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January 31, 2014

DCN: NMED-2014-01

Mr. David Cobrain
New Mexico Environment Department (NMED)
Hazardous Waste Bureau
2905 Rodeo Park Dr. E/Bldg 1
Santa Fe, NM 87505

RE: Draft Technical Review Comments on Attachments G and H of the Class 3 Permit Modification Request for Addition of an Open Burning Unit at Technical Area (TA) 16 to the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit, dated September 2013.

Dear Mr. Cobrain:

Attached please find the draft technical review comments on the "Class 3 Permit Modification Request for Addition of an Open Burning Unit at Technical Area (TA) 16 to the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit, dated September 2013." As requested in an email dated 11/13/2013 from Mr. Timothy Hall (NMED), this review was to focus on the air dispersion modeling and risk assessment contained within Attachments G and H of the permit modification request.

Based on the technical review, it is not clear that LANL considered the results of previous air modeling and risk-based screening analyses performed by NMED in completing the analyses described in Attachment G. LANL did not identify emission factors for dioxins and furans due to the elevated processing temperature at the TA-16-388 Flash Pad; thus, the air modeling analysis and the screening analysis in Attachment G do not address dioxins and furans. However, the risk assessment included in Attachment H clearly shows that dioxins and furans remain an issue for the TA-16 Burn Ground, including the flash pad.

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If you or any of your staff have questions, please contact me at (801) 451-2864 or via email at paigewalton@msn.com.

Thank you,

Paige Walton

Paige Walton
AQS Senior Scientist and Project Manager

Enclosure

cc: Timothy Hall, NMED (electronic)
Mike Smith, AQS (electronic)
Joel Workman, AQS (electronic)

Draft Technical Review Comments on the Class 3 Permit Modification Request for Addition of an Open Burning Unit at Technical Area (TA) 16 to the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit
Dated September 2013

Attachment G: Screening Level Air Modeling Analysis and Risk Evaluation for Open Burning Operations for Los Alamos National Laboratory
LA-UR-13-24178

SPECIFIC COMMENTS

1. Section 1.1, Description of Open Burning Unit, page 1. Note that simulating a 30-minute burn in the air modeling analysis, as mentioned in Section 1.1 (page1) and listed in Table 2-1 (page 7), will result in a permit condition that limits burn times to 30 minutes. If burns occur that are in excess of 30 minutes, a longer burn time should be modeled.

2. Section 1.2, Waste Treated through Open Burning, page 1. In the discussion entitled Explosives Machining Waste, LANL indicates that approximately one-third (1/3) of this waste stream is water. The last paragraph of Section 1.2 (page 2) states that explosives machining waste represent up to 95% of the waste treated annually at the TA-16-388 Flash Pad. Based on the information contained in Attachment G, Screening Level Air Modeling Analysis and Risk Evaluation for Open Burning Operations for Los Alamos National Laboratory, LA-UR-13-24178 (Attachment G), it is not clear how the presence of the water was incorporated into the air dispersion modeling. Revise this discussion to provide additional details regarding the water in this waste stream. Indicate the amount of water in the waste stream when treated and demonstrate the amount of energy required to evaporate the water during treatment. In addition, indicate if the energy required to evaporate the water was subtracted from the heat content used in the air modeling analysis. If not subtracted, the impact of the water on the air modeling results should be identified and discussed as a source of uncertainty in the air dispersion modeling analysis.

3. Section 1.3, Typical Open Burning Treatment Operations Compared to Modeled Parameters, page 3. The next to last paragraph of Section 1.3 states "Modeling of air impacts assumed that the unit conducted treatment operations for a full hour..." However, Table 2-1 (page 7) and the Open Burn Open Detonation Model (OBODM) output files submitted to NMED as part of Attachment G indicate a burn time of about 30 minutes. It is not clear if the one-hour time period noted in Section 1.3 includes preparation time (Section 2.6 does state that due to preparation time, only one burn per hour can be conducted). Review the next to last paragraph of Section 1.3 and revise the text for consistency and accuracy with Attachment G and the submitted OBODM files. State that preparation time is included in the one-hour time period noted in the quoted statement if, in fact, this is the case.

