

APPENDIX F

Tronox Response to NDEP January 26, 2010 Comments Regarding: Interim Groundwater Capture Evaluation and Vertical Delineation Report, Tronox LLC, Henderson, Nevada, Dated December 23, 2009

Tronox general response to comments:

To address remaining data gaps identified by NDEP and Tronox in these comments and previous documents, Tronox has prepared a *Capture Zone Evaluation Work Plan* (revised version to be dated March 25, 2010), which proposes significant additional data collection and evaluation activities related to capture zone analysis. A standalone capture zone evaluation report incorporating the results of this enhanced analysis with the previous analysis will be completed by the end of 2010. Therefore, Tronox's changes to this *Interim Groundwater Capture Evaluation and Vertical Delineation Report* in response to NDEP's comments focus on correcting factual errors and misstatements and identifying and acknowledging the remaining data gaps. A specific response to each comment is provided below.

1. *General comment, TRX has failed to use the water bearing zone (WBZ) nomenclature from the NDEP's January 6, 2009 Guidance Letter RE: BMI Plant Sites and Common Areas Projects, Henderson, Nevada Hydrogeologic and Lithologic Nomenclature Unification. The revised Deliverable must comply with this nomenclature or it will be rejected without review and Stipulated Penalties may apply.*

Tronox Response: The document has been modified to consistently use the BMI unified WBZ nomenclature.

2. *General comment, as NDEP has requested numerous times, in all Deliverables, TRX should provide "live" executable files (spreadsheets) for all tables, including formulas used for calculations.*

Tronox Response: "Live" executable spreadsheets, including formulas used for calculations, are included with this revised deliverable.

3. *Executive Summary, NDEP has the following comments:*
 - a. *Page 1, 2nd paragraph, TRX describes the vertical gradients as being "generally upward". Inspection of the remaining text and tables do not indicate the calculation of any downward gradients; please clarify if downward vertical gradients have been calculated or are suspected to exist at any areas of the Site.*

Tronox Response: The qualifier “generally” has been removed.

b. *Page 1, last paragraph, NDEP has the following comments:*

i. *TRX notes that for the Athens Road well field “data gaps have been partially addressed.” This is unacceptable given the extremely protracted time frame that this work plan was implemented in. NDEP considers TRX’s response to be unresponsive.*

Tronox Response: Comment noted. As indicated in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, completion of this work is scheduled for May/June 2010.

ii. *TRX references the McGinley and Associates 2007 model; however, TRX chooses not to reference the limitations of this model which presents a biased interpretation of the results of the model. This is not acceptable.*

Tronox Response: The document has been revised to acknowledge the limitations and uncertainties associated with the model.

c. *Page 2, 2nd paragraph, TRX should submit the Seep Area Well Field Groundwater Capture Report under separate cover and not revise and combine the Seep evaluation with the On-Site and Athens Road Well Fields Groundwater Evaluation document.*

Tronox Response: The Seep Area Well Field capture evaluation will be reported in the revised capture zone evaluation report, scheduled for submittal by the end of 2010.

4. *Section 1.1, page 5, 1st paragraph, NDEP has the following comments:*

a. *A high TDS area of up to 19,000 mg/L is referred to east of the Tronox facility; however, this area is not shown on Plate 8. Please clarify.*

Tronox Response: The cited concentration was an older sample result presented in the 2008 Annual Remedial Performance Report for the Tronox facility, which incorporated data from neighboring sites. This section has been updated to reflect the most recent groundwater monitoring report available from the Timet site.

b. *The highest TDS concentration for the plume originating onsite is stated as being 15,100 mg/L; however, Plate 8 shows higher concentrations (e.g., well I-T is labeled as 21,100 mg/L. Please rectify.*

Tronox Response: The text has been modified to be consistent with data shown on Plate 8.

