NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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ENTERED

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DRAFT not sent to KAFB per direction of Bureau Chief
6-5-2020

RE: DISAPPROVAL
FINAL IN SITU BIOREMEDIATION LONG-TERM MONITORING WORK PLAN
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-20-002

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the Kirtland Air Force Base (Permittee) *Final In Situ Bioremediation Long-Term Monitoring Work Plan* (Work Plan), dated February 2020. NMED has reviewed the Work Plan and hereby issues this Disapproval. The Permittee may continue to monitor long-term effects on in-situ biodegradation of 1,2-dibromoethane (EDB) as proposed; however, the abatement of light non-aqueous phase liquid (LNAPL) from the aquifer must be a primary focus of future remedial efforts. NMED's comments are provided in the attachment to this letter.

The Permittee must submit a revised Work Plan that addresses all comments contained in the Attachment. Two hard copies and an electronic version of the revised Work Plan must be submitted to the NMED. The Permittee must also include a redline-strikeout version of the Work Plan in electronic format showing where all revisions to the Work Plan have been made. The revised Work Plan must be accompanied with a response letter that details where all revisions have been made, cross-referencing NMED's numbered comments. The Revised Work Plan must be submitted to NMED no later than **December 31, 2020**.

Should you have any questions, please contact Michiya Suzuki of my staff at (505) 476-6046.

Sincerely,

Kevin Pierard
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
M. Suzuki, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Clark, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment

GENERAL COMMENTS

1. Lack of Page Numbers in Tables, Figures and Appendices

NMED Comment: Page numbers are missing from some sections of the Work Plan. Provide appropriate page numbers in all parts of the Work Plan, including tables, figures and appendices. Revise the Work Plan accordingly. This comment applies to all future submittals.

2. Discrepancy between the Submittal Date for the Work Plan and the Timeframe for Phase 4 Long-Term Monitoring

NMED Comment: Section 3.6 of the *Ethylene Dibromide In Situ Biodegradation Pilot Test Report* (EDB Report), dated April 2019, states, "Phase 4 consists of continued groundwater monitoring with no active recirculation and began upon completion of the final Phase 3 sampling event on November 19, 2018." This Work Plan that outlines the long-term monitoring was submitted on February 2020 although Phase 4 long-term monitoring began upon completion of the Phase 3 sampling event in November 2018. Since three quarterly sampling events were proposed in the Work Plan, Phase 4 long-term monitoring would have been completed by the end of 2019, if the monitoring had begun at the end of 2018. Provide a clarification for the discrepancy between the submittal date of the Work Plan and the timeframe for Phase 4 monitoring in the revised Work Plan.

3. Clarification on NMED April 2, 2020 Letter

NMED Comment: NMED's letter titled *Request for Extension Response to Disapproval for the Ethylene Dibromide In-Situ Biodegradation Report*, dated April 2, 2020, states, "[r]egarding the continuation of monitoring associated with this pilot test, I want to acknowledge receipt of the In-Situ Bioremediation Long Term Monitoring Workplan and this plan does not require NMED approval." To clarify, NMED approves the continuation of monitoring associated with the pilot test. However, the Work Plan must still be reviewed and approved by NMED. In addition, the Permittee must acknowledge that EDB degradation without the removal of LNAPL, which acts as a source of dissolved phase constituents, would not provide a permanent remedy for the site. Therefore, the focus of future efforts must be shifted from EDB mitigation to LNAPL and groundwater remediation.

SPECIFIC COMMENTS

4. Section 2.2, Site History, page 2-1

Permittee Statement: "The goals of the groundwater interim measure are to protect drinking water supply wells and collapse the distal EDB plume."

NMED Comment: Comment 21 in NMED's *Disapproval Ethylene Dibromide In Situ Biodegradation Pilot Test Report* (March 2020 Disapproval), dated March 4, 2020, states, "LNAPL recovery must be a primary focus of remedial efforts and must not be compromised." The Permittee must acknowledge that the primary focus of future remedial efforts is an abatement of LNAPL and source area groundwater remediation. Once LNAPL is abated, the concentrations of the dissolved constituents will likely begin to decrease.

