

# Kirtland Air Force Base Fuel Leak Cleanup

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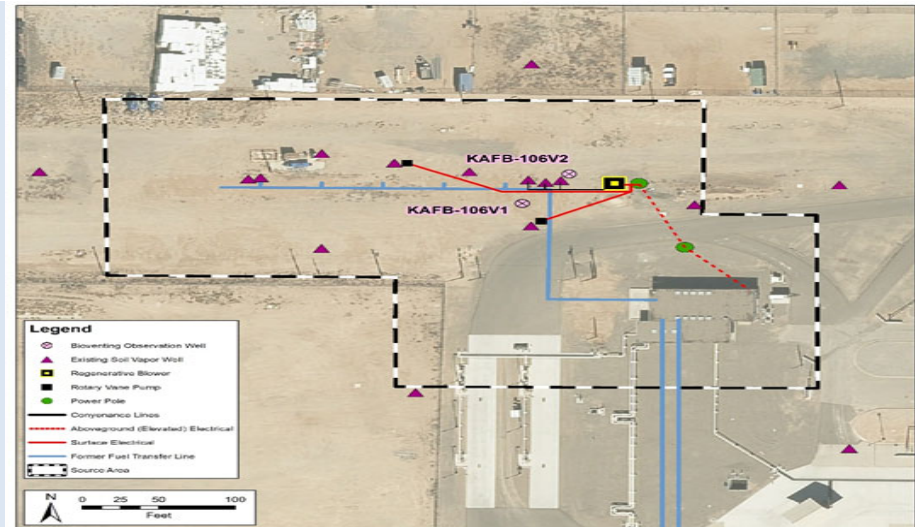


**Project Status Update**  
**November 07, 2019**



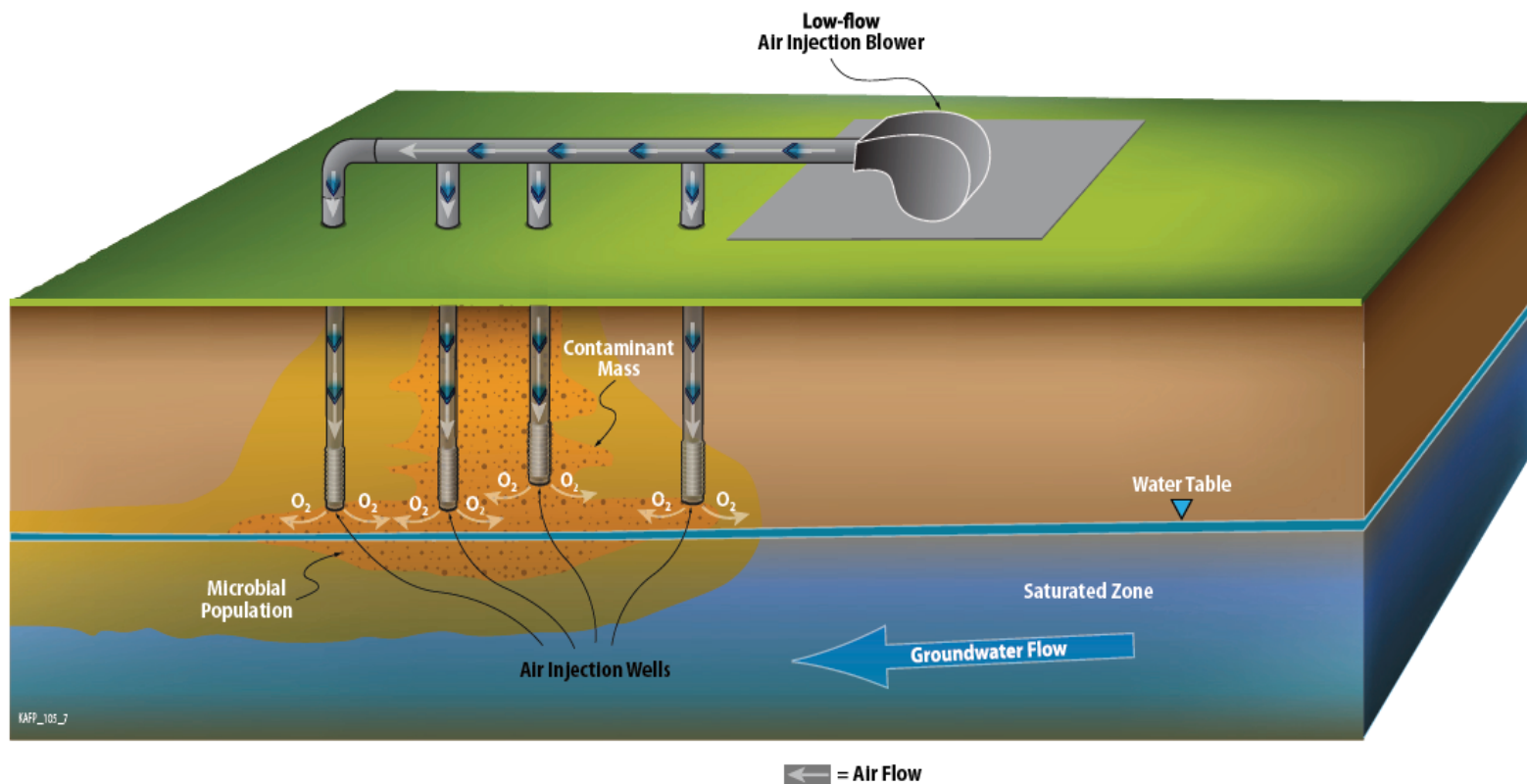
# Bioventing Pilot Test

- A bioventing pilot test is currently underway
- Intended to deliver oxygen and moisture to soil bacteria
- A summary report is due to NMED on Jan 31, 2020
- The bioventing pilot test will continue through 2020-2021



# Bioventing Pilot Test

- Bioventing is an effective technology for fuel hydrocarbon remediation. Injecting oxygen into the vadose zone increases microbial populations and increases biodegradation rates, leading to more rapid degradation of fuel contaminants.