5. *Section 1.3, page 6, NDEP has the following comments:*
- a. *1st paragraph, TRX should revise this paragraph to state that NDEP has requested for the demonstration and verification of mass and hydraulic capture at each well remedial well field.*

Tronox Response: This statement has been added to the end of Section 1.3, paragraph 1.

- b. *2nd paragraph, TRX should note and use the most current and final guidance issued by USEPA: A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems, Final Project Report (January 2008).*

Tronox Response: As indicated in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, the January 2008 USEPA capture zone guidance will be followed in the revised capture zone evaluation to be completed by the end of 2010.

6. *Section 2.1.1, NDEP has the following comments:*

- a. *Data Gap # 1, pages 8 – 9, NDEP has the following comments:*

- i. *Page 8, 1st paragraph, TRX states that “at the present time, no pumping has been performed at any of the wells. Tronox is working on securing a power source...” This is unacceptable. TRX has been working on implementing this scope of work for over two years and has chosen not to fully implement the NDEP-approved scope of work. For example, it is not clear why a power source could not have been secured or a mobile power source (e.g., generator) could not have been used.*

Tronox Response: Comment noted. As indicated in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, completion of this work is scheduled for April-May 2010.

- ii. *Page 8, 2nd paragraph, NDEP has noted that there is a response between well pair M-56 and M-71. The response in above-barrier well M-56 is smaller than that of M-71 but the groundwater elevations seem to increase and decrease together. Please explain how this would impact the determination that the barrier wall is not leaking.*

Tronox Response: As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, additional testing to evaluate whether the barrier wall is leaking is scheduled for April-June 2010. Tronox does not believe the water levels in well M56 reflect changes occurring below the barrier, but will further evaluate data for well pair M56 and M71 and nearby pumping/injection wells to assess this.

- iii. *Page 8, 2nd paragraph, TRX states that the “below-barrier wells would not show such a dramatic decrease in water levels as was observed during times of trench shutdown” if the barrier wall was leaking because the “below-barrier wells would be recharged by water coming through the barrier wall from upgradient.” NDEP believes that the groundwater mound would dissipate even if the barrier wall were leaking because the groundwater recharge from upgradient would be no greater than approximately the recharge before the installation of the barrier wall. TRX should include discussion on pre-barrier wall gradients and mounding to support this discussion.*

Tronox Response: This text has been removed from the revised document.

As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, additional testing to evaluate whether the barrier wall is leaking is scheduled for April-June 2010.

- iv. *Page 8, 3rd paragraph, TRX’s assumptions in this paragraph appear to be without basis due to the lack of referencing within this paragraph. These assumptions need to be supported and quantified.*

Tronox Response: It is not clear to Tronox what NDEP is referring to with this comment. The first sentence of this paragraph has been revised to make the basis of the assumption in that sentence clearer.

- v. *Page 9, 1st paragraph, TRX states that any contaminants passing beneath the barrier wall will eventually daylight into the alluvium. Please provide a conceptual trajectory (i.e., expected vicinity of daylighting) and timeframe for this migration (using an average linear groundwater velocity).*

Tronox Response: As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, this evaluation will be conducted using both analytical methods and the new numerical groundwater flow model.

- b. *Data Gap # 3, page 10, NDEP has the following comments:*

- i. *TRX should discuss the mass capture expected in wells I-AB and I-AA.*

Tronox Response: Estimates of mass capture for wells I-AB and I-AA have been added to the revised text.

- ii. *Results section, 1st paragraph, TRX states that wells I-AA and I-AB will be hooked up in the 2nd quarter of 2010 (nearly two and a half years after the scope of work was approved). This is unacceptable and not reasonable.*

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, this work is scheduled for April-May 2010.

iii. *NDEP does not consider this data gap addressed.*

Tronox Response: Comment noted. The text has been modified to provide current estimates of flow around the east and west ends of the barrier wall.

