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Date: June 29, 2010

To: Shannon Harbour, PE
Nevada Division of Environmental Protection

RE: Response to Nevada Division of Environmental Protection's May 13, 2010 Comments on BRC's *Technical Memorandum – Screening-Level Indoor Air Health Risk Assessment for the 2008 Tronox Parcels A/B Soil Gas Investigation, BMI Industrial Complex, Clark County, Nevada*, dated March 30, 2010

Responses to Comments

1. *General comment, please note that the comments provided below pertain to the redline strike-out (RLSO) version of the Deliverable.*

   Response: Comment noted.

2. *Page 2, Section 2.0, 4th paragraph, 1st sentence, the Tronox Risk Assessment Work Plan (and the BRC Closure Plan) describes receptors that will be considered for risk assessments performed for risk-based decision units at the Tronox facility. This list includes construction workers, outdoor workers (maintenance workers), and indoor (commercial) workers. On-site visitors will not be addressed quantitatively, although trespassers and off-site residents can be evaluated qualitatively. This should be clarified here.*

   Response: The text of Section 2.0 has been revised to clarify the receptors that will be considered for risk assessments performed at the Tronox facility in general and for receptors evaluated in the screening-level indoor air HRA in particular (p. 2).

3. *Page 2, Section 2.0, 4th paragraph, last sentence, this sentence should clarify that the scope of this risk assessment is indoor air.*

   Response: The text of Section 2.0 has been revised to clarify that the scope of this risk assessment is indoor air (p. 2).

4. *Page 3, Section 3.0, listed items, the listed items should match the intent of this indoor air risk assessment. For example, the 3rd listed item is irrelevant in this context and should be deleted. More generally, the listed items should recognize that this is a partial risk assessment, and that the results should be considered in concert with those presented in the previously approved (with conditions) Tronox Parcels A/B risk assessment report.*

Response: The text of Section 3.0 has been revised such that the listed items are relevant to this risk assessment (pp. 2-3). In addition a new section has been added (what is now Section 4.0) that summarizes the results of the screening-level HRA for soil (pp. 9-10) and the results of both assessments are discussed in the Summary section (now Section 5.0, p. 10).

5. *Page 4, Section 3.2, 1st paragraph, 8th line, please replace the discussion on what UCLs are with the text as follows: "For the 95 percent UCL concentration approach, the 95 percent UCL was computed in order to represent the area-wide exposure point concentrations. The 95 percent UCL is a statistic that quantifies the uncertainty associated with the sample mean. If randomly drawn subsets of site data are collected and the UCL is computed for each subset, the UCL will equal or exceed the true mean roughly 95 percent of the time. The purpose for using the 95 percent UCL is to derive a conservative, upper-bound estimate of the mean concentration, which takes into account the different concentrations a person may be exposed to at the Site. That is, an individual will be exposed to a range of concentrations that exist at an exposure area, from non-detect (ND) to the maximum concentration, over an entire exposure period"*

   Response: Section 3.2 has been revised to indicate that maximum detected concentrations were used as exposure point concentrations (p. 4); therefore, the suggested text regarding 95 percent UCLs was no longer relevant and thus not added to this section of the document.

6. *Page 4, Section 3.2, 2nd paragraph, NDEP has the following comments:*
   a. *TRX should also note that this 95% UCL approach should only be applied if the data are from a single population, which has not been demonstrated and the data for chloroform indicate spatial differences (see comments on Table 1 below). Consequently, the data and hence the area, should probably be split into two sets or the maximum reported values should be used in the risk assessment instead of a UCL.*
   b. *TRX should also consider whether there are enough data to support a risk-based decision. Perhaps the indoor air risks should be considered in concert with the previous risks reported for other media exposures to provide multiple lines of evidence. For example, chloroform is the main driver for this risk assessment. Perhaps there are chloroform data for the other media that could be used to help explain or update the conceptual model for this site.*

   Response: (a) see response to Comment No. 5.
   (b) A new section has been added (what is now Section 4.0) that summarizes the results of the screening-level HRA for soil (pp. 9-10) and the results of both assessments are discussed in the Summary section (now Section 5.0, p. 10). As noted in revised document, chloroform was not detected in any of the 64 soil samples collected at the property. The apparent source of chloroform and other chemicals in soil gas is impacted groundwater south and west (upgradient) of Parcels A and B.