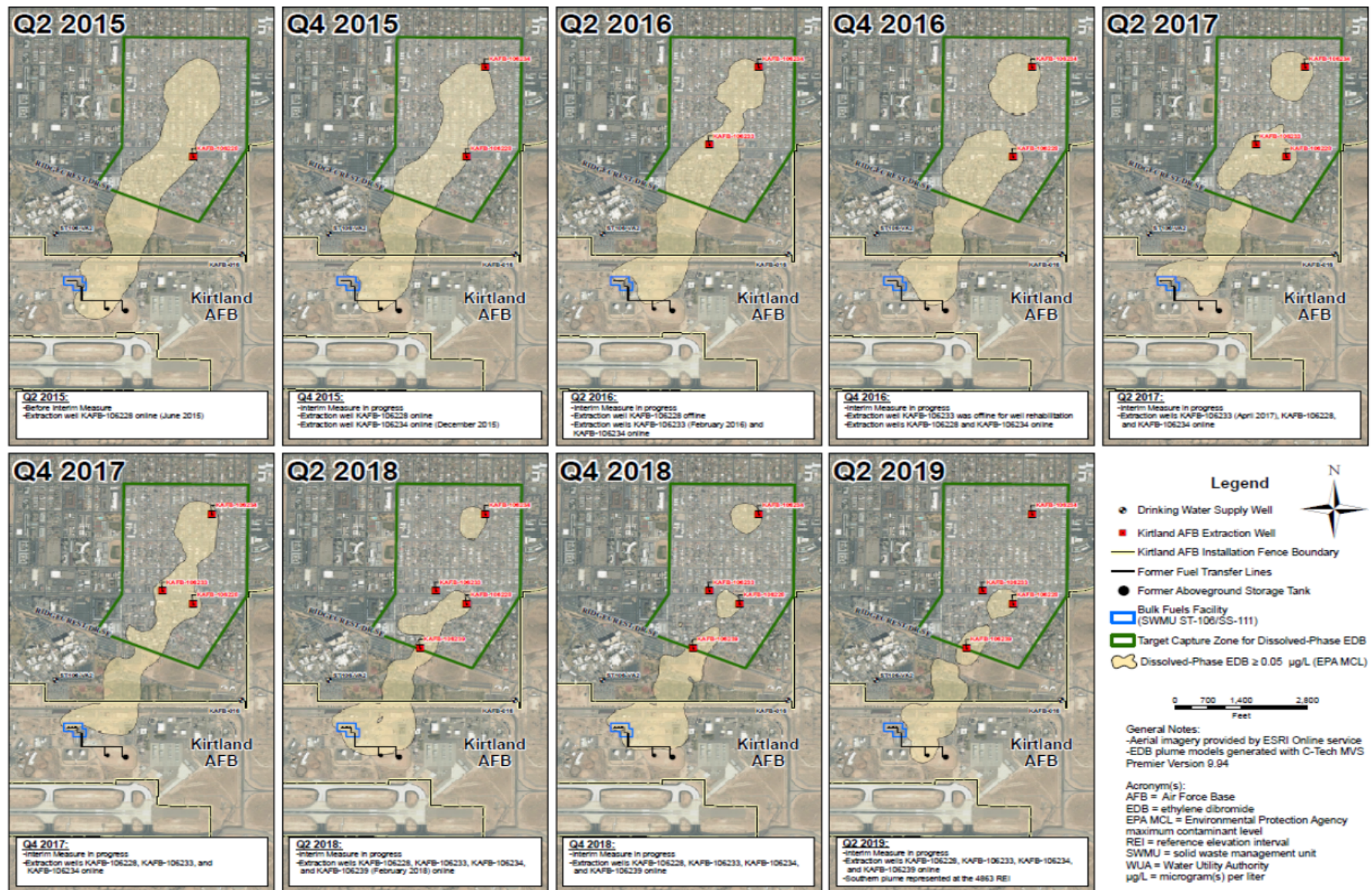
# Groundwater Treatment System

- Two treatment trains up and running. To date, approximately 757 million gallons of groundwater have been treated



