

**From:** Deni Chambers, CEG, CHG  
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**Date:** September 9, 2010

**To:** Shannon Harbour  
Nevada Division of Environmental Protection (NDEP)

**RE:** August 9, 2010,  
Nevada Division of Environmental Protection (NDEP) Response to:  
*Technical Memorandum: Background Comparisons for Metals in Remediation Zones B through E, Compared to Remediation Zone A*  
Dated: July 22, 2010

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This memorandum presents a Response to Comments (RTC) provided by NDEP in an August 9, 2010 letter regarding the *Technical Memorandum: Background Comparisons for Metals in Remediation Zones B through E, Compared to Remediation Zone A* (Northgate, 2010a). A summary of recent correspondence and discussions between NDEP and Tronox regarding background comparisons is provided below, followed by individual responses to NDEP's August 9 comments on the July 22 technical memorandum.

### **Summary of Previous Correspondence and Discussions Regarding Background Comparisons**

In the technical memorandum dated July 22, 2010 that is the subject of this RTC, Tronox presented comparisons of Site Phase B soil concentration data for RZ-B through RZ-E to the Phase B RZ-A data set (Northgate, 2010a). The background comparison results for the depth interval from the ground surface to 10 feet below ground surface (bgs) were also summarized in the Errata to the Revised Health Risk Assessment for Remediation Zone A, dated July 23, 2010 (Northgate, 2010b). NDEP provided comments on the July 22 technical memorandum in a letter dated August 9, 2010 (NDEP, 2010b). In a subsequent letter dated August 17, 2010, NDEP determined that the RZ-A dataset is appropriate for background comparisons regardless of the laboratory used for analysis at the TRX facility (NDEP, 2010c). The August 17, 2010 letter partially superseded comments provided by NDEP in their August 9, 2010 letter. In accordance with NDEP's August 17, 2010 letter, Tronox presented a revised comparison of Site Phase A and B soil concentration data to RZ-A soil results in Attachment 2 of the *Technical Memorandum: Calculation of Leaching-Based, Site-Specific Levels (LSSLs) for the Soil-to-Groundwater Pathway Using NDEP Guidance*, dated August 23, 2010 (Northgate, 2010c).

Since submittal of the August 23 technical memorandum, NDEP has indicated that some of their comments in the letter dated August 9, 2010 regarding background comparisons remain to be addressed. These comments are summarized as follows:



Comment 1: Statistical plots for the comparisons between LOU 62 borings and RZ-A background, and for comparisons between RZ-A background and RZ-B through RZ-E data should be provided.

Comment 5: Clarify for which statistical analyses one-half of the detection limit was used.

Comment 6a: Address the comparability of data sets with low frequency of detection (i.e., less than a 25%).

Comment 6c: Relate the results of statistical tests to the Conceptual Site Model (CSM).

**Responses to NDEP's August 9, 2010 Comments on the *Technical Memorandum: Background Comparisons for Metals in Remediation Zones B through E, Compared to Remediation Zone A*, dated July 22, 2010**

NDEP's comments regarding background comparisons in the August 9, 2010 letter are addressed individually, below. NDEP's August 9, 2010 comments are transcribed in italics, followed by responses to these comments.

1. *General comment, TRX should provide plots of the BRC-TIMET McCullough Range background data and the RZ-A data (e.g., in Appendix A).*

**Response:** Based on the subsequent letter dated August 17, 2010 from NDEP which stated that RZ-A should be used as the background data set, plots of the comparison between the BRC-TIMET/McCullough Range and the RZ-A data sets are not needed. For the statistical comparison between the RZ-A background data set and Remediation Zones B through E (RZ-B through RZ-E), refer to Tables 1, 2A through 2D, and 3A through 3D of Attachment 2 of the revised technical memorandum, to which this RTC is attached. Plots for the statistical comparisons between the LOU 62 borings and the RZ-A background data set and comparisons of the RZ-B through RZ-E data with RZ-A background data set are included in Attachment 2 to the revised technical memorandum.

