

New Mexico Environment Department 2018 Strategic Plan For Kirtland Air Force Base Aviation Fuel Cleanup



October 12, 2018



Sand and gravel deposited by the ancestral Rio Grande is the host material for a major aquifer in the Albuquerque area

2018 Strategic Plan

Goal: *Protect Albuquerque's aquifer and drinking water supply wells in the area of the fuel leak*

Strategies to Achieve the Goal

In 2018, NMED and the Air Force will continue to:

- 1. Implement a robust site monitoring and wellhead protection program**
- 2. Update the Conceptual Site Model, as necessary, to describe physical, chemical and biological processes that affect the migration and fate of fuel contamination in soil, soil vapor and groundwater**
- 3. Using information gained in Strategies 1 and 2, deploy multiple engineered technologies, both simultaneously and sequentially as interim corrective measures, to mitigate soil, soil vapor and groundwater contamination**
- 4. Meet or exceed all requirements for providing public information and involvement**

Strategy 1 – Implement Robust Site Monitoring and Wellhead Protection

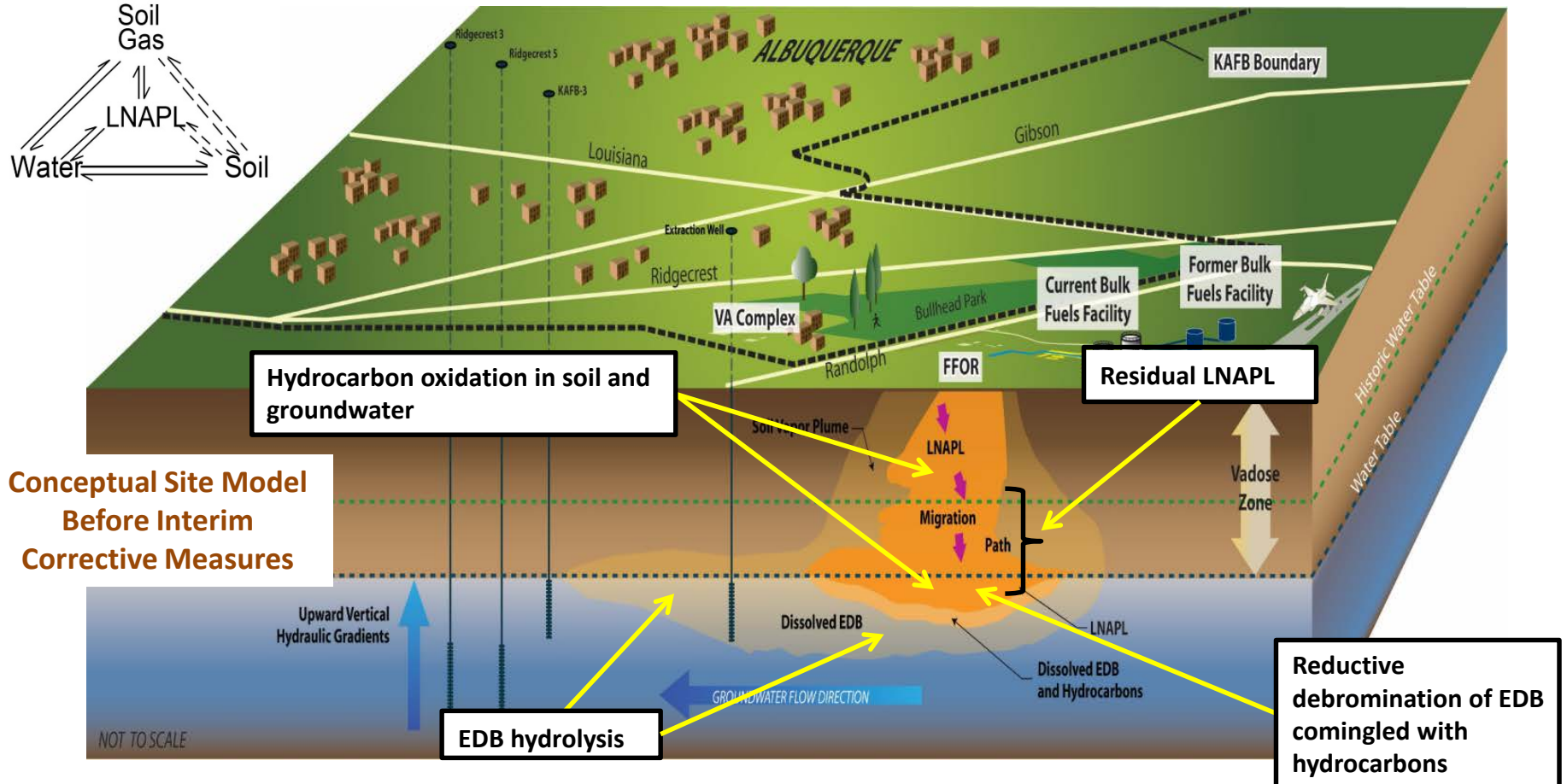
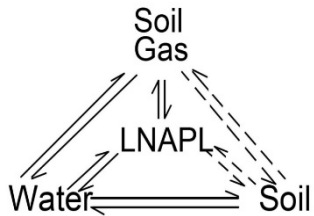
- No detections of EDB in drinking water wells or sentinel wells
- EDB plume capture analysis/modelling by Air Force and NMED
- Evaluate changes to groundwater flow direction and contaminant migration
- Monitoring well drilling to fill data gaps caused by water level rise
- Soil coring to fill data gaps on residual LNAPL

KAFB fuel contaminants will not be allowed to adversely impact any community drinking water wells

Strategy 2 – Update Conceptual Site Model

- Define effect of water table fluctuations on locations and amounts of residual LNAPL
- Identify natural degradation processes and potential opportunities for enhancement through engineered cleanup technologies

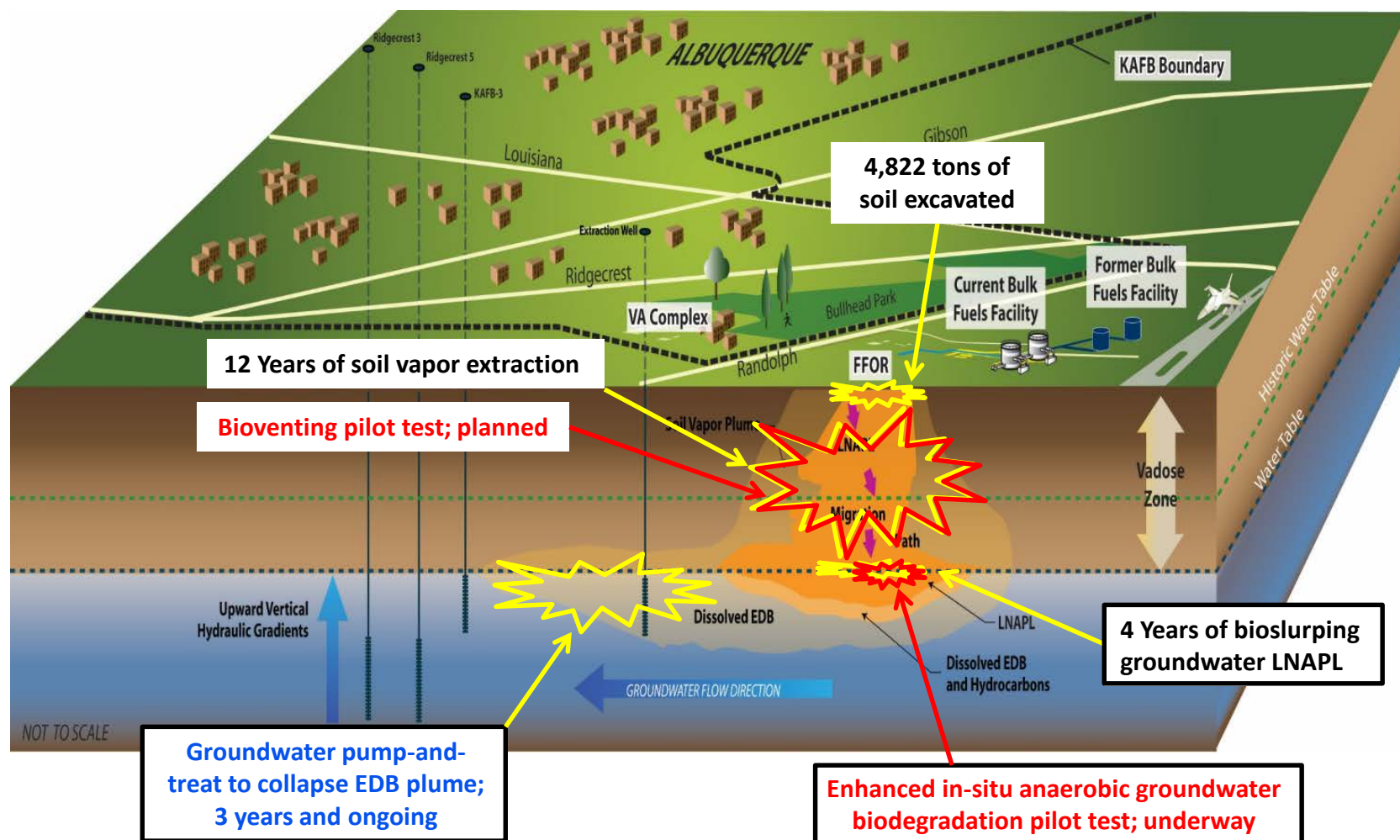
Contaminant partitioning between LNAPL, water, soil gas and soil (adsorbed) phases