4. Section 2.2, Methodology Steps, pages 6 and 7. Pages 6 and 7 present a numbered list (1 through 8) of the steps comprising the methodology followed in the air dispersion modeling

analysis. Item 8 indicates calculated ground level concentrations (GLCs) were compared to ambient air quality standards and risk screening values for soil. Although not mentioned in Item 8, screening was also performed for air. Revise Item 8 to indicate that GLCs were compared to ambient air quality standards and risk-based screening values for soil and air.

5. Section 2.3, Model Input Values, page 7. As discussed in Section 2.3 and listed in Table 2-1, LANL used a heat content of 11,893 calories per gram (cal/g) for propane in the air dispersion modeling analysis. This value was taken from Appendix A, Miscellaneous Data and Conversion Factors, of EPA's AP-42 and compares well with the 11,986 cal/g (obtained from the 1977 ASHRAE Handbook of Fundamentals) identified in the NMED air dispersion modeling and risk-based screening analysis of the TA-16-388 Flash Pad. However, OBODM model developers have indicated that OBODM predicts plume rises closer to the observed plume rise from open burns when the theoretical heat content is reduced by about 50% (White, 1998). The model developers indicated further that the heat content values for open burns in the OBODM database include this reduction (White, 1998). A factor of 50% was applied in the NMED air dispersion modeling resulting in a heat content of approximately 6,000 cal/g for propane and a total heat content for open burning operations of about 7,000 cal/g. While LANL has used the "reduced" heat content from the OBODM data base for the explosives to be treated, no reduction has been applied to the maximum available heat content for propane. The impact of this approach on the air dispersion modeling results should be identified and discussed as a source of uncertainty in Attachment G. Revise Attachment G to include a qualitative assessment of the impact that using the maximum heat content for propane has on predicted plume rise and the air modeling results. As part of the assessment, identify potential loss mechanisms in converting the maximum heat content of the propane into the energy available for the actual burning process. If conversion efficiencies or application-specific efficiencies are available (e.g., measured, calculated, or manufacturer's specification), they should be included in the discussion.

6. Section 2.3, Model Input Values, page 7. Section 2.3 indicates a release height of 0.5 meters was used in the air dispersion modeling analysis. However, the basis for specifying this value is not provided. Revise Section 2.3 to provide the basis for specifying a release height of 0.5 meters.

7. Section 2.4, Meteorological Data, page 8. The text on page 8 indicates the same meteorological data set used in previous air dispersion modeling performed by NMED was used in the present air dispersion modeling analysis. Ensure an electronic copy of the model-ready meteorological data file, LOSAL95.is2, has been submitted to NMED as part of Attachment G.

8. Section 2.6, Model Methodology Description, page 10. The text on page 10 indicates an hourly source strength file was used in modeling the maximum one-hour concentrations and a separate hourly source strength file was used in modeling the maximum annual air concentrations. Ensure electronic copies of these files (src388H.txt and src388A.txt for

hourly and annual air concentrations, respectively) have been submitted to NMED as part of Attachment G.

9. Section 3.2, Emission Factors for Combustible Solids, pages 16 and 17. Based on NMED's present level of knowledge of the combustible solids contaminated by explosives at LANL, it is not clear why emission factors for the burning of aluminized ammonium perchlorate propellant manufacturing waste surrogate (manufacturing waste) were not proposed as surrogates for this waste stream. The first paragraph of Section 3.2 indicates the diesel and dunnage surrogate waste emission factors listed in Volume 1 of the OBODM Users Guide were used to represent the emissions from treatment of explosives-contaminated combustible debris. The second paragraph of Section 3.2 indicates that manufacturing waste may appear to be a better fit but LANL does not treat aluminized ammonium perchlorate by open burning, and issues with the BangBox testing of the manufacturing waste preclude its use for any waste stream treated by open burning at LANL.

   A comparison of the emission factors listed in Volume 1 of the OBODM Users Guide for manufacturing waste and the emission factors listed in Table 3-1, Emission Factors by surrogate Waste Streams and Combined Waste Stream, indicates that except for dioxin/furan isomers, potentially emitted constituents are fairly well represented in Table 3-1.

