NEVADA DIVISION OF
ENVIRONMENTAL
PROTECTION

STATE OF NEVADA
Department of Conservation & Natural Resources
Steve Sisolak, *Governor*
Bradley Crowell, *Director*
Greg Lovato, *Administrator*

June 9, 2020

Jay A. Steinberg
Nevada Environmental Response Trust
35 East Wacker Drive, Suite 690
Chicago, IL 60601

Re: **Tronox LLC (TRX) Facility**
Nevada Environmental Response Trust (Trust) Property
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection (NDEP) Response to: *Baseline Health Risk Assessment Report for OU-1 Soils*

Dated: January 31, 2020

Dear Mr. Steinberg,

The NDEP has received and reviewed the Trust's above-identified Deliverable and provides comments in Attachment A. A revised Deliverable should be submitted by 09/30/2020 based on the comments found in Attachment A. The Trust should additionally provide an annotated response-to-comments letter as part of the revised Deliverable.

Please contact the undersigned with any questions at wdong@ndep.nv.gov or 702-486-2850 x252.

Sincerely,

Dong Weiquan

Weiquan Dong, P.E.
Bureau of Industrial Site Cleanup
NDEP-Las Vegas City Office

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Attachment A

This technical memorandum summarizes a review of, and provides comments regarding, the above-referenced document. Page numbers referenced are for the hard copy version of this document. We understand that the purpose of this document was to evaluate the potential health risks to worker exposure to residual levels of chemicals, radionuclides, and asbestos; as such, the soil data set used did not include data associated with removal actions that have taken place within Operable Unit 1 (OU-1). As noted in the document, a separate report to evaluate worker health risks to soil gas and groundwater is currently being prepared and that the cumulative exposures to OU-1 soil and soil gas/groundwater will be presented in this future report.

Fatal Flaw

None noted.

Essential Correction

General comment #1 Decision Units

The rationale for first identifying COPCs on the scale of the entire 143-acre Study Area, and subsequently identifying COPCs in the three Decision Units (DUs) as a subset of those initial COPCs, should be explained. NDEP believes that the size of the decision units should be reconsidered and an evaluation of potential hot spots should be conducted based on Spatial Quartile plots and Risk/Hazard plots. If hot spots are identified, smaller exposure units may need to be proposed. For the NERT Site, NDEP recommends that exposure units be based on current site usage and exposure potential.

General Comment #2 **ProUCL**

ProUCL was used to calculate UCLs for each COPC. Historically, NDEP steered the companies away from ProUCL as a means for UCL calculation. This decision was based on recommendations from Neptune in their review of ProUCL to NDEP in February of 2007 explaining the limitations of ProUCL and why it is not an appropriate software package for estimation of UCLs. ProUCL has changed since then, but the underlying premises for UCL calculations have not. Hence, NDEP's conclusion remains. Neptune has also provided code in R (www.r-project.org) to perform appropriate UCL calculations. It is recognized that ProUCL has only been used here to provide UCL estimates based on the bias-corrected accelerated (BCa) bootstrap method, however, the ProUCL output includes as many as three different BCa-based calculations (95% KM (BCA) UCL [under Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs], 95% BCA Bootstrap UCL [under Lognormal ROS Statistics Using Imputed Non-Detects], and, 95% BCA Bootstrap UCL [under Nonparametric Distribution Free UCLs]. It is not immediately clear which BCa method has been used when more than one is presented, however, it is clear that the decision logic in ProUCL that leads to presentation of a subset of these BCa results is flawed.

NDEP would prefer that ProUCL is not used for these calculations because it potentially sets a precedent for its more general use within the BMI Complex projects. NDEP, through

Neptune, has provided an alternative code for UCL calculations that has been used across the BMI Complex at least since 2007, and should be considered in this case. NERT can develop their own similar code in R if they prefer. Regardless, the code should be included in an Appendix.

Specific Comment #1. Section 5.

The spatial intensity and spatial concentration/risk plots for Section 5 are not well suited to visualizing spatial patterns of contamination. These plots sort the results among a few bins (such as HI>1 and HI<1, <0.1 BCL, 0.1 BCL – BCL, and >BCL, etc). The spatial quartile plots in Appendix F use four bins for detected values. This type of plotting works well for asbestos fibers, where the range of detected fibers in any sample is between zero and three. But for many analytes, a continuous measure of soil concentration or risk, such as with bubble plots or color-graded heat map, should be used because the bins don't provide enough resolution to see the actual magnitude of concentration differences.