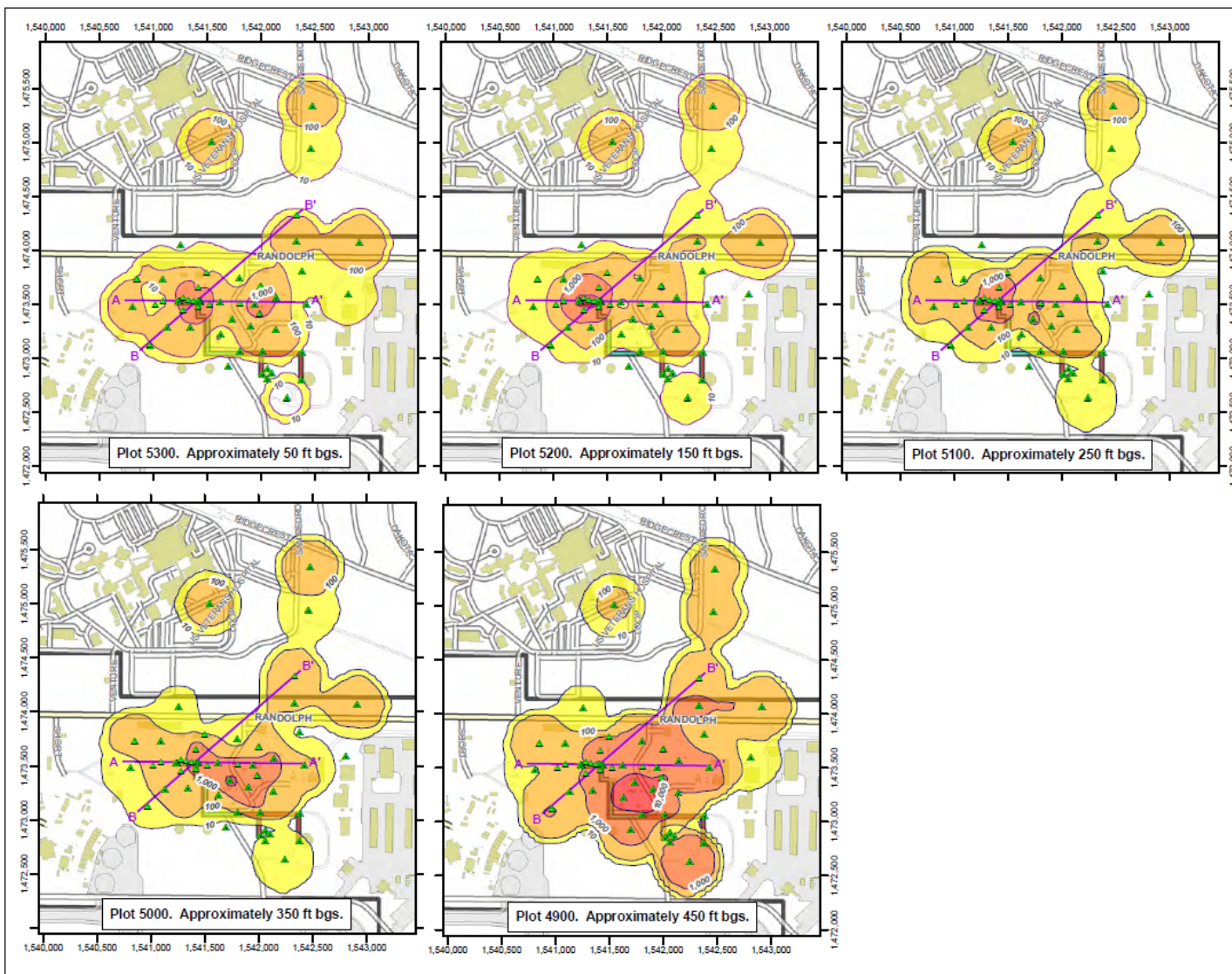
Strategy 3 – Deploy Multiple Engineered Cleanup Technologies, Simultaneously and Sequentially, as Interim Corrective Measures

During 2018:

- Efforts to collapse the EDB groundwater plume with pump-and-treat technology will continue; and
- Pilot tests for enhanced in-situ anaerobic groundwater biodegradation, and soil bioventing will be conducted.



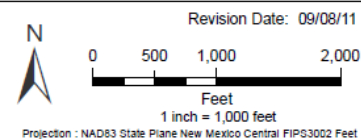
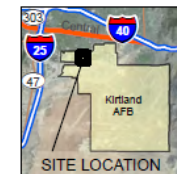
3. Total VOC Soil Vapor, June 2011



Legend

- ▲ SVE Extraction Well
- ▲ SVE Cluster
- Cross-Section Line
- VOC Concentration Contour (ppmv)
- VOC Concentration (ppmv)
 - 10 - 99
 - 100 - 999
 - 1,000 - 9999
 - ≥ 10,000
- ▭ Installation Boundary
- ▭ Aboveground Fuel Transfer Lines
- ▭ Underground Fuel Transfer Lines
- ▭ Structure
- ▭ Runway
- ▭ Highway
- ▭ Major Road
- ▭ Road

Note:
The vadose zone VOC plume was gridded in three dimensions using inverse distance weighting in RockWorks and then concentration plan-view maps were "cut" at respective elevations. Ground elevations range from 5314 to 5364 ft above mean sea level across the ST-106/SS-111 investigation area.

