OFFICE OF THE NEVADA ENVIRONMENTAL RESPONSE TRUST TRUSTEE

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July 22, 2021

Dr. Weiquan Dong, P.E.
Bureau of Industrial Site Cleanup
Nevada Division of Environmental Protection
375 E. Warm Springs Road, Suite 200
Las Vegas, Nevada 89119

RE: Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan Addendum and Cost Estimate and Basis
Nevada Environmental Response Trust
Henderson, Nevada

Dear Dr. Dong:

The Nevada Environmental Response Trust (NERT) is pleased to present the Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan Addendum and Cost Estimate and Basis for Nevada Division of Environmental Protection (NDEP) review. As you are aware NERT began implementation of the Unit 4 Source Area In-Situ Bioremediation Treatability Study in July 2018, limited to the Phase 1 pre-design activities as specified in the Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan dated June 28, 2018 (Work Plan) and subsequently approved by the NDEP on July 10, 2017. During completion of the Phase 1 pre-design activities NERT prepared a Treatability Study Modification No. 4 recommending the completion of an extended groundwater extraction test to evaluate if short-term groundwater extraction (up to 3 months) would reduce TDS concentrations to levels at which bioremediation has been successful in the bench-scale testing. NDEP approved the modification in a letter dated September 10, 2018 and the extended groundwater extraction test was completed in January 2019. Based on the results of the Phase 1 efforts, the Trust directed Tetra Tech to prepare documentation to implement a Phase 2 field program of the study to evaluate the effectiveness of implementing in-situ bioremediation to reduce contaminants present in the alluvium and UMCf at the Unit 4 Building source area. NERT worked closely with Tetra Tech and Arcadis to ensure the scope of this treatability study was sized appropriately to achieve the objectives of the study and capture data necessary to support an evaluation of this remedial technology in the forthcoming Feasibility Study. Upon finalization of the Phase 2 project scope, the Trust directed Tetra Tech to prepare a Work Plan Addendum and Phase 2 Cost Estimate and Basis document for final review by Arcadis, the Trust's third-party subject expert. This review involved a detailed evaluation to ensure the following with respect to the proposed Phase 2 scope of work:

1. Implementability;
2. Scope is commensurate with the study's objectives; and,
3. Costs are commensurate with the scope of work.

Arcadis submitted its final Review and Comment memorandum **(Attachment A)** to NERT on July 21, 2021. The attached Work Plan Addendum **(Attachment B)** and Phase 2 Cost Estimate and Basis **(Attachment C)** represent revised documentation to the satisfaction of both Arcadis and the Trust.

Although the final evaluation performed by Arcadis resulted in the comments as detailed in Attachment A, Arcadis concluded that through the collaborative efforts of all parties in late 2020 and early 2021 to refine project scope and budget, the study is implementable, the scope is commensurate with the study's objectives, and the

costs are commensurate with the scope of work. The attached final comments are associated with challenges with implementing the treatability study in the two sub-areas identified in the work plan addendum, Areas 1 and 2, simultaneously. While Attachments B and C address all comments provided by Arcadis and the Trust through the review process, the following table presents the Trust's response to the Arcadis comments provided in Attachment A.

Arcadis Comment	NERT Response
Hydraulic response to extraction from a single intermediate or deep zone well is seen at monitoring wells screened in each of these zones (Appendix D). This hydraulic connection between the intermediate and deep zones may limit the maximum extraction rate achievable when 6 extraction wells are running simultaneously as planned for the TS. This is because there is a limited volume of groundwater available under these aquifer conditions. These scenarios were modeled and appear to work with 12 gpm and injections will add water to the aquifer, but the 12 gpm extraction rate may not be maintained over the duration of the testing period. This could have an influence either on the cost to complete the scope as written or adaptation of the achievable objectives for a similar cost.	The Trust understands the hydrogeologic constraints associated with this project and how they may impact the cost and schedule of the project. However, the only means to truly understand how much these constraints may impact the project logistics and schedule is to implement the planned Phase 2 field activities and closely monitor aquifer response. By implementing the planned Phase 2 field activities the Trust can quantify the costs associated with implementing in-situ bioremediation in this source area.
Based on this hydraulic connection, operation of simultaneous injection and extraction at both Areas 1 and 2 at the same time is a complex system to monitor and optimize. Conducting the test in this manner will make understanding of the respective hydraulic influences challenging. A phased approach, such as a single zone in a single Area, may help to better understand the hydraulic influence of that specific action. A phased approach may avoid unexpected surprises, such as pulling injected water south to Area 2 extraction wells rather than Area 1 extraction wells pulling water north as the model predicts. This would require a longer implementation schedule but should not grossly influence the costs.	The Trust acknowledges that implementing in-situ bioremediation within two hydrogeologic zones will pose some challenges. However, the Trust is successfully implementing in-situ bioremediation in two connected hydrogeologic zones at the Las Vegas Bioremediation Pilot Study area and will apply lessons learned from that study for this project. Nevertheless, the Trust will be closely monitoring the hydraulic gradient during injection and performance monitoring to gain a comprehensive understanding of the impact injections have on groundwater flow in the study area. If in-situ bioremediation is selected as the remedial action alternative for the Unit 4 and 5 Buildings source area, the data collected in this treatability study will be critical in designing and ensuring success of the final remedy.

Arcadis Comment	NERT Response
If there are any plans to rotate extraction wells to injection wells (or vice versa), there is likely to be immediate fouling even with aggressive and frequent well development. The achievable (and predicted) extraction rates at all extraction wells are already low and would be expected to diminish over time after they are used as injection wells. This also influences the ex-situ management of diluted molasses.	The Trust anticipates that well maintenance will be an important issue to monitor. To date, the Trust has been successful in maintaining injection wells at their optimum level of performance during the Seep Well Field Area Bioremediation Treatability Study and will apply lessons learned to this treatability study to ensure its success. Additionally, the best means of assessing the challenges with maintaining optimum injection well maintenance is to experiment in the field and test a variety of well development techniques. As such, if in-situ bioremediation is selected as the remedial action alternative for the Unit 4 and 5 Buildings source area, well maintenance data collected in this treatability study will be critical in designing and ensuring success of the final remedy.

Acknowledging successful completion of the third-party review process, it is the desire of the Trust to initiate the Phase 2 efforts as detailed in Attachment B as soon possible. The Trust currently estimates field mobilization can begin within 60 days of receipt of NDEP comments and/or approval of the attachments contained herein assuming there are not any delays in obtaining the necessary permits. Project updates on all facets of this study will continue to be provided through submittal of monthly progress reports.

If you have any questions or concerns regarding this matter, feel to contact me at (702) 960-4309 or at steve.clough@nert-trust.com.

Office of the Nevada Environmental Response Trust

Stephen R. Clough

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