HAA-15 MCA BARRACKS SITE

SAVANNAH, GEORGIA

Date: To Be Determined (TBD)

3d Inf Div (Mech)

Hunter Army Airfield Proposed Plan

This Proposed Plan identifies the Preferred Alternative for remediating the groundwater and soil impacts at the Hunter Army Airfield (HAAF) HAA-15 Military Construction Army (MCA) Barracks Site (*Figure 1)* which includes the Special Operations Forces (SOF) Investigation Area, MCA Barracks Investigation Area, Retention Pond 29, Hangar Buildings 811 and 813, the former Industrial Wastewater Treatment Plant (IWTP) and Old Hospital Area (*Figure 2)*. This plan also provides the rationale for this recommendation and includes alternative remedies that were evaluated for this site. This document is issued by Hunter Army Airfield , the responsible party for site activities, and the Georgia Environmental Protection Division (GAEPD), which oversees regulatory actions for this site. HAAF, in consultation with GAEPD, will select a final remedy after reviewing and considering all information submitted during the 30-day public comment period. HAAF, in consultation with GAEPD, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives in this **Proposed Plan**. Please note body text shown in **bold** that does not represent a section heading is defined in the glossary.

HAAF is issuing this Proposed Plan as part of its public participation responsibilities under Section 117 of the **ComprehensiveEnvironmental Response, Compensation, and Liability Act (CERCLA)** of 1980, as amended, 42 United States Code § 9617, as amended by the Superfund Amendments and Reauthorization Act, and Section 300.430(f)(ii) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (C.F.R.) § 300.430(f)(ii)**. This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation/Feasibility Study (RI/FS)** Report (Arcadis, 2019) and other documents contained in the **Administrative Record** file for this site. HAAF and the GAEPD encourage the public to review these provided documents to gain a more comprehensive understanding of the site, as well as remedial activities that have been conducted at the site.

DATES TO REMEMBER

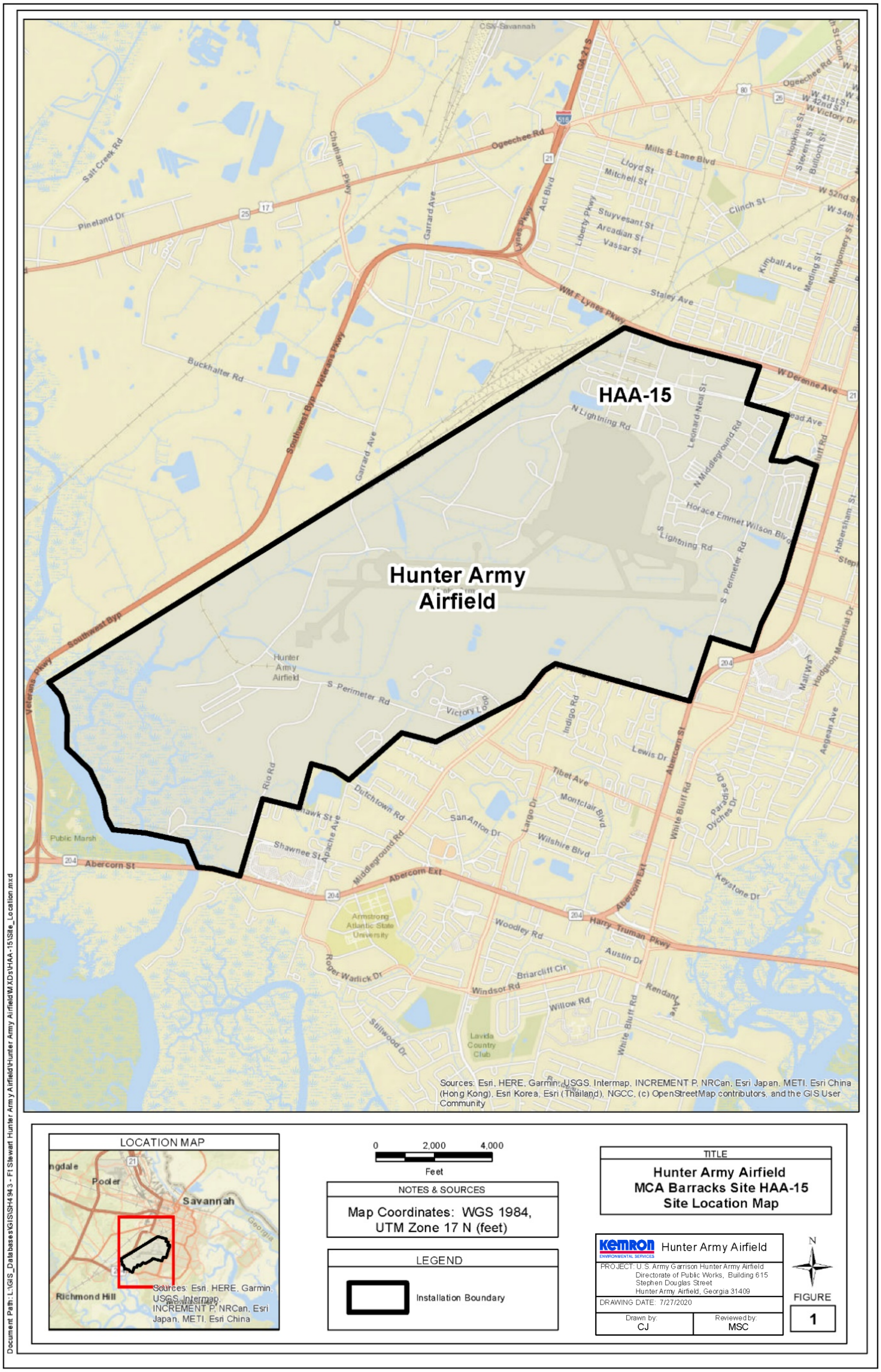
PUBLIC COMMENT PERIOD:
Date: TBD
HAAF will accept written comments on the Proposed Plan during the 30-day public comment period.

PUBLIC MEETING:
Date: TBD
6:00 p.m. – 8:00 p.m.
HAAF will hold a public meeting to clarify any questions regarding the Proposed Plan and all remedial alternatives presented in the Feasibility Study. Oral and written comments will be accepted at the meeting. The meeting will be held at the Southwest Chatham Library, located at: 14097 Abercorn Street, Savannah, GA 31419 at 6:00 p.m.

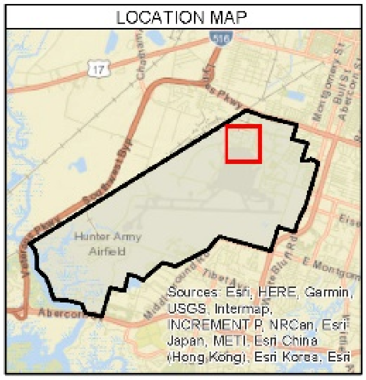
For more information, see the Administrative Record for the Site at the following location:

Fort Stewart
DPW Prevention & Compliance Branch,
1550 Veterans Parkway, Building 1137,
Fort Stewart, Georgia 31314
(912)315-5144 or (912)767-2010
Hours: Mon. – Fri. 8:00 a.m. – 4:00 p.m
Website:
https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

This Proposed Plan includes the following sections:


HAA-15
Hunter Army Airfield
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
LOCATION MAP
Pooler
Savannah
Richmond Hill
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China
0 2,000 4,000
Feet
NOTES & SOURCES
Map Coordinates: WGS 1984, UTM Zone 17 N (feet)
LEGEND
Installation Boundary
TITLE
Hunter Army Airfield
MCA Barracks Site HAA-15
Site Location Map
KEMRON ENVIRONMENTAL SERVICES
Hunter Army Airfield
PROJECT: U.S. Army Garrison Hunter Army Airfield
Directorate of Public Works, Building 615
Stephen Douglas Street
Hunter Army Airfield, Georgia 31409
DRAWING DATE: 7/27/2020
Drawn by: CJ
Reviewed by: MSC
FIGURE
1
Document Path: L:\GIS_Databases\GIS\SH4943 - Ft Stewart Hunter Army Airfield\Hunter Army Airfield\MXDs\HAA-15\Site_Location.mxd

LOCATION MAP



NOTES & SOURCES

Map Coordinates: WGS 1984, UTM Zone 17 N (feet)

LEGEND

Installation Boundary

0 400 800
Feet

TITLE

Hunter Army Airfield
MCA Barracks Site HAA-15
Site Layout

KEMRON ENVIRONMENTAL SERVICES Hunter Army Airfield

PROJECT: U.S. Army Garrison Hunter Army Airfield
Directorate of Public Works, Building 615
Stephen Douglas Street
Hunter Army Airfield, Georgia 31409

DRAWING DATE: 7/27/2020

Drawn by:	Reviewed by:
CJ	MSC

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FIGURE 2

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SITE BACKGROUND

HAAF is an active military installation located in Savannah, Georgia, with areas of industrial, commercial, and temporary residential properties occupied by a variety of administrative, maintenance, and barracks facilities. HAA-15 is located in the northeastern portion of HAAF. The facility includes an active air field and a 10- acre man-made storm water retention pond. A site map depicting approximately where the HAA-15 area is located within the boundaries of the Installation is included as *Figure 1* and the investigation areas that comprise HAA-15 are shown on *Figure 2*. Facility locations with **constituents of potential concern** (**COPCs**) currently and formerly located in the investigation areas are described below. A full list of COPCs is provided on Page 7.