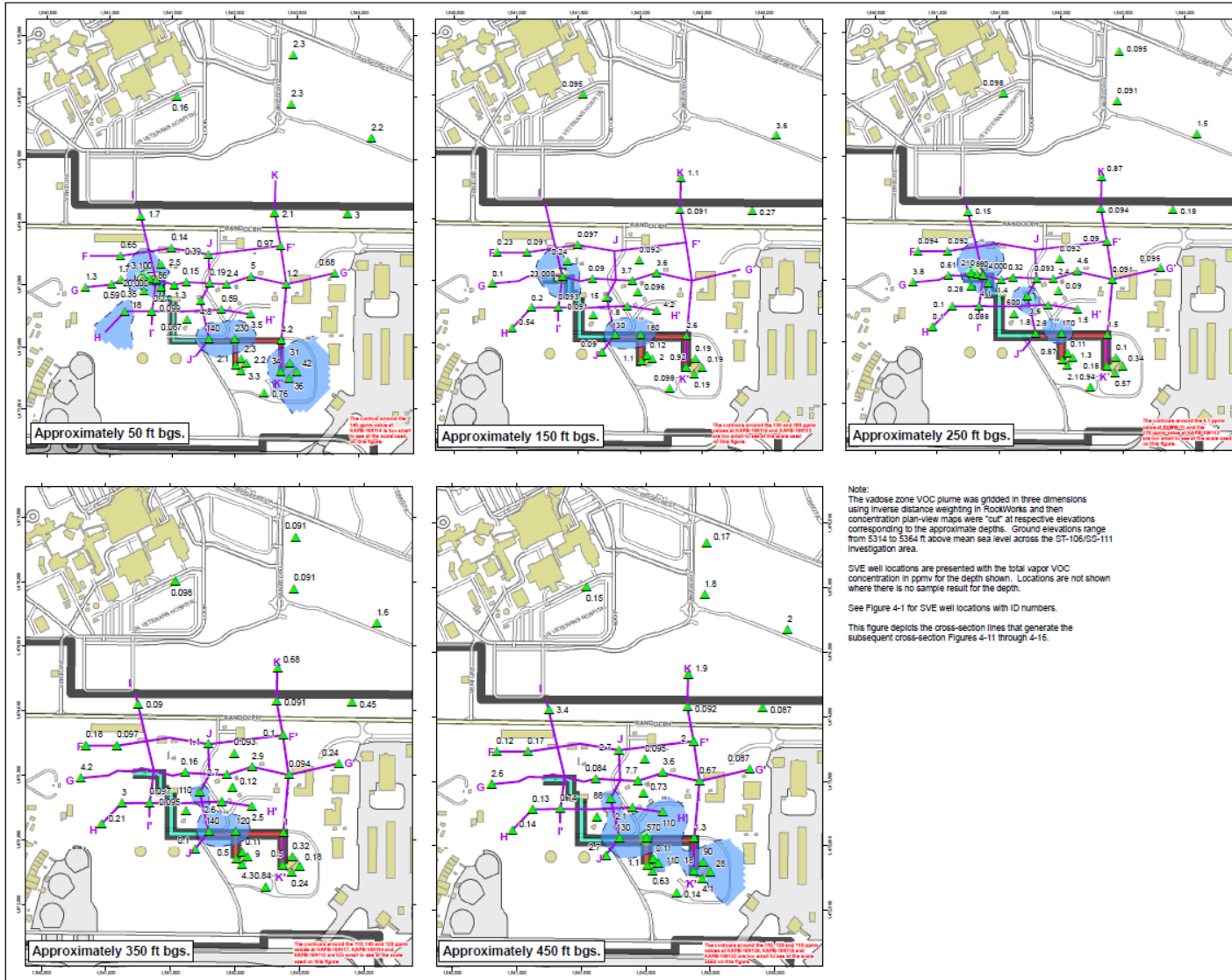


2011 QUARTERLY REPORT 02
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 4-8

LAB TOTAL VOC VAPOR PLUME
FOOTPRINTS BY ELEVATION
JUNE 2011

3. Total VOC Soil Vapor, Sept. 2014



Legend

- ▲ SVE/SVM Well with Vapor VOC Concentration (ppmv)
- Fence Diagram Line
- - - - VOC Concentration Contour (ppmv)
- VOC Concentration (ppmv)
- 10 - 100
- 100 - 1,000
- 1,000 - 10,000
- 10,000 - 30,000

Note:
The vadose zone VOC plume was gridded in three dimensions using inverse distance weighting in RockWorks and then concentration plan-view maps were "cut" at respective elevations corresponding to the approximate depths. Ground elevations range from 5314 to 5364 ft above mean sea level across the ST-106/OS-111 investigation area.

SVE well locations are presented with the total vapor VOC concentration in ppmv for the depth shown. Locations are not shown where there is no sample result for the depth.

See Figure 4-1 for SVE well locations with ID numbers.

This figure depicts the cross-section lines that generate the subsequent cross-section Figures 4-11 through 4-16.



Revision Date: 12/17/14



0 400 800 1,600

Feet
1 inch = 415 feet

Projection : NAD83 State Plane New Mexico Central FIPS3002 Feet

THIRD QUARTER 2014
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 4-9

TOTAL VOC VAPOR PLUME
FOOTPRINTS BY DEPTH
AND CROSS-SECTION LINES
SEPTEMBER 2014

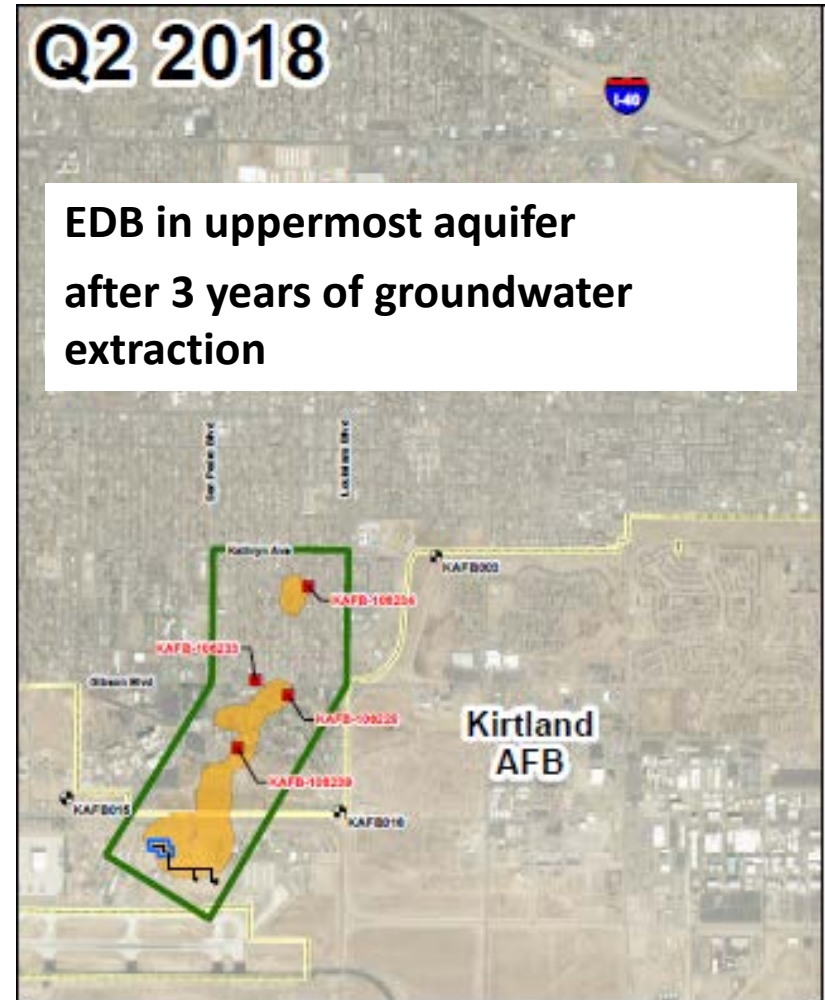
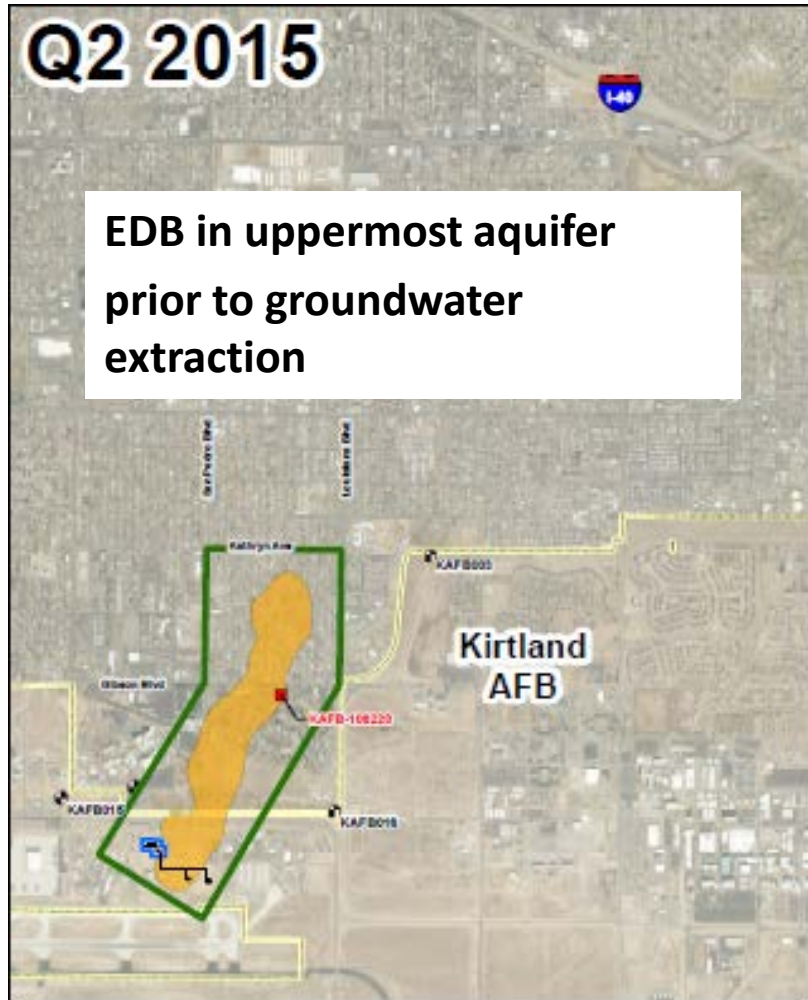
3. Collapse the EDB Plume