Section 5.1.2 states, "The purpose of DU identification is to avoid "diluting" or lowering EPCs by averaging concentrations from hot spots (if present) with samples collected from areas with significantly lower concentrations." And Section 5.4.1 indicates TCDD-equivalent is an important contributor to estimated cancer risks in DU-1 and DU-2. Below, an example is given for TCDD-equivalent in DU-1, 0 – 10 ft, to demonstrate the difficulty of evaluating whether it's appropriate to aggregate all DU samples to estimate an EPC in the context of the statement cited from Section 5.1.2. Please note that DU-1 represents a substantial portion of the 143-acre BHRA Study Area, and no basis is provided in the HHRA for an assumption that individuals under future land use would likely be exposed in a random manner across all of DU-1. This makes the identification of potential areas of elevated soil concentrations of risk-driving analytes critical for the defensibility of the risk assessment results.

The ProUCL output file for DU-1, 0 – 10 ft, shows detections in 473 of 474 observations, with a median of 1.7E-05 mg/kg and a mean of 2.7E-04 mg/kg, and a maximum value of 0.025 mg/kg. The TCDD-equivalent data are clearly right-skewed, but do not follow lognormal or gamma distributions at the 5% significance level. The Section 5 plots for TCDD show only where concentrations exceed the TCDD-TEQ action level of 0.0027 mg/kg, which for the 0 – 2 ft interval are in the NE corner of DU-1 (Figure 5-18b). Review of the spatial quartile plot (Figure F-34) shows lower 0 – 10 ft TCDD-equivalent concentrations in the portion of DU-1 below DU-3 (mostly green-yellow) and higher concentrations in an east-west band just south of the Excavation Control Area for the holding ponds (mostly red, orange, and yellow). This observation calls into question whether it's appropriate that EPCs should be calculated for all of the area designated as DU-1. However, a continuous-scale plotting of TCDD-equivalent concentrations is necessary to support a judgment on whether one or more subareas of elevated concentrations warrant separate consideration.

Specific comment # 2 Section 6.1.3 Completeness

This section notes that the percent completeness for the individual DUs are all 99.9%, and that the small percentage of rejected data is not expected to have a significant impact on the spatial coverage of the dataset. There are a total of 132 valid results for cyanide and 20 rejected cyanide results (completeness = 87%). As the cyanide results were rejected for poor matrix

spike recovery and exceeded holding time, no conclusions can be reached as to the presence or absence of cyanide in these samples. How was it determined that the valid cyanide data are adequate to support the risk assessment? Thirteen of the rejected results are in DU-1, were these located in one subarea?

Specific Comment #3 Table 5-20
Asbestos Cancer Risks for Individual Decision Units – Why is the Best Estimate 0E+00 for DU-3? Please explain.

Specific comment # 4 Phase B Area IV Investigation Soil DVSR/EDD
The dataset provided in Appendix B reports the TEQ for sample SA121009-0.5B. Cross checking this sample to the Phase B Area IV Investigation EDD indicates the dioxin/furan analysis of this sample was not validated ("validated_flag" = F). This result should not be used in the risk assessment, unless it can be shown to have been validated.

Specific comment # 5 Phase B Supplemental Sampling Areas I and II DVSR/EDD
Similar to the previous comment, perchlorate results for samples SA49009-1.5BR and SA49-1.5BR were not validated ("validated_flag" = F). These results should not be used in the risk assessment, unless they can be shown to have been validated.

Specific Comment #6 GiSdT Code
Please provide the GiSdT code so that it may be reviewed.

<u>Minor Correction</u>

Specific comment # 7 Executive Summary (page ES-3)
The end of the sentence ("data representative…were selected") appears to indicate that not all of the data for 0-10 ft bgs, remaining/in-place samples were used in the risk assessment.

"Soil analytical data collected from 0-10 feet…(bgs) in areas that were not excavated…were evaluated and data representative of current Site conditions were selected for purposes of the BHRA."

If all results for the remaining samples were used, this sentence should be revised for clarity. If results/samples were curated and include less than all of the remaining samples, the process by which the results were excluded needs to be explained.

Specific Comment #8 Section 4.6.1 Criterion V – Data Review, page 21 (including Table 4-1 Data Usability Evaluation and Section 6.1 Uncertainties Identified in the Data Usability Evaluation, page 73)
The report refers to the DVSRs regarding rejected data; however, the data usability section, its associated table and the uncertainty analysis section do not describe the impacts of the rejected data in terms of how it affects COPC selection and/or exposure point concentrations in the soil BHRA. This additional information would help to inform whether there is a potential underestimation of the worker health risks quantified in the report.

