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Date: November 12, 2010

CC: Brian Rakvica, McGinley and Associates
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RE: Response to Comments re: Revised 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

1. *General comment, NDEP has noted that previous versions of the subject Deliverable were reviewed in late 2008 and in April 2010. NDEP acknowledges that, in general, most of the previous comments have been addressed; however, there are some cases that the way in which the comments have been addressed has raised new issues. General and specific comments are provided below. Note that the comments on the text pertain to the redline strike-out version.*

Response: Comment noted.

2. *General comment, TRX should note that not all of the electronic files were delivered on the CD included with the report. For future submittals, TRX should make sure that all electronic files are included with the Deliverable CD.*

Response: Comment noted.

3. *General comment, the following are elements of a risk assessment that are required in NDEP guidance that were not included in the Deliverable and should be included in the revised version. (Please note that several of these elements were also purposed in the health risk assessment (HRA) work plan and Chapter 9 of the BRC Closure Plan:*
 - a. *Electronic copies of the laboratory reports. NDEP acknowledges that these laboratory reports are included in the data validation summary report (DVSR) but TRX should electronically provide either the DVSR or the laboratory reports in this HRA Deliverable. Additionally, the laboratory and the analytical methods used should be identified with the data or with the laboratory reports. For example, presumably TO-15 and TO-15 SIM were used and clarification is needed.*
 - b. *A summary of the data validation that is reported in the DVSR to verify that the data are of sufficient quality from the laboratory.*

- c. *A data usability evaluation to demonstrate that the data are usable for the decision to be made.*
- d. *Plots of the data (including spatial plots) as part of exploratory data analysis (potentially focused on the primary contributors to the risk assessment results).*
- e. *A data quality assessment to demonstrate that enough data have been collected to support the decisions to be made.*

Response: (a) An electronic copy of the DVSR for the soil gas data, including the laboratory reports, has been included as Appendix D of the revised document. (b) A summary of the data validation that is reported in the DVSR has been added to the revised document as Appendix E. (c) A data usability evaluation for the relevant Parcels A/B soil gas data has been added to the revised document (Appendix E). It should be noted that the pending Site-wide soil gas report will provide a data usability evaluation for all soil gas data (including Parcels A/B). NDEP requested a separate data usability evaluation be conducted for Parcels A/B rather than as part of the site-side assessment (NDEP September 7, 2010 meeting minutes). (d) Data plots have not been submitted. Rather the soil gas results for chloroform, the primary contributor to the incremental lifetime cancer risk (ILCR) estimates, are shown on a new figure (Figure 2). (e) The text of what is now Section 3.5 has been revised to include a qualitative discussion of the sufficiency of the soil gas data collected in Parcels A/B to support decision-making (p._). A quantitative data quality assessment will be included in the pending site-wide soil gas HRA for the soil gas dataset as a whole, including the samples in Parcels A/B.

- 4. *Johnson & Ettinger (J&E) model, NDEP has the following comments:*
 - a. *NDEP notes that several input parameters to the J&E model were changed from the previous version of this Deliverable with no explanation for the changes. Please clarify why the following values were changed and the rationale for the new value (Note: the values **not in** parentheses are the values from Table 2 in the current version of the report while those **in** parentheses are the values from Table 2 in the previous revision of the report):*
 - i. *Average soil temperature (deg C): 17 (15)*
 - ii. *Soil gas sampling depth (cm): 150 (200)*
 - iii. *Thickness of soil stratum (cm): 150 (200)*
 - iv. *Enclosed space floor thickness (cm): 10 (15)*
 - v. *Enclosed space floor length (cm): 2000 (1000)*
 - vi. *Enclosed space floor width (cm): 2000 (1000)*
 - vii. *Average vapor flow rate into building (L/m): 20 (5)*
 - viii. *Indoor air exchange rate (1/hr): 1 or 2 (0.25)*



- b. The following is a list of chemicals and the toxicological surrogates identified by NDEP to be used to obtain necessary toxicological values needed for the J&E model:

Chemical	Surrogate
1,2-Dichlorotetrafluoroethane	See Attachment B
1,3-Dichlorobenzene	1,2-Dichlorobenzene
4-Ethyltoluene	Isopropylbenzene (Cumene)
4-Isopropyltoluene	Isopropylbenzene (Cumene)
alpha-Methylstyrene	Styrene
cis-1,2-Dichloroethene	trans-1,2-Dichloroethylene
Ethanol	See Attachment B
N-Butylbenzene	Isopropylbenzene (Cumene)
n-Heptane	See Attachment B
n-Octane	See Attachment B
sec-Butylbenzene	Isopropylbenzene (Cumene)
t-Butyl alcohol	sec-Butyl Alcohol
tert-Butylbenzene	Isopropylbenzene (Cumene)

Response: (a)

- (i) The previous value of 15°C was cited as a model default value; however, according to United States Environmental Protection Agency (USEPA) guidance,¹ there is no default value for this parameter. Instead, USEPA recommends that the groundwater temperature, as shown in Figure 8 of the guidance, be used as a surrogate. As such, the currently recommended value of 17°C is based on that guidance, as indicated in Table 2. Further, because previous comments from NDEP suggested that surface air temperature may be a better surrogate for soil temperature, Tronox notes in a footnote to Table 2 that the average surface air temperature reported for nearby Boulder City is 19°C, which is essentially the same as the value of 17°C used in the assessment.
- (ii) The previous value of 200 cm was incorrect, i.e., as noted in the original table, soil gas samples were collected at 5 feet below ground surface; however, 200 cm is not equivalent to 5 feet. Therefore, the correct value of 150 cm was used.
- (iii) See response to (ii)
- (iv) The previous value of 15 cm was cited as a model default value; however, according to EPA guidance, the default value is 10 cm; therefore, the correct value was used.
- (v) As noted in NDEP's comments to earlier versions of the document, it did not make sense that the vapor intrusion modeling was based on a residential scenario when the future use of the site is expected to be commercial. Therefore, building-specific input parameters, such as enclosed space floor length, were modified to reflect a commercial scenario. The basis for these

¹ U.S. Environmental Protection Agency (USEPA). 2004a. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Office of Emergency and Remedial Response. Washington, DC.



input values was noted in Table 2 and further described in what is now Section 3.3.1 of the document.

- (vi) See response to (v)
- (vii) See response to (v)
- (viii) See response to (v)

(b) The toxicity values for the identified surrogates are incorporated into the revised document.

5. *Page 1, Section 1.0, 11th line, NDEP has observed that a data summary, data usability and data adequacy are not presented. Please see above general comments for further details.*

Response: See response to Comment 3.

6. *Page 3, Section 3.0, 2nd listed item, please clarify what is meant by the qualifier “most” in the sentence “For most known or suspected chemical carcinogens, the NDEP point of departure is a cumulative incremental lifetime cancer risk of 1×10^{-6} ” as this is not consistent with the approved TRX HRA work plan.*

Response: A footnote has been added in the revised document that notes that dioxin and asbestos are examples of known or suspected chemical carcinogens that are not consistent with the general NDEP point of departure of an incremental lifetime cancer risk of 1×10^{-6} (p. _).

7. *Page 4, Section 3.1, please clarify why a screening target of $1/10^{\text{th}}$ BCL is not used for COPC selection to account for possible additive effects for chemicals that were not detected. Please discuss any differences that occur between the two screening methods. TRX should provide justification for not using the $1/10^{\text{th}}$ BCL method if still applicable.*

