



Air Force Civil Engineer Center



Semi-Annual Public Meeting



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26 Oct 23



Air Force Civil Engineer Center



Kirtland AFB Optimized Remediation Contract (ORC)

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26 Oct 23



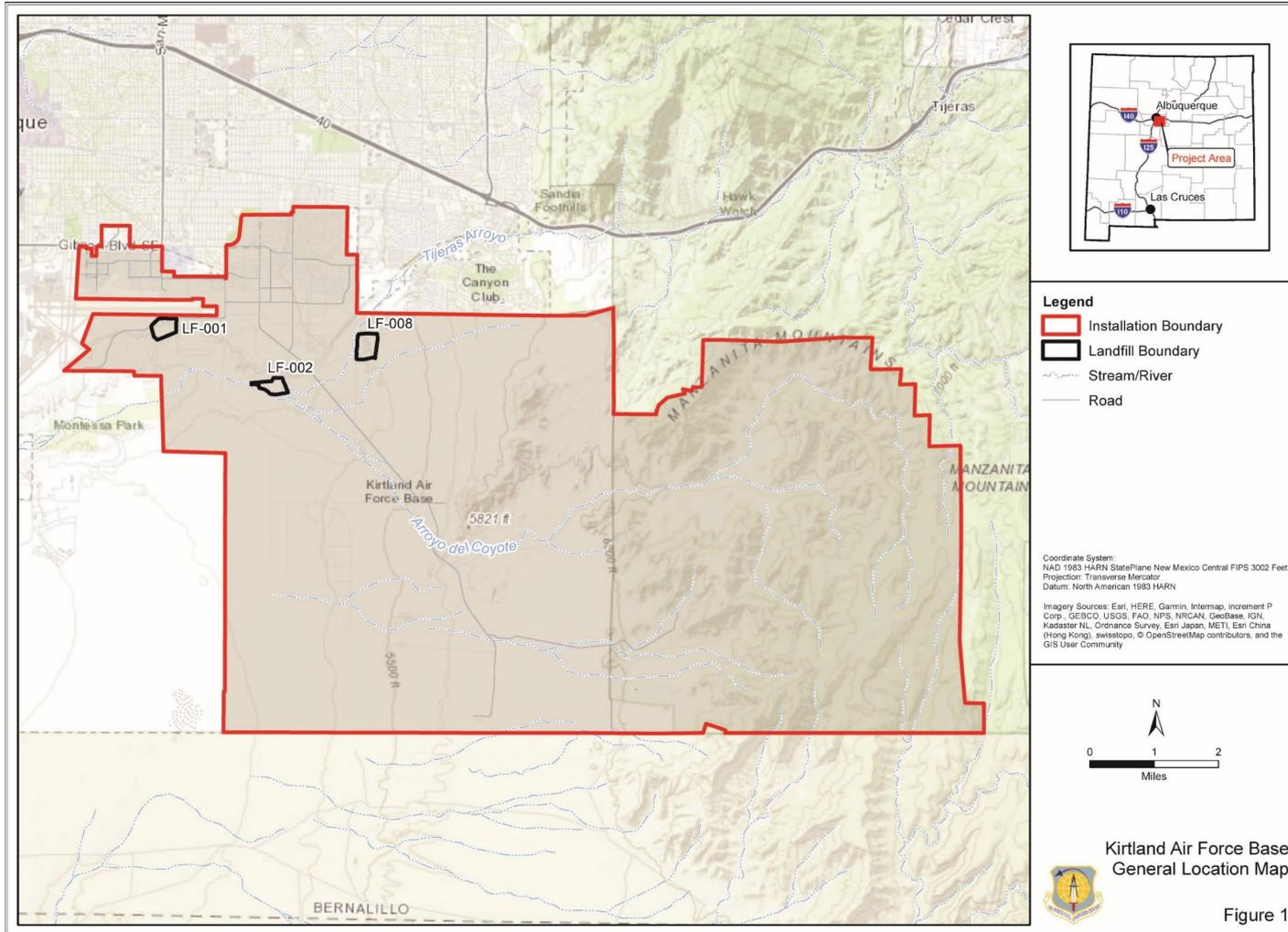
Landfill Regulatory Framework



- Landfills listed on Table I-3 of the Kirtland AFB RCRA Permit as a SWMU or AOC Requiring Corrective Action
- Primarily contain municipal waste and construction waste and debris
- Are regulated under NMAC 4.1.500, which addresses RCRA landfill requirements under CFR Parts 264.111 and 264.310
- The regulations prescribe closure requirements and post-closure care and monitoring requirements
- The ET covers designed as an equivalent system as a RCRA landfill cap, as permitted under 40 CFR part 264.310(a)(7)
- Are now in the “Remedial Action-Operation” (RA-O) phase



Landfill LF-001, LF-002, LF008





Summary – Selected Landfill Remedy



| Landfill | Selected Remedy | Area (Acres) | Construction Details | Installation Completion Date |
|----------------------|-----------------|--------------|--|------------------------------|
| LF-001 (SWMU 6-1) | ET Cover | 49 | 36-inch ET layer over 6-inches compacted clay, 2.5 mm annual percolation rate | 2006 |
| LF-002 (SWMU 6-2) | ET Cover | 32 | 36-inch ET layer over 6-inches compacted clay, 2.5 mm annual percolation rate, drainage and erosion control system | 2004 to 2006 |
| LF-008 (SWMU 6-4) | ET Cover | 65 | 36-inch ET layer over 6-inches compacted clay, 2.5 mm annual percolation rate, drainage and erosion control system | 2001 to 2005 |



Background LF-001 (SWMU-6-1)



Evapotranspiration (ET) Cover – Landfill 1





Background LF-001 (SWMU 6-1)



- Operated as early as 1951 but primarily between 1960 and 1975
- Waste was disposed in 'trench-and-fill' fashion
- Estimated 425,000 cubic yards (CY) of municipal waste and 175,000 CY of construction waste and demolition debris
- Depth to groundwater ranges from 420 to 450 feet
- Currently four regional aquifer groundwater monitoring wells
- Groundwater monitoring program initiated in 1996
- Evapotranspiration (ET) cover installation completed in 2006



Background LF-001 (SWMU-6-1)



Current Inspections and Monitoring Program

- Biennial groundwater sampling of four monitoring wells with semi-annual groundwater depth measurements
- Landfill inspections are conducted semi-annually and following large rain events

Groundwater Sampling

- Dissolved metals (21 target analyte list metals)
- Anions (nitrate, chloride, fluoride, sulfate) and Total Dissolved Solids
- Field Parameters (pH, dissolved oxygen, ORP, specific conductance, turbidity and temperature)



