

Results Driven Investigative Approach for Shallow Soil Vapor Sampling

Mark Stapleton PhD, PE BCEE

February 1st, 2021



For the best of reasons



Purpose

- To conduct a results driven phased investigative approach to determine if existing shallow utilities are acting as conduits for vapor migration north of the base perimeter and into Bullhead Park. Based on the results of the first sampling campaign (Summer and Winter) and in coordination with NMED, additional step out sampling efforts will be accomplished (if necessary).
- Information collected during this phased approach will provide information useful in resolving **comments #7 and #8** in the notice dated May 26th, 2020 for the WORK PLAN FOR SHALLOW SOIL VAPOR SAMPLING, BULK FUELS FACILITY, SOLID WASTE MANAGEMENT UNITS ST-106/SS-111, KIRTLAND AIR FORCE BASE, NEW MEXICO, NOVEMBER 2019. Further, recommendations provided in **comments #9 and #10** of the same document will also be implemented (if appropriate).
- The data will be used to confirm that no off-base soil vapor intrusion risk based on current and foreseeable future use.

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Objectives

- **Objective of this Presentation**

- Obtain concurrence from NMED by the end February 2021 to conduct a limited investigation, near existing utilities and over the known benzene footprint in Source Area Plume in Bullhead Park.
- Air Force to submit a revised work plan incorporating the results driven investigative approach.
- The results of the investigation will be used to determine if additional step out sampling is required.
- Obtain approval from NMED on the revised work plan by May of 2021.

- **Constraints**

- The current contract vehicle has sufficient funds to revise the existing work plan, conduct two sampling campaigns (Summer and Winter), with three samples per sampling location for a total of 8 locations.
- Soil vapor monitoring points need to be installed in June of 2021, acclimate for two weeks and the first round of sampling to be completed by the end of June 2021. The first round of sampling needs to occur in June of 2021 (summer months) with the second round occurring in December of 2021 (winter months). This will provide sufficient time to compile, review and deliver the report prior to the contractor's period of performance being reached in the third quarter 2022.



Information Reviewed and Chronology Leading to the Development of this Presentation.



- Vapor Sampling Work Plan, Bulk Fuels Facility date May 20, 2019, Document ID #KAFB4794
- Notice dated May 26th, 2020 for the WORK PLAN FOR SHALLOW SOIL VAPOR SAMPLING, BULK FUELS FACILITY, SOLID WASTE MANAGEMENT UNITS ST-106/SS-111, KIRTLAND AIR FORCE BASE, NEW MEXICO, NOVEMBER 2019
- November 10th, 2020, Air Force presentation regarding Shallow Soil Vapor Investigation Work Plan with base level utility information included.
- In December 2020, Air Force provided the initial round of information regarding on and off based utilities, size and depths in the area of interest.
- In January 2021, The Air Force provided the final round of information regarding the on and off base utilities, size and depths in the area of interest as requested by NMED.
- January 6th, 2021 Air Force presentation on shallow soil vapor friction point with updated on and off base existing utility information and US EPA Regulatory guidance information showing incomplete pathways at bulk fuels facility. Presentation included additional information indicating VISLS are conceptually inaccurate for use at bulk fuels facility.
- January 15th, 2021, during a meeting with Secretary Kenney and Mr. Mark Correll, Air Force personnel were directed to develop a Results Based Investigative Approach to collect additional shallow soil vapor data near existing utilities and into Bullhead Park. Air Force assets indicated that the conceptual approach could be pulled together in two weeks - soft deliverable date. NMED technical staff were directed to provide a response in two weeks following receipt of the conceptual approach.



Existing Data Review



- **Existing Data**
 - **Slide 7** illustrates the existing utilities at Kirtland Air Force Base. **Table 1** on **Slide 7** provides size and depth information for each utility.

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Approach



Approach

- Proposed locations for 8 soil vapor monitoring point (SVMP) installations are shown on the site map on **Slide 8**. Each TSVMP will collect sample from the 5 foot, 10- and 15-foot horizons. Two sampling campaigns are envisioned (Summer 2021 and Winter 2021).
- The three sampling horizons were selected based on the data contained in **Table 1** on **Slide 7** indicating that the deepest utility near Kirtland Air Force Base is approximately 12 feet deep. Fractionating the subsurface on five-foot intervals will bracket the existing utilities and provide a clear understanding if soil vapor migration is occurring along or in the backfill of the existing utility corridors.
- **Slides 9, 13, 14, 15 and 16** illustrates the primary utility corridor along the northern perimeter of Kirtland Air Force Base as well as the complexities of conducting sampling along Randolph Ave.
- Sampling locations will be near existing utilities along the northern perimeter of Kirtland Air Force Base and into Bullhead Park over the known benzene plume footprint as depicted in the second quarter 2020 monitoring report.