Response: As noted in what is now Section 3.2 of the document, all chemicals detected in soil gas were identified as chemicals of potential concern (COPCs). As also noted in Section 3.2, for chemicals that were not detected in any of the samples, the detection limits were compared to shallow soil gas to indoor air vapor intrusion screening levels from USEPA. These screening levels are based on an excess cancer risk of 1×10^{-6} or a noncancer hazard index of 1 for a residential scenario assuming a generic soil gas to indoor air attenuation factor (alpha) of 0.1. These screening values are considered sufficiently conservative for purposes of evaluating detection limits (as opposed to $1/10^{\text{th}}$ of the screening values) for the following reasons. First, future use of Parcels A/B will be commercial rather than residential. Second, USEPA provides screening levels for both shallow and deep soil gas. “Shallow” soil gas is defined as soil gas samples collected just below the foundation to depths less than 5 feet below the foundation, whereas “deep” soil gas is defined as soil gas samples collected from just above the groundwater table or from depths greater than 5 feet below the foundation. For deep soil gas, the generic screening levels are based on an alpha of 0.01, resulting in screening levels that are a factor of 10 higher than those for shallow soil gas. Because soil gas samples in Parcels A/B were collected at 5 feet below ground surface (bgs), comparison to either the shallow soil gas or deep soil gas screening levels may be justifiable, and the shallow soil



screening levels were used to be conservative. As noted in Table 1 and in Section 3.2, none of these chemicals had detection limits that exceeded these generic screening levels and, therefore, were not identified as COPCs. Additional text has been added to Section 3.2 to clarify this rationale (p. _).

8. *Page 5, Section 3.2, last sentence, please provide the appropriate reference for the use of the maximum concentration instead of the 95% UCL for this risk assessment.*

Response: Based on further discussions with NDEP on September 7, 2010, the text of what is now Section 3.3 has been modified to state that the maximum detected concentration was used as the exposure point concentration consistent with NDEP's comments on a previous version of the technical memorandum (p. _).

9. *Page 6, Section 3.2.1, 7th line from top of page, TRX references Table 2; however, even though the parameter Qsoil is an input for one of the scenarios modeled in J&E, this value is not provided in Table 2.*

Response: Table 2 is intended to provide values for parameters "input" into the model by the user, as opposed to intermediate values that are calculated by the model. As noted in what is now Section 3.3.1, two values were used for the average vapor flow rate into the building (Qsoil). The source of the first value, 20 liters per minute (L/min), is described in Section 3.3.1. The second value is calculated by the model, as also described in Section 3.3.1. No change was made to the technical memorandum in response to this comment.

10. *Page 6, Section 3.2.1, 1st full paragraph on page, 2nd sentence, this is the 1st instance where use of parameters for a sand soil has been described as conservative. NDEP understands the intent is to compare to different soil types; however, the alluvium at this site is essentially sand. Therefore, the parameter for sand is not conservative for this site; instead it should be considered "representative". Please revise.*

Response: The sentence has been deleted (p. 4)

11. *Page 7, Section 3.2.1, 2nd full paragraph, 3rd line, please provide a reference for "Nazaroff".*

Response: As noted at the end of this sentence, the information provided is from USEPA guidance and not from the primary article authored by Nazaroff. The primary reference is provided in the USEPA guidance document. No change was made to the technical memorandum in response to this comment.

12. *Page 8, Section 3.3, 1st paragraph, last sentence, this sentence is unclear. Please revise "The BRC Closure Plan (BRC, ERM, and DBS&A 20072009) and Tronox HRA Work Plan (Northgate 2010) provides a full discussion on the risk assessment methodology for the project, and used in this screening-level indoor air HRA" to "The BRC Closure Plan (BRC, ERM, and DBS&A 20072009) and Tronox HRA Work Plan (Northgate 2010) provide a full discussion of the risk assessment methodology for the project and are used as the basis for this screening-level indoor air HRA".*



Response: What is now Section 3.4 has been revised as requested (p. 6).

13. *Page 8, Section 3.3, 2nd paragraph, last sentence, NDEP requires more complete references to the Tronox HRA WP and/or the BRC Closure Plan Chapter 9. In this case, please provide reference to hierarchy used.*

Response: Based on further discussions with NDEP on September 7, 2010, it is our understanding that this comment actually pertains to the 1st paragraph of Section 3.3. The text has been revised to specifically identify the sections of the *Tronox HRA Work Plan* relied upon in this screening-level indoor air evaluation (p. _).