   The last paragraph of Section 3.2 discusses the potential for dioxin/furan formation during open burning of the explosives-contaminated combustible debris waste stream. The text indicates dioxin/furan formation requires relatively low temperature (compared to the process temperature at the TA-16-388 Flash Pad), long residence time (numerous seconds), the presence of chlorine and organic materials, and a metal to serve as a catalyst. LANL concludes that dioxin/furan formation is unlikely given the burn temperatures maintained during open burning at the TA-16-388 Flash Pad.

   An examination of Table 3-1 indicates that chlorine and organic materials as well as metals are present in the waste emissions. In addition, a burn duration of 1800 seconds (30 minutes) is assumed in the air dispersion modeling analysis. Further, air dispersion modeling performed by NMED showed that dioxin/furan TEQ was a potential issue close to the location of the flash pad. The presence of dioxins and furans in areas close to the flash pad was subsequently confirmed by soil sampling.

   Based on the available information, it appears the dioxin/furan emission factors cited in Appendix D of *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)* should be added to the list of emission factors in Table 3-1 so that the potential for impacts from dioxin/furan TEQ emissions can be assessed for soil. Revise Section 3.2 (and Table 3-1) to address this issue.

10. Section 3.3, Emission Factors for Open Burning of Liquids, page 17. The first paragraph of Section 3.3 indicates the only solvent to be treated at the TA-16-388 Flash Pad is dimethyl sulfoxide (DMSO) that contains at least 25 percent dissolved explosives. However, the

second paragraph states that no emission factors for DMSO were incorporated into the assessment because this waste stream is "treated infrequently." It is not clear why the emission factor for DMSO used in the air dispersion analysis performed by NMED (5.34E-05) was not used in the current assessment. Revise Section 3.3 (and Table 3-1) to include the emission factor for DMSO used in the air dispersion and risk-based screening analysis performed by NMED or provide additional lines of evidence to support the exclusion of DMSO from the current assessment.

11. Section 4.2, Toxic Air Pollutant Screening Levels, page 24. The first bulleted item in Section 4.2 indicates that the cancer-based Regional Screening Levels (RSLs) were adjusted to a target risk of $1x10^{-5}$. Attachment G does not include a description of how the adjustment was made. Revise Section 4.2 to include an example calculation to illustrate how the cancer-based RSLs were adjusted to a target risk of $1x10^{-5}$.

12. Section 5.0, Results, page 30. Page 30 presents the equations used by LANL to convert deposition values obtained from the air modeling analysis into soil concentrations. The equations were taken from *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (Hot Spots Guidance Manual). It is not clear why this reference was used instead of EPA's 2005 *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (HHRAP) as the HHRAP includes algorithms for calculating soil concentrations from deposition modeling results. Equation 5-1c in the HHRAP (Section 5.2.1, Calculating Cumulative Soil Concentration, p. 5-6) is similar but not identical to the equation used by LANL. Revise Section 5.0 of Attachment G to explain why soil concentrations were calculated using the approach presented in the Hot Spots Guidance Manual rather than the approach presented in EPA's HHRAP. In addition, discuss the impact that using the equations from the Hot Spots Guidance Manual rather than the approach presented in the HHRAP has on the estimated soil concentrations.

13. Section 5.0, Results, page 30. Page 30 indicates that the soil loss constant, Ks, was assumed equal to $6.93x10^{-9}$. Examination of the Hot Spots Guidance Manual indicates this value is appropriate for metals but not for semi-volatile organic compounds (SVOCs) or polycyclic aromatic hydrocarbons (PAHs) that are emitted in both vapor and particulate phases. Revise the calculation of soil concentrations for SVOCs and PAHs to use Formula 5.3.2 D (p. 5-6 of the Hot Spots Guidance Manual) for calculating the value of Ks. The calculation should be based on the values of Soil Half Life, $t_{1/2}$, recommended in Table 5.3 (p. 5-14) of the Hot Spots Guidance Manual.

