NEVADA DIVISION OF
ENVIRONMENTAL
PROTECTION

STATE OF NEVADA
Department of Conservation & Natural Resources
Steve Sisolak, *Governor*
James R. Lawrence, *Acting Director*
Greg Lovato, *Administrator*

July 5, 2022

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: *GW-11 Pond Closure Pre-Closure Summary and Alternatives Analysis*

Dated: February 22, 2022

Dear Mr. Steinberg,

The NDEP has received and reviewed the Trust's above-identified Deliverable and provides comments in Attachment A. A revised Deliverable should be submitted **by 09/05/2022** based on the comments found in Attachment A. The Trust should additionally provide an annotated response-to-comments letter as part of the revised Deliverable.

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

Sincerely,

Dong Weiquan

Weiquan Dong, P.E.
Bureau of Industrial Site Cleanup
NDEP-Las Vegas City Office

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Attachment A

1. Introduction

This technical memorandum summarizes a review of, and provides comments regarding, the above-referenced document. Page numbers referenced are for the hard copy version of this document.

2. General Comments

General Comment 1 In Section 2.1 recommend adding sentence that provides the general dimensions (H x W x L) of the Pond embankment inclusive of the below ground component along with an additional figure showing both the map view and cross section. Doing so would be a helpful reference when reviewing each alternative.

3. Fatal Flaws

Fatal Flaw 1: Cost Sections 4.3.1.3, 4.3.2.3, 4.3.3.3, 4.3.4.3, 4.4.3 various pages.

The NDEP acknowledges this is a screening level alternatives analysis, however it is still important to provide sufficent cost detail for each alternative in order to support justification of a recommended remedy. For instance, in Section 3.3.3 Semi-volatile Organic Compounds (SVOCs) page 19 the HCB concentrations are relatively high in multiple borings. Per Section 3.3.10 additional investigation was to be completed in January 2022 with laboratory results expected in February 2022. The February 2022 results are not presented in this report, and therefore it is unclear what the cost impact could be if there were a larger quantity of embankment material failing TCLP. Therefore, the NDEP requests NERT provide an assumptions table for each alternative that inlcudes all items that are expected to have a significant influence (cummulatively or individually) on the overall cost. The assumptions tables can show either an estimated quantity or quantity range for each item. The assumptions table should also include references to the cost estimate basis (e.g., contractor knowledge, vendor quote, model, etc.).

Fatal Flaw 2: Section 4.0 Development and Screening of Alternatives Page 25

The United States Environmental Protection Agency (USEPA) recognizes remedy effectiveness can be evaluated in terms of protectiveness and ability to achieve removal objectives. The protectiveness of the alternatives can be assessed in terms of how well they protect public health and the community, protect workers during implementation, protect the environment and comply with ARARs. The alternatives analysis exhibits little consideration for worker safety beyond H_2S exposure. Given the nature of the work required to close GW-11 Pond, including potentially hazardous materials, working around water, and high volume of construction traffic, worker safety should be a priority consideration outlined for each alternative. Worker safety should also be captured in Section 4.4.1 Effectiveness Page 36.

4. Essential Corrections

Essential Correction 1: Section 3.2.2 Analytical Testing Results Page 8 Section 3.2.2 states that the sludge sample contains 2.78 percent total solids and 1.71 percent suspended solids. Please provide more clarity regarding how the volume of sludge is defined. Is the 1.71 percent suspended solids inlcuded in the total solids, or are they two distinct layers?

Essential Correction 2: Section 3.2.2 Analytical Testing Results Page 8 High sulfate concentrations are present in the Pond which is said to be under anaerobic conditions. The Pond is currently utilized to receive off-spec GWETS effluent and to receive and store extracted groundwater during GWETS maintenance events therefore it does not seem that there is a constant, ongoing source of sulfate. If the Pond is under anaerobic conditions, sulfate levels should be lower. Please clarify if the anaerobic conditions have been verified. If the anaerobic conditions have been verified then please explain the presence of high sulfate concentrations.

Essential Correction 3: Section 3.2.3 Solids Settling Test Page 9 The report on the settling tests is not included in Appendix C. Was this testing performed at a different time? Is this why the data from the settling tests were not used to determine the polymer/coagulant doses performed in the Geotube and Centrifuge tests?

Essential Correction 4: Section 3.2.3 Solids Settling Test Page 9 Solids settling tests were not performed with coagulant alone option. It is standard practice in jar testing to test each reagent separately. Please explain the rationale for this choice.

Essential Correction 5: Section 3.2.3 Solids Settling Test Page 9 Provide the rationale for not testing permanganate on undiluted samples. Permanganate should have been included in all tests as permanganate addition is planned and the production of manganese dioxide from the reaction of the permanganate will affect settling parameters and any unreacted permanganate will affect the quality of the supernatant.

