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CERTIFIED MAIL - RETURN RECEIPT REQUESTED - AND HAND DELIVERED

June 6, 2014

Colonel Tom D. Miller
Base Commander
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2000Wyoming 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: DISAPPROVAL OF WHITE PAPER ON INTERIM MEASURE FOR EDB DISSOLVED PLUME

Dear Colonel Miller and Mr. Pike:

The New Mexico Environment Department (NMED) has reviewed the U. S. Air Force's White Paper on the Interim Measure for EDB Dissolved Plume (White Paper), for the Bulk Fuels Facility Spill that we received on April 8, 2014. The White Paper proposes to increase the pumping rate of Kirtland Well #3, draw the EDB contamination into this operating public water supply well, and install a carbon treatment unit when detectable EDB concentrations reach the well. In our meeting of May 7, 2014, I informed the U.S. Air Force that the approach presented in the White Paper would not be considered by NMED as a viable interim measure. In our meeting of May 28, 2014, however, I was informed that the U.S. Air Force contractor, CB&I, was nonetheless working with the Office of the New Mexico State Engineer to move forward with the modeling of the pumping of Kirtland Well #3 as proposed in the White Paper.

The purpose of this letter is to clearly articulate the position of NMED. For the reasons explained below, the approach proposed by the White Paper is inconsistent with applicable federal and state law, and is hereby disapproved.

Under longstanding EPA policy implementing the Resource Conservation and Recovery Act (RCRA), the purpose of Interim Measures is "to control or abate threats to human health and/or the environment from releases and/or to *prevent or minimize the further spread of contamination*

while long-term remedies are pursued." RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, May 1994. (emphasis added). Accordingly, the Hazardous Waste Permit NMED issued to Kirtland provides that in the course of corrective action the Department may require interim measures as necessary "*to reduce or prevent migration* of hazardous waste or hazardous constituents . . . while long-term corrective action remedies are being evaluated and implemented. See Permit No. NM9570024423 at section 6.2.2.2.12.1. (emphasis added).

Inducing the EDB plume to migrate into clean or noncontaminated groundwater is in direct opposition to the purpose of interim measures. Rather than stabilizing the plume by minimizing or preventing migration of hazardous constituents, the proposed strategy would actively enhance the spread of contamination into the very resource NMED seeks to protect, Albuquerque's drinking water supply. Not only would this do nothing to reduce risk to human health and environment in the short term, it poses a substantial risk of limiting the range of final corrective actions available. As a matter of fundamental logic, such an approach cannot be considered an appropriate interim measure for implementation while a long term corrective action remedy is evaluated.

Moreover, numerous technical deficiencies in the White Paper approach have been identified by the Hazardous Waste Bureau and previously conveyed to the Air Force. Specifically:

- The proposed "interim measure" is based on incomplete characterization data with regard to preferential flow pathways which could cause the plume to split or be diverted in a direction other than to the Kirtland Well #3.
- The vertical extent of EDB contamination has not been defined.
- The White Paper does not address the capability of Kirtland Well #3 to accomplish the intended goal of redirecting and capturing EDB plume. Kirtland Well #3 was designed as a water supply well and is screened across two confining layers (A-1 and A-2). Because pumps are not typically placed close to the top of the screen in water supply wells, the uppermost confining unit (A-2) likely creates a barrier between the primary zone where water is extracted and the water table. The length of the screened interval and the location of the pump in the well will likely affect the ability of pumping to influence flow direction at depths less than 150 feet below the water table where the EDB plume has been detected.
- The referenced model, used to support the proposed interim measure, is presented in an unreviewed, unapproved document, which is not appropriate
- The White Paper assumes isotropic conditions in the aquifer. There is no direct evidence in the record to support this assumption.
- The pattern of hydraulic conductivity consistent with extant regional and local geologic studies and aquifer tests must be considered.
- The design basis for interim measures must fully describe the hydraulic conditions created by potential extraction wells including specifying capture zone dimensions,

stagnation point distances and groundwater velocities based on actual data. This information is not provided in the White Paper.