14. Section 5.0 Results, Table 5-2, Health and Ecological Screening Level Comparisons, pages 32 through 34. The following screening levels presented in Table 4-1 are inconsistent with the values listed in the cited sources and/or the values are missing:

    - Human health soil screening level for benzo(b)fluoranthene,
    - Ecological screening level for methylene chloride,
    - Acute and chronic air screening levels for dibenz(a,h)anthracene,

- Acute air limit for dimethyl phthalate,
- Human health soil screening level for n-pentane,
- Acute air limit for 2,3,7,8-tetrachlorodibenzodioxin,
- Chronic air screening level for phenol,
- Human health soil screening level for propene, and
- Acute air limit for vinylidene chloride.

The screening levels presented in Table 4-1 and subsequently utilized for screening in Table 5-2 must be consistent with the values listed in the sources cited. It appears that RSLs from 2011 were applied if New Mexico Screening Levels were not available. As this permit modification request is dated September 2013, more recent RSLs (several updates were made in 2012 and 2013) should have been used. In addition, it was noted that the RSLs listed in Table 4-1 of Attachment G are from 2012. In addition, to correcting inconsistencies with the ecological screening levels listed in Tables 4-1 and 5-2, revise the tables to reflect EPA's current RSLs (e.g., May 2013). Ensure that the listed RSLs are consistent with those presented in the rest of the permit modification request (e.g., Attachment H).

15. Section 5.0 Results, Table 5-2, page 34. It is noted that the endnotes to Table 5-2 indicate ecological screening levels as being taken from the ECORISK database version 3.0 (2011). However, the ecological risk assessment data referenced in Table 4-1 of Attachment G is identified as being taken from ECORISK version 3.1 (2012). Revise Table 5-2 to include the more recent data as contained in ECORISK version 3.1.

16. Section 5.0, Results, pages 29 through 34. A qualitative presentation of chronic risk is provided in Table 5-2; this assessment consists of a comparison of chemical-specific predicted concentrations to corresponding screening levels. Although the results of the air modeling analysis were compared to applicable risk-based screening levels, a quantitative assessment showing the cumulative chronic risks and hazards based on the modeling results has not been provided. While annual compliance soil sampling will be required each year during operations to assess current risks and determine if corrective action is required, EPA's *Draft Final Open Burning/Open Detonation Permitting Guidelines* clearly states that air dispersion modeling results and soil deposition modeling results should facilitate human health and ecological risk assessments and risk characterization for the purposes of permitting and assessing whether there are potential annual and long-term impacts to human health and the environment. Revise Section 5.0 to include calculations of risk/hazard for individual chemicals as well as cumulative risks and hazard indices for chronic exposure to predicted annual air and soil as well as 10-year soil concentrations. In addition, provide calculations of hazard quotients and indices for ecological impact based on the 10-year soil data.

17. Section 5.0, Results, pages 29 through 34. For acute hazards, the table includes 1-hour inhalation exposure concentrations (AIEC) for a qualitative comparison to the predicted 1-hour air concentrations. EPA's HHRAP provides that the potential for adverse health effects

from acute exposure to COPC-specific emissions be determined through calculation of the acute hazard quotient (refer to Chapter 7 of the HHRP) and that hazard quotients are summed for individual chemicals if they have similar effects. Revise this section to include calculation of acute hazard quotients and indices as appropriate.

18. Section 5.1, Discussion of Results, page 35. Section 5.1 indicates that the air and soil concentrations estimated in LANL's air modeling analysis are below all human health and ecological screening levels. NMED's air modeling and risk-based screening analysis found a significant concern for ecological receptors at Universal Transverse Mercator (UTM) coordinates 379780 easting and 3967920 northing (datum NAD83). The NMED analysis predicted a unitized air concentration of 1.13 micrograms per cubic meter ($\mu g/m^3$) per gram per second at this location. LANL indicates that the maximum GLC occurs on LANL property but does not identify the location in UTM coordinates or provide the value of the air modeling result predicted for this location. Thus, it is unclear if the air modeling analysis performed by LANL has addressed the concern for ecological receptors identified in the NMED analysis. Revise Section 5.1 to include the UTM coordinates and the predicted air modeling result for the location of the maximum GLC identified in LANL's air modeling analysis. Discuss the results in relation to those obtained by NMED to demonstrate that the concern for ecological receptors stemming from the NMED analysis has been adequately addressed in the LANL air dispersion modeling analysis.