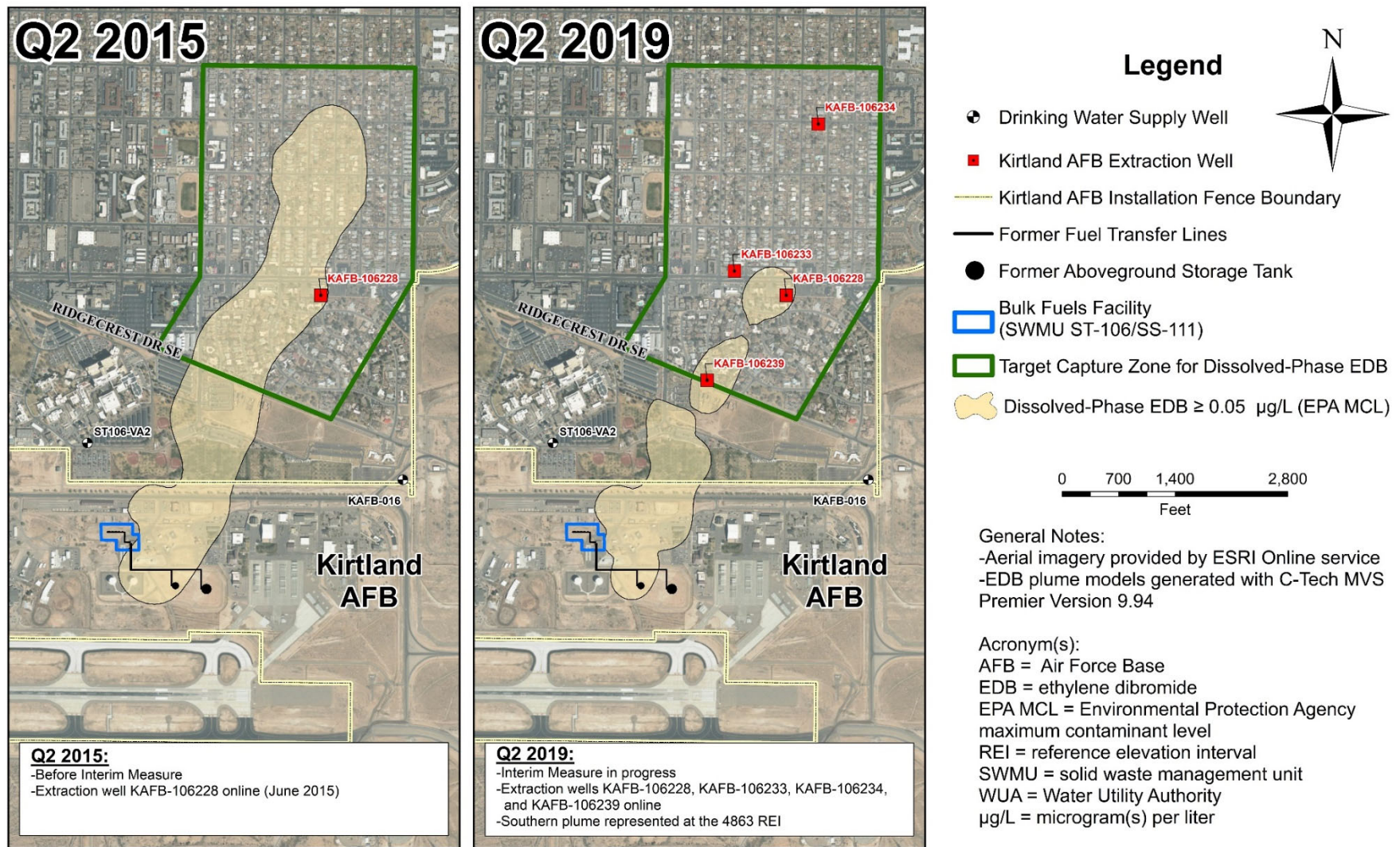


# EDB Plume Update





# EDB Plume – 2015 vs 2019



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# EDB Plume Update – cont'd

- 4 groundwater extraction wells have been installed as part of the Interim Measures pump and treat system
- Plume map is based on actual monitoring data, and not modeling
  - 162 groundwater monitoring wells have been installed to monitor and evaluate the plume
  - Wells are screened at varying depths to delineate both the lateral and vertical extent of the plume
- Pumping will continue – no plans to shut off pump and treat system

# Source Area Characterization



- Addressed data gaps in the horizontal and vertical extent of residual light non-aqueous phase liquid (LNAPL)
  - Vadose zone
  - Below groundwater table.
- Data to be used to inform the corrective measures evaluation.

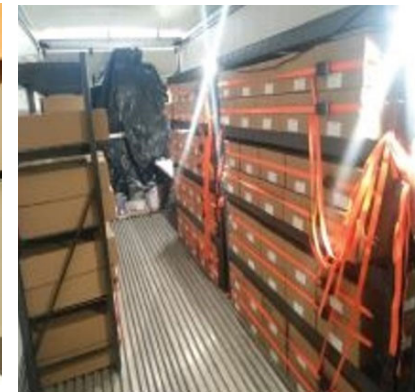




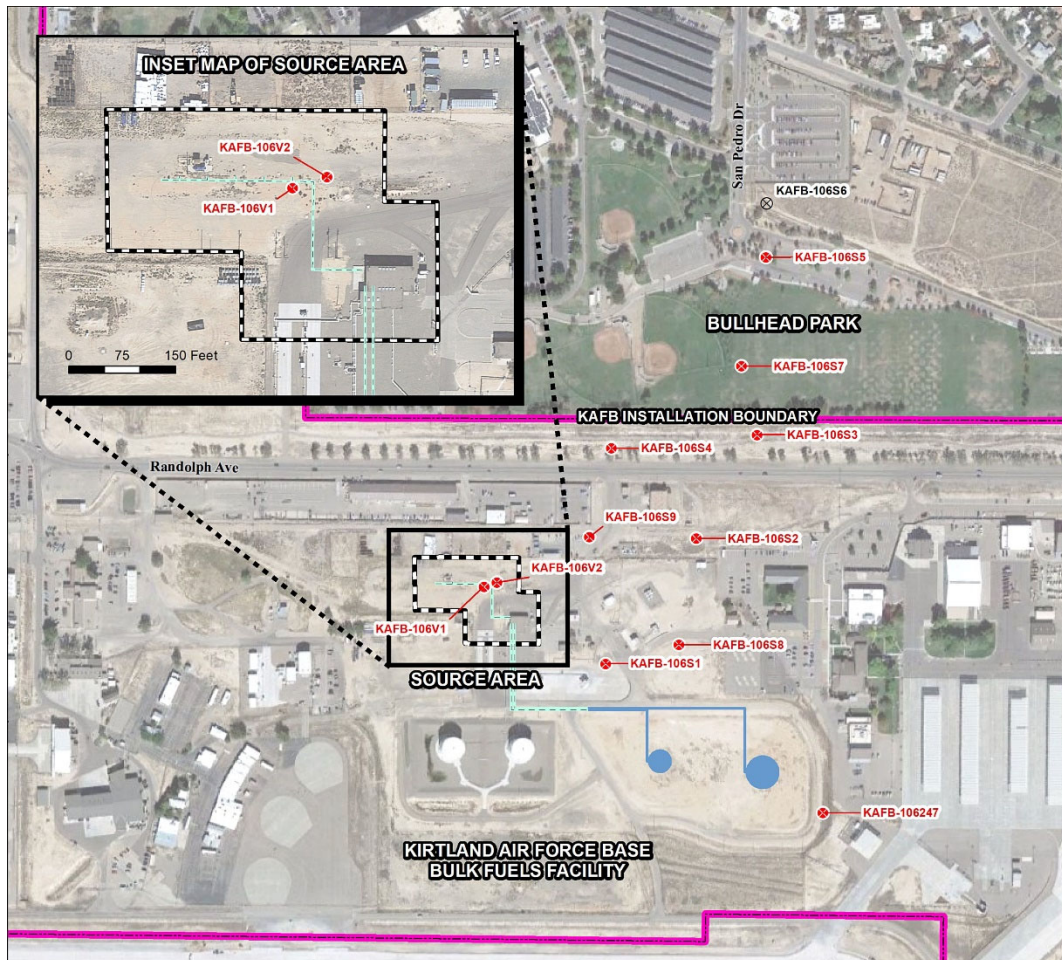
# Source Area Characterization Overview



- Eleven coring locations were drilled
- Cored more than 3,500 linear feet for sub-surface samples.
  - Soil cores collected using advanced drilling method
  - Used to collect intact cores
  - Special procedures used to maintain sample integrity



# Source Area Characterization Overview



- Nine boreholes were converted to “nested” groundwater monitoring wells – 2 wells per borehole (water table and contingency)
- Two boreholes were converted to 6-well nested vapor monitoring wells
- Two additional locations drilled
- One well installed to provide background data to compare to impacted areas.