Utilities Information Requested by NMED

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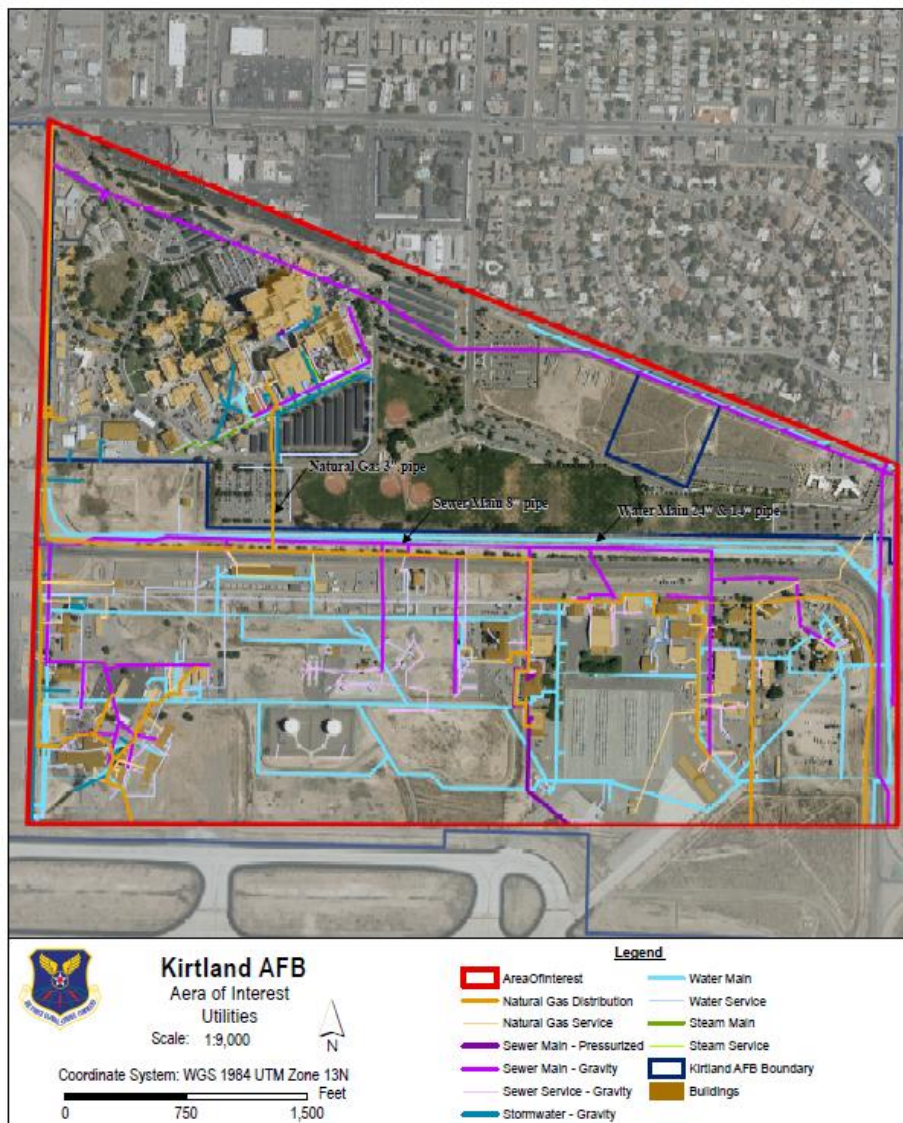


Table 1
Utility Information

Utility Type	General Location/ Operator	Pipe Diameter (inches) ^a	Approximate Depth (bgs) ^b
Natural Gas Distribution	On Base/KAFB	1.5 - 6.0	18-24 inches
Natural Gas Service	On Base/KAFB	1.5 - 4.0	18-24 inches
Sewer Main- Pressurized	On Base/KAFB	4.0 - 6.0	4-12 ft
Sewer Main- Gravity	On Base/KAFB	4.0 - 72.0	4-12 ft
Sewer Service- Gravity	On Base/KAFB	2.0 - 18.0	2-6 ft
Storm Water - Gravity	On Base/KAFB	8.0 - 60.0	2-6 ft
Water Main	On Base/KAFB	3.0 - 24.0	2-7 ft
Water Service	On Base/KAFB	1.5 - 12.0	2-7 ft

