process is the protection of human health. Ms. Henshel suggests, but provides no data, that there are chronic exposures to people living south of the firing line and around JPG through exposures via air or water. Harry Anagnostopoulos will testify to the insignificance of the air pathway. The streams that flow from the DU Impact Area are not used as a potable water source near JPG. There are no chemical data to indicate that residential wells are contaminated with DU. In fact, there is no indication that there is routine or widespread DU contamination outside of the DU impact area.

Q19. Do you agree with Ms. Henshel's opinions and conclusions in her Answer 18 concerning the sources and types of biological data needed for meaningful modeling of DU fate and transport from the impact area to potential receptors?

A19. (MLB) No, I do not

Q20. What is the basis of your disagreement?

A20. (MLB) The types of biological data that Ms. Henshel suggests need to be collected would add to the body of literature on DU. However, there are no NRC requirements to conduct such an extensive sampling program. In a similar manner to Mr. Norris' testimony on the insufficiency of the hydrogeological program proposed by the Army at JPG, Ms. Henshel requests that numerous pathways, no matter their significance, be sampled. As I just discussed in A18, there is no indication that there is routine or widespread DU contamination outside of the DU impact area. In effect, the Army is being asked to trace all DU potentially leaving the DU Impact Area and then JPG. This is not required for the Army to adequately update the RESRAD model. While Ms. Henshel and STV believe that meaningful fate and transport modeling require the collection of biological data, the model inputs to RESRAD, one of the NRC-approved models that can be used in the decommissioning process, are abiotic (non biological). Furthermore, the decommissioning process criterion that the Army must meet is 25 mrem/yr to humans. The sampling plan broadly defined in the FSP (SAIC 2005a) meets this objective.

The time frame to collect all of the biological data Ms. Henshel desires but are not required for decommissioning would be at least 3 to 4 years from October 2007, at a minimum. Most of Year 1 would be occupied with planning and approval acceptance, especially for such a large study. Year 2 might focus on identifying the species of biota that inhabit the DU Impact Area, the migratory patterns of these biota in the DU Impact Area, and the food web relationships among these biota both in and outside the DU Impact Area. Year 3 would focus on collecting uptake, bioaccumulation, and effects data. Year 4 would focus on data interpretation and report writing. This also assumes no complicating factors in collecting data, which is certainly not the case at the DU Impact Area because of Unexploded Ordnance (UXO). There would be significant health and safety hurdles to collect data that would not be directly used in the RESRAD model. Furthermore, completion of such an extensive study would interfere with the Army's legal requirement to submit an effective decommissioning plan in 2011.

Q21. Do you agree or disagree with the opinions stated by Ms. Henshel in her Answers 20 and 21 concerning the sufficiency and adequacy of the biological characterization as contained in the FSP?

A21. (MLB) I disagree. The deer data were collected in response to NRC concerns about human health exposure to deer, as stated in Section 6.3 of the FSP (SAIC 2005a). Other biota would have been collected if DU was detected above background levels. This did not occur, so no further biota were collected.

Other biota have been previously collected at JPG. Ms. Henshel claims that these "activities are essentially being discounted by the Army" but fails to provide technical evidence. Although DU has been detected in vegetation, the detections have been minimal (SEG 1995 (pages 4-7, 4-11 and 4-12) and 1996 (pages 4-11 and 4-12). All historical animal samples obtained from the DU affected area showed no radiological evidence of DU contamination by virtue of both the magnitude of uranium concentration and the U-238/U-234 activity ratio (Ebinger and Hansen 1996 (pages H-1 and H-2) and SEG 1996 (page 4-13)). In effect, the historical biota data support NOT collecting additional biota data because DU has been absent from historical animal (i.e., raccoon, clams, fish, turtle and deer) samples. Nonetheless, as a good steward, the Army agreed to collect other biota if DU was detected in the deer samples.

The overall purpose of the FSP is to provide better data with which to update the RESRAD model. As I have previously stated, there are no biological data inputs to this model. There also are no NRC requirements to collect more biological data. Rather, the Army collected deer in response to an NRC request. If DU had been detected at levels of concern, other biota would have been sampled.

I concur that aquatic filter feeders and terrestrial vegetation might be better indicators of DU uptake than deer. For that matter, I agree that other biota might be beneficial indicators of DU uptake. I proposed collection of other biota (plants, earthworms, fish, small birds, and small mammals) in the FSP (SAIC 2005a) **if** the deer data, in conjunction with the abiotic data (e.g., surface soil,

surface water), suggested that migration and subsequent uptake could be occurring. However, as the deer data did not indicate the presence of DU in the tissues, there is no need to collect additional biota samples.

The decommissioning activities focus on potential radiological risks to humans. While clams would be a potential food source to raccoons and other wildlife, their use as a human food source at and near JPG is unlikely. Entrance into the DU Impact Area is restricted and fishing/clamming activities are prohibited. As a result, clam consumption is an incomplete pathway for human receptors and there is no benefit to collecting clam samples.

Ms. Henshel states that "Nonetheless, when samples from early and late in DU testing are not combined, it is evident that DU in the deer are increasing over time." However, she fails to provide quantitative support for her assertion. What data are she proposing to separate? Data from the same year? Data from different years? No DU has been detected in deer tissues collected from 1984 to 2006. Without any DU detected, one cannot conclude that DU levels are increasing. Please see A33 below for further clarification on "DU levels" in deer.

IV. SUMMARY AND CONCLUSION

As to Basis Item "n"

Q22. Please summarize your testimony with regard to Basis Item "n".

A22. (MLB) My testimony can be summarized as follows:

The collection of samples according to ecological risk guidance is neither required under the decommissioning process nor warranted at JPG. Deer, which represent the greatest potential for exposure to human receptors through the consumption of meat and other organs, were collected based upon a request by NRC according to their stewardship responsibilities (2004). No DU was detected in any of the deer tissues (SAIC 2006). I believe that we should avoid further biota sampling as specified in the work plan.

The abiotic data collected according to the FSP (SAIC 2005a) and subsequent addenda will be technically sufficient to revise the RESRAD model to

determine if DU is a concern to public health. As a result, there is no benefit to be gained from the cost, effort, and potential schedule delays associated with collecting additional biota data.

V. OVERVIEW

Issues Raised By Basis Item "o" to STV Contention B-1

Q23. What is your understanding of the technical issues raised by Basis Item "o" of STV's Contention B-1?

