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AQS, Inc.
2112 Deer Run Drive
South Weber, Utah 84405

(801) 476-1365
www.aqsnet.com

October 10, 2011

DCN: NMED-2011-34

Mr. David Cobrain
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building One
Santa Fe, NM 87505

RE: Technical Review of Attachment E, Screening Level Air Modeling Analysis and Risk Evaluation for Open Detonation Operations for Los Alamos National Laboratory and Attachment G, Open Detonation Human-Health Risk Assessment, Los Alamos, New Mexico

Dear Mr. Cobrain:

Attached please find the technical review of Attachment E, Air Modeling Analysis and Risk Evaluation for Open Detonation Operations for Los Alamos National Laboratory and Attachment G, Open Detonation Human-Health Risk Assessment, for the open detonation operations at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico.

Several issues were identified during the technical review requiring additional consideration and analysis and/or additional information to provide a comprehensive and transparent analysis of potential impacts due to emissions from open detonation operations at LANL. These issues are:

- Not all constituents detected in soils and evaluated as part of the analysis of historical open detonation (OD) operations described in Attachment G were addressed in Attachment E. In fact, it appears the analysis of historical operations is completely independent of the analysis of current and future operations described in Appendix E. Among the chemicals detected in the vicinity of the OD units but not addressed in Attachment E are dioxin/furans. A general comment has been drafted instructing LANL to include all chemicals addressed in Attachment G in the analyses described in Attachment E.

- It is unclear if the emissions analysis performed for the OD units generated a "worst-case" suite of potentially emitted constituents as was generated for the analysis of the TA-16 Burn Ground. The list of emitted constituents reported in Attachment E appears limited, especially when many constituents detected in soils in the vicinity of both units were not included in the Attachment E analyses. A general comment has been included directing LANL to provide additional details regarding the emission analysis described in the text of Attachment E and tabulated in Attachment A.

- LANL presented arguments to exclude the metal compounds in wastes treated by OD from the air dispersion analysis, although the deposition of these compounds was evaluated. Further, LANL cited research performed at the Naval Air Warfare Center in China Lake as the basis for excluding dioxins/furans from the air modeling and risk-based screening analyses even though they were detected and evaluated in the screening analysis of soil concentrations stemming from historical OD operations. Specific comments were generated instructing LANL to provide

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additional information in support of the exclusion of metal compounds from the air dispersion analysis and to demonstrate that the air concentrations of particle-phase constituents (i.e., metals) do not pose a threat to off-site receptors. A separate specific comment directs LANL to provide additional information regarding the exclusion of dioxin/furans from the air modeling analysis. Further, the comment instructs LANL to include dioxin/furans in the air modeling and subsequent risk-based screening analyses unless adequate justification for their exclusion is provided.

- LANL indicates that liquid and wet hazardous explosive wastes and wastes from future remediation activities are or will be treated in the two OD units. Through a specific comment LANL has been asked to provide additional information characterizing these liquid and wet hazardous explosive wastes so it can be determined if open detonation is the appropriate treatment technology. A separate specific comment instructs LANL to indicate that treatment of wastes from remedial activities is not covered by the RCRA operating permit for the two OD units.

- LANL has not used OBODM to model deposition. Rather, a method outlined in *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* dated August 2003 prepared by the California Environmental Protection Agency has been used to estimate soil concentrations from modeled air concentrations. A general comment instructs LANL to demonstrate that the implemented method gives conservative results compared to deposition values determined through air deposition modeling.

- Because LANL excluded metal compounds from the air dispersion analysis, air concentrations for particle-phase constituents are not available for screening against risk-based inhalation criteria or comparison to air quality standards (e.g., the NAAQS for lead). LANL has been instructed to demonstrate that particle phase air concentrations do not produce negative health impacts to off-site receptors.

- As in the analysis of the TA-16 Burn Ground, LANL has used the meteorological data set from the TA-6 meteorological data tower in the air modeling effort. However, both the TA-36-8 OD Unit and the TA-39-6 Range are located in areas where the terrain likely influences local meteorological conditions. LANL has not addressed this situation; thus, the impact of using the TA-6 meteorological data on the air modeling results is currently unknown. A specific comment directs LANL to address the potential impact of using a meteorological data set in the air modeling analysis that does not adequately reflect meteorological conditions at the modeled source locations on the air modeling results as well as discuss the uncertainties associated with this approach.

