

FORT KNOX

Army Cleanup Program

Installation Action Plan

Final

September 2021

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STATEMENT OF PURPOSE

The Installation Action Plan provides evidence that the Army is firmly committed to expeditious identification and cleanup of environmental contamination, and that the installation has a credible, organized program to carry out that commitment. The IAP provides an outline of the total multi-year environmental cleanup program for each site with ongoing or future planned restoration activity and includes the (1) environmental restoration requirements, (2) the rationale for the selected technical approach, and (3) foundation to develop corresponding financial needs for each cleanup site.

INSTALLATION OVERVIEW

Installation Name: FORT KNOX

Installation City: FORT KNOX

Installation County: Not assigned

Installation State: 10

Regulatory Participation - Federal: US Environmental Protection Agency (USEPA) Region IV

Regulatory Participation - State: Kentucky Department of Environmental Protection (KDEP)

ACRONYMS

Acronym	Definition
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CC	Compliance-Related Cleanup
C/DD	Construction/Demolition Debris
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLF	Closed Landfill
CMI(C)	Corrective Measures Implementation-Construction
CMI(O)	Corrective Measures Implementation-Operation
CMS	Corrective Measures Study
COC	Contaminant of Concern
CS	Confirmation Sampling
DCS	Deputy Chief of Staff
DD	Decision Document
DERP	Defense Environmental Restoration Program
DES	Design
DWM	Division of Waste Management
EMD	Environmental Management Division
ENV	Environmental
ER,A	Environmental Restoration, Army
FS	Feasibility Study
FSL	Former Sludge Lagoon
FY	Fiscal Year
GIS	Geographic Information System
GWAR	Groundwater Assessment Report
HQAES	Headquarters Army Environmental System
IC	Institutional Control
IM	Interim Measure
IR	Installation Restoration
IRA	Interim Remedial Action
KDEP	Kentucky Department for Environmental Protection
LTM	Long-Term Management
LUC	Land Use Control
MNA	Monitored Natural Attenuation
MW	Monitoring Well
NFA	No Further Action
NPL	National Priorities List
OWS	Oil Water Separator

Acronym	Definition
PAH	Polycyclic Aromatic Hydrocarbon
PCE	Tetrachlorethene
PFAS	Per- and Polyfluoroalkyl Substances
POL	Petroleum, Oil, Lubricants
PRT	Pesticide Rinse Tank
RA	Remedial Action
RA(C)	Remedial Action (Construction)
RA(O)	Remedial Action (Operations)
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	Resource Conservation and Recovery Act Facility Assessment
RFI	Resource Conservation and Recovery Act Facility Investigation
RI	Remedial Investigation
RIP	Remedy-In-Place
SDB	Sludge Drying Bed
SIR	Site Investigation Report
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
TNFA	Tentative No Further Action
UST	Underground Storage Tank
UE	Unrestricted Exposure
UU	Unlimited Use
WWTP	Waste Water Treatment Plant

PHASE TRANSLATION TABLE

HQAES Phase ID	CERCLA Phase	RCRA Phase	RCRA UST Phase
.01	Preliminary Assessment (PA)	RCRA Facility Assessment (RFA)	Initial Site Characterization (ISC)
.02	Site Inspection (SI)	Confirmation Sampling (CS)	Investigation (INV)
.03	Remedial Investigation/ Feasibility Study (RI/FS)	RCRA Facility Investigation/Corrective Measures Study (RFI/CMS)	Corrective Action Plan (CAP)
.04	Remedial Design (RD)	Design (DES)	Design (DES)
.05	Interim Remedial Action (IRA)	Interim Measure (IM)	Interim Remedial Action (IRA)
.06	Remedial Action Construction (RA(C))	Corrective Measures Implementation (CMI(C))	Implementation (Construction) (IMP(C))
.07	Remedial Action (Operations) (RA(O))	Corrective Measures Implementation (Operations) (CMI(O))	Implementation (Operations) (IMP(O))
.08	Long-Term Management (LTM)	Long-Term Management (LTM)	Long-Term Management (LTM)



SITE-LEVEL INFORMATION

FTK-011_17 WWTP SLUDGE DRYING BEDS

HQAES ID: 21405.1002

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 03/15/2009

RC Date: 06/15/2009

RC Reason: All Required Cleanup(s) Completed

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	08/15/1986	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	05/15/1989	11/28/2007
DES:	11/28/2007	03/31/2008
IRA:	--	--
CMI(C):	03/31/2008	03/15/2009
CMI(O):	03/15/2009	06/15/2009
LTM:	06/15/2009	06/15/2051

