Sent Via Certified Mail

December 9, 2021

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Los Alamos Field Office
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RE: NMED Response to Los Alamos National Laboratory, Work Plan for Groundwater Modeling for Contaminant Migration from Wells R-42 and R-28, Revision 1

Dear Troy Thomson and Arturo Q. Duran:

On September 13, 2021, the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) received the *Submittal of the Work Plan for Groundwater Modeling for Contaminant Migration from Wells R-42 and R-28, Revision 1* (Work Plan) from U.S. Department of Energy (DOE) and N3B, hereafter referred to as "LANL." The Work Plan was submitted in response to NMED's letter requesting "detailing [LANL's] proposed initial modeling, both conceptual and computer simulation, of the contaminant migration," dated July 15, 2021.

NMED has reviewed the Revision and requires the following:

- *Section 2.0 Background on Page 2*
  NMED Comment: Detailed modeling simulations shall be conducted to identify and quantify biogeochemical processes that have contributed elevated concentrations of dissolved manganese (Mn) at CrEX-3. A conceptual model shall be presented that provides details on oxidation and dissociation or breakdown of molasses at R-28, generation and migration, including transport time, of a dissolved anoxic groundwater plume from R-28 to CrEX-3, oxidation of ferrous iron to ferric iron by dissolved oxygen and/or iron-oxidizing bacteria, and reductive dissolution of manganese dioxide to dissolved Mn(II) at R-28, along groundwater flow paths to CrEX-3, and at CrEX-3. A detailed statistical analysis shall be performed for CrEX-3 with selected solutes (chloride, total organic carbon, and manganese) and field parameters (pH, dissolved

oxygen, and Eh (calculated from corrected oxidation and reduction potential) prior to and after addition of molasses at R-28.

- *Section 3.2 Numerical Modeling on Page 6*
  NMED shall work with DOE/N3B to develop PHREEQC model simulations quantifying one-dimensional reactive transport of iron (Fe) and Mn at R-28 and R-42 to evaluate fate and transport of these two solutes. Transport of Fe and Mn at R-28 and R-42 are influenced or controlled by aqueous speciation, pH, redox, cation exchange onto clay minerals, surface complexation on strong- and weak-binding site present on ferrihydrite, oxidation of Fe(II) resulting in reductive dissolution of Mn(IV) phases, and oxidation of sulfide phases formed from reduction of Fe(III) and Mn(IV) (oxy)hydroxides and free sulfite sourced from sodium dithionite injected at R-42 and initial reduction of sulfate in the presence of dissolved and suspended organic carbon derived from molasses at R-28. Results of the reactive transport modeling are anticipated to realistic constraints dependent on time and distance for Fe and Mn transport.

NMED hereby approves the revised Work Plan as submitted, contingent upon the above requirements.

Approval of the Request does not relieve DOE of the responsibility to comply with any other applicable federal, state, and/or local laws and regulations. This approval does not relieve the DOE of liability should operations associated with these time extensions result in significant additional pollution of groundwaters.

Thank you for your cooperation.

Sincerely,

Melanie Sandoval Digitally signed by Melanie Sandoval
Date: 2021.12.09 11:08:10 -07'00'

Melanie Sandoval
Industrial Waste Team Lead
Ground Water Quality Bureau

MS:ar

cc: Justin D. Ball, NMED GWQB
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