18. Section 6.0, References, pages 36 and 37. *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (CA OEHHA, 2003) is not listed in Section 6.0 although it is referenced on page 30 of Attachment G. Revise the reference list to include this document.

Attachment H, Technical Area 16 Burn Ground Human Health and Ecological Screening Assessments

GENERAL COMMENTS

1. Exposures to constituents of potential concern (COPCs) by human and ecological receptors were considered at TA-16 by: 1) conducting baseline human health and ecological risk assessments from exposure to current levels of COPCs in soil at the TA-16 Burn Ground (Attachment H) and around the TA-16-388 flash pad; and 2) comparing future modeled/predictive soil and air concentrations of contaminants related to proposed open burn (OB) operations with corresponding screening levels (Attachment G). Once the TA-16-388 flash pad is permitted and operations resumed, human health and ecological receptors at the proposed OB unit and within the vicinity of the burn deposition area would not only be exposed to the predictive levels of contaminants (incremental annual air and soil concentrations) but the exposure would be an added exposure to the existing levels of contamination. The human health and ecological screening assessments must include a cumulative estimate of risks/hazards from exposure to all COPCs to include incremental risk above baseline levels due to future operations for both on-site and off-site (public) receptors. This is especially of concern since current residential risk estimates are at the NMED target level of 1E-5 and additional exposure to COPCs may pose unacceptable risks to ecological receptors.

   In addition, the assessment of risk to public receptors and off-LANL ecological risks for the first year of operation as well as for the chronic 10-year permit life has been the focus of concern from the public and private interest groups on previous permit applications for this site. Comments focused on whether there were any risks to receptors off post, and a general concern regarding whether there were ecological impacts from runoff and deposition to Fish Ladder Spring and other downgradient surface water locations.

2. The OBODM does not account for downwash or structural interference of emissions. As the current flash pad is structured (permit application Figure 3-2), there is a retaining wall around three sides of the flash pad and a retractable roof, both of which are open toward the northeast. It is likely that this retaining wall and the roof structure influence the dispersal of emissions and are potentially the reason for the high concentrations detected in soils to the northeast of the TA-16-388 Flash Pad. While the wind roses (permit application Figure 3-11) do show some daytime winds to the northeast, the predominant winds are to the north and northwest. Discuss the potential impacts of the retaining wall and retractable roof on emission deposition, specifically related to the hot spot (centered around sample RE16-12-17681) located to the northeast of the flash pad.

3. The baseline ecological risk assessment using the results of soil sampling shows potential for low to moderate risk to receptors. The risks are driven primarily by TCDD TEQs and a few metals (barium, cadmium and nickel). However, as discussed in the permit application, waste stream and system controls will be employed to minimize future deposition of dioxins

furans. In addition, Section 3.2 of Attachment G indicates dioxins and furans will not form during open burn operations at the flash pad because of the elevated processing temperature. However, the current level of risk appears to be driven by an area of localized elevated soil concentrations centered around sample location RE16-12-17681. If incremental risk is added to the baseline risk assessment, it is likely that the resulting assessment will show moderate to potentially high risk to ecological receptors. It may be warranted to conduct some localized removal of impacted soil to the northeast to reduce future risk to ecological receptors.

4. It is noted that if the TA-16-388 Flash Pad is permitted, the volume and type of waste streams will be decreased compared to past operations and donor material (fuel) will be cleaner burning (propane versus kerosene). These changes will result in changes in chemical emissions and subsequently changes in the amount and types of chemicals ultimately deposited on soil. It is recommended that if the unit is permitted, an aggressive soil monitoring program be put in place to evaluate annual conditions from operation of the TA-16 burn unit. An annual update to the human health and ecological risk assessments should be conducted using soil compliance data. In addition, a trend analysis is also recommended to see if there are detectable increases in soil concentrations and risk. It is also recommended that permit conditions allow for immediate termination of treatment operations the TA-16 burn unit by NMED and initiation of closure activities and corrective action in the event that compliance monitoring indicates increasing contaminant trends in soil and/or adverse impacts to human health or the environment.