These comments along with other general and specific comments generated to address additional issues identified during the technical review follow this letter.

Two other issues that NMED may wish to consider include:

- The drainage control features at TAs 36-8 and 39-6 are in place at each OD Unit to "prevent runoff of waste constituents from the unit to other areas of the facility or to the environment". These drainage control features are insufficient in fulfilling their purpose as they are located within the immediate vicinity of each OD Unit (i.e., within a few hundred feet as shown in Figures 2.14 and 2.15). The air dispersion modeling conducted and presented in Attachment E suggests that maximum ground level concentrations are predicted within a 1000 square meter grid of each OD Unit, and further ground level concentrations (albeit at lower levels) are predicted at

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public receptor sites off LANL property. More in-depth investigation on how OD treatment operations would impact surface water runoff and storm water long term at LANL, including all areas that may be affected by OD treatment operations (i.e., not only directly adjacent to the OD Unit), may be warranted.

- Past monitoring activities conducted for soil, groundwater, surface water, and ambient air are discussed in the permit modification request. However, no discussion is included of any future planned monitoring of environmental media that would directly be affected by OD treatment operations. It is suggested that the permit modification request include planned future sampling and monitoring of environmental media, and continued monitoring of potential risks/hazards to human and ecological receptors from exposure to COPCs directly related to the proposed OD treatment operations at TAs 36-8 and 39-6.

If you or any of your staff have questions or would like to discuss this technical review, please contact me at (801) 451-2864 or via email at paigewalton@msn.com.

Thank you,

Paige Walton

Paige Walton
AQS Senior Scientist and Program Manager

cc: John Kieling, NMED (electronic)
Steve Pullen, NMED (electronic)
Mike Smith, AQS (electronic)
Sunny McBride, AQS (electronic)
Joel Workman, AQS (electronic)

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TECHNICAL REVIEW COMMENTS
ATTACHMENT E SCREENING LEVEL AIR MODELING ANALYSIS AND RISK EVALUATION FOR OPEN DETONATION OPERATIONS FOR LOS ALAMOS NATIONAL LABORATORY
AND
ATTACHMENT G OPEN DETONATION HUMAN-HEALTH RISK ASSESSMENT LOS ALAMOS NATIONAL LABORATORY
JUNE 2011
LOS ALAMOS, NEW MEXICO

GENERAL COMMENTS

1. The analyses described in Attachment E, Screening Level Air Modeling Analysis and Risk Evaluation for Open Detonation Operations, do not appear to incorporate key information from historical operations at Technical Area (TA)-36-8 and TA-39-6. Among the chemicals of potential concern (COPCs) addressed in the risk assessment of historical operations described in Attachment G, Open Detonation Human-Health Risk Assessment, but not addressed in Attachment E for the TA-36-8 open detonation unit (TA-36-8 OD Unit) are 10 carcinogens including 2,3,7,8-TCDD, and 13 noncarcinogens. In addition, 2 carcinogenic COPCs and 6 noncarcinogenic COPCs evaluated in Attachment G were addressed for deposition only in Attachment E. For the TA-39-6 Range, it appears 6 carcinogens and 9 noncarcingens addressed in Attachment G were not assessed in Attachment E. Further, one carcinogen and 7 noncarcinogens (including lead) were evaluated for deposition (i.e., soil concentration) only in Attachment E. Neither Attachment E nor Attachment G includes a discussion explaining why all COPCs detected in soils and attributed to historical operation of the two open detonation units were not addressed in Attachment E. Revise Attachment E to include an evaluation of all COPCs addressed in Attachment G that are not addressed in the current air modeling analysis and screening analysis. Alternatively, provide multiple lines of evidence for not evaluating the excluded COPCs in Attachment E.