Similar technical deficiencies were identified by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), the agency charged with meeting the increasing challenges of protecting the quality and quantity of water in the groundwater aquifer. The ABCWUA provided written comments on the White Paper, which are attached as Appendix A (Technical Memorandum dated May 1, 2014 prepared by INTERA (Geoscience and Engineering Solutions). Among other things, INTERA found that CB&I had not adequately modeled the hydrologic flow system to demonstrate the feasibility of proposed method; had not explained how a single extraction well could overcome the regional gradient caused by numerous wells with a much larger aggregate pumping rate; had not demonstrated that the proposed method would not split the EDB plume or demonstrated how much of the known EDB mass would be captured; had not demonstrated whether the EDB plume would be spread across other volumes, and had proposed designs that contained inconsistencies and made assumptions contradicting available data. More fundamentally, INTERA found that the design "if it were to function as described, would spread, not contain, the EDB plume over an additional 3,500 ft of clean aquifer." Encouraging the migration of EDB into noncontaminated groundwater is at variance with the ABCWUA's protection efforts. Every effort must be taken to contain and prevent the EDB plume from contaminating a larger volume of the aquifer.

Despite the objections of NMED and of the ABCWUA, work has continued on the White Paper approach. Any proposal involving the use of an extraction well that would enhance the migration of the EDB plume through an extensive volume of noncontaminated groundwater in the aquifer is fundamentally defective and will not be accepted by the NMED. Further discussions of this concept will not only be unproductive, but may also delay the development of an acceptable interim measure as is required by December 31, 2014.

NMED would be willing to consider a proposal to drill a well or wells closer to the toe of the EDB plume that could be used to capture contaminants. The U.S. Air Force is hereby directed to pursue an approach that will not allow further degradation of the aquifer. Deliver an approach in the form of a Work Plan that is responsive to these issues to NMED no later than by June 30, 2014.

If you have any questions, please contact me at 505-827-2855.

Sincerely,

Tom Blaine, P.E.
Director
Environmental Health Division

TB/DM

cc: Col. J. Lanning, KAFB
D. Wilson, KAFB
B. Gallegos, AEHD
F. Shean, ABCWUA
L. King, EPA-Region 6 (6PD-N)

File: KAFB 2014 Bulk Fuels Facility Spill and Reading

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TECHNICAL MEMORANDUM

DATE: **1 May 2014**

FROM: **John Sigda, Ph.D., INTERA, Incorporated**

TO: **Dave Cobrain, Manager, Hazardous Waste Bureau, NMED**

CC: **Rick Shean, Water Quality Hydrologist, Albuquerque Bernalillo County Water Utility Authority (ABCWUA)**

SUBJECT: **ABCWUA comments on the Interim Measure for EDB Dissolved Plume of April 2014**

1.0 INTRODUCTION

On behalf of the Albuquerque Bernalillo County Water Utility Authority (Water Authority), INTERA Incorporated (INTERA), reviewed the document entitled *Interim Measure for EDB Dissolved Plume* written by Chicago Bridge and Iron, Inc. (CB&I). This document (CB&I, 2014a) was reviewed in conjunction with a companion white paper on air sparging of the LNAPL source area (CB&I, 2014b).

The white paper describes an interim measure (IM) for the containment of the dissolved phase 1,2-dibromoethane (EDB) plume that depends on hydraulic capture by the existing KAFB-3 water supply well or a proposed new water supply well, called KAFB-3 South, that would be constructed closer to the plume than KAFB-3. Produced water is treated for EDB removal with granulated activated carbon filters and put into the KAFB water supply distribution system. Using CB&I's numerical models of groundwater flow and solute transport, pumping rates at the capture wells were varied from 167 to 500 gallons per minute (gpm) for several scenarios to examine the EDB concentrations arriving at the ABCWUA Ridgecrest 5 public water supply well.

2.0 SUMMARY

In summary, INTERA's review of CB&I's proposed IM for dissolved phase EDB identified the following major issues:

1. Hydraulic capture and treatment is in general a feasible approach for achieving removal or containment of the migrating EDB plume, but the proposed design does

not achieve removal within decades, let alone 6 to 12 months, and, if it were to function as described, would spread, not contain, the EDB plume over an additional 3,500 ft of clean aquifer.