Essential Correction 6: Section 3.2.3 Solids Settling Test Page 9 In addition to photographs showing the settled solids and the clarity of the supernatant, quantitative measurements of the turbidity or TSS of the supernatant and the percent solids content of the settled solids would be helpful to assess the efficacy of the polymer/coagulant doses. Please explain why this was not done.

Essential Correction 7: Appendix D How do the doses of polymer used in the geotube tests relate to the doses of polymer used in the settling test? Was the settling test data used to inform the polymer/coagulant choice fo the geotube tests?

Essential Correction 8: Section 3.2.4.2 Centrifuge Page 11 How do the doses of polymer used in the centrifuge tests relate to the doses of polymer used in the settling test? Was the settling test data used to inform the polymer/coagulant choice fo the centrifuge tests?

Essential Correction 9: Section 3.2.4.3 Filter Press Page 12 Polymer and/or coagulant are often added to assist with dewatering using a filter press. Because it is likely this test would have yeilded different results if the polymer and/or coagulant were used, please explain why this was not done.

Essential Correction 10: Section 3.2.5 Hydrogen Sulfide Mitigation Page 13 A dose of 800 parts per million (ppm) permanganate is indicated as being effective to reducing H_2S concentrations below 10 ppm for the Pond. Adjusting to add in the molecular weight of sodium, this permanganate dose translates to a dose of 952 ppm sodium permanganate. Sodium permanganate is shipped as a 40 percent liquid so 2.4 g of the 40 percent solution would be added per liter of Pond material. The average volume of water in the GW-11 Pond in 2021 was approximately 35.1 million gallons. This would require a dose of 184,000 pounds of 40 percent sodium permanganate. Sodium permanganate is a strong oxidant capable of igniting if spilled on something flammable such a paper or wood. Using this amount of sodium permanganate would have a large cost and be risky to handle. The cost and risk should be addressed in the analysis.

Essential Correction 11: Section 3.3.3 Semi-volatile Organic Compounds (SVOCs) page 19 The HCB concentrations are relatively high in multiple borings. This could have significant project implications if material fails TCLP during implementation. Per Section 3.3.10 additional investigation was to be completed in January 2022 with laboratory results expected in February 2022. These results should be included in the closure analysis.

Essential Correction 12: Section 3.4.3.1 Embankment Fill page 22 1st paragraph stated that "Standard penetration resistance values in the fill ranged from 22 to greater than 50 blows per foot". A review of the boring log does not appear to have any SPT values greater than 50 blows. Please correct or update as necessary.

4th paragraph stated "cohesion values of 430 and 180 pounds per square foot. Please discuss how these two numbers are used to produce the value in Table 7.

Essential Correction 13: Section 3.4.3.2 Natural Sand page 22 2nd paragraph stated "cohesion values of 350 and 390 psf. Please discuss how these 2 numbers are used to produce the value in Table 7.

Essential Correction 14: Section 3.4.4 Slope Stability Analysis page 23 2nd paragraph, item 6 stated that "the WC-West Pond remains fully lined, nearly empty. The evaluation presented is a long-term stability scenario based on the WC-West Pond filled to the maximum height. Recommend adding the factor of safety for short-term stability scenario where the WC-West Pond is nearly empty, which is stated to be the normal condition, and the water in the GW-11 Pond is rapidly drawn down.

Essential Correction 15: Table 7 page 24 Unit Weight Values: Please provide a statement indicating whether these values are average values from the 4 test samples or from one specific sample.

Essential Correction 16: Section 3.4.4 Slope Stability Analysis Last paragraph, item 4 page 24 "If necessary, new fill …" Would the requirement for new fill be determined in the design phase considering that the type of material specified as "new fill" may impact the requirement for erosion protection?

Essential Correction 17: Section 3.4.4 Slope Stability Analyssis Last paragraph, item 5 page 24. "If necessary, provide rip rap …" Would erosion protection be determined in the design phase considering that when the liner is removed from the GW-11 Pond as part of the closure requirement, the slope will be exposed and susceptible to erosion.

Essential Correction 18: Section 4.2 GW-11 Pond Contents Removal and Treatment/Disposal Alternatives page 27 Alternative A is the only alternative where water is pumped off prior to solids removal. Please explain whether water is being retained in the other two options to create a water blanket to prevent the emission of H_2S?

Essential Correction 19: Section 4.2 GW-11 Pond Contents Removal and Treatment/Disposal Alternatives (various subsection bullets) page 27
Bullet 3a. The NDEP recommends considering constructing the geotube containment area within the GW-11 Pond footprint. After pumping water down within the Pond area to the extent practicable, an area for the geotubes could be partitioned off with a temporary dam. The sludge within the containment area could be pumped and consolidated within the remaining Pond area.