2. *Footnote 1, page 1, NDEP provides the following comments:*
  - a. *1st sentence, NDEP has not challenged the correctness of the analytical methods used for the Phase B data. NDEP has suggested that the methods used in one laboratory are different than the methods used by another laboratory (in particular the laboratory that was used for the Phase A data, the TRX Parcels A and B data, and the BRC-TIMET background data). NDEP acknowledges that the method definition for Method 6020 allows for some flexibility. Specifically, CAS-Kelso has confirmed use of 10% HNO<sub>3</sub>. However based upon similar issues at the BMI Common Areas, review of the DVSRs for the referenced data, and discussions with TestAmerica, NDEP currently believes that TestAmerica used 10% HNO<sub>3</sub> / 2% HCL. While both methods are correct, they are different*



*and may be potentially different enough to generate relative differences in the reported concentrations between the two labs. This issue is under on-going investigation. NDEP will advise as soon as the requisite information is available; however, neither TRX nor TestAmerica has been able to produce the SOP for the preparation method to facilitate this review.*

**Response:** This comment has been superseded by the August 17, 2010 letter from NDEP.

*b. Last sentence, NDEP is not sure what direction TRX is still expecting from NDEP other than information regarding extraction at TestAmerica and provides the following comments:*

- i. In a letter dated April 30, 2010, NDEP provided direction for the use of RZ-A data as local background for TRX Site data from CAS-Kelso (e.g., Phase B data) and use of Parcels A and B data as local background for TRX Site data from TestAmerica (e.g., Phase A data).*
- ii. NDEP notes again that the Parcels A and B arsenic data are, in general, less than the BRC-TIMET McCullough arsenic data, suggesting the possibility of a geologic difference. Also, the RZ-A data are lower than the Parcels A and B data, which possibly suggests an analytical difference. Either way, NDEP finds that it is inappropriate to suggest that the BRC-TIMET McCullough Range background data be used for background comparisons for the RZ's data when the data for RZ-A are considerably different than the BRC-TIMET McCullough Range and where different mostly means less than (e.g., arsenic).*
- iii. Since the RZ-A data are often statistically less than the BRC-TIMET McCullough Range, then either the sampling and analysis for the RZ's should be repeated (because Site data cannot be less than background if background is properly characterized) or the RZ-A should be accepted as local background for CAS-Kelso data and the Parcels A and B data should be accepted as local background for TestAmerica data at TRX sites.*

**Response:** This comment (including parts i-iii) has been superseded by the August 17, 2010 letter from NDEP.

*3. Background Dataset, pages 2-3, NDEP provides the following comments:*

- a. TRX describes the comparisons between BRC-TIMET McCullough range background data in shallow soils (0-10 ft bgs) and the RZ-A shallow soils data (0-10 ft.). However, the analysis is incomplete given that the results show clear differences for several metals, indicating that the two datasets are different whether the differences are geological, chemical analytical or other. NDEP does not concur with the conclusions that the BRC-TIMET background data would be better suited to background comparisons for RZ-B through RZ-E.*

**Response:** This comment has been superseded by the August 17, 2010 letter from NDEP.



- b. *2nd and 3rd paragraphs, NDEP has observed that the statistical analyses are not presented. TRX should note that comparison of maximums and means is not sufficient to draw conclusions. Proper statistical tests should be run and presented with conclusions based on lines of evidence such as the statistical results, plots of the data, and the conceptual site model (CSM) for this area.*

**Response:** Complete statistical comparisons between the six LOU 62 Phase A and B soil borings are presented in Attachment 2, Table 1 of the revised technical memorandum, to which this RTC is attached. Plots showing the results of these statistical comparisons are also presented in Attachment 2 of the revised technical memorandum.

