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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

March 27, 2013

Colonel John Kubinec
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John Pike
Director, Environmental Management Services
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RE: DISAPPROVAL:
IN-WELL TREATMENT INTERIM MEASURES WORK PLAN PART 1
DATA GATHERING AND ANALYSIS PLAN, BULK FUELS FACILITY SPILL,
SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111, DECEMBER 2012
KIRTLAND AIR FORCE BASE, EPA ID# NM9570024423
HWB-KAFB-12-026

Dear Colonel Kubinec and Mr. Pike:

The New Mexico Environment Department (NMED) has reviewed the Kirtland Air Force Base (Permittee) document titled *In-Well Treatment Interim Measures Work Plan Part 1 - Data Gathering and Analysis Plan, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111,* dated December 2012, hereinafter referred to as the Work Plan. The Work Plan was received by NMED on December 20, 2012. The *Executive Summary* of the Work Plan states that the Work Plan focuses chiefly on remediating the floating non-aqueous phase liquid (NAPL) plume, most of which has now been submerged by rising groundwater.

NMED has identified deficiencies concerning the Work Plan, which are conveyed by the comments enumerated below.

1. In the fourth paragraph of the Executive Summary, the Permittee states: "*Data have shown that migration of the NAPL plume has stabilized....[b]ecause the NAPL plume is stable, the*

measures outlined in this plan, and the Phase II Remediation Interim Measures Work Plan to be submitted December 2012, will replace the NAPL hydraulic containment system as the major interim measure for the BFF Spill." In Section 1.3 of the Work Plan the Permittee states: "*Data have shown that migration of the NAPL plume has stabilized....[b]ased on the analysis of the degradation indicator compounds and the spatial extent of the organic compounds, it appears that microbial degradation is limiting the extent of a majority of the organic compounds....*"

The Permittee stated in Section 5.6.3 of the Quarterly Pre-Remedy Monitoring and Site Investigation Report for July – September 2012: "*Stable concentrations do not mean the plume is not migrating. Stable concentrations indicate that the portions of the groundwater plume monitored by the existing wells have stable concentrations downgradient of the NAPL area.*"

A. Clarify what is meant by the term "stable plume" in the context of the Work Plan and the NAPL plume and explain, in detail, how the stability of the NAPL plume was determined.

   For groundwater, data do not allow a determination as to whether the dissolved-phase plume is stable because of the large distances between monitoring wells. The flow velocity of the groundwater is estimated at 100-300 feet per year; therefore, the dissolved-phase plume, if advancing, will not have traveled far enough during the limited time these wells have been in existence for significant changes to be observed. The fact that EDB is not naturally attenuating or biodegrading indicates that this particular compound is not part of a stable plume.

B. The NMED does not agree that the Permittee may abandon the NAPL Containment System proposed by the Permittee in November 2010. Although much of the floating NAPL has now been submerged by the rising water table, the NAPL Containment System is also capable of extracting and remediating dissolved-phase contamination in spite of this condition. Furthermore, because most of NAPL has been submerged, remediation of contaminated groundwater rather than remediation of floating NAPL is the major priority for an interim measure.

   The NMED does not believe that the SVE treatment system alone will be sufficient to clean up the dissolved-phase contamination in the groundwater. NMED required KAFB to evaluate in-well treatment of groundwater so that this technology can be compared to the earlier proposed NAPL Containment System. At a minimum, groundwater in the southern half of the dissolved-phase plume that contains the highest concentrations of contaminants needs aggressive treatment. The proposed NAPL Containment System would likely be a viable technology to accomplish this goal and must be evaluated as a potential interim measure alternative. Revise the Work Plan such that the focus of the in-well treatment is remediating dissolved-phase contamination in groundwater, not NAPL.

2. In Section 1.4 of the Work Plan, the Permittee identifies hydraulic conductivity as being a data gap for designing and implementing an in-well treatment system. This is also true for

designing any other groundwater treatment system such as the proposed NAPL Containment System, in which pumped, highly contaminated groundwater would be treated. Accurate and defensible hydraulic conductivity parameters are vital for designing groundwater treatment systems of all types. Review of U. S. Environmental Protection Agency (EPA), U.S. Department of Defense, and other literature on in-well treatment suggests well spacing should be typically 40-80 feet for proper overlap at most sites, but spacing depends on hydraulic factors such as hydraulic conductivity.

