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August 3, 2016

Mr. Weiquan Dong, Ph.D.
Bureau of Industrial Site Cleanup
Nevada Division of Environmental Protection
2030 E. Flamingo Rd, Suite 230
Las Vegas NV 89119

RE: Response to Comments – Seep Well Field Area Bioremediation Treatability Study Work Plan
Nevada Environmental Response Trust
Henderson, Nevada

Dear Mr. Dong:

The Nevada Environmental Response Trust (NERT) is pleased to present this Response to Comments associated with comments received from the Nevada Division of Environmental Protection (NDEP) regarding the Seep Well Field Area Bioremediation Treatability Study Work Plan. NERT received written comments from NDEP via letter dated June 28, 2016. Each of NDEP's comments is repeated below in italics followed by NERT's response.

1) To the extent feasible, NERT should use 'lessons learned' from the on-going Athens Road bioremediation pilot study. Although the Athens Road pilot study report will not be finalized until late 2016, information about well placement, injection rates, EOS delivery concentration, effects of hydrant chase water, and other technical details gleaned from the on-going Athens Road pilot study should be incorporated into the Seep Well Field pilot study.

Trust's Response:

Notable findings from the Athens Road bioremediation treatability study, including the injection well set up, configuration, and spacing; optimal quantities of carbon substrate, distribution and chase water during injections; and the desired number of injection events will be incorporated into the final design for the Seep Well Field (SWF) Area bioremediation treatability study. Additionally, the following text will be added to the SWF Bioremediation Treatability Study Work Plan.

In regards to the use of geophysics described in Section 3.1.3:

> "One of the lessons learned during the on-going COH treatability study (described in Section 2.2) was that improved definition of preferential flow pathways and paleochannel morphology was needed to better define original perchlorate mass and mass removal rates during bioremediation."

In regards to the injection well transect layout described in Section 4.3.1:

> "Preliminary analyses of the geochemical response and data collected at the on-going COH treatability study area have indicated that there is considerable heterogeneity in lithology within relatively short distances. The soil grain type and thickness of the gravel and paleochannels vary in all three dimensions in the saturated sub-surface. Therefore, flow pathways and, thereby, the transport of organic carbon

during injections appears to be non-uniform. To counter the impacts of heterogeneity and non-uniform flow, a prudent design approach is to install two transects of injection wells, rather than a single transect. The injection wells will also be staggered on these two transects in order to provide overlap and better distribution of the injected carbon substrate."

In regards to the injection well spacing described in Section 4.3.2:

"Because the wells along the two transects will be staggered, the effective spacing of wells is 37.5 feet. This proposed and planned spacing is closer than the 60 feet spacing between injection wells that was implemented for the on-going treatability study, which will further address subsurface variability and non-uniform groundwater flow and lithology by improving contact of carbon substrate with perchlorate in the saturated matrix."

In regards to the preliminary injection design described in Section 4.4:

"Preliminary evaluation and findings of the on-going COH treatability study (described in Section 2.0) have indicated that the stoichiometric estimates (with a factor of safety of five) for the first carbon injection event was sufficient for a period between two and three months. The on-going study had a second injection event in which half the quantity of carbon substrate was added to the groundwater in comparison to the first event. The reason for adding only half the quantity was to examine the lower threshold of the substrate that would be required for bioremediation. Secondly, the UNLV bench-scale column study indicated that aquifer clogging could be an issue if excess carbon substrate was added. The second carbon substrate addition appeared to be sufficient for less than two months, despite the observation that perchlorate continued to degrade and very little DO was present. Based on this current evaluation of the on-going COH treatability study, it appears that to ensure continuous availability of organic carbon and perchlorate biodegradation in the groundwater in this high velocity aquifer, injection events could possibly be required every two months for future efforts. Furthermore, for subsequent events following the first event, it is proposed that three-quarters of the original quantity, rather than half the original quantity would provide a sufficient factor of safety for continuous and sustained biodegradation of perchlorate. Therefore, based on the results of the previous laboratory bench-scale tests performed at the UNLV and on-going COH treatability study, up to three separate injection events may be required during the proposed six-month field test."

In regards to the use of slug tests during the injection design described in Section 4.4:

"Slug tests will continue to be performed periodically throughout the treatability study as they have been shown to provide valuable information on subsurface conductivity changes following carbon substrate injections in the on-going COH treatability study described in Section 2.2."