2. CB&I states that their numerical modeling demonstrates the feasibility of the IM, but that only applies to their choice of the key characteristics of the flow system: regional hydraulic gradient, hydraulic conductivity, and storage properties. There is no analysis presented to demonstrate that their conclusion applies within the reasonably well-established ranges for these key characteristics. Given the uncertainties in these key characteristics, the modeling conducted is far from adequate and cannot serve as a defensible foundation for designing an interim measure of hydraulic capture.
3. CB&I state that their proposed design will achieve hydraulic capture across a distance of approximately 3,500 feet by pumping up to 500 gpm at a single extraction well while simultaneously overcoming the regional gradient that is driven by pumping of many thousands of gpm at numerous water supply wells and that is oriented obliquely to the induced capture gradient. CB&I do not show or discuss the orientation of the regional gradient nor do they demonstrate that the proposed design, or any single extraction well, can capture the entire plume by diverting it away from its present course with a pumping rate that is much smaller than aggregate pumping rate that drives the regional gradient.
4. The IM proposed design does not address how it will affect contaminants migrating away from the KAFB source area, especially whether the proposed design will increase spreading of the EDB plume "core" across other volumes of clean aquifer without active control in the source area.
5. The proposed IM design does not demonstrate that it will not split the existing EDB plume nor does it demonstrate how much of the known EDB plume mass it will capture.
6. The proposed design contains inconsistencies that must be resolved and makes assumptions that contradict available data.

3.0 DETAILED COMMENTS

1. An IM should achieve source removal or contain contaminant migration within a reasonably short time period. As described by CB&I, the proposed design will not remove any EDB for several decades. This is too long a time period to be considered an appropriate IM. Moreover, the proposed design serves to contaminate a volume of clean aquifer that is approximately 3,500 feet in width between the known plume and KAFB-3. Thus, the proposed design fails to achieve source removal within a reasonable time period and actively spreads the EDB plume into volumes on uncontaminated aquifer.
2. Hydraulic capture of a plume migrating under a regional head gradient strongly depends on the key characteristics: the magnitude and orientation of the regional hydraulic gradient, horizontal and vertical hydraulic conductivity, and the aquifer's storage properties. The proposed design does not discuss any of these key characteristics. Worse still, it does not describe whether hydraulic capture of the plume will occur if the values of these key

characteristics are allowed to vary across the reasonably well-established ranges for the gradient magnitude, hydraulic conductivity, or storage properties. For example, horizontal hydraulic conductivity in the CB&I model was set to 60 ft/day, whereas one pump test on KAFB yielded values between 150 and 250 ft/day and KAFB's own test of KAFB-106157 yielded values between 90 and 140 ft/day. The proposed design must be tested against the full range of values for the key characteristics to show that it is an effective and robust design in the face of these well-established uncertainties.

3. The IM design does not demonstrate the orientation of the regional gradient that is created by the many water supply wells in the Ridgecrest well field and the well fields to the north and northeast. The IM design proposes that a single extraction well with a maximum pumping rate of 500 gpm can overcome EDB plume migration along the regional gradient driven by water supply pumping in the tens of thousands of gpm. As shown in Figure 1, the regional gradient likely carries the plume obliquely away from KAFB-3 with a separation distance on the order of 3,500 ft. If the proposed design is realistic, then EDB and other contaminants from the plume source area should be moving towards KAFB-7, is only 3,700 feet from the plume and which pumps at an average rate of 300 gpm with a maximum rate of 500 gpm. Examination of the shallow groundwater heads from spring of 2012 show that pumping at KAFB-7 does not appear to capture the contaminant plume, but may be acting to spread it to the east.
4. No discussion is provided about the impacts that the proposed IM design will have on spreading the EDB plume from its current location into volumes of presently uncontaminated aquifer. How will the design prevent spreading of the plume "core" within the source area into new areas? How much of the deeper aquifer will the design contaminate by pumping from KAFB-3?
5. The proposed IM design does not discuss what proportion of the EDB plume will be captured or how much of the total mass it will remove over time. Will the design split the existing EDB plume? How much of the known EDB plume mass it will capture?
6. The IM design states in the third paragraph of page 3 that "*When the dissolved phase plume reaches KAFB-3, EDB concentrations in the groundwater are expected to be no higher than 0.1 to 0.25 µg/L"*. The assumed range of influent EDB concentrations contradicts data from KAFB's quarterly monitoring reports. Data through the end of the third quarter for 2014 show downgradient concentrations range between 0.1 and 3 µg/L at the most distal well cluster with detected EDB: in monitoring wells KAFB-106055, 106057, and 106058, the observed concentration ranges are 0.7 to 3, 0.2 to 0.9, and 0.2 to 0.6 µg/L, respectively. CB&I must provide a defensible and conservative influent concentration.
7. The following inconsistencies must be resolved.
    - 7.1. Page 1, 2nd paragraph: *Additionally, 10-year pumping averages (2003 through 2013)*