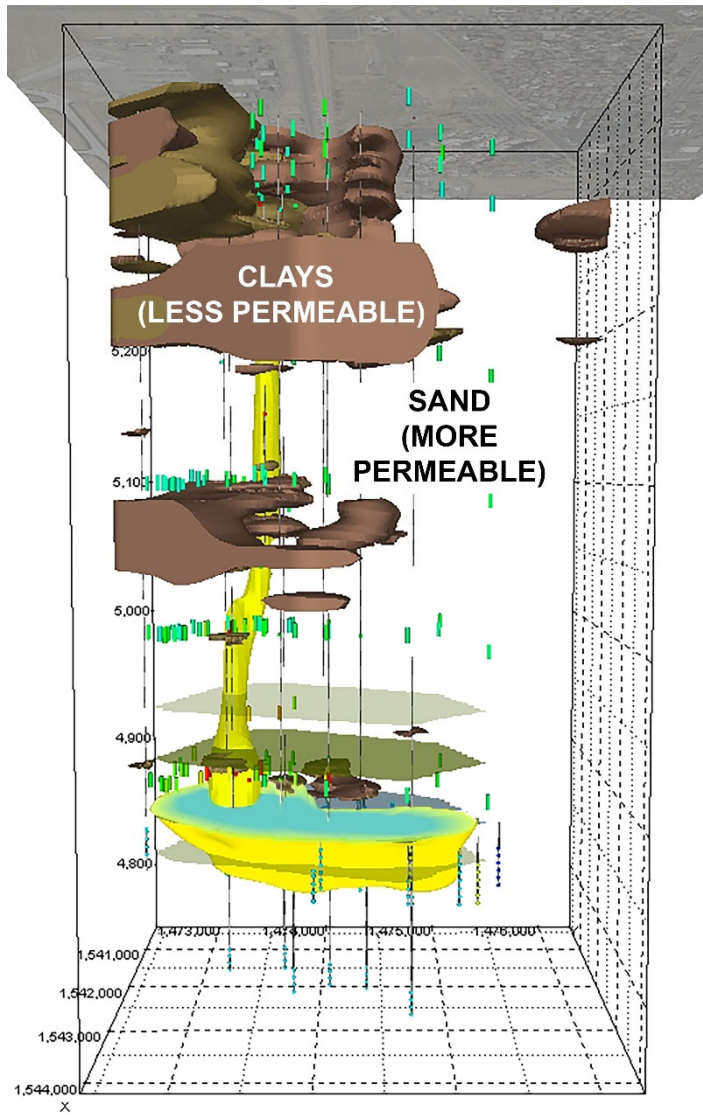


# Source Area Characterization Data Collected

**Data were collected to provide information to inform the Corrective Measures Evaluation:**

- **Logging of Soil Types (Lithology):** What are the soil types at the site and how do they affect the release?
- **Fuel Constituents:** Where are the fuels located and in what quantities?
  - Volatile organic compounds (VOCs),
  - ethylene dibromide (EDB),
  - total petroleum hydrocarbons (TPH)
- **LNAPL Location and Mobility:** Where is the LNAPL and is the rising water table affecting it?
  - Grain size
  - Fluid properties
  - Capillary pressure air/water drainage
  - Free product mobility
  - Relative permeability
  - Hydraulic conductivity
  - Specific gravity
  - Hydrocarbon component analysis
  - Viscosity
- **Microbiological Data:** Are there bacteria present that can break down the fuels?
  - QuantArray- Chlor
  - Moisture analyses
- **Mineralogical Data:** Are there minerals present that can help with breaking down the fuels?
  - X-ray diffraction
  - X-ray fluorescence
  - Magnetic susceptibility