HAA-15 AREAS OF INVESTIGATION

Special Operations Forces Investigation Area

Prior to the construction of a proposed new SOF facility, **volatile organic compounds (VOCs)** in groundwater were discovered in 1996 when the United Sates Army Corps of Engineers (USACE) collected soil and groundwater samples at the proposed location. The location of the proposed SOF facility, labeled as “Special Forces Investigation Area”, is shown on *Figure 2*. The sampling results indicated that trichloroethene (TCE) and tetrachloroethene (PCE) were present in groundwater at concentrations exceeding their respective primary drinking water standards. Cis- 1,2- dichloroethene (cis-1,2-DCE) was also detected in two groundwater samples.

In September 1999, four shallow monitoring wells (less than 20 feet below ground surface (ft bgs) were installed at the SOF facility. The wells were installed at locations based on data from the temporary points sampled in 1996. Groundwater samples were collected from the four monitor wells for the analysis of VOCs, **semi-volatile organic compounds (SVOCs)**, and metals. The sampling results confirmed the presence of organic contaminants that had been detected in 1996, including TCE, cis-1,2-DCE, PCE, 1,2-dichloroethane, 1,3- dichloroethene, bis(2-ethylhexyl)phthalate, and chloroform. TCE and bis(2-ethylhexyl)phthalate were the only constituents detected above the US Environmental Protection Agency (USEPA) **Maximum Contaminant Levels (MCLs**) (USEPA, 2020).

MCA Barracks Investigation Area

The MCA Barracks Investigation Area was identified as an area of concern in 1998 during an environmental assessment prior to the construction of new barracks. The location of the barracks facility, labeled as “MCA Barracks Investigation Area”, is shown on *Figure 2*. The investigation was conducted by the USACE-Savannah District and consisted of six composite soil samples and 12 groundwater samples. The groundwater samples were collected from temporary wells at a screened depth of 9.8 to 13.1 ft bgs. The results of the groundwater sampling indicated the presence of TCE at three locations, naphthalene at one location, and acetone at another location. Only TCE was detected at concentrations exceeding the USEPA MCL.

USACE conducted an additional site investigation in May 1998 to further investigate the groundwater impacts at the MCA Barracks Investigation Area. Groundwater samples were collected from temporary wells screened across the water table. TCE was detected at five locations above the USEPA MCL at concentrations ranging from 5.9 µg/L to 160 µg/L. Cis-1,2-DCE was detected at low levels in two groundwater samples.

Supplemental sampling of groundwater was conducted between 1999 and 2001. The vertical VOC profiling of groundwater was conducted by collecting samples using direct push technology (DPT). Fifteen vertical profile borings were sampled every 5 ft from the water table to a depth of 45 to 50 ft bgs for laboratory analysis. Ten borings were sampled at 5-ft intervals from the water table to a total depth of 36 to 45 ft bgs for approximately three samples at each location selected and submitted for laboratory analysis. Several VOCs were detected in groundwater samples with TCE exceeding the USEPA MCL in numerous samples. In addition to TCE, cis-1,2- DCE was also detected at levels that exceeded the USEPA MCL.

In 2002 and 2003, additional groundwater sampling was conducted for delineation of VOCs. These investigations included installation of 13 vertical-profile borings. Groundwater was sampled every 5 ft to a total depth of approximately 45 ft for analysis of VOCs. Approximately eight samples were collected from each boring. VOCs were detected in eight of the 13 borings in samples collected between 10 ft bgs and 45 ft bgs. TCE, cis-1,2- DCE, and vinyl chloride (VC) were detected above their respective USEPA MCL.

Retention Pond 29

As part of the site investigation activities, surface water samples were collected from storm water Retention Pond 29 in October 2005. The location of Retention Pond 29 is displayed on *Figure 2*. Six samples were collected from the surface water entering the pond from the impacted side (east). No VOCs were detected in surface water above laboratory method detection limits. Based on these results and the shallow groundwater results, it does not appear that groundwater impacts near the pond are affecting surface water quality.

Sediment samples were collected from Pond 29 in October 2005 and February 2006. Nine sediment samples were collected from different portions of the base of the pond. There were no VOCs detected above laboratory method detection limits, except for 2-butanone, acetone and dichlorodifluoromethane (Freon-12).

The maximum detected concentrations of these compounds (0.023 milligrams per kilogram [mg/kg], 0.78 mg/kg and 0.011 mg/kg, respectively) were below their respective USEPA Residential Soil Screening Levels. Based on the sediment sampling results, it does not appear that groundwater impacts near the pond are affecting sediments.

Aircraft Hanger Buildings 811 and 813

Buildings 811 and 813 are located to the south of the SOF and MCA Barracks Investigation Areas. TCE was utilized as a cleaner and solvent as part of operations in the buildings, and they were investigated for potential source area contamination. Investigation events consisted of soil characterization, groundwater well installation, and sampling.

In 2007, HAAF sampled liquids in a grease trap connected to Hangar Building 811. The sampling results indicated that elevated concentrations of TCE, cis-1,2- DCE and VC (65,000, 39,000 and 6,600 µg/L, respectively) were present in the liquid. All liquids from the grease trap were subsequently removed, and the grease trap was partially removed on April 12, 2007. Isolated detections of benzene and 1,1-Dichlorethene (1,1-DCE) were found in groundwater monitoring wells around Buildings 811 and 813 in 2014. Benzene was not detected in the same well in the following sampling event, and 1,1-DCE exceeded the **Residential Screening Level (RSL)** in one well. The locations of Aircraft Hanger Buildings 811 and 813 are shown on *Figure 2*.

Former Industrial Waste Treatment Plant and Wash Racks

The former Industrial Waste Treatment Plant (IWTP) and Wash Racks (*Figure 2*) were investigated as potential source areas for TCE groundwater contamination at HAA-15. During groundwater investigations conducted in 2006, TCE was detected at a concentration of 5.9 µg/L at a sample collected 30 ft bgs in the former IWTP area.

In the aircraft wash rack area, TCE and cis-1,2-DCE were detected at 76 µg/L and 140 µg/L, respectively, in samples collected at 30 ft bgs. Additionally, Cis-1,2-DCE was detected at 29 µg/L in a 16-ft bgs sample. Other petroleum-based VOCs (xylenes, n-propylbenzene) were detected in samples collected from the groundwater sample locations, but only methylene chloride (6.4 µg/L at 45 ft bgs) was above the USEPA MCL.

Old Hospital Area

The Old Hospital Area (*Figure 2*) is located to the west of the SOF and MCA Barracks Investigation Areas. Soil samples were collected in 2006 at locations near the Old Hospital Area. A soil sample collected near the Old Hospital Area Boiler Room was analyzed for SVOCs and metals. Among various SVOC detections, the only SVOC detected above the applicable USEPA residential soil screening level was benzo(a)pyrene at an estimated concentration of 0.41 mg/kg. Several metals were also detected. All were below USEPA residential soil and site- specific background concentrations, except for arsenic at 2.7 mg/kg and mercury at 1.4 mg/kg in a duplicate sample, where the parent sample concentration was an estimated concentration of 0.7 mg/kg. Due to these exceedances, locations to the north, south, east, and west were sampled. Arsenic was detected above the site-specific background concentration in two samples at 2.7 mg/kg and 7 mg/kg, but these exceedances were delineated in the 2006 study. Mercury was not detected above the **RSL** in any other samples. Lead was detected above the USEPA residential soil screening level at an estimated concentration of 5,300 mg/kg. Further investigations conducted in 2009 delineated lead impacts to the east and south of the Old Hospital Area.

SITE CHARACTERISTICS

HAAF field investigations were conducted from 1996 to 2017 at HAA-15 to delineate the extent of COPC concentrations in soil, groundwater, surface water, sediment, and vapor that may have resulted from historical use of the site. Particularly, areas north of Aircraft Hangar Building 811, the former IWTP and the wash racks to the northeast of Building 850, and The Old Hospital Area were targeted areas of investigation for source area contamination within the site. Additionally, site wide investigations were conducted to characterize the extent of contamination at HAA-15.