A23. (MLB) In Basis Item "o" to its contention B-1, STV stated (in part) that:

"Although deer are not the most representative biota to sample, they are the only biota proposed for sampling by section 6.3 of the FSP. Nonetheless, when data from samples early and late in DU testing are not combined, it is evident that DU levels in even the deer are increasing. This result in deer clearly mandates sampling other, more representative biota as well. Based on what little data is available, the bioaccumulation factors (BAFs) for vegetation and the aquatic filter feeders such as crayfish (both of which are eaten by higher animals and humans) are relatively high, on the order of 10^2 to 10^3 times as high as the BAFs for persistent, bioaccumulative, and toxic chemicals (PBTs) listed as being of concern by the U.S. EPA and the Persistent Organic Pollutants (POPs) Treaty. Clearly, vegetation and aquatic filter feeders are better indicators of DU migration into the eco-food chain than are deer and they should be sampled. For example, the mean of the two clam data points, when compared to the mean of the surface water data provided in Table 2-1 indicate that the clams bioaccumulation factor (BAF) is approximately 900. This is the highest bioaccumulation rate determinable among the biota listed in Tables 2-1 and 2-2 on page 2-9 of the FSP. Since clams are also eaten by both wildlife (raccoons and wading birds, for example) and humans, clams are thus an important second species to include in the biotic sampling throughout the monitoring period. Additionally, the FSP proposes (and the Staff accepts on page 6 of the April 2006 SER) to sample other biota ONLY IF there is detectable levels of DU in the deer tissue, and will only do this in another sampling year. This proposal is directly contrary to what is

considered to be "Best Practices" for sampling biota as part of an ecological assessment. See, e.g., *G.W. Suter II,* et al., *Ecological Risk Assessment for Contaminated Sites, CRC Press [Lewis Publishers], Boca Raton, FL (2000), esp. at 77."*

Once again, STV is asserting that the collection of additional biota samples in accordance with the ecological risk suggestions found in Suter (2000) is warranted for the Army's site characterization at JPG and that the license amendment should not be approved unless the Army is required to perform additional biota sampling.

Q24. Do you agree with the assertion in STV Contention B-1, Basis Item "o", that the Army's application for an alternate decommissioning schedule should not be approved unless the Army is required to perform additional biota sampling as a condition to the approval of the license amendment?

A24. (MLB) No.

Q25. What is the basis for your disagreement?

A25. (MLB) My response to Basis Item "n" concerning the need to collect biota samples other than deer is also applicable here. The collection of samples according to ecological risk assessment suggestions (Suter 2000) is neither required by NRC nor warranted as the Army does not intend to conduct an ERA.

VI. Discussion

Ecological Sampling

Q26. Besides the Suter ERA guidance, does STV raise other technical issues in supporting it assertion that further sampling should be required?

A26. (MLB) Yes. Besides citing the same ERA guidance as in Basis Item "n", STV raises more specific technical points that they believe justify the collection of other biota at JPG. A few of these points made by STV merit further response.

Q28. Do you agree with STV that these specific technical points justify the collection of other biota samples at JPG?

A28. (MLB) No.

Q29. What is the basis for your disagreement?

A29. (MLB) First, as a point of clarification, the FSP does not state that deer are the most representative biota to sample. Rather, deer were collected in direct response to an NRC request (NRC 2004). As far as potential food ingestion pathways to humans, deer ingestion represented the greatest potential for harm due to the number of deer harvested from JPG each year. Thus, deer represented the logical first choice in a tiered-sampling design.

As the primary author of the deer sampling FSP Addendum 1 (SAIC 2005b) and Deer Tissue Sampling Results Report (SAIC 2006), I do not agree with STV's assertion that the historical data support the contention that DU levels in deer are increasing. No data are presented by STV to support the claim that "Nonetheless, when data from samples early and late in DU testing are not combined, it is evident that DU levels in even the deer are increasing."

In addition, STV does not specify from what year(s) these samples were collected from which the data should be separated. Indeed, the data presented in the recent Deer Tissue Sampling Results Report (SAIC 2006), which represents the most comprehensive deer sampling at JPG to date, do not even indicate the presence of DU in the tissues. Without any DU detections in the most recent deer sampling, there can be no increasing trend of DU levels.

I concur that aquatic filter feeders and terrestrial vegetation might be better indicators of DU uptake than deer. For that matter, I agree that other biota might be beneficial indicators of DU uptake. I proposed collection of other biota (plants, earthworms, fish, small birds, and small mammals) in the FSP (SAIC 2005a) **if** the deer data, in conjunction with the abiotic data (e.g., surface soil, surface water), suggested that migration and subsequent uptake could be occurring. However, as the deer data did not indicate the presence of DU in the tissues, there is no need to collect additional biota samples.

As noted in my response to Basis Item n, the decommissioning activities focus on potential radiological risks to humans. While clams would be a potential food source to raccoons and other wildlife, their use as a human food source at and near JPG is unlikely. Entrance into the DU Impact Area is restricted and fishing/clamming activities are prohibited. As a result, clam consumption is an incomplete pathway for human receptors and there is no benefit to collecting clam samples.

Q30. Do you agree or disagree with Ms. Henshel's opinions and conclusions regarding adequacy of the deer sampling?

A30. (MLB) I disagree.

Q31. What is the basis of your disagreement?

A31. (MLB) First, I would like to clarify some information cited by Ms. Henshel in her Answer 22. The text on page 6-24 of the FSP (SAIC 2005a) states that "Although NRC has acknowledged that DU concentrations in the most recently collected deer samples were low from a human health perspective, there were modest DU increases in kidney and bone compared to background. As a result, NRC has expressed concern that concentrations may continue to increase to levels that could affect human health." NRC's actual comment in RAI #6 is below:

> *The Army should provide additional information on the apparent trend of increasing **uranium** (emphasis added) concentration in deer kidneys and bone, and how this relates to the potential for DU in deer meat that is consumed by humans. A detailed characterization survey was conducted for the Army in 1996 (SEG, Inc. 1996). Deer showed a modest increase from background **uranium** (emphasis added) concentrations in kidneys (from 0.05 to 0.151 pCi/g) and a larger increase from background in bone (from 0.0003 to 0.416 pCi/g). From the perspective of human health protection, the levels of **uranium** (emphasis added)in deer remain low. However, it is not clear if the concentration of uranium in deer kidneys and bone will continue to increase and potentially be of concern to human health from the consumption of contaminated deer meat.*

While I regret that our reports suggest that NRC reported a trend of increasing DU levels, this is simply not the case. Furthermore, the sampling data

referenced by the reviewer (SEG, Inc. 1996) actually represents samples of liver, kidney, and bone harvested from a single 4-to-5-year-old female deer killed in the DU Impact Area. Although the samples collected from this single deer specimen appear higher than other samples collected from deer samples collected prior to that time, total uranium activities are low and do not indicate an impact from DU (U.S. Army 2002).

In summary, the Army agreed to collect deer samples to alleviate concerns that an increasing trend in **uranium** tissue concentrations in ONE deer was not indicative of a potential future concern in DU concentrations to hunters. There are no historical trends of DU uptake in deer a JPG.