c. *Data Gap # 4, pages 11 – 12, NDEP has the following comments:*

i. *Page 11, Results section, 1st paragraph, TRX notes that the length of the pump tests may not have been long enough to assess the influence of the pumping. NDEP notes that this is TRX's failure to collect the appropriate data and fully implement the NDEP-approved scope of work. This is unacceptable.*

Tronox Response: Comment noted. The primary purpose of these pump tests was to provide data for calculating recovery well efficiencies so that a more accurate assessment of capture could be conducted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, up to 22 new piezometers near recovery wells in the Interceptor Well Field are scheduled for installation in May/June 2010. These piezometers will provide water level data for assessing capture in this area.

ii. *Page 12, table, TRX should additionally represent this data in a figure of the well field.*

Tronox Response: These data have been added to Figure 6.

iii. *Page 12, 2nd paragraph, the presented well triplet analysis shows that northward flow (towards recovery wells) is expected; however, the analysis does not show that hydraulic capture is achieved. Well triplet analysis, for the purpose of capture zone analysis should be performed on down- and/or side-gradient wells and show that inward or reverse flow is achieved.*

Tronox Response: Comment noted.

iv. *TRX should provide the location of well M-61 on the included Site Figures.*

Tronox Response: This well is shown on the Site figures, located adjacent to the upgradient eastern end of the barrier wall.

v. *TRX should include a figure showing the well triplets and the resulting gradients and directions.*

Tronox Response: These well triplets and resulting gradients are shown on revised Figure 6.

- vi. *TRX should consider solving for well triplet M-135, M-131, and I-AA.*

Tronox Response: Tronox will consider solving for this well triplet in future capture analyses.

- vii. *NDEP does not concur that this data gap has been completely addressed.*

Tronox Response: Comment noted. Additional work to address this data gap is proposed in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010.

7. *Section 2.1.2.1, page 13, NDEP has the following comments:*

- a. *This Section lacks the context of a fully defined target capture zone. TRX needs to clearly define the target capture zone based on geometry and concentrations. In addition, TRX needs to discuss the proposed target zone with the NDEP to insure that the target zone is acceptable.*

Tronox Response: Comment noted. Defining target capture zones with input from NDEP is part of the scope presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010.

- b. *2nd paragraph, TRX should include a description of the methods and data used in this analysis, and in the preparation of Table 4.*

Tronox Response: A brief description of the methods and data used in the mass flux analysis has been added to the beginning of the second paragraph of Section 2.1.2.1, and additional detail has been added to Table 4 (see response to Comment 16 below).

8. *Section 2.1.2.2, pages 14 through 16, the NDEP has the following comments:*

- a. *Page 14, 2nd bullet, TRX states that the width of the zone is the “length of the barrier wall”. This assumption is without technical basis as it is not clear why the width of the zone would not equate to the width of the property.*

Tronox Response: Comment noted. Defining target capture zones with input from NDEP is part of the scope presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010.

- b. *Page 14, 3rd bullet, TRX needs to place the precipitation rate into the context of the expected infiltration rate. TRX should also review the NDEP's leaching guidance dated January 16, 2010.*

Tronox Response: Tronox has added a description of the USGS estimated infiltration rate for undeveloped land used in the NDEP leaching guidance. To date, no Site-specific infiltration rate has been developed for the Tronox facility.

- c. *Page 15, 1st bullet, NDEP has the following comments:*

- i. *NDEP notes that based upon the size of the on-site water supply pipelines that this un-quantified quantity of water can be quite large.*

Tronox Response: Tronox recognizes that pipeline leaks may contribute significantly to subsurface water.

- ii. *TRX references a total of 53.8 gpm in the text; however, the associated calculations in Table 4 appear to indicate a value of 54.6 gpm. Please rectify.*

Tronox Response: The number in Table 4 is correct. The text has been revised to state the correct value.