In regards to the use of chase water with respect to the preliminary injection design described in Section 4.4:

"Based on a preliminary review of the impact of chase water during the two injection events in the on-going COH treatability study, it is believed that larger amounts of chase water would be required to obtain enhanced distribution of the carbon substrate in vicinity of the injection wells. It appears that up to two-thirds of a single pore volume of chase water could be required for each well. Preliminary findings also indicate that alternating the chase water between wells or injecting into alternatively spaced wells provides better distribution of carbon substrate that was injected. These findings will be incorporated into the final chase water protocol for the SWF area treatability study."

2) Single borehole dilution tests (Section 3.1.5) and slug tests (Section 3.1.6) provide localized information about subsurface hydraulic conditions immediately adjacent to the well. NERT should consider doing pump tests and/or wider scale tracer tests to better understand the hydrogeology within the Seep Well Field study area or, to the extent feasible, utilize existing pump test information from gathered in the SWF area from the COP.

Trust's Response:

The existing data provided by pumping tests and wider scale tracer tests will be carefully considered and incorporated into the understanding of the Seep Well Field treatability study area hydrogeology. The existing body of pumping test and wide scale tracer test data is considered to be adequate for the purposes of characterizing the overall hydrogeology.

The single borehole dilution tests and slug tests are intended to supplement the wider-scale data with localized hydrogeological information. The hydrogeological characteristics of the Seep Well Field treatability study area are expected to vary spatially, so representative wells will be selected to obtain localized groundwater velocity information via single borehole dilution tests. The slug tests are primarily intended to monitor the effects of emulsified oil injection over time in the immediate vicinity of individual wells. At the on-going City of Henderson bioremediation treatability study area, minor changes in hydraulic conductivity were noted over the course of the testing. Slug tests were very effective in identifying these changes, so this lesson learned prompted inclusion of sequential slug testing in the Seep Well Field area to monitor the hydrogeological effects of the injections.

3) Proposed monitoring wells in Figure 2 (Field Test Conceptual Layout) lack further downgradient sites and are narrow compared to the width of the injection wells. NDEP suggests that NERT adding additional monitoring wells in further and wider downgradient area of the injection wells. If the access is an issue for the downgradient area, NERT should consider utilizing existing wells and the surface water sampling site of LW5.5.

Trust's Response:

To address the portion of the comment regarding the lack of monitoring wells located farther downgradient of the injection well transects, existing monitoring wells COH-1A (if accessible), MW-K8, PC-91, PC-92, PC-97, and PC-133 will be added to the wells to be sampled as part of the effectiveness monitoring program.

To address the portion of the comment regarding the monitoring well network required to address the width of the injection well transects, Figure 2 has been revised to show the location of the geophysical transects that will be evaluated during the Preliminary Field Activities phase. Per Section 3.4.1.2, "As many as ten borings could be converted to permanent monitoring wells, some or all of which may be installed as paired wells with separate screened intervals in both the alluvium and UMCf." These wells will be located along the lengths of the geophysical transects, with final locations being decided based on geophysical results. Therefore, there will be additional monitoring wells that will be periodically sampled and could be added to the effectiveness monitoring program that will help evaluate the effectiveness of the entire width of the injection well transects.

Section 5.1.1 and Figure 2 will be updated accordingly. The following statement will be added to Section 5.1.1:

> "Effectiveness monitoring wells will include newly installed monitoring wells as well as existing monitoring wells COH-1A (if accessible), MW-K8, PC-91, PC-92, PC-94, PC-97, and/or PC-133.

Additionally, some or all of the monitoring wells installed during the preliminary field investigation may be sampled during the treatability study to assist in determining remedial effectiveness."

4) *The injection events in Table 3 (Preliminary Project Schedule) should be scheduled based on the groundwater velocity at the field site because hydrogeology of the field site is likely different from the existing bioremediation study site that was near the AWF.*

Trust's Response:

A footnote will be added to the Table 3 in regards to Injection Events 2 and 3 that states:

"Dates projected for injection events 2 and 3 are tentative dates that were estimated based on observations from the on-going bioremediation treatability study described in Section 2.0. Actual dates for these subsequent injection events will be decided based on effectiveness monitoring data from this treatability study following the first injection event."

5) *Please add Arsenic to the analytical parameters of Table 2 (Example Performance Monitoring Sampling Protocol).*

Trust's Response:

Arsenic is included as part of the dissolved metals analysis. In the purpose column, there is a note that says "includes arsenic." Additionally, there is a footnote associated with dissolved metals analysis that states: "Metals include arsenic, chromium, iron, and manganese."