Specific Comment #9 Section 6.2.3 Toxicity Assessment, page 87 (Uncertainties Identified in the Risk Assessment)

This section focuses on the uncertainty related to toxicity criteria for zirconium, 4,4-DDE, and asbestos. However, a discussion of the uncertainties associated with the toxicity criteria for other chemicals of potential concern (COPCs) such as dioxins, cobalt, and manganese would also provide context around the uncertainty and conservatism with the values used in the risk assessment.

Specific comment # 10 Section 5.1.2.2

The text of this section (Determination of DUs) indicates that DU-3 potentially has a "different exposure profile" than the other DUs. What does this mean, and is there a reference or basis for the statement?

Specific comment # 11 Section 6.1.5 (pages 76-78)

References to "reporting limit exceedance" should be revised to "reporting limit criterion exceedance." As written, it sounds as though the results were qualified because the reporting limit was high. Also "reporting limit" should be changed to PQL for consistency with NDEP terminology.

Specific comment # 12 Tables 4-1 and A-5

The summary of qualified data presented in A-5 would provide more information if the reason codes had been retained and defined in the table footnotes (like Table A-2). Equivalently, listing the reason codes along with the qualifiers in the provided dataset (Appendix B) would allow for an independent assessment of the statement on page 14 of Table 4-1, that qualifications do not indicate a "systematic or widespread impact" on data quality.

Specific Comment #13 Dataset Issues

Tables B-1 (Soil BHRA Data Set – Chemicals and Radionuclides) and B-2 (Asbestos Soil Data Summary) provide a list of samples that were used in this report. An attempted was made to verify the dataset by querying data from the BMI database versus the information provided in Appendix A. These sample IDs and data were then compared to the sample IDs and data provided in Tables B-1 and B-2.

A number of issues were encountered:

Sample ID matching. From Table B-1, the "sys_sample_code" was used to match the sample ID in the BMI database. In many cases, the sample IDs were slightly different, but most could be made to match the sample by location, sample date, sample time, analyte, or result. For example, CTMW-04D-0.5-201703201703201355 in Table B-1 has the sample ID CTMW-04D-0.5-20170320 in the BMI database. Another example is sample CS-E14C-1 in Table B-1 which has the corresponding sample ID of CS-E14C-1a or CS-E14C-1b in the BMI database.

Sample IDs should have a one-to-one match with the BMI database to ensure that they can be matched correctly, and that the BMI database contains the same data as used by the companies.

Missing sample IDs. Not all sample IDs listed in Tables B-1 and B-2 were found. The missing samples were primarily from Tronox from 2007 and 2010. See attached Tables 1 and 2 (provided in Excel format).

A subset of the sample IDs that were matched to the database were checked to ascertain if the sample results matched the BMI database (see Tables 3 and 4 attached). The items below describe issues identified with some of the sample results in Table B-1.

Detection limits. For the soil data, some results did not match because Table B-1 reported non-detected concentrations at the PQL while the BMI database reports the SQL. There are also other non-detects that do not match any of the non-detected values or limits in the BMI database. 7,892 non-detect results could not be matched to the BMI database.

Analyte name. Differences in the analyte name also made it difficult to match the results between the two sources of data (CAS IDs were also used to try to match the data results). Examples include 4-methylphenol (reported as 3,4-methylphenol in the database), trans/gamma-chlordane, benzo(a)pyrene (TEQ), nitrate and nitrite.

Results. Based on a match of location, sample ID, CAS ID and sample date, multiple records were identified for both detected and non-detected concentrations that did not match results in the database. A small number of results were NULL in the BMI database. Most results that did not match were for nitrate and nitrite. Various reporting bases and CAS IDs likely contribute to this issue.

Subset samples. The samples not found in the database included a series of samples that did not match the database because the database had them subset into two samples (e.g., CS-C10B-1a and CS-C10B-1b). A new row was created in a working version of Table B-1 to catch each sample in these scenarios, but this was not successful as the same analytes are not present in each sample. Some results that did not match are from sample CS-C10B-1b. It is a case where a few of the same parameters were analyzed in both CS-C10B-1a and CS-C10B-1b. The values that do not match for those parameters for CS-C10B-1b are matched to CS-C10B-1a. Additionally, some of the asbestos sensitivity results do not match the database.

Attached:
Table 1: Sample IDs from Table B-1 with no BMI database records found
Table 2: Sample IDs from Table B-2 with no BMI database records found
Table 3: Data set for Soil Data from BMI database (reference Table B-1)
Table 4: Data set for Asbestos data from BMI database (reference Table B-2)