14. *Page 9, Section 3.4, paragraph below sentence below bullets, last sentence, this sentence does not follow from the rest of this paragraph. The paragraph is about uncertainty related to sampling and analysis. This sentence is about uncertainty associated with use of the maximum concentration. A new paragraph is needed along with a comment on the uncertainty associated with a maximum concentration (statistics this far in the tail are always very uncertain). Please revise as necessary.*

Response: What is now Section 3.5 has been revised as requested (p. 8).

15. *Page 11, Section 3.4, 3rd line on page, please clarify how the risk could be zero at this Site or any Site.*

Response: As discussed with NDEP on September 7, 2010, this statement is based on the fact that cancer risk estimates are generally based on low-dose extrapolations from high-dose animal studies. These extrapolations are done in a manner to not underestimate risk and, as a result, the risk may be overestimated or even zero. Nonetheless, what is now Section 3.5 has been revised to remove this language. Similar language is commonly used in risk assessment evaluations (p. _).

16. *Page 11, Section 3.5, results are now presented for both risk assessments performed for this site. If these 2 risk assessments had been performed within the context of a single risk assessment, then these risks would have been added across media to present cumulative risk. If they are added, then the ICLR is 2×10^{-6} . Tronox should acknowledge this and discuss the results as appropriate.*

Response: Based on discussions with NDEP on September 7, 2010, we are still awaiting additional guidance to be provided by NDEP to address this issue. However, we believe that the previous version of the technical memorandum provided the information necessary for risk management decisions. Therefore, no change was made to the technical memorandum in response to this comment.

17. *Page 12, Section 4.0, 1st bullet, NDEP rejects the notion that the largest contributor to the cumulative HI is lead. Lead should not be included in a HI calculation, but should be evaluated separately. NDEP acknowledges that inclusion of lead in the HI calculation in the previous risk assessment report occurred; however, NDEP provided comments in a January 17, 2008 Part 2 Response letter that were intended*



to be considered for future risk assessments. Comment 7 of the January 17, 2010 letter addressed this issue. Whereas NDEP acknowledges that Tronox is referencing this previous work, NDEP does not want the issue to be perpetuated in future Deliverables, including this Deliverable; therefore, the HI as presented needs to be provided better context.

Response: The hazard index has been changed to exclude lead; however, a footnote has been added to indicate that lead was included in the original hazard index reported in the cited document (p. 10).

18. Page 13, asbestos bullet. This bullet first indicates that the estimated asbestos risks are less than 1×10^{-6} ; however, later in the bullet TRX acknowledges that the upper bound estimate for amphibole is 5×10^{-6} . Please clarify.

Response: As discussed with NDEP on September 7, 2010, the first sentence in this bullet refers to maintenance workers and the latter sentences of this bullet refer to construction workers. No change was made to the technical memorandum in response to this comment.

19. RTC #17.b (previous RTC # 5.a), the previous comment stands as it has not been demonstrated that the data are sufficient for decision making. Given the apparent spatial differences described above, it seems that only 3 samples have been taken in the area of greatest risk-based concentrations (the east side of Parcel B). Use of the maximum concentration might be acceptable for the risk assessment, but misses the point of trying to understand how the data impact the conceptual site model (CSM). It appears that the concentrations of chloroform in these 3 samples (440, 400, 270 ppb) are much greater than those for the other 6 samples (14, 16, 8.6, 8.6, 62, 34). These 3 samples are co-located. There is a clear spatial pattern in the data. Please provide a figure, and please describe in the context of nature and extent, and in the context of the CSM.

Response: What is now Section 3.4 has been revised in response to this comment. The discussion includes reference to a new Figure 2 that presents the chloroform results for soil gas and groundwater in Parcels A/B. Additionally, as previously indicated, the pending site-wide soil gas assessment will more fully discuss the site-wide conceptual model including potential groundwater and soil sources and the impact of these sources on the measured soil gas concentrations, including data collected in Parcels A/B (p. _).

