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TRANSMITTAL LETTER FOR UNIVERSITY OF FLORIDA COMMENTS ON THE REMEDIAL INVESTIGATION REPORT FOR UNEXPLODED ORDNANCES (UXO) 1, 3, AND 5 NAS JACKSONVILLE FL
5/13/2016
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Florida Department of Environmental Protection

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Secretary

May 13, 2016

Ms. Adrienne Wilson
Code OPDE3/AW
Department of the Navy
Naval Facilities Southeast
Attn: AJAX Street, Building 135N
P.O. Box 30A
Jacksonville, FL 32212-0030

Re: Draft Remedial Investigation Report for Former Machine Gun Range Complex, Munitions Response Program Sites UXO 1, 3, and 5, Naval Air Station Jacksonville, Jacksonville, Florida

Dear Ms. Wilson:

Attached are the University of Florida comments, on behalf of the Florida Department of Environmental Protection, for the Draft Remedial Investigation Report for Former Machine Gun Range Complex, Munitions Response Program Sites UXO 1, 3, and 5, Naval Air Station Jacksonville, Jacksonville, Florida, dated January 2016, (received February 15, 2016), prepared and submitted by Tetra Tech under Contract Number N62470-08-D-1001.

If you have any questions regarding this letter, please contact me at (850) 245-8935.

Sincerely,

Aaron B. Cohen
Remedial Project Manager
Department of Defense and Brownfields Partnerships
Bureau of Waste Cleanup

KAW

EC: Pete Dao, EPA Region IV, Atlanta
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April 27, 2016

Brian Dougherty, PhD
Office of District and Business Support
Division of Waste Management
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Review of the remedial investigation reports for NAS Jacksonville Sites UXO 1, 3, and 5

Dear Dr. Dougherty:

At your request, we have reviewed the *Remedial Investigation Report for Former Machine Gun Range Complex Munitions Response Program Sites UXO 1, 3, and 5, Naval Air Station (NAS) Jacksonville, Jacksonville, Florida.* This report was prepared by Tetra Tech and is dated January 2016. This report includes human health and ecological risk assessments for three of six Munition Response Program (MRP) sites associated with the Former Machine Gun Range Complex at NAS Jacksonville (UXO 1, 3, and 5). The remedial investigation report for the other three MRP sites (UXO 2, 4, and 6) is being conducted separately. All six MRP sites are located within the boundaries of the NAS Jacksonville Golf course. This document identifies PAHs and metals as contaminants of concern for human and ecological receptors at UXO 1 and UXO 3. Risk from lead pellets is not assessed in this document.

Although we have nearly 50 technical comments on the Remedial Investigation (RI) report (see below), our overarching concern is with the characterization of the site. The construction of the golf course undoubtedly resulted in redistribution of contaminated soil, and there is no indication that in the report that newly created contaminated areas resulting from this redistribution are known. The approach to sampling is based on locations of the shooting ranges where the metals and PAHs were introduced into the environment decades ago, which is not necessarily where all of them exist today. Making the corrections, resolving the inconsistencies, adding clarifications, and redefining exposure units in response to the technical comments are important, but do not solve the fundamental problem that the characterization is incomplete both spatially, and in the case of lead, in terms of the full range of concentrations present at the site that can be included in the risk assessment. We recognize that a different, more comprehensive approach to site characterization for the golf course could be expensive and time consuming, and therefore may not be practical. However, it should be acknowledged that without additional characterization, confidence in the risk assessment will always be compromised.

We have the following specific comments regarding the RI.

1. Based on Figures 5-10 through 5-12, UXO 1 is not delineated horizontally in the 0-0.5 ft, 0-5-2 ft, and greater than 2 ft depth intervals. Additionally, these figures suggest delineation has occurred in many locations (samples labeled "no exceedances in soil") where delineation is not complete. For example, in Figure 5-10 sample X1SS041 exceeds criteria for metals and PAHs in soil 0-0.5 ft below ground surface (bgs). It appears to be delineated to the south by sample X1SB051 where no exceedances were detected in soil. However, 1) sample X1SB051 was taken 2-4 ft bgs and should not be used to delineate contaminants in the 0-0.5 ft interval and 2) metals were not analyzed in samples X1SB051 or X1SS051 (the corresponding sample taken in the 0-0.5 ft interval). Therefore, metals are not delineated to the south at this location.