2. LANL proposed and NMED HWB implemented a "worst-case" analysis of potential emissions from treatment operations at the TA-16 Burn Ground. This approach called for development of a suite of "worst case" emission factors for chemicals potentially emitted from open burning operations, regardless of the waste stream being burned, so the permit would not limit the wastes that could be burned at TA-16 to only those demonstrated as protective in the risk-based screening analysis. It is not clear that the emission analysis performed for the TA-36-8 OD Unit and the TA-39 Range is compatible with the analysis performed for the TA-16 Burn Ground. While it is known that the emissions analysis for the open detonation (OD) sites and the TA-16 Burn Ground were based on historical operational records and the primary source for emission factors in both cases was the emission tests summarized in EPA's 1998 Mitchell and Suggs report, Section 3.0, Emission Factors, and Attachment A of Attachment E do not furnish the level of detail needed to determine if the emissions analysis reflects a "worst case" approach. For example, it is assumed that the "categories" alluded to in the last sentence of the first paragraph of Section 3.0 are delineated by the rows highlighted in yellow and pink in Attachment A as this is not explained in the text or table endnotes. Further, while the categories appear to be self-explanatory, it is unclear how the list of emission products associated with the explosive hazardous wastes and explosives-contaminated wastes historically treated at the OD sites was developed. In fact, it is not clear that any emission products for the solid and liquid wastes treated at the OD sites have been included. Finally, there is no discussion of how the listed emission factors were calculated or what the actual numerical values represent (e.g., average for all items/chemicals included in a category or maximum emission factor for all items in a category). This type of information is essential to understanding how the emission analysis was performed and if the emission products and emission factors are sufficient to

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demonstrate the protectiveness of open detonation operations at the TA-36-8 OD Unit and the TA-39-6 Range. Revise Section 3.0 to provide additional details regarding the emission analysis described in the text of Attachment E and tabulated in Attachment A. At a minimum, ensure that all issues and concerns discussed above are addressed in the added discussion. Further, demonstrate that the emission analysis does, in fact, represent worst-case conditions and is appropriate for demonstrating the protectiveness of OD operations at TA-36 and TA-39.

3. It is known that OBODM does not calculate gravitational deposition in complex terrain. Further, OBODM calculates only gravitational deposition and does not address other components of dry particle or vapor deposition, although Volume II of the OBODM User's Guide outlines an approach for estimating dry deposition outside of the model itself based on an assumed deposition velocity and dosages predicted by OBODM (Bjorklund *et.al*, 1998b). Because the OD sites at LANL (i.e., TA-36-8 OD Unit and the TA-39-6 Range) are located in complex terrain, the facility chose to determine deposition values using a methodology presented in *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* dated August 2003 prepared by the California Environmental Protection Agency (CALEPA). Thus the approach implemented in Attachment E does not reflect the approach used to characterize deposition in the Screening Level Air Modeling Analysis and Risk-Based Screening Analyses for the TA-16 Burn Ground. The approach is similar to that outlined in Section 1.1.6.3 of Volume II of the ISC User's Guide. While the ISC User's Guide states that the approach produces a conservative result when depletion is ignored, the depletion process and the conservatism inherent in the implemented approach to determine deposition are not addressed in Attachment E. Another level of conservatism can be introduced through specification of the particle deposition velocity labeled as "Dep-rate" in the CALEPA document. LANL has used the CALEPA recommended Dep-rate of 0.05 meters per second (m/sec) but has not discussed the level of conservatism this value represents when compared to the particle deposition velocities available in the scientific literature and, specifically, those for the emission products addressed in the air modeling analysis of the OD sites. Revise Attachment E to include a discussion of the conservatism in the implemented approach for determining deposition. The discussion is needed to document that the approach used in determining the deposition values produces conservative results when compared to obtaining these values from air deposition modeling. As part of the discussion, indicate if depletion was considered in calculating the deposition values and address the level of conservatism introduced through application of the CALEPA recommended value for Dep-rate.

4. Given the uncertainties associated with emissions, air modeling, and risk-based screening analyses for open detonation units, it is important that the sources be identified and discussed. LANL has not included a discussion of uncertainties related to these analyses in Attachment E. For example, Attachment E does not identify any limitations or uncertainties associated with the method employed to estimate deposition to soil. Attachment E should identify all the components of dry deposition flux represented by the method extracted from the *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* and discuss the uncertainties introduced into the analysis. Revise Attachment E to include a discussion of the uncertainties associated with the emissions, air modeling, and risk-based screening analyses.