Q32. Do you agree or disagree with Ms. Henshel's opinion that the deer sampling study is inadequate?

A32. (MLB) I disagree with her assertion that the deer sampling is inadequate; and I disagree with her allegations about inadequacies in sampling methods and data collection, management and interpretation.

Q33. What is the basis of your disagreement with Ms. Henshel on those points?

A33. (MLB) There are two alleged inadequacies cited concerning the sampling methods: location of harvested deer and use of baiting. Only 12 of the 30 deer were collected during the fall sampling period, most likely because the deer were skittish after the hunting season, which had just ended. No deer were collected from the nearby hunting zones in the fall. Two deer were collected from background locations and the remainder were collected from the DU Impact Area. Although it is unknown whether the deer collected from the DU Impact Area spent most of their time in or near the DU Impact Area or had been displaced from nearby hunting zones, it is more likely the deer spent most of their time in the DU Impact Area. Many deer studies have suggested that deer will leave their home ranges when pursued, but will return quickly (within a day) to their home range (Sweeney et al. 1971, Downing and McGinnes 1976, Pilcher and Wampler 1982, VerCauteren and Hygnstrom 1998 as cited in D'Angelo et al. 2003, page 318). A study of deer hunting using dogs (which is the most

disruptive hunting of deer) indicated that disturbed deer move an average of 0.8 km from their home range while pursued, but that all of the deer returned to the home ranges within 13 hrs after the hunting ended (D'Angelo et al. 2003, page 322). These data suggest that the JPG deer hunt that occurred one week before the deer sampling event is not likely to have had any impact on the locations of the deer that were harvested for the sampling. In other words, it is not likely that some or all of the deer collected from the DU Impact Area could have spent most of their time in the nearby hunting zones which do not contain DU.

However, whether some, none, or all of the deer collected from the DU Impact Area spent the majority of their time in the nearby hunting zones is not germane to the purpose of the Deer Tissue Sampling Study.

Three geographic groups of deer were selected for sampling: background, nearby adjacent hunting areas, and the DU Impact Area. Hunting is not permitted in the DU Impact Area. Samples were collected there because those are the deer most likely to exhibit DU because their exposure would be greater than the nearby adjacent hunting areas. No DU was detected in ANY of the deer samples, so even if the deer collected from the DU Impact Area were from nearby hunting areas, this provides further evidence that hunters are not at risk from exposure to DU through ingestion of deer meat. The public is safe in consuming deer tissue from JPG as it relates to DU. The sampling design satisfied the objectives of the Deer Tissue Sampling Results Report (SAIC 2006).

Ms. Henshel states that the "Deer Sampling Study observes that the uranium content of wildlife reflects an animal's recent diet." If true, the use of DU-free bait could affect the tissue concentrations in the deer, perhaps to the extent that DU would not be detected. However, the text in the Deer Tissue Report (SAIC 2006) on page 1-6 actually states that "exposure of wildlife to DU can be highly variable depending on animal behavior and recent diet...." There is a difference between exposure and uranium content in wildlife. Although uptake into tissues cannot occur without exposure, the existence of exposure does not always mean that uptake has occurred.

Bait stations were used as a means to attract the deer to areas on or near roads for harvesting. However, not all deer were harvested at the bait stations. Furthermore, very little if any bait was used in the fall sampling event when all of the deer from the DU Impact Area were collected. Without stomach analyses the amount of ingested corn is unknown. Nonetheless, the Deer Tissue Sampling Results Report (SAIC 2006) as well as Ms. Henshel provide evidence that some bioaccumulation of uranium has been observed in plants and animals. Foraging on corn for a few days or few weeks would seem unlikely to appreciably affect tissue concentrations of DU.

Q34. Do you have additional bases for your disagreement?

A34. (MLB) Yes. I disagree with Ms. Henshel's allegations that there are a significant number of inadequacies in the collection, management, and interpretation of the data collected in the Deer Tissue Sampling Study.

First, I do not agree that the data presented in the Deer Tissue Sampling Results Report (SAIC 2006) are indicative of DU in deer collected from the Nearby Hunting Zones and the DU Impact Area. While Mr. Norris provides some qualitative discussion on DU ratios, he does not provide any specific discussion on other DU ratios that might be expected from nonmetallic DU media. No quantitative data are presented by Mr. Norris to support Ms. Henshel's contention that an average isotope activity ratio of 0.61 "is consistent with the deer consuming groundwater from the area around the impact area, base flow from streams around the impact area, and vegetation that relies upon those same waters." In fact, he suggests further study is needed (starting on the bottom of page 78 of the Norris testimony) in this area rather than provide hard evidence as suggested by Ms. Henshel. As he states on page 79 of his testimony "...fractionation during weathering of projectiles within soils and migration of weathered DU through the soils may alter isotope ratios for mobile and residual DU from the ratios of the metallic uranium in the projectiles." In A075, Mr. Norris states that in order to correct the alleged deficiencies (including fractionation) that "the tasks of studying any effects of fractionation should be

added." While not contradictory, Mr. Norris, in recommending further fractionation study, does not support Ms. Henshel's assertion that the deer data are indicative of DU uptake.

Second, ERM program data for groundwater show that the U-238/U-234 ratio is about 0.5. This is normal, expected, well documented, and reflects the presence of natural U, not DU. If DU were present, the ratio would be greater than 1 and around 6, not less than one. The effect of fractionation only brings into question a result with a ratio that is in excess of 1, not one that is less than one. Please see Harry Anagnostopolous's testimony for specific details on the ratios associated with DU.

Q34. Do you agree or disagree with Ms. Henshel's claim, in her Answer 28, that the Army has failed to meet the accuracy data quality objective in the laboratory analysis?

A34. (MLB) I disagree.

Ms. Henshel claims that the Army failed to meet the accuracy data quality objective (DOQ) in the laboratory analysis. Specifically, STV provides a long listing of discrepancies for the requirement for a relative percent difference (RPD) of less than 50 percent between all duplicate samples. After discussing Ms. Henshel's contention with the technical staff, I have determined that she has confused accuracy with precision. Field duplicate samples are collected and analyzed to measure precision. STV is correct in stating that the goal for precision in biota samples is an RPD of less than 50 percent. Unfortunately, Ms. Henshel may not have read FSP (SAIC 2005a), Appendix A.3.2.2., which states, "The relative percent difference (RPD) between two positive results will be calculated and used as a QC indication of the field procedures, matrix effects, and precision of the analyses conducted."

The Deer Tissue Sampling Results Report (SAIC 2006) did not calculate RPD values for the field duplicate samples because there were no positive duplicate results that could be compared and calculated. It is not clear why Ms. Henshel performed a calculation when no calculation was warranted or feasible.