2. Based on Figures 5-15 through 5-17, UXO 3 is not delineated horizontally in the 0-0.5 ft, 0-5-2 ft, and greater than 2 ft depth intervals. If delineation (when complete) shows that soil contamination to the north and east of the site is located near the pond boundaries, surface water and sediment from these ponds should be included in the assessment.

3. Based on Figures 5-18 and 5-19, UXO 5 is not delineated horizontally in the 1-2 ft and greater than 2 ft depth intervals.

4. As stated in the document, mechanical redistribution of soil occurred at the UXOs during the creation of the golf course. The document does not discuss how much or where soil was moved. It is possible that contamination has been redistributed on the golf course outside the UXO boundaries. It is unclear whether investigation has occurred to determine the horizontal extent of contamination across the golf course.

5. Three samples from UXO 1 (JAX-22-SS020-0006, JAX-22-SS033-0006, and X1SS0370006) displayed metal and/or PAH concentrations several orders of magnitude above the other samples (e.g., sample X1SS0370006 had 3,298,236 μg/kg BaP equivalents (BaP-Eq)). The document states these elevated concentrations are due to bits of skeet targets, lead shot, and brass or bronze present in the sample. These results were considered anomalies, which were not representative of the soil, and were not included in the risk assessment. While we agree these elevated concentrations are unlikely to represent current soil concentrations, pieces of skeet targets, bullets, and lead shot represent a continuing source of contamination to soil. Concentrations of these metals and PAHs may be higher in soil in the future due to disintegration of these fragments over time. A protective approach would be to determine the mass of metals and PAHs present per unit volume of surface soil and convert this to a measured concentration in the fine fraction.

6. The risk from ingestion of lead pellets was not assessed in the document. While adults may not incidentally ingest lead shot, waterfowl and children are known to ingest these pellets (ATSDR, 2102; ITRC, 2003; USEPA, 2000). Consequently, ingestion of lead shot should be included in predicting risks to ecological receptors and humans under certain future use scenarios (USEPA, 2003). The Agency for Toxic Substances and Disease Registry (ATSDR) requested that the

Department of Defense recognize direct ingestion of lead pellets as a viable exposure pathway for children using former shooting ranges and other metal debris areas (ATSDR, 2012). If the future use of this site changes to include scenarios where children will be present (e.g., residence, school, park/recreational area), risk from ingestion of lead shot should be included in the risk assessment, either quantitatively or qualitatively. Additionally, a bird lead pellet ingestion model should be added to the ecological risk assessment.

Human Health Risk Assessment

7. The document identifies contaminants of potential concern (COPCs) for the 0-2 ft and >2 ft depth intervals. The FDEP usually determines COPCs for all the depth intervals promulgated in Chapter 62-780, FAC (0-0.5 ft, 0.5-2 ft, and in two-foot intervals thereafter). This methodology identifies COPCs in the 0-0.5 ft depth interval, which is the most relevant interval for direct contact.

8. UXO 1 and UXO 3 were divided into three exposure units (EUs) – fairways, wooded areas, and the entire site (fairways and wooded areas combined). A 95% UCL was used as the exposure point concentration (EPC) for the human health risk assessment for these sites. The use of a 95% UCL assumes equal and random exposure over and EU. Therefore, it is important to have appropriately sized EUs when using the 95% UCL as the EPC. While the proposed EUs may be appropriate for current and future golfers and maintenance workers (landscapers), they are not relevant to future industrial workers and future residents. UXO 1 is 31 acres in size (15 acres fairway, 14 acres wooded, and 2 acres ponds) and UXO 3 is 18 acres in size (14 acres fairway, 4 acres wooded, and less than an acre in ponds). As promulgated in Chapter 62-780, FAC, the exposure unit size for future unrestricted use should not exceed ¼ acre. Although no promulgated EU size exists for industrial workers, the FDEP has used EUs of 5-acres at other sites. In order to show compliance with the SCTLs promulgated in Chapter 62-777, FAC either 1) the maximum concentration on-site should be compared with the SCTLs or 2) the 95% UCL of an appropriately sized EU (¼ acre for residents or 5-acres for industrial) should be compared to the apportioned SCTLs.

