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June 3, 2015

Heather L. Buono, Colonel
Commander, 27th Special Operations Mission Support Group
27 SOCES/CEIE – Environmental
402 S Chindit Blvd, Bldg 102
Cannon AFB, NM 88103

RE: SECOND DISAPPROVAL
REVISED FINAL RISK SCREENING EVALUATION FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 127, PETROLEUM, OIL, AND LUBRICANTS (POL) WASH PAD AT FACILITY 4095, NOVEMBER 2014
CANNON AIR FORCE BASE, NEW MEXICO
EPA ID # NM7572124454
HWB-CAFB-14-005

Dear Col. Buono:

The New Mexico Environment Department (NMED) has received Cannon Air Force Base's (Permittee) *Revised Final Risk Screening Evaluation for Solid Waste Management Unit (SWMU) 127, Petroleum, Oil, and Lubricants (POL) Wash Pad at Facility 4095* (Report), dated November 2014. NMED has reviewed the Report and hereby issues this second Disapproval. The Permittee must address the following comments.

General Comments:

1. **95% Upper Confidence Limit**

   It was noted that an estimate of the average concentration (i.e., 95% upper confidence limit [UCL]) for trichloroethene was used as an input concentration for estimating risks and hazards for vapor intrusion in the J&E model. Typically, maximum detected concentrations are appropriate for use in the Johnson and Ettinger (J&E) soil gas model. Due to a lack of written guidance on the appropriateness of using 95% UCLs for input concentrations in the soil-gas model, the U.S. EPA's EPA vapor intrusion support line was contacted (note: the name and location/State of the facility was not provided). The EPA concurred that there was insufficient justification to support the use of a 95% UCL for input concentrations in the J&E model and indicated that it was likely the vapor points have different spatial relationships with the location of the subsurface vapor source rendering an average not representative. Therefore, maximum detected concentrations in soil gas must be used as input concentrations. Revise the Report to include risk and hazard calculations using maximum detected concentrations in soil gas for model input values. As noted in the NMED's current (2014) *Risk Assessment Guidance for Site Investigations and Remediation*, and following (draft) EPA guidance, the trend is away from the J&E model and toward the use of the Vapor Intrusion Screening Levels (VISLs), lines of evidence, and additional data collection.

Specific Comments:

2. **Previous NOD**

The Permittees did not adequately address several comments from the original NOD dated August 7, 2014. The following are some of the more important comments that received inadequate treatment:

a) NMED's NOD Comment 4 stated in part, "Since it has been shown that vapor intrusion is a complete pathway, and in compliance with both EPA and NMED guidance, additional characterization is required using active soil gas...and subsequent risk screening/analyses of the data."

In response to the NOD Comment Number 4, the Permittee agreed to collect soil gas samples in order to quantify risks and hazards associated with the vapor intrusion pathway. The methodology for collecting the soil gas samples was not discussed and it is not known whether the samples were passive or active soil gas samples; given that the results are provided as concentrations per mass, it is assumed the data are from active soil gas. Consistent with EPA and NMED's current (2014) Risk Assessment Guidance for Site Investigations and Remediation, active soil gas samples are required for quantitative risk assessments for the vapor intrusion pathway. The Permittee must provide information on the sample collection methods used for collection of the soil gas samples (active or passive) and justification as to whether the soil gas samples are of adequate quality for use in risk assessment.

As shown on Figure 1 of the Report, ten locations were sampled for soil gas on the western portion of the site, while only one location (SV-01) was sampled for soil gas on the eastern portion of the site. Section 2.8.3 of the Report indicates that this approach was selected because the western portion of the site had the majority of volatile organic compound (VOC) contamination. Since the highest detected soil gas for some constituents was on the eastern portion of the site, it is not clear that the extent of VOC contamination at the site has been defined. Provide additional analyses, either quantitatively through the collection of additional soil gas samples or qualitatively through further investigation of site history, how one sample adequately characterizes soil gas contamination on the eastern portion of the site. Also, determine whether data gaps exist that need to be investigated to determine the extent of contamination.

b) NMED's NOD Comment 5 stated in part, "Given the history of this site (sand trap and leach field for the refueling truck wash rack), there is potential for PAHs to be present based on historical activities (oil and other fluids washed off the vehicles, washing particles from tires, etc.). Revise the risk screening Report to include risks from all detected PAHs."