- d. *Page 15, 1st full paragraph after 1st bullet, it is not clear what the technical basis is to assume that the eastern and western flow boundaries are "no flow" boundaries. Without justification from TRX, this assumption is rejected.*

Tronox Response: Tronox acknowledges that there may be some flow into or out of the area defined by the barrier wall, but given the flow direction and orientation of the alluvial deposits relative to the barrier wall, this component is expected to be small compared to the two sources considered. The text has been revised to include this explanation. (that's actually a much crisper explanation than is in the text. May want to revise based on comment)

- e. *Page 15, 2nd and 3rd bullets, TRX assumes a cross sectional area without a technical basis for the selected width.*

Tronox Response: These calculations were based on the cross section defined by the barrier wall rather than a target capture zone. This will be revisited once the target capture zones have been established with input from NDEP (see response to Comment 7b and 8a above).

- f. *Page 15, 3rd bullet, TRX references an upward vertical hydraulic gradient average of 0.07. This value appears to be low based on information provided in Table 2. Please list values used for averaging, and/or rectify.*

Tronox Response: The specific values averaged are listed in Note 8 of Table 4 and presented in Table 2. The values used are vertical gradients measured in well triplets on either side of the barrier wall.

- g. *Page 16, 1st paragraph, the total flow values listed on page 16 and Table 4 are inconsistent.*

Tronox Response: The number in Table 4 is correct. The text has been revised to state the correct value.

9. *Section 2.1.4, given the already protracted schedule for implementation of the Groundwater Capture Zone Evaluation Work Plan, NDEP finds the continued delay in addressing Data Gap #1 unacceptable.*

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, this work is scheduled for April-May 2010.

10. *Section 2.2.1, pages 18 through 21, the NDEP has the following comments:*

- a. *Page 19, Results section, 1st paragraph, please explain why temperature measurements were not taken. In addition, please explain this relative to the flow through cell for low flow sampling.*

Tronox Response: Temperature readings were not collected due to an oversight by sampling technicians who were not fully briefed on the data requirements. Tronox is taking steps to improve communication of sampling protocols and improved data collection and management in the field.

- b. *Page 19, Results section, 2nd paragraph, please explain why the well completions were not adjusted instead of being allowed to be buried under pavement.*

Tronox Response: Tronox made repeated attempts to alert contractors to the well locations and work with them to preserve the well completions, but unfortunately wells were still covered. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, these wells are scheduled to be re-established or replaced in May/June 2010. In re-establishing or installing these and all other wells associated with the work plan, ongoing well protection will be considered in designing wellhead completions and selecting new well locations.

- c. *Page 20, tables, TRX should additionally represent this data in a figure of the well field.*

Tronox Response: These well triplets and resulting flow gradients have been added to revised Figure 11.

- d. *Page 20, 2nd paragraph, TRX should provide a schedule for the clearing or replacement of PC-134 – 137.*

Tronox Response: As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, these wells are scheduled to be re-established or replaced in May/June 2010.

- e. *Page 21, 1st paragraph, if the “currently available and accessible monitoring wells are insufficient to confirm the precise location of these [Athens Road Well Field] contours”, then the contours should be dashed or queried.*

Tronox Response: Figure 10 shows contours in these areas as dashed lines.

- f. *Page 21, Results section, 2nd full paragraph, please explain why the flow rates in wells ART-3 and ART-9 have not been adjusted.*

Tronox Response: The pumping rate in ART-3 was increased from about 39 gpm to about 45 gpm on December 8, 2009. ART-9 is pumping at full capacity and any increase will have to wait until ART-7 is deepened.

11. *Section 2.2.2, pages 21 – 23, the NDEP has the following comments:*

- a. *Page 21, TRX’s selection of the boundaries of the target capture zone appear to be a matter of convenience rather than having any technical basis. For example, TRX has selected differing concentrations to define the capture zone. This is unacceptable and as noted above, TRX needs to work with the NDEP to define an acceptable target capture zone.*

Tronox Response: Comment noted. Establishing target capture zones with input from NDEP is part of the work presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010 (see response to Comment 7b and 8a above).