- c. *4th paragraph, NDEP provides the following comments:*

- i. *The small number of data points in the RZ-A background dataset is not sufficient reason to suggest that BRC-TIMET background data are more representative of site conditions.*
- ii. *NDEP is willing to acknowledge differences in depth intervals and performing analysis based on reasonable depth ranges. For example, surface samples in the BRC-TIMET background dataset are 0-6 in bgs, whereas in the RZ-A data the surface samples are 0-2 ft bgs. Consequently, NDEP is comfortable with ranges of 0-2 ft bgs and 2 – 10 ft bgs for comparison purposes, while acknowledging that the statistical analysis is only one line of evidence in conclusions that are drawn (plots of data and CSM being other lines of evidence).*
- iii. *The much smaller geographic area is also not a sufficient reason to suggest that BRC-TIMET background data are more representative of site conditions. The BRC-TIMET background data are not collected as near to the other remediation zones (RZ-B through RZ-E) as the RZ-A data and the Parcels A and B data.*
- iv. *Although incomplete, the analysis that TRX has performed adequately demonstrates statistical differences between the RZ-A data and the BRC-TIMET background data (excepting further comments on statistical methodology herein). NDEP agrees that these two datasets are statistically different whether the reasons are geological, analytical, both, or other.*

**Response:** This comment (including parts i-iv) has been superseded by the August 17, 2010 letter from NDEP. For the statistical comparison between the RZ-A background data set and RZ-B through RZ-E, refer to Tables 1, 2A through 2D, and 3A through 3D of the revised technical memorandum, to which this RTC is attached.

4. *Depth Interval Determination, page 3, NDEP provides the following comments:*
- a. *NDEP finds that the use of depth intervals in the RZ-A and BRC-TIMET background data comparisons is confusing. In some cases, the RZ-A data has been broken into different depth intervals and in other cases, the BRC-TIMET data has been broken into different depth intervals. On their own, these depth distinctions are reasonably based on statistical differences for each metal. However, combined, the statistical analyses should be presented for common*



depth intervals (e.g. 0-2 ft bgs for surface, and 2-10 ft bgs for near surface). Instead, analyses are not performed when depth distinctions are different for the two data sets (NA in Table A1). Another way of looking at it is that, for example for arsenic, the RZ-A data are different by depth interval, whereas the BRC-TIMET data are not different by depth interval; therefore, the arsenic data for RZ-A are different than the arsenic data for BRC-TIMET. This logical approach would indicate more metals that are different between the two datasets. However, a more complete statistical approach is needed to compare the two data sets.

- b. NDEP also noted that the statistical analyses for the differences by depth are not presented. The conclusions should be supported by the analyses, which should be included in an Appendix.

**Response:** This comment (including parts a and b,) has been superseded by the August 17, 2010 letter from NDEP.

5. Site Data, page 3, 5th line, NDEP noted that the non-detects (NDs) were set to half the detection limit (DL) for statistical analysis. However, this is not necessary for the non-parametric tests. Please clarify for which statistical analyses  $\frac{1}{2}$  DL was used.

**Response:** For the statistical comparison between the RZ-A background data set and RZ-B through RZ-E, refer to Tables 1, 2A through 2D, and 3A through 3D in Attachment 2 of the revised technical memorandum, to which this RTC is attached. A footnote has been added to each of the tables, indicating that  $\frac{1}{2}$  of the detection limit was used in all of the statistical analyses that included non-detected data.

6. Statistical Comparisons, pages 4-5, NDEP provides the following comments:
  - a. Several chemicals have a low frequency of detection (less than 25%). The TM should address issues with DLs, which might render some statistical analyses inappropriate simply because there are not enough detects or because of lack of comparability of detection limits between datasets. TRX should note that lack of comparability can lead to poor decisions based on statistical analyses that should not be performed. NDEP has provided guidance to BRC on how to deal with NDs and can review this with TRX as well. There are options to statistically compare the frequency of detection for the two competing datasets, which is reasonable if the detection limits are similar (comparability issue) and if the frequencies are statistically similar, to then consider the detected values only.
  - b. Paragraph under bullets, last sentence, a directional determination can also be made the other way. When p-values for 1-sided tests are one (or near one), this suggests the test is set up the wrong way round or in this case, that site data are statistically less than background.
  - c. Results for each remediation zone, pages 5-6, TRX should tie the results back to the CSM to answer the following questions:
    - i. Do these results match what might be expected?
    - ii. Can they be explained?



