ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

August 31, 2010

Matt Paque
Tronox LLC
PO BOX 268859
Oklahoma City, OK 73134

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection (NDEP) Response to:
Revised Technical Memorandum: Screening-Level Indoor Air Health Assessment for the 2008 Tronox Parcels A/B Soil Gas Investigation, Tronox LLC, Henderson, Nevada
Dated: June 29, 2010

And

Errata to Revised Technical Memorandum: Screening-Level Indoor Air Health Risk Assessment for the 2008 Tronox Parcels A/B Soil Gas Investigation, Tronox LLC, Henderson Nevada: NDEP Facility ID # 000539

Dear Mr. Paque,

The NDEP has received and reviewed TRX's above-identified Deliverable and provides comments in Attachment A. A revised Deliverable should be submitted **by September 21, 2010** based on the comments found in Attachment A. TRX should additionally provide an annotated response-to-comments letter as part of the revised Deliverable.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or 775-687-9332.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Carson City Office
Fax: 775-687-8335

SH:gl:sh

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Attachment A

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.
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.
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.
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)

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.
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 1x10-6" as this is not consistent with the approved TRX HRA work plan.
7. Page 4, Section 3.1, please clarify why a screening target of 1/10th 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 1/10th BCL method if still applicable.
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.
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.
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 is should be considered "representative". Please revise.
11. Page 7, Section 3.2.1, 2nd full paragraph, 3rd line, please provide a reference for "Nazaroff".
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".

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.
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.
15. Page 11, Section 3.4, 3rd line on page, please clarify how the risk could be zero at this Site or any Site.
16. 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 2x10-6. Tronox should acknowledge this and discuss the results as appropriate.
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.
18. Page 13, asbestos bullet. This bullet first indicates that the estimated asbestos risks are less than $1x10^{-6}$; however, later in the bullet TRX acknowledges that the upper bound estimate for amphibole is 5x10-6. Please clarify.
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, 40, 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.

Attachment B

NDEP is providing this attachment to identify recommended screening reference concentrations (RfCs) for n-heptane, n-octane, ethanol, and 1,2-dichlorotetrafluoroethane that have been detected in soil gas at the Tronox facility. These chemicals do not have inhalation RfCs derived by the USEPA in the IRIS database or in other EPA-recommended databases (USEPA, 2003). Accordingly, we have located noncancer inhalation criteria from other reliable sources or have identified an appropriate toxicological surrogate as the basis for RfCs for these chemicals. The bases for the recommended RfCs are provided herein. It is noted that these RfCs should be considered as conservative "screening" level RfCs and that, if warranted, additional analysis may be conducted by NDEP or the Companies.

n-Heptane

Neither USEPA (2010a, 2010b, 1997), ATSDR (2009) or other EPA-recommended sources (USEPA, 2003) have an RfC for n-heptane; however, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) provides an oral reference dose (RfD) for n-heptane which is based on an inhalation toxicity study. The TPHCWG extrapolated rodent inhalation data to derive an oral RfD. They started with a USEPA RfC for n-hexane of 0.2 mg/m^3,[1] converted it to an RfD of 0.06 mg/kg-day using standard conversion factors and metabolic data that support their conclusion that n-heptane is 38 times less toxic than n-hexane and calculated an oral RfD for n-heptane of 2 mg/kg-day (0.06 mg/kg-day x 38 = 2.28 mg/kg-day; rounded down to 2 mg/kg-day) (TPHCWG, 1997). The RfD was converted back to an RfC by assuming an inhalation rate of 20 m^3/day and a body weight of 70 kg. This results in a screening level RfC of 7 mg/m^3 for n-heptane. This RfC is consistent with simply multiplying the original USEPA n-hexane RfC by 38.

n-Octane

Neither USEPA (2010a, 2010b, 1997), ATSDR (2009) or other EPA-recommended sources (USEPA, 2003) have an RfC for n-octane; however, the TPHCWG provides an RfC of 18.4 mg/m^3 for the C5 – C8 alkane and cycloalkane compounds, which includes n-octane (TPHCWG, 1997). This RfC is based upon a no observed adverse effect level (NOAEL) from two lifetime studies (one rat, one mouse) that used a commercial mixture of hexane. Accordingly, the TPHCWG RfC for C5 – C8 alkane and cycloalkane compounds of 18.4 mg/m^3 is identified as a screening level RfC for n-octane.

Ethanol

Toxicity criteria for ethanol were not found in the USEPA or ATSDR databases (USEPA, 2010a. 2010b. 1997; ATSDR, 2009); however, the California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) has reviewed the toxicity of ethanol in their draft report entitled, "Potential Health Risks of Ethanol in Gasoline" (CalEPA, 1999). Based upon a review of the vast database for ethanol toxicity, CalEPA derived

[1] This was the USEPA RfC for n-hexane at that time. USEPA has since revised the RfC for n-hexane upward to 0.7 mg/m^3 (USEPA, 2010).

a draft RfC of 100 mg/m^3 (CalEPA, 1999), which is recommended as a screening RfC for ethanol.

1, 2-Dichlorotetrafluoroethane

Neither USEPA (2010a, 2010b, 1997), ATSDR (2009) or other EPA-recommended sources (USEPA, 2003) have identified an RfC for 1,2-dichlorotetrafluoroethane; however, 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113) is structurally similar and does have a USEPA RfC of 30 mg/m^3 available from HEAST (USEPA, 1997). The difference between the two chemical structures is that 1, 2-Dichlorotetrafluoroethane has four fluorine and two chlorine atoms while Freon 113 has three fluorine and three chlorine atoms. While there is this difference in chemical structure, it was determined that Freon 113 is a reasonable toxicological surrogate. Accordingly, the screening RfC recommended for 1, 2-dichlorotetrafluorethane is 30 mg/m^3.

References

Agency for Toxic Substances and Disease Registry (ATSDR). (2009). Minimal Risk Levels for Hazardous Substances. U.S. Dept. Health Human Serv., September. http://www.atsdr.cdc.gov/mrls/index.html

California Environmental Protection Agency (CalEPA). (1999). Potential Health Risks of Ethanol in Gasoline. Draft. Office of Environmental Health Hazard Protection. http://oehha.ca.gov/air/pdf/ETOH1099.pdf

California Environmental Protection Agency (CalEPA). (2010). Toxicity Criteria Database. http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG). (1997). Development of Fraction-Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH) (Volume 4 of Series). Amherst Scientific Publishers.

U. S. Environmental Protection Agency (USEPA). (1997). Health Effects Summary Tables. FY 1997 Update. Office of Research and Development, Office of Emergency and Remedial Response. EPA 540/R-97-036.

USEPA. (2003). Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53, December 5. http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf

USEPA. (2010a). Integrated Risk Information System. http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList

USEPA. (2010b). Regional Screening Levels for Chemical Contaminants at Superfund Sites, RSL Table Update, May. http://www.epa.gov/region09/superfund/prg/