The Quality Control Summary Report provided in the Deer Tissue Sampling Results Report (SAIC 2006) is correct as stated.

Furthermore, and as noted previously in the *Army Response To Amend Motion of Save The Valley, Inc., To Admit For Hearing Additional Contention B-2 and Supporting Bases A through G* on March 15, 2007, mislabeling of sample duplicates did not occur in the field. Rather, a duplicate kidney sample was collected from a different deer than the duplicate liver, bone, and muscle samples. There is no requirement to do so, nor does the collection of the duplicate kidney from another deer affect the validity of the results. It would have been perfectly acceptable to collect each tissue duplicate (muscle, liver, kidney, and bone) from a different deer

Q35. In your opinion, is Ms. Henshel correct in her assertion that the deer sampling failed to properly and consistently collect information on the deer samples as they were conducted?

A35. (MLB) No. The basis for my opinion is as follows.

There are valid reasons as to why the Army did not collect certain measurements in some areas during the deer tissue sampling. As noted previously in the *Army Response To Amend Motion of Save The Valley, Inc., To Admit For Hearing Additional Contention B-2 and Supporting Bases A through G* on March 15, 2007, ovary data were collected during the February 2006 sampling period at the request of USFWS, which wanted the ovary data for a research project being conducted by a student at Hanover College. There are no ovary data in the field logbooks for the DU Impact Area because USFWS did not request any ovary data in the fall of 2005. The Deer Tissue Sampling Results Report (SAIC 2006) did not discuss any of the ovary results because these data were not collected for the purposes of the Army's study nor were any of the ovaries analyzed for DU.

Ms. Henshel notes the lack of "spot radiation readings," which probably refers to dose-rate measurements taken on the deer samples in the field. These readings were documented in the field logbook for many samples, although these

readings were not required in the field sampling procedure for the deer tissue study. The readings were taken with a dose-rate meter and such readings generally reflect the background radiation level of the surrounding area and add very little information about the tissue being sampled.

Spot radiation readings were not recorded for deer from the DU Impact Area. The reason is unknown and cannot be determined, since the employee no longer works for SAIC. Since we sampled the deer tissues for the presence of DU, the absence of spot readings does not affect the overall conclusions of the deer tissue sampling study.

Q36. In your opinion, is Ms. Henshel correct in her assertion that the deer sampling was inadequate for failure to fully collect, preserve and analyze information about the deer sampled so that a more accurate assessment of potential ecological impacts could be made?

A36. (MLB) In my opinion, she is not correct.

The purpose of the study was to collect deer tissue samples and analyze them for DU. This was specifically discussed in the FSP (SAIC 2005a) and FSP Addendum (SAIC 2005b) and agreed to by NRC. There was no intent to collect data for use in evaluating the health of the deer population. Furthermore, Ms. Henshel continues to suggest, yet not directly state, that certain important pieces of information were not collected from the DU Impact Area, constituting willful omission by the Army. This is just not true.

As noted previously in the *Army Response To Amend Motion of Save The Valley, Inc., To Admit For Hearing Additional Contention B-2 and Supporting Bases A through G* on March 15, 2007, ovary data were collected during the February sampling period at the request of the USFWS, which wanted the ovary data for a research project being conducted by a student at Hanover College. There are no ovary data in the field logbooks for the DU Impact Area because USFWS did not request any ovary data in the fall. Why did USFWS only request ovaries in February and not in November/December? Ms. Joseph Robb, USFWS, indicated to me at the time that there were few data on ovaries during

February. I surmise this is because February is out of hunting season. The Deer Tissue Sampling Results Report (SAIC 2006) did not discuss any of the ovary results because these data were not collected for the purposes of the Army's study nor were any of the ovaries analyzed for DU.

Given all the alleged deficiencies in the deer tissue sampling report and the "meager" sample size, Ms. Henshel certainly uses the results to make specific conclusions about the health of the deer population at JPG. This is a very important point. She is using a study intended to measure DU in tissues, not the health of the population, and makes numerous claims about the insufficiency of the study and the sample size, yet she makes a number of assertions about the health of the population. Based on the above, her assertions are speculation.

For example, she claims that the fecundity data indicate 0 percent in the DU Impact Area. This is incorrect. Although four females were collected in the DU Impact Area, their ovaries were not examined to determine if they were or were not pregnant. There are no data with which to state that fecundity in the DU Impact Area samples is zero. In the end, this is not a failure of the deer tissue study to test a hypothesis of DU uptake by deer (the stated objective of the study), but a failure to study the potential effects of DU on the deer population as deemed necessary by Ms. Henshel.

While stating that the Army's sample size of **30** deer is "meager", she does not specify what might be acceptable. If DU had been detected in the deer then another round of sampling might have occurred. Due to funding constraints the Army cannot just collect 100 or 1000 deer and sample their tissues. The tiered approach is cost-effective and reasonable from a scientific approach. Target certain areas of deer and review the results. If no DU was detected in any of the 30 deer collected at JPG, there is no sense in collecting additional deer. More than likely, the sample size is "meager" because it does not suit the purposes of Ms. Henshel's desire for an extensive DU research program. I note that in a similar deer study at the future Rocky Flats National Wildlife Refuge, which was

formerly used as a nuclear weapons research, development, and production facility, USFWS collected **26** total deer to investigate tissue concentrations of the isotopes of americium, plutonium, and uranium (Todd and Sattelberg 2005). These deer were collected to determine if hunting could be a future recreational use at the Refuge.

Q37. In your opinion, is Ms. Henshel correct that the deer sampling data is deficient in not assessing bioaccumulation?

A37. (MLB) In my opinion she is not correct.

Q38. What is the basis for your opinion?

A38. (MLB) Bioaccumulation analysis was not part of the study objective as outlined in the FSP (SAIC 2005a) and FSP Addendum (SAIC 2005b). Moreover, no DU was detected in the deer tissue samples. Without the detection of DU, there is no benefit to bioaccumulation analysis. Furthermore, bioaccumulation rates are not needed to revise RESRAD.

Q39. In your opinion, has projectile-derived uranium moved into the JPG deer population, as asserted by Ms. Henshel in her Answer 32?

A39. (MLB) In my opinion, based on the data available, projectile-derived uranium has not moved into the JPG deer population.

Q40. What is the basis for your opinion?