Results from the groundwater investigations identified Hangar 811, the aircraft wash racks and former IWTP adjacent to Building 850 as source areas for TCE. The locations of Hangar 811 and the former IWTP are shown on *Figure 2*.

Additionally, soil investigations identified impacts exceeding USEPA **RSL** within the eastern and southern portions of the Old Hospital Area.

The results of these investigations are sufficient to identify the COPCs, delineate their nature and extent, complete a human health and ecological risk assessment, and develop appropriate remedial measures to address them.

Based on monitoring data collected to date, target COPCs identified in groundwater are:

- TCE and its daughter products cis-1,2-DCE and VC
- Isolated detections of, benzene, 1,1-DCE.

TCE plumes in the shallow and deep zones of the shallow aquifer at HAA-15 are shown on *Figures 3 and 4*, respectively. The extent of TCE adequately represents the area of all chlorinated solvents at HAA-15.

Based on soil data collected to date, the target COPCs in soil are:

- Lead and Arsenic in surface soil in the Old Hospital Area
- **Polycyclic Aromatic Hydrocarbons (PAHs),** particularly benzo(a)pyrene in soil in the Old Hospital Area

SCOPE AND ROLE OF ACTION

This proposed action as described in the following sections, will be the final action for this site. The **Remedial Action Objectives (RAOs)** for HAA-15 are to prevent exposure of potential receptors to contaminants through soil, groundwater, surface water, and sediment by the utilization of treatment through the alternative solutions provided in this Proposed Plan. Response actions are focused on groundwater and soil which present the primary risks at the site. This will result in the permanent reduction of toxicity, mobility, and volume of source contaminants at HAA-15.

SUMMARY OF SITE RISKS

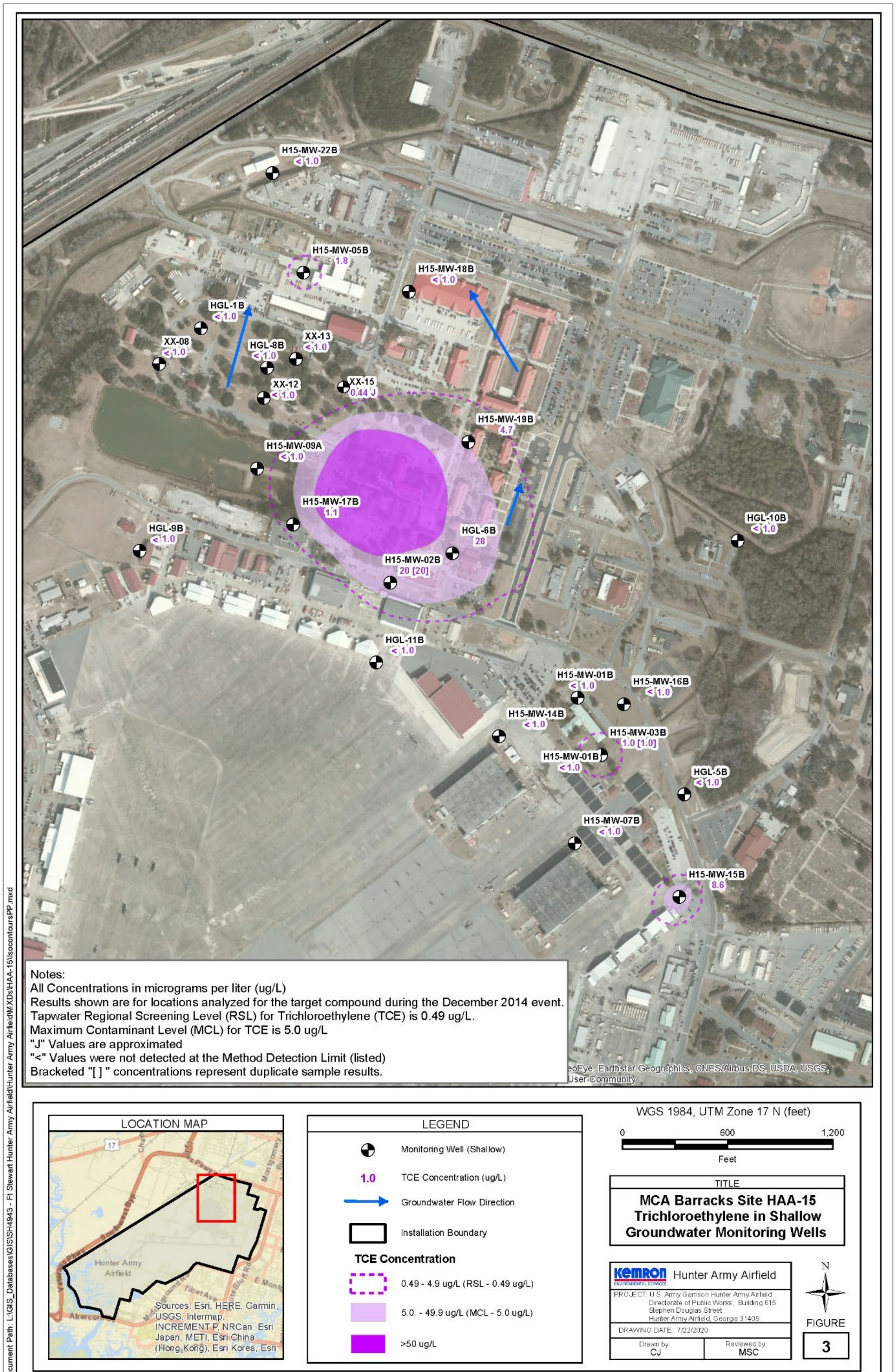
As part of the RI/FS, HAAF conducted a baseline risk assessment to determine the risk from current and future contaminants on human health, as well as the environment. A Human Health Risk Assessment (HHRA) was completed to evaluate the potential risks to human health at HAA-15. It is HAAF’s current judgement that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect human health or the environment from actual or potential risks from contaminants at the site.

Under current conditions, the following potential threats to human health from impacted groundwater were identified:

- Site Workers (Adults):
  - Ingestion of constituents in groundwater;
  - Dermal contact with constituents in groundwater; and
  - Inhalation of vapors from groundwater.
- Construction Workers (Adults):
  - Ingestion of constituents in groundwater;
  - Dermal contact with constituents in groundwater; and
  - Inhalation of vapors from groundwater.

Exposure to lead in soil posed a potential risk to:

- Hypothetical future residents (Adults and Children; surface soils):
  - Dermal contact with constituents in soil; and/or
  - Ingestion of constituents in soil.
- Utility Workers (Adults; surface/subsurface soils):
  - Dermal contact with constituents in soil; and/or
  - Ingestion of constituents in soil.