Bullet 4a. At this point. consider not eliminating plate and frame press and provide it as an option with centrifuge, referring to them both as mechanical dewatering.

Essential Correction 20: Section 4.3.2 Alternative A Removal of GW-11 Pond Liquids in Advance of Solids (various subsection bullets) page 29
Bullet 2a. Is there an option to add more solids removal equipment ahead of the GWETS to allow more processing of the water with the system?

Bullet 3a. It is stated that mechanical removal would be the most effective means to remove the solids. Before discounting it due to potential damage to the liner, the NDEP recommends further evaluation of methods to protect the liner such as using small rubber tire equipment with specialty buckets and extensive monitoring and contingency plans during removal. A protective layer could also be used for an isolated area in the Pond to perform any aggressive mixing and/or loading. Consider as part of this step to allow the material to dry out to the extent practicable and mix with the embankment soil to meet the paint filter test.

Bullet 3b. The NDEP recommends further discussion of the disposition of the material in the vacuum trucks. How many trucks would have to be removed accounting for the excess water that would be generated using this approach? What would be the cost implications for subsequent solidification prior to disposal?

Essential Correction 21: Section 4.3.2.2 Implementability page 30

The term "technically feasible" is used to describe additional measures that could minimize damage to the liner. Given the significance damaging the liner presents, and the apparent influence this concern has to the rating of Alerntaive A, the NDEP recommends expanding this section to include some examples of methods and equipment that would make removal of solids using heavy equipment technically feasible. The addition of a figure(s) showing tools, equipment and techniques would be helpful.

Essential Correction 22: Section 4.3.3 Alternative B – Solids Dewatering Utilizing Geotubes page 31

If H_2S mitigation is being done prior to solids or water removal, why wouldn't the water be removed before removing and dewatering the solids? The solids would be easier to manage if the water was pumped off and it would be more efficient to empty the Pond during the dewatering step without additional water removal and treatment. Is there a concern that a water blanket is necessary to manage the H_2S even after the permanganate treatment?

Essential Correction 23: Section 4.3.3 Alternative B – Solids Dewatering Utilizing Geotubes page 31

3b notes "hydraulic methods" while cost table 11 states "Hydraulic Dredging". If hydraulic dredging is the only hydraulic method being employed then recommend changing 3b and entireity of Section 4.3.3 to "hydraulic dredging" as it is more succinct.

Essential Correction 24: Section 4.3.3.2, 3e, Page 31
Sending the water from the geotube dewatering to the GWETS and not back to the Pond would minimize managing the water multiple times. Please consider making this change or provide an explanation of why this is not possible/advisable.

Essential Correction 25: Section 4.3.3.2 Implementability page 32
The document would benefit from additional discussion of the challenges of dewatering this material with the geotubes. It may be difficult because the material has 90 percent fines that will pass though the geotube without the appropriate chemical addition and a dredge will produce a very inconsistent dredge stream requiring continuous adjustment of the chemical additives.

Essential Correction 26: Section 4.3.3.2 Implementability page 33

Section notes: "Hydraulic removal and geotube dewatering are commonly used in the environmental industry for removal of sediments from impoundments and waterways." This section would benefit from the addition of a figure(s) that shows examples of the tools, equipment and methods used to accomplish this.

Essential Correction 27: Section 4.3.4 Alternative C – Solids Dewatering Utilizing Centrifuge page 33

3b notes "hydraulic methods" while cost table 12 states "Hydraulic Dredging". If hydraulic dredging is the only hydraulic method being employed then recommend changing 3b and entireity of Section 4.3.4 to "hydraulic dredging" as it is more succinct.

Essential Correction 28: Section 5.0 Recommendations page 39

State clearly that NERT is recommending Alternative B. Please also provide a textual explanation for the range of costs presented in Table 14. It appears that the range of estimated costs is between $14.8 M and $31.7 M, with the most probable cost being $21.1 M. Clearly state that these estimates together represent the range of probable costs and explain.

5. Minor Corrections

Minor Correction 1: Appendix E Boring Log, please provide legends for the symbols and abbreviations used in the log.

Minor Correction 2: Section 3.2.6 Pond Solids Removal page 14 The text should clarify the discussion of the dredge type. The term hydraulic dredge typically includes any dredge that moves the material hydraulically (including a typical cutter-head dredge).

Minor Correction 3: Section 3.4.3.1 Embankment Fill page 22 4th paragraph stated "Direct shear testing was performed". It should be noted that the mode of failure in a direct shear test sample may overestimate shear strength values and result in a less conservative FOS.