SPECIFIC COMMENTS

1. Section 1.2.1, Sampling, page 6. Data from TA-16-399 (burn tray) were excluded from the risk assessment; these data included results for 2,3,7,8-tetrachlorodibenzodioxin (TCDD) equivalents, barium and silver. Unit 16-399 is located to the northeast of the flash pad, unit 16-388. In looking at the soil results from the 2009, 2012, and 2013 sample events that are included in the risk assessment for 16-388 (Figures 1.2-2 and 1.2-3), the highest concentrations of TCDD, barium and silver are to the northeast in the direction of unit 16-399. As such, there is some uncertainty whether potential soil contamination around 16-399 is due solely from past open burning processes at that unit or whether some of the soil concentrations are the result of operations from 16-388. It appears that wind does prevail in the northeast direction part of the time during day/operational hours; in addition, it is likely that the retaining wall around the flash pad which is open toward the northeast (permit application Figure 3.2) may influence deposition patterns from the open burning resulting in deposition closer in to the flash pad and to the northeast toward 16-399.

    a. Additional discussion is needed to justify exclusion of the data around 16-399 from the 16-388 risk assessment.

    b. Clarification is needed regarding which specific samples and sample locations are being excluded from the 16-388 risk assessment.

c. A figure is needed to display the excluded sampling locations and corresponding TCDD concentrations and illustrates the spatial relationships between the excluded samples and the samples at TA-16-388.

d. It is noted that 16-399 is to be closed under interim status closure requirements. Clarify what area is being considered as 16-399 for closure (e.g., the fenced area around 16-399 or a larger area). Are impacts outside the fenced area to be addressed as part of 16-388? How are impacts between the two areas to be segregated and addressed during the 16-399 closure?

2. Section 1.2.1, Sampling, Figure 1.2-1. The mammalian toxicity equivalency concentration for dioxins/furans on Figure 1.2-1 at sample location WST16-13-29796 (1.15E-4 mg/kg) is inconsistent with the value of 4.62E-5 mg/kg for this same sample location in Tables 1.3-2 and 1.3-4. Revise the figure to ensure consistency between the values listed on the figure versus the values listed in the tables.

3. Section 1.2.1, Sampling, Figure 1.2-1 and Table 1.2-1. The 2009 sample identification numbers shown on Figure 1.2-1 do not match the sample identification numbers listed on Table 1.2-1 (the last numbers are off by 1). In addition, Figures 1.2-1 and 1.2-2 have different sample identification numbers for the 2009 locations for what appears to be the same locations. Revise Table 1.2-1 and/or all of the figures presented in Attachment H to ensure consistency between all sample identification numbers and sample locations.

4. Section 1.2.1, Sampling, page 6. Bis(2-ethylhexyl)phthalate and hexahydro-1,3,5-triazine (RDX) are also stated as being excluded from the 16-388 risk assessment with the rationale they were not detected in the area around the 16-388 flash pad unit. Attachment H indicates that RDX has been and is to be treated at 16-388. Further the 2012 sample data showed bis(2-ethylhexyl)phthalate and RDX detected at sample location RE16-12-17679 (of which dioxin/furan data from this same location have been included in the risk assessment as part of the burn area, refer to Attachment 2 of Attachment H) and both constituents were retained as constituents of potential concern (COPCs) for the industrial and residential screening (Tables 2.1-4 and 2.1-8) as well as the ecological risk assessment. Please clarify the text with regard to this issue.

   If RDX is being retained for conservatism, information that shows energetic components, such as residual RDX, are completely destroyed during the treatment process (e.g, analysis of BangBox data) and would not be present from burn operations in the flash pan should be provided and addressed in the uncertainties.

5. Section 1.2.3, Evaluation of Organic Chemicals. Figure 1.2-4 indicates that soil concentrations with detected organics is to be provided; however, the figure itself shows the results for barium, silver and perchlorate identical to Figure 1.2-2. It appears Figure 1.2-4 is incorrect.