    This statement is incorrect because the period from 2003 through 2013 constitutes 11 years.

    - 7.2. Page 2, 1st regular paragraph: *The final simulation, 500_South, indicates the lowest EDB concentrations over time. The lower concentrations at KAFB-3 are due to increased EDB plume capture by conceptual well, KAFB-3_South*.

For 500_South scenario, KAFB-3_South is the pumping well but the breakthrough curve is for KAFB-3, whereas, for other 3 scenarios, KAFB-3 is both the pumping well and monitoring well. As a result, comparison of the breakthrough curve for 500_South scenario to the curves for the other scenarios is not valid.

7.3. Page 2, next to last paragraph: *Based on the groundwater model, increasing the pumping rate at KAFB-3 from its current 10 year average of 79 to 90 million gallons per year (150 to 170 gpm) to roughly 263 million gallons per year (500 gpm) will contain the EDB dissolved phase plume*

Figure 3 shows that none of the pumping scenarios 'contain' the EDB plume.

7.4. Page 3, 1st paragraph: *The lead adsorber removes all of the EDB and the lag or second unit is essentially a backup unit that will pick up any EDB that makes it through the first bed.*

Reword this sentence to: The lead adsorber is <u>intended</u> to remove all of the EDB...

7.5. Page 3, 2nd paragraph: The carbon system will be designed for 600 gpm. This is needed to account for downtime in operation of the treatment system.

How does a 600-gpm carbon system account for downtime? Is the capture well pumped at 600 gpm but its expected average is 500 gpm? What if both carbon tanks must be brought off-line?