5. Although small mammal investigations (i.e., population investigation and uptake analysis) were conducted at the proposed OD Units at TAs 36-8 and 39-6 (Attachments H and I), risks/hazards to other ecological receptors found at these sites were not assessed. Include a baseline ecological risk assessment of potential risks/hazards to all potential ecological receptors from exposure to COPCs under current conditions at the proposed OD sites at TAs 36-8 and 39-6.

6. Exposure to COPCs by residential receptors were considered at TAs 36-8 and 39-6 by: 1) conducting a baseline human health risk assessment (HHRA) from exposure to current levels of COPCs at TAs 36-8 and 39-6 (Attachment G); and 2) comparing future modeled soil and air concentrations of

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contaminants related to proposed OD treatment operations with corresponding screening levels (Attachment E). After the occurrence of OD treatment operations, receptors at the proposed OD Units would be exposed to current levels of COPCs and future levels of contaminants (10-year soil concentrations). The HHRA must include a cumulative estimate of risks/hazards from exposure to all COPCs; current and future. Modify the HHRA to include an evaluation of the risks/hazards that current and future COPCs would pose for the receptors evaluated in the risk assessment. Determine if current conditions added together with future modeled conditions of soil would pose unacceptable risks/hazards for receptors evaluated in the HHRA.

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SPECIFIC COMMENTS

1. **Attachment E, Section 1.2, Description of the OD Unit and Operations, Page 1.** Section 1.2 provides a brief description of the characteristics of the area surrounding both the TA-36-8 OD Unit and the TA-39-6 Range. According to the text, a concave area is located in the western portion of the TA-36-8 OD Unit to minimize fragment dispersion. The discussion of the TA-39 area indicates it is located in a canyon bottom with steep canyon walls that rise to over 100 feet. Because these features may influence local meteorological conditions, it is important that stakeholders are aware of the location of additional discussion and depiction of the topography surrounding both OD units. Such information is not provided in Section 1.2 although additional descriptions and topographic maps (e.g., Figures 2.4, 2.6 and figures in Attachment B) are available in the Permit Modification Request and accompanying attachments. Revise Section 1.2 to include references to the locations of descriptions and maps of the topography surrounding the two OD units within the Permit Modification Request and accompanying attachments.

2. **Attachment E, Section 1.2, Waste Treated Through Open Detonation, Page 5.** The second paragraph of Section 1.2 indicates that liquid hazardous explosive waste may be treated at the OD units. Sections 2.4.1, Waste Description, of the Permit Modification Request also notes that liquid hazardous explosives may be open detonated. Further, Section 2.4.3, Verification Frequencies, states sampling is not usually conducted because formulations are "closely controlled and well known." Additional descriptions and/or characterizations of these liquid hazardous and wet explosives were not found in the Permit Modification Request. Additional information is needed to characterize these liquid and wet explosive wastes. Further, any special procedures followed when these wastes are detonated should be discussed. Depending on the amount of liquid present in these wastes, it may be necessary to include a liquid hazardous explosive waste stream in the air modeling analysis to demonstrate that treatment of such wastes by open detonation is protective of human health and the environment. Revise Section 1.2 to include additional information describing the liquid hazardous and wet explosives that may be treated by open detonation at LANL. Specifically identify the liquids present (e.g., water, solvent); provide a qualitative description of the level of moisture in the wastes (e.g., free standing liquids, slurry, saturated solid explosives); and estimate the moisture content of these wastes if possible. Further, provide the procedures followed in treating liquid and wet explosives in the OD Units. Finally, demonstrate that the liquid contained in this waste stream has no impact on the effective treatment of the waste stream and the dispersion and deposition of the emitted compounds. If such a demonstration cannot be made, revise the air modeling analysis to include detonation of a liquid hazardous explosive waste stream to illustrate that the treatment operation is protective of human health and the environment.