6. Section 1.3, Exposure Point Concentration Calculations, page 7. For determination of risk, the TA-16 area was divided into two specific subareas: the burn ground and 16-388. Exposure point calculations (EPCs) were determined for both of these two subareas. It is not clear from the figures or tables provided what is considered the burn ground versus the 16-388 unit. The tables associated with Section 1 list all the data as burn area and there is no differentiation to indicate which samples are considered part of 16-388. Further, the ProUCL files segregate the data but there are no sample numbers to coordinate locations of the results. Provide a map (or revise Figure 1.2-1) to clearly show the delineation between these two subareas and to also show which samples are being considered as associated with each subarea. Also, provide tables that display: 1) inorganic chemicals detected or detected above background at Unit TA-16-388, and 2) organic chemicals other than dioxins/furans detected at Unit TA-16-388.

   In addition, it appears that some of the dioxin furan data associated with the hotspot to the northeast of the flash pad (samples associated with RE16-12-17681) were included in the EPC for the 16-388 subarea but none of the follow up sampling conducted to define this hot spot was included. For example, in reviewing the data included in the ProUCL files for determination of the EPC, it does not appear that results for WST16-13-29796, WST16-13-299794, or WST16-13-29798 were considered part of 16-388. Clarify why these samples were not considered part of 16-338 and provide clarification as to how the samples were determined to be associated with which subarea.

7. Section 1.3, Exposure Point Concentration Calculations, Tables 1.3-2 and 1.3-4. It appears that an incorrect toxicity equivalency factor (TEF) was used to calculate mammalian toxicity equivalency for 1,2,3,7,8-pentachlorodibenzofuran in Tables 1.3-2 and 1.3-4. It is noted that the values presented (based on a TEF of 0.3 rather than 0.03) are more conservative and would not affect the results of the risk assessment but for consistency and defensibility of data, please revise accordingly.

8. Section 1.3, Exposure Point Concentration Calculations, Tables 1.3-3 and 1.3-5. The avian toxicity equivalency concentration for sample location WST16-13-29799 (5.53E-6 mg/kg) appears to be incorrect. If all the congener specific toxicity equivalencies shown on Tables 1.3-3 and 1.3-5 for WST16-13-29799 are added, a sum of 5.20E-6 mg/kg is returned. It was also noted that the ProUCL input data (Attachment 2) listed the correct value of 5.20E-6 mg/kg and not the incorrect value of 5.53E-6 mg/kg for both the Burn Area and Unit 16-388. Revise Tables 1.3-3 and 1.3-5 to display the correct toxicity equivalency concentrations.

9. Section 1.3, Exposure Point Concentration Calculations, Table 1.3-4. The mammalian dioxin/furan toxicity equivalency concentration listed in Table 1.3-4 for sample location RE16-12-17681 (3.00E-4 mg/kg) is slightly different than the toxicity equivalency values listed in Table 1.3-2, Figure 1.2-3, and in the ProUCL input data (2.98E-4 mg/kg). It is noted that 2.98E-4 mg/kg can be rounded to 3.00E-4 and the difference is minor. However, to ensure consistency, revise Table 1.3-4 accordingly.

10. Section 1.3, Exposure Point Concentration Calculations, Table 1.3-4. The toxicity equivalency concentration for sample location WST16-13-29797 (1.70E-4 mg/kg) appears to be incorrect. If all the congener specific toxicity equivalencies shown on Table 1.3-4 for WST16-13-29797 are summed, a value of 2.39E-4 mg/kg is returned. Revise Table 1.3-4 and any subsequent calculations and tables or figures that may be affected.

11. Section 1.3, Exposure Point Concentration Calculations, page 7. For determination of the TEFs for dioxins and furans, the individual congener sample results were multiplied by an appropriate TEF and the results summed to derive a TCDD equivalent (TEQ) concentration. The TCDD equivalent concentrations were then used to estimate the 95% upper confidence level of the mean (UCL) using ProUCL (Attachment 2). However, for determination of the TCDD equivalents, if a datum for a specific congener in a given sample was non-detect, a value of zero was assumed. While the determination of the TCDD equivalent is not statistically derived, there is some potential for underestimation of the value through the assumption that non-detects are assigned a value of zero. Further, other States provide guidance on how to handle censored data in determination of the TEQ and application of zero for non-detects is only appropriate when the congener has not been detected anywhere on site (State of Washington: http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/clarification-memos/Dioxin-Furan-PCB%20Method%20Memo.pdf).