Notes

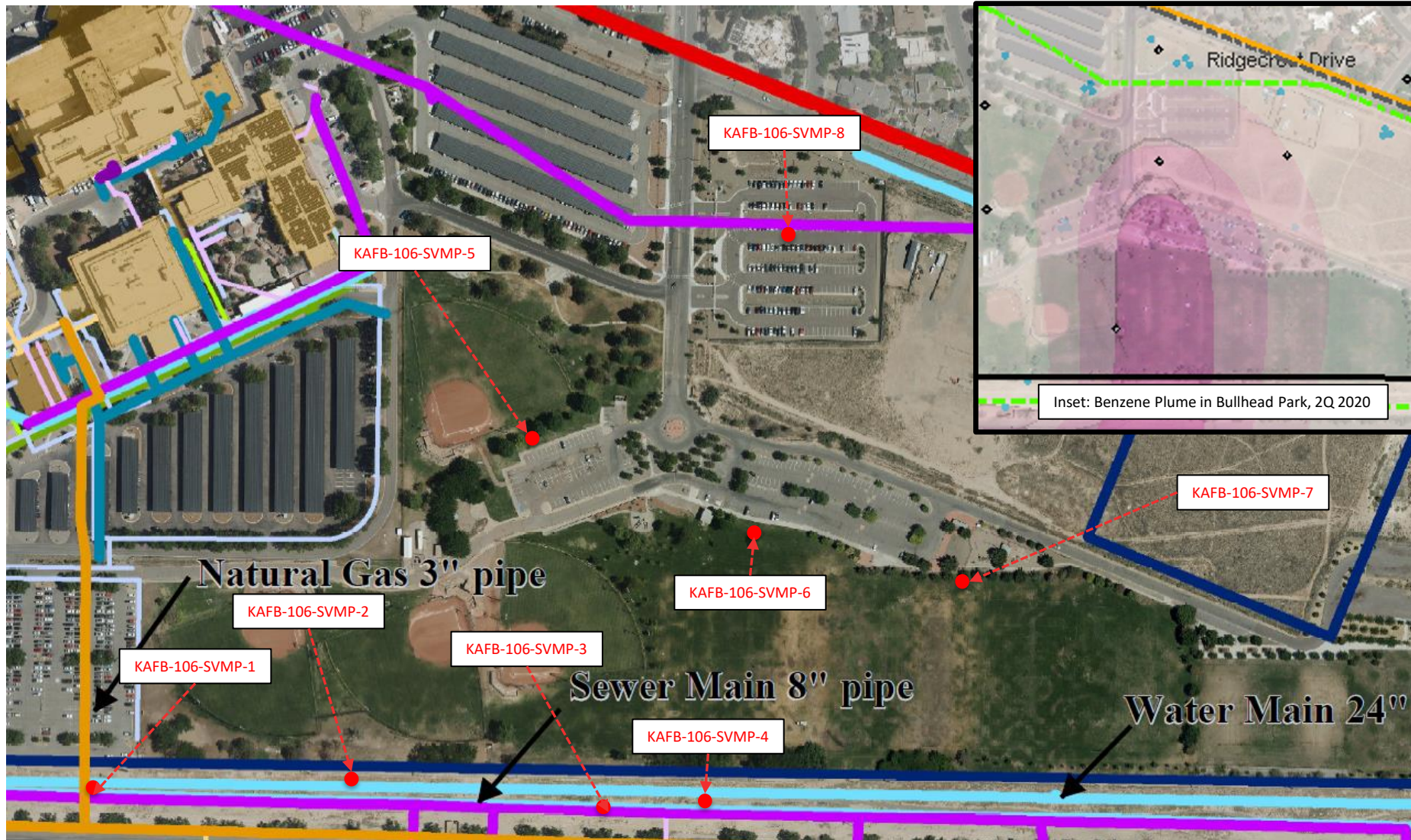
- Pipe diameters are ranges for each utility depending on the specific segment. All on base pipe diameters are from the Kirtland AFB Geo database
- Utility depths are based on general construction specifications for the given utility.

Acronyms and Abbreviations

AFB - Air Force Base
KAFB - Kirtland Air Force Base
bgs - below ground surface
ft - feet



Proposed Sampling Locations Along the Base Perimeter and Into Bullhead Park Over the Known Benzene Plume





Complexity of Proposed Sampling Locations along Randolph Ave

1:600



Cooperative Agreement Number:
WG126G-14-2-0018 -
WG126G-20-2-0004

Legend

- Monitoring Well
- Manhole - Sewer
- Main Water Line
- Communication Line
- Main Sewer Line - Gravity
- Service Sewer Line - Gravity
- Kirtland AFB

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed.

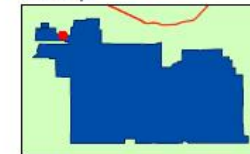
Kirtland AFB KAFB-106137 and nearby Utilities

Scale: 1:600

Coordinate System: WGS 1984 World Mercator

0 15 30 60 90 120 Feet

Locator Map



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Last Save Date: 1/11/2021

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Page:
1 of 1



Soil Vapor Monitoring Point Selection Rationale

Soil Vapor Monitoring Point	Rationale
KAFB-106-SVMP-1	Strategically located adjacent to the only utility running off base. Location will monitor natural gas, portable water and sanitary sewer lines
KAFB-106-SVMP-2	Monitoring northern perimeter along water and sanitary sewer utilities
KAFB-106-SVMP-3	Monitoring northern perimeter along the sanitary sewer utilities and over the known benzene footprint
KAFB-106-SVMP-4	Monitoring northern perimeter along the water utilities and over the known benzene footprint
KAFB-106-SVMP-5	Monitoring western edge of the known benzene footprint in Bullhead Park
KAFB-106-SVMP-6	Monitoring the centerline of the benzene footprint in Bullhead Park
KAFB-106-SVMP-7	Monitoring eastern edge of the known benzene footprint in Bullhead Park
KAFB-106-SVMP-8	Monitoring leading edge of the known benzene footprint in Bullhead Park. Strategically located adjacent to an off-base sanitary sewer line

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Mobilization/Demobilization

- **Mobilization/Demobilization**

- Since ½ of all of the proposed drilling and monitoring point installation sites are located off Base and in non-secure areas, all equipment and personnel will be mobilized to and from the drill sites daily.
- All investigation derived waste will be removed from the sites and monitoring point sites will be covered and secured at the end of each working day.
- All work sites will be restored to initial conditions and documented with pre- and post-work photographs.
- Safe and secure construction sites will be maintained during the execution of all activities pursuant to off-site soil vapor monitoring point installation and sampling.
- Work areas for soil vapor monitoring point drilling and installation will be protected from pedestrian and vehicular access.
- Barricades, temporary traffic control measures, and detour routes will be established where necessary in accordance with COA Construction Services Division requirements.
- In selecting sampling locations, care was taken to avoid areas in roadways and parking lots with heavy vehicular traffic.



Drilling Equipment and Methods

- **Drilling Equipment and Methods**

- Soil vapor monitoring points will be drilled using Direct Push Technology (DPT) when possible.
- Proposed drilling equipment is a Geoprobe 7822DT drilling rig or equivalent. The drilling rig is a rubber tracked rig that is designed to traverse variable terrain with minimal surface disturbance.
- During advancement of the DPT tools, cores will be collected in the lead rod in acetate core tubes on 4- foot intervals and brought to land surface. Acetate core tubes will be cut longitudinally such that retrieved cores may be inspected for lithologic logging and visual inspection.
- Where DPT methods cannot penetrate to design depths, partial DPT cores will be retained and hollow stem auger cuttings will be collected to complete descriptions of penetrated sediments. Soil cores will be visually inspected and logged in accordance with American Society of Testing and Materials (ASTM) methods.
- Additional details regarding drilling equipment and sampling port installation will be included in the revised work plan.



Water Distribution

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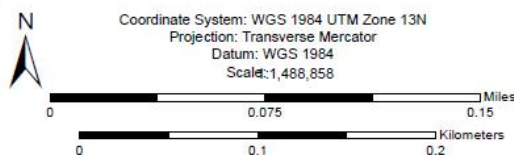


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Cooperative Agreement:
Number W0128G-20-2-0004



Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

Legend

- Main Water Distribution
- To Be Determined
- Domestic
- Fire Protection
- Irrigation
- Fence
- Water Meter
- Fire Hydrant
- Kirtland AFB Boundary

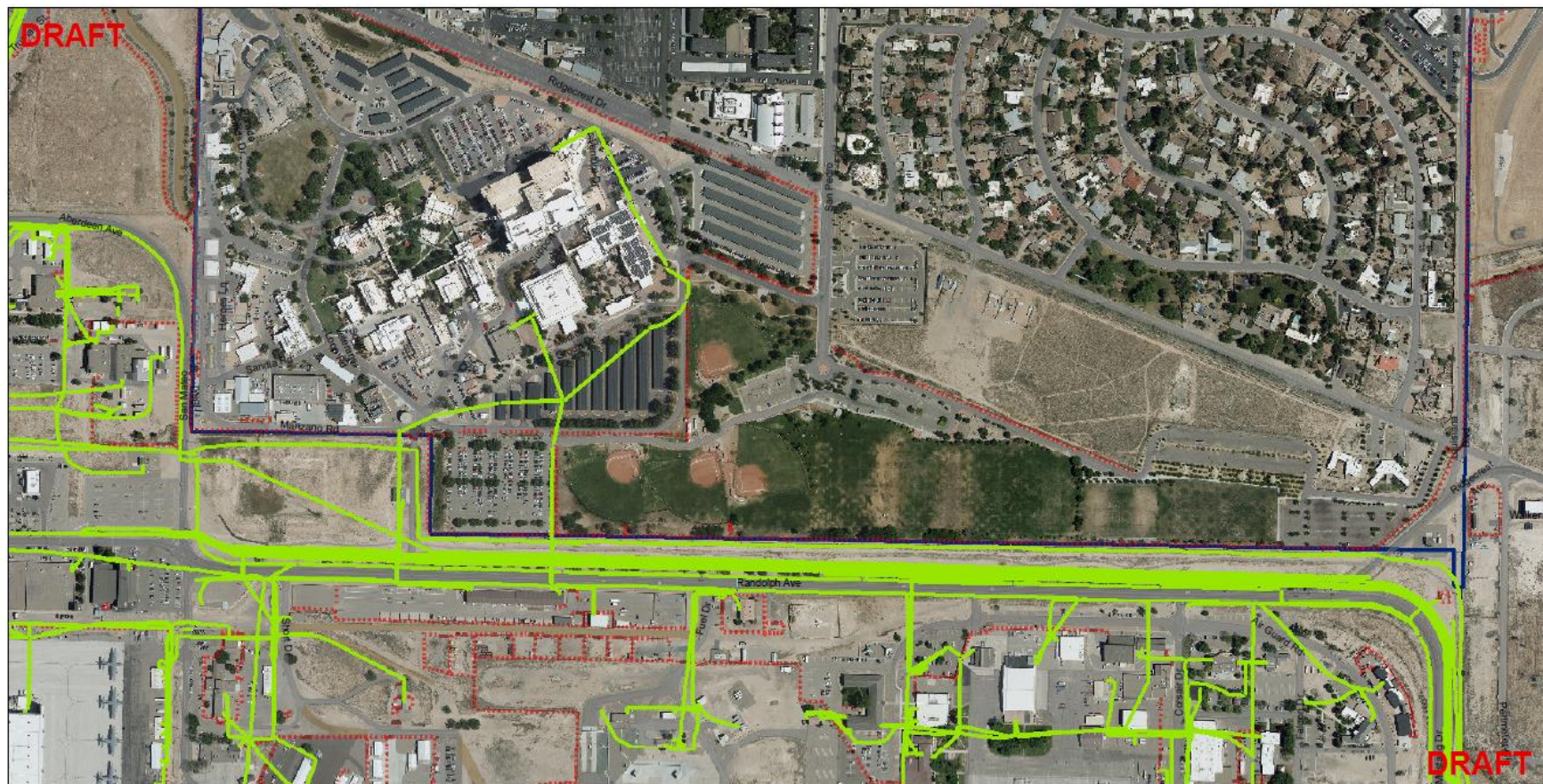
Kirtland AFB
Water Utilities

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Communication Lines

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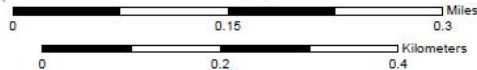


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Coordinate System: WGS 1984 UTM Zone 13N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1,488,858



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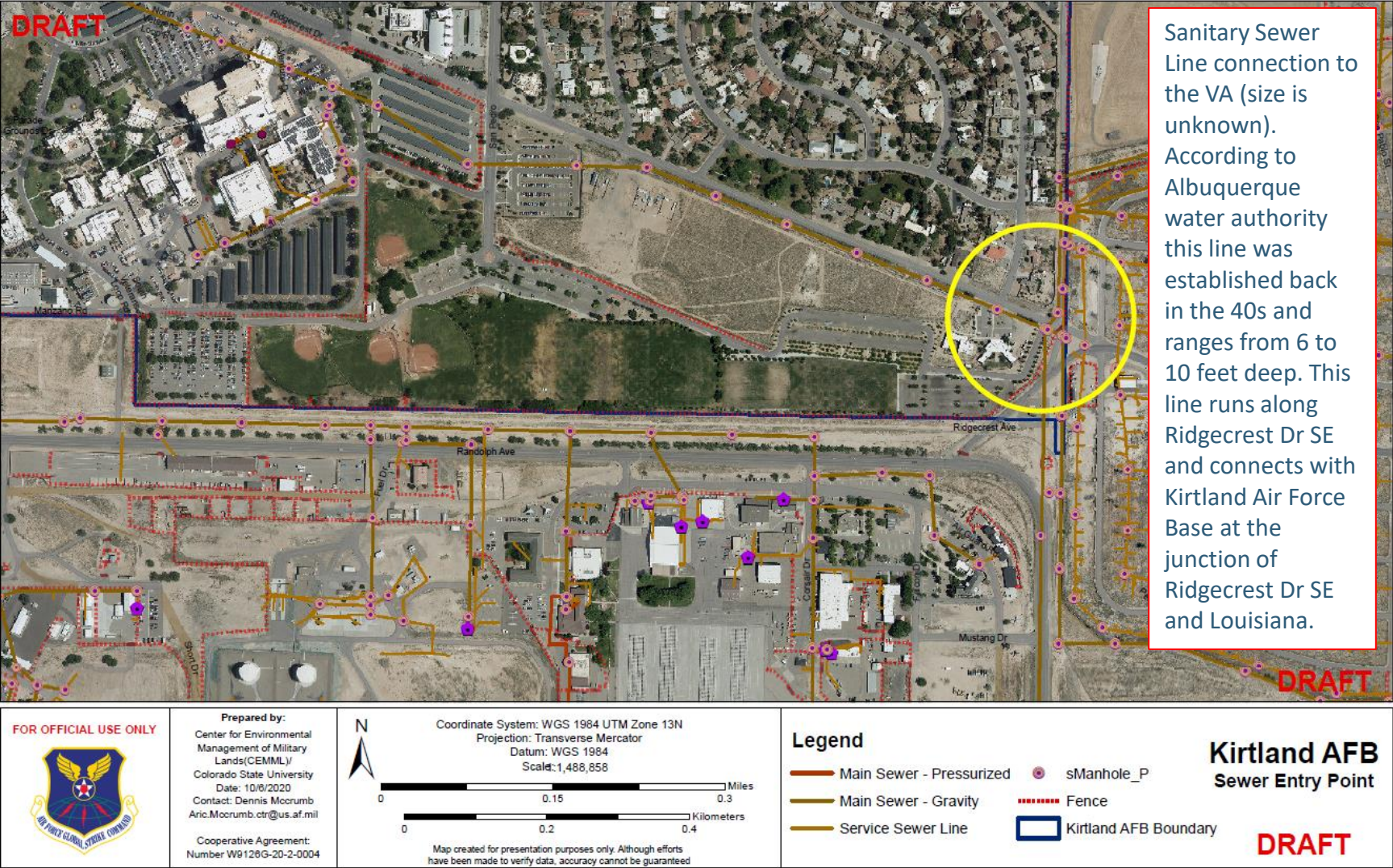
Legend

- Communication Line
- Fence
- Kirtland AFB Boundary

Kirtland AFB
Communication Lines

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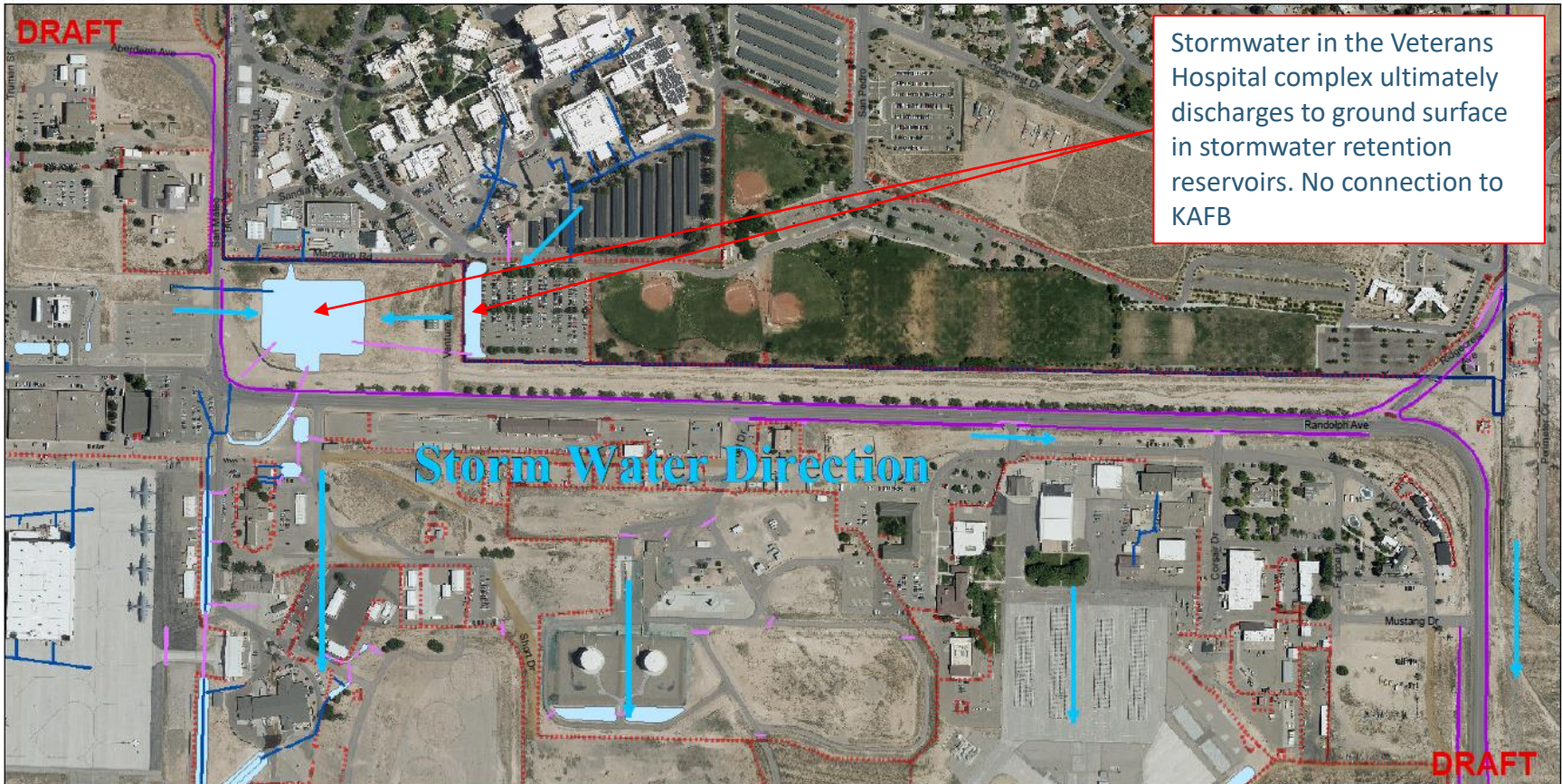
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Stormwater Lines, Open Drainage Ditches and Culverts

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Number W9126G-20-2-0004

Coordinate System: WGS 1984 UTM Zone 13N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1,488,858

Legend

- Open Drainage
- Culvert
- Storm Water - Gravity
- Storage Reservoir
- Fence
- Kirtland AFB Boundary

**Kirtland AFB
Storm Water System**

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Soil Vapor Monitoring Point Construction

- **Proposed Soil Vapor Monitoring Point Construction**

- Proposed soil vapor monitoring point completions are shown on **Slide 18**. **Slide 18** shows the DPT boring advanced to a depth of 15 feet and 6-inch soil vapor sampling ports positioned on ¼-inch Teflon tubing at depths of 15 feet, 10 feet and 5 feet below grade.
- Bentonite chips (¼-inch) will be placed in the boring opposite the vapor ports. Intervening sections of the borings between the vapor ports will be filled with dry bentonite power or acceptable alternate to seal the monitoring point between the vapor ports and promote soil vapor sampling in the intended zones at 5 feet, 10 feet and 15 feet below grade.
- One vehicular well vault construction may be required at KAFB-106-TSVMP-8.
- Additional details regarding soil vapor monitoring point construction will be included in the revised work plan.

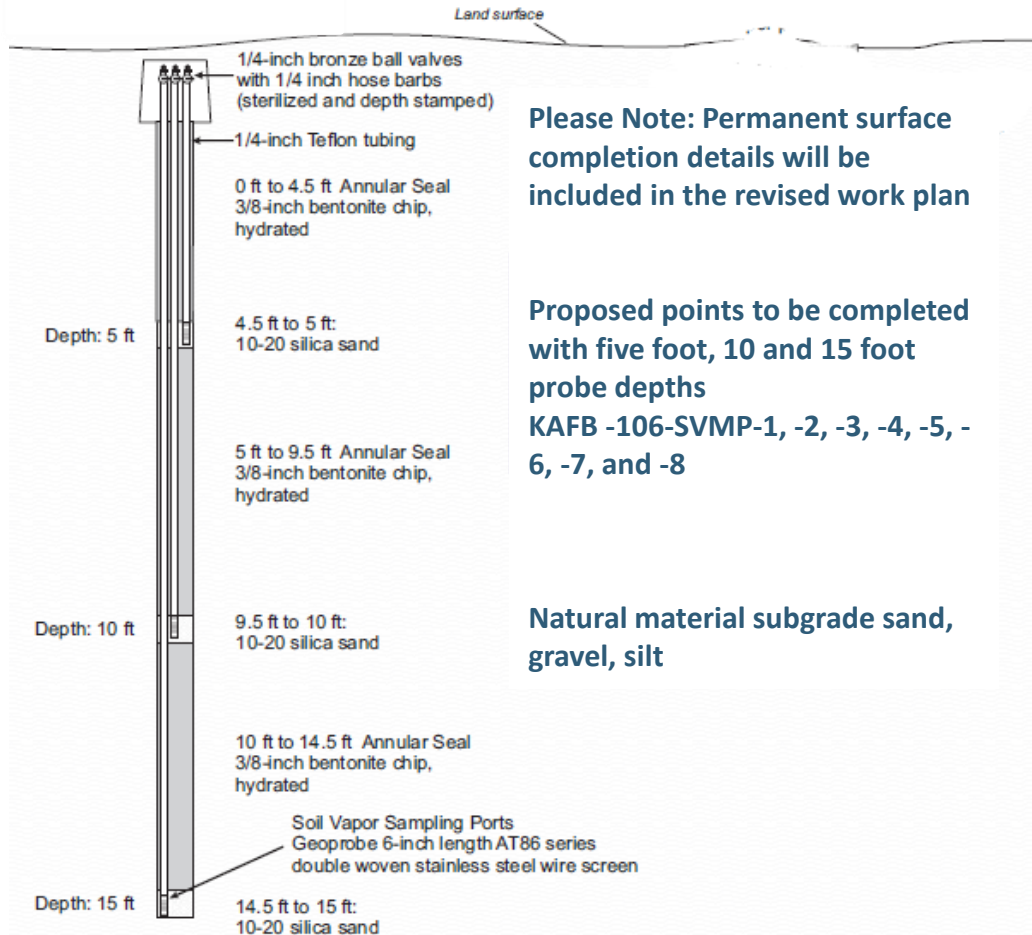
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Proposed Construction Diagram For The Soil Vapor Sampling Points To 15 Feet BGS