H15-MW-22B
< 1.0
H15-MW-05B
1.8
H15-MW-18B
< 1.0
HGL-1B
< 1.0
XX-08
< 1.0
HGL-8B
< 1.0
XX-13
< 1.0
XX-12
< 1.0
XX-15
0.44 J
H15-MW-19B
4.7
H15-MW-09A
< 1.0
H15-MW-17B
1.1
HGL-6B
28
HGL-9B
< 1.0
H15-MW-02B
20 [20]
HGL-10B
< 1.0
HGL-11B
< 1.0
H15-MW-01B
< 1.0
H15-MW-16B
< 1.0
H15-MW-14B
< 1.0
H15-MW-03B
1.0 [1.0]
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< 1.0
HGL-5B
< 1.0
H15-MW-07B
< 1.0
H15-MW-15B
8.6
Notes:
All Concentrations in micrograms per liter (ug/L)
Results shown are for locations analyzed for the target compound during the December 2014 event.
Tapwater Regional Screening Level (RSL) for Trichloroethylene (TCE) is 0.49 ug/L.
Maximum Contaminant Level (MCL) for TCE is 5.0 ug/L
"J" Values are approximated
"<" Values were not detected at the Method Detection Limit (listed)
Bracketed "[ ]" concentrations represent duplicate sample results.
eoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, User Community
LOCATION MAP
Hunter Army Airfield
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
LEGEND
Monitoring Well (Shallow)
1.0 TCE Concentration (ug/L)
Groundwater Flow Direction
Installation Boundary
TCE Concentration
0.49 - 4.9 ug/L (RSL - 0.49 ug/L)
5.0 - 49.9 ug/L (MCL - 5.0 ug/L)
>50 ug/L
WGS 1984, UTM Zone 17 N (feet)
0 600 1,200
Feet
TITLE
MCA Barracks Site HAA-15
Trichloroethylene in Shallow
Groundwater Monitoring Wells
KEMRON ENVIRONMENTAL SERVICES
Hunter Army Airfield
PROJECT: U.S. Army Garrison Hunter Army Airfield
Directorate of Public Works, Building 615
Stephen Douglas Street
Hunter Army Airfield, Georgia 31409
DRAWING DATE: 7/22/2020
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FIGURE
3
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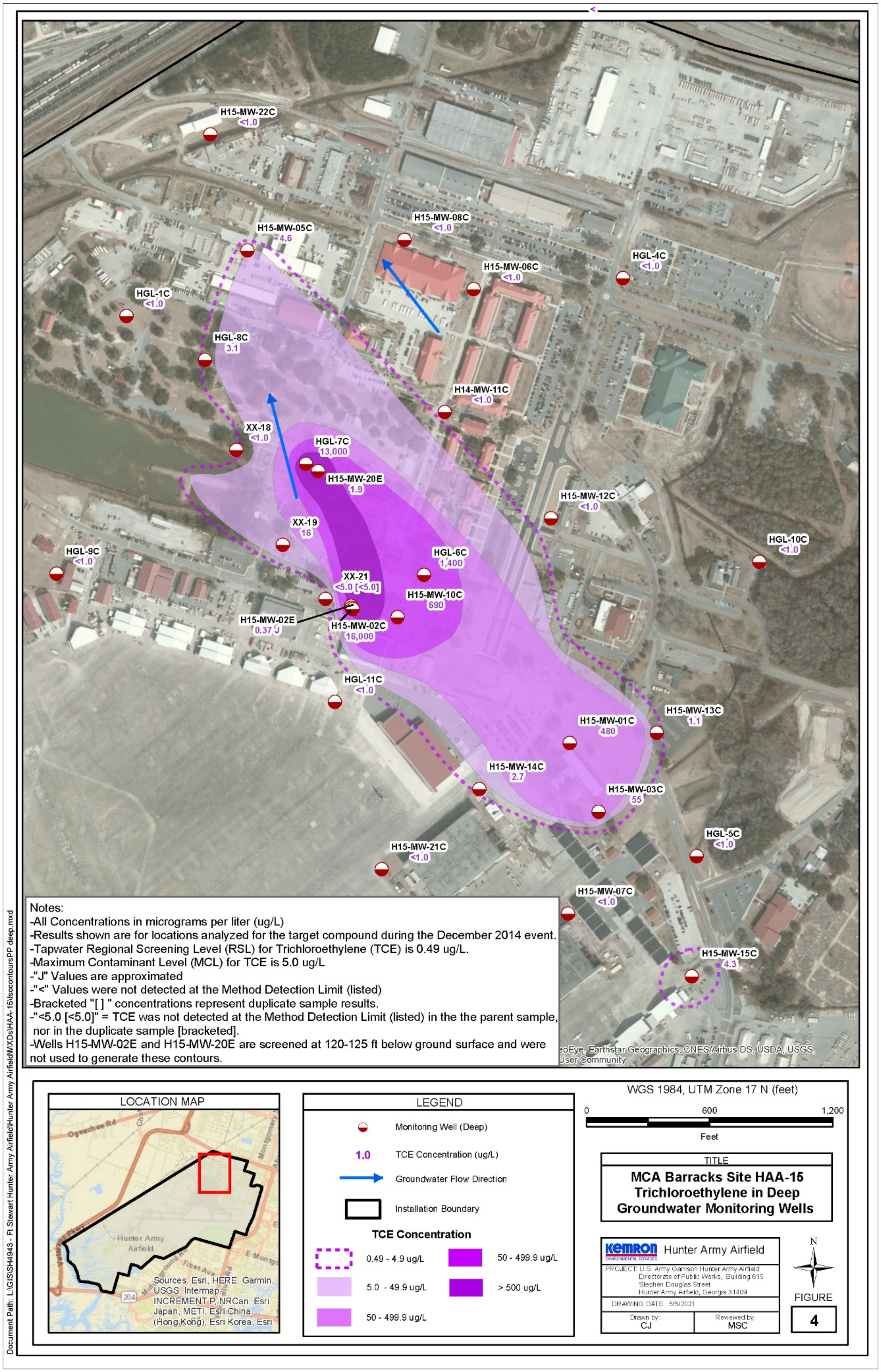
H15-MW-22C
<1.0
H15-MW-05C
4.6
H15-MW-08C
<1.0
HGL-4C
<1.0
H15-MW-06C
<1.0
HGL-1C
<1.0
HGL-8C
3.1
H14-MW-11C
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XX-18
<1.0
HGL-7C
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XX-19
16
HGL-10C
<1.0
HGL-9C
<1.0
HGL-6C
1,400
XX-21
<5.0 [<5.0]
H15-MW-10C
690
H15-MW-02E
0.37 J
H15-MW-02C
16,000
HGL-11C
<1.0
H15-MW-13C
1.1
H15-MW-01C
480
H15-MW-14C
2.7
H15-MW-03C
55
HGL-5C
<1.0
H15-MW-21C
<1.0
H15-MW-07C
<1.0
H15-MW-15C
4.3
Notes:
-All Concentrations in micrograms per liter (ug/L)
-Results shown are for locations analyzed for the target compound during the December 2014 event.
-Tapwater Regional Screening Level (RSL) for Trichloroethylene (TCE) is 0.49 ug/L.
-Maximum Contaminant Level (MCL) for TCE is 5.0 ug/L
-"J" Values are approximated
-"<" Values were not detected at the Method Detection Limit (listed)
-Bracketed "[ ] " concentrations represent duplicate sample results.
-"<5.0 [<5.0]" = TCE was not detected at the Method Detection Limit (listed) in the the parent sample, nor in the duplicate sample [bracketed].
-Wells H15-MW-02E and H15-MW-20E are screened at 120-125 ft below ground surface and were not used to generate these contours.
eoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, User Community
Document Path: L:\GIS\SH4943 - Ft Stewart Hunter Army Airfield\Hunter Army Airfield\MXDs\HAA-15\IsocontoursPP deep.mxd
LOCATION MAP
Ogeechee Rd
Hunter Army Airfield
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
LEGEND
Monitoring Well (Deep)
1.0 TCE Concentration (ug/L)
Groundwater Flow Direction
Installation Boundary
TCE Concentration
0.49 - 4.9 ug/L
5.0 - 49.9 ug/L
50 - 499.9 ug/L
50 - 499.9 ug/L
> 500 ug/L
WGS 1984, UTM Zone 17 N (feet)
0
600
1,200
Feet
TITLE
MCA Barracks Site HAA-15
Trichloroethylene in Deep
Groundwater Monitoring Wells
KEMRON
Hunter Army Airfield
PROJECT: U.S. Army Garrison Hunter Army Airfield
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Hunter Army Airfield, Georgia 31409
DRAWING DATE: 5/5/2021
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CJ
Reviewed by:
MSC
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FIGURE
4

Contaminants of Potential Concern

HAAF and GAEPD have identified the following contaminants that pose the greatest potential risk to human health at this site.

HAA-15 MCA Barracks Site – VOCs in Groundwater

TCE: TCE is commonly used as a solvent to eradicate grease from metal. Physiological effects of TCE exposure include dermatitis, central nervous system (CNS) depression, neurological abnormalities, liver damage, abdominal pain, nausea, and vomiting. TCE is reasonably projected to be a human carcinogen.

Cis-1,2- DCE: Cis-1,2-DCE is commonly used to is used in chemical mixtures, to produce solvents, and is a daughter product of TCE. Cis-1,2-DCE has been identified to cause physiological effects including liver and kidney damage, drowsiness, nausea, and cardiovascular complications. Cis-1,2-DCE is reasonably projected to be a human carcinogen.

VC: VC is used to manufacture polyvinyl chloride (PVC), and is a daughter product of TCE. Adverse health effects of VC include CNS depression, ataxia, tingling of extremities, visual disturbances, coma, and death. VC can aggravate the eyes, mucous membranes, and the respiratory tract. VC is a known human carcinogen.

Benzene: Benzene is a natural constituent of crude oil and is one of the most utilized chemical compounds to date. Physiological effects of benzene include neurological and immunological damage. Benzene is classified as a known human carcinogen.

MTBE: MTBE is used as a gasoline additive. Adverse effects to acute MTBE exposure can result in respiratory irritation, dizziness, and disorientation. Long-term exposure to methyl tert-butyl ether has resulted in central nervous system (CNS) effects, respiratory irritation, liver and kidney effects. The USEPA has not classified MTBE with respect to potential carcinogenicity.

1,1-DCE: 1,1-DCE is a chemical that is not found naturally in the environment. It is mainly utilized to manufacture specific plastics (such as plastics for food wrapping), as well as packaging materials. It is also used to make flame retardant coatings, as well as coating for steel piping. 1,1- DCE can cause liver, developmental, and neurological damage, as well as respiratory harm.