As part of the proposed NAPL Containment System, the Permittee proposed to determine aquifer parameters by conducting pumping tests – this is the best method for determining hydraulic conductivity. The slug test method proposed by the Permittee in the subject Work Plan is a less accurate method and frequently underestimates hydraulic conductivity. The Bulk Fuels Facility Spill is the most significant groundwater contamination site in New Mexico because of contaminant types and concentrations, and the plume's proximity to water supply wells serving the most populated community in the state. The higher cost of conducting pumping tests in lieu of slug tests is justified in this case. Thus, the Permittee is directed to determine hydraulic conductivity for the Bulk Fuels Facility Spill project via well pumping tests. NMED conditionally approved the Enhanced Well Development Plan on June 28, 2012, that was associated with the extraction well completed for the proposed NAPL Containment System and was intended to estimate specific capacity. The Permittee has not implemented this plan, which if implemented, would not have provided the best estimate of the hydraulic conductivity of the aquifer. Although the Permittee may still implement the Enhanced Well Development Plan, the Permittee must conduct pumping tests using observation wells and in consideration of the directions in NMED's letter of March 31, 2011. Aquifer testing must include development and subsequent testing of the extraction well installed at Bullhead Park (Well KAFB-106157). The Permittee is reminded that NMED reserved its right to require additional pumping tests for any aspect of the Bulk Fuels Facility Spill project in NMED's letter of March 31, 2011. Revise the Work Plan to include a pumping (constant discharge) test at well KAFB-106157 using observation wells. See also Comment #8.

3. In Section 1.6 of the Work Plan, the Permittee states: "*The Original phase II interim measure, the NAPL hydraulic containment system, was designed to contain the NAPL plume, not to remediate groundwater or the plume source. Because the plume is stable, the in-well treatment system along with the new SVE system, which will effectively treat contaminated groundwater and the NAPL plume source, will replace the implementation of the NAPL hydraulic containment system as the major interim measure for the BFF spill. As a result, NMED directives remain that are no longer applicable to the project.*"

   In Section 5.1 of the NAPL Containment System work plan (November 2010) the Permittee states: "*The remedial objective to be addressed by this work plan is to contain the separate-phase NAPL and dissolved contamination migrating adjacent to, and below, the NAPL to prevent further migration downgradient and to treat the fluids produced to meet groundwater underground injection control (UIC) program for a Class V well into a drinking water aquifer.*" And, in describing the components of the NAPL Containment System (Section 5.4), the Permittee states: "*Given the nature of the compounds and contaminant load in the*

influent from the NAPL containment wells, the main treatment process will consist of an oil-water separator (OWS), an iron/manganese removal system, and a granular activated carbon (GAC) organic removal system. To protect the discharge from any excursions in the primary treatment system, a final GAC guard bed will be installed just before the water is discharged into the injection well."

NMED disagrees with the Permittee's claim that the NAPL Containment System was not designed to remediate groundwater because treating groundwater by GAC to meet UIC standards is groundwater remediation. The associated NMED directives continue to be applicable to the project because data may demonstrate, and NMED may choose, the NAPL Containment System as the preferred interim measure for the Bulk Fuels Facility. Furthermore, it is unlikely, given the spacing of wells KAFB-106160 and KAFB-106161 and the extent of the plume, that an in-well treatment system consisting only of two of these wells will be effective in remediating adequate volumes of contaminated groundwater and submerged NAPL. See Comment #9.

4. Sections 4.5.2.1 and 4.5.2.2 of the Work Plan discuss determining which contaminants are to be labeled Contaminants of Potential Concern (COPCs) for vadose zone and groundwater, respectively. The Permittee has set the following criteria for labeling a compound as a groundwater COPC:
   - The total number of samples for a given parameter during the period between January 2009 and March 2012 was more than 20.
   - More than 5% of the analytical results were detected for a given parameter.
   - The maximum concentration was greater than the lowest regulatory concentration established by the NMED or U.S. Environmental Protection Agency (EPA). (Note: NMED assumes the phrase "lowest regulatory concentration" means the lowest regulatory standard.)