5. Section 2.3, In Situ Bioremediation Pilot Test, page 2-2

Permittee Statement: "Groundwater samples were collected at extraction, injection, and the six groundwater monitoring wells during the active and the passive portions of the pilot test phases, except for Phase 4, which did not include an active recirculation portion. Evaluation of the test was completed through the comprehensive groundwater sampling which assessed both direct and indirect indicators of EDB biodegradation."

NMED Comment: The statement implies that Phase 4 was complete. It is not clear whether this Work Plan is associated with part of, or activity beyond, the Phase 4 pilot test. Section 4, *Scope of Activities,* page 4-1, states, "[t]he purpose of this Work Plan is to continue evaluating longer-term ISB performance at existing pilot test wells through quarterly groundwater monitoring of contaminant, geochemical, and microbial parameters," which is consistent with the purpose of the Phase 4 pilot test. However, it does not clarify whether the Work Plan outlines monitoring activities beyond Phase 4. If the Work Plan outlines monitoring activities beyond Phase 4 of the pilot test, provide an explanation for how they are different from the activities associated with Phase 4 of the pilot test in the revised Work Plan (see Comment 2).

6. Section 2.3, In Situ Bioremediation Pilot Test, page 2-2

Permittee Statement: "The objective to demonstrate anaerobic ISB of EDB was successfully achieved, with greater than 97 percent reduction in EDB concentrations observed at five of the six shallow wells. Results of the pilot test are included in the Ethylene Dibromide In Situ Biodegradation Pilot Test Report (USACE, 2019a)."

NMED Comment: The statement is misleading. According to the EDB Report, EDB concentrations increased in groundwater samples collected from all intermediate wells (KAFB-106063, KAFB-106MW1-I, and KAFB-106MW2-I) during the pilot test. Discuss the EDB concentrations observed in the intermediate wells in the revised Work Plan.

7. Section 5.3, Extraction and Injection Well Assessment, page 5-2

Permittee Statement: "Further, the condition of these [injection and extraction] wells will also be assessed using a downhole video camera."

NMED Comment: Section 3.5 of the EDB Report states, "[i]ncreased mounding was also observed throughout the active portion of Phase 3 at the injection well (see Figure 7), increasing to approximately 35 feet above the static level by the end of Phase 3 active recirculation." Microbial debris accumulated inside the injection well and the flow was restricted during the injection process. Unless the debris was removed, the proposed video camera survey may not be feasible in the injection well. Include the provision to remove the debris prior to conducting the survey in the revised Work Plan.

In addition, Comment 25 of NMED March 2020 Disapproval states, "[i]t should be noted that the samples collected from the injection well were not representative of groundwater conditions. The sample collected from the injection well was likely the remaining injection fluid that is stagnant in the injection well." The Permittee must ensure that the clogged screen is rehabilitated prior to conducting further monitoring activity in order to collect groundwater samples that are representative of formation water. Include the provision in the revised Work Plan.

8. Section 5.3.1, Removal of Downhole Equipment, page 5-3

Permittee Statement: "the well bottom will be tagged after removal of the downhole equipment to determine if formation material or filter pack has entered the well."

NMED Comment: Formation material or filter pack may have entered the wells due to the activity associated with injection and extraction. The screened intervals may have been obstructed with formation or filter pack materials. Remove the materials from the wells prior to the initiation of long-term monitoring, as necessary. Include this provision in the revised Work Plan (see Comment 7).

9. Section 6.1.2, Well Purging Requirements, page 6-2

Permittee Statement: "Purging will be considered completed when field water quality parameters have stabilized according to the requirements listed below for three consecutive readings..."

NMED Comment: The listed stabilization criteria are dissolved oxygen, oxidation-reduction potential, turbidity, conductivity, pH, and temperature. Clarify whether purging is considered complete when one or all of these criteria is met in the revised Work Plan.