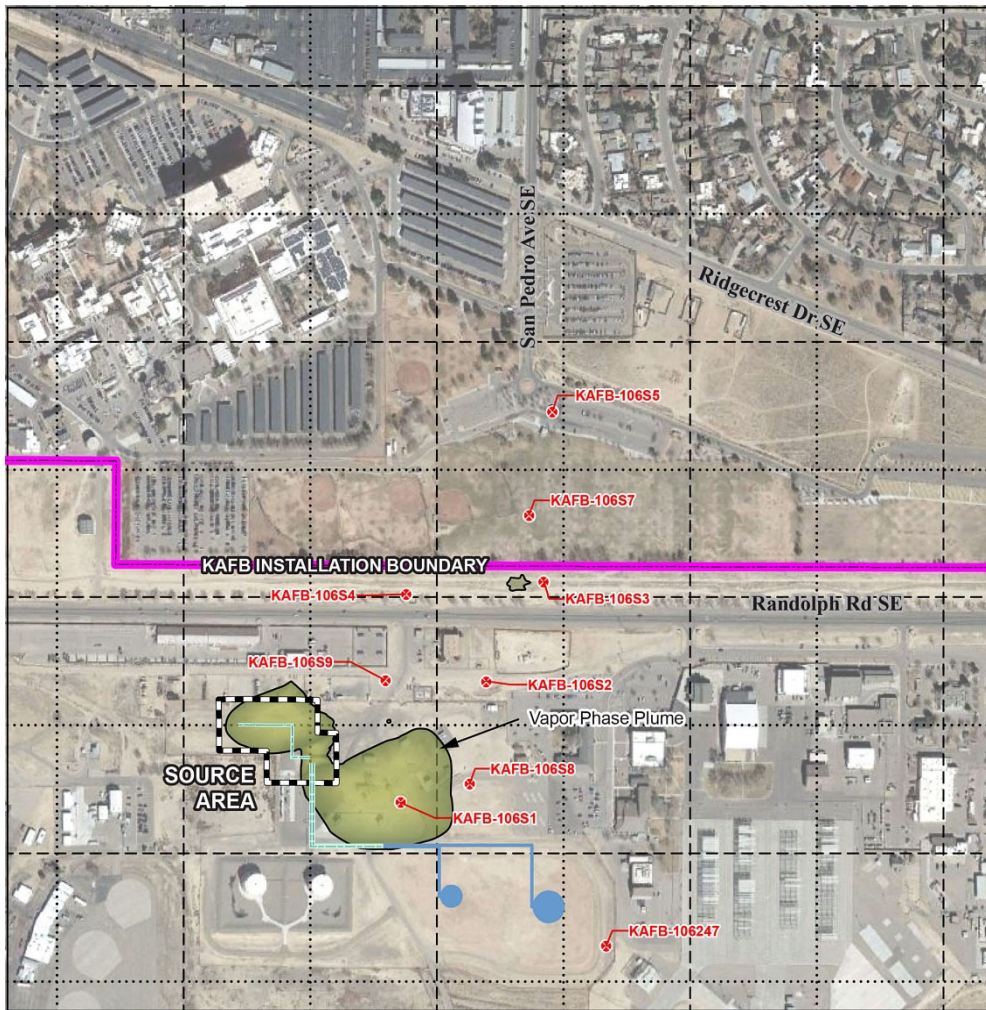
# Site Soils



- The lithologic (soil) logs were very similar to previously prepared borehole logs.
- Soils consisted of:
  - Silts and clay units to a depth of approximately 160 ft bgs.
  - Fine to coarse gravelly sand to a depth of approximately 250 ft bgs.
  - Low permeability silt and clay from about 250 and 300 ft bgs.
  - Fine to coarse sand and gravel dominate to bottom of the deepest borehole (approximately 515 ft bgs).
- These soil units are typical of Ancestral Rio Grande deposits.

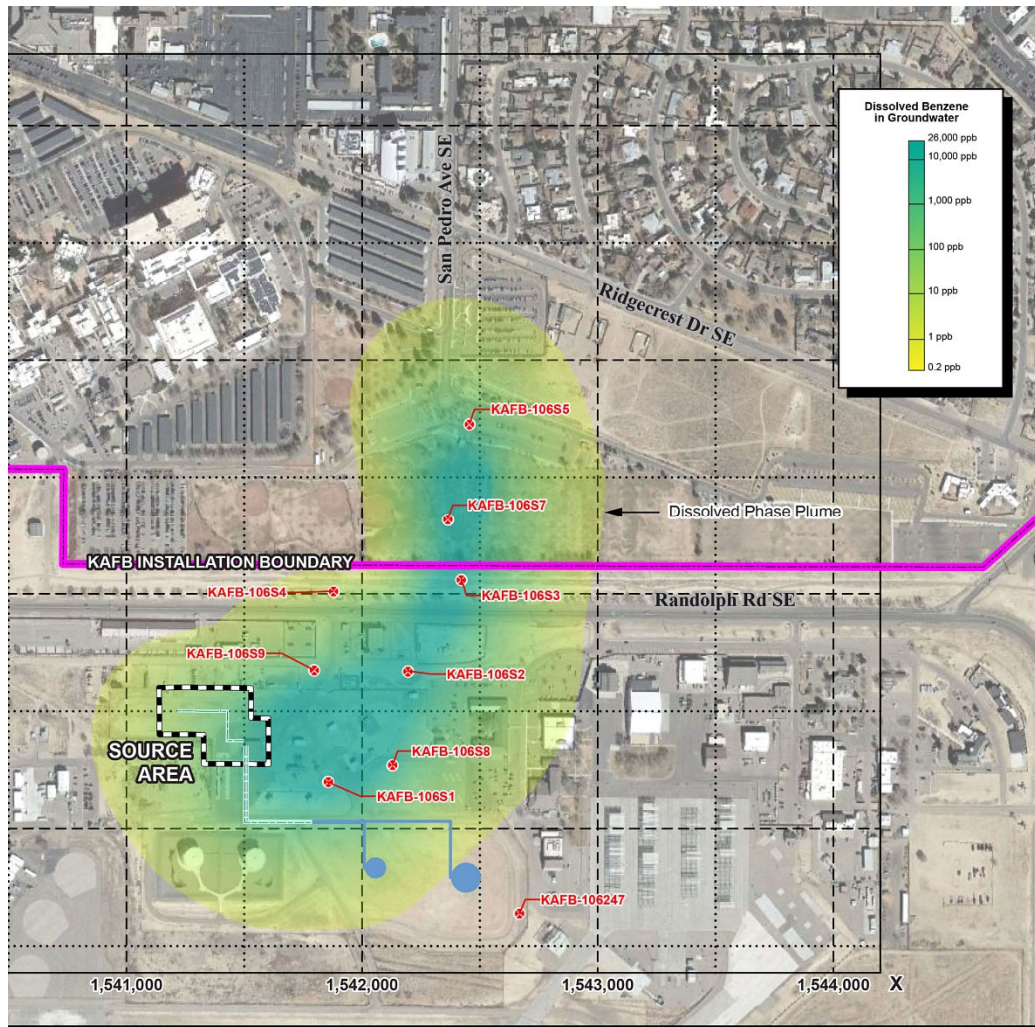


# Fuel Constituents-Vadose Zone



- Fuel constituents in vadose zone core samples were limited to the source area (near the release location)
- Concentrations of fuel constituents are below the laboratory reporting limit in the soil above the groundwater table