In response to the NOD Comment Number 5, the Permittee collected four background samples and analyzed for polycyclic aromatic hydrocarbons (PAHs). Based on the results, background tolerance values (BTVs) were calculated. In looking at the background sample locations on Figures 1 and 2 and background data in Appendix C of the Report, sample locations SB19 and SB22, which are located adjacent to what appears to be a parking lot west of the site, had significantly higher levels of PAHs (several detections were greater than NMED soil screening levels). Conversely, background sample locations SB20 and SB21, which were collected adjacent to a road east of the site, had significantly lower levels of PAHs (all detections were below NMED soil screening levels). If site PAH concentrations are attributable to background, it can be inferred that the elevated concentrations at the site are a result of PAH migration from parking lot runoff west of the site. However, as shown on Figures 1 and 2 of the Report, the sample locations nearest the parking lot (locations 12704 and SB11-SB15) had lower detected concentrations of PAHs than other sample locations farther away from the parking lot (12711 and 12705, for example). The background investigation does not discuss surface water flow migration paths or whether the site is downgradient from the parking lot. Nor are there sufficient data to show a migration trend from the suspected source(s) to the site. As such, the background data and information provided do not sufficiently demonstrate that site concentrations of PAHs are related to background sources.

As shown on Figures 1 and 2 of the Report, all four of the background samples were collected directly adjacent to asphalt surfaces where the expected PAH concentrations would be highest. These background locations may not be representative of site conditions since most of the site area and site samples are not located directly adjacent to asphalt surfaces. A more effective approach would have been to collect some additional samples showing the concentration trend from the source moving toward the site. Additionally, the sample size of four is inadequate for calculating meaningful BTVs.

While it is possible to calculate BTVs with small data sets containing as few as three samples, these results are not considered representative and reliable enough to make cleanup or remediation decisions. EPA's (2013) ProUCL guidance recommends a minimum sample set size of 10 to 15 for each background data set, but more are preferable. NMED's (2014) Risk Assessment Guidance for Site Investigations and Remediation requires a minimum sample set size of 10 in order to calculate BTVs. In addition, it was noted that many of the calculated upper tolerance limits (UTLs) shown on Table 3 are significantly greater than the maximum detected background concentrations. While it is possible for UTLs to be greater that background, significant differences (more than 1.5 times the maximum) are an indication that the UTL is based on either the accommodation of low-probability outliers (which may or may not be attributable to the background population), highly skewed data sets, and/or inadequate sample size. The UTLs listed in Table 3 are consistently 2.8 – 2.9 times higher than the maximum; this is mostly likely due to inadequate data size. Additional background samples for PAHs at SWMU-127 must be collected. In addition, if the Permittee chooses to proceed with this approach, provide information on the surface features and surface water flow direction, etc, at the site to help justify that the concentrations at the site could be related to parking lot runoff.

c) NMED's NOD Comment 6 stated in part, "In determining the upper confidence level of the mean (UCL), it is not clear how nondetects were handled. Non-detects (censored datasets) should be evaluated following the appropriate methodology outlined in US EPA's Pro UCL Technical Guide. Discuss how non-detects were handled, and if simple substitution methods were applied, revise the UCL calculations in accordance with methods recommended in Pro UCL (regression on order)."

Although the methods for handling nondetects in calculating exposure-point concentrations (EPCs) were correct, an EPC (based on an upper-confidence limit [UCL]) was calculated for ethylbenzene in soil, which had only two detections in the dataset. As discussed in US EPA's (2013) ProUCL Version 5.0.00 Technical Guide, upper confidence limits should only be calculated for data sets that meet the minimum requirements for calculating UCLs. The minimum requirements for calculating UCLs are: 1) each data set must contain at least eight samples (i.e., $n \geq 8$) for the analyte being evaluated; and 2) there must be a minimum of five detections (i.e., ≥ 5 detected observations) for the analyte being evaluated. Although it is possible to calculate UCLs with small datasets and low frequencies of detection, these estimates are not considered reliable and representative enough to make defensible and correct cleanup and remediation decisions (US EPA, 2013). Therefore, a UCL calculated based on only two detections is not considered to be representative and reliable enough and the maximum detected concentration for ethylbenzene should be used in the risk assessment calculations. Revise the risk assessment to utilize the maximum detected concentration for ethylbenzene in the risk assessment and eliminate the use of the UCL as an exposure point concentration. Update the cumulative risks (Table 7) accordingly.

3. **Table 2, Cumulative Risk and Hazard Calculations for Organics in Soil for SWMU 127**

   NMED's Comment: In Table 2, the soil screening levels are designated as either carcinogenic or noncarcinogenic for each constituent and are given the same designation for both residential and industrial soil screening levels. However, screening levels for some constituents are based on different endpoints for residential versus industrial. Two examples of this are tetrachloroethylene and methylene chloride whose residential screening levels are based on noncarcinogenic endpoints while industrial screening levels are based on carcinogenic endpoints. Therefore, the industrial carcinogenic risk estimate is slightly underestimated, while the hazard quotient is slightly overestimated. It is recognized that this would not significantly affect the results of the risk assessment and as such, revisions are not required. However, ensure endpoints are tabulated correctly in future assessments.