3. **Attachment E, Section 1.2, Waste Treated Through Open Detonation, Pages 5 and 6.** The last paragraph on Page 5 indicates that firing site debris is one possible component of the explosives-contaminated waste that can be treated in the OD Units. Further, the last sentence on Page 5 (and continuing onto Page 6) states that firing site debris could include corrective action wastes and wastes generated in future remedial investigations and remediation efforts. Treatment of these waste streams is beyond the scope of the RCRA operating permit. Under RCRA, these wastes could be treated in a Corrective Action Management Unit (CAMU). If the wastes are generated under CERCLA, a remedy should be selected as required by the CERCLA process. Regulatory actions involving the use of the TA-36-8 OD Unit and/or the TA-39-6 Range as CAMUs or CERCLA remedies should be addressed outside of the RCRA operating permit for these units. Revise Section 1.2 to remove the sentence at the bottom of Page 5 (and continued onto Page 6) regarding the potential treatment of corrective action wastes and wastes generated from future investigations and remedial efforts in TA-36-8 and the TA-39 Range.

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4. **Attachment E, Section 1.2, Waste Treated Through Open Detonation, Pages 5 and 6.** Section 1.2 provides a brief description of the types of wastes treated at the TA-36-8 OD Unit and the TA-39 Range. In general, the discussion lacks the level of detail needed to establish the basis for the emissions analysis described in Section 3.0, Emission Factors. Additional details are available in the text and tables referenced in Section 2.4.1, Waste Description, of the Permit Modification Request. Revise Section 1.2 of Attachment E to include a reference to Section 2.4.1 of the Permit Modification Request.

5. **Attachment E, Section 2.4, Meteorological Data, Page 8.** As noted in Section 2.4, the meteorological data set used in air modeling dispersion from open detonation operations is the same set that was used to model dispersion and deposition from the TA-16 Burn Grounds. However, the locations of the TA-36-8 OD Unit and the TA-39-6 Range may influence local meteorological conditions and produce different dispersion patterns than those predicted using the TA-6 meteorological tower data set. Section 2.4 does not present information that assists in characterizing the potential differences in dispersion if a meteorological data set based on local meteorological conditions had been used rather than the data set based on meteorological conditions measured at the TA-6 station tower or demonstrate that the TA-6 data set sufficiently represents local conditions for the purposes of air dispersion modeling. At a minimum, Section 2.4 should be revised to include the following information:

   - A wind rose for the TA-6 meteorological tower data set;
   - A reference to the discussion in Section 2.3.4.1, Meteorological Assessment and Potential Releases from the Open Detonation Units, of the Permit Modification Request;
   - A discussion comparing the meteorological conditions represented in the TA-6 meteorological tower data set to the meteorological conditions at the unit locations;
   - A comparison of the plume rise predicted by OBODM to the height of the canyon walls at the TA-39 Range;
   - A discussion of the land use and land cover surrounding the TA-6 meteorological tower, the TA-36-8 OD Unit, and the TA-39-6 Range focused on potential differences in surface roughness length for the three sites;
   - The ground elevation at the location of the TA-36-8 OD Unit, the TA-39-6 Range, and the TA-6 meteorological data tower;
   - A summary of any meteorological data (e.g., wind speed, wind direction, air temperature) collected at the OD units and a comparison of the conditions represented by that data to the conditions represented in the TA-6 meteorological tower data set; and
   - Any other information necessary to understand the uncertainty introduced into the air dispersion modeling by using the TA-6 data to represent local meteorological conditions.

6. **Attachment E, Section 2.5, Receptors, Page 8.** Table 2-2, Public Receptors, lists the easting and northing Universal Transverse Mercator (UTM) coordinates of the roadways, recreation areas, schools, hospitals, and tribal land addressed in the air dispersion modeling analysis. Because both OD units are located in areas of complex terrain, the z-coordinate (i.e., elevation) should also be presented in the table. Revise Table 2-2 to include the elevation for each public receptor location addressed in the air modeling analysis.

7. **Attachment E, Section 2.5, Receptors, Page 8.** Attachment E does not identify the datum on which the coordinate system used in the air dispersion modeling analysis is based. Revise Section 2.5 to indicate that locations were specified in UTM coordinates in the air dispersion modeling analysis and identify the datum on which the coordinates are based (e.g., NAD83).