Upon approval of the proposed changes contained in this response to comment letter, the NERT will prepare a revised work plan and an implementation budget for NDEP's final approval.

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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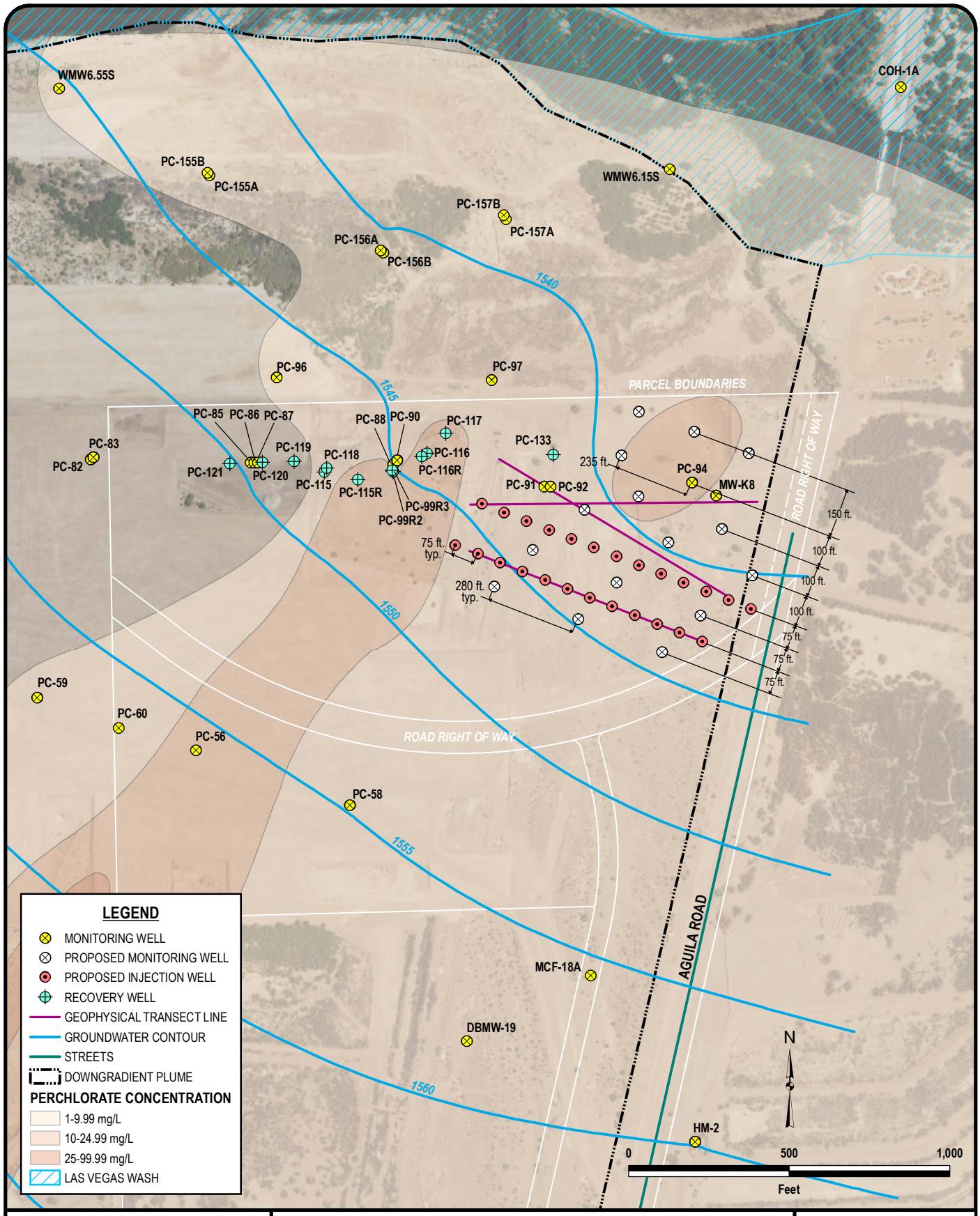

MAY 26, 2016 N:\PROJECTS\NERT\GIS FIGURE DATABASE\MXD\FIGURE 2 - FIELD TEST CONCEPTUAL LAYOUT.MXD

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NEVADA ENVIRONMENTAL RESPONSE TRUST

FIELD TEST CONCEPTUAL LAYOUT

Project No.:	114-520225
Date:	JUNE 29, 2016
Designed By:	SRA

Figure No.
2