9. For golfers and maintenance workers (landscapers), risk is assessed separately for each UXO under a current exposure scenario. Because six UXOs lie within the boundaries of the current golf course, it is likely golfers and maintenance workers would have exposure to all six areas. Therefore, for these receptors, risk should be added across all of the UXOs.

10. Background concentrations for groundwater were proposed for antimony (43 µg/L), arsenic (13.2 µg/L), and lead (45.8 µg/L). These values are background concentrations developed for a nearby site, OU1. We did not review the derivation of the proposed background values, however, they appear high. The most extensive source of background concentrations in Florida is from the Florida Groundwater Quality Monitoring Network (FGWQMN). The St. Johns River Reporting Unit B network is in the vicinity of NAS Jacksonville. We have the following comments based on the background concentrations from this network.

a. The highest concentration of arsenic observed in the FGWQMN surficial aquifer system was 7.4 μg/L (35 wells, 51 observations). Although the monitoring network attempts to use locations thought to be free of anthropogenic influence, values representing contamination are occasionally encountered. According to their criteria for exclusion of outliers believed to represent contamination (i.e., in excess of three times the interquartile range), the upper end of the range of background of arsenic concentrations is better represented by the upper quartile (2.8 μg/L). The proposed background value of 13.2 μg/L exceeds both values.

b. For antimony, the proposed background value of 43 μg/L is 10 times greater than the maximum detected antimony concentration in this area (<3 μg/L).

c. The proposed background value for lead (45.8 μg/L) is slightly above the upper end of the range of background for this area (41 μg/L).

11. Page 7-13 states that twice the average site-specific background concentration is compared to the maximum detected concentration to determine if it is representative of background. The FDEP Guidance for Comparing Background and Site Chemical Concentrations in Soil (FDEP, 2012) states, that for non-statistical comparisons with background, the lower of twice the mean or maximum background concentration should be used. This document does not provide the background data so it is unclear if any of the proposed background values exceed the maximum detected background concentration.

12. The document states that elevated arsenic in areas of low lead concentrations are due to arsenical pesticide application on the golf course. We agree that pesticide application is likely a secondary source of arsenic at the site. Further discussion with FDEP may be necessary to determine the extent of delineation and remediation/management of arsenic at the site.

13. Alternate leachability SCTLs were developed for antimony, arsenic, copper, lead, and zinc on a site-specific basis for UXOs 1, 3, and 5. These SCTLs are listed in Section 7.2.5 of the report. We could not locate the derivation of these values in this document and it is unclear how they were calculated. Therefore, we cannot comment on the protectiveness of these values.

14. The antimony exceedance in groundwater well X1TW010 is not attributed to the site because it is upgradient of the area where the majority of antimony soil exceedances were detected. However, an upgradient antimony soil concentration (11.7 mg/kg) exceeds leachability criteria. Therefore, it is possible that exceedances of antimony in groundwater are site-related.

15. The XRF results were not utilized in the risk assessment. While XRF results are not currently used in risk assessments by the FDEP, the magnitude of excluded samples at this site is of concern. Approximately 40% of all SCTL exceedances were excluded from the assessment, including the highest detected concentrations. Because there are no fixed-based lab samples in those areas to

replace the excluded concentrations, areas with high lead exceedances are not accounted for in the risk assessment. This could result in significant underestimation of human health risk at the site.

16. Table 5-13 provides surface water human health criteria. We have the following comments regarding this table.

    a. The table lists the surface water cleanup target levels (CTLs) for individual PAHs as 0.031 μg/L. It is important to note that, as promulgated in Chapter 62-302, FAC, the annual average criterion of 0.031 μg/L applies to the total concentration of acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and phenanthrene. Therefore, the individual concentrations should be added before being compared to the criterion. This does not alter the conclusion that PAHs exceed the surface water criterion in UXO-1. However, due to the lipophilic nature of PAHs, we agree the exceedances are likely due to the suspension of sediment in the surface water.

    b. The reference for the FDEP surface water criteria for this site should be Chapter 62-302, FAC, not Chapter 62-777, FAC.

    c. A lead criterion of 1 μg/L was included in the table. Because hardness was not tested in the on-site ponds, it is unclear how this criterion was derived. If hardness was not tested, a conservative value of 25 mg/L $CaCO_3$ should be used to derive a surface water criterion of 0.5 μg/L.