Groundwater Extraction and Treatment System:

- Pump contaminated groundwater from extraction wells, treat water to remove contaminants, use treated water for KAFB golf course irrigation and aquifer recharge
- Four extraction wells have been installed to date
- Analyze plume capture, optimize system operation, add extraction wells if necessary
- Monitor for evidence of decreasing contaminant levels and plume collapse

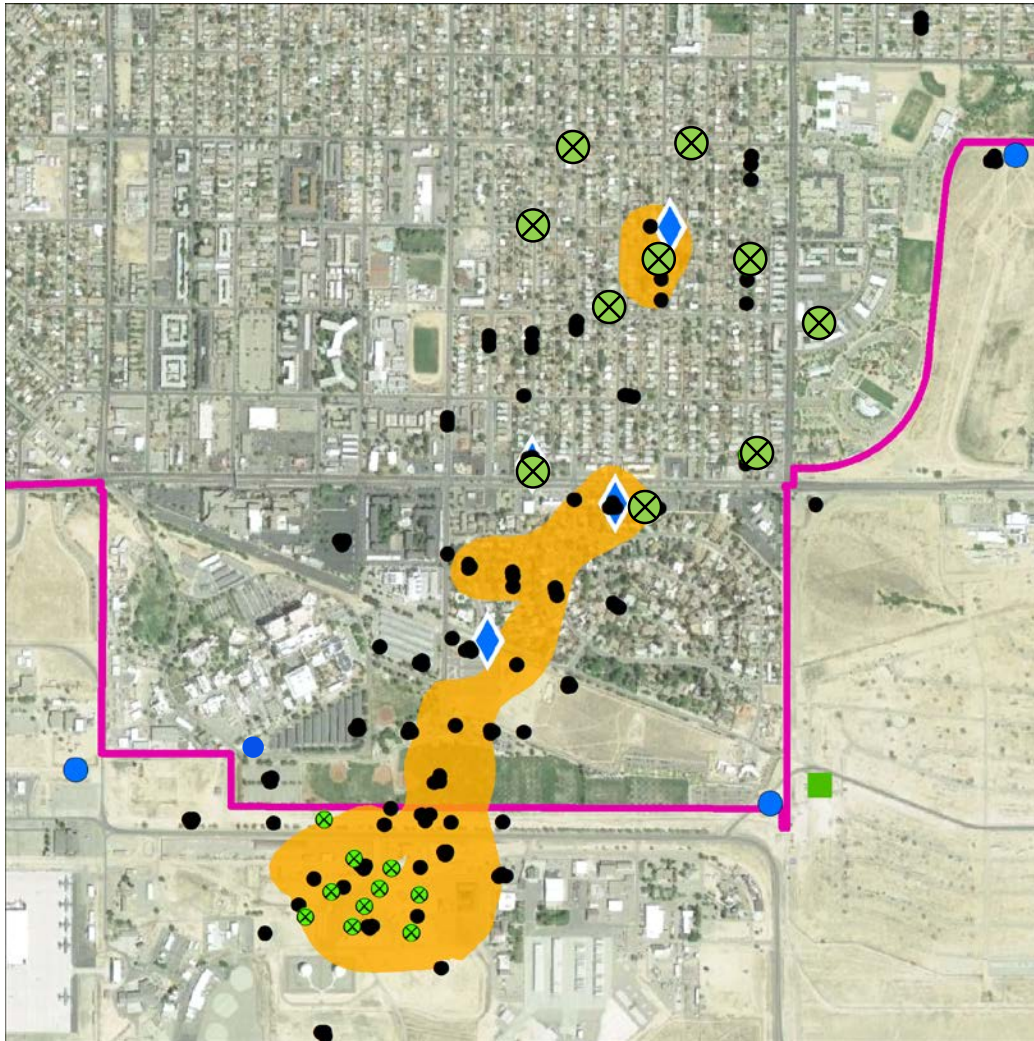


3. Strong Evidence of EDB Plume Collapse



The EDB footprint in the groundwater extraction area has varied, but is presently the smallest it has been since extraction began in 2015. The most likely explanation for this is that the extraction system is beginning to collapse the plume.

Northern Plume Area Still Has Unsubmerged Wells



Legend

- Groundwater Monitoring Well (Screen Not Submerged)
- Groundwater Monitoring Well (Screen Submerged)
- Extraction Well
- Water Supply Well
- KAFB Base Boundary
- EDB Plume, Q2 2018 (>0.05 µg/L)
- Groundwater Treatment System

Strategy 4 - Public Outreach Schedule

The Air Force and NMED are conducting public outreach and involvement activities related to investigation and cleanup of the KAFB aviation fuel contamination in accordance with the public notice and community relations requirements of the WQCC and RCRA Permits.

Additionally, NMED will prepare and implement a Public Involvement Plan pursuant to NMED Policy 07-13, <https://www.env.nm.gov/wp-content/uploads/2018/02/NMED-Policy-and-Procedure-07-13.pdf>.

Date	Description
March 21, 2018	ABCWUA Governing Board Meeting, project update
March 22, 2018	Regular Public Meeting with Technical Poster Session
March 24, 2018	Groundwater Treatment System Open House
July 12, 2018	Regular Public Meeting with Technical Poster Session
Sept. 29, 2018	International District Fair
October 12, 2018	ABCWUA Water Protection Advisory Board
October 17, 2018	63 rd Annual New Mexico Water Conference presentation
October 20, 2018	Geologic Field Trip
November 15, 2018	Regular Public Meeting with Technical Deep Dive

NMED and the U.S. Air Force welcome invitations from neighborhood associations, civic organizations, environmental groups, and local government agencies.