   The Permittee's rationale for choosing groundwater COPCs is not clear. Furthermore, the rationales for determining COPCs for purposes of investigation versus remediation are different. Examples of why this rationale is confusing are:

   - If a contaminant is detected at high concentration in only one well does that contaminant have to be detected for more than 20 sampling events before it is reported as a COPC?
   - For every 100 wells sampled for a contaminant, does that contaminant have to be detected at greater than the regulatory standard in at least six of the wells for more than five quarters of sampling in order to be reported as a COPC?
   - If a contaminant is detected in all of the BFF wells at 95% of the lowest regulatory standard, would the Permittee not consider that contaminant to be a COPC?

   For the purpose of site characterization, any inorganic contaminant that occurs at a level above its background level, and any organic contaminant that is detected in groundwater at any level is a COPC. COPCs subject to remediation will be those that pose unacceptable risk to human health or the environment (see also NMED's Risk Assessment Guidance for Site Investigations and Remediation 2012, as it may be updated). In addition, the Permittee is

reminded of the definitions of hazardous waste and hazardous waste constituents in Permit Section 1.8; and the requirements for corrective action procedures and cleanup levels under Permit Sections 6.2.2 and 6.2.3 of the KAFB Hazardous Waste Treatment Operating Permit. Revise the Work Plan accordingly.

5. For vadose zone soils, the Permittee has set the following criteria for labeling a compound as a groundwater COPC:

   - The total number of samples for a given parameter during the period between February 2007 and September 2011 was more than 20.
   - More than 10% of the analytical results were detected for a given parameter.

   Again, the Permittee's rationale for choosing COPCs is not clear. COPCs are to be identified for soil as for groundwater (see Comment #4 above). Revise the Work Plan accordingly.

6. In Section 4.5.5.2, the Permittee states: "*The EDB plume is moving at least 50 ft/y to the northeast simply based on plume extent.*" From Figure 1-6 in the Phase II Remediation Interim Measures Plan, the EDB plume is at least 6,000 ft long. At a migration rate of 50 ft/y it would take 120 years for the fuel plume to migrate 6,000 ft. Assuming the fuel line has been leaking for 60 years (since 1953) then the EDB migration rate is 6,000 ft / 60 y = 100 ft/y not including the time necessary for contamination to migrate to groundwater; this is a more reasonable minimum migration rate. If the leaking fuel did not impact groundwater until later then the EDB plume migration rate would be higher (e.g., 30 y to travel 6,000 ft would be 200 ft/y). Correct the rate-of-migration estimate for EDB in the Work Plan and provide justification.

7. Section 5.3, *Well Development*, any activity that removes water from a well, e.g., bailing and pumping, will produce water that is potentially a hazardous waste. Managing this wastewater is not described in the Permittee's two-paragraph Waste Management Plan (Appendix D). Submit an expanded plan in a revised Work Plan that addresses management of wastewater.

   1.

8. Section 5.4 of the Work Plan, *Slug Testing*, provides an inadequate plan for estimating hydraulic conductivity (See Comment #2). Revise the Work Plan by replacing the slug testing plan with a pumping test plan.

9. In Section 7.2 of the Work Plan, the Permittee describes implementing in-well treatment in well KAFB-106160 and using KAFB-106161 for assessing the effectiveness of the technology and its radius of influence (ROI). KAFB-106161 is over 300 feet from, and cross gradient to, KAFB-106160. Thus, the Permittee apparently expects that the in-well treatment technology will have a ROI of approximately 300 ft. The Work Plan does not provide for an adequate demonstration of in-well treatment based on a 300 ft spacing between wells KAFB-106160 and KAFB-106161. Even the most ambitious claims that the Department could find in the literature was for a ROI of 200 feet, and 40-80 feet is more typical as discussed in Comment #2. The Permittee must demonstrate the effectiveness of the treatment technology

and its ROI based on empirically derived data, which will require the installation of an appropriate monitoring well array at an appropriate well spacing. Revise the Work Plan to provide for a robust method of demonstrating treatment effectiveness and ROI.

The Permittee shall submit to the NMED a revised Work Plan that corrects the above noted deficiencies no later than **June 1, 2013**. Should you have any questions, please contact Mr. William Moats of my staff at (505) 222-9551.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

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