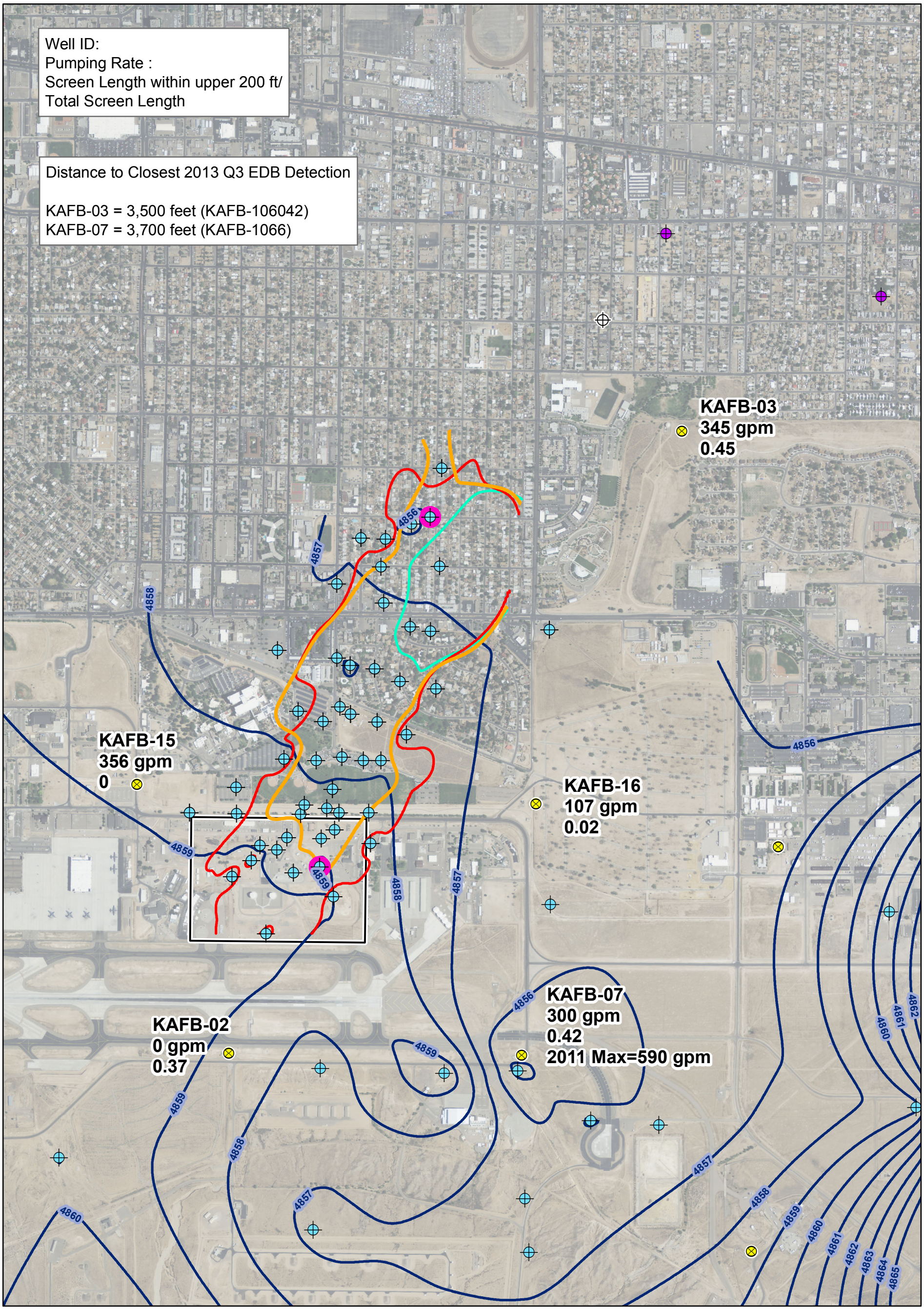
7.6. Page 3, last paragraph: *The carbon system feed pumps are two identical 500 gpm centrifugal pumps, where one pump will be in operation and the other is an online spare*.

Page 3, 2nd paragraph states that pumps will be designed to 600 gpm to account for downtime, yet carbon system feed pumps are only designed to 500 gpm.

REFERENCES

CB & I, 2014a. *Interim Measure for EDB Dissolved Plume*. Prepared for U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, NM 87109 by Chicago Bridge and Iron, Inc. April, 2014.

CB & I, 2014b. *Interim Measure for LNAPL Source*. Prepared for U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, NM 87109 by Chicago Bridge and Iron, Inc. April, 2014.



Trumbull monitoring well

Ridgecrest water supply well

Monitoring Well Locations

KAFB Pumping Wells

March/April 2012 water elevation contours (ft)

Bulk Fuels Facility

EDB Shallow Plume (0.013 ug/L)

EDB Intermediate Plume (0.011 ug/L)

EDB Deep Plume (0.032 ug/L)

Closest EDB Dectection

N

1,000 0 1,000

Feet

Notes: Average Total Pumping Rates from January 2007 to December 2007

KAFB-07 Average Total Pumping Rate from January 2011 to December 2011

Sources: Data - Shaw 2012 Q4 Report, MWH December 2009 Report
Geology - NMBGMR OFR 496
Aerial Imagery - NAIP, 2011

INTERA

Figure 1
March/April 2012 Shallow Groundwater Contour Map
Conceptual Site Model

FILE: S:\Projects\ERA_Ranger_R3Deeps\Task6_Pit1\Report\Figures\Section03\EDB_DissolvedInterim_PumpJMS.mxd 5/2/2014