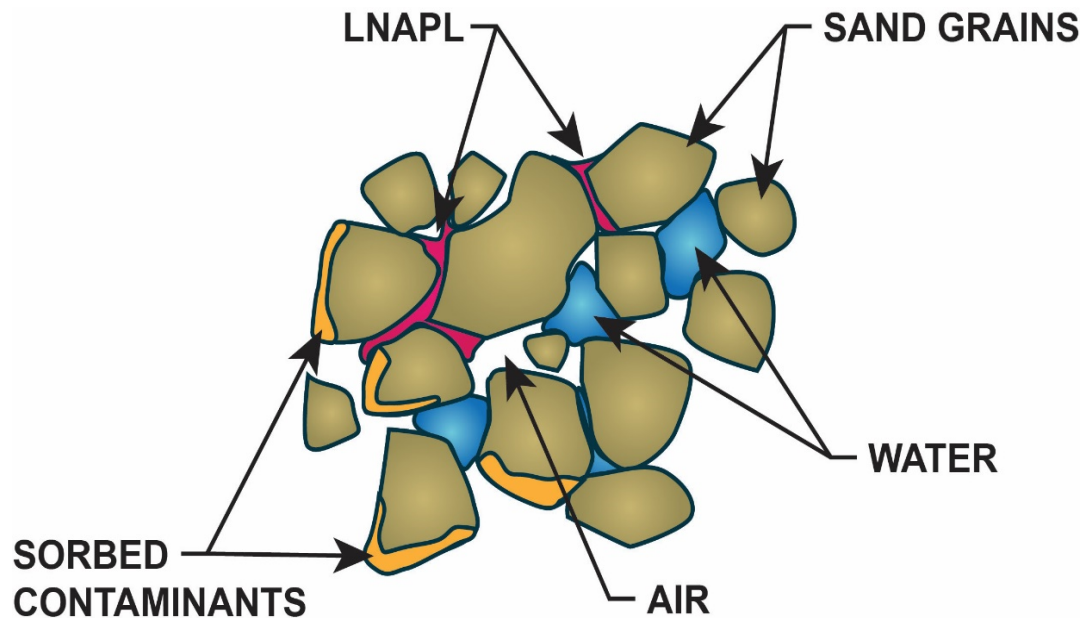
# Fuel Constituents - Groundwater



- The highest concentrations in the saturated zone are in wells located to the east of the source area.
- Concentrations of fuel constituents decrease significantly in wells located off-Base.
- Fuel constituent concentrations are below the groundwater table at approximately 475 feet below ground surface.

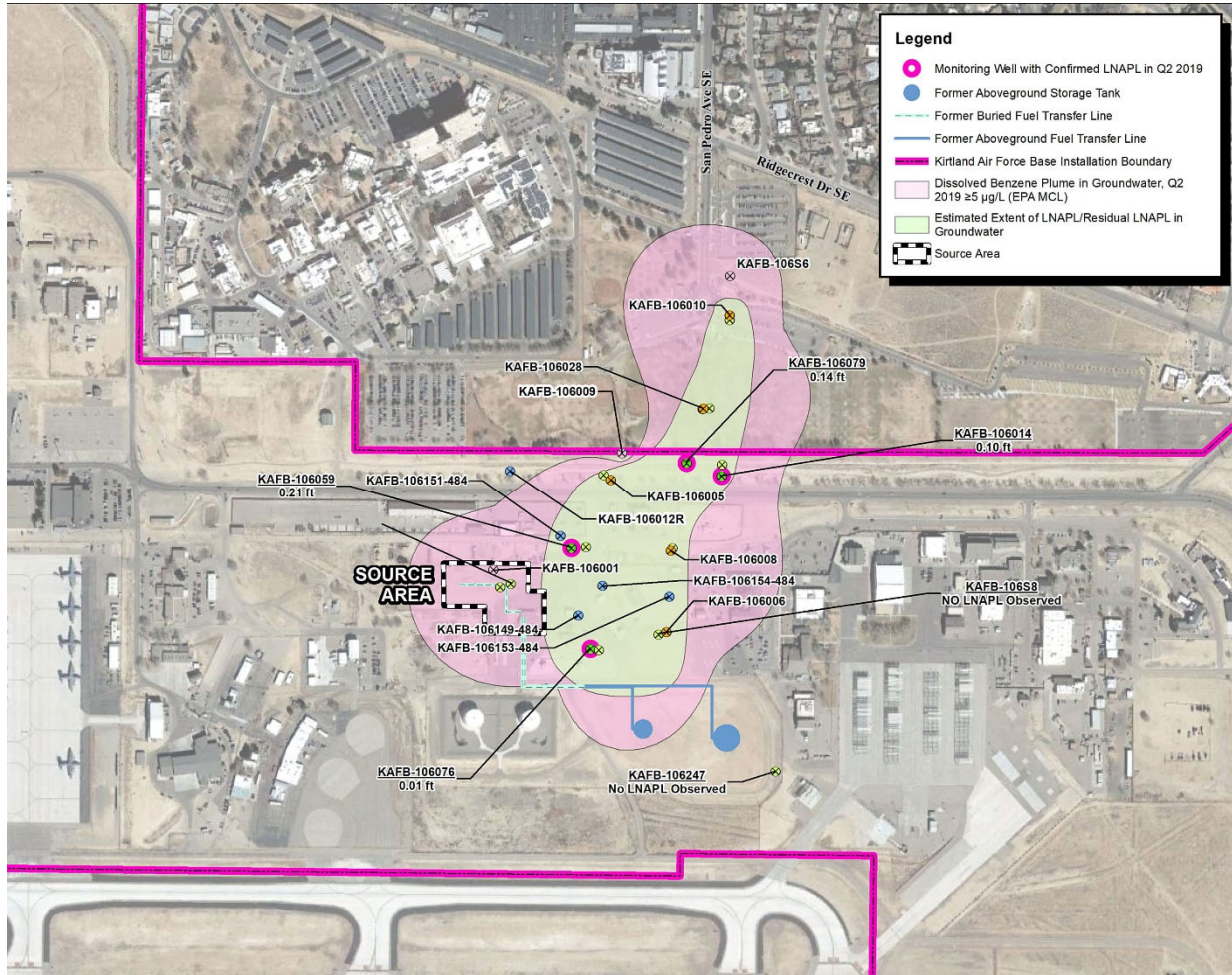


# LNAPL Testing and Mobility Analyses



- LNAPL was looked for above and below the water table
- LNAPL mobility was directly measured using two different methods (centrifuge and water drive techniques)
- **Neither analytical method found any mobile LNAPL**

# Estimate of Residual LNAPL



The presence of LNAPL can be estimated by using the effective solubility of benzene (the concentrations of benzene that will dissolve out of LNAPL)

- The effective solubility of benzene was analyzed from samples of LNAPL collected during an assessment performed in 2011
- Gives an approximate location of where the LNAPL is below the groundwater table