- b. *Page 22, Flow Budget section, NDEP has the following comments:*

- i. *It appears that TRX estimates that up to 655 pounds per day of perchlorate could be captured and estimates that 497 pounds per day is being captured. This is very concerning to the NDEP as it indicates that 158 pounds per day of perchlorate are not being captured. TRX must propose additional work to address this data gap in the separate Deliverable in the form of a new Work Plan (please see in that above-attached letter).*

Tronox Response: The mass actually being captured and removed from the Athens Road well field (ARWF) is calculated at 655 pounds while the mass calculated using a mass flux approach is 257 pounds (the 497 pounds was based on the mass flux calculations with a “flow correction,” and has since been removed from the report). The system is removing *more* mass than calculated using the mass flux approach, not less as interpreted by NDEP based on this comment.

- ii. *Additionally, it appears that this section states that the mass flux calculations do not correspond well to the documented flow and mass capture at this sub-system. However, NDEP does not agree that scaling the calculations to the documented flow rates is a valid exercise but that the underpinning assumptions of the calculations are more likely at error. Please revise this Section or omit.*

Tronox Response: The sentence on scaling the mass flux calculations based on a “flow correction” has been deleted.

- iii. *TRX speculates that the lower calculated mass flux may be related to reduced in-place hydraulic conductivities. This is an unsupported assumption that should have been verified with field testing. Also, hydraulic conductivities in a formation are not expected to be modified by a factor of two or more due to pumping of localized silts; and furthermore, removal of fines from a formation would result in increased conductivities rather than decreases. Until quantitative information can be provided, these statements are rejected and should be removed from the Deliverable.*

Tronox Response: Fines removal and resultant increases in hydraulic conductivity was offered as a possible explanation for why the mass calculated based on mass flux using 2002 pump test conductivities is *lower* than the actual mass removed, not the reverse as interpreted by NDEP based on this comment. Tronox agrees that this explanation is speculative, however, and has modified this sentence to simply state that the available estimates of parameters used to calculate mass flux are not well constrained. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, mass flux and capture at the ARWF will be further evaluated during 2010.

- c. *Pages 22 – 23, Overlapping Cones of Depression, NDEP concurs that considerable net drawdown has been achieved over relatively wide areas, and that drawdown cones may overlap throughout the area. However, NDEP does not agree that net drawdown may be used as a line of evidence for capture.*

Tronox Response: The last sentence of the paragraph on “Overlapping Cones of Depression” has been modified to clarify that net drawdown will not be used as a direct

line of evidence for hydraulic capture, and to note that additional capture evaluation following the USEPA 2008 guidance will be completed during 2010.

- d. *Page 23, Numerical Modeling section, TRX needs to note that the McGinley model and the NDEP comments clearly stated that the existing concentration contours do not support the referenced 99 percent capture efficiency.*

Tronox Response: The “Numerical Modeling” paragraph has been modified to make this clear.

- e. *Page 23, Downgradient Concentration Declines Over Time, TRX must provide some estimate of time to reach asymptotic levels for these monitor wells. TRX should additionally use monitoring points closer to the well field for this demonstration.*

Tronox Response: Based on recent concentration trends in the wells evaluated, an accurate prediction of time to reach asymptotic levels is not possible. Tronox agrees that concentration trends over time in wells closer to the ARWF should also be evaluated, and this will be part of the revised capture zone evaluation to be completed by the end of 2010.

12. *Section 2.2.3, pages 23 and 24, the NDEP has the following comments:*

- a. *Page 24, Data Gap #4, NDEP does not concur with TRX’s proposed path forward and notes that TRX must work with the NDEP and the City of Henderson to insure that this work transpires immediately.*

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, this work is scheduled for May/June 2010.

- b. Given the already protracted schedule for implementation of the Groundwater Capture Zone Evaluation Work Plan, NDEP finds the continued delay in addressing these Data Gaps unacceptable.

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, all of this work is scheduled for May/June 2010.