Isopropylbenzene: Isopropylbenzene, or cumene, is derived from Ceylon cinnamon. It is an aromatic hydrocarbon and a constituent of refined fuel and crude oil. Prolonged exposure has been linked to CNS system damage, as well as liver and kidney failure. Immediate exposure side effects include skin and eye irritation, headaches, dizziness, and unconsciousness.

HAA-15 MCA Barracks Site – Contaminants in Soil

Lead: Lead is a heavy metal that has a wide variety of uses, including manufacturing batteries, radiation protection, ammunition, as a gasoline constituent, and as roofing material. Some side effects of Lead exposure can result in developmental issues in children, miscarriage, brain damage, and seizures.

Arsenic: Arsenic is a metal used in semiconductors, as well as amalgamation of gold in mining practices, pyrotechnic manufacturing, and bronzing processes. Acute Arsenic poisoning can result in red and swollen skin, vomiting, muscle cramps, long- term exposure can cause digestive issues and damage to internal organs, as well as the skin.

Benzo(a)pyrene: Formed during the burning of solid waste, oil, coal, and other organic materials, once derived, it can be used as a laboratory reagent. Benzo(a)pyrene exposure can cause darkening of the skin, rash, and eye irritation, benzo(a)pyrene has been identified as a carcinogen.

Human Health Risks

HAAF performed a HHRA to evaluate potential risks from constituents in surface soil, subsurface soil, sediment, surface water, and groundwater from historical operations at HAA-15. The available data were evaluated and compared to applicable screening levels. COPCs were identified for soil and groundwater. None of the constituents detected in sediment or surface water exceeded applicable screening levels.

The calculated risks and hazards exceed the benchmarks for potable use of site groundwater. The risks from exposure to soil and groundwater not used as a potable water supply were within the United States Environmental Protection Agency target risk range and the non-cancer hazards were less than the benchmark of 1, with the exception of a hypothetical construction or utility worker, primarily driven by lead in soil and TCE in shallow groundwater. In addition, exposure to lead in surface soil posed an unacceptable risk to hypothetical adult and child residents.

Remedial goals were calculated for those constituents with excess lifetime cancer risks greater than 1×10-6 or a hazard index greater than 1.

Ecological Risks

The Ecological Risk Assessment as performed for the RI/FS provides the results of a Screening-Level Ecological Risk Assessment and Step 3a Baseline Ecological Risk Assessment for **ecological receptors** at HAA-15. Risks were characterized for ecological receptors at the HAA-15 green space by considering direct contact with constituents of potential ecological concern (COPECs) in pond sediment and surface water, and through ingestion of prey tissue via the food web to upper-trophic level wildlife. For Pond 29 (*Figure 2*), no COPECs were identified in sediment and surface water, or for the groundwater to surface water pathway. For soil, most COPECs have **hazard quotients (HQs)** below 1. While the HQs for exposure to some COPECs in soil (i.e., lead and mercury) were above 1, population- level effects for terrestrial receptors are not expected considering the *de minimis* area with concentrations above alternative screening values (ASVs), and the conservativeness of the ASVs. Overall the potential ecological risks are considered negligible for exposure to constituents in green space surface soil and in pond sediment and surface water.

Because mercury is considered bioaccumulative and the HQ for direct contact to terrestrial organisms exceeded the threshold value of 1, mercury was also assessed in dose models to upper-trophic level wildlife. The HQs for both the shrew and the robin are well below 1. Based on this assessment, potential ecological risk at the HAA-15 green space is considered negligible, and further evaluation is not warranted.

REMEDIAL ACTION OBJECTIVES

The RAOs for the remediation of groundwater at the site include the following:

1) Reduce potential cancer risk and potential non-cancer health hazards for people (i.e., site workers and construction workers) exposed to TCE and cis-1,2- DCE in contaminated groundwater by reducing the concentrations of or controlling exposure to these COPCs;

2) Reduce potential exposure of ecological receptors to COPCs in groundwater; and

Prevent potential for migration of TCE and cis-1,2-DCE above MCLs to off-site locations.

The RAOs for remediation of soil at the site include the following:

1) Reduce potential cancer risk and potential non-cancer health hazards for people (i.e., site workers and construction workers) exposed to lead and high molecular weight – polycyclic aromatic hydrocarbons (HMW-PAHs) in contaminated soils by reducing the concentrations of or controlling exposure to these COPCs in soils;

2) Reduce or control potential exposure to areas identified with metals in surface soil;

3) Reduce potential exposure of ecological receptors to COPCs and metals in soil; and

4) Prevent potential for migration of unacceptable levels of HMW-PAHs and metals to off-site locations.

This proposed action will reduce the risk associated with exposure to contaminated groundwater and soil.

For site groundwater, HAAF has established **Preliminary Remediation Goals (PRGs)** as follows:

- VOCs:
  - Bromodichloromethane – 0.13 μg/L;
  - Chloroform – 0.22 μg/L;
  - Cis-1,2-DCE – 70 μg/L;
  - Ethylbenzene – 700 μg/L;
  - Methylene chloride – 5 μg/L;
  - TCE – 5 μg/L; and
  - VC – 2 μg/L.

For site soil, HAAF has established PRGs as follows:

- Polycyclic Aromatic Hydrocarbons (PAHs):
  - Benzo(a)pyrene – 0.11 mg/kg for residents.
- Inorganics:
  - Arsenic – 0.68 mg/kg for residents, 3 mg/kg for site workers.
  - Hexavalent chromium – 0.31 mg/kg for residents.
  - Lead – 400 mg/kg for residents, 441 mg/kg for utility workers.

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for the HAA-15 Site are presented below. The alternatives are in consecutive order to correspond with their order in the RI/FS Report. Each alternative has been screened for effectiveness, implementability, and cost to determine which process options should be used in the development of remedial alternatives General Response Actions (GRAs).

Remedial Alternatives for Groundwater

Alternative 1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0

Under Alternative 1, no corrective action of any kind would be employed. This alternative would not adequately control the chemical hazard or risks posed by the COPCs. However, the no action alternative must be evaluated [per

40 CFR 300.430(e)(6)] to establish a baseline of comparison regarding future performance and risk for the remaining alternatives, even though this alternative is not a viable option itself.

Alternative 2: Monitored Natural Attenuation and Land Use Controls

Estimated Capital Cost: $30,000
Estimated Present Worth Cost: $650,000 (basis of 30 years)
Estimated Construction Timeframe: 0 years
Estimated Time to Achieve RAOs: >100 years

Monitored Natural Attenuation (MNA) is a potentially applicable technology for the aqueous groundwater contamination associated with the source areas at Hangar 811 and the former Wash Rack and former IWTP near Building 850. MNA for the chlorinated volatile organic compound (CVOC) groundwater plume is an alternative premised on natural processes providing sufficient degradation and/or attenuation of target contaminants to meet remedial goals within a reasonable precipitation, as well as biological processes.

Land Use Controls (LUCs) would also be put in place so that protection of human health and the environment is maintained, and land and groundwater use is restricted until site groundwater contaminant concentrations are at levels that allow unrestricted use and unlimited exposure. The NCP requires LUCs when site levels do not allow unrestricted use and unlimited exposure. They can also serve to notify current and future users about the environmental conditions of the property.