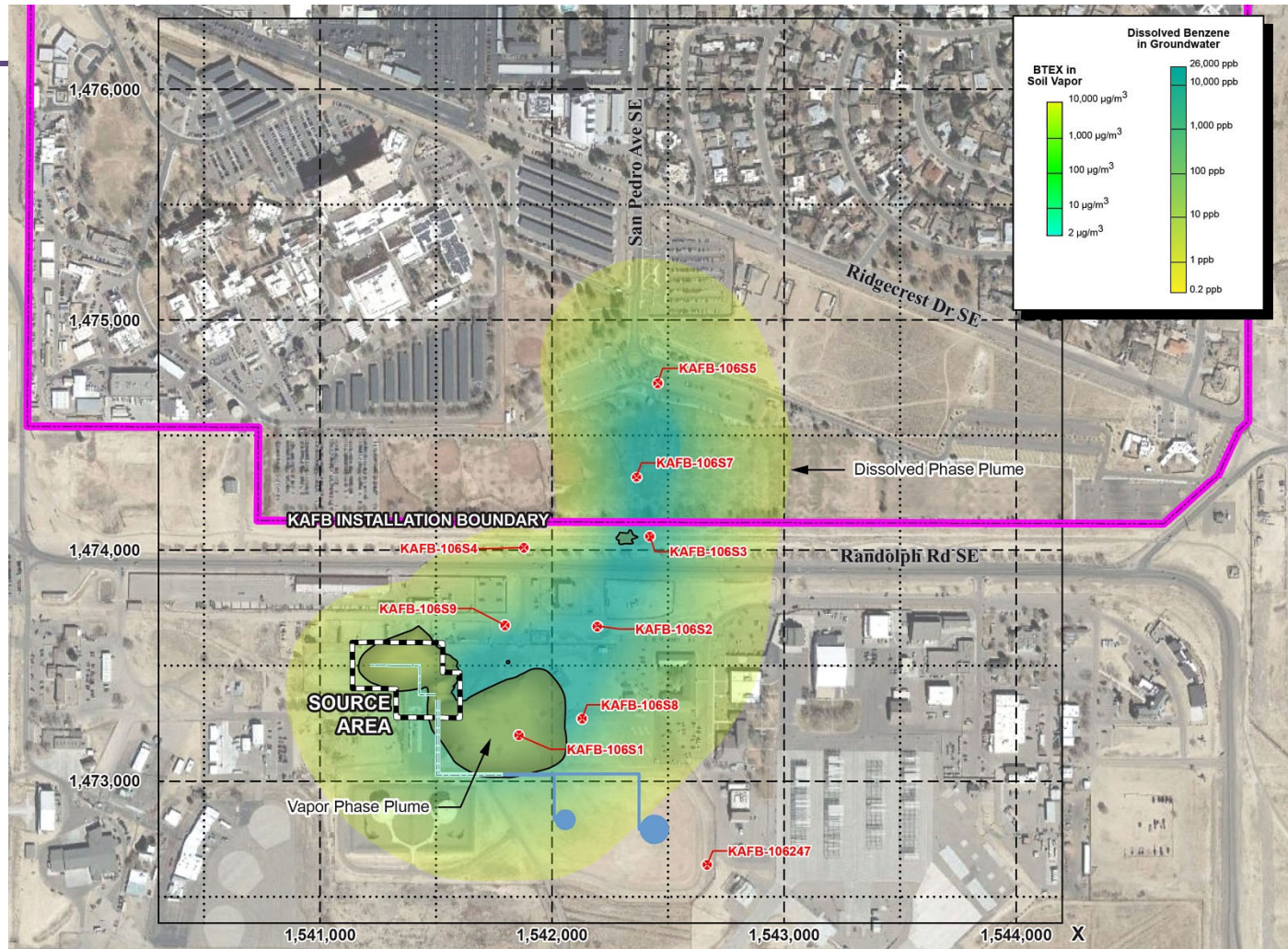
- LNAPL is not moving or expanding
- Dissolved fuel constituents are not moving
- The benzene plume has not extended farther north than its current location



# Fuel Constituent Distribution Model

- Gives a three-dimensional idea of where the fuel constituents are in the soil and below the groundwater table
- The vadose zone model uses soil vapor monitoring data at 100 ppmv from the Q2 2019 data
- The groundwater model uses the solubility of benzene to approximate the location of LNAPL
- Shows the current state of hydrocarbons in the subsurface (not historical)