A40. (MLB) As discussed in my Answer 34, the Army maintains that no DU was observed in the deer tissues (SAIC 2006). As I have noted above, there are no significant deficiencies in the deer tissue study based on the Army's objectives. To the contrary, the Army corrected some deficiencies in the previously collected deer samples at JPG in other studies. First, muscle tissue, although not as likely to accumulate DU but most likely to be consumed in the greatest quantities by humans, was sampled for the first time at JPG. In addition, liver, kidney, and bone, three other tissues more likely to show uptake, were sampled as they had been previously. Second, the Army collected 30 deer. The previous yearly high was 16 deer in 1987. Third, deer were collected from all areas of JPG, including

those most likely impacted by DU. This study was designed to detect DU if it was present in the deer and determine if hunters were at risk. The study met these objectives.

Given all the alleged deficiencies she finds in the Deer Tissue Sampling Results Report (SAIC 2006), I question the definitive nature with which Ms. Henshel claims that the study proved the presence of DU. At best, if the study is as flawed as she claims, then no definitive conclusions could be made and this would be the reason to collect another round of deer samples. She fails to provide quantitative support for why certain ratios might be indicative of DU.

In the larger context of her argument, she claims other biota should be sampled. First, there is no regulatory requirement by NRC for such sampling. The Army is not conducting an ERA nor biological research program. With the FSP (SAIC 2005a) as configured, adequate data will be collected to revise the RESRAD model.

VII. SUMMARY AND CONCLUSION

As to Basis Item "o"

Q41. Please summarize your testimony with regard to Basis Item "o".

A41. (MLB) I disagree with the basis that ERA sampling principles need to be followed because they are not required by NRC guidance nor warranted at JPG, as previously noted in my response to Basis Item "n". The abiotic data collected according to the FSP (SAIC 2005a) and FSP Addendum (SAIC 2005b) will be technically sufficient to revise the RESRAD model to determine if DU is a potential concern to public health.

The specific points raised by STV to support other biota sampling either are not supported by data or represent incomplete exposure pathways to human receptors. As a result, they do not support the need for additional biota sampling.

VIII. REFERENCES

Q42. In your testimony you referred to several documents. Would you specifically identify those documents?

A42. (MLB) Yes.

1. D'Angelo, Gino, J., John C. Kilgo, Christopher E. Comer, Cory D. Drennan, David A. Osborn, and Karl V. Miller. 2003. Effects of controlled dog hunting on movements of female white-tailed deer. In: Proceedings of the Annual Conference Southeast. Association of Fish and Wildlife Agencies. 57:317-325. Attached as Exhibit MLB #2.

2. Ebinger, M. and W. Hansen. 1996. JPG Data Summary and Risk Assessment. Submitted to the U.S. Army Test and Evaluation Command by Los Alamos National Laboratory, New Mexico. Attached as Exhibit MLB #3.

3. NRC. 2006. Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria. NUREG-1757, Vol. 2, Rev. 1. Final Report. Division of Waste Management and Environmental Protection, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

4. Science Applications International Corporation (SAIC). 2005a. Field Sampling Plan, Site Characterization of the Depleted Uranium Impact Area. Final. May.

5. SAIC. 2005b. Field Sampling Plan Addendum 1, Site Characterization of the Depleted Uranium Impact Area. Final. November.

6. SAIC 2006. Deer Tissue Sampling Results Report, Depleted Uranium Impact Area Site Characterization, Jefferson Proving Ground. Final. August.

7. SEG (Scientific Ecology Group). 1995. JPG Depleted Uranium Impact Area, Scoping Survey Report. Volumes 1-3. March., Florida. Attached as Exhibit MLB #4.

8. SEG. 1996. Jefferson Proving Ground Depleted Uranium Impact Area Characterization Survey Report. Volume 1. Oak Ridge, Tennessee. February. Attached as Exhibit MLB #5.

9. Todd, A.S., and Sattelberg, M. 2005. Actinides in Deer Tissues at the Rocky Flats Environmental Technology Site. Integrated Environmental Assessment and Management 1(4):391-396. Attached as Exhibit MLB # 6.

Q43. Does that conclude your testimony?

A43. (MLB) Yes, it does.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judges:

Alan S. Rosenthal, Chair
Dr. Paul B. Abramson
Dr. Richard F. Cole

In the Matter of	)	Docket No. 40-8838-MLA
U.S. ARMY	)	ASLBP No. 00-776-04-MLA
(Jefferson Proving Ground Site)	)	August __, 2007

AFFIDAVIT OF MICHAEL L. BARTA

RE STV CONTENTION B-1, BASIS ITEMS "n" AND "o"

County of SHELBY)
State of Tennessee)

I, Michael L. Barta, being duly sworn according to law, depose and state the following:

1. I am a Senior Ecological Risk Assessor with Science Applications International Corp. (SAIC) in their Memphis office. My business address is 1634 Carr Avenue, Memphis, Tennessee 38104-5010.

2. I am providing testimony, dated August 14, 2007, on behalf of the U.S. Army, Licensee, in the above captioned proceeding, entitled "TESTIMONY OF MICHAEL L. BARTA ON STV CONTENTION B-1, BASIS ITEMS 'n' AND 'o'. SUBJECTS: Environmental and Ecological Risk; Ecological Sampling."

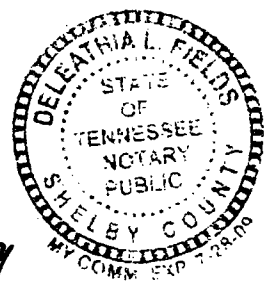
3. The factual statements and opinions I express in the cited testimony are true and correct to the best of my personal knowledge and belief.

4. I declare under penalty of perjury that the foregoing is true and correct.

Further, the affiant sayeth not.

Michael L. Barta

Subscribed and sworn to before me this 14th day of August, 2007.



Notary Public

My commission expires 7-28-2009

BARTA TESTIMONY

EXHIBIT MLB #1

Résumé

MICHAEL L. BARTA

EDUCATION:

M.S., Zoology, Ohio State University, 1992
B.A. and B.S., Zoology, Miami University, 1989

ADDITIONAL TRAINING:

40-Hour OSHA Hazardous Materials Training
8-Hour OSHA Hazardous Materials Supervisor Training

SECURITY CLEARANCE: None

EXPERIENCE SUMMARY:

Mr. Barta has 15 years of experience as an ecological risk assessor. He manages and provides technical support on ecological risk assessments (ERAs) conducted for Remedial Investigations/Feasibility Studies (RI/FSs) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs). These assessments typically focus on hazardous waste sites. His primary responsibility is evaluating potential adverse effects to aquatic receptors and terrestrial wildlife posed by these waste sites. He is currently the ecological lead at Army installations in Arkansas, Illinois, and Indiana and at an Air Force installation in New Jersey. Mr. Barta also serves as the deputy project manager on range condition assessments at U.S. Navy installations in Virginia and California. Prior to joining SAIC, Mr. Barta spent 7 years with ICF Kaiser Engineers as an ecological risk assessor. He was the lead scientist on 21 ERAs and provided technical support on an additional 21 ERAs. These assessments most often occurred in Florida, Maryland, New Jersey, and South Carolina.