17. In Section 7.2.5.1 (Selection of COPCs at UXO 1), total PAHs should be added as a COPC in surface water for UXO 1.

18. In Section 7.5.4.2 (results of subsurface soil evaluation using FDEP methodology), arsenic should be included as a COPC in UXO 3 subsurface soil. Sample X3SB0170204 has an arsenic concentration of 3.9 mg/kg, which exceeds the residential SCTL of 2.1 mg/kg. Additionally, arsenic should be identified as exceeding screening criteria in Section 5.4.2 (describing the nature and extent of contamination for UXO 3 subsurface soil).

19. Section 7.3.2 (exposure assumptions) states non-default FDEP CTLs (for scenarios other than residential and industrial) were calculated using FDEP equations and assumptions. Calculations sheets were stated to have been included in Appendix G-1. The calculations for the CTLs were not provided in the copy of Appendix G that we received. We have the following comments on these CTLs (listed in Table 7-34).

    a. We could not replicate several of the calculations for the maintenance worker, construction worker, and adult visitor/golfer scenarios. It is unclear why our numbers differed for only some of the chemicals, but we did not have the calculation sheets to check the assumptions. The difference in calculated versus proposed values is a concern for arsenic

under the construction worker scenario (proposed 46.8 mg/kg versus calculated 34 mg/kg) and naphthalene under the adult visitor/golfer scenario (proposed 1,610 μg/kg versus calculated 1,500 μg/kg).

b. Non-carcinogenic PAH CTLs for the adult visitor/golfer appear to be listed in mg/kg rather than μg/kg.

20. We have the following comments regarding Table 7-34, which lists receptor-specific USEPA RSLs and FDEP CTLs.

    a. The FDEP does not have a groundwater cleanup target level (GCTL) for BaP-Eq. The number listed under this category should be removed from the table.

    b. It is unclear how alternative FDEP surface water numbers were calculated. Equations for the calculation of these values were not provided in the report or appendices. Further, Chapter 62-780, FAC does not currently have a provision for the calculation of alternative surface water criteria. Therefore, the surface water criteria promulgated in Chapters 62-302 and 62-777, FAC would apply to this site.

21. Page 7-39 states a typical lifetime is defined as 80 years by USEPA and 76.1 years by FDEP. The lifetime appears to have been confused with adult body weight. Currently lifetime is defined as 70 years by both the USEPA and FDEP (USEPA, 2014; Chapter 62-777, FAC). Carcinogenic risk needs to be recalculated using the correct lifetime.

22. In the risk assessment, soil lead concentrations are compared to criteria developed using the adult lead model for adult residents, industrial workers, maintenance workers, construction workers, and adult visitors/golfers. No comparison is made to lead criteria protective of children, the most sensitive receptor. It should be assumed that children would be present under the residential scenario unless the site is restricted to exclude child residents (e.g., 55 and older community). Therefore, the promulgated FDEP SCTL of 400 mg/kg lead for the protection of future child residents (Chapter 62-777, FAC) would apply to this site.

23. Site-specific SPLP data were collected during the SI and Phase II RI. The document states correlations were poor and inconsistent for all metals analyzed. It states no valid conclusions could be made from the SPLP data in regards to leachability. However, these data appear to have been used as leachability to groundwater criteria in Section 7.2.5. If the data did not create a valid correlation, we recommend removing SPLP comparisons from the screening evaluation. Because groundwater samples were obtained from the site, a determination of whether leaching is occurring to an unacceptable extent can be determined directly from groundwater concentrations.

24. Page 7-10 discusses disposal operations that ended in the mid-1950s for UXO 1 and in 1978 for UXOs 3 and 5. Because this is the first time disposal operations were mentioned, it is unclear what type of disposal activities took place on-site. More information is needed regarding these operations.

25. In the conceptual site model for human health, contact with surface water is assumed to be limited to wading. Therefore, only dermal contact is evaluated in this assessment. Incidental ingestion of surface water may also occur during wading. Although it is a minor pathway, incidental ingestion of surface water should be added to the assessment for future residential use.

