



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street  
San Francisco, CA 94105-3901

Sent via email only

July 2, 2021

Kristine Boyer  
Environmental Health & Safety Manager  
NAES Corporation  
34759 Lencioni Avenue  
Bakersfield, CA 93308-9797

Re: Maximum Allowable Injection Pressure (MAIP) Limitation  
Underground Injection Control (UIC) Permit No. R9UIC-CA1-FY17-3  
McKittrick WD-1, Class I Non-hazardous Waste Injection Well

Dear Ms. Boyer:

The United States Environmental Protection Agency, Region 9 (EPA) has reviewed McKittrick Limited's (McKittrick's) step rate test (SRT) report dated February 26, 2021. Based on our review of the SRT report, and as we discussed with you and your technical team on June 17, 2021, EPA has concluded that the maximum allowable injection pressure (MAIP) in McKittrick WD-1 should be 151 psi. This MAIP value replaces the injection pressure limit of 1,015 psi included in Appendix H of the Permit. EPA's evaluation of the SRT and basis for the MAIP determination are discussed below.

### **Evaluation of SRT**

The SRT was performed in general accordance with the permit conditions and EPA Region 9's SRT guidance. However, the surface pressures were not reported in Table 3. Also, EPA does not generally consider estimated fracture gradients (such as the 0.8 psi/ft gradient estimated by CalGEM) to be suitable for establishing the MAIP of a Class I injection well. During the SRT, the formation fracture pressure was apparently not reached, which resulted in the MAIP, based on the maximum bottom hole pressure, not being reached during the SRT. The low pressures in the SRT were due to the under-pressured status of the injection zone. A fluid level of 1,100 feet and a bottom hole pressure of 823.4 psi were reported before the SRT began, which is indicative of a pressure gradient of only 0.27 psi/ft in the injection zone. While we agree there is some uncertainty as to the actual fracture gradient, it may be far below 0.8 psi/ft, based on the low current static pressure in the injection zone. In any case, McKittrick WD-1 can probably inject at the maximum authorized injection rate of 2,500 bpd without exceeding the MAIP of 151 psi. If not, re-perforating and/or an acid stimulation through tubing could increase injectivity to allow an increase in the injection rate without exceeding the MAIP.

### **Basis for MAIP Determination**

Per Paragraph II.D.3.a. of the McKittrick Permit, EPA establishes the MAIP at 80 percent of the calculated pressure at the surface, based on bottom hole fracture pressure, without consideration of friction losses. Although fracture pressure was not achieved, the surface pressure was 577 psi at the maximum bottom hole pressure of 1,456.9 psi according to the SRT report, but that includes friction pressure. In accordance with this data and the referenced permit condition, the MAIP would be set at 121 psi ( $0.80 \times [1,456.9 \text{ psi} - (3,010 \text{ ft} \times 0.4339 \text{ psi/ft})]$ ). However, given that the maximum pressure reached in the SRT was below the fracture pressure, EPA concluded that eliminating the 0.80 safety factor is acceptable and adjusted the MAIP to be 151 psi.

If you have any questions about this letter, please contact Calvin Ho at (415) 972-3262, or call me at (415) 972-3971.

Sincerely,

David Albright  
Manager, Groundwater Protection Section

cc (via email): Chris Jones, CalGEM Inland District  
Clay Rodgers, Central Valley Regional Water Quality Control Board