7. *Page 4, Section 3.2, 2nd paragraph, it is not clear how detection limits were treated for calculation of UCLs. Based on some of the values reported in Table 1, it appears as though ½ the detection limit (DL) was used. Please clarify.*

   Response: This comment is no longer relevant because 95 percent UCLs were not calculated; however, the text of Section 3.1 was revised to clarify that, consistent with NDEP guidance, one-half the detection limit was used to calculate the mean, median, and standard deviations presented in Table 1 (p. 3).

8. *Page 4, Footnote 1, the information alluded to in this footnote should be provided in a table so that a direct comparison of DLs and risk threshold concentrations is available in the report.*

   Response: A column has been added to Table 1 that provides the U.S. EPA indoor air screening levels referenced in the text to allow for a direct comparison to the detection limits also provided in the table. A second column was added that indicates the number of detection limits exceeding the screening value for each chemical. The chemicals eliminated from further evaluation based on this comparison are discussed in 3.1 (p. 3).

9. *Page 5, Section 3.2.1, last paragraph of the section, please clarify that average soil moisture content was determined using ASTM D2216. Additionally, the water-filled porosity in the above-quoted text should be corrected to read, water-filled porosity = 0.090.*

   Response: The text of Section 3.2.1 has been revised to indicate that soil moisture content was determined using ASTM D2216, and the typographical error has been corrected (pp. 4-5).

10. *Page 6, Section 3.3, 1st paragraph, last sentence, please update the references to the BRC Closure Plan to 2010.*

    Response: It is our understanding that the 2010 version of the BRC Closure Plan has not been finalized; therefore, the 2009 document is the most recent version available. Section 3.3. has been revised to update the reference to the 2009 BRC Closure Plan (p. 6).

11. *Page 7, Section 3.4, 2nd paragraph under bullets, last sentence, it is not clear to NDEP that these statements about the sampling data being sufficient are reasonable. The chloroform data are clearly spatially distinct between the east side of Parcel B and the remainder of the data. TRX should consider a different evaluation of the data.*

    Response: The text of Section 3.4 (as well as other sections in the document) has been revised to indicate that the maximum detected concentration was used as the exposure point concentrations (p. 7).

12. *Page 7, Section 3.4, 4th paragraph under bullets, regarding the Johnson and Ettinger (J&E) modeling, NDEP is not clear why the modeling was performed assuming a residential scenario, given that a residential scenario is not consistent with the future*

uses of the site, or with the TRX Health Risk Assessment Work Plan. Earlier in the report (Page 2), TRX states that a commercial scenario is protective of other potential receptors but no mention is made of a residential scenario. Please clarify.

Response: The text of Section 3.4 (as well as other sections in the document) has been revised to indicate that the J&E model was used to evaluate a commercial, rather than residential, scenario (p. 8). Revised calculation spreadsheets are provided in Attachment A that document the use of commercial exposure and modeling assumptions (also see response to Comment 16).

13. *Page 8, Section 3.5, 3rd paragraph, last sentence, please delete this sentence as NDEP will make the determination on what are "unacceptable carcinogenic risks".*

    Response: The text of Section 3.5 has been revised to note that the estimated excess cancer risks are equal to or below NDEP's point of departure of 1×10^{-6} (p. 9).

14. *Page 9, Section 4.0, 2nd paragraph, TRX should present the results of both risk assessments so that the risks can be evaluated together and that the risk drivers in both cases can be considered. The conceptual site model (CSM) would then be implicitly updated and an appropriate risk management decision could be made. Please provide risk estimates from both this indoor air risk assessment and from the risk assessment previously performed for the other media exposures.*

    Response: A new section has been added (what is now Section 4.0) that summarizes the results of the screening-level HRA for soil (pp. 9-10) and the results of both assessments are discussed in the Summary section (now Section 5.0, pp. 10-11).

15. *Table 1, NDEP provides comments as follows:*
    a. *NDEP notes that this table does not follow current NDEP guidance on summary tables. Half the DL appears to have been used for NDs for statistics other than the median and the mean. Please clarify.*
    b. *There are many detected values reported at levels that are lower than detection limits. This implies that reporting limits are used here instead of sample quantitation limits (SQLs). NDEP guidance indicates that SQLs should be reported. Please revise this table as necessary to comply with NDEP guidance.*
    c. *Since the data are not presented in the Deliverable, determining whether the UCL calculations are justified has been difficult. Chloroform is the chemical of primary concern (the primary risk driver for this pathway). NDEP retrieved the data from the NDEP database website (ndep.gisdt.org). The chloroform data from the NDEP database website (presented below) show that the high concentrations of chloroform are from locations SG10, SG11, and SG12, which are located on the eastern side of Parcel B, closer to known chloroform plumes. These data indicate that the population is not sufficiently homogeneous that an assumption of one population can be made; therefore, the calculation of a UCL is not appropriate because it "averages away" potential risk for decision units that are larger than exposure areas. Because the data are not indicative of one population and given the relatively few data points from the eastern side of Parcel B, the maximum concentration should be used in this screening risk assessment instead of the UCL (for all chemicals). Please note that the same*