Background LF-001 (SWMU-6-1)



Landfill Inspections and Repairs

- Semi-annual inspections - inspector walks inspection route across landfill area and documents conditions (fencing, signage, drainage, erosion, burrows, desiccation, vegetation) with notes and photographs
- Inspection reports are used to plan maintenance and mitigation measures
- Landfill Repairs - significant repairs of LF-001 conducted since 2013 included: Removal of fiber rolls, backfilling of fissures, backfill of rilling and erosional gullies with topsoil, repair of rock berms



Background LF-002 (SWMU 6-2)



Evapotranspiration (ET) Cover – Landfill 2





Background LF-002 (SWMU 6-2)



- Operated between 1942 and 1965
- Waste was disposed in 'trench-and-fill' fashion
- Estimated 1,321,700 cubic yards (CY) of general refuse, construction and demolition debris
- Depth to groundwater ranges from 370 to 415 feet
- The Water Authority's 21-inch Tijeras Interceptor sanitary sewer line crosses the site
- Currently six regional aquifer groundwater monitoring wells
- Groundwater monitoring program initiated in 1996
- Tijeras arroyo was modified in 1999 to reduce flooding potential at LF-002 under the 100-yr runoff event



Background LF-002 (SWMU 6-2)



Current Inspections and Monitoring Program

- Annual groundwater sampling of nitrate, anions and TDS
- Biennial groundwater sampling for expanded analyte list with semi-annual groundwater depth measurements
- Landfill inspections are conducted semi-annually and following large rain events

Groundwater Sampling

- Anions (nitrate, chloride, fluoride, sulfate) and Total Dissolved Solids (annual)
- Field Parameters (pH, dissolved oxygen, ORP, specific conductance, turbidity and temperature) (annual)
- Dissolved metals (21 target analyte list metals) (biennial)



Background LF-002 (SWMU 6-2)

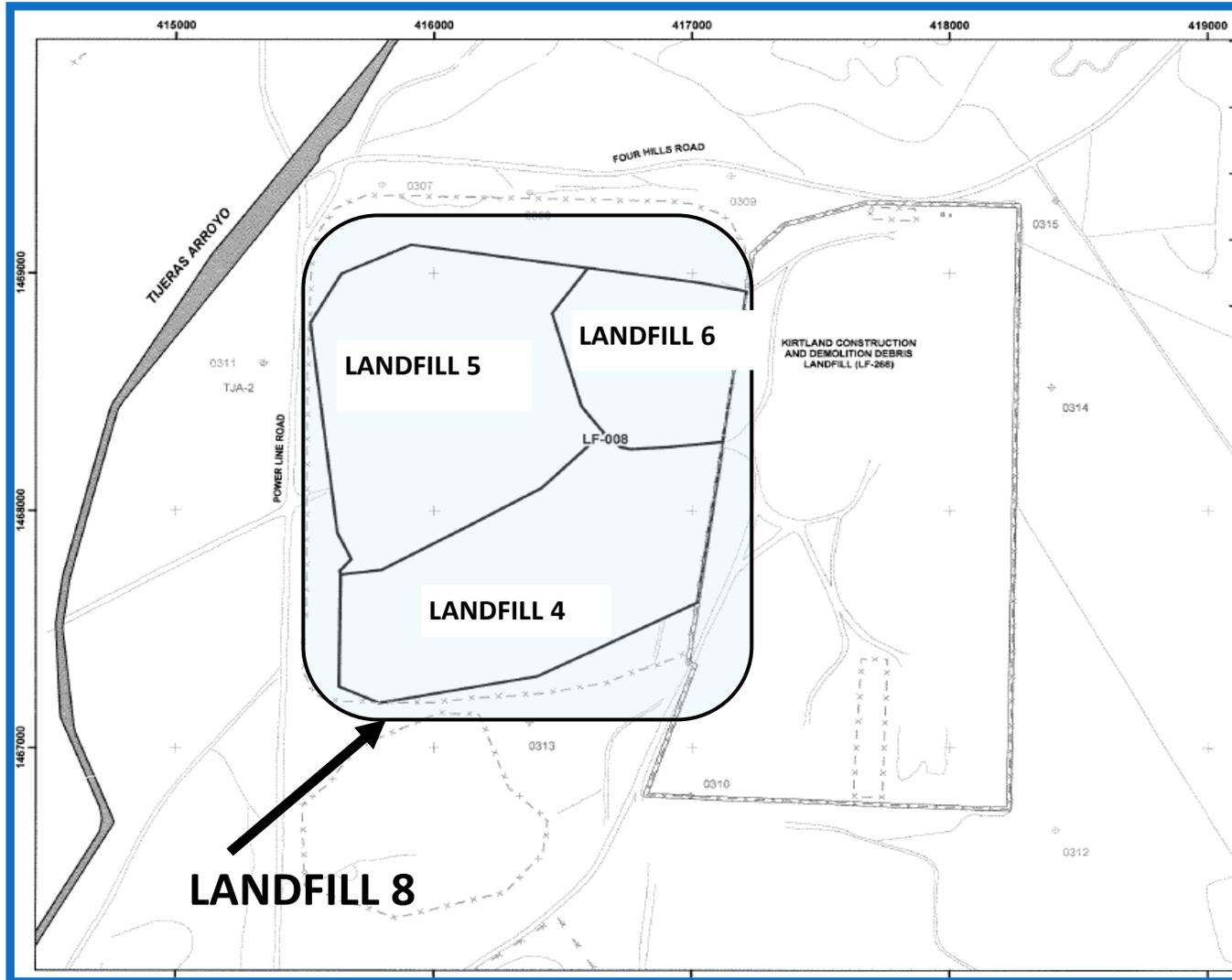


Landfill Inspections and Repairs

- Semi-annual inspections - inspector walks inspection route across landfill area and documents conditions (fencing, signage, drainage, erosion, burrows, desiccation, vegetation) with notes and photographs
- Inspection reports are used to plan maintenance and mitigation measures
- Landfill Repairs - Significant repairs of LF-002 conducted since 2013 included: Removal of fiber rolls, backfilling of fissures, backfill of rilling and erosional gullies with topsoil, removal of debris from intake #1, and revegetation of disturbed areas



Background LF-008 (SWMU 6-4)





Background LF-008 (SWMU 6-4)