In addition, Mr. Barta has designed field sampling plans, collected environmental samples, and conducted environmental audits. His academic background encompasses environmental toxicology, biophysical ecology, and physiology. He has practical experience related to hazardous waste site investigations concerning the collection and evaluation of surface water, sediment, soil, groundwater, and biological samples.

PROFESSIONAL EXPERIENCE:

Ecological Risk Assessment

Lead Ecological Risk Assessor, U.S. Army Corps of Engineers, Louisville District, Savanna Army Depot, Savanna, Illinois. Currently evaluating potential ecological risks associated with past activities at over 100 sites at Savanna Army Depot. Risks have been calculated for exposures to surface soil, surface water, sediment, biota, and air. More than 50 screening-level ERAs and 7 baseline ecological risk assessments (BERAs) have been completed. Designed ecological sampling work plans that included surface water, sediment, and surface soil bioassays, benthic community assessments, and fish tissue studies.

Lead Ecological Risk Assessor, DOE, Pantex Plant, Amarillo, Texas. Conducted 15 Tier 2 screening-level ecological risk assessments (SLERAs) at solid waste management units (SWMUs) at Pantex Plant following the Texas Commission on Environmental Quality (TCEQ) guidance. A cumulative Site-wide ERA also was conducted and focused on risks to wide-ranging receptors from exposures to contaminants at multiple playas (basins that periodically contain water). Developed a unique quantitative approach for evaluating the Texas Horned Lizard, a state-threatened species. Ten of the Tier 2 SLERAs went from draft final to final with no revisions. The limited number of regulatory comments were resolved either through comment responses or based on changes incorporated into the final five Tier 2 SLERAs and the Site-wide ERA. Less than 10 regulatory comments received on the 2,500 page Site-wide ERA.

Lead Ecological Risk Assessor, U.S. Army Corps of Engineers, Baltimore District, Picatinny Arsenal, Dover, New Jersey. Managed an ERA for 57 sites at Picatinny Arsenal. Designed the ecological sampling work plan that included surface water, sediment, and surface soil bioassays, benthic and fish community assessments earthworm and fish tissue bioaccumulation studies, and terrestrial habitat surveys. Work plan incorporated data for each sample location on GIS plots. Coordinated sampling efforts and personally collected over 90% of the biological data. Responsible for writing work plan, responding to Army and regulatory comments, evaluating subcontracting bids, tracking subcontractor costs, evaluating data, oversight of GIS staff (both external and internal), and report preparation. Investigated whether a large number of explosives compounds (e.g., RDX, HMX, 2,4,6-TNT, and nitroglycerin) in Picatinny Lake were adversely affecting benthic macroinvertebrates. Also evaluated potential risks to the endangered Indiana bat through potential food-chain consumption of mercury, PCBs, and pesticides. Extensive negotiations with USFWS, USEPA Region II, and NJ Department of Environmental Protection resulted in the collection of insects for tissue analysis. The results were used in the food-chain model to provide a more accurate estimate of the potential risk to Indiana bats.

Lead Ecological Risk Assessor, U.S. Army Corps of Engineers, Louisville District, Newport Chemical Depot, Newport, Indiana. Evaluated potential ecological risks associated with past activities at nine SWMUs at Newport Chemical Depot. Risks were calculated for exposures to surface soil, surface water, and sediment. Chemical data from surface water suggested the potential for adverse effects to aquatic receptors in Little Raccoon Creek. As a result, a semi-quantitative benthic survey was conducted in Little Raccoon Creek to aid in the decision-making process. Successfully negotiated with USFWS concerning soil clean-up levels for lead and mercury at two SWMUs.

Lead Ecological Risk Assessor, Program Manager for Chemical Demilitarization (PMCD), Pine Bluff Chemical Disposal Facility (PBCDF), Pine Bluff, Arkansas. Leading SAIC's ecological risk team in providing risk-based decision support tools for evaluating human health and ecological health risk related to the emissions from PBCDF, an incinerator that will be used to dispose of U.S. chemical agent stockpile and related iteDr. SAIC has developed a custom-built database-driven tool for rapid assessment of human health and ecological scenarios that uses advanced fate and transport modeling to assess the incinerator stack emissions. Evaluated the ecological risks predicted based on different operational scenarios in the baseline risk assessment. Currently waiting on trial burn data in order to revise risks.

Lead Ecological Risk Assessor, U. S. Army Environmental Command (USAEC), Fort Dix, New Jersey. Evaluated potential ecological risks associated with past activities at nine areas requiring environmental evaluation (AREEs) at Fort Dix. Risks were calculated for exposures to surface soil, surface water, and sediment. The AREE of greatest concern was the PDO Landfill, which was directly upgradient of a wetland. Chemical data from surface water and sediment suggested the potential for adverse effects to aquatic receptors. However, the results of surface water and sediment bioassays in conjunction with a qualitative benthic survey suggested that adverse effects would be limited in this stream. In order to determine if long-term monitoring was a viable option in the Alternatives Analysis, additional chemical (surface water and sediment) and biological (sediment bioassays) analyses were conducted.

Ecological Risk Assessor – Technical Support, Defense National Stockpile Center (DNSC), Mercury Management Environmental Impact Statement (MM EIS). The DNSC of the Defense Logistics Agency maintains stockpiles of 65 essential industrial commodities. The mercury stockpile consists of 4,890 tons of pure elemental mercury sealed in steel flasks in four warehouses. The warehouses are located at the Somerville Depot near Somerville, New Jersey; the Casad Depot near New Haven, Indiana; the Warren Depot near Warren, Ohio; and the DOE's Y-12 National Nuclear Security Complex in Oak Ridge, Tennessee. The ERA provided an evaluation of potential releases, exposures, and ecological consequences related to activities involved in managing the mercury stockpile, including potential accidents associated with those activities. The results were used in the MM EIS to facilitate comparisons between several alternatives for disposition of the mercury stockpile. The ERA

evaluated plants, soil invertebrates, short-tailed shrew, American robin, red-tailed hawk, great blue heron, aquatic biota, and sediment-dwelling biota.

Lead Ecological Risk Assessor, AEC, Cornhusker Army Ammunition Plant, Grand Island, Nebraska. Evaluated ecological risks at Cornhusker Army Ammunition Plant (CAAP), Grand Island, Nebraska. Assessment primarily focused on surface soil contamination as there were limited surface water bodies at CAAP. Although potential for adverse effects existed, the areas with contamination were generally considered to have poor quality habitat due to past and present uses (e.g., industrial operations) and/or an abundance of manmade structures. As a result of the poor quality habitat, extensive use of these areas by terrestrial receptors was not expected. In addition, terrestrial receptors would more likely occur in areas adjacent to sites, such as cropland or shelterbelt areas, where the habitat quality was better, food was more plentiful, and chemical contamination was expected to be minimal or nonexistent. As a result, ERA results were not a risk driver in the FS.

