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# EX-SITU CONDUCTIVE SOIL THERMAL REMEDICATION

- Remediation project conducted at Camp James A. Garfield (CJAG)/former RVAAP from 2020 to 2021.
- Five separate Load Lines where remediated to achieve Commercial/Industrial Use which is inclusive of military training.
- 24 different excavations were completed.
- Contaminants of Concern included explosives, Polycyclic-Aromatic Hydrocarbons (PAHs), PCBs, and metals.
- Approximately 2,528 cubic yards of soil was excavated and thermally treated.
- A total of 88 cubic yards of metals impacted soils were disposed of off-site as non-hazardous waste.
- Approximately 400 tons of concrete was demolished and recycled off site.

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# Load Lines 1-4 and 12 Thermal Remediation

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- Total square footage excavated was 47,646 sqft. or 1.09 acres.
- Remedial activities lasted approximately 5 months starting in October 2020 with field activities completed in February 2021. Currently, completing the Remedial Action Completion Report.
- Soil was treated between 3-12 days. Approximately 525 cubic yards per cell
- The average soil temperature achieved was from 479 to 634 degrees Fahrenheit.
- One composite soil sample was collected for each 150 CY of treated soil for verification.
- Excavation confirmation samples consisted of ISM sample methodology, and consisted of between 30 to 50 aliquots. 311 ISM excavation soil samples were collected to confirm completion of the excavations.
- Treated soil was used as backfill in the excavations which were then graded/seeded.

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# Load Lines 1-4 and 12 Thermal Remediation

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## COSTS

- SA/R for the Louisville US Army Corps of Engineers was \$100,000 (for oversight).
- Contractor cost to prepare the Remedial Design document, perform the Remedial Action, and prepare the Remedial Action Completion Report was \$ 2.082 million.
  - Cost per cubic yard of soil including all reports, mobilization, demobilization and reclamation \$823/cubic yard.
  - Approximately 70,000 gallons of propane was used for thermal treatment and to run generators for the mobile offices. The Propane was \$1.92/gallon =\$134,400.
  - Local contractors were used for propane supply, to provide seed mix and restroom facilities, for grading and seeding activities, for food and lodging for the field contractors.

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# Two Treatment Units Up and Running

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# Moving End Wall of Treatment Unit

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# Building the Soil Pile for Treatment

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# Haul Truck

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# Excavation Wall Sampling Grid

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# Restored Excavation Site

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# PROs

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- Reuse of treated soils, no backfill purchase costs, less trucking costs.
  - To haul soil to landfill and bring in backfill would have had to use 253 truck loads at 20 cubic yards each.
- Soil not heated too high to prevent regrowth of vegetation.
- System has no moving parts, i.e. no mechanical break downs.
- Verification sampling of treated soil happens in treatment chamber so if additional treatment is needed easy to reheat.
- No screening of soil prior to treatment. Rocks, vegetation, concrete, and gravel can go through the treatment process.
- Off gasses are passed through an after burner system - no emissions.
- Zero reject of materials regardless of moisture content or soil type.
- All weather operations.
- No landfill liability for treated soils - reused

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# CONs

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- Large area required for setup of treatment system- approximately 2 acres.
- Large amount of fuel required to heat the soils
- Treatment system is not mobile- soil must be brought to the system.
- Soils are not placed back into the same excavations that they originated from.
- Cannot treat metals contaminated soils

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