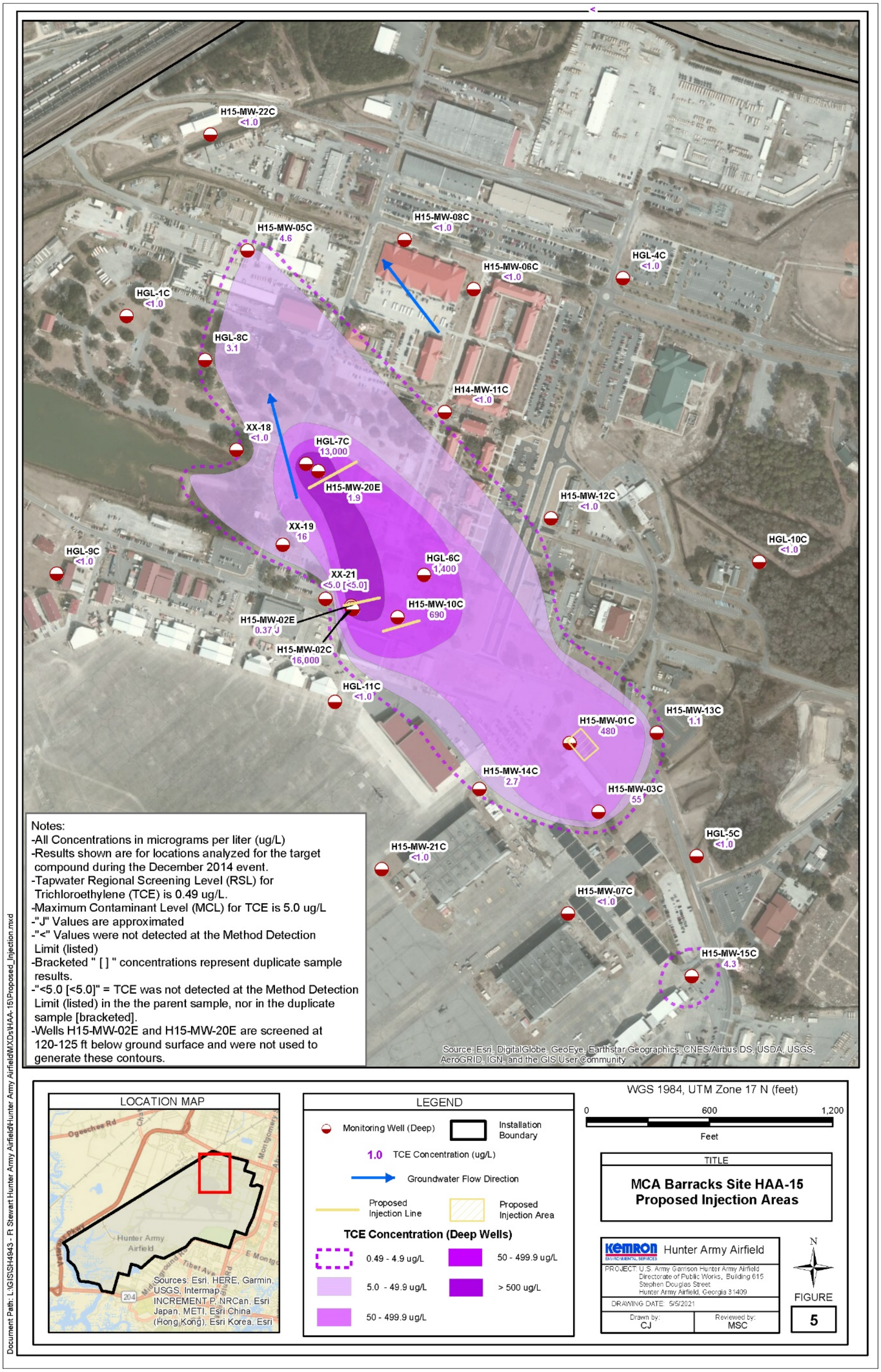
Implementation of MNA for HAA-15 groundwater involves continued monitoring of COPC concentrations to quantify attenuation rates and, in certain cases, monitoring of other parameters, such as biogeochemical parameters, to define processes responsible for the observed attenuation, and to demonstrate transformation of the COPCs. The application of MNA takes advantage of natural processes to attenuate contaminant concentrations. The infrastructure required to implement MNA is an adequate monitoring network. This monitoring network is already in place at HAA-15, translating to relatively low capital costs and moderate O&M costs for sampling, analysis, and monitoring. Because the site is characterized, monitoring would be relatively infrequent for HAA-15 groundwater (semi- annually). Finally, the remedy will include CERCLA five-year reviews. Under CERCLA 121c, any remedial action that results in contaminants remaining onsite at concentrations greater than those allowing unrestricted use must be reviewed as least once every 5 years.

<u>Alternative 3: Enhanced Reductive Dechlorination (with carbon substrate injection)</u>

Estimated Capital Cost: $553,762
Estimated Present Worth Cost: $1,100,000 (basis of 30 years)
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 11 years

Alternative 3 includes the implementation of an **Enhanced Reductive Dichlorination (ERD)** system to enhance the mass removal associated with the TCE and cis-1,2-DCE impacted groundwater near Hangar 811 and the former Wash Rack and former IWTP near Building 850, followed by MNA. The conceptual design assumptions for the **in situ reductive zone** (**IRZ**) installation associated with Alternative 3 are:

- Installation of 22 injection wells in three injection lines located in the CVOC source zone near Hangar Building 811 targeting TCE concentrations above 1,000 µg/L, as shown on *Figure 5*.
- Installation of 4 injection wells in an injection area located in the higher concentration zone near the former Wash Rack and former IWTP as depicted on *Figure 5*.
- Wells will be constructed of 10-ft vertical stainless- steel V-wire wrap screens to target the zone with the highest concentrations of TCE and cis-1,2-DCE. Actual well depths may vary from 45 to 50 ft bgs, depending on location-specific analytical data.
- Annual **emulsified vegetable oil (EVO)** injections will be required until routine performance monitoring determines when an IRZ has been established.
- Temporary injection infrastructure will be used to inject the EVO due to the very busy and access limited HAA- 15 area.
- Seven additional performance monitoring wells will be installed to supplement the existing monitoring well network, five to characterize treatment within the main plume, and two wells within the former IWTP secondary hot spot. New wells will have 10-ft screens and will be installed to total depths of approximately 45 to 50 ft bgs.
- Performance monitoring of selected wells, including newly installed wells, if required, will be conducted to monitor the overall performance of the EVO, the effectiveness of MNA in achieving remedial goals, and to determine if more injections are required.


H15-MW-22C
<1.0
H15-MW-08C
<1.0
H15-MW-05C
4.6
HGL-4C
<1.0
H15-MW-06C
<1.0
HGL-1C
<1.0
HGL-8C
3.1
H14-MW-11C
<1.0
XX-18
<1.0
HGL-7C
13,000
H15-MW-20E
1.9
H15-MW-12C
<1.0
XX-19
16
HGL-10C
<1.0
HGL-9C
<1.0
HGL-6C
1,400
XX-21
<5.0 [<5.0]
H15-MW-10C
690
H15-MW-02E
0.37 J
H15-MW-02C
16,000
HGL-11C
<1.0
H15-MW-13C
1.1
H15-MW-01C
480
H15-MW-14C
2.7
H15-MW-03C
55
HGL-5C
<1.0
H15-MW-21C
<1.0
H15-MW-07C
<1.0
H15-MW-15C
4.3
Notes:
-All Concentrations in micrograms per liter (ug/L)
-Results shown are for locations analyzed for the target compound during the December 2014 event.
-Tapwater Regional Screening Level (RSL) for Trichloroethylene (TCE) is 0.49 ug/L.
-Maximum Contaminant Level (MCL) for TCE is 5.0 ug/L
-"J" Values are approximated
-"<" Values were not detected at the Method Detection Limit (listed)
-Bracketed " [ ] " concentrations represent duplicate sample results.
-"<5.0 [<5.0]" = TCE was not detected at the Method Detection Limit (listed) in the the parent sample, nor in the duplicate sample [bracketed].
-Wells H15-MW-02E and H15-MW-20E are screened at 120-125 ft below ground surface and were not used to generate these contours.
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Document Path: L:\GIS\SH4943 - Ft Stewart Hunter Army Airfield\Hunter Army Airfield\MXDs\HAA-15\Proposed_Injection.mxd
LOCATION MAP
Ogeechee Rd
Hunter Army Airfield
Montgomery
E Montg
Tibet Ave
204
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
LEGEND
Monitoring Well (Deep)
Installation Boundary
1.0 TCE Concentration (ug/L)
Groundwater Flow Direction
Proposed Injection Line
Proposed Injection Area
TCE Concentration (Deep Wells)
0.49 - 4.9 ug/L
5.0 - 49.9 ug/L
50 - 499.9 ug/L
50 - 499.9 ug/L
> 500 ug/L
WGS 1984, UTM Zone 17 N (feet)
0
600
1,200
Feet
TITLE
MCA Barracks Site HAA-15
Proposed Injection Areas
KEMRON ENVIRONMENTAL SERVICES
Hunter Army Airfield
PROJECT: U.S. Army Garrison Hunter Army Airfield
Directorate of Public Works, Building 615
Stephen Douglas Street
Hunter Army Airfield, Georgia 31409
DRAWING DATE: 5/5/2021
Drawn by:
CJ
Reviewed by:
MSC
N
FIGURE
5

Details of the conceptual design are estimates and are subject to change according to the results of baseline sampling prior to initiation of injections.

Implementation of an IRZ will reduce the higher concentration zone within three years of operation, allowing for the residual mass to attenuate naturally.

Long-term monitoring of downgradient monitoring wells and any necessary new monitoring well installations at the site will also be conducted to ensure that the selected remedy continues to be effective.

The remedy will also include CERCLA five-year reviews. Under CERCLA121c, any remedial action that results in contaminants remaining on-site at concentrations greater than those allowing unrestricted use must be reviewed as least once every five years. Concentrations of COPCs in groundwater will potentially remain that preclude the unrestricted use of the site under this alternative. During five-year site reviews, an assessment is made of whether the implemented remedy continues to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate.