PROPOSED SOIL VAPOR MONITORING POINT CONSTRUCTION

15 FOOT DEPTH KAFB BFF SITE INVESTIGATION



Please Note: Permanent surface completion details will be included in the revised work plan

Proposed points to be completed with five foot, 10 and 15 foot probe depths
KAFB -106-SVMP-1, -2, -3, -4, -5, -6, -7, and -8

Natural material subgrade sand, gravel, silt

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Decontamination, IDW and Borehole Logging

- **Decontamination and Drilling Investigation Derived Waste (IDW)**
 - All the tools and equipment that are used to penetrate below grade will be decontaminated prior to arriving on site and will be decontaminated after use at each soil vapor monitoring point location.
 - Decontamination of drilling tools will take place in designated decontamination areas specific to the work activity and approved by Kirtland AFB. All decontamination wastewater will be managed in accordance with KAFB waste containment and disposal procedures.
 - The DPT drilling method proposed for soil vapor monitoring point installations will not penetrate saturated soils, and will require no fluids to perform. Additional details regarding IDW handling will be included in the revised work plan.
- **Borehole Logging**
 - During drilling, each boring will be fully described on the boring log form in accordance with ASTM International D5434.

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Surveying

- **Soil Vapor Monitoring Point Survey**

- Upon completion, each soil vapor monitoring point will be surveyed by a Registered Land Surveyor (RLS). The surveys will establish northings, eastings, and elevations within 0.01 foot accuracy at all soil vapor monitoring point locations having permanent completions, referenced as follows:
 - New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1983
 - North American Vertical Datum 1988
- A deliverable document that includes a tabular summary of the XYZ coordinates for each monitoring point, as well as a map showing the locations of the monitoring points and bearing the RLS seal will be prepared.



Sampling

- **Soil Vapor Sample Collection, Analysis And QA/QC Samples**

- Proposed soil vapor sampling will be conducted after each of the proposed soil vapor monitoring points have been completed and adequate time has elapsed to allow perturbed soil vapor conditions from monitoring point installation to return to ambient conditions (proposed two weeks minimum).
- In addition to soil vapor monitoring point sampling, additional QA/QC samples will be collected over the duration of the sampling event. Two blind duplicate samples will be taken during the sampling event to be analyzed by the laboratory to identify potential sampling or laboratory method variances. One time-weighted atmospheric sample will be taken for each day soil vapor monitoring point sampling is conducted. Finally, two trip blanks will be submitted to the laboratory for analysis for the sampling event.
- Details of the proposed sampling train, field parameters to collected, purging procedures and equipment to be used will be presented in the revised workplan scheduled for Spring of 2021.

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Results

- Summa cannisters will be shipped to a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certified laboratory and analyzed for the analytical methods listed in the revised Work Plan scheduled for submittal in Spring of 2021.
- Samples will be analyzed for Volatile organic compounds (VOCs) by method TO15.

Results

- A draft technical memorandum will be prepared and submitted to Air Force within 90 days of data validation. Data validation and summary tables will be prepared for ease of data review.
- Air Force will coordinate the results of each sampling event with NMED to determine if additional step out sampling is required, obtain concurrence and collectively determine the path forward prior to contractor generating the deliverable.