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8. **Attachment E, Section 2.6, Model Methodology Description, Pages 11 and 12.** Section 2.6 references Table 2-3, Model Scenarios, for a summary of the four scenarios modeled in the air dispersion modeling analysis. The last column of Table 2-3 identifies the OBODM input and output file for each scenario by name. However, there is no indication that any of the air dispersion modeling files has been submitted to NMED HWB. Revise Section 2.6 to indicate that the OBODM input and output files along with the accompanying hourly source strength files, and the model-ready meteorological data file were submitted to NMED HWB in electronic format.

9. **Attachment E, Section 2.7, Model Results, Page 12.** Section 2.7 references Table 2-4, Maximum Ground Level Concentrations and Locations, for a listing of the maximum ground level concentrations predicted by OBODM for both OD sites. The last column of Table 2-4 lists the maximum ground level concentration from among all public receptors for the units and averaging periods listed in the far left-hand column. It is recommended that a column identifying the public receptor location exhibiting the highest ground level concentration be added to the table.

10. **Attachment E, Section 2.7, Model Results, Page 12.** No graphical depiction of the OBODM modeling results has been included in Attachment E. It is recommended that the locations exhibiting the highest ground level concentrations presented in Table 2-4 be plotted on site figures to provide stakeholders with a visual presentation of the air modeling results. Revise Attachment E to address this issue.

11. **Attachment E, Section 3.0, Emission Factors, Page 13.** The second paragraph of Section 3.0 discusses the results of research performed at the Naval Air Warfare Center at China Lake, California on the fate of metals during OD treatment operations. While the document describing this research is referenced, the actual document is not provided as part of Attachment E. The document or a reference to its location (e.g., the document was found at http://dodreports.com/pdf/ada433712.pdf) should be provided as it is used as technical support for excluding metals, including metal compounds contained in the explosives treated by open detonation, from the dispersion analysis (although they are addressed in the deposition analysis). Revise Attachment E to include the referenced research report, its location on the World Wide Web, and/or technical information that adequately supports the exclusion of metals, including metal compounds contained in detonated explosives, from the dispersion analysis.

12. **Attachment E, Section 3.0, Emission Factors, Page 13.** It is not clear why particle phase air concentrations have not been calculated in the air modeling analysis, especially for off-site receptors. While larger particles may deposit close to the source, smaller particles, especially metals in compounds that are constituents of the explosives and/or the explosives-contaminated solid and liquid waste streams, may remain in the air for some time before depositing to the surface. Revise Attachment E to demonstrate that particle phase air concentrations do not result in potential health impacts for off-site receptors. This demonstration should be based on the results of air dispersion modeling and subsequent health-based screening of the results or other lines of evidence that are not currently discussed in the second paragraph of Section 3.0.

13. **Attachment E, Section 3.0, Emission Factors, Page 13.** The last sentence in the second paragraph of Section 3.0 requires reference citations so all stakeholders can access the information needed to judge the validity of the assertions made concerning the emission factor for metal compounds and the exclusion of metal compounds from the air dispersion (i.e., air concentration) analysis. Revise Section 3.0 to include references to the documents that specify an emission factor of 2.6E0-01 for metal compounds in energetics and provide the technical justification for the exclusion of metal compounds from the air dispersion modeling analysis. Finally, specify the units for the emission factor provided in the last sentence (e.g., pound of compound emitted per pound of energetic treated).

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14. **Attachment E, Section 3.0, Emission Factors, Page 13.** The third paragraph of Section 3.0 discusses the results of research performed at the Naval Air Warfare Center at China Lake, California on the formation of dioxins during OD treatment operations. While the document describing this research is referenced, the actual document is not provided as part of Attachment E. Further, Attachment G, Open Detonation Human-Health Risk Assessment, indicates dioxins/furans were detected in the vicinity of the OD sites and these detections were evaluated as part of the risk assessment associated with historical open detonation operations. These detections are not mentioned in Attachment E. The discussion of dioxins/furans should be expanded to account for all information available including the detection of such compounds in the vicinity of the modeled OD sources. Revise Attachment E to include the referenced document as it is currently used as the sole technical support for excluding dioxins and furans from the air modeling analysis. In addition, discuss the detections of dioxin/furans in the vicinity of the modeled sources as well as any procedural changes or control measures implemented to minimize the deposition of dioxin/furans from current and future open detonations. If the protectiveness of human health and the environment cannot be demonstrated through a qualitative discussion, include dioxins/furans in the air modeling analysis and subsequent risk-based screening analyses.