Alternative 3 will mitigate the risks to receptors via carbon substrate injection and subsequent enhanced reductive dechlorination of COPCs. MNA and LUCs, will also be implemented to control the remaining risk/hazards associated with COPCs that remain in excess of unrestricted use.

<u>Alternative 4: In Situ Chemical Oxidation via Chemical Oxidant</u>

Estimated Capital Cost: $250,000
Estimated Present Worth Cost: $1,100,000 (basis of 30 years)
Estimated Construction Timeframe: 1 years
Estimated Time to Achieve RAOs: 11 years

Remedial Alternative 4 includes **in situ chemical oxidation (ISCO)** via injection of an oxidant such as sodium persulfate, and MNA. Under this alternative, groundwater would be remediated by a combination of natural attenuation and ISCO. ISCO introduces oxidizing compounds to the aquifer for the purpose of chemically destroying contaminants. ISCO would be implemented to enhance the mass removal of TCE and cis-1,2-DCE impacted groundwater near Hangar 811 and the former Wash Rack and former IWTP near Building 850. MNA would be relied upon to treat residual COPCs in the other areas to achieve the corrective action objectives. The oxidizing chemistry that would most likely be optimal is sodium persulfate (oxidizer) and an activator such as sodium hydroxide. In the treatment area, sodium persulfate and sodium hydroxide would be injected through the same network of wells as discussed in Alternative 3. The conceptual design assumptions associated with Alternative 4 are:

- Installation of 22 injection wells in three IRZ injection lines located in the CVOC source zone near Hangar Building 811 targeting TCE concentrations above 1,100 µg/L, as shown on *Figure 5*. Wells will be installed with 30-ft on-center spacing to target an injection radius of influence of 15 ft.
- Installation of four injection wells in a fourth IRZ injection area located in the higher concentration zone near the former Wash Rack and former IWTP as depicted on *Figure 5*.
- Wells will be constructed of 10-ft vertical stainless- steel V-wire wrap screens to target the zone with the highest concentrations of TCE and cis-1,2-DCE.; Actual well depths will vary from 45 to 50 ft bgs depending on location-specific analytical data.
- Two injection events with a 2-year duration between the events.
- Estimated injection volume on average of 4,500 gallons of 60 g/L sodium persulfate and 40 g/L sodium hydroxide solution per well per event.
- Temporary injection infrastructure will be used to inject due to the very busy and access limited HAA-15 area.
- Seven additional performance monitoring wells will be installed to supplement the existing monitoring well network, with five of these new wells installed to characterize treatment within the main plume and two wells within the former IWTP secondary hot spot. New wells will have 10-ft screens and will be installed to total depths of approximately 45 to 50 ft bgs.
- Groundwater quality parameters (i.e., specific conductance, pH, and depth to water) and injected oxidant would be monitored during injection for real- time determination of injection breakthrough in the field. Groundwater COPCs and presence of oxidant would also be monitored during and after the injection test to evaluate the effectiveness of the ISCO technology and the need for additional injection

pulses. MNA and LUCs, would also be implemented to control the remaining risk/hazards associated with COPCs that remain in excess of unrestricted use.

- The remedy will also include CERCLA five-year reviews.

Remedial Alternatives for Soil

Alternative 1: No Action

Estimated Capital Cost: $0
Estimated Present Worth Cost: $0

Under Alternative 1, no corrective action of any kind would be employed. This alternative would not adequately control the chemical hazard or risks posed by the COPCs. However, the no action alternative must be evaluated [per

40 CFR 300.430(e)(6)] to establish a baseline of comparison regarding future performance and risk for the remaining alternatives, even though this alternative is not a viable option itself.

Alternative 2: Capping – Vegetative Cover

Estimated Capital Cost: $13,000
Estimated Present Worth Cost: $39,000
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 10 years

A vegetative cover is a containment technology for impacted surficial soils. It would feature a minimum 1.5 ft of compacted soil and 6 inches of top soil. This barrier layer would eliminate potential direct contact with impacted soils. The vegetative cover system does not pose significant impacts to human health or the environment due to construction or during the operational period. Installation of this type of cover is a proven and effective method of providing an exposure barrier, erosion control, and providing some long-term enhancement of ecological habitat. The potential advantages of a vegetative cover include:

- Minimizes and controls infiltration of rain water and subsequent dissolution of contaminants;
- Commonly used, predictable, and not complex;
- Generally easy to construct and relatively inexpensive; and
- Prevents both direct and indirect exposures to human health and the environment.

The potential disadvantages of a vegetative cover include:

- Does not reduce source zone mass, concentration, or toxicity;
- LUCs are required to ensure protection of human health and the environment
- Requires long-term inspection and monitoring, including CERCLA five-year reviews.

Installation of a vegetative cover at HAA-15 would be relatively simple to implement and can be completed with standard construction equipment and methods.

Alternative 3: Excavation and Disposal

Estimated Capital Cost: $43,275
Estimated Present Worth Cost: $200,000
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 5 years

Excavation of surface soil involves the physical removal of surface wastes or impacted media via standard excavation practices and technology. Excavation can be performed in hazardous waste site remediation and would satisfy the RAO of preventing direct contact with contaminated soils that may result in an unacceptable risk. It is regarded as an aggressive treatment technology. Typical equipment used includes backhoes, drag lines, clamshells, vacuum trucks, and front-end loaders.

Materials handling is a concern that affects the implementability of excavation. Staging areas are used to prepare wastes for disposal or treatment; the staging areas would be graded to reduce ponding, lined to prevent groundwater contamination, and bermed to prevent runoff. The off-site transportation of wastes resulting from excavation must meet Federal and State of Georgia shipping and manifesting regulations. Excavated soil would be transported to an approved landfill for disposal. Characterization of the material would be required to ensure proper disposal, treatment requirements, and to ensure compliance of material left in place. Labor and materials for transportation of the material is generally available. Backfilling, grading, and revegetation after excavation are necessary to prevent large open areas that would collect rainwater. Sampling would be performed to ensure the attainment of remediation goals and the complete removal of contaminants. The excavated area would be backfilled with clean soil.

Excavation and removal of impacted soil eliminates the environmental and health concerns associated with direct contact of contaminated soil. However, consideration must be given to the health and safety of remedial workers. On-site air monitoring and dust and vapor control provisions would be necessary during excavation operations. Excavation activities can result in the release of fugitive dusts and runoff from disturbed soil. Dust controls could include water sprays or application of chemical dust suppressants. Surface water controls may also be required. Excavation at HAA-15 would create minimal disturbance of the overall operational activities of the surrounding facilities.

Alternative 4: In Situ Phytoremediation

Estimated Capital Cost: $14,000
Estimated Present Worth Cost: $40,000 over 5 years
Estimated Construction Timeframe: 1 years
Estimated Time to Achieve RAOs: 5 years

Alternative 4's in situ phytoremediation strategy takes advantage of natural processes of plants including water and chemical uptake, metabolism within the plant, exudate release into soil that leads to contaminant loss, and the physical and biochemical impacts of plant roots.

The potential advantages of phytoremediation include:

- Cost estimates generally indicate a substantial savings over the cost of traditional technologies;
- Perceived to be a more environmentally friendly/ "green" and low-tech alternative to more active and intrusive remedial methods;
- Able to remediate shallow soil and groundwater;
- Does not have destructive impact on soil fertility and structure that more vigorous conventional technologies may have; and
- Vegetation can reduce or prevent erosion and fugitive dust emissions.

The potential disadvantages of phytoremediation include:

- Depth limitation;
- Longer time period is generally required than other more conventional technologies;
- Must accompany LUCs to restrict site use
- Contaminated plant matter may need to be harvested and disposed of;
- May have reduced and limited effectiveness during winter months;
- High contaminant concentrations may be toxic to plants;
- Uncertainty about attainment of remedial goals; and
- May require greater use of land area than other technologies.
- CERCLA five-year reviews are required.

Removal of lead can be accomplished by phytoextraction, also known as phytoaccumulation, phytoabsorption, and phytosequestration. Uptake of lead by the plant roots is then accumulated in the aboveground portion of the plant. Harvest and disposal of the plant biomass would completely remove lead from the surface soil near the Old Hospital Area. Lead, among various other metals, can be successfully removed by plant roots.