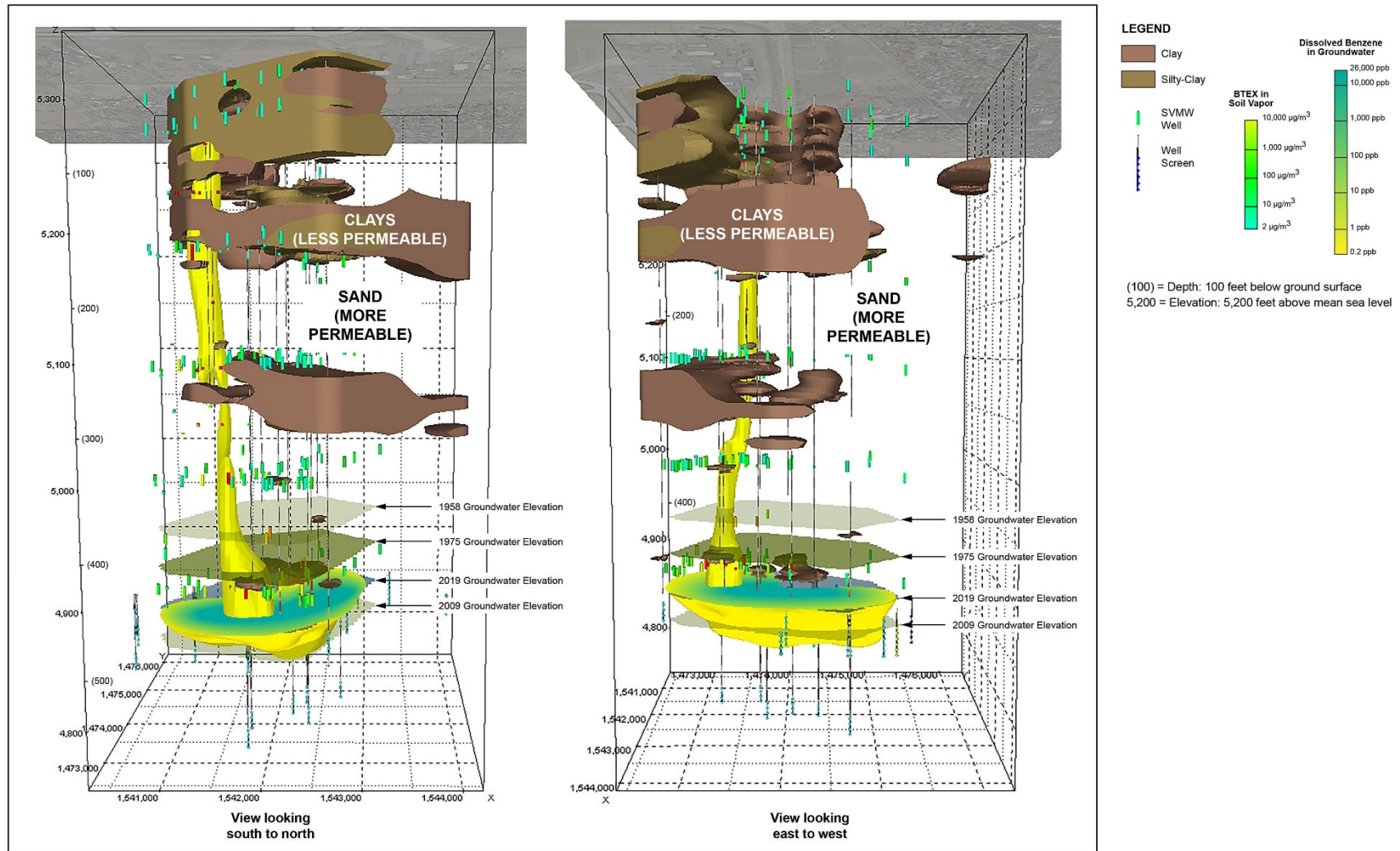
# Fuel Constituent Distribution Model



Plan view showing vadose zone impacts overlying benzene plume in groundwater.



# Fuel Constituent Distribution Model



# Summary

- Fuel constituents moved differently through the subsurface than originally believed
- Soil impacts are contained on Base
- LNAPL laboratory analyses did not indicate that it was mobile in either the soil or below the groundwater table
- Dissolved fuel constituents appear stable
- Dissolved fuel constituents do not appear to extend north of Ridgecrest Drive SE



# The BFF Regulatory Framework

- Corrective Action requirements in Resource Conservation and Recovery Act (RCRA) permit → Hazardous Waste Bureau
- Air quality, noise permits, and right-of-entry license agreements → City of Albuquerque
- Class V underground injection control (UIC) for the injection of treated groundwater → Ground Water Quality Bureau (GWQB) and Office of the State Engineer (OSE)
- Point of Diversion permits and prohibition on groundwater use over plume → OSE
- National Pollutant Discharge Elimination System (NPDES) surface water point source discharge permit → EPA

# Where Are We at in the RCRA Process?

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- We are still in the investigation stage (more on that in a minute)
- In addition to completing the investigation stage, the Air Force is:
  - Continuing to operate the pump and treat Interim Measure to collapse the EDB plume north of Ridgecrest Drive
  - Implementing the passive monitoring phase of the *in-situ* EDB biodegradation pilot test



## Where Are We at in the RCRA Process? (cont.)

- Implementing the bioventing treatment pilot
- Pursuing the following additional mechanisms for the disposition of treated groundwater:
  - NPDES Permit
    - It was issued by EPA on 30 September 2019 and it went into effect on 30 October 2019
    - The infrastructure is in the design stage
  - New Class V injection well
    - The Affidavit of Publication for the OSE permit was published on 18 October 2019
    - Comment period ends 06 December 2019
    - Work plan for the well will be submitted to the GWQB in early December

# RCRA Facility Investigation Phase Update

- Why is the investigation phase of BFF taking so long?
  - The iterative, data-driven corrective action process established by EPA and Kirtland AFB's RCRA Permit drives the pace of the BFF cleanup
  - The primary focus of investigation and cleanup resources from 2014 to 2018 was on defining the nature and extent of the EDB plume north of Ridgecrest to support the pump and treat Interim Measure
  - The faster than anticipated water table rise in 2016-2017 required the installation of additional water table monitoring wells
  - The source area coring and monitoring well installation work began in October 2018 after the Interim Measure was well established



# RCRA Facility Investigation Phase Update (cont.)

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- We are still collecting data from the in-situ EDB biodegradation and bioventing pilot tests
- We are still collecting groundwater and soil vapor monitoring data
- Are we getting close to the end of the investigation phase?
  - The results-based RCRA corrective action process focuses on collecting only the data needed to support an appropriate, implementable remedy
  - The Air Force believes that the source area investigation was the last major investigation required before writing the RFI Phase II Report

# RCRA Facility Investigation Phase Update (cont.)

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- What needs to be done before the Air Force can begin the RFI Phase II Report?
  - Obtain NMED approval on the RFI Phase I Report, which was submitted on 30 August 2018
  - Obtain NMED approval of the *Source Zone Characterization Report*, which was submitted to NMED on 31 October
  - Receive direction from NMED to begin the RFI Phase II Report



# RCRA Facility Investigation Phase Update (cont.)

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- The Air Force will continue to perform all regular monitoring and operate the pump and treat Interim Measure throughout the RFI and Corrective Measures Evaluation (CME) process
- Any pilot studies or field work (e.g. next round of data gap wells or shallow soil vapor sampling) performed after the RFI Phase II data cut-off will be incorporated into the CME
- How does the CME process work – come to the 30 April 2020 public meeting and find out!

# BFF Open House Groundwater Treatment System

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# 2019 to 2021 Activities

## **2019**

- Monitoring phase of the in-situ bioremediation pilot test will continue
- Anticipated EPA issuance of NPDES permit by end of 2019
- Quarterly monitoring and groundwater pump and treat IM will continue
- Bioventing pilot test will be implemented
- Shallow soil vapor data will be collected and evaluated

## **2020**

- Second injection well will be completed under DP-1839
- Site investigation phase will be completed when coring report is approved by NMED and the Phase II RFI Report and updated risk assessment will be submitted
- Quarterly monitoring and groundwater pump and treat IM will continue

## **2021 (\*estimated)**

- Phase II RFI Report (note: NMED has 360 days to review an RFI report)
- CME will begin upon NMED's approval of Phase II RFI Report

# Upcoming Public Meetings

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- BFF public meeting schedule:
  - 30 April 2020
  - 24 July 2020
  - 5 November 2020



# Questions?

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## Contact Info:

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