26. For UXO 1, Figures 5-10 through 5-12 do not match Figures 5-21 through 5-29 in the document. For example, Figure 5-10 (0-0.5 ft bgs) shows metal exceedances in sample X1SS035 and PAH exceedances in sample X1SS025. However, on Figures 5-22 and 5-23, X1SS035 (labeled as X1SB035 on Figure 5-23) is below lead and arsenic CTLs. On Figure 5-21, X1SS025 is below BaP-Eq CTLs. These figures should be amended to show the same result for each sample (exceeding or below screening criteria).

27. For UXO 3, Figures 5-15 through 5-17 do not match Figures 5-31 through 5-34.

    a. Samples in Figure 5-15 are named differently from Figures 5-31 through Figures 5-34. Many of the samples in Figures 5-15 have an extra "SB" in the sample names. If these are different samples, that is not clear in the document.

    b. The two sets of Figures are inconsistent. For example, JAX-23B-SBSS025, -016, and -019 are labeled as having metal exceedances in Figure 5-15. Figure 5-32 labels these samples as not exceeding the lead soil cleanup target level (SCTL) (they were not tested for arsenic). As stated above, these figures should be amended to show the same result for each sample (exceeding or below screening criteria).

28. Section 5.6.2 (UXO 3) states there were no metal exceedances in the 0.5-2 ft depth interval with the exception of one PAH and one arsenic exceedance. However, Figure 5-16 shows four locations where metal SCTLs were exceeded in this depth interval. The section also states there were no exceedances of SCTLs in the 2-4 ft interval with the exception of one lead sample. Figure 5-17 shows 6 locations from 2-4 ft bgs that exceed metal SCTLs. It is unclear why the figures differ from the text.

29. Section 5.4.1 states zinc exceeded screening values in UXO 3 surface soil. However, zinc is not listed as a COPC or COPEC in Figures 5-13 and 5-14. If these figures do not include all of the samples, we recommend adding figures with all of the exceedances so that the true extent of contamination can be visualized.

Ecological Risk Assessment

30. Risk to ecological receptors from soil was assessed over the 0-2 ft bgs interval. While this may be appropriate for burrowing animals and plants with deeper roots, it is not representative of direct contact for most receptors. Soil COPECs should be rescreened using concentrations in the 0-0.5 ft depth interval since this is the interval most relevant for direct contact of ecological receptors.

31. In Tables 5-4, 5-19, 8-2, 8-3, 8-4, 8-13, and 8-14, ecological soil screening level (Eco SSL) criteria are presented for each PAH individually. Soil concentrations for each PAH are compared to the criteria for either the low or high molecular weight PAHs (LMW and HMW, respectively). The LMW and HMW PAH Eco SSLs were not intended to be applied to each individual chemical, but to represent criteria for the sum of the concentrations across the group. The sum of the LMW PAHs should be compared to the Eco SSL of 29,000 μg/kg and the sum of the HMW PAHs should be compared to the Eco SSL of 1,100 μg/kg (USEPA, 2015). A table of LMW and HMW PAHs from Region 4 Guidance is presented below (USEPA, 2015).

Low Molecular Weight PAHs	Screening Level (μg/kg)
Acenaphthene	See Total
Acenaphthylene	See Total
Anthracene	See Total
Fluorene	See Total
1-Methylnaphthalene	See Total
2-Methylnaphthalene	See Total
Naphthalene	See Total
Phenanthrene	See Total
Total LMWPAHs	29,000
High Molecular Weight PAHs	**Screening Level (μg/kg)**
Benzo(a)anthracene	See Total
Benzo(b)fluoranthene	See Total
Benzo(k)fluoranthene	See Total
Benzo(g,h,i)perylene	See Total
Benzo(a)pyrene	See Total
Chrysene	See Total
Dibenz(a,h)anthracene	See Total
Fluoranthene	See Total
Indeno(1,2,3-cd)pyrene	See Total
Pyrene	See Total
Total HMWPAHs	1,100

32. We have the following comments regarding Tables 5-11 and 8-5 (ecological criteria exceedances in submerged sediment).

    a. Screening values are available for sediment from EPA Region 3 for the sum of benzo(b)fluoranthene and benzo(k)fluoranthene (0.0272 mg/kg), benzo(g,h,i)perylene (0.17 mg/kg), and indeno(1,2,3-cd)pyrene (0.017 mg/kg) (USEPA, 2006). These values should be included in the tables.

    b. It is important to note that sediment quality assessment guidelines (SQAGs) are available for total PAHs (TEC = 1,600 μg/kg, PEC = 23,000

μg/kg) and should be included in these tables. Total PAHs in submerged sediment for UXO 1 are less than the TEC and, therefore, total PAHs are not of concern in sediment.