Lead Ecological Risk Assessor, USEPA Region IV, Lake Hartwell, South Carolina. Assessed potential ecological impacts to aquatic and terrestrial receptors associated with a PCB-contaminated lake and watershed. Site-specific biological investigations including bioindicator analyses, fish health assessment indices, and family-level macroinvertebrate bioassessments were the primary basis for evaluating potential adverse impacts to aquatic receptors. Terrestrial wildlife that may consume PCB-contaminated fish (i.e., mink and green-backed heron) also were evaluated.

Ecological Risk Assessor – Technical Support, DOE, Savannah River Site and Idaho National Engineering Laboratory (INEL). Completed a qualitative evaluation of current and future ecological risks posed by existing conditions at two DOE weapons installations, the Savannah River Site and the Idaho National Engineering Laboratory. Results of this investigation, which included reviews of existing ecological risk assessments, current environmental monitoring data, and supporting documentation, as well as interviews with site personnel, were supplied to DOE for their 1995 Report to Congress. At Savannah, ecological units were delineated based upon a watershed approach. At INEL, the analysis focused on subsurface soil, surface soil, and surface water. Radionuclides received the most evaluation as previous INEL studies focused on these contaminants.

Lead Ecological Risk Assessor, U.S. Army Corps of Engineers, Baltimore District, Green Pond Brook & Bear Swamp Brook Feasibility Study Data Gap Work Plan, Picatinny Arsenal, Dover, New Jersey. Primary author of data gap work plan in which 39 sediment samples, 14 surface water samples, and a limited number of geotechnical samples were planned for collection in the winter of 1999. There are few potential exposures to humans in the study area so the FS was driven by ecological concerns. Data from field investigations in 1993 to 1997 were used to create extensive GIS plots in order to assess data gaps. Responsible for writing work plan, responding to Army

and regulatory comments, oversight of GIS staff, and coordination with engineering staff.

Lead Ecological Risk Assessor, Private Client, Bayonne, New Jersey. Evaluated potential ecological impacts associated with emissions from an operating chemical waste incinerator. Assessment focused on food-chain exposures to aquatic and terrestrial wildlife species and surface water exposures to aquatic species.

Lead Ecological Risk Assessor, USEPA Region IV, Leeds, Alabama. Estimated potential ecological impacts to terrestrial and aquatic receptors at a former lead smelter site for USEPA Region IV. Although comparisons of surface water and sediment concentrations to toxicity reference values suggested that aquatic receptors might be adversely affected by lead, site-specific biological testing (benthic macroinvertebrate surveys and toxicity tests) indicated that no significant observable adverse effects seemed to be occurring.

Lead Ecological Risk Assessor, AEC, Aberdeen Proving Ground, Maryland. Estimated potential adverse effects to terrestrial plants, soil invertebrates, shrews, robins, and aquatic receptors for five separate ERAs in the Edgewood Area and 1 ERA in the Aberdeen Area, Aberdeen Proving Ground, Maryland. Southern Bush River Area, Northern Bush River Area, Lauderick Creek Area, Western Boundary Area, Cluster 3, and Cluster 4 each were evaluated and submitted as separate reports. These ERAs relied primarily on abiotic chemical data to estimate hazards to plants and wildlife.

Ecological Risk Assessor – Technical Support, Private Client, Louisiana. Provided technical support on a SLERAt for a private client proposing to burn sulfuric acid in an incinerator. Risks from exposure to emissions were calculated for terrestrial plants, earthworms, aquatic receptors, raccoon, American woodcock, and great blue heron.

Ecological Risk Assessor – Technical Support, USEPA Region II. Reviewed several ERA and sampling plans under the ARCS II contract (Passaic River Site, Jones Sanitation Site, Rosen Brothers Site, and General Motors Powertrain Site). The risk assessment reviews focused on data evaluation, selection of chemicals of potential concern (copcs), and an evaluation of exposure pathways. The ecological sampling plan reviews focused on sampling rationale, strategies, and endpoints.

Chemical Research and Assessment

Ecological Risk Assessor – Technical Support, USEPA. Evaluated the ecological effects of trichloroacetic acid (TCAA) in the environment. This review paper included methods for quantifying TCAA in aqueous and solid samples, possible routes of formation through natural processes, as well as summaries of concentrations in various

environmental media. Concentrations of TCAA found to be toxic to aquatic and terrestrial organisms in laboratory and field studies were compiled. This report was ultimately submitted and accepted for publication in *Environment International.*

Lead Ecological Risk Assessor, USEPA Region IV, North Miami Beach, Florida. Assessed the potential for adverse effects to aquatic receptors from exposure to ammonia in a mangrove preserve located adjacent to a municipal landfill. Site-specific ambient water quality criteria (AWQC) were modified based on pH, salinity, and temperature data and compared to measured concentrations of total ammonia. Toxicity test data for inland silverside minnow and microalgae were also evaluated. Presented results of the study for USEPA Region IV at three public meetings.

Ecological Risk Assessor – Technical Support, Private Client, Alabama. Evaluated DDTR residues in wildlife and subsequent toxic effects at a Superfund site located in southern bottomland wetland habitat. More than 300 scientific articles were reviewed to evaluate potential food-chain impacts to crustaceans, fish, amphibians, reptiles, birds, and mammals.

Ecological Risk Assessor – Technical Support, USDOI, Alaska. Assessed the potential short- and long-term impacts of the Exxon *Valdez* oil spill on subsistence fish (Chinook salmon and Pacific cod) and shellfish (Spot shrimp) used by native Alaskan groups. After identification as important subsistence species, the habitats and ecological characteristics of each species then were described. Characterization of habitat and impact relied heavily upon the results of Natural Resource Damage Assessment (NRDA) studies. Toxicity data from the literature were used to augment the results of the NRDA studies.

Modeling

Lead Ecological Risk Assessor, USEPA Region IV, Lake Hartwell, South Carolina. Developed an aquatic food web that was used in the USEPA's Fish Gill Exchange of Toxic Substances (FGETS) model to assess the bioaccumulation of PCBs at a Superfund site. After determining the appropriate food web, morphometric, physiologic, and trophic parameters were selected from the literature if site-specific data were unavailable.

Ecological Risk Assessor – Technical Support, Private Client, Illinois. Reviewed ERA in support of litigation. Project focused on food-chain impacts to red-winged blackbird and mink. Revised sections of the ERA based on regulatory comments. Stochastic uncertainty analysis was used to clarify the deterministic results.