4. Outreach with Public Schools

NMED will engage middle school, high school and college students with the project by:

- 1. Making presentations to schools and colleges;**
- 2. Encouraging and assisting students with the creation of original papers, slide presentations, physical models, digital animations, poetry, and musical compositions based on protecting the environment;**
- 3. Providing opportunities for students to present their original work at public meetings.**

Outreach will include all students who are interested in environmental protection.

4. Public Involvement Plan (PIP)

- **NMED will develop a Public Involvement Plan (PIP) to ensure that public participation opportunities related to NMED activities and proceedings on the KAFB fuel cleanup project are in accordance with Title VI of the Civil Rights Act of 1964, 42 U.S.C. § § 2000d to 2000d-7, and the EPA regulations at 40 C.F.R. Parts 5 and 7.**
- **NMED plans to issue a draft PIP for a 30 day public comment period.**

About NMED's Strategic Plan

- NMED's annual Strategic Plans are not regulatory documents, but serve to communicate goals and strategies with the public.
- NMED's Strategic Plans summarize the detailed, and often highly-technical, regulatory permits, workplans, engineering specifications, schedules, and approval letters that can be accessed from the NMED Hazardous Waste Bureau website: <https://www.env.nm.gov/hazardous-waste/kafb/#KAFBBulkFuelsFacSpill>.
- NMED's Strategic Plans for 2015, 2016, 2017 and 2018 are available online: <https://www.env.nm.gov/kabfuelplume/kafb-fuel-plume-documents/>
- Kirtland Air Force Base jet fuel remediation website: <https://www.kirtland.af.mil/Home/Environment/>
- Drinking Water Watch contains information and drinking water test results for public water systems in New Mexico, including Albuquerque Bernalillo County Water Utility Authority, Kirtland Air Force Base, and Veterans Administration Hospital: <https://dww.water.net.env.nm.gov/NMDWW/>
- NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities.

