UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

Mr. Russ Patterson, Manager
WIPP Compliance and Recertification
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, New Mexico 88221-3090

Dear Mr. Patterson:

On February 2-3, 2016, EPA and DOE staff participated in meetings held in Albuquerque related to DOE's 2014 Compliance Recertification Application (CRA-2014) for the Waste Isolation Pilot Plant. The topic for these meetings was to discuss and clarify issues related to the Agency's set of completeness questions and DOE's responses. During our discussions it became evident that clarification to the Agency's chemistry completeness question, 2-C-4, related to hydromagnesite conversion rates, was needed. We also discussed the withdrawal of two FEP related comments. This letter transmits to you amended text related to completeness question 2-C-4 and the two FEP questions that are being withdrawn.

If you have any questions concerning this request, please contact Kathleen Economy at (202) 343-9844 or economy.kathleen@epa.gov.

Sincerely,

Tom Peake

Tom Peake
Director
Center for Waste Management and Regulations

Enclosure
cc: Electronic Distribution
Todd Shrader, DOE/CBFO
George Basabilvazo, DOE/CBFO
Andy Ward, DOE/CBFO
Frank Marcinowski, DOE/HQ
Doug Tonkay, DOE/HQ
Alton Harris, DOE/HQ
Ricardo Maestas, NMED
Nick Stone, EPA Region 6
EPA WIPP Team
EPA WIPP Docket

1. Addendum to Comment 2-C-4 (a)

In completeness comment 2-C-4, EPA stated that DOE must re-evaluate the rate of hydromagnesite conversion to magnesite that was used in the CRA 2014 PA (Edwards 2015). DOE's response to this comment (Franco 2015) indicates that there was confusion about the meaning of this comment. Comment 2-C-4 is reworded as follows to provide clarification:

2-C-4. Hydromagnesite Conversion Rate. Clayton (2013) formulated the conversion reaction from hydromagnesite to magnesite for inclusion in the BRAGFLO calculations as:

$$Mg_5(CO_3)_4(OH)_2{\bullet}4H_2O(s) \rightarrow 4\ MgCO_3(s) + Mg(OH)_2(s) + 4\ H_2O(l)$$

Clayton (2013) calculated a range for the hydromagnesite conversion rate based on assumed reaction times of 100 to 10,000 years (Cases A and B, Table 1), citing the EPA (1998) evaluation of hydromagnesite conversion times of "hundreds to perhaps thousands of years." However, Clayton (2013) did not consider an updated evaluation of hydromagnesite conversion times (SCA 2008). SCA (2008) reviewed the available experimental and natural analogue data and concluded that it was possible that no hydromagnesite would convert to magnesite over the 10,000 year period of performance (Case C). Consequently, the available data show that the lower limit of the reaction rate distribution should be 0 mol/kg*s (Case C).

Table 1. Effects of Reaction Times on Hydromagnesite Conversion Reaction Rates and Hydromagnesite Remaining after 10,000 Years

Description	Reaction Time (years)	Reaction Rate (mol/kg*s)	Hydromagnesite After 10,000 Years (%)
Case A: Clayton (2013) maximum rate	100	6.8×10^{-10}	0
Case B: Clayton (2013) minimum rate	10,000	6.8×10^{-12}	0
Case C: SCA (2008) minimum rate	Infinite	0	100

Clayton (2013) cited a minimum reaction time (maximum reaction rate) of "hundreds" of years based on EPA (1998), but then used a shorter minimum reaction time of 100 years to calculate the maximum reaction rate without providing adequate justification. The minimum 100 year reaction time is inconsistent with the available reaction rate data. For example, Zhang et al. (2000) extrapolated higher-temperature experimental rate data obtained in GWB brine to 25°C and determined an induction period of 200 years and a reaction half-time of 73 years. This extrapolated rate is consistent with a higher minimum reaction time (on the order of 350 years), which would result in a lower maximum reaction rate than the 6.8×10^{-10} mol/kg*s maximum rate used by Clayton (2013).

The effect of using 0 mol/kg*s (Case C) rather than 6.8×10^{-12} mol/kg*s (Case B) as the minimum conversion rate is likely to be less brine production in the water balance. DOE should use 0 mol/kg*s as the lower limit of the hydromagnesite conversion rate. DOE should also re-evaluate the upper limit of the hydromagnesite conversion rate, select a lower maximum conversion rate (minimum reaction time greater than 100 years) that is consistent with the available data and provide adequate justification for this maximum conversion rate.

References

Clayton, D.J. Justification of Chemistry Parameters for Use in BRAGFLO for AP-164, Rev 1. Sandia National Laboratories, ERMS 559466.

Edwards, J.D. 2015. Second Set of CRA 2014 Completeness Comments. U.S. Environmental Protection Agency Letter to J.R. Franco, U.S. Department of Energy, February 27, 2015.

EPA (U.S. Environmental Protection Agency). 1998. Technical Support Document for Section 194.24: EPA's Evaluation of DOE's Actinide Source Term. Environmental Protection Agency Office of Radiation and Indoor Air, Washington, DC. Docket A-93-02, Item V-B-17.

Franco, J.R. 2015. Response to Environmental Protection Agency Letters Dated December `7, 2014 and February 27, 2015 Regarding the 2014 Compliance Recertification Application. U.S. Department of Energy, Carlsbad Field Office, May 29, 2015.

SCA (S. Cohen and Associates). 2008. Review of MgO-Related Uncertainties in the Waste Isolation Pilot Plant. Final Report Prepared for U.S. Environmental Protection Agency Office of Radiation and Indoor Air. January 24, 2008.

Zhang, P.C, H.L. Anderson, J.W. Kelly, J.L. Krumhansl and H.W. Papenguth. 2000. Kinetics and Mechanisms of Formation of Magnesite from Hydromagnesite in Brine. Sandia National Laboratories, SAND99-1946J, ERMS 514868.

2. The following EPA completeness comments are being withdrawn and DOE does not need to provide a response because of changes to PBRINE that EPA will be requiring.

2-32-S16.
Please supplement the screening argument with information on the impacts of changes in GLOBAL:PBRINE and the PCS on brine inflow.

2-32-S17
Please supplement the screening argument with information on the impacts of changes in GLOBAL:PBRINE and the PCS on the availability of brine in the waste panels.