33. Section 8.2.4.3 selects receptor species for the ecological risk assessment. We have the following comments on the species chosen for this assessment.

    a. The proposed receptor for piscivorous birds is the great blue heron. The great blue heron is a large bird with a body weight of approximately 2.2 kg. Instead, we recommend using the little blue heron or the tricolored heron for the piscivorous bird receptor. Both have a smaller body size (approximately 0.3 kg) and are considered species of special concern by the State of Florida (FFWCC, 2016).

    b. Raccoons were chosen as the receptor for piscivorous mammals. We recommend using the river otter for the piscivorous mammal receptor. The river otter's diet consists almost exclusively of fish. However, only about 3% of the raccoon's diet actually includes fish and only about 12% of the diet includes aquatic species (e.g., crayfish) (USEPA, 1993). Therefore, the river otter is more representative of a piscivorous mammal than a raccoon, which is usually considered omnivorous.

34. Aquatic organisms often ingest soil invertebrates. Therefore, ingestion of food from sediment should be identified as a complete exposure pathway for aquatic organisms in the ecological conceptual site model (Figure 8-2).

35. Region 4 soil screening values for ecological risk assessment were updated in 2015 (USEPA, 2015). Table 8-2 (ecological soil screening criteria) of the document utilizes the previous Region 4 soil screening values developed in 2001. The proposed Region 4 criteria should be updated to reflect current values. This is a concern for the plant screening value for acenaphthene (proposed = 20,000 mg/kg, Region 4 criteria = 250 mg/kg) and the soil invertebrate screening value for pyrene (proposed = 34,000 mg/kg, Region 4 criteria = 10,000 mg/kg). These criteria indicate acenaphthene is a COPEC for plants at UXO 1 fairway and wooded EUs and at UXO 3 in the wooded EU. Pyrene is a COPEC for soil invertebrates at UXO 1 in the fairway EU.

36. Risk to aquatic organisms was evaluated by comparing surface water concentrations in UXO 1 to the National Recommended Water Quality Criteria (NRWQC) and USEPA Region 4 surface water screening values from 2001. The State of Florida has promulgated surface water criteria in Chapters 62-302 and 62-777, FAC. Based on the FDEP surface water criteria, total PAHs are a COPEC in surface water at UXO 1. However, as stated above, we agree that the exceedances are likely a result of suspended sediment or particulate material in surface water.

37. Lowest observed adverse effect level (LOAEL) toxicity reference values (TRVs) were calculated as the geometric mean of growth and reproduction LOAELs from the Eco SSL documents. Although no standard methodology exists for calculating LOAELs, a geometric mean LOAEL is an estimate of the central tendency of effect levels. Consequently, the proposed LOAELs are not

protective of approximately half of the more sensitive species and effects. In estimating a LOAEL, the most defensible approach is to use the lowest bounded LOAEL (for reproduction, growth, and survival) above the no observed adverse effect level (NOAEL).

Chemical	Species	Proposed LOAEL (mg/kg)	Recommended LOAEL (mg/kg)
LMW PAHs	Mammal	356	110
HMW PAHs	Mammal	38.4	3.07
Antimony	Mammal	2.76	0.59
Arsenic	Mammal	4.55	1.66
Copper	Mammal	82.7	6.79
Copper	Bird	34.87	4.68
Lead	Mammal	186.4	5.0
Lead	Bird	44.63	1.94
Zinc	Mammal	297.58	75.9
Zinc	Bird	171.44	66.5

38. In Appendix H, Table 5 and in the ecological risk assessment, a default bioaccumulation factor (BAF) of 1 was used when a BAF could not be located. A sediment invertebrate BAF of 1 was used for antimony in the assessment. However, a sediment invertebrate BAF of 7 is available in the USEPA Screening Level Ecological Risk Assessment Protocol, Appendix C (USEPA, 1999). This value should be incorporated in the risk assessment.