Kirtland Air Force Base Fuel Leak Cleanup

Presenter: Kathryn Lynnes, Air Force



Water Protection Advisory Board

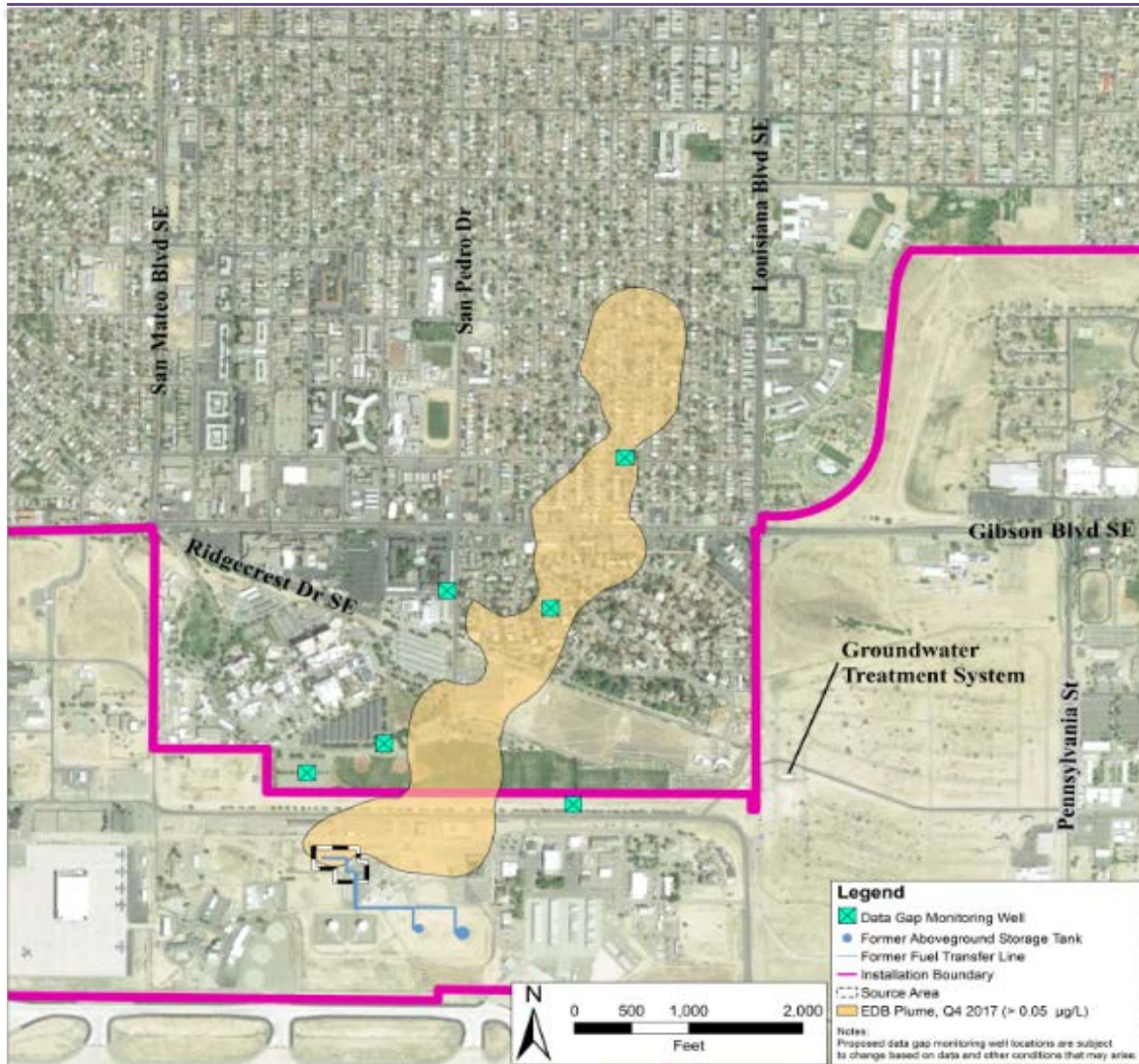
Project Status Update

October 12, 2018

Drilling to Fill Data Gaps

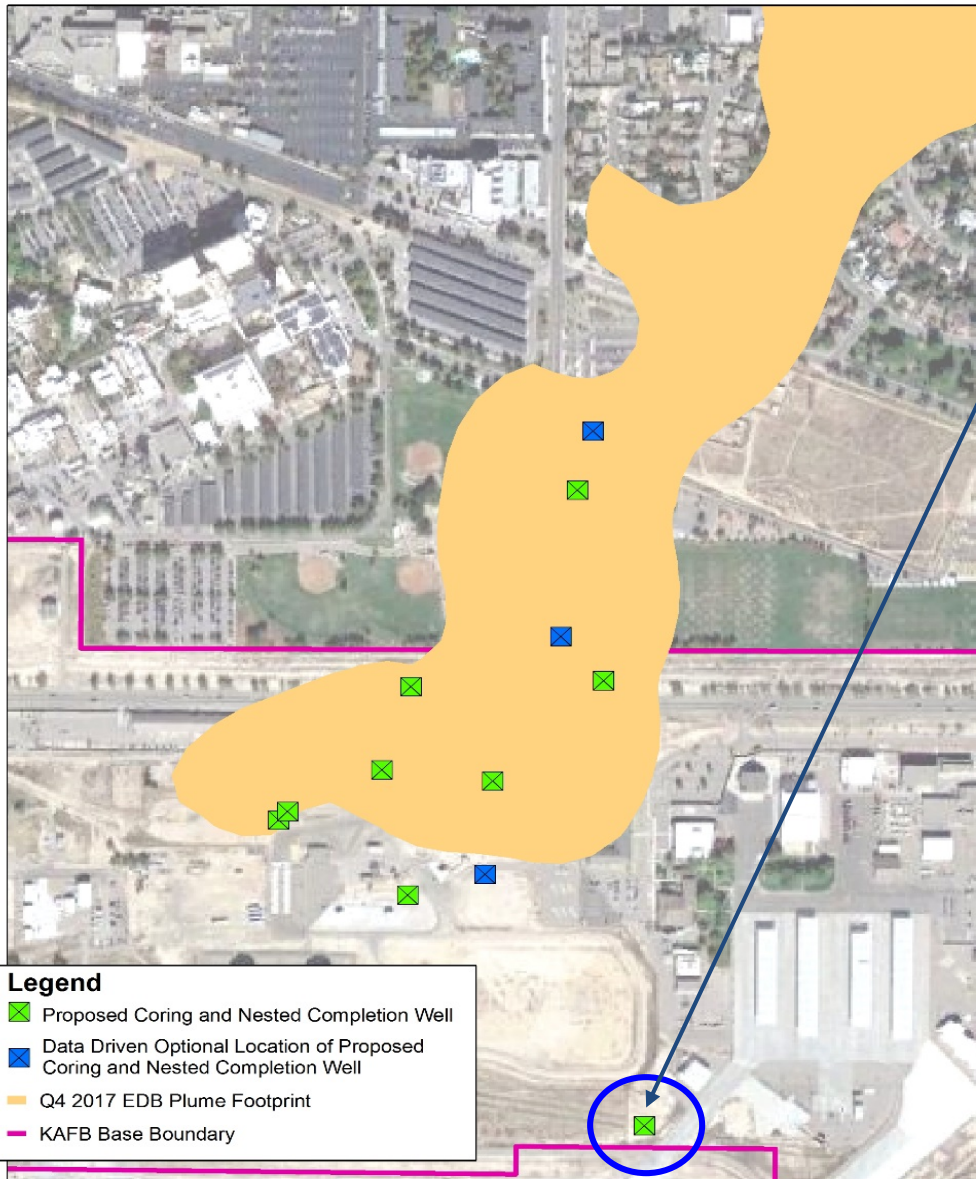


Data Gap Monitoring Wells



- There was an unexpected rapid rise in water table in first half of 2017
- Six initial “data gap” well locations
- All wells are installed and first round a sampling data is undergoing validation

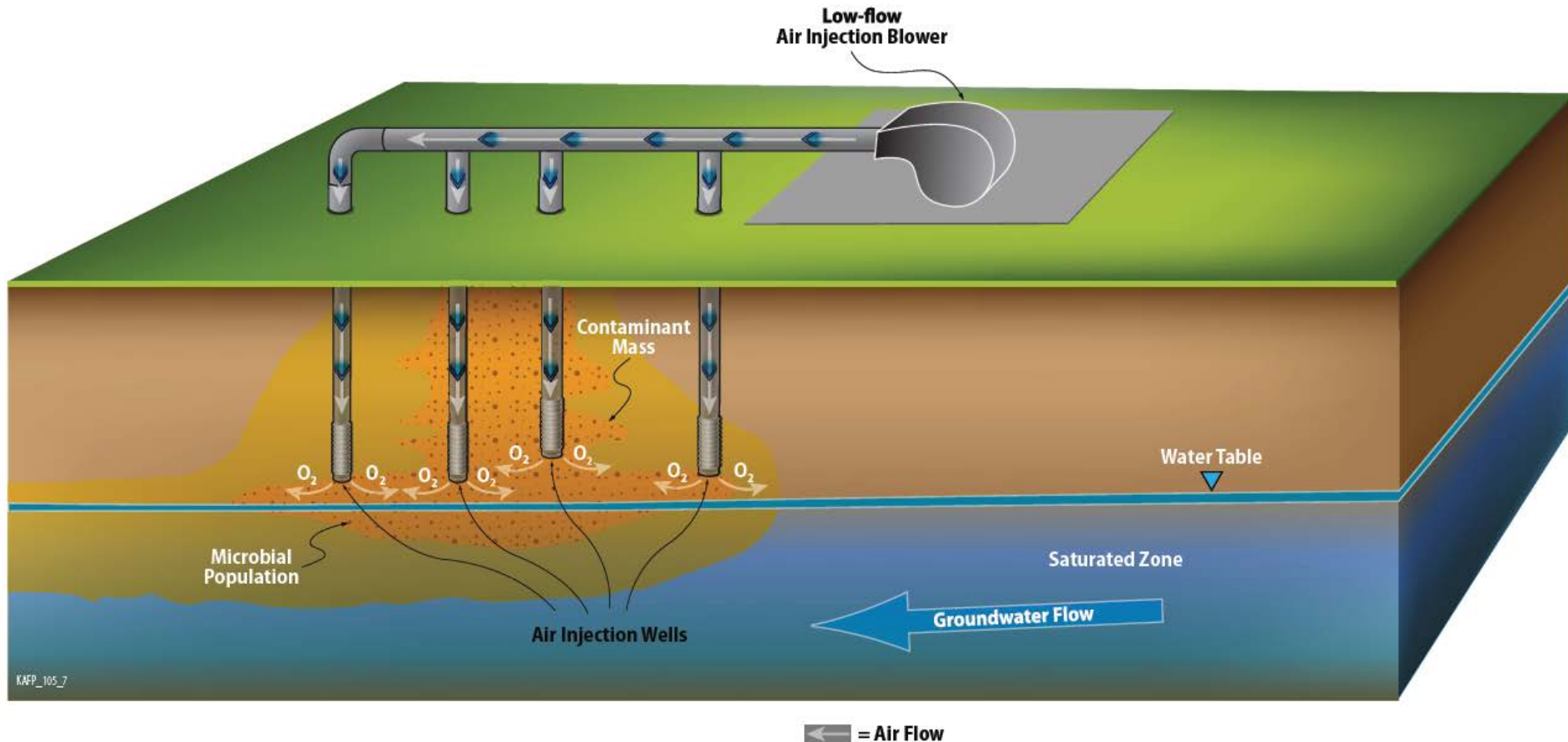
Data Gap Coring and Monitoring Wells



- Eight soil cores will be drilled to determine extent of remaining LNAPL in the source area (field work began 10/01/2018)
- One background location
- Three optional locations that may be drilled pending results of other cores
- Seven coreholes will be completed as groundwater monitoring wells and two will be completed for soil vapor monitoring
- **Total of 18 groundwater monitoring locations to be added to over 150 existing monitoring wells**

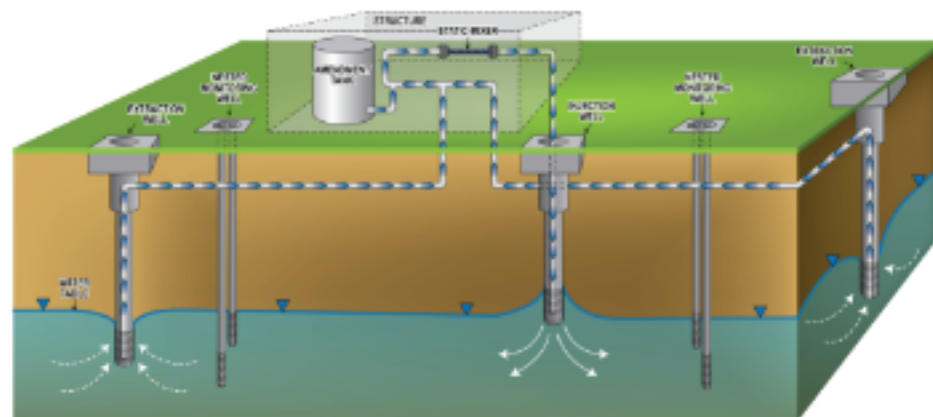
Bioventing

Bioventing is a logical follow up to SVE and bioslurping. Air will be blown into the soil to deliver oxygen and moisture to naturally occurring bacteria and enhance their ability to biodegrade petroleum hydrocarbons