Site Narrative: FTK-011, the 17 Waste Water Treatment Plant (WWTP) Sludge Drying Beds (SDB) are located off of Ninth Avenue. The 17 sludge-drying beds have a total area of approximately 34,000 square feet. They were constructed in 1960 to dewater domestic sludge generated at the former WWTP. The site was listed as FTK-011A-Q as a solid waste management unit (SWMU) in the Resource Conservation and Recovery Act (RCRA) facility assessment (RFA). The RFA reported that sludge from the beds overflowed on occasion and the liquid previously drained to surface water drainage systems. The beds were rebuilt and updated in 1987. This update also included a pumping station designed to collect the liquid from the drain tiles and transfer the liquid back to the plant for further treatment. A new WWTP was built in 1995 and the SDB were utilized. The site has not received sludge from the current WWTP since at least 2009. The area is designated as industrial use and the land use is anticipated to remain unchanged in the future. The former WWTP SDB (FTK-011) and the WWTP Former Sludge Lagoons (FTKX-10) were investigated and cleaned up concurrently. Historical data and the results of three phases of RCRA facility investigations (RFI) have provided information on the nature and extent of soil contamination. The RFIs indicated potential risk to human health from elevated metals, pesticides, and semi volatile organic compounds in surface and subsurface soil. This corrective measures study (CMS) was completed in fiscal year (FY)07 and the selected alternative consisted of arsenic hot-spot removal, site regrading, and land use controls (LUC). Kentucky Department for Environmental Protection (KDEP) approved the CMS Nov. 28, 2007. The selected remedial action for the beds and lagoons site included the following elements- excavating surface soil hot-spots with elevated arsenic concentrations, off-site disposal of excavated soil, collecting confirmatory samples from hot-spot areas, grading the Beds and Lagoons to eliminate future use, restricting land use (by industrial designation), posting warning signs, and inspection and maintenance of the site. Remedial Actions (RA) were completed in FY08 and presented in a RA Report in FY09. Warning signs were installed around the perimeter of the site. KDEP issued a tentative no further action (TNFA) letter June 4, 2009. The area is designated as industrial use and the land use is anticipated to remain unchanged in the future. The site is on the installation's RCRA corrective action permit. Periodic reviews are performed at the site. Annual LUC inspections are performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until unlimited use (UU)/unrestricted exposure (UE) is achieved.



FTK-020_DRMO FORMER WASTE OIL TANK SITE

HQAES ID: 21405.1005

Alias: FTKX-44

Regulatory Driver: RCRA-C

RIP Date: 09/15/2008

RC Date: 09/15/2051

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	02/29/1988	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	06/30/1992	01/11/2008
DES:	01/11/2008	01/11/2008
IRA:	--	--
CMI(C):	01/11/2008	09/15/2008
CMI(O):	09/15/2008	09/15/2051
LTM:	--	--

Site Narrative: FTK-020, the former DRMO Waste Oil Tank site is located in the vicinity of Building 2952 off of Frazier Road. Aerial photographs indicate that the site was used as early as 1964 as a storage yard for Army vehicles, scrap metals, shell casings and drums. The site formerly contained a 12,000-gallon underground storage tank (UST) that stored waste oil. The site was identified in the RFA for the installation as a SWMU. The RFA recommended that the tank be removed, and the site cleaned up. According to cleanup documents, from 1978 to 1985 the unit was used to store waste oil collected from smaller tanks on the post until removed by a contractor. Beginning in 1987 the unit was used by a waste oil contractor that was allowed to drain water from his load before leaving post. Within the DRMO storage area, which is approximately 16 acres, there were five formerly identified SMWUs that were potential source areas of contamination. These SWMUs are SMWU FTK-019 (Former DRMO Hazardous Waste Storage Area, Buildings 2947 and 2949), FTK-020 (also designated FTK-015C, Former DRMO Waste Oil Tank Site which was temporarily replaced by FTK-044), FTK-017N (an oil/water separator((OWS)), FTK-017BD (another oil/water separator) and FTK-032 (Transformer Storage Building 2953). The tank and associated OWS (FTKX-017BD) were removed in July 1990. Due to the types of contamination, the site was removed from UST regulatory requirements, picked up as a RCRA regulated SWMU in FY99, and assigned SWMU number FTKX-44. It was grouped into SWMU Group #6 in the 1997 RCRA permit. Multiple investigations were completed at the site and was included in a Sitewide Karst Monitoring Program. Investigations suggest that surface drainage flows into a karst window southwest of the site. Elevated levels of grease and oil persist in the soil at depths greater than 30 feet. Soil samples collected from the site indicated the presence of petroleum hydrocarbons, metals, and Polycyclic Aromatic Hydrocarbons (PAH). No single definitive source for contamination has ever been identified. The CMS was completed in FY07, and the selected alternative consisted of LUC, maintenance of the gravel cover, long-term inspections and maintenance, and groundwater monitoring. KDEP tentatively approved the CMS Jan. 11, 2008, and was made final after public notice. In the 2009 RCRA permit, the former waste storage area FTK-044 was granted a TNFA and certified closed, with long-term monitoring required. All monitoring activities take place under site name, FTK-020. Periodic reviews are performed at the site, along with groundwater monitoring, and annual LUC inspections performed and documented in the Fort Knox annual reports. Current monitoring frequencies are captured in the Draft/Final 2017 Annual Report on LTM and CMI(O) at sites FTKX-01, FTKX-10, FTK-011, FTKX-15D, FTK-

020, FTKX-21, FTKX- 22, and FTKX-40) that was approved by KDEP Feb. 11, 2019. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-01_CLOSED LANDFILL (9TH AND WILSON)

HQAES ID: 21405.1009

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 09/30/2005

RC Date: 09/30/2051

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	08/31/1986	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	05/31/1989	08/24/2004
DES:	08/24/2004	03/07/2005
IRA:	--	--
CMI(C):	03/07/2005	09/30/2005
CMI(O):	09/30/2005	09/30/2051
LTM:	--	--