- LF-008 comprises 3 former landfills: Landfill 004, 005 & 006, located adjacent to the currently operational construction/demolition debris landfill (LF-268, since 1989)
- Landfill 4 operated by City of Albuquerque and KAFB from 1964 to 1969, where approximately 600,000 cubic yards (CY) of general refuse was placed over a 25-acre area
- Landfills 5 and 6 operated from 1960 through 1989
- Landfill 5 was used for construction/demolition debris and Landfill 6 was general refuse
- Landfills 5 & 6 comprise approximately 1,746,000 CY of waste disposed over an area of approximately 40 acres
- Groundwater monitoring program initiated in 1995



Background LF-008 (SWMU 6-4)



Current Inspections and Monitoring Program

- Annual groundwater sampling of 5 regional aquifer and 5 perched unit monitoring wells
- semi-annual groundwater depth measurements, and semi-annual landfill inspections or following large rain events

Groundwater Sampling

- VOCs (annual)
- Alkalinity and Total Dissolved Solids (annual)
- Dissolved metals
- Anions (including nitrate)
- Field Parameters (pH, dissolved oxygen, ORP, specific conductance, turbidity and temperature) (annual)



Background LF-008 (SWMU 6-4)

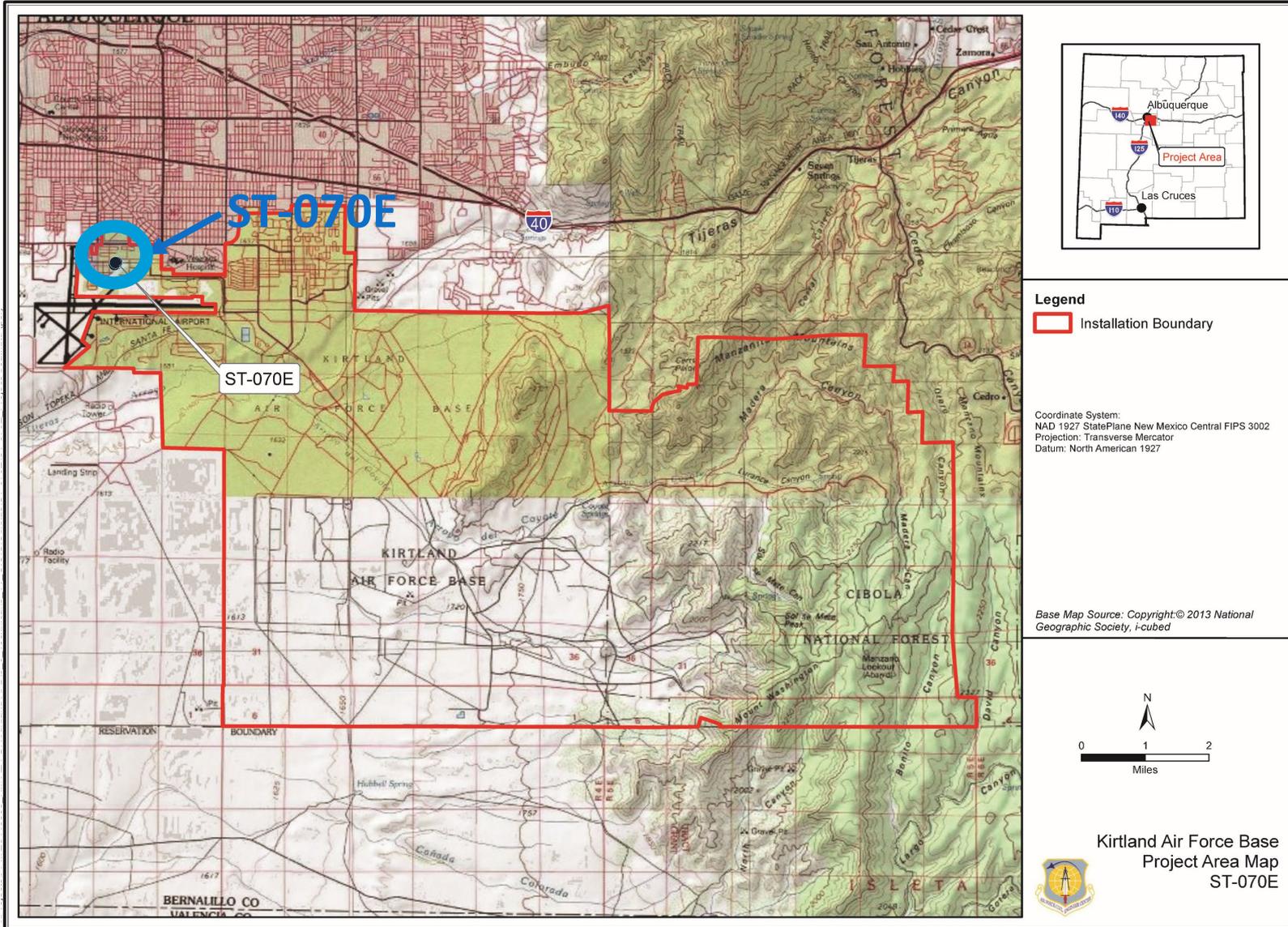


Landfill Inspections and Repairs

- Semi-annual inspections - inspector walks inspection route across landfill area and documents conditions (fencing, signage, drainage, erosion, burrows, desiccation, vegetation) with notes and photographs
- Erosion repairs and sediment removal most recently conducted in April 2022 .



Oil/Water Separator, ST-070E (SWMU ST-219)





Oil/Water Separator, ST-070E (SWMU ST-219)



Site Background

- Area used for aircraft movement and parking around hangar buildings 481 & 482
- Potential historic releases of fuels, lubricants and degreasers
- Former Oil Water Separator (OWS) identified as a contaminant release site based on inspections and sampling in 1990 & 1992
- Several RCRA Facility Investigation (RFI) phases conducted between 1993 & 1999
- 39 soil borings were advanced and sampled up to 150 feet depth below surface
- 7 soil vapor monitoring wells were installed



Oil/Water Separator, ST-070E (SWMU ST-219)



Site Background (cont.)

- Petroleum hydrocarbon contamination (Avgas, jet fuel, diesel and gasoline and limited mineral spirits and chlorinated solvents) impacted soils below the former OWS and drainage sump
- Groundwater characterization began in 2001 with installation of monitoring well KAFB-7001, a 480 ft deep well screened in the regional aquifer
- Two new groundwater wells (KAFB-7004 and KAFB-7005) were installed in September 2021
- To date, no site-related contaminants have exceeded regulatory standards in groundwater samples. Trichloroethylene (TCE) and tetrachlorethylene (PCE) have been detected at levels below regulatory standards



Remediation History

- **Bioventing was conducted between 1999 and 2001**
 - Active subsurface ventilation with humidified air through a vapor well and extraction well
 - Soil samples collected to confirm presence of TPH degrading bacteria
 - Lower than anticipated degradation rates were achieved
- **Soil Vapor Extraction (SVE) Pilot Tests conducted in 2003**
 - Results of pilot testing indicated SVE would be an effective alternative for remediation of TPH and chlorinated solvents
 - Between 2007 and 2008 the SVE pilot scale system was expanded to full scale system by converting two monitoring wells to SVE wells



Oil/Water Separator, ST-070E (SWMU ST-219)



Remediation History (cont.)