13. *Section 3.0, page 25 and 26, the NDEP has the following comments:*

- a. *General comment, as noted above, since TRX has failed to comply with the NDEP's water-bearing zone nomenclature, the NDEP's comments should not be considered comprehensive.*

Tronox Response: Comment noted. The text has been revised to comply with NDEP's water-bearing zone nomenclature.

- b. *NDEP has noted that TRX has taken over two and a half years to complete and sample these wells since the NDEP approved the Groundwater Capture Evaluation Work Plan. NDEP finds this unacceptable.*

Tronox Response: Comment noted.

- c. *Page 25, last paragraph, NDEP does not concur with TRX's proposed target capture zone as there is no apparent technical basis for the selected concentrations of 1 mg/l and 5 mg/l given that the NDEP's interim action level is 18 µg/l.*

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, establishing target capture zones with input from NDEP is part of the work planned for 2010 (see response to Comment 7b, 8a and 11a above).

- d. *Page 26, TRX states that "The pending November 2009 results will provide further data to evaluate the vertical extent of the chromium plume. These results will be reported in the updated and revised report." NDEP did not note that chromium was discussed in this Deliverable. TRX should note that both the Groundwater Capture Evaluation and the Vertical Delineation portions of this document should discuss chromium capture and vertical extent, respectively. As such, NDEP does not understand why the chromium data from May 2009 was not discussed and analyzed in this Deliverable as this data was included in several Figures and Tables. NDEP finds this unacceptable.*

Tronox Response: Comment noted. In addition to addressing perchlorate, the revised capture zone evaluation to be completed by the end of 2010 will include chromium capture and vertical extent.

14. *Section 4.0, pages 27 – 28, TRX should revise this section as necessary based on the comments found in this Attachment.*

Tronox Response: Section 4, Conclusions, has been modified to reflect changes made to the rest of the document in response to NDEP's comments.

15. *Table 2, the NDEP has the following comments:*

- a. *Vertical Gradient column, the use of arrows in the right hand column is misleading without explanation; for instance, the arrows appear to indicate that the gradient decreases from M-135 (a shallow well) to M-134 (a middle well). Please arrange the wells in order of elevation midpoint of screen or otherwise clarify the use of the arrows.*

Tronox Response: Arrows have been deleted from Table 2.

- b. *Note 2, this reference is incorrect as noted above.*

Tronox Response: This reference has been corrected.

- c. *Note 3, it is not clear why TRX has not surveyed these wells since the scope of work was approved in October 2007.*

Tronox Response: The note in Table 2 was out of date and has been revised. The eight vertical delineation wells were surveyed and the survey data was presented in Appendix D.

16. *Table 4, NDEP has the following comments:*

- a. *TRX must provide a description of the methods used to prepare the table and its use in mass flux analysis.*

Tronox Response: The notes for Table 4 have been expanded to include the equation used for calculating mass flux and additional detail on the parameter values selected.

- b. *Please consider discretizing hydraulic conductivity across the cross section (as for the Athens Road analysis) or further justify the use of a broad average value.*

Tronox Response: Mass flux and capture calculations will be revisited and enhanced as part of the revised capture zone evaluation. This may include further discretization of hydraulic conductivity and other parameters if necessary. However, Tronox does not have well-specific hydraulic parameters for the IWF wells

- c. *Alluvium, ClO₄ mg/L (May 2009) and Notes (10), (12), and (14), please provide justification for using an average value from several surrounding wells for the perchlorate concentration in a particular listed well rather than the value measured in that listed well.*

Tronox Response: Averages were used for transect segments with perchlorate concentrations and resultant flux that were interpreted to be best represented by

concentrations in more than one monitoring well. Mass flux and capture calculations will be revisited and enhanced as part of the revised capture zone evaluation.

- d. *Muddy Creek – Ends of Barrier Wall, ClO₄ mg/L (May 2009) and Definition **, the value for the perchlorate concentration used in this well was measured at 60.9 ppb; however, the Definition for this value states that an average concentration from contouring was used. Please provide justification for using an estimated value of 250 ppb when the measured value in the well was 60.9 ppb.