10. Section 6.1.3, Sample Collection, pages 6-2 and 6-3

NMED Comment: The analytical suite must be consistent with that of the active phases of the pilot test. However, some analytical parameters previously included in the active phases of the pilot test were not proposed for long-term monitoring (e.g., Fluorometric

Spectrofluorophotometry, δ2H). Provide an explanation for why they were not proposed in the revised Work Plan.

11. Section 6.2, Analytical Methods, page 6-5

Permittee Statement: "The following analyses will be performed to assess concentrations of identified site contaminants:
- Volatile organic compounds (VOCs) by EPA Method 8260B
- EDB by EPA Method 8011

The following analyses will be performed to help assess site geochemical conditions:
- Dissolved iron and manganese by EPA Method 6010C
- Anions (bromide, nitrate, nitrite, chloride, and sulfate) by EPA Method 9056A
- Nitrate and nitrite as nitrogen by EPA Method 353.2
- Iodide by EPA Method 300.0
- Alkalinity by Standard Method 2320B
- Dissolved ortho-phosphate by Standard Method 4500 PE."

NMED Comment: Table 6-1, *Analytical Requirements*, lists semi-volatile organic compounds (SVOCs), dissolved metals, and total lead as analytical requirements for groundwater samples. However, Section 6.2 of the Work Plan does not include these analytical parameters. Resolve the discrepancy in the revised Work Plan. In addition, include an explanation for the inclusion of ortho-phosphate analysis in the revised Work Plan.

12. Section 6.2, Analytical Methods, page 6-6 and Section 8.1, Data Review, page 8-1

Permittee Statement: "Samples collected for reduced/dissolved gases and volatile fatty acid analyses will be submitted to the APTIM Lawrenceville Laboratory located in Lawrenceville, New Jersey."
and,
"Four laboratories will provide analytical results in support of long-term monitoring activities: ALS Environmental in Houston, Texas; ALS Environmental in Cincinnati, Ohio; Microbial Insights, Inc. in Knoxville, Tennessee; and the APTIM laboratory in Lawrenceville, New Jersey."

NMED Comment: Comment 28 of NMED's March 2020 Disapproval states, "APTIM executed the pilot test and prepared the Report. APTIM should not have sent the samples to an internal corporate-owned laboratory. All laboratory analyses should have been conducted by a certified and independent third-party laboratory." Reduced/dissolved gases and volatile fatty acid analyses must not be conducted by APTIM laboratory. Solicit independent third-party laboratories for the analyses and propose to conduct the analyses using an independent laboratory. Revise the Work Plan accordingly.

13. Section 6.2, Analytical Methods, page 6-6

Permittee Statement: "The following analyses will also be performed to help assess microbial and degradation activity: • Reduced/dissolved gases by RSK SOP-175 • Volatile fatty acids by EPA Method 300 Modified • Microbial Community by QuantArray-Chlor."

NMED Comment: Comment 40 of NMED March 2020 Disapproval states, "[h]ydrocarbons in the aquifer may serve as carbon substrate to degrade EDB anaerobically. When dissolved hydrocarbons are utilized for EDB debromination, the concentrations of hydrocarbons may also decrease which provides synergistic degradation... Since EDB may be naturally degrading due to the current site conditions (e.g., anaerobic conditions, presence of hydrocarbons), the amendment of the carbon substrate may not be useful. Evaluate the necessity of the amendment to balance the EDB and hydrocarbon constituents degradation and provide the discussion in the revised Report." Clarify whether the proposed microbial analysis is sufficient for the evaluation as required by Comment 40 of the Disapproval in the revised Work Plan.

14. Section 6.2, analytical Methods, page 6-6

Permittee Statement: "Laboratory reporting limits for each analytical suite and the applicable regulatory limits are summarized in Table 6-2."

NMED Comment: Comment 3 in NMED's March 2020 Disapproval states, "[a]naerobic in-situ bioremediation of chlorinated solvents (e.g., trichloroethene) produces toxic byproducts such as vinyl chloride. Some byproducts are recalcitrant under anaerobic conditions. Although Section 4.5.2, EDB, *EDB Degradation Products*, pages 4-20, discusses EDB degradation products, the discussion lacks detail; therefore, it is not clear whether or not EDB produces toxic byproducts under anaerobic conditions (e.g., bromoethane, bromoethanol, vinyl bromide)." Table 6-2 does not list any potential byproducts of anaerobic EDB degradation. Include these byproducts or explain why these analytes are not proposed for analysis in the revised Work Plan.