39. COPECs for soil invertebrates in the UXO 1 fairway (lead), UXO 1 wooded EU (arsenic, copper, zinc), and UXO 3 wooded EU (copper, zinc, lead) and for terrestrial plants in the UXO 1 wooded EU (arsenic, copper, zinc) and the UXO 3 wooded EU (antimony, copper, zinc) were eliminated from concern because they had infrequent exceedances of ecological criteria and were not risk drivers at the site. COPECs that exceed screening criteria should not be eliminated based on a qualitative statement regarding frequency of exceedances at the site. Quantitative methods, such as calculating average concentrations of the contaminants over appropriately sized EUs, should be used to eliminate COPECs.

40. Section 8.5.3.1 states six PAHs exceed their Region 4 terrestrial plant soil screening level of 100 μg/kg in the UXO 1 fairway; however the basis for the screening level is unknown. Therefore, concentrations were compared to an EC_{50} for plants of 30,000 μg/kg listed in the Eco SSL document for PAHs. Because none of the individual PAHs exceed this value, all six PAHs were eliminated as COPECs. As stated above, the Eco SSL documents evaluate toxicity for the total concentration of PAHs in two groups – low and high molecular weight PAHs. At sample X1SS0390624, the total concentration of HMW PAHs is 83,3000 μg/kg. This exceeds the Eco SSL EC_{50} for plants,

suggesting PAHs should not be eliminated as a COPEC for plants in the UXO 1 fairway.

Editorial comments

41. In this document, fluoranthene was categorized as a LMW PAH. The USEPA Eco SSLs categorize fluoranthene as a LMW PAH. However, Region 4 categorizes fluoranthene as a HMW PAH. They are categorized differently between the two agencies because they use different properties to define "low" and "high" molecular weight. The USEPA determines a HMW or LMW PAH based on similar chemical/physical properties while Region 4 uses the number of rings to categorize the chemicals (4 rings or greater are defined as HMW PAHs). Fluoranthene is the only PAH for which the categories differ. For the purposes of this document the grouping of this chemical does not matter as long as it is consistent throughout the assessment.

42. In Table 5-7 (human health criteria exceedances in subsurface soil for UXO 1), residential and industrial SCTLs for acenaphthylene were transcribed incorrectly. They should be 1,800,000 μg/kg for residential and 20,000,000 μg/kg for industrial exposure. This does not alter the conclusion that acenaphthylene is not a COPC in subsurface soil at UXO 1.

43. In Table 5-27 (surface soil samples at UXO 1) the asterisk (*) should be removed from cPAHs on sample JAX-22-SS023-0006 since it does round up to 0.2 mg/kg, which exceeds the screening level of 0.1 mg/kg BaP-Eq.

44. Section 7.3.2 states the risk assessment assumes 1 hour on each UXO fairway and 0.25 hours in each UXO wooded area. This results in a total of 1.25 hours at each site. However, Table 7-33 lists 1 hour exposure time at each site. Although the difference in these values will not significantly change the risk calculations, the values should be reconciled in the report.

45. Tables G-10C and G-10R list zero as the EPC for metals. This is incorrect. Because metals were not analyzed greater than 2 ft bgs in the UXO 1 wooded area, the concentration should be designated as "not analyzed (NA)", not zero.

46. Section 6.2.1 states that elevated PAH concentrations in drainageway (surface) sediments were generally detected at lower concentrations than in surface and subsurface soils, indicating PAHs are not readily leaching into drainageway (surface) sediment. This statement appears to contradict Section 6.4 (contaminant fate and transport summary), which states that the presence of higher concentrations of PAHs in the drainageway (surface) sediment indicates that lateral migration is occurring at the site.

47. In Appendix H, Table 1, the TRVs do not have units. They should be in mg/kg.

48. In Appendix H, Table 3, the average home range of a great blue heron was left blank. The Wildlife Exposure Factors Handbook (USEPA, 1993) lists the average size of a great blue heron foraging range as 5 km and the average size of the feeding territory as 11 acres (4.5 hectares).

As requested, we have reviewed the reference citations, tables, figures, Table of Contents, List of Tables, and List of Figures for accuracy. All of these elements were correctly represented in the document. Typographical, formatting, or other editorial errors (if any) were noted above. Conclusions and recommendations were inherent in the document and are addressed in the above comments. Please let us know if you have any questions regarding this review.

Sincerely,

Leah D. Stuchal, Ph.D.

Hannah M. Neeley, MPH

Stephen M. Roberts, Ph.D.

References:

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