15. **Attachment E, Section 3.0, Emission Factors, Page 13.** The last sentence in the third paragraph of Section 3.0 requires a reference to assist all stakeholders in locating information used in determining the validity of the assertion concerning the exclusion of dioxins/furans from the air modeling analysis. Revise Section 3.0 to include a reference to *Emissions from the Energetic Component of Energetic Wastes During Treatment by Open Detonation*, NAWCWD TP 8603, dated 2005.

16. **Attachment E, Section 3.0, Emission Factors, Pages 13 and 14.** The last paragraph of Section 3.0 indicates that emission factors for constituents other than those listed in Table 3-1, Emission Products and Emission Factors Used in Screening Analysis for OD Operations, were "...developed and have been used in the health screening analysis where practicable." It is not clear how these additional constituents were identified, how the emission factors were determined, why the constituents were not listed in Table 3-1, and what criteria were applied to determine if inclusion in the health screening analysis was "practicable." Revise Section 3.0 to provide additional information regarding constituents not included in Table 3-1 but included in the health screening analysis. Further, include these additional constituents in Table 3-1 or list them in a similar but separate table.

17. **Attachment E, Table 3-1, Emission Products and Emission Factors Used in Screening Analysis for OD Operations, Page 14.** The last column of Table 3-1 lists the units for the emission factors. However, the units should be more specifically identified. Revise the units to be more specific. Indicate if the denominator represents the total weight of explosive treated (lb emitted/lb of explosive treated) or represents the net explosive weight treated (lb emitted /lb of NEW treated).

18. **Attachment E, Section 5.0, Results, Page 15.** The fourth bulleted item in Section 5.0 indicates soil concentrations were calculated from deposition values and compared to NMED Human Health residential Soil Screening Levels (SSLs) and LANL-derived ecological screening levels (ESLs). While it is known that deposition values were not determined through air deposition modeling, the text of Attachment E does not explain how deposition values were estimated for use in calculating soil concentrations. Attachment B, EXCEL Tables Used for Modeling Results Evaluation, of Attachment E outlines the methodology and presents the equation used to calculate deposition values from an assumed value of deposition velocity and the air dispersion modeling results. Due to the importance of deposition in demonstrating the protectiveness of OD operations and the use of an approach that differs from the approach implemented in the screening level air modeling analysis and risk-based screening analyses performed for the TA-16 Burn Grounds, the methodology used in Attachment E should be presented and discussed within the main text. Revise Attachment E to include a detailed discussion addressing the methodology used to calculate deposition values for the

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OD units. The discussion should explain why this approach was used, and present the equations and assumed parameter values used in performing the calculation. Ensure the discussion is referenced to *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* and the document is listed in the References Section of Attachment E. In addition, the methodology for calculation of the 10-year soil concentration should be presented, discussed, and appropriately referenced within the main text of Attachment E.

19. **Attachment E, Section 5.0, Results, Page 16.** An examination of Tables 5-1 and 5-2 indicates that the air concentration for lead has not been compared to the quarterly National Ambient Air Quality Standard (NAAQS) of 0.15 $\mu g/m^3$. Revise Section 5.0 to demonstrate that the air concentration for lead emitted from each OD unit complies with the NAAQS of 0.15 $\mu g/m^3$ (rolling 3-month average).

20. **Attachment E. Tables 5.3 and 5.4, Pages 17 and 18**. Residential soil screening levels are inconsistent with those found in NMED (2009) or RSL (USEPA, 2011) tables (adjusted to 1E-5 risk level for carcinogens) for the following contaminants: ammonium perchlorate, nitrocellulose, nitroguanidine, nitromethane, acrylonitrile, dibutyl phthalate, dinitrotoluene, dioctyladiapate, dioctylphthalate, and diphenylamine. It appears that in some cases the industrial SSL was used, and also not adjusted to the risk level of 1E-5 for carcinogens. It is noted that the predicted concentrations of these contaminants would still be below the corrected soil screening levels and would not change the conclusions. However, modify Tables 5.3 and 5.4 and all subsequent tables that would be affected to display the correct SSLs. In addition, clarify the sources for the SSLs for bis(2-ethylhexyl)adipate and BDNPA, as there are no SSLs for these chemicals listed in NMED (2009) or the RSL (USEPA, 2011) table.