    The assumption of using a value of zero for non-detects is forward populated into ProUCL for the determination of the EPC. In ProUCL, use of simple substitution is not-recommended due to its poor performance and thus, ProUCL includes several parametric and non-parametric methods for evaluating non-detect data. While statistical determinations of the TCDD equivalents are not required, a discussion of the uncertainties and potential for underestimation of the TCDD equivalents and corresponding UCLs through use of assigning values of zero to non-detects is warranted.

    It is noted that while ProUCL version 5.0.00 is currently available, ProUCL version 4.1.00 was the most current version at the time of drafting of this document. ProUCL version 4.1.00 also recommends against use of simple substitution.

12. Section 2.1, Screening Evaluation, Tables 2.1-7 and 2.1-9. It appears that styrene was omitted from the residential screening evaluations for both the burn subarea and the 16-388 subarea. Since styrene is clearly identified as a residential COPC for both subareas, as noted in Tables 2.1-1 and 2.1-2, styrene should be included in Tables 2.1-7 and 2.1-9. Revise the tables accordingly.

13. Section 2.2.1, Data Evaluation, page 8. In reviewing the dioxin/furan data, it was noticed that several results for 1,2,3,4,6,7,8,9-octachlorodibenzodioxin (OCDD) were rejected. Discuss why these results were rejected and discuss whether there is any impact on data completeness and if sufficient data are available to define baseline levels in soil for OCDD.

14. Section 2.3, Interpretation, page 9. Since this risk assessment only addresses risk based on historic operations and does not include incremental risks as predicted by the air modeling for future or continued operations at 16-388, clarify the statement that there are no potential unacceptable human health risks based on past operations.

15. Section 3.1, Screening Evaluation, page 10. Bis(2-ethylhexyl)phthalate and RDX are stated as being excluded from the 16-388 ecological risk assessment with the rationale they were not detected in the area around the 16-388 flash pad unit. Clarity in the document is needed to discuss what criteria were used to delineate the two subareas (burn area and 16-388) and which data are associated with each subarea. In addition, as noted in previous comments, additional justification such as bang box data that show energetic components being completely destroyed during the treatment process or other supporting information that demonstrates residual RDX would not be present from burn operations in the flash pad should be provided and exclusion of bis(2-ethylhexyl) phthalate and RDX should be addressed in the uncertainties.

16. Section 3.2.3 Toxicity Values, page 11. Based on comments on the 2010 ecological risk assessment for this area, an analysis of the potential impacts of 2,3,7,8-TCDD on avian receptors was included. It is noted that avian risks are addressed herein using data obtained from version 2.0 of ECORisk, which have subsequently been removed from the database due to the high degree of uncertainty associated with the route of exposure used during testing to derive these values. Despite the uncertainties associated with the screening data, inclusion of the avian receptor is needed as the Mexican Spotted Owl is an engendered and threatened species; however, discuss whether any other literature reviews were conducted to assess whether there are more current and appropriate avian screening data for 2,3,7,8-TCDD. It may be helpful to provide a bounding assessment of risk using other available data and look at how other States are evaluating dioxins and furans (e.g., Washington's Department of Ecology).

17. Section 3.2.8, Small-Mammal Field Investigation, page 14. It is unclear how or why the results of contaminants in body tissue were compared to soil background levels. According to other studies by Fresquez (2011), there are no screening levels for chemicals in tissue of biota and thus if the biota (tissue) samples are higher than regional statistical reference levels (RSRLs), the chemical concentrations in soil (not tissue concentrations) are compared to ecological screening levels. Clarify the text as to why tissue/biota concentrations were compared to soil concentrations.

18. Section 3.2.8, Small-Mammal Field Investigation, page 14. It is noted that both of the animals tested for polychlorinated biphenyls (PCBs) had detections of PCBs. While the PCB concentrations were within the range of RSRLs for urban sites, the PCB detections raise a question as to whether nature and extent of potential contamination from historical operations is incomplete with respect to PCBs. Discuss the potential for PCBs to have been emitted from past operations of TA-16-388 and whether there is a data gap with respect to PCBs.

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