spatial pattern has been observed for carbon tetrachloride. Please revise this Deliverable as necessary.

Chloroform data:

SG01	0.014
SG02	0.016
SG03	0.0086
SG04	0.0086
SG05	0.062
SG06	0.034
SG10	0.44
SG11	0.4
SG12	0.27

Response: (a) Table 1 has been revised to be consistent with NDEP guidance. It should be noted that the mean, median, and standard deviation were estimated assuming one-half the detection limit for non-detect values, which is also consistent with NDEP guidance.
(b) Table 1 has been updated such the detection limits are based on sample quantitation limits (SQLs).
(c) As stated previously, the maximum detected concentration was used as the exposure point concentration rather than the 95 percent UCL.

16. *Table 2, NDEP provides the following comments:*
    a. *Line 7, TRX should identify "Vadose zone total porosity (unitless)" as "Gravimetric moisture content per ASTM D2216".*
    b. *Line 8, Reference/Rationale, the equation provided is not dimensionally correct, please refer to the equation provided herein (above).*
    c. *While NDEP understands that pulling the J&E worksheets together simplifies presentation, for purposes of transparency TRX should then provide the actual inputs for the J&E in Table 2 and where necessary, Table 2 should include information (including formulas where necessary) that support the derivation of some of the hard-coded inputs in the specific J&E model worksheets.*
    d. *The crack-to-total-area ratio (crack fraction – cell F90) is specified in the specific J&E worksheets as 400/Area of enclosed space below grade (building area – cell E90). The value of 400 is really a consequence of a 4000 cm floor-wall seam perimeter (Cell K79) and the crack radius of 0.1 cm (Cell G100). Since the basic inputs are the perimeter and the radius, these should be included explicitly in the formula for crack fraction. Please revise.*

Response: (a) Line 8 (not 7) of Table 2 has been moved to a footnote for Line 9, where "Soil moisture content" has been replaced with "Gravimetric moisture content per ASTM D2216."
(b) Line 9 of Table 2 has been updated so that the equation provided under Reference/Rationale is dimensionally correct.
(c) The J&E Modeling spreadsheet used in this assessment is included in Attachment B. This is the "advanced" soil gas spreadsheet as opposed to the "screening" spreadsheet used previously. All of the non-chemical-specific input values are shown on the "Data Entry Sheet" worksheet and are provided in Table 2. Unlike the "screening" version of the spreadsheet, the "advanced" version does not

include any additional “hard-coded” input values. Instead, all values are calculated from the input parameters shown on the “Data Entry Sheet” worksheet or in Table 2.
(d) See the response to (c) above.

17. *Attachment A, NDEP provides the following comments:*
    a. *Response-to-comment (RTC) # 3, the comparisons for the NDs should be given in a table, which may demonstrate that all of the DLs were less than soil gas screening criteria and could not contribute significantly to risk. Please revise as necessary.*
    b. *RTC # 5a, TRX has not demonstrated that the data are sufficient for decision making. Given the apparent spatial differences described above, it seems that only three samples have been taken in the area of greatest risk-based concentrations (i.e. the east side of Parcel B). Please clarify.*
    c. *RTC # 6, the additional text included in response to NDEP's original comment provides no useful specific information about the risk assessment performed for the other pathways. The risks should be presented so that NDEP can consider both sets of risks together with the risk drivers for both assessments identified.*

Response: (a) The U.S. EPA soil screening levels have been added to Table 1.
(b) The maximum detected concentration was used as the exposure point concentration rather than the 95 percent UCL. This is conservative assumption given that it is unlikely that receptor will be exposed to the maximum concentrations of all COPCs over an extended period of time.
(c) A new section has been added (what is now Section 4.0) that summarizes the results of the screening-level HRA for soil (pp. 9-10) and the results of both assessments are discussed in the Summary section (now Section 5.0, pp. 10-11).