15. Section 6.3.2, Field Quality Control Samples, page 6-7

Permittee Statement: "Field duplicate samples will not be collected for microbial analysis."

NMED Comment: Explain how the quality of microbial analysis is assured without the collection of duplicate samples; otherwise, propose to collect duplicate samples for microbial analysis in the revised Work Plan.

16. Section 7.2.2, Labeling, page 7-3

NMED Comment: The information presented in the hazardous waste labels must also include waste-specific information (e.g., purge water). Revise the Work Plan accordingly.

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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

APR 0 2 2020

Colonel Christopher J. King
Vice Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

RE: REQUEST FOR EXTENSION
RESPONSE TO DISAPPROVAL FOR THE
ETHYLENE DIBROMIDE IN-SITU BIODEGRADATION REPORT
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-20-001

Dear Colonel King:

Thank you for your letter of March 26, 2020, regarding the NMED Disapproval of the EDB Bioremediation Report for KAFB. Our Disapproval cited several deficiencies in the report as well as several observations concerning the study itself. The intent of the pilot study was not only to determine if the bioaugmentation and biostimulation enhanced EDB biodegradation, but also to ascertain the scalability of the approach and its potential inclusion of this option in any array of feasible remedial alternatives.

At the conclusion of the pilot study many questions remained. It was clear that EDB biodegradation had occurred, but the study also raised other questions concerning breakdown products and the physical design of the wells that are important considerations in any decision to move forward with the technology. This does not represent a failure of the pilot. In fact, it is to be expected that pilots such as this answer the immediate question, provide insights for

future work, and identify additional questions that must be answered before a decision is made on the acceptability of the approach.

We agree, as I mentioned in a follow up e-mail to your staff, that the scope of the pilot was not to determine the extent of LNAPL. However, the presence or absence of LNAPL is very important to the success or failure of biodegradation and was prominently highlighted in the workplan. As you mention, the presence and distribution of LNAPL in the vadose and saturated zones is critical to defining the nature and extent of contamination and evaluating potential corrective measures. Bioremediation can be one potential component of any corrective measure. Understanding the limits of this technology and how the technology could be most efficiently deployed must be a goal during the study phase. Understanding such issues at an early stage will allow us to efficiently and cost effectively proceed to a remedy evaluation and ultimate remedy selection. To that end, our comments in the March 4, 2020 Disapproval included questions and concerns that remain regarding the implementation and potential success of this technology. If some of our comments were misinterpreted by your staff, a teleconference would be helpful to resolve any misunderstandings. Your letter requests a meeting with NMED to discuss the Disapproval. We will reach out to your staff to arrange this teleconference.

Regarding the continuation of monitoring associated with this pilot, I want to acknowledge receipt of the In-Situ Bioremediation Long Term Monitoring Workplan and advise that this plan does not require NMED approval. We hope that you will use the information provided in our March 4, 2020 Disapproval to support the ongoing assessment of the efficacy of bioremediation. Once the results from this continued monitoring effort are available, please submit them as a supplement to the existing Report. This approach should make any extension of time for submittal of the revised report unnecessary. However, in order to assure KAFB has sufficient time to make the necessary changes to the Report and, in light of workload challenges associated with the COVID-19 pandemic, we are extending the due date for a response to our Disapproval to September 18, 2020.

I appreciate your dedication to this project, and we look forward to continued work with you and your staff toward its completion. Should you or your staff have any questions, please contact me at (505) 476-6035.

Sincerely,

Kevin M. Pierard, Chief
Hazardous Waste Bureau

cc: Stephanie Stringer, Director NMED RPD
Colonel David S. Miller, Base Commander KAFB
D. Cobrain, NMED HWB
B. Wear, NMED HWB
M. Suzuki, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading