Air Force Civil Engineer Center

Performance-Based Remediation (PBR) at the Former Galena Forward Operating Location (FOL), Alaska

Restoration Advisory Board (RAB) Meeting
24 October 2018

Battle Ready…Built Right!

Former Galena FOL Performance Based Contract

- **Parsons - Prime Contractor**
- **Partnering Team – CH2M/Jacobs and Ahtna Engineering Services**
- **Remediation of 32 sites contaminated primarily with fuels and solvents**
- **To date, six sites have achieved Cleanup Complete**
- **Installation of remediation systems from 2015 to 2019**
- **Operations and monitoring through Summer 2020**

Installation of Bioventing Cover at Former Fire Training Protection Area (Site FT001)

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Sites Achieving Cleanup Complete

1. Site CST009 Building 1400 Former Ammunition Storage UST (UST1400) – 9/29/15
2. Site CST013 Former Incinerator USTs (UST1770) – 12/6/16
3. Site CSS005 Refueling Pads (PADS) – 6/23/17
4. Site CSS001 Electric Power Station AST (AST1569) – 6/30/17
5. Site SS021 Building 1549 Old Fire Station - 9/29/17
6. Site SS013 Control Tower Drum Storage Area South – 8/13/18

Excavation at Site CSS001

Excavation at Site CST013

2018 Field Activities

Subsurface Aeration (Vertical Well) Air Sparging

– Completed small air sparge system at northern portion of Million Gallon Hill (Site CG001) to supplement treatment from horizontal well system.

Soil Vapor Extraction (SVE)

– Completed system at Former South Apron Maintenance Area (Site SS015)
– Installed small system at POL Yard (Site ST005 Area C)
– Installed system at Building 1845 TCE Area/Building 1700 Refueler Maintenance Shop (Sites SS006/SS019) (*Startup in 2019*)

Bioventing

– Installed system at Former Fire Protection Training Area (Site FT001)

Enhanced Anaerobic Bioremediation/Enhanced Biogeochemical Transformation (EAB/EBT) Injections

– Former South Apron Maintenance Area (Site SS015)
– Building 1845 TCE Area (Site SS006)

2018 Field Work (continued)

Excavations

- Completed small excavation at Former Birchwood Hangar (Site SS014) (*started in 2017*)
- Small excavation at POL Yard (Site ST005 Area D)
- Surface soil excavation at Building 1845 TCE Area (Site SS006)

In Situ Chemical Oxidation (ISCO) Injection

- Old Abandoned Pipeline (CPL006 Area 2 – along ski strip)
- Combat Alert Cell USTs (Site CST011 Area 1)

Other Field Work

- SS019 Drywell removal
- OAP pipeline inspection (CPL006 Area 3 and FT001)
- TCE soil pile remediation
- System modifications (e.g., expand or replace vent wells)
- Annual groundwater monitoring

Galena Landfarm

- Landfarm reconstruction and operation

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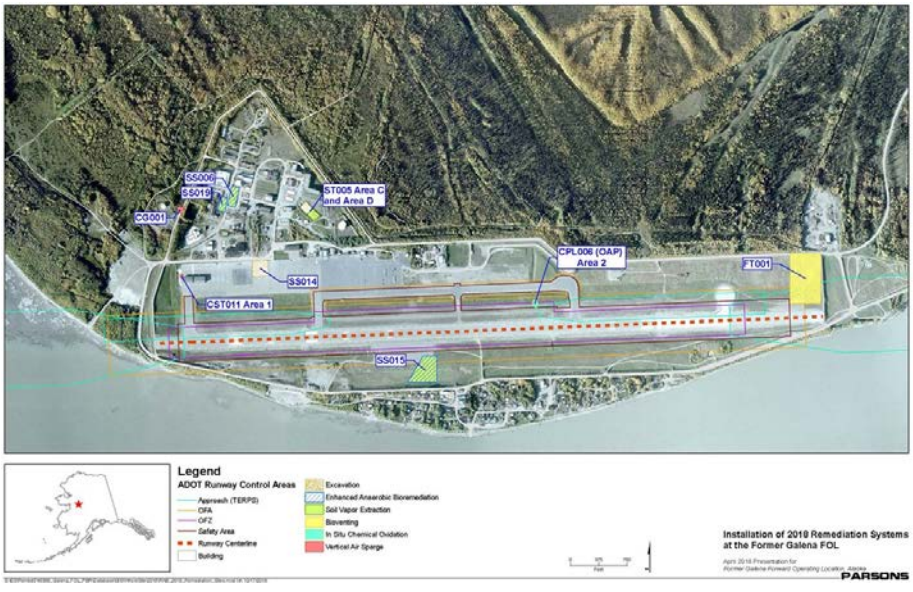
2018 Field Work Locations



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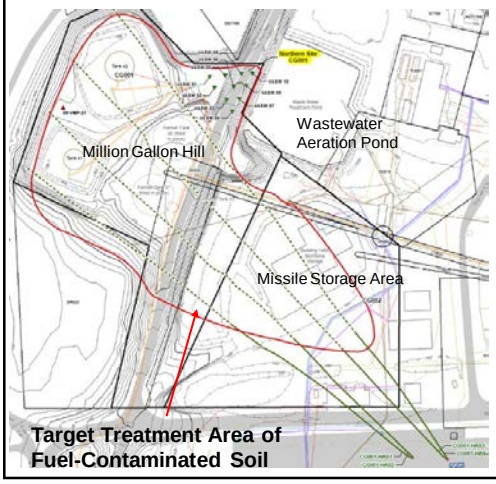
Vertical Air Sparge System at Million Gallon Hill (Site CG001)

- **Ten air sparging wells were added to the northern portion of the Million Gallon Hill remediation system to supplement aeration treatment from the 4 horizontal wells.**



Target Treatment Area of Fuel-Contaminated Soil

Blower enclosure building for air sparge system.

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Soil Vapor Extraction (SVE) at POL Yard (Site ST005 Area C)

- **Seven SVE wells were installed around the former aboveground storage tanks to treat fuel-contaminated soils.**
- **Will be operated from November – April when groundwater levels are low.**

Tank farm ASTs at Site ST005 Area C

Installation of SVE piping

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Petroleum Soil Excavation at POL Yard (Site ST005 Area D)

- **75 CY of fuel-contaminated soil were excavated from this former AVGAS truck fill stand.**

Excavation area around former fill stand

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In Situ Chemical Oxidation at Combat Alert Cell (Site CST011 Area 1)

- **Sodium persulfate was injected into a small area at 5 feet deep to oxidize remaining gasoline-contaminated soil from former fuel underground storage tanks (USTs).**
- **Will resample next summer to determine if site meets cleanup objectives.**

Northwest corner of CAC Building where USTs were formerly located.

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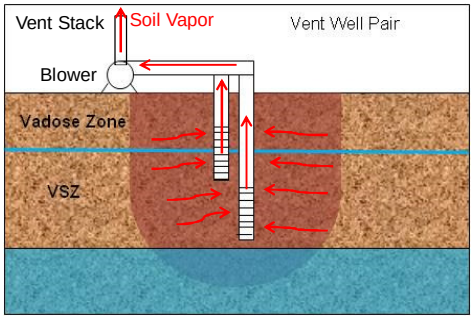
Soil Vapor Extraction for TCE Sites SS015 and SS006

- **SVE removes volatile TCE in unsaturated soil and vents it to the atmosphere**
- **Air quality is monitored to ensure ADEC exposure levels are not exceeded**



Note: VSZ = variably saturated zone

SVE vent pipe installation at Site SS015

- **SVE System at Site SS015 completed in 2018**
- **SVE System at Site SS006 installed with startup in 2019**

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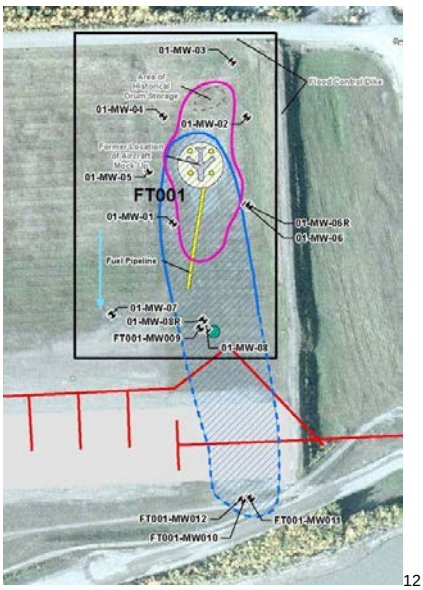
Bioventing System at Former Fire Protection Training Area (Site FT001)

- **Soil and groundwater contaminated with petroleum hydrocarbons from fire training exercises**
- **Per- and polyfluoroalkyl substances (PFAS) are also present in soil and groundwater but will be addressed separately**
- **Bioventing selected to treat petroleum hydrocarbons in unsaturated soil as an interim remedy**



Magenta outline is extent of soil contamination above cleanup levels
Blue hatch is extent of benzene in groundwater

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Bioventing System Installation at Site FT001

- 12 shallow and 2 deep vent wells installed under an impermeable cover
- Cover will limit infiltration and enhance influence of bioventing
- Benzene and diesel-range organics in groundwater will attenuate as soil bioventing removes petroleum hydrocarbons from soil

Installing bioventing cover at Site FT001

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Enhanced Anaerobic Bioremediation/ Enhanced Biogeochemical Transformation (EAB/EBT)

- TCE degrades in groundwater:
  - Biologically by anaerobic microorganisms (EAB)
  - Abiotically by reactions with reduced iron sulfide minerals (EBT)
- End product of biodegradation (ethene) is unstable in groundwater and further degrades to carbon dioxide and water
- Injected chemicals/cultures:
  - Emulsified vegetable oil to stimulate anaerobic conditions for biological degradation of TCE
  - Bioaugmentation culture that is capable of complete anaerobic degradation of TCE to ethene
  - Sulfate which is reduced to sulfide that precipitates with iron to form reactive iron sulfide minerals

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Direct-Push Injection for EAB/EBT

Amendments are mixed with water at the surface and injected directly into groundwater through direct-push rods and tools

Bioaugmentation culture injected after amendments

Emulsified vegetable oil product staged at Site SS015

Injecting Bioaugmentation Culture

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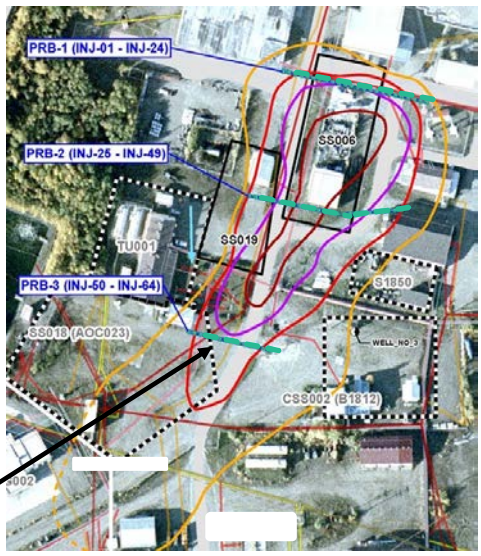
EAB/EBT at Site SS006

- **Emulsified vegetable oil, sulfate amendment, and bioaugmentation culture injected into three rows of injection points to form permeable reactive barriers (PRBs) oriented perpendicular to groundwater flow**
- **Total of 7,300 gallons of emulsified vegetable oil injected into 3 PRBs at Site SS006, and a total of 6,500 gallons of emulsified vegetable oil injected into 3 PRBs at Site SS015**

PRBs intercept TCE in groundwater above 50 micrograms per liter



Plan View SS006 PRBs

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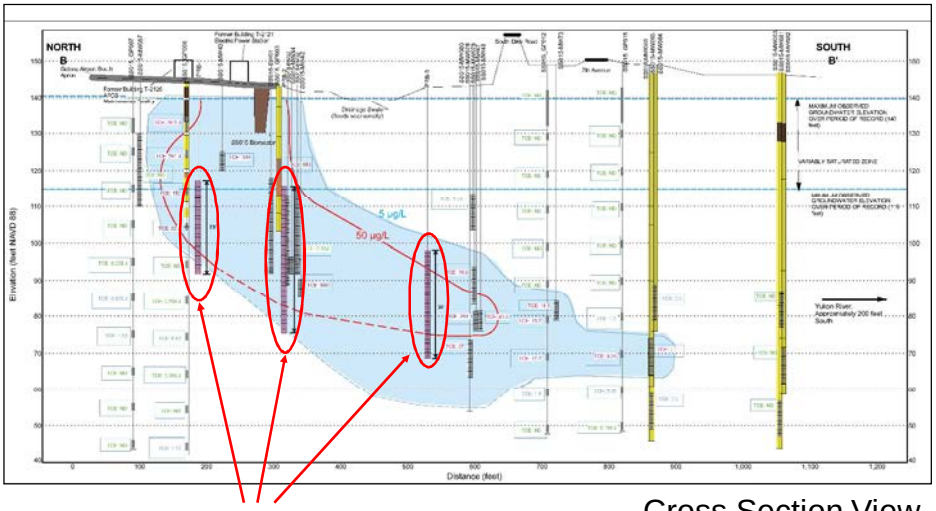
Injection into Permeable Reactive Barriers at Site SS015



PRBs intercept TCE in groundwater

Cross Section View

Soil Excavation at Site SS006 and Site SS014

- **Building 1845 TCE Area Excavation (Site SS006)**
  - **Removed approximately 30 cubic yards of soil contaminated with pentachlorophenol and polycyclic aromatic hydrocarbons at the Utility Pole Storage Area**
  - **Soil staged at RAPCON Yard for disposal outside of Galena in 2019**
- **Former Birchwood Hangar (Site SS014)**
  - **Removed soil with petroleum hydrocarbons remaining from the 2017 excavation of a former floor drain**
  - **Soil transported to landfarm for treatment**

Utility Pole Storage Area at Site SS006

Excavation at Site SS014

Drywell Removal at Site SS019

- **Former underground drywell drained an oil/water separator in Building 1700**
- **Drywell and soil being characterized for disposal**

Drywell constructed of perforated 55-gallon drum

Drywell excavation

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Treatment of TCE Soil Pile

- **Soil excavated from Site CSS002 (Building 1812) and soil cuttings lightly contaminated (below human health but above migration to groundwater standards) with TCE was staged at Million Gallon Hill**
- **Soil was tilled at the Missile Storage Yard to remove TCE by volatilization**
- **Breathing zone air monitored to ensure no exposure occurred**
- **After treatment soil was transported to the Galena Landfarm to treat residual petroleum hydrocarbons**

Tilling soil at Missile Storage Yard

Soil covered pending test results

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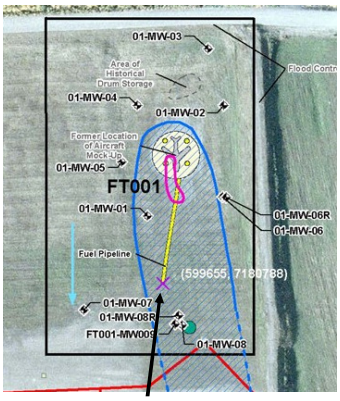
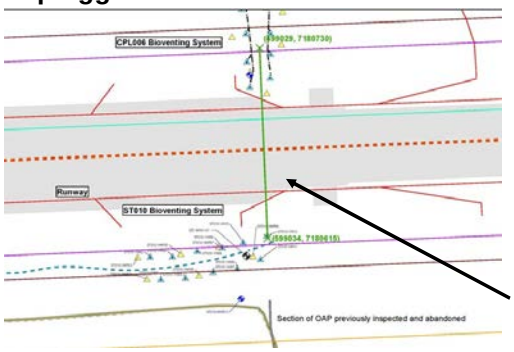
OAP and FT001 Pipeline Inspection

- **Inspected former fuel pipelines under east side of runway (Sites CPL006 and ST010) and at the Former Fire Protection Training Area**
- **Pipelines were cut and did not contain fuel product but were not plugged**



Pipeline Location at Site FT001



Pipeline Location at Sites CPL006 and ST010

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OAP and FT001 Pipeline Inspection

- **Exposed pipeline ends were plugged contaminated soil was sampled**

Plugged Pipe at OAP under runway

Exposed pipeline at FT001

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Galena Landfarm Expansion

- Expanded landfarm tilling area by pushing berms out to the south and east
- Amount of soil that can be treated by the windrow turner increases from 4,100 to 5,250 cubic yards
- Installed a detention basin to capture excess storm water – water used for moisture control during dry periods

Construction of fenced detention basin

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Galena PBR 2019-2020 Schedule

- 2019 Proposed Plan Meeting and RODs for Sites DP023 (Disposal Site West of Dike) and CS001 (Contaminated Sediments – DDT Soils)
- 2019 – Implement remaining remedies
  - Site DP023 complete excavation
  - Former Waste Accumulation Area South of Building 1499 (Site SS018) excavation
- Operate remedies and prepare close out reports, as appropriate (through 2020)
- Operate Landfarm
- Five-year Reviews for all open sites
- Current PBR Contract ends September 2020

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Communications

- **Public Review of Proposed Plan for remaining CERCLA sites**
  - **Site DP023 and Site CS001 in March/April of 2019**
- **Notices will be published when RODs are finalized for public review**
- **Semi-annual RAB Meetings (April/October) to continue**
- **Air Force maintains Administrative Record for Final Documents at:**

  http://afcec.publicadmin-record.us.af.mil/

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Questions?

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