Site Narrative: The Closed Landfill (CLF) is located in the southeastern quadrant of the cantonment area southwest of the intersection of 9th Avenue and Wilson Road. Available historical information, including aerial photographs and old topographic map records, indicate that the landfill was active from the 1940s until 1950. Information from source-characterization activities confirmed that the landfill contents consisted of primarily inert industrial and sanitary wastes, including paper/cardboard, wood, construction debris, metal (including automotive parts), and household debris (cans, bottles). Coal fines, slag, and flash were confirmed in some of the trenches. The landfill is located over a broad sinkhole. Some leachate has been noted in a spring near the southeast corner of the landfill (Satan's Cave); however, groundwater has been traced to Rushing Spring. The CLF was identified as a SWMU in the RFA and in the installation's RCRA permit. The results of three phases of the RFI indicated potential risk to human health from contaminants in surface soil, subsurface soil, groundwater, surface water, and sediment and to the environment from contaminants in surface soil and sediment. Remedial levels were developed for all human health contaminants of concern (COC). The corrective measures study (CMS) was completed in FY03, and the selected alternative consisted of- surface soil and sediment consolidation, LUCs, 12-in. landfill-gas-collection layer, a 12-in. clay cap and 12-in. topsoil/vegetated cover, and monitoring of groundwater, landfill gas, surface water, and sediment. KDEP approved the CMS Aug. 24, 2004. Remedial actions were completed in FY05 and presented in a RA Report. While monitoring results demonstrate that the landfill cap is effective there are still contaminants that are above cleanup goals in the groundwater and sediment. In prior years, the site was reported as beginning in the LTM phase in FY06, but due to cleanup goals not being achieved, the site is currently in the CMI(O) phase in accordance with the DERP Manual Number 4715.20, March 9, 2012, Sec. 4.b.(12). Periodic reviews are performed at the site, groundwater monitoring, and annual LUC inspections performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-02_RESIDENTIAL LANDFILL

HQAES ID: 21405.1010

Alias: #

Regulatory Driver: RCRA-D

RIP Date: 05/31/2001

RC Date: 05/31/2001

RC Reason: Completed, No Cleanup Required

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	08/31/1986	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	10/31/1994	05/31/2001
DES:	--	--
IRA:	--	--
CMI(C):	--	--
CMI(O):	--	--
LTM:	09/30/2001	09/15/2051

Site Narrative: Site FTKX-02, the closed Residential Landfill, is located north of the cantonment area bounded by Baker Road on the north and by Brandenburg Station Road on the west. It has two components. The lower landfill comprises the entire landfill footprint and was used from 1953 until November 1984; it is of trench and fill construction. The overlying area-type lined landfill was used from 1984 until 1992; it covered approximately two-thirds of the lower trench and fill landfill. Both landfills were used for disposal of residential and installation solid waste consisting of asbestos, construction debris, large inert objects, petroleum, oil and lubricants contaminated soil, grit and grease, rinsed empty pesticide containers, and infectious/pathological wastes (bandages, dressings, glass, metal, dead animals, sewage treatment plant sludge, and pentachlorophenol treated wood). The residential landfill is overlain by a newly constructed construction and demolition debris (C/DD) landfill in the northeastern portion of the residential landfill. The combined landfills occupy approximately 285 acres of permitted area with 42 acres of residential waste and 27.4 acres of C/DD waste. The site was investigated to assess the potential for groundwater contamination from the underlying pre-1984 trench-type landfill. This site was identified as a SWMU in the RFA and was listed in RCRA Part B permit signed Jan. 21, 1997. The initial groundwater monitoring system consisted of five monitoring wells installed around the landfill. A first quarter sample analysis in 1993 indicated contamination in one of the five wells; the contaminants were lead and benzene. A groundwater assessment plan, including a dye trace study and the construction of new wells, was implemented. Dye trace work plans were approved and KDEP issued a permit to allow placement of a C/DD landfill over a portion of the old landfill. In FY98 the state approved the final conduit flow study (dye tracing) report and reviewed the draft diffuse flow study (monitoring well) report. In FY99, six new wells were installed, the five old wells were decommissioned, and a conduit mapping report was completed and submitted. In FY00 the final groundwater monitoring plan was submitted, and baseline groundwater characterization was initiated. In FY01 the final well installation and decommissioning report was submitted, as well as the first through fifth quarterly monitoring letters. In FY02 KDEP approved the groundwater monitoring plan with the stipulation that monitoring be increased to bi-quarterly to accommodate high and low flow conditions each quarter. The evaluation of eight baseline monitoring events indicated no significant issues with organic (COCs) but did identify significant background issues with metals and indicator parameters. Consequently, Fort Knox requested an extension of the baseline period by eight events to characterize those influences. Six

monitoring events were conducted in FY02 and eight events in FY03. Activities accomplished in FY04 included two baseline monitoring events (and associated quarterly reporting to KDEP), a baseline summary report, and six detection-mode monitoring events. Monitoring continued and in FY11, KDEP put the facility into assessment and in FY12, a Groundwater Assessment Plan was submitted to KDEP. In FY13, the Groundwater Assessment Report (GWAR) was submitted to KDEP, deficiencies were addressed, and the GWAR was approved Jan. 28, 2019. The Solid Waste Permit, sw04700058, sw04700054, sw04700008, effective Nov. 13, 2010, requires quarterly monitoring of six wells and one spring. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-10_WWTP SLUDGE LAGOONS (2)

HQAES ID: 21405.1017

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 03/15/2009

RC Date: 06/15/2009

RC Reason: All Required Cleanup(s) Completed

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	08/31/1986	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	05/31/1989	11/28/2007
DES:	11/28/2007	03/31/2008
IRA:	--	--
CMI(C):	03/31/2008	03/15/2009
CMI(O):	03/15/2009	06/15/2009
LTM:	06/15/2009	06/15/2051

Site Narrative: FTKX-10, the WWTP Former Sludge Lagoons (FSL) were part of the former WWTP located in the south-central portion and along the eastern perimeter of the cantonment area. The FSLs were in use from 1942 to 1960 and received partially treated sewage and other wastes from the WWTP, allowing the sludge waste to dry. Use of the FSLs were discontinued in 1960 when 17 SDBs (FTK-011) were placed into operation. In 1980, sludge was removed from the western lagoon and the lagoon was backfilled using construction debris and soil. The lagoons are not lined. Improper disposal of petroleum, chemicals, solvents, pesticides, and other compounds directly into the lagoons via sewer outfalls or direct discharge into the lagoons is suspected to have resulted in the release of contaminants into the lagoon surface waters and sediments. The FSLs were included in FTK-010A & B with the description of the releases being openings were cut into the southwest dike of these lagoons which allowed the contents of the lagoons to drain out towards Mill Creek. Both the FSLs and WWTP SDBs were investigated concurrently. Historical data and the results of three phases of RFIs provided information on the nature and extent of soil contamination. The RFIs indicated potential risk to human health from elevated metals, pesticides, and semi-volatile organic compounds in surface and subsurface soil. This corrective measures study (CMS) was completed in FY07, and the selected alternative consisted of arsenic hot-spot removal, site regrading, and LUCs. KDEP approved the CMS Nov. 28, 2007. The selected remedial action for the SDB and FSL site included the following elements- excavating surface soil hot-spots with elevated arsenic concentrations, off-site disposal of excavated soil, collecting confirmatory samples from hot-spot areas, grading the Beds and Lagoons to eliminate future use, restricting land use (by industrial designation), posting warning signs, and inspection and maintenance of the site. Remedial actions (RA) were completed in FY08 and presented in a RA report in FY09. Warning signs were installed around the perimeter of the site. KDEP issued a TNFA letter June 4, 2009. The area is designated as industrial use and the land use is anticipated to remain unchanged in the future. The site is on the installation's RCRA corrective action permit. Periodic reviews are performed at the site. Annual LUC inspections are performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-21_BOATWRIGHT MAINT AREA NR BLD 277

HQAES ID: 21405.1027

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 12/07/2007

RC Date: 12/07/2051

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	09/30/1986	01/31/1987
CS:	02/15/1987	03/15/1987
RFI/CMS:	05/31/1989	04/17/2007
DES:	04/17/2007	04/17/2007
IRA:	04/17/2007	04/17/2007
CMI(C):	12/07/2007	12/07/2007
CMI(O):	12/07/2007	12/07/2051
LTM:	--	--

Site Narrative: FTKX-21 the former Spent Solvent Storage Area, is located within the Boatwright Maintenance Area near Frazier Road, at the northern boundary of the cantonment area. This area was used for the storage of chlorinated solvents, caustics, petroleum-based fluids, and acids, and is currently used for the storage of lubricants. The site consists of a fenced, bermed 2,500 square foot concrete pad. Surface runoff from the site is directed to a catch basin connected to an OWS. In the past, immiscible-phase liquids were directed to an UST, and aqueous discharge was directed to a storm drain that passes beneath Frazier Road to the north. The UST is no longer present, and records of its removal are not available. The OWS is still present and functional. Materials were typically stored in 55-gal drums. Leaks and spills may have occurred, but records are not available. Presently, the site is used to store various petroleum-based materials associated with the Boatwright Maintenance Area. The site was identified in the RFA and listed as SWMU FTK-021. Spent solvent storage was discontinued at this site in 1987. Historical data and the results of three phases of RFIs provided information on the nature and extent of soil contamination. Tetrachloroethene (PCE) and trichloroethene (TCE) were identified as contaminants of concern in groundwater. In 2007, the CMS and Decision Document (DD) selected a corrective action of biostimulation and bioaugmentation in the high-concentration portions of the plume, monitored natural attenuation (MNA) for the low-concentration portions of the plume, and institutional controls (IC) to maintain industrial land use. Groundwater monitoring was specified to evaluate the effectiveness of the remedial efforts. PCE and TCE concentrations in groundwater have decreased to concentrations near or below remedial action (RA) levels at most monitoring wells on site, and the interim measure (IM) of biostimulation and bioaugmentation has been largely effective for groundwater at those wells. However, the IM has not been effective at well MW-BW13, located within the contaminant plume downgradient of the former source area. TCE concentrations at that well fluctuate above and below the RA level and have not changed significantly since 2003. In the 2017 Annual Report (FPM 2018) additional injections were recommended in accordance with the IM Work Plan, targeting groundwater at well MW-BW13. This recommendation was approved by KDEP in February 2019 and injections activities were completed by Oct. 22, 2019. The site is on the installation's RCRA corrective action permit. Periodic reviews are performed at the site. Annual LUC inspections are performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.



FTKX-22_BLD T-112 UST PESTICIDE

HQAES ID: 21405.1028

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 03/14/2013

RC Date: 09/15/2051

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	09/30/1986	02/28/1989
CS:	03/15/1989	04/15/1989
RFI/CMS:	05/15/1989	03/14/2013
DES:	03/14/2013	03/14/2013
IRA:	08/02/2007	03/14/2013
CMI(C):	03/14/2013	03/14/2013
CMI(O):	03/14/2013	09/15/2051
LTM:	--	--

Site Narrative: FTKX-22 is a former pesticide rinse tank site located behind Building 112 in the southern part of the cantonment area. Building 112 was used as an automotive maintenance facility, and later was used for mixing and formulation of insecticide and rodenticide solutions. The site was identified in the RFA and listed as SWMU FTK-022. An UST that collected the pesticide rinseate and associated piping was removed in 1988. Excavated soil from the tank pit contained elevated concentrations of chlordane, which prompted the removal and off-site disposal of 180 cubic yards of contaminated soil. Historical data and the results of three phases of RFIs have provided information on the nature and extent of soil contamination. The identified site related COCs in groundwater are primarily PCE and TCE, and their degradation products. The presence of TCE in high concentrations cannot be directly attributable to past practices associated with FTKX-22. It is possible that past practices in the area contributed to the contamination of the soil and groundwater at the site. The residuum TCE in deep subsurface soil is contributing to the contamination in the groundwater through migration to groundwater. The observed soil concentrations are not suggestive of the former pesticide rinse tank site being the source of contamination. Groundwater flow has been determined through multiple dye trace tests from the site. COCs were detected at Gold Vault Spring (SP-250). A CMS and DD were both finalized in 2007. The CMS recommended biostimulation, bioaugmentation, MNA, and interim ICs to address contamination in groundwater. The biostimulation and bioaugmentation IM were implemented in 2007. Groundwater monitoring was included in the remedy to evaluate the effectiveness of remedial efforts and MNA. Since 2007, groundwater samples have been collected from monitoring wells and Gold Vault Spring. Sampling data suggest that although geochemical indicators suggest reductive dechlorination is occurring at the site, concentrations of TCE and its degradation products in groundwater have rebounded above RA levels, suggesting that MNA processes are not occurring completely. The site is on the installation's RCRA corrective action permit. Periodic reviews are performed at the site. Annual LUC inspections are performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-40_UST 1473-A SITE CLOSURE

HQAES ID: 21405.1045

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 03/13/2006

RC Date: 03/13/2051

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	04/30/1993	06/30/1993
CS:	07/15/1993	08/15/1993
RFI/CMS:	01/31/1994	03/13/2006
DES:	03/13/2006	03/13/2006
IRA:	--	--
CMI(C):	03/13/2006	03/13/2006
CMI(O):	03/13/2006	03/13/2051
LTM:	--	--

Site Narrative: Site FTKX-40 (UST 1473A) is the location of a former 10,000-gallon gasoline UST. The site is a former gasoline fueling station and is located between Chaffee Avenue and Knox Street in the main cantonment area. The UST was installed in 1947 and was used until 1986. A nearby 2,000-gallon diesel UST (UST 1473B) was used to store diesel fuel. Both USTs were removed in 1992, and the tanks appeared to be in good condition. The tank excavation went 16 feet below ground surface. A UST closure was performed in 1992 in accordance with KDEP UST regulations (SAIC 2005). Several previous site investigations have been conducted (Ogden 1995; SAIC 2000a, 2004, 2005). The UST contained low levels of chlorinated solvents. Site FTKX-40 was investigated under the Fort Knox RCRA corrective action permit and regulated by the KDEP Hazardous Waste Branch, rather than the KDEP UST program. However, KDEP UST classification guidelines were used as guidance in assessing the nature and extent of contamination. Benzene, toluene, ethylbenzene, and xylenes (BTEX), TCE, and 1,2-DCA were identified as COCs for groundwater. BTEX, TCE, and 1,2-DCA were not detected in groundwater in a deep bedrock monitoring well (MW-07). A DD for Site FTKX-40 selected an IM of MNA and interim ICs with semi-annual groundwater monitoring (USAEC 2007d). LUCs for Site FTKX-40 include categorical land use restrictions, restrictions on groundwater use and installation of wells, and access controls (warning signs). LUC inspections were required annually and have not been conducted since 2008. Groundwater sampling has been conducted semiannually at three wells (MW-01, MW-06, MW-07). MW-05 was sampled semiannually in 2016, 2017, and 2018. Groundwater samples were collected and analyzed for volatile organic compounds. The 2014 Annual Report (FPM 2015) noted that benzene in groundwater had not decreased below remediation goals in all wells. The following modifications were recommended in that report- Add analysis of the following parameters that will allow an evaluation of whether aerobic biodegradation of benzene is occurring in the plume; nitrate, nitrite, sulfate, manganese, and field measurement of ferrous iron. Add groundwater sampling at MW-05, which may be a downgradient well if groundwater flow direction is radially away from the location of the former UST. These recommendations were approved by KDEP in a letter dated March 7, 2016 (KDEP 2016) and were implemented beginning in the first quarter of 2016. The 2016 Annual Report (FPM 2017) found that benzene concentrations remained elevated in downgradient well MW-06, demonstrating that the downgradient edge of the benzene plume was not being monitored. The following modification was recommended in that report- Install one additional groundwater monitoring well southwest of

downgradient from MW-06, to determine the downgradient extent of benzene contamination in groundwater. This recommendation was approved by KDEP in a letter dated Jan. 10, 2018. The monitoring well was installed in 2019. The following modification was recommended in the 2017 Annual Report (FPM 2018). The remedial decision should be reevaluated, and a new IM should be performed to be in accordance with RCRA permit condition IV.F. The modification was approved by KDEP in a letter dated Feb. 11, 2019. Per the approved modification, a new IM will be developed, using the data obtained from the new well installed in 2019 and the revised conceptual site model. It is anticipated that a minimum of two sampling events will be needed to update the conceptual site model. The site is on the installation's RCRA corrective action permit. Periodic reviews are performed at the site. Annual LUC inspections are performed and documented in the Fort Knox annual reports. The cleanup/exit strategy at the site is to continue monitoring, reporting, LUCs, and periodic reviews until UU/UE is achieved.

CCFTK-103_Multiple Heating Fuel UST Reme

HQAES ID: 21405.1076

Alias: #

Regulatory Driver: RCRA-I

RIP Date: 09/15/2016

RC Date: 09/15/2016

RC Reason: Other

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
PA:	09/30/2007	12/31/2007
SI:	12/31/2008	07/31/2009
RI/FS:	12/31/2009	09/15/2016
RD:	--	--
IRA:	--	--
RA(C):	--	--
RA(O):	--	--
LTM:	09/15/2016	09/15/2051

Site Narrative: Part of the Fort Knox UST program in the past was to close numerous state exempt petroleum tank systems, some of which were heating oil tanks. Many of these sites met the applicable soil limits during closure and received an NFA letter from the state; however, some of the sites required further remediation in order to meet applicable soil levels. Analytical tests of soil samples taken during the removal action indicated that the sampling results did not meet the preliminary remediation goals for PAH at many of these sites. In FY08, the heating fuel UST cleanup program was created to investigate 55 UST sites. In 2009 additional sampling was conducted and analyzed. Based on analytical tests of soil samples during this sampling event, it was determined that over-excavation, confirmatory sampling, and submittal of a closure report were required to close out 26 of these 55 sites. The 55 sites are as follows- 17.1, 17.2, 17.3, 580.1, 608.1, 609.1, 889.1, 1118, 1173, 1468, 1475, 1479, 1483, 1486, 1535, 1537, 1797, 2001, 2010, 2373, 2723, 2730, 2763.1, 2766.2, 2780, 2786.1, 2959, 2963.1, 2974.1, 4238.1, 4769, 5222, 5542, 6117, 6544, 6548, 6553, 6577.1, 6590, 6901, 7238.1, 7342.1, 7342.2, 7342.3, 7423.1, 7425.1, 7474.1, 9189, 9244, 9261, 9297.2, 9297.3, 9298.1, 9298.4, and 9661. The 26 that needed additional work were 17, 1118, 1173, 1468, 1483, 1486, 1537, 1797, 2001, 2373, 2723, 2959, 4769, 5222, 6544, 6548, 6553, 6590, 6901, 9189, 9244, 9261, 9297.2, 9297.3, 9298.1, and 9298.4. Upon completion, a NFA was achieved at all sites with the exception of sites 7342.1, 7342.2, 7342.3, 1118, 1483, 1486, and 6901. Regulated UST sites 7342.1, .2, and .3 required additional investigation to determine the extent of contamination; therefore, a new site was created; CCFTK-7342 (21405.1078). Four heating fuel USTs have not received clean closure due to the close proximity of buildings and utilities- sites 1118, 1483, 1486, and 6901. Complete closeout cannot be achieved due to proximity of buildings and/or utilities to each site. This site will be included on the next Periodic Review and future Periodic Reviews. These former heating fuel USTs sites appear on the installation's environmental LUC geographic information system (GIS) layer. The site's underway work will be performed by government employees (e.g., maintaining/recording/reporting on LUCs. The cleanup/exit strategy at the site is to continue LUCs until building and or utilities are moved.

CCFTK-7342_UST 7342.1 .2 .3

HQAES ID: 21405.1078

Alias: #

Regulatory Driver: RCRA-I

RIP Date: 09/30/2019

RC Date: 09/30/2019

RC Reason: All Required Cleanup(s) Completed

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
RFA:	10/15/1997	10/15/1998
CS:	07/15/2011	03/09/2016
RFI/CMS:	01/04/2017	09/12/2019
DES:	--	--
IRA:	--	--
CMI(C):	09/01/2019	09/30/2019
CMI(O):	--	--
LTM:	09/30/2019	09/30/2051

Site Narrative: The CCFTK-7342 Site is located at the southwest corner of Ninth Avenue and Wilson Road, in the southeast quadrant of the Fort Knox cantonment area. The Site CCFTK-7342 fueling system, used primarily for fueling military vehicles and equipment, was originally installed in 1963 and consisted of two 12,000-gallon diesel USTs, one 12,000-gallon gasoline UST (designated 7342.1, 7342.2, and 7342.3, respectively) and associated piping that serviced three pump islands. The CCFTK-7342 piping and pump islands were removed in 1997 and the USTs were removed in 1998 along with an unknown volume of soil over-excavated from the tank pit. Documentation from these activities demonstrated that some concentrations of COCs- BTEX and PAH remained in the soil after excavation. The former UST pit area was not closed following the UST closure guidance and Fort Knox EMD was not able to secure NFA status from KDEP Division of Waste Management UST Branch. Site CCFTK-7342 is located adjacent to the north boundary of the CLF, FTKX -01, which is regulated per the Fort Knox RCRA corrective action permit (KY6-210- 020-479) as Solid Waste Management Unit (SMWU) ID FTKX-01. Prior to the 2018 RFI, four previous investigations of Site CCFTK-7342 (2011, 2012, 2013 and 2014) were conducted. An approved uniform federal policy – quality assurance project plan (CUES 2017) was developed in accordance with the Hazardous Waste Branch RFI guidance. The implemented RFI delineated the vertical and lateral extent of site COCs in soil and the nature and extent of COC impacts to groundwater. The fieldwork and sampling were completed in 2018. Based on the RFI findings, Site CCFTK-7342 was transferred from the Hazardous Waste Branch back to the UST Branch in November 2018. One of the requests of the transfer were to leave the monitoring wells in place and exchange one of the CLF monitoring wells for one of the CCFTK-7342 wells to be included as part of the annual monitoring of the CLF. Fort Knox and the LTM contractor agreed. A site investigation report (SIR) was prepared in accordance with UST branch guidance. A draft report was submitted to Fort Knox Environmental Management Division (EMD) and US Army Corp of Engineers for review on April 11, 2019. A Draft-final SIR was submitted on May 28, 2019, and the report was finalized in September 2019 following KDEP approval. The SIR recommended NFA status for Site CCFTK-7342 based on the following- No COC concentrations exceeding applicable screening levels were identified in groundwater, five soil investigations with a total of 115 soil borings were completed to refusal. Soil samples collected at multiple depth intervals (255 samples) were analyzed for COCs; the results were used in delineating the horizontal and vertical extent of contamination with the exception of the southern site boundary that is shared with the CLF. Delineation

of impact further to the south was constrained by the presence of the CLF cap. Groundwater flow in the vicinity of CCFTK-7342 is to the northeast, away from the CLF, and monitoring results identified only trace site related compounds, at concentrations less than the Site screening levels. The CLF long-term remedy involves maintenance of the cap, monitoring of landfill gases, monitoring of groundwater quality, and enforcement of land use controls. As such, the closure of Site CCFTK-7342 is not anticipated to alter either the soil or groundwater closure strategy for the CLF site or any other SWMU or area of contamination. On Sept. 12, 2019- KDEP issued an NFA determination for CCFTK-7342 whereby the site was formally closed under UST Branch guidelines. KDEP requires no additional actions by the Army with regard to Site CCFTK-7342. The site will be included on the next Periodic Review and reviews will be conducted at the site until UU/UE conditions are achieved. The site is catalogued in the Fort Knox Land Use Control Implementation Plan and is in the environmental land use control GIS layer. The GIS data input by Fort Knox EMD is one of the many resources the Base Master Planner will reference when developing future projects. If there a change to the land use, the risk will be re-evaluated. The cleanup/exit strategy at the site is to continue reporting, LUCs, and periodic reviews until UU/UE is achieved.

FTKX-46_PFAS

HQAES ID: 21405.1088

Alias: #

Regulatory Driver: CERCLA

RIP Date: 01/01/2025

RC Date: 01/01/2025

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: No

Phase	Start	End
PA:	09/30/2017	06/24/2019
SI:	06/25/2019	12/31/2021
RI/FS:	01/01/2022	01/01/2025
RD:	--	--
IRA:	--	--
RA(C):	--	--
RA(O):	--	--
LTM:	--	--

Site Narrative: Per direction from Deputy Chief of Staff (DCS) G9, site created to account for all per- and polyfluoroalkyl substances (PFAS) costs at the installation. Currently a PA/SI is underway to identify all releases of PFAS to the environment. The RI/FS will follow the PA/SI. Actions will be determined at the end of the RI/FS.

FTKX-45 Camp Knox Dump Site

HQAES ID: 21405.1089

Alias: #

Regulatory Driver: RCRA-C

RIP Date: 07/01/2022

RC Date: 07/01/2022

RC Reason: Not assigned

Program: ENV Restoration, Army

Subprogram: IR

NPL Status: Not assigned

Phase	Start	End
RFA:	05/01/2021	06/01/2021
CS:	--	--
RFI/CMS:	06/01/2021	07/01/2022
DES:	--	--
IRA:	--	--
CMI(C):	--	--
CMI(O):	--	--
LTM:	--	--

Site Narrative: Not part of FY21 IAP Strategy Call, Information was not captured.

SITE SUMMARY

SITE CLOSEOUT SUMMARY

HQAES ID	Site Name	Site Closeout Date
21405.1001	FTK-008_PATHOLOGICAL INCINERATOR BLDG. 8	2/28/1989
21405.1003	FTK-014_4 WATER TREAT. PLANT LIME SLUDGE	2/28/1989
21405.1004	FTK-018_2 CENTRAL WASH RACKS	2/28/1989
21405.1006	FTK-038_PCB TRANSFORMER STORAGE SITE BLD	9/30/2001
21405.1007	FTK-41A_ANDERSON GOLF COURSE	6/30/2000
21405.1008	FTK-41L_LINDSEY GOLF COURSE	6/30/2000
21405.1011	FTKX-03_STEAM GENERATOR INCINERATOR	2/28/1989
21405.1012	FTKX-04_BOILER USED TO BURN CLASSIFIED W	2/28/1989
21405.1013	FTKX-05_CLASSIFIED DOCUMENT INCINERATOR	2/28/1989
21405.1014	FTKX-06_PATHOLOGICAL INCINERATOR IRELAND	2/28/1989
21405.1015	FTKX-07_PATH INCINERATOR BLDG T-1068	2/28/1989
21405.1016	FTKX-09_WASTEWATER TREATMENT PLANT	2/28/1989
21405.1018	FTKX-12_WWTP FILTER PRESS BLDG	2/28/1989
21405.1019	FTKX-13_WWTP 3 LIME SLUDGE LAGOONS MULDR	2/28/1989
21405.1020	FTKX-15A_UST & PIPELINE REMOVALS BLDG 10	7/31/2003
21405.1021	FTKX-15B_UST'S BURK MOTOR PARK BLDG 2730	2/28/1989
21405.1022	FTKX-15C_UST SITE BUILDING 2952	2/28/1989
21405.1023	FTKX-15D_UST SITE 2823 INVESTIGATION/REM	11/8/2017
21405.1024	FTKX-16_MULTIPLE ABOVE GROUND STORAGE TA	2/28/1989
21405.1025	FTKX-17_MULTIPLE OIL WATER SEPARATORS	2/28/1989
21405.1026	FTKX-19_FORMER DRMO HW STG AREA	2/28/1989
21405.1029	FTKX-23_PCP TRANSFORMER STORAGE AREA T-6	2/28/1989
21405.1030	FTKX-24_FIRE FIGHTER TRNING AREA	9/30/2007
21405.1031	FTKX-25_RAD HOS WST STG AREA BNKER 1070	2/28/1989
21405.1032	FTKX-26_HOSPITAL SILVER RECOVERY OPERATI	2/28/1989
21405.1033	FTKX-27_DENTAL CLINIC SILVER RECOVERY OP	2/28/1989
21405.1034	FTKX-28_PHOTOGRAPHIC LAB SILVER RECOVERY	2/28/1989
21405.1035	FTKX-29_CRUMB RANGE EOD SITE	2/28/1989
21405.1036	FTKX-30_TIOGA SPRINGS EOD SITE	9/30/2007
21405.1037	FTKX-31_FORMER TRANSFORMER STG BLD 58,59	9/30/2003
21405.1038	FTKX-32_FORMER TRANSFORMER STG BLD 2953	3/31/1999
21405.1039	FTKX-33_FORMER TRANSFORMER STG PAINT SHO	9/30/2001
21405.1040	FTKX-34_FORMER TRANSFORMER STG BLD 4240	2/28/1989
21405.1041	FTKX-35_FORMER TRANSFORMER STG BLD 4019	9/30/2001
21405.1042	FTKX-36_PRINTING PLANT SILVER RECOVERY O	2/28/1989
21405.1043	FTKX-37_PARKERIZATION PROCESS AREA, BLG	1/31/1996
21405.1044	FTKX-39_ABANDONED GASOLINE LINE DISTRIB	9/30/2003
21405.1046	FTKX-41_SANDERS SPRING	6/30/1994
21405.1047	FTKX-42_TWO GOLF COURSES	2/28/1989
21405.1048	FTKX-43_OIL & GREASE PIT	7/31/1994

21405.1049	FTKX-002-R-01_CAMP CARLSON	10/31/2007
21405.1050	FTKX-001-R-01_1918 RIFLE RANGE	10/31/2007
21405.1051	PBC at Knox_PBC	10/15/2012
21405.1052	FTKX-003-R-01_Munition Debris Crypts	10/31/2008
21405.1053	CCFTK-1725_Heating Fuel UST Building 172	5/15/2010
21405.1054	CCFTK-5943_Heating Fuel UST Building 594	5/15/2010
21405.1055	CCFTK-6564_Heating Fuel UST Building 656	5/15/2010
21405.1056	CCFTK-2943_Waste Oil UST Building 2943	2/15/2010
21405.1057	CCFTK-1479_Heating Fuel UST Building 147	3/31/2009
21405.1058	CCFTK-127_Heating Fuel UST Building 127	9/30/2010
21405.1059	CCFTK-297_Heating Fuel UST Building 297	5/15/2010
21405.1060	CCFTK-1475_Heating Fuel UST Building 147	9/30/2010
21405.1061	CCFTK-2942_Waste Oil UST Building 2942	2/15/2010
21405.1062	CCFTK-2010_Heating Fuel UST Building 201	9/30/2010
21405.1063	CCFTK-1730_UST ID# 5631-047 (1730.1 and	9/30/2010
21405.1064	CCFTK-1395_UST ID# 5628-047 (1395.5)	3/15/2010
21405.1065	CCFTK-101_St John Motor Park	9/30/2009
21405.1066	CCFTK-6147_UST ID# 5991-047 (6147.1)	9/30/2008
21405.1067	CCFTK-9245_UST ID# 5720-047 (9245.2)	8/15/2008
21405.1068	CCFTK-5901_UST ID# 5978-047 (5901.1, .2,	6/15/2009
21405.1069	CCFTK-6143_UST ID# 5687-047 (6143.1)	8/15/2007
21405.1070	CCFTK-6146_UST ID# 5690-047 (6146.1)	9/30/2008
21405.1071	CCFTK-6142_UST ID# 5686-047 (6142.1)	2/15/2010
21405.1072	CCFTK-2754_UST ID#5634-047 (2754.1)	2/15/2010
21405.1073	CCFTK-2764_UST ID# 5641-047 (2764.1)	9/30/2008
21405.1074	CCFTK-479_UST ID# 5605-047 (479.1, 479.2	8/15/2008
21405.1075	CCFTKX-15B_UST'S BURK MOTOR PARK BUILDIN	12/31/2009
21405.1077	CCFTK-104_Warrior In Transition Complex	7/31/2011
21405.1079	CCFTKX-17_Removal of 2 Oil Water Separat	3/15/2013
21405.1080	CCFTK-012_WWTP FILTER PRESS BLDG - RCRA	1/31/2008
21405.1081	CCFTK-016_MULTIPLE ASTS - RCRA CA	1/31/2008
21405.1082	CCFTK-029_CRUMB RANGE EOD SITE - RCRA CA	9/30/2002
21405.1083	CCFTKX-017AK_Removal of Oil Water Separ	2/15/2014
21405.1084	CCFTK-018_TWO CENTRAL WASHRACK - RCRA CA	6/30/2002
21405.1085	CCFTK-017_MULTIPLE OIL/WATER SEPARATORS	2/28/2010
21405.1086	CCFTK-011_17 WWTP SLUDGE DRYING BEDS - R	6/30/2008
21405.1087	CCFTK-100_UST Program Cleanup	3/31/2007
21405.1096	CCFTK-2758_UST ID# 5638-047 (2758.1, 275	1/31/2010
21405.1099	CCFTK-102_Heating Fuel UST Cleanup Progr	9/30/2009

COMMUNITY INVOLVEMENT

Restoration Advisory Board (RAB) Establishment Date:
RAB Adjournment Date:
RAB Adjournment Reason:
Reasons for Not Establishing RAB: No sufficient, sustained community interest in a RAB has been expressed by the community
RAB Date of Solicitation from Community: 8/29/2017
RAB Results of Solicitation: Insufficient community interest in the past has indicated a lack of interest in establishing a RAB. In August 2017 a RAB solicitation was run in the local newspaper; Fort Knox received no comments.
Community Involvement Plan (Date Published): 5/15/2013

FIVE YEAR / PERIODIC REVIEW SUMMARY

1) Status: COMPLETE
2) Title: Final Periodic Review Report, Second Periodic Review for Fort Knox, Kentucky September 2018
3) Start Date: 7/5/2016
4) End Date: 9/29/2017
5) Status: N/A
6) Title: N/A
7) Start Date: N/A
8) End Date: N/A