EDB In Situ Biodegradation Pilot Test

- Multi-part, data driven pilot test
- Phase 1 – Baseline definition, tracer, test circulation, passive monitoring (completed Dec 2017)
- Phase 2 – Bio-Stimulation by adding nutrients and lactate (completed July 2018)
- Phase 3 – Based on Phase 2 success, additional Bio-Stimulation. (scheduled for summer 2018). Bio-Augmentation on hold.
- Phase 4 – Additional passive monitoring



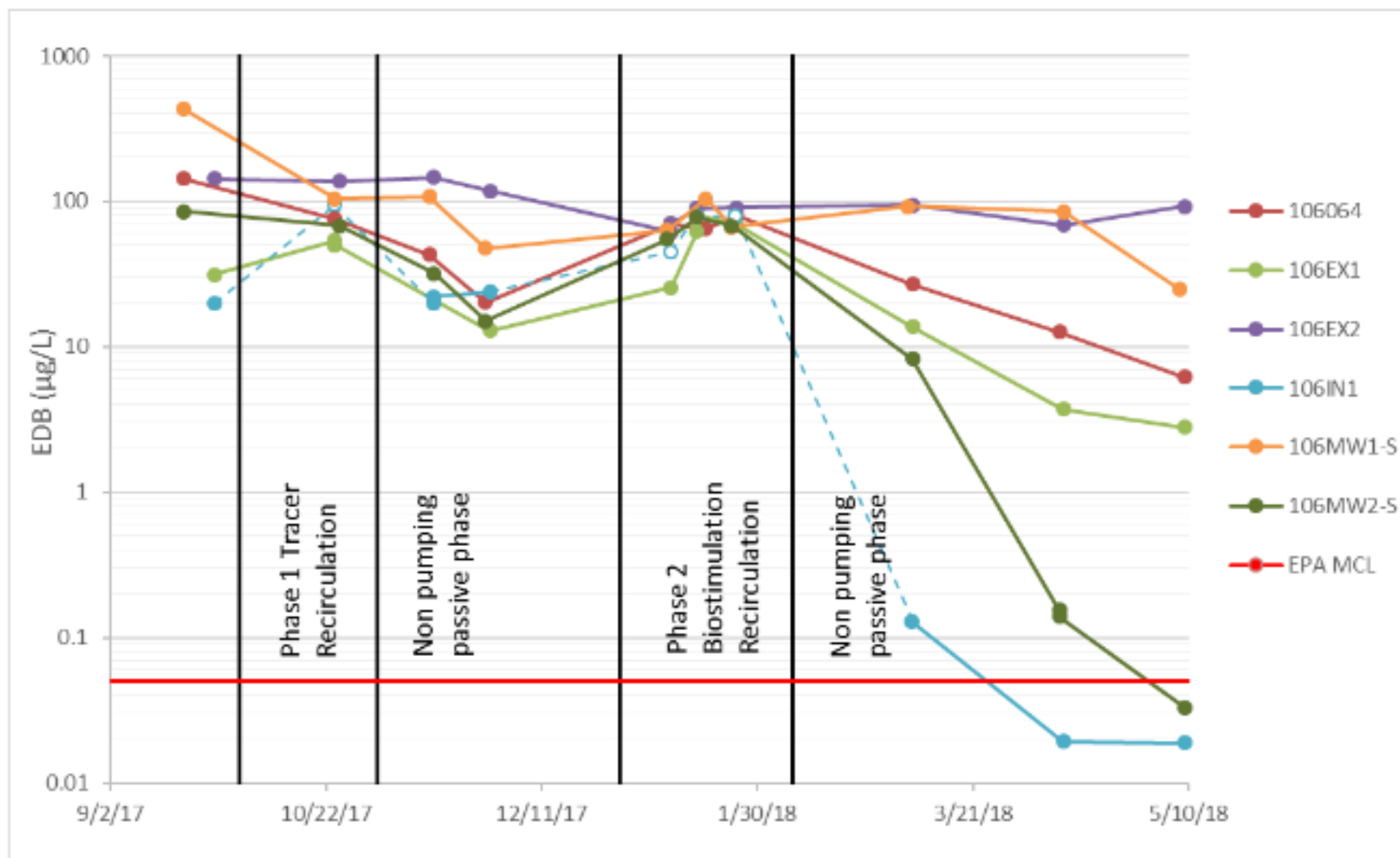
EDB In Situ Biodegradation Pilot Test

- Began Phase 1 in October 2017 - GW extracted and injected for 30 days with tracers to evaluate transport times and distribution throughout the pilot test area
- Completed passive part of Phase 1 from Nov – Dec 2017
- Phase 1 showed effective distribution of tracers at the site and provided opportunity to evaluate EDB concentrations and native bacteria already present
- Began Phase 2 in Dec 2017 - GW extracted and injected for ~30 days with addition of treatment amendments and tracer
- Completed passive monitoring part of Phase 2 from Feb – July 2018

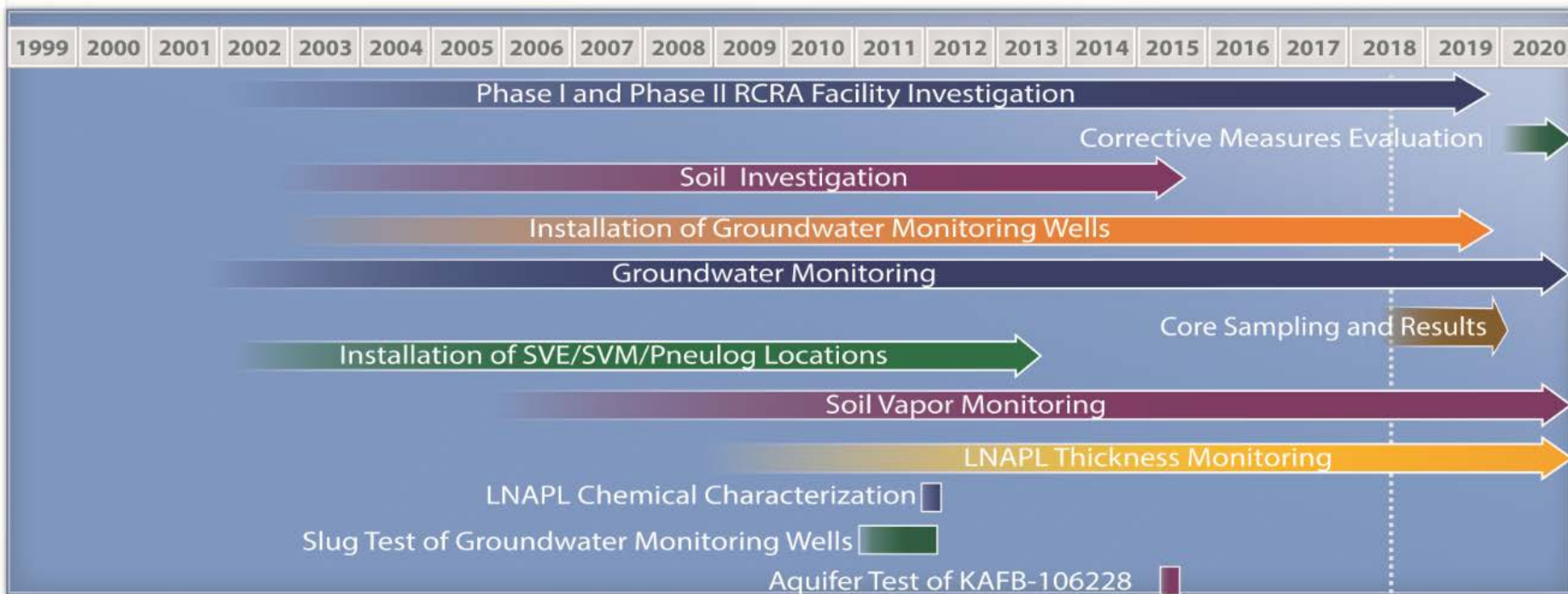
EDB In Situ Biodegradation Pilot Test

- Phase 2 results:
 - Effective distribution of tracers and amendments
 - Decreasing concentrations of EDB at the shallow monitoring wells, injection well, and 1 extraction well
 - Native dehalogenating bacteria present in high counts at all wells in the pilot test area
 - Other VOC constituents remain at higher and steady concentrations, indicating little dilution