21. **Attachment G, Section 1.1, Conceptual Site Model, Page 1.** Section 1.1 does not discuss the potential uses of groundwater beneath the TA-36-8 OD Unit or the TA-39 Range. Thus, it is unclear if soil to groundwater migration should be assessed in the screening level risk analysis described in Attachment G. Revise Section 1.1 to discuss the potential use of groundwater from beneath the two OD sites so it can be determined if historical soil concentrations should be compared to soil-to-groundwater migration screening values. If the potential exists for groundwater exposure to occur, revise Attachment G to include such a comparison.

22. **Attachment G. Section 1.2.1 Sampling, Page 1.** The bulleted list indicates that high explosives were analyzed per methods SW-846-8321A and SW-846-8321A-MOD. As explosives are also measured by method SW-846-8330A, provide further clarification on methods SW-846-8321A and SW-846-8321A-MOD and the target analytes that are quantified via these methods.

23. **Attachment G, Section 1.2.2, Evaluation of Inorganic Chemicals, Page 2.** The second paragraph of the discussion entitled TA-36-8 indicates that the concentrations of 6 inorganic chemicals were statistically compared to background data. While the statistical tests and the test results are addressed in the discussion, no information on the background data is provided. Revise Section 1.2.2 to specify the locations from which background data were taken in relation to the TA-36-8 OD Unit and the TA-39-6 Range. In addition, state whether these locations were impacted by deposition from historical operation of the two OD units.

24. **Attachment G, Section 2.1, Screening Evaluation, Pages 3 and 4.** The last sentence on Page 3 and continuing on to Page 4 indicates that radionuclide exposure point concentrations (EPCs) were determined using Version 6.5 of LANL's residual radioactive (RESRAD) model. A reference, (LANL 2009), is cited for the model. However, this reference is not included in Section 4.0, References, of Attachment G. Further, there is no indication in Section 2.1 that the input and output files for the RESRAD modeling runs applicable to the Open Detonation Units Human Health Risk Assessment were (or will be) submitted to NMED. Revise Attachment G to include a bibliographic

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citation in Section 4.0 for the RESRAD model. Further, revise Section 2.1 to indicate that electronic copies of all RESRAD input and output files pertinent to the calculated radionuclide EPCs will be submitted to NMED HWB.

25. **Attachment G, Section 2.1, Screening Evaluation, Page 4.** The discussions entitled TA-36-8 and TA-39-6 on Page 4 refer to Tables 2.1-5 through 2.1-14 for the results of the screening evaluations. An EXCEL workbook was used to verify the entries for some of these tables. While no errors related to the results reported in the text were found, some errors were discovered in the COPC-specific cancer risks and hazard quotients listed in the tables (e.g., for Styrene, Table 2.1-11: hazard quotient listed as 7.6E-09 but calculated as 6.6E-09 by the workbook). Review all tables and ensure all entries are correct.

26. **Attachment G. Table 2.1-5, Page 13.** The industrial SSL for TATB listed on Table 2.1-5 (2700 mg/kg) is based on 1,3,5-trinitrobenzene and is inconsistent with the industrial SSL for 1,3,5-trinitrobenzene of 270,000 mg/kg (adjusted to a cancer risk level of 1E-5) listed on the regional screening level (RSL) table (USEPA, 2011). Although the SSL that was used is more conservative and correction would not affect the results of the risk assessment, modify Table 2.1-5 to include the correct industrial SSL for TATB.

27. **Attachment G. Table 2.1-11, Page 17**. Correct the typographical error on Table 2.1-11 which lists the industrial SSL for HMX (34300 mg/kg) to 34200 mg/kg per NMED (2009). It is noted that correction of the industrial SSL would not affect the results of the risk assessment.

28. **Attachment G. Table 2.1-12, Page 18**. Correct the typographical error on Table 2.1-12 which lists the residential SSL for 4-isopropyltoluene (3120 mg/kg) to 3210 mg/kg per NMED (2009). It is noted that correction of this residential SSL would not affect the results of the risk assessment.

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