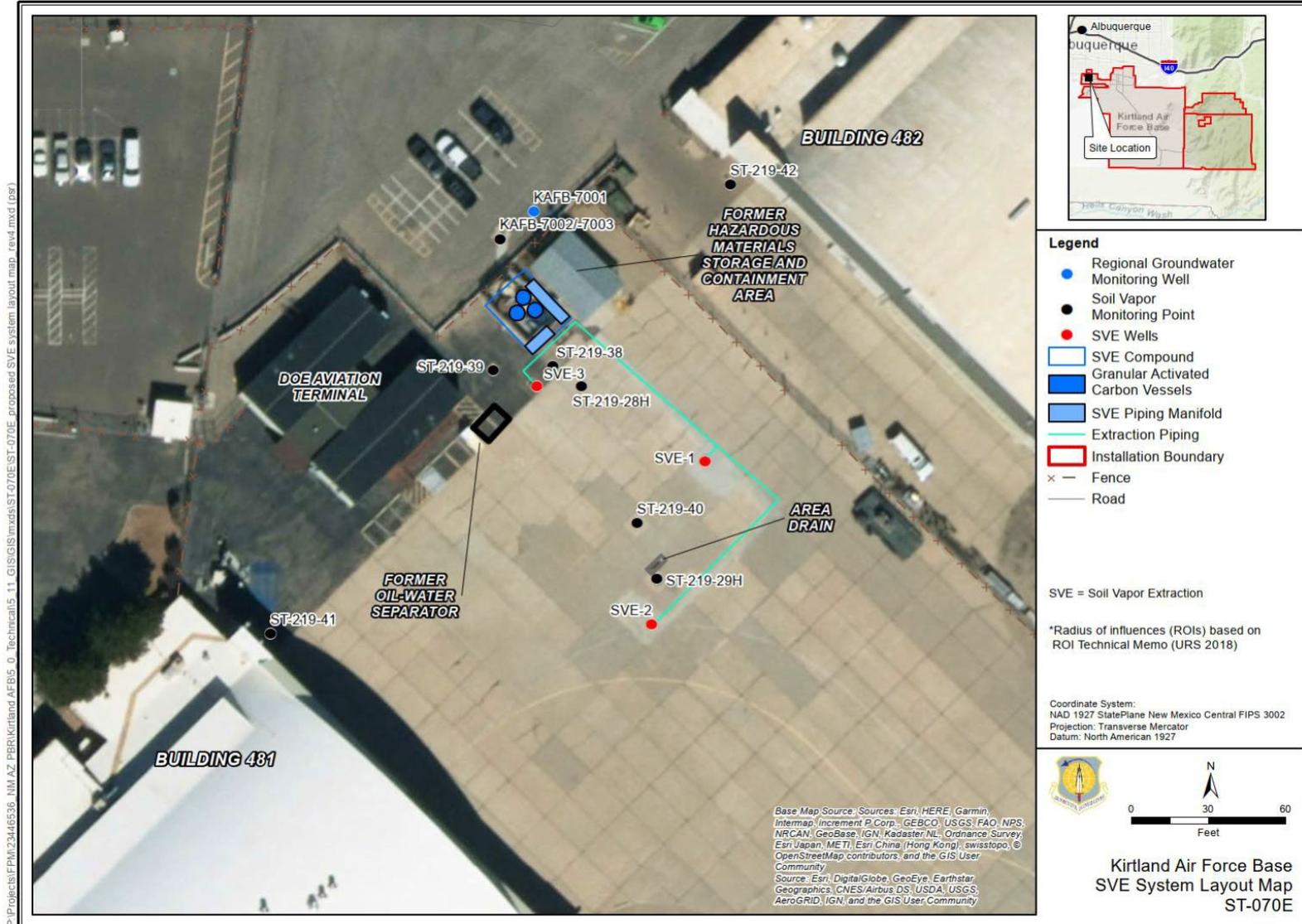
- **SVE full scale system operation 2008 - 2016**
 - The SVE treatment system was upgraded in 2008 with 3 SVE wells
 - Full operation under previous contract between June 2014 and June 2016
 - System operated at an air extraction rate of 80 to 85 standard cubic feet per minute (scfm)
- **Upgraded SVE System – Three New SVE Extraction Wells (2016)**
 - SVE-1 (nested well screens at 7-12 ft; 16-26 ft; and 31-36 ft)
 - SVE-2 (single well screen at 32-42 ft)
 - SVE-3 (nested well screens at 35-50 ft; 94-104 ft; 132-142 ft)



Oil/Water Separator, ST-070E (SWMU ST-219)



Upgraded SVE System



P:\Projects\FPM\23446536_NM_AZ_PBR\Kirtland AFB\5_0_Technical\5_11_GIS\GIS\mxd\ST-070E\proposed SVE system layout map_rev4.mxd (psr)



Oil/Water Separator, ST-070E (SWMU ST-219)



Additional Investigation

- Installation of groundwater monitoring wells KAFB-7004 and KAFB-7005 (2021)
 - Two down-gradient, 4" wells installed in Sept. 2021 (~460 ft total depth)





Additional Investigation (cont.)

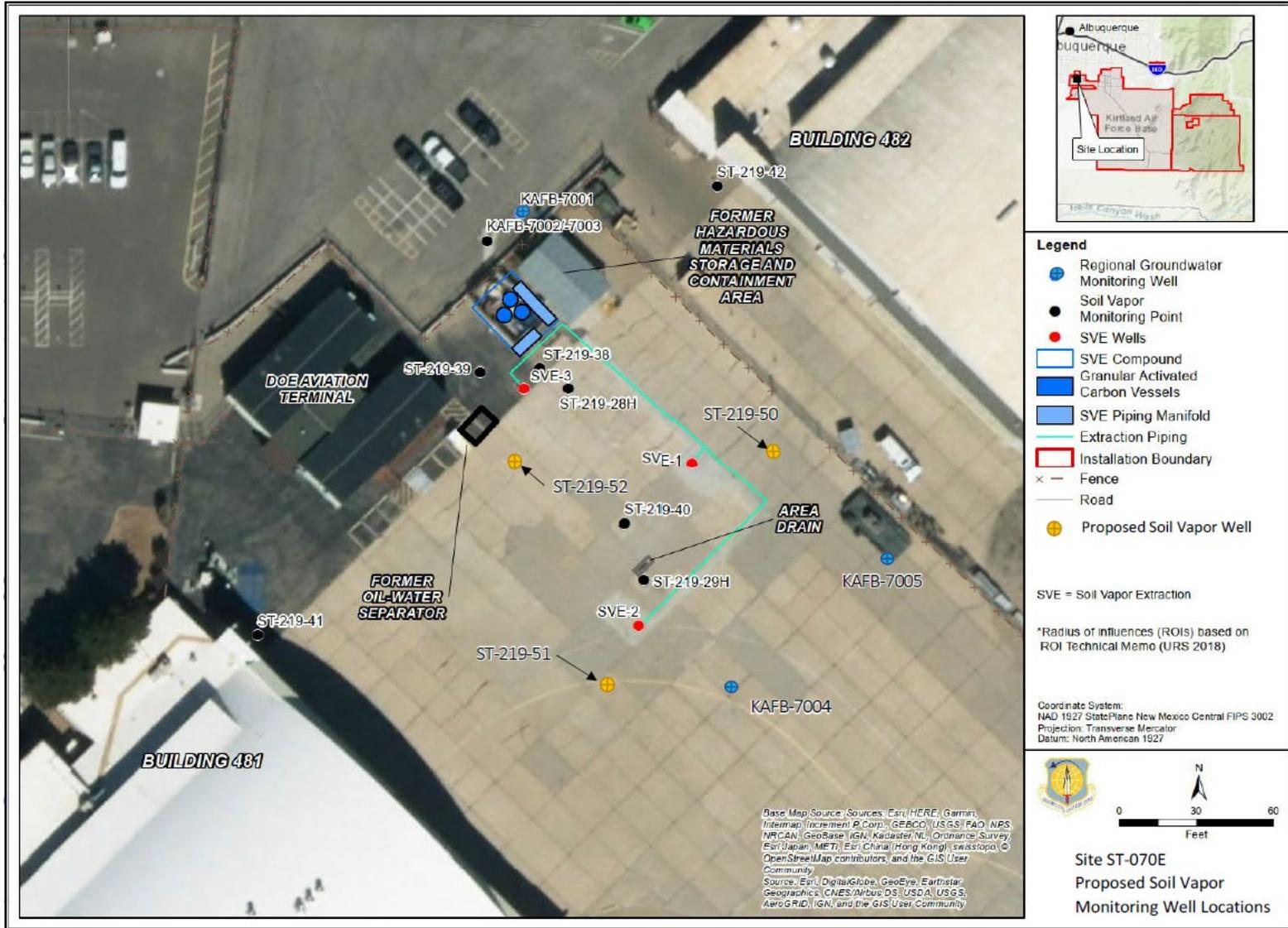
- **Three new soil-vapor monitoring (SVM) wells planned**
 - Three SVM wells with 7 sampling intervals (2 - triple nested and 1 - single nested) will be installed at locations proximate to the 2016 SVE wells
 - The ST-070E SVM Well Work Plan is currently under NMED review
 - The Work Plan includes a requirement for annual sampling of all Site ST-070E SVM wells



Oil/Water Separator, ST-070E (SWMU ST-219)



New and Planned Wells





Oil/Water Separator, ST-070E (SWMU ST-219)

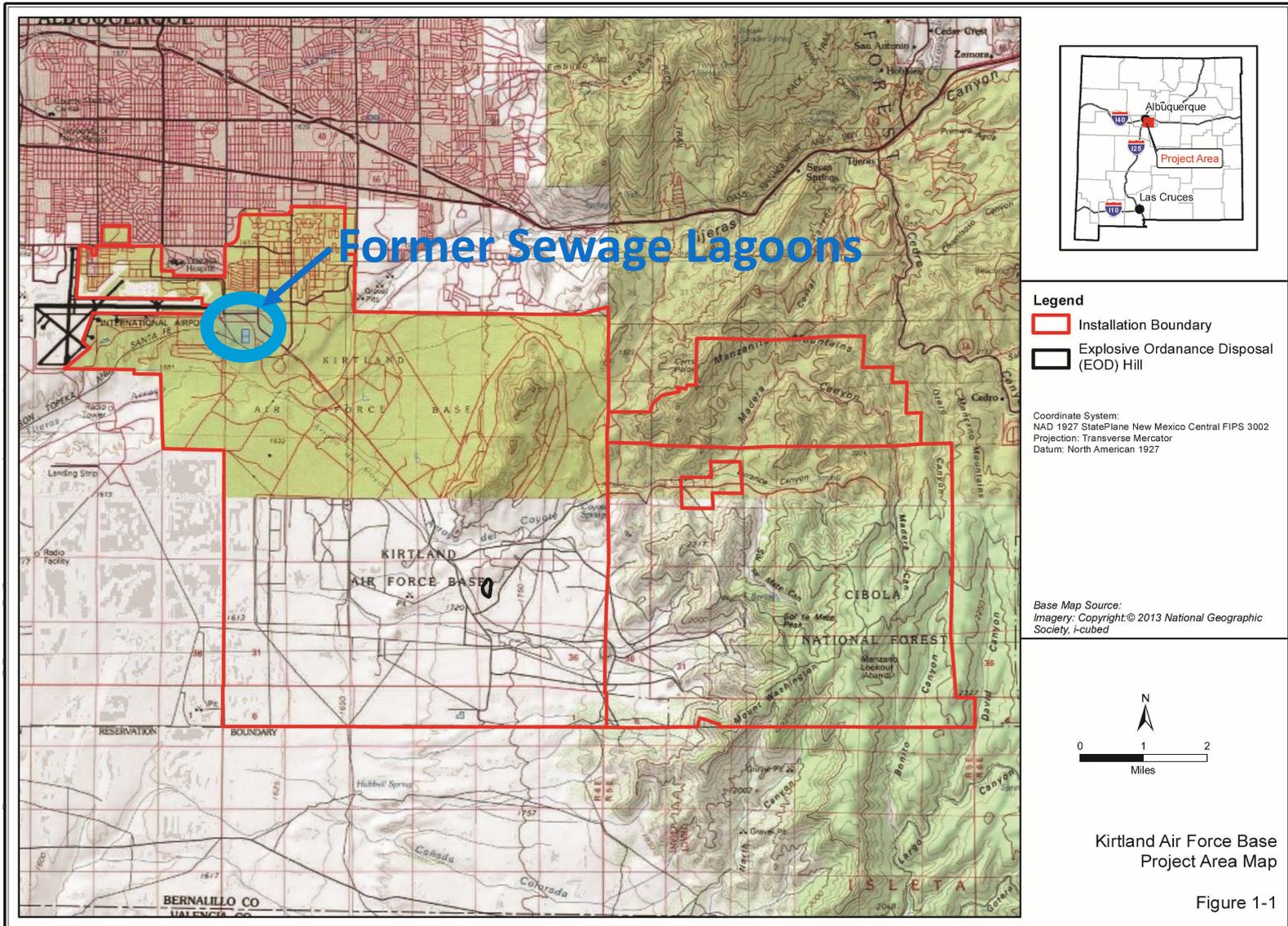


Path Forward

- SVE System is currently shut down (May 2019)
- Awaiting installation of three new soil vapor monitoring (SVM) wells
- Initiation of annual SVM (vapor) monitoring
- Continued quarterly groundwater sampling of three site wells
- Re-evaluation of site risk based on sampling results