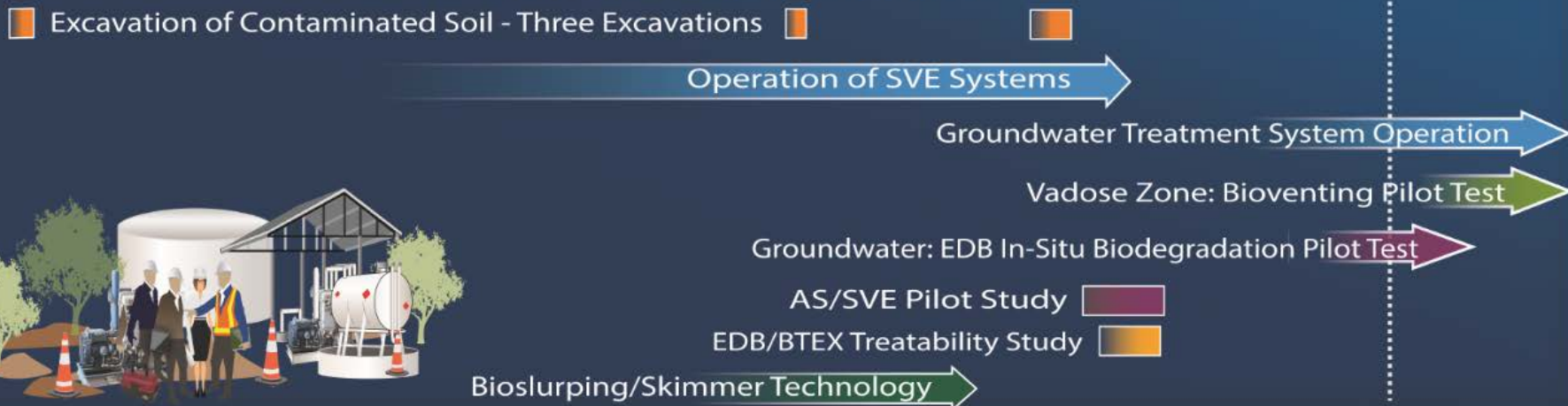
EDB In Situ Biodegradation Pilot Test



Site Activity Timeline



INTERIM CLEANUP MEASURES



2018 to 2020 Activities

2017

- Risk Assessment Report submitted
- In-situ bioremediation pilot test began

2018

- Phase I RFI Report was submitted (covers investigations and interim measures from 11/1999 to 12/2015)
- In-situ bioremediation pilot test is ongoing
- First six wells to fill water table data gaps were installed
- Vadose zone coring and well installation to fill LNAPL data gaps underway
- 2-Quarter groundwater monitoring report and six-step plume capture analysis was submitted
 - Plume capture analysis will be repeated twice per year and included in the 2-Q and 4-Q groundwater monitoring reports
 - Daniel B. Stephens & Associates is providing modeling support to assist NMED in their reviews
- Bioventing wells will be installed

2018 to 2020 Activities (cont.)

2018

- The Class V UIC well will be repaired and back online
- An NPDES permit application was submitted to EPA

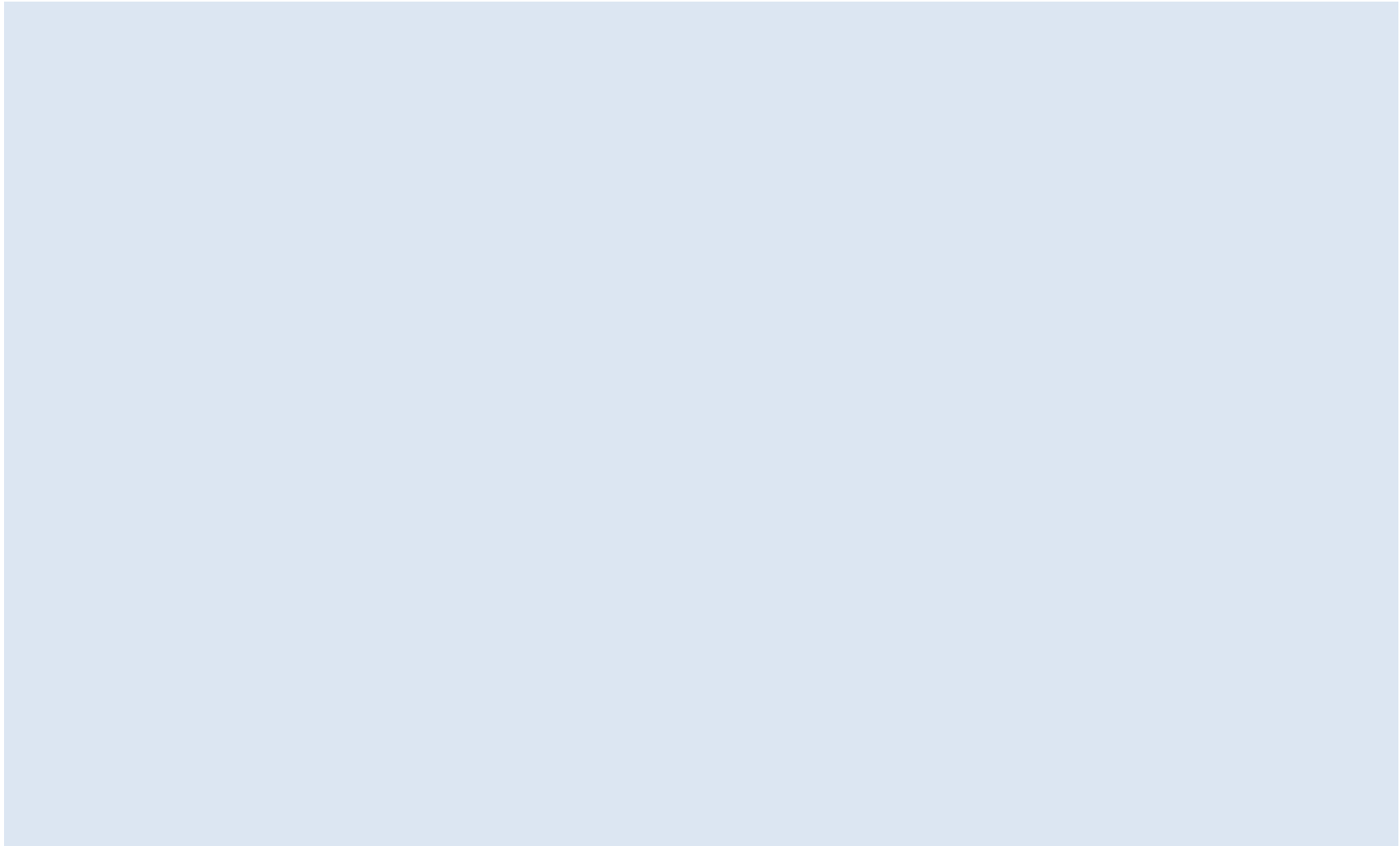
2019

- Second Class V UIC well will be installed under DP-1839
- Monitoring phase of the in-situ bioremediation pilot test will continue
- NPDES permit will be issued by EPA
- Quarterly monitoring and groundwater pump and treat will continue
- Site investigation phase will be completed
- Phase II RFI Report will be submitted
- Bioventing pilot results will be available

2020

- Corrective Measures Evaluation will begin

Backup Slides



BFF Overview

EDB Plume map over time:

