NEVADA DIVISION OF
ENVIRONMENTAL
PROTECTION

STATE OF NEVADA
Department of Conservation & Natural Resources
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October 16, 2023

Jay A. Steinberg
Nevada Environmental Response Trust
35 East Wacker Drive, Suite 690
Chicago, IL 60601

Re: **Tronox LLC (TRX) Facility**
Nevada Environmental Response Trust (Trust) Property
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection (NDEP) Response to the NERT's Response to NDEP's Comments on Phase 6 Groundwater Model and the Updates for *Phase 7 Groundwater Flow and Transport Model*

Dated: October 9, 2020, and November 8, 2022

Dear Mr. Steinberg,

The NDEP wants to provide following supplementary comments on the NERT's Response to NDEP's Comments on Phase 6 Groundwater Model and the Updates for Phase 7 Groundwater Flow and Transport Model:

1. Groundwater Model Boundary Conditions: On July 22, 2020, the Nevada Division of Environmental Protection (NDEP) issued comments on the Phase 6 Model for the Nevada Environmental Response Trust (NERT) Site in Henderson, Nevada. Those comments recommended the use of a specified flux or hydraulic head-dependent boundary condition (i.e., a General Head Boundary [GHB] condition) along the bottom boundary to better align with deep observed groundwater elevations and vertical hydraulic gradients. NERT's response to comments on October 9, 2020 proposed the use of a GHB condition for the bottom boundary of the model in the upcoming Phase 7 Model, and NDEP approved NERT's responses on November 4, 2020. However, in their study on groundwater residence time distributions within the NERT Site, the Desert Research Institute (DRI) identified limitations associated with applying a GHB condition at the model's bottom boundary.

Further discussion on the application of the GHB condition for the model's bottom boundary took place during Ramboll's conference call and presentation on the Phase 7 Model on November 8, 2022. Ramboll explained that the specified head for the GHB is based on observed groundwater elevations used as calibration targets but adjusted to reflect the potentiometric surface at depth in the Muddy Creek Formation. This approach raises concerns about potential limitations in using a GHB condition for the model's bottom boundary. Specifically, there is concern that assigning the specified head as a function of calibration targets could overly constrain model calibration and unduly influence predictive model applications. The specified head could govern simulated groundwater elevations above the GHB, causing them to closely match the specified head. When the specified head is based on calibration targets, this could potentially achieve a good match to the calibration targets independently of other specified model input parameters, such as hydraulic conductivity, recharge, lateral model domain boundaries, etc. The potential outcome is a non-unique model calibration, where multiple input parameter combinations could yield a similar model calibration. To address this concern, NDEP emailed draft commentary and suggestions to NERT on August 10, 2023, recommending a detailed sensitivity and uncertainty analysis to demonstrate that the model calibration is not overly sensitive to the GHB. NDEP also suggested that a specified flux boundary is a preferred alternative to a GHB boundary, as the specified flux will not act as an unlimited source/sink of groundwater and may have less potential to unduly influence model predictions compared to a GHB, especially when evaluating potential remedial designs.

Therefore, NDEP is now strongly recommending implementation of the specified flux boundary condition for the bottom boundary of the Phase 7 model. Additionally, conducting sensitivity/uncertainty analysis is recommended to ensure that the model calibration and predictions are not unduly influenced by the specified flux boundary condition.

2. Calibration-Constrained Uncertainty Analysis: Looking ahead to the later stages of the project, NDEP anticipates the need to integrate calibration-constrained uncertainty analysis into the uncertainty assessment concerning potential remedial designs. Calibration-constrained uncertainty analysis is recommended because multiple sets of different parameter values can yield a similar goodness of fit during model calibration. However, when applied to predict remedial design performance, they can result in a wide range of predictive outcomes. By incorporating calibration-constrained uncertainty analysis, we can enhance the robustness of the remedial design process, ensuring it accounts for variability in the model predictions and leading to well-informed, reliable remedial design selections.

Please contact the undersigned with any questions at wdong@ndep.nv.gov or 702-668-3929.

Sincerely,

Dong Weiquan

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