4. **Table 7, Cumulative Risks and Hazards, Future Residential Land Use Scenario, All Media, SWMU 127, and Appendix B, Johnson & Ettinger Vapor Intrusion Model Input and Output Files**

   NMED's Comment: As stated in the risk assessment, US EPA's (2003) J&E model was used to calculate risks and hazards from inhalation of indoor air. A review of the data grouping and model input parameters revealed several inconsistencies including the following:

   - A default indoor air exchange rate of 0.25 hr^{-1} is recommended in EPA's User's Guide to the Johnson and Ettinger model, but a less conservative exchange rate of 0.50 hr^{-1} was applied for the 10 feet below ground surface (ft bgs) dataset.
   - The Report indicates that default soil input parameters were based on a soil type of "sand", however some of the input parameters (e.g., stratum A soil total porosity and stratum A soil water filled porosity) are not consistent with a soil type of "sand" and the values selected for these parameters are less conservative. The soil type at SWMU-127 is not discussed and it is not known whether the selected input parameters are appropriate.
   - Soil-gas data were grouped according to depth and risks and hazards were calculated separately for 5 and 10 ft bgs. The greater of the two calculated risks and hazards was included in the cumulative risk estimate. Maximum detected concentrations, regardless of sampling depth, must be utilized as input concentrations in the model to calculate cumulative risks and hazards.
   - 2-Hexanone was omitted from the risk assessment calculations. This constituent is volatile, has published EPA inhalation toxicity data and should have been included in the hazard index calculations.
   - A 95% UCL exposure point concentration for trichloroethene and ethylbenzene was utilized as an input concentration in the J&E soil gas model. Maximum detected

concentrations in soil gas must be used as input concentrations in the soil gas model (see Comment 1).

Because of these inconsistencies, risk and hazard estimates for the vapor intrusion pathway have been underestimated. Revise the risk and hazard estimates for vapor intrusion via use of the J&E soil gas model by using the default recommended air exchange rate; discussing the soil type and using appropriate input values for that soil type; and using all appropriate soil gas concentrations. Revise Table 7 displaying the cumulative risks. If revised risk and hazard estimates are above NMED target levels, additional refinement of the assessment using site-specific parameters and collection of additional data may be required. Following the 2014 NMED Soil Screening Guidance, multiple lines of evidence must be developed to support a refined and technically defensible site model and a thorough characterization of potential subsurface vapor sources must be conducted to refine the screening assessment. If results still indicate excess risk and/or hazard, implementation of remedial action or site controls may be required.

5. **Current Vapor Intrusion Screening Levels and Methodology**

NMED's Comment: At the time this report was written, use of the J&E model was an acceptable method for evaluating vapor intrusion. Because the J&E model is no longer recommended for initial screening assessments for the vapor intrusion pathway, risks and hazards via soil gas intrusion were calculated for informational purposes and shown in the following tables using current NMED (2014) vapor intrusion screening levels (VISLs) and methodology:

Carcinogenic Risks from Exposure to VOCs, Vapor Intrusion Pathway SWMU-127, Cannon Air Force Base

COPC	Maximum Detected Concentration (5-10 ft bgs) (µg/m³)	NMED Residential VISL (µg/m³)	end-point	NMED industrial VISL (µg/m³)	end-point	Residential Risk (5-10 ft bgs)	Industrial Risk (5-10 ft bgs)
1,2-Dichloropropane	1.10E+00	2.81E+01	c	1.38E+02	c	3.92E-07	7.99E-08
Benzene	6.70E+00	3.60E+01	c	1.76E+02	c	1.86E-06	3.80E-07
Bromoform[a]	7.40E-01	2.60E+02	c	1.10E+03	c	2.85E-08	6.73E-09
Carbon tetrachloride	7.60E-01	4.68E+01	c	2.29E+02	c	1.62E-07	3.31E-08
Chloroform	3.50E+00	1.22E+01	c	5.98E+01	c	2.87E-06	5.85E-07
Methyl chloride (chloromethane)	1.60E+00	1.56E+02	c	7.65E+02	c	1.03E-07	2.09E-08
Ethylbenzene	6.70E+00	1.12E+02	c	5.51E+02	c	5.97E-07	1.22E-07
Cumulative Risk						**6.01E-06**	**1.23E-06**

ft bgs = feet below ground surface
µg/m³= micrograms per cubic meter
VISL = Vapor Intrusion Screening Level from NMED (2014) Risk Assessment Guidance for Site Investigations and Remediation
[a] VISLs for bromoform were determined by applying an attenuation factor of 0.1 to the US EPA indoor air Regional Screening Levels (RSLs). The RSLs were adjusted to a risk level of 1E-5.