**General Response to Comment 6:** For the statistical comparison between the RZ-A background data set and RZ-B through RZ-E, refer to Tables 1, 2A through 2D, and 3A through 3D in Attachment 2 of the revised technical memorandum, to which this RTC is attached.

**Response to Comment 6a:** For chemicals for which the frequency of detection is less than 25 percent in either the RZ-A background data set or the Site RZ-B through RZ-E data sets, additional statistical analyses were performed to evaluate the comparability of these data sets using methods described by NDEP (e-mail correspondence from Paul Black of Neptune and Company, Inc., a consultant for NDEP, to NDEP and Tronox, dated October 8, 2009). The results of these evaluations are summarized in Tables 3A through 3D of Attachment 2 of the revised technical memorandum, to which this RTC is attached.

**Response to Comment 6b:** Instances in which the p-values are equal to 1 are noted with a qualifier in Tables 2A through 2D

**Response to Comment 6c:** A discussion of the relationships between chemicals that exceed background and the CSM has been added to Attachment 2 of the revised technical memorandum, to which this RTC is attached.

7. *Conclusions, page 7, NDEP provides the following comments:*

- i. 1st sentence TRX should note that the fact that the BRC-TIMET and RZ-A datasets are different for several metals is enough to acknowledge that these data sets are different and because RZ-A data are often less than BRC-TIMET data, that RZ-A probably represents local background conditions (for CAS-Kelso analyzed data).*
- ii. 3rd sentence, NDEP agrees that the greatest impact will be for arsenic. However, the intent of using the most appropriate background dataset is to address CSM issues in evaluating the potential releases that have occurred at the site.*
- iii. Last sentence, NDEP is not clear as to what further supporting documentation is needed as NDEP provided direction for background comparisons in a letter dated April 30, 2010. However, when the extraction method SOPs are made available and if the extraction methods are confirmed to be different between CAS-Kelso and TestAmerica, then NDEP will compare data from RZ-A with data from Parcels A and B.*

**Response:** This comment (including parts i-iii) has been superseded by the August 17, 2010 letter from NDEP.

**References:**

BRC and Titanium Metals Corporation (TIMET). 2007. Background Shallow Soil Summary Report, BMI Complex and Common Areas Vicinity. March 16.



Nevada Division of Environmental Protection (NDEP), 2010a. Letter re: Tronox LLC (TRX), NDEP Facility ID #H-000539, Nevada Division of Environmental Protection (NDEP) Response to: Technical memorandum: Background Evaluation for Metals in Shallow Soils in Remediation Zone A and Remediation Zone D (including statistical analysis data and graphs), Dated: April 8, 2010. April 30.

NDEP, 2010b. Letter re: Tronox LLC (TRX), NDEP Facility ID #H-000539, Nevada Division of Environmental Protection (NDEP) Response to: Technical memorandum: Background Comparisons for Metals in Remediation Zones B through E, Compared to Remediation Zone A, Dated: July 22, 2010. August 9.

NDEP, 2010c. Letter re: Tronox LLC (TRX), NDEP Facility ID #H-000539, Nevada Division of Environmental Protection (NDEP) Response to Background Issues and Determination of Background Dataset for TRX. August 17.

Northgate. 2010a. Technical Memorandum: Background Comparison for Metals in Remediation Zones B through E, Compared to Remediation Zone A [prepared for Tronox LLC, Henderson, Nevada]. July 22, 2010.

Northgate. 2010b. Errata to Revised Human Health Risk Assessment for Remediation Zone A, Tronox LLC, Henderson Nevada. July 23, 2010.

Northgate. 2010c. Technical Memorandum: Calculation of Leaching-Based, Site-Specific Levels (LSSLs) for the Soil-to-Groundwater Pathway Using NDEP Guidance, Tronox LLC, Henderson, Nevada. August 23, 2010.