Successful implementation of phytoremediation near the Old Hospital Area would likely consist of planting Indian mustard to extract lead from the surface soil. Indian mustard has been demonstrated to successfully extract lead from surface soil between 0 to 15 centimeters deep. Prior to planting, the area would be designed and graded to control drainage and prevent accumulation of surface water. Soil preparations including tilling and the addition of fertilizer, soil conditioners, and pH control agents would be completed to improve plant growth. If necessary, an irrigation system would be installed to prevent the loss of plants in the case of drought conditions. Fencing may also be required to prevent damage to the plants from wildlife. After planting, operation and maintenance activities including mulching, weeding, pruning, fertilizing and watering would be completed as needed to ensure vigorous growth. As necessary dead or damaged plants would be replaced to ensure sufficient density. In all cases, seed type, fertilizer, lime, and the agricultural test report would be in compliance with local, state, and federal regulations.

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, and whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 %.
State/Support Agency Acceptance considers whether the State agrees with the HAAF's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with USEPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

EVALUATION OF REMEDIAL ALTERNATIVES

Section 300.430(e)(9) of the NCP lists nine criteria against which each remedial alternative must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified.

The first two threshold criteria (must be met by each alternative) are:

- Protection of human health and the environment; and
- Compliance with **applicable or relevant and appropriate requirements (ARARs).**

The next five primary balancing criteria provide the basis for analysis:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, volume, or mass through treatment;
- Short-term effectiveness;
- Implementability; and
- Cost

The final two criteria, state acceptance and community acceptance, are analyzed following comments on the Proposed Plan.

Evaluation of Groundwater Remedial Alternatives

1. Protection of Human Health and the Environment

Alternatives 3 (ERD) and 4 (ISCO) will provide adequate protection of human health and the environment from short-term and long-term risks through source remediation and natural attenuation of peripheral impacts. Alternative 4 entails the use of hazardous oxidizing chemicals and appropriate safeguards would be required, whereas Alternative 3 uses EVO, a nonhazardous substrate, to achieve remediation. Alternative 1 (No Action) fails to afford any additional protection to human health or the environment. Alternative 2 (MNA and LUCs) while a feasible option, may not achieve remediation over an acceptable timeframe in the absence of an active remedial measure.

2. **Compliance with ARARs**

Alternatives 2, 3, and 4 have an equivalent degree of ARAR compliance as they will address COPCs exceeding PRGs and will be implemented in accordance with action and location specific ARARs. Alternative 1 fails to be compliant with chemical specific ARARs as COPCs will remain in place.

3. **Long-term Effectiveness and Permanence**

Both Alternatives 3 and 4 will result in the long-term reduction in total COPC mass; however, the application of a longer-lived carbon source to the aquifer per Alternative 3 will reduce the probability of dissolved phase COPC rebound that may occur with Alternative 4.

Alternative 1 does not actively reduce COPC concentrations and has no effectiveness in the reduction of total COPC mass.

While Alternative 2 also does not reduce total COPC mass, it does offer LUCs to restrict exposure to COPCs in the long-term.

4. **Reduction of Toxicity, Mobility, Volume, and Mass**

Both Alternatives 3 and 4 will result in the degradation of COPCs to less-toxic compounds and will reduce the total COPC mass, mobility, and volume. Alternatives 1 and 2 fail to reduce the mobility or volume of COPCs.

5. **Short-Term Effectiveness**

Both Alternatives 3 and 4 are generally effective in the short term. Alternative 1 has the least short-term risks or impacts but fails to meet the RAOs. While Alternative 2 does not reduce total COPC mass, it does offer LUCs to restrict exposure to COPCs in the short-term.

6. **Implementability**

Alternatives 2, 3, and 4 are technically and administratively feasible. While Alternative 1 is the most technically feasible alternative to implement, this alternative is administratively not feasible and therefore the least implementable alternative.

7. **Cost**

Based on the present worth cost estimates for the alternatives, Alternative 2 is more cost effective than Alternatives 3 and 4.

8. **State/Support Agency Acceptance**

The State of Georgia supports the Preferred Alternative without comment.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision (ROD) for this site.

<u>Evaluation of Soil Remedial Alternatives</u>

1.**Protection of Human Health and the Environment**

The No Action alternative does not afford any protection to human health or the environment, nor does this alternative monitor impacted media or document land uses to ensure protection to human health and the environment. These observations indicate that the No Action Alternative does not reduce or control potential exposures of human or ecological receptors to soil COPCs at HAA-15.

Maintaining a vegetative cover for Alternative 2 would maintain RAOs by limiting exposure to impacted soils while institutional controls (i.e., land and groundwater use restrictions) would protect against human exposure to soil impacts. This would thereby protect against both current and future human exposure to soil and would be protective of human health and the environment.

Excavating impacted soil per Alternative 3 would maintain RAOs by eliminating exposure to impacted soils to protect against human exposure to soil impacts. This would thereby protect against both current and future human exposure to soil and would be protective of human health and the environment.

The in situ phytoremediation implemented with Alternative 4 will protect human health and the environment by providing both a vegetative cover to eliminate surface soil contact and erosion and will remove metals in soil via phytoextraction. Vegetation can then be harvested and removed for off-site disposal following uptake of metals.

2. **Compliance with ARARS**

ARARs are not met with the No Action alternative, as no remedy would be implemented.

Alternative's 2, 3, and 4 would comply with chemical-specific, location-, and action-specific ARARs for soil.

3. **Long-term Effectiveness and Permanence**

The No Action alternative does not provide any controls for monitoring the reduction of COPC concentrations over time, reduction of exposure, or the long-term management of impacted media; therefore, the No Action alternative does not meet this criterion.

Alternative 2 would achieve long-term effectiveness and permanence through the maintenance of vegetative cover and implementation of institutional controls. The Old Hospital Area contains residual soil impacts resulting from historical activities that have since ceased. Vegetative cover and institutional controls would provide adequate and reliable long-term controls to ensure exposure does not occur. However, the COPC mass would not be actively reduced.

Alternative 3 would achieve long-term effectiveness and permanence through the physical removal of impacted soil from the Old Hospital Area and provides the greatest confidence in long-term effectiveness.

Alternative 4 would achieve long-term effectiveness and permanence through phytoremediation of COPC impacts and implementation of institutional controls. The Old Hospital Area contains residual soil impacts resulting from historical activities that have since ceased. Phytoextraction and institutional controls would provide adequate and reliable long-term controls to ensure exposure does not occur.

4. **Reduction of Toxicity, Mobility, Volume, and Mass**

The No Action alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of impacted material; therefore, the No Action alternative does not meet this criterion.

Alternative 2 would permanently reduce the mobility of COPCs via the erosion control provided by a well-maintained vegetative cover. Toxicity, volume, and mass of organic COPCs in soil may decrease over time via natural attenuation processes.

Alternative 3 would permanently reduce the toxicity, mobility, volume, and mass of COPCs via the physical removal of impacted soil.

Alternative 4 would permanently reduce the mobility of COPCs via the erosion control provided by a well-maintained vegetative cover. Toxicity, volume, and mass of organic COPCs in soil may decrease over time via natural attenuation processes and metal impacts would be phytoextracted for subsequent plant harvesting and off-site disposal.

5. **Short-Term Effectiveness**

The No Action alternative does not pose any additional risks to the community, the workers, or the environment since there are no remedial activities associated with it; however, it does not mitigate any existing or potential future risks/hazards.

Implementation of Alternative 2 and 4 would result in minimal exposure risks to the community and workers via institutional controls.

Implementation of Alternative 3 would be immediately effective upon removal of impacted soil, but removal activities may result in minimal exposure risks to the community and workers via the release of fugitive dusts and runoff from disturbed soil. Dust controls may include water sprays or application of chemical dust suppressants.

6. **Implementability**

The No Action alternative is technically implementable, as no action would be taken.

Alternative 2 and 4 are technically implementable, as the impacted area of the Old Hospital Area is limited in size, inactive, and easily accessible.

Alternative 3 is technically implementable. Excavator services are readily available, as are the services and materials necessary for the transportation of excavated soil to an approved off-site disposal facility or landfill.

7. **Cost**

There are no present worth costs and capital costs for the no action alternative because no action would be taken.

The estimated present worth cost of Alternatives 2 and 4 is less than Alternative 3. Alternative 3 provides more certainty on time to complete remediation, potentially resulting in reduction in periodic costs.

8. **State/Support Agency Acceptance**

The State of Georgia supports the Preferred Alternative without comment.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision (ROD) for this site.

PREFERRED ALTERNATIVES

Preferred Alternative - Groundwater

For CVOCs in groundwater, Alternative 3, which consists of the implementation of ERD, MNA and LUCs to address risk to potential receptors, is selected as the recommended alternative. This alternative is implementable, effective in meeting the RAOs, and is reasonable with respect to present-worth cost. Alternative 4 is also implementable, similarly effective in mitigating and controlling risks at the site, and results in the reduction of the volume and mobility of on-site waste but requires the use of hazardous oxidizing chemicals to meet the RAOs.

Preferred