Range Condition Assessments

Technical Support, U.S. Navy, San Clemente Island, California. Assisted with the preparation of a work plan, field sampling plan, quality assurance project plan, and health and safety plan in support of a 5-year Range Condition Assessment review. Due

to the potential for off-range migration, sampling for explosives constituents will occur in tributaries throughout a bombing range.

Technical Support, U.S. Navy, Naval Surface Warfare Center Dahlgren, Dahlgren, Virginia. Assisted with the preparation of a work plan in support of an initial Range Condition Assessment. Prepared the compliance assessment for natural resources. Assessed the potential for off-range migration through the development of operational range site models (ORSMs).

Human Health Risk Assessment

Human Health Risk Assessor, U.S. Army Corps of Engineers, Louisville District, Jefferson Proving Ground, Madison, Indiana. Developed a work plan to investigate depleted uranium (DU) concentrations in deer muscle, kidney, liver, and bone. In a collaborative effort with USFWS, 10 deer each were collected in a DU testing area, adjacent hunting zones, and background hunting zones. DU was not detected in any tissue samples. In addition, total uranium levels were not elevated in the samples collected from the DU testing area, the area where the greatest potential for exposures occurred.

Human Health Risk Assessor – Technical Support, DOE, Savannah River Site, Brookhaven National Laboratory, and Argonne National Laboratory-East. Developed Conceptual Site Models (CSMs) for three DOE facilities that were used by Pacific Northwest Laboratories (PNL) in their Baseline Environmental Management Report (BEMR). Analyzed data from the Savannah River Site, Brookhaven National Laboratory, and Argonne National Laboratory-East for information concerning waste types, release mechanisms, source locations, receptor pathways, and contaminants of interest. Information in the CSMs was input into the MEPAS program by PNL to develop unit risk factors (URFs) for these sites.

Environmental Audits

Environmental Auditor and Manager – Texas Commerce Bank, Houston, Texas. From 1993 to 1997, conducted a review of 38 environmental audit questionnaires of gasoline stations as part of a loan application process. This work involved researching past, current, and future environmental compliance issues regarding the underground storage tanks (USTs) on-sites, as well as other on-site activities and evaluating potential environmental liabilities. Research also involved Federal and state UST regulations and applicability of state UST Trust Funds. From 1995 to 1998, performed day-to-day oversight activities of the program, including selecting auditors, responding to client questions and needs, training new auditors, and preparing technical memoranda. From

1998-1999 acted as the co-Program Manager in charge of trouble shooting, qualifying properties, training auditors, cost estimating with the client, and internal marketing.

Environmental Auditor, GTE, Michigan, Indiana, Illinois, and Georgia. Conducted an environmental audit of 240 telephone company properties for GTE in Michigan, Indiana, Illinois, and Georgia by telephone. County health and local fire officials were interviewed about site information concerning chemical spills, leaking USTs, groundwater contamination, and groundwater depth.

Environmental Auditor, Lederle Labs, Pearl River, New York. Performed an air emissions audit at a chemical and pharmaceutical company in Pearl River, New York. Responsible for verifying old permits, writing new permits, and inspecting emissions sources and points.

MISCELLANEOUS TRAINING:

Rapid Bioassessment Protocols. 1998. Virginia Commonwealth University.

A Way of Seeing: The Study of Birds. 1997. Fairfax (VA) Audubon Society.

Society of Environmental Toxicology and Chemistry (SETAC) Shortcourses:
Sediment Toxicity Testing: Methods to Achieve Strong Data Sets and Interpret Results (2004);
Evaluation of Ecological Effects in Surface Water-Ground Water Transition Zones (2000);
Soil Toxicity Evaluation: Current Practice and Applications (1999);
Responses to Common Questions Regarding Data Analysis and Interpretation of Toxicity Tests (1998);
Practical GIS for the Non-GIS Professional (1997);
Interspecies Toxicity Extrapolations for Terrestrial Systems (1996);
Ecological Risk Assessment at Contaminated Sites (1995);
Environmental Fate Data, Estimates, and Assessments (1994);
and The Principles of Radioecology: Studying the Fate and Effects of Radioactive Contaminants in the Environment (1993).
Research and Teaching Associate, Ohio State University Department of Zoology, 1989-1992.
CPR Training
First-Aid Training

CUSTOMERS:
Air Force Center for Environmental Excellence (AFCEE)
U.S. Army Corps of Engineers, Louisville and Baltimore Districts
U.S. Department of Energy (DOE)
U.S. Army Environmental Center (AEC)

U.S. EPA Region IV
U.S. Navy
BWXT Pantex

AFFILIATIONS:

SETAC
Sigma Xi

PUBLICATIONS:

Cornaby, B.W., C. T. Hadden, and M. L. Barta. 2004. Cases histories from the ecological risk assessment world. Society for Risk Analysis meeting. December 5-8, Palm Springs, CA.

Lewis, T.E., Wolfinger, T.F., and Barta, M.L. 2004. The Ecological Effects of Trichloroacetic Acid in the Environment. Review Article. Environment International 30:1119-1150.

Barta, M. 2000. Benefits of the Triad Approach at Picatinny Lake, Picatinny Arsenal, New Jersey. Presented at the 21st annual SETAC meeting.

Barta, M., and J. Mitchell. 1997. Ammonia Toxicity from Landfill Leachate in a Mangrove Preserve. Presented at the 18th annual SETAC meeting.

Barta, M., and Mayernik, J. 1995. Lead hazard quotients in contradiction with site-specific biological results. Presented at the 16th annual SETAC meeting.

Barta, M., and M. Woolfolk. 1994. Calculating Sediment Clean-Up Criteria by using USEPA's Food and Gill Exchange of Toxic Substances (FGETS) Modeling Program. Presented at the 67th Annual Conference Exposition of the Water Environment Federation.

Barta, M., and G. Drendel. 1994. Ecological Risk Assessment of PCB-Contaminated Lake Hartwell, SC. Presented at the 15th annual SETAC meeting.

Barta, M., and Woolfolk, M. 1994. Biologically-Based Target Sediment Concentrations for a Southeastern Lake. Presented at the 15th annual SETAC meeting.

Woolfolk, M., Barta, M., and Drendel, G. 1994. Modeling the Accumulation of PCBs in Largemouth Bass from Lake Hartwell, SC. Presented at the 15th annual SETAC meeting.

WORK HISTORY:
2003 to present, Senior Ecological Risk Assessor, SAIC, Memphis, Tennessee
2001 to 2003, Risk Assessment and Data Validation Section Manager, SAIC, Reston, Virginia
1999 to 2003, Ecological Risk Assessor, SAIC, Reston, Virginia
1992 to 1999, Ecological Risk Assessor, ICF Kaiser Engineers, Fairfax, Virginia