Noncancer Hazards from Exposure to VOCs, Vapor Intrusion Pathway SWMU-127, Cannon Air Force Base							
COPC	**Maximum Detected Concentration (5-10 ft bgs) (µg/m³)**	**NMED Residential VISL (µg/m³)**	**end-point**	**NMED Industrial VISL (µg/m³)**	**end-point**	**Residential HQ (5-10 ft bgs)**	**Industrial HQ (5-10 ft bgs)**
Methylethylketone (2-butanone)	7.30E+01	5.21E+04	n	2.46E+05	n	1.40E-03	2.97E-04
Methylisobutylketone (4-methyl-2-pentanone)	6.10E+00	3.13E+04	n	1.47E+05	n	1.95E-04	4.14E-05
Acetone	4.20E+02	3.23E+05	n	1.52E+06	n	1.30E-03	2.76E-04
Carbon disulfide	7.60E+01	7.30E+03	n	3.44E+04	n	1.04E-02	2.21E-03
Chloroethane (ethyl chloride)	1.00E+00	1.04E+05	n	4.92E+05	n	9.59E-06	2.03E-06
cis-1,2-Dichloroethylene[a]	3.80E+00	6.26E+02	n	2.95E+03	n	6.07E-03	1.29E-03
Xylenes[b]	3.60E+01	1.04E+03	n	4.92E+03	n	3.45E-02	7.32E-03
Methylene chloride	5.10E+00	6.26E+03	n	2.95E+04	n	8.15E-04	1.73E-04
Styrene	3.40E+00	1.04E+04	n	4.92E+04	n	3.26E-04	6.92E-05
Tetrachloroethene	3.40E+01	4.17E+02	n	1.97E+03	n	8.15E-02	1.73E-02
Toluene	3.80E+01	5.21E+04	n	2.46E+05	n	7.29E-04	1.55E-04
Trichloroethylene	9.20E+02	2.09E+01	n	9.83E+01	n	4.41E+01	9.36E+00
Vinyl acetate	5.80E+01	2.09E+03	n	9.83E+03	n	2.78E-02	5.90E-03
2-Hexanone[c]	4.80E+00	3.10E+02	n	1.30E+03	n	1.55E-02	3.69E-03
Hazard Index						**4.43E+01**	**9.40E+00**

ft bgs = feet below ground surface
µg/m³= micrograms per cubic meter
VISL = Vapor Intrusion Screening Level from NMED (2014) Risk Assessment Guidance for Site Investigations and Remediation
[a] VISLs for cis-1,2-dichloroethylene are based on VISLs for trans-1,2-dichloroethylene.
[b] The concentration for xylenes is the sum of all isomers.
[c] VISLs were determined by applying an attenuation factor of 0.1 to the US EPA indoor air Regional Screening Levels (RSLs).

If NMED's current (2014) methodology were applied, hazard estimates using current methodology and VISLs would be above the NMED target levels, indicating that further evaluation may be warranted for the vapor intrusion pathway at SWMU-127. The exceedances are a result of detected concentrations of trichloroethene. If current guidance were to be followed, further evaluation would be necessary which may include further sampling and a weight of evidence analysis. However, since the risk assessment was conducted prior to the release of NMED's (2014) methodology and guidance, use the J&E model is deemed appropriate for use at SWMU-127 with the recommended revisions noted in the above comments. No response is required for this comment.

6. Table 8, Soil Leaching Evaluation – Organics at SWMU 127

NMED's Comment: In Table 8 of the Report, some of the soil screening levels presented for the soil to groundwater pathway are not consistent with the values listed in Table A-1 of NMED Risk Assessment Guidance for Site Investigations and Remediation (2012) for the following constituents: 2-butanone, carbon tetrachloride, 1,1-dichloroethene (appears to be a unit conversion error), acenaphthene, and di-n-butyl phthalate (NMED soil screening levels are available). It is acknowledged that these inconsistencies were minor and did not affect the results of the soil-to-groundwater evaluation. No revision is necessary.

A revised Report that corrects all of the deficiencies noted in this second Disapproval must be submitted no later than **August 17, 2015**. The revised Report must be accompanied by a response letter that details where the comments were addressed that cross-references NMED's numbered comments. The Permittee must also submit an electronic redline-strikeout version of the Report that shows where all changes were made to the Report.

If you have any questions regarding this letter, please contact Naomi Davidson at (505) 476-6022.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: N. Davidson, NMED HWB
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