Former Sewage Lagoons (SWMU WP-026)





Former Sewage Lagoons (SWMU WP-026)



Site Background

- Site WP-026 includes two distinct areas – Former Base Sewage Lagoons and Golf Course Main Pond (GCMP)
- Sites linked because GCMP historically received effluent from the Sewage Lagoons thus they shared the same waste stream
- Both the perched groundwater unit and the regional aquifer are present at the former Sewage Lagoons and at the GCMP
- Three groundwater monitoring wells are screened in the perched unit at the GCMP, and nitrate is the only constituent that exceeds regulatory levels
- Nitrate in groundwater at the GCMP is regulated under Kirtland AFB Site ST-105, through NMED Ground Water Quality Bureau



Former Sewage Lagoons (SWMU WP-026)



Former Sewage Lagoons Background

- Constructed in 1962 – operated through 1987
- Unlined north and south cells
- Approximately 14 acres filled up to 6 ft depth
- Approximately 330 million gallons raw sewage handled from April through October each year
- November to March KAFB sewage was diverted into City of Albuquerque sewer system
- Lagoon side slopes reinforced with soil cement and concrete in 1970 & 1975



Former Sewage Lagoons (SWMU WP-026)



Former Sewage Lagoons Background (cont.)

- USGS study and Stage 2 RFIs – 1988 through 1992
- Groundwater monitoring initiated 1994 through 1996
 - Focus was chromium
 - Several exceedances of nitrate in groundwater (max concentration 14.3 mg/L, but no nitrate exceedances since 1997 in the perched groundwater zone)
- Annual monitoring initiated in 1996 (on-going)
- Supplemental Soil Investigations 1998 through 2000
- Soils excavation and removal (dry sludge near surface) – 2010
Accelerated Corrective Measure



Former Sewage Lagoons (SWMU WP-026)



Former Sewage Lagoons Background (cont.)

- Current remaining contaminant of concern is TCE in perched groundwater unit
- 2012 RFI addressed data gaps with installation of three new monitoring wells in the perched groundwater unit and two new monitoring wells in the regional aquifer for better characterization of extent on the south and east sides of the former sewage lagoons
- Soil samples during well/borehole installation did not have any analytes above NMED residential soil screening levels
- Limited VOCs were detected in perched groundwater unit, including TCE, but none exceeded regulatory levels in new wells



Former Sewage Lagoons (SWMU WP-026)



Former Sewage Lagoons Background (cont.)

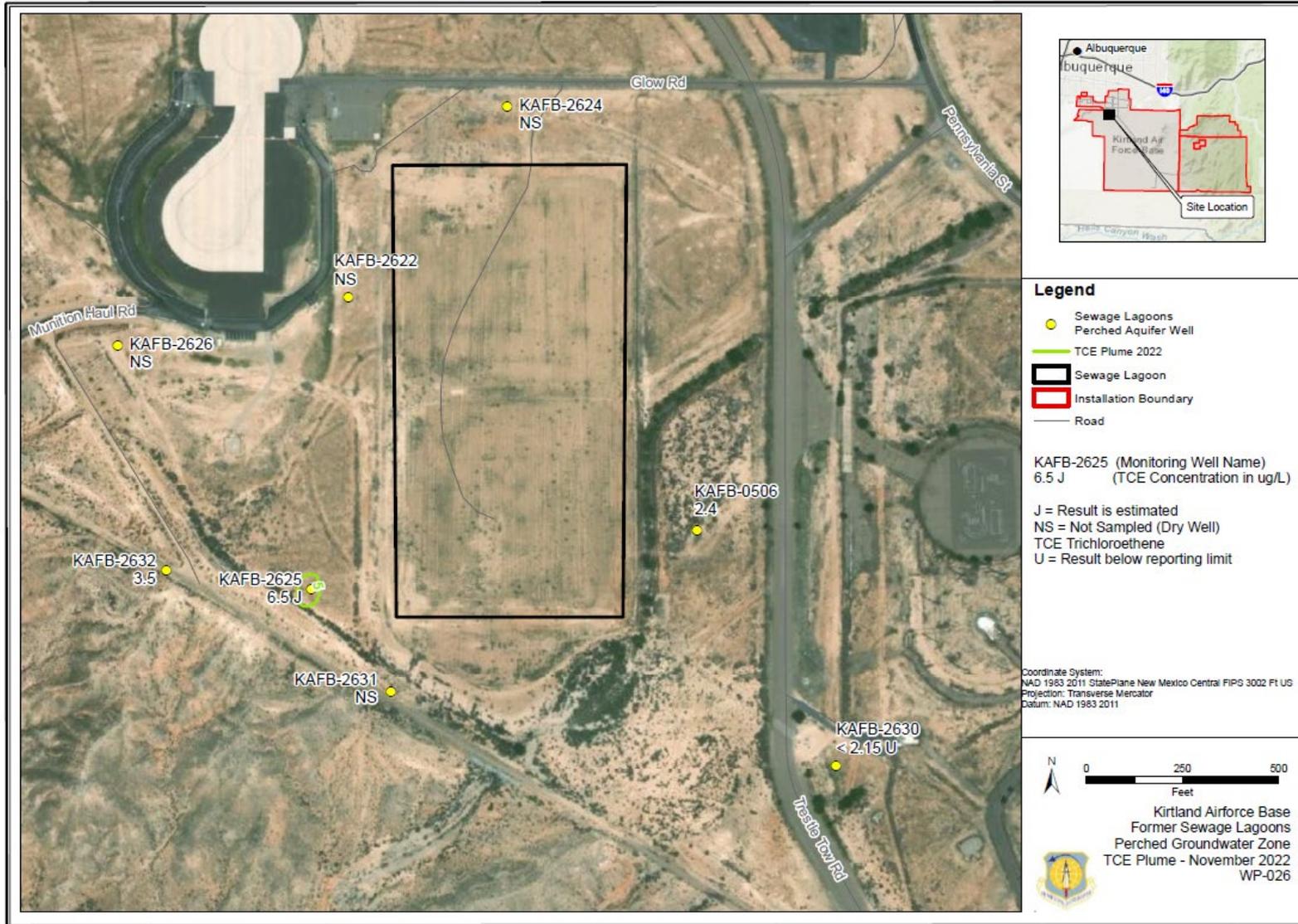
- In 2015 NMED disapproved the 2012 RFI, and an updated RFI report was submitted to NMED (Revision 1, December 2019), and revised and submitted again in April 2021 (Revision 2)
- NMED approved the 2012 RFI Report (Revision 2, April 2021) in September 2021, with the condition that Kirtland AFB conduct a constant discharge aquifer pump test in the perched groundwater unit below the Former Sewage Lagoons
- Conducted aquifer pump test in perched groundwater unit below Former Sewage Lagoons (September 2022)



