NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.env.nm.gov

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lt. Governor

RYAN FLYNN
Cabinet Secretary
BUTCH TONGATE
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

January 22, 2016

Colonel Eric H. Froehlich
Base Commander
377 ABW/CC
2000 Wyoming Blvd.SE
Kirtland AFB, NM 87117-5606

John Pike
Director, Environmental Management Services
377 MSG
2050 Wyoming Blvd. SE, Suite 116
Kirtland AFB, NM 87117-5270

Re: KIRTLAND AIR FORCE BASE BULK FUEL FACILITY AQUIFER TEST FOR GROUNDWATER EXTRACTION WELL KAFB-106228
BULK FUELS FACILITY SPILL
SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111
KIRTLAND AIR FORCE BASE
EPA ID#NM9570024423, HWB-KAFB-13-MISC

Dear Colonel Froehlich and Mr. Pike:

The New Mexico Environment Department (NMED) attended a Modeling Working Group meeting on September 25, 2015 where the Permittee presented preliminary results from the aquifer test performed at extraction well KAFB-106228. The aquifer test was performed under the conditions and requirements of the *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan*, dated March 25, 2015. The NMED has reviewed the preliminary aquifer test results presented, as well as draft data provided in response to follow-on questions to the presentation, and has identified the following deficiencies:

- The flow meter used for recording flow rates during both the step-test and constant rate tests was not calibrated prior to the start of testing. The flow meter was calibrated on September 15, 2015, nearly two months after the test. The calibration demonstrated that actual flow rates from extraction well KAFB-106228 were approximately 7 percent higher than the flow meter readings. The delay in calibration introduces a significant and

unacceptable uncertainty in flow rates during aquifer testing and therefore in the aquifer parameter calculations and analysis.

- The flow rate was not verified during the duration of the step and constant rate tests, as is standard practice due to the variations that are typical in the operation of pumps.
- The Permittee assumes a wide range of vertical to horizontal anisotropy (0.001 to 2.97 dimensionless) indicating that the curve-fitting and data analysis did not account for known site conditions. The vertical to horizontal anisotropy is an input parameter into the estimation of aquifer parameters; the random assignment of ratios in order to provide the best curve fit, independent of site conditions, results in aquifer parameters that are not realistic or representative of the aquifer.
- The use of the software AQTESOLV requires an over-simplification of site conditions. Additionally, this software is not able to accurately analyze data from observation wells screened across intervals different from the pumping well. This over-simplification and limited capability results in uncertainty in the estimated aquifer parameters and therefore plume capture analysis.

The lack of calibration and flow rate verification is a fatal deficiency in the aquifer test conducted at extraction well KAFB-106228. As such, the NMED requires that the Permittee complete another aquifer test at extraction well KAFB-106228 as outlined in the *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan*, dated March 25, 2015 with the additional conditions outlined below:

1. The Permittee shall submit a revised *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan* documenting flow meter calibration methods, flow monitoring and verification, and analysis methods.
2. The Permittee shall provide to the NMED documentation of flow meter calibration prior to the start of aquifer testing.
3. Flow will be measured and adjusted, as needed, throughout the duration of both the step and constant rate tests. The NMED recommends following the recommended time intervals for flow monitoring in the U.S. Environmental Protection Agency (EPA) *Technical Guidance for Hydrogeologic Investigations and Ground Water Monitoring* (Attachment 1 to this letter).

Time Interval
5 minutes
10 minutes
20 minutes
30 minutes
60 minutes
Every hour

4. The Permittee shall use three-dimensional modeling program(s) to analyze aquifer test data for the estimation of aquifer parameters, including the vertical to horizontal anisotropy ratio. The use of a 3D modeling program will allow for a more accurate evaluation of observation well data where the observation well screen is partially covering the pumping well screen. Additionally, this analysis method provides the ability

to account for known site conditions and heterogeneity in the estimation of aquifer parameters.

5. The Permittee shall coordinate a Stakeholder kickoff meeting to include the NMED and Albuquerque Bernalillo County Water Utility Authority (ABCWUA). The kickoff meeting shall be conducted prior to the start of aquifer testing and should be scoped to cover instrument calibration and setup, test operation, and schedule.

The specific capacity estimated from the constant rate test at extraction well KAFB-106228 was 5 gallons per minute per foot (gpm per foot). This is at the lowest end of the acceptable range of specific capacity as described in the NMED approved work plan *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan*, dated March 19, 2015. The NMED recommends that the Permittee evaluate the estimated specific capacity and well operation data to determine if additional well development is required prior to the start of aquifer testing at extraction well KAFB-106228. If additional well development is required, the Permittee shall submit a letter work plan to the NMED documenting well development procedures and metrics.

The NMED requests that the Permittee review the above-required conditions for applicability to the upcoming aquifer testing planned for extraction wells KAFB-106233 and KAFB-106234 under the *Groundwater Extraction Wells KAFB-106233 and KAFB-106234 Aquifer Testing Letter Work Plan*, dated November 3, 2015.

Should you have any questions regarding this letter please contact Diane Agnew of my staff at (505) 222-9555.

Sincerely,

Kathryn Roberts
Director
Resource Protection Division

KR/DA

Cc: Col. T. Haught, KAFB
K. Lynnes, KAFB
A. Bodour, KAFB-AFCEC
L. Bitner, KAFB
M.L. Leonard, AEHD
F. Shean, ABCWUA
L. King, EPA-Region 6 (6PD-N)
J. Kieling, NMED-HWB

D. McQuillan, NMED
D. Agnew, NMED-HWB
S. Pullen, NMED-GWQB
S. Reuter, NMED-PSTB

File: KAFB 2015 Bulk Fuels Facility Spill