Tronox Response: The estimated value of 250 ppb was considered more representative of average perchlorate concentrations for this mass flux cell than the single well concentration. Mass flux and capture calculations will be revisited and enhanced as part of the revised capture zone evaluation.

- e. *Muddy Creek – Upflow, ClO₄ mg/L (May 2009) and Note (15)*, please provide justification for the use of the average perchlorate concentration captured for the upflow for the Muddy Creek.

Tronox Response: The upflow perchlorate concentration used in Table 4 is an average of concentrations measured only in IWF wells where the top of the water table is located in the UMCf. Groundwater in these wells is considered representative of upflow in the well area, and the average concentration for these wells is a reasonable statistic to represent upflow throughout the UMCf upflow area.

- f. *Notes*, please review the use of the notes in this Table. Notes (3), (4), and (5) appear to be misused.

Tronox Response: The numbering of notes on Table 4 has been corrected.

- g. *Note (8)*, please provide the vertical gradient values and the resulting calculation to determine the vertical gradient used in Muddy Creek – Upflow calculation.

Tronox Response: The locations for specific values averaged are listed in Note 8 of Table 4 and the values are presented in Table 2. The values used are vertical gradients measured in well triplets on either end of the barrier wall.

17. *Table 6, TRX should note the reference for the listed hydraulic gradients used in this Table.*

Tronox Response: A note has been added to Table 6 to indicate the source of hydraulic conductivity values used.

18. *Figure 4, the notes regarding the date of the trench refurbishment should be added to all hydrographs.*

Tronox Response: These notes have been added to all hydrographs shown on Figure 4.

19. *Figure 5, the 1720 feet groundwater contour, in vicinities of the west and east barrier wall, are not supported with plotted values. Please dash or query contours where they are not supported by field measurements, or provide measurements.*

Tronox Response: The contour lines shown on Figure 5 were drawn using data from additional wells that are located outside of the boundary of the Figure, and were previously presented in the *Annual Remedial Performance Report for Chromium and Perchlorate* (Northgate, 2009).

20. *Figure 6, the concept of “net drawdown” is meaningless in terms of capture zone analysis and should be removed from this Deliverable.*

Tronox Response: Comment noted. References to net drawdown as a line of evidence for capture have been removed from this document, and will not be included in the revised groundwater capture evaluation.

21. *Figure 7, please discuss why concentrations are not approaching zero as an asymptote for these concentration trends.*

Tronox Response: Evaluating concentration trends over time in these and other wells will be part of the revised capture zone evaluation.

22. *Figure 8, since there is no data in the Muddy Creek formation (MCf) “ridge” this area is not quantified and is a data gap that must be addressed in the new Work Plan.*

Tronox Response: As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, two new wells will be installed to investigate the UMCf ridge in May/June 2010.

23. *Plate 1, NDEP has noted that the wells located in the MCf are very elevated for perchlorate and chromium and the nature and extent of this contamination is not defined. This issue must be addressed in the new Work Plan.*

Tronox Response: As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, seven new wells are scheduled for installation in May/June 2010 to help define the lateral and vertical distribution of perchlorate and chromium in the UMCf.

24. *Plate 2, NDEP is not clear why there is no data for the deeper wells on this Plate. This data gap must be addressed in the new Work Plan.*

Tronox Response: These wells were not accessible during the May 2009 sampling event and no data were collected. Data from 2008 have been added to the figure, and as presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, these wells will be re-established or replacement wells will be installed.

25. *Plate 3, as noted above, the NDEP does not agree with the target capture zone depicted on this Plate.*

Tronox Response: Comment noted. As presented in the revised *Capture Zone Evaluation Work Plan*, to be dated March 25, 2010, establishing target capture zones with input from NDEP is part of the work planned for 2010.