Former Sewage Lagoons (SWMU WP-026)



TCE Detections in Perched Unit November 2022

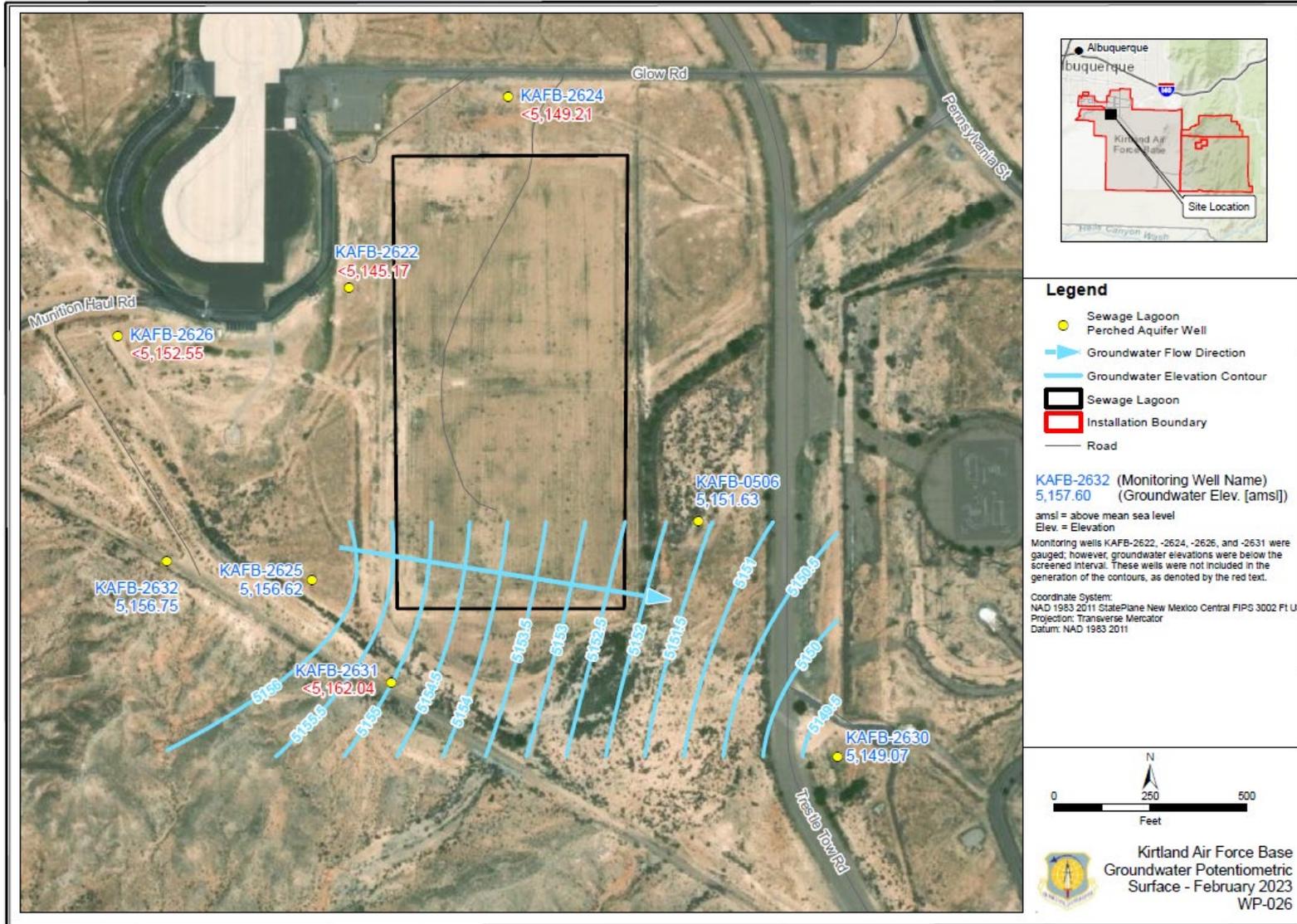




Former Sewage Lagoons (SWMU WP-026)



Perched Unit Groundwater Elevation Map (February 2023)

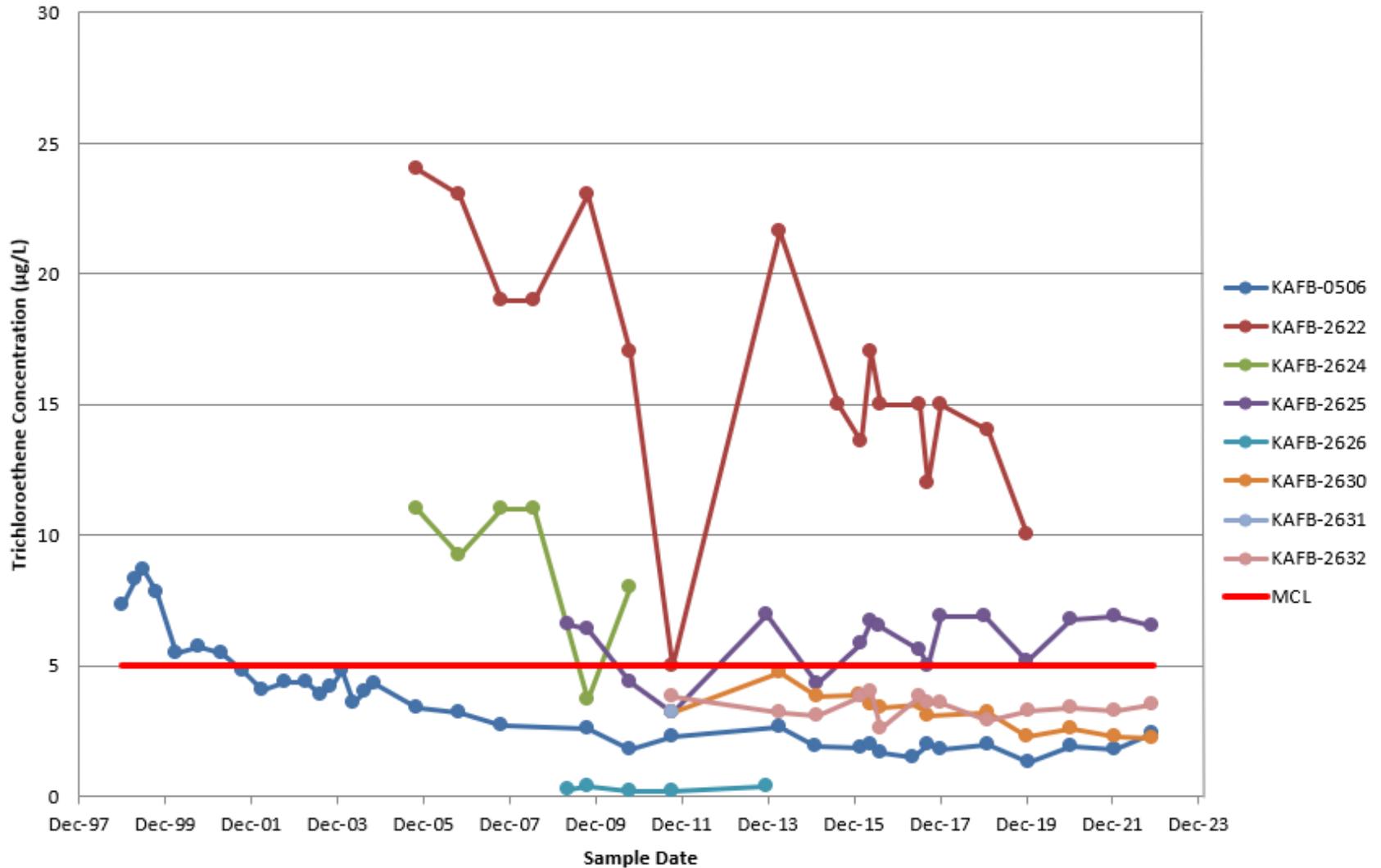




Former Sewage Lagoons (SWMU WP-026)



Perched Unit Groundwater TCE Trends





Former Sewage Lagoons (SWMU WP-026)



Perched Unit Groundwater - Summary

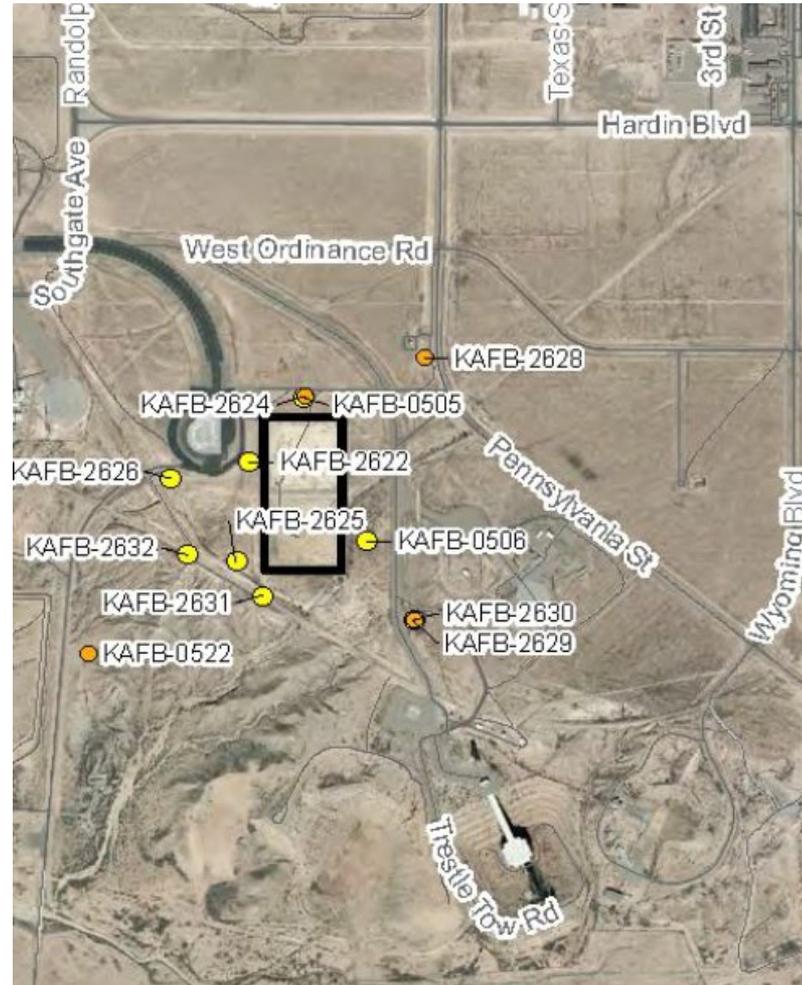
- Sampled annually for nitrate, anions, TAL metals, VOCs
- TCE only constituent exceeding groundwater standards (well KAFB-2625 occasionally)
- Significant decreasing concentration trend in well of highest concentration (KAFB-2622, at 10 $\mu\text{g}/\text{L}$ in 2020, then went dry in 2021)
- Strong trend in declining water levels in wells (~ 1 ft/year on average in northern wells); 4 perched unit wells have gone dry, 4 wells still being sampled
- Based on aquifer testing maximum sustainable yield measured between 0.07 and 0.13 gpd



Former Sewage Lagoons (SWMU WP-026)



Regional Groundwater Monitoring Wells





Former Sewage Lagoons (SWMU WP-026)



Regional Groundwater - Summary

- 4 wells sampled annually for anions (including nitrate), TAL metals, VOCs
- All VOC sample results are below laboratory reporting limits
- Well KAFB-0522 has intermittently had nitrate exceedances – this well is up-gradient of the Site WP-026 and has groundwater chemistry indicative of a natural “geogenic” nitrate source. Well KAFB-0522 is also related to Site ST-105 nitrate.



Former Sewage Lagoons (SWMU WP-026)



Path Forward

- Aquifer Test Report is in NMED review
- Continued annual groundwater monitoring
- Evaluate Site risk and determine path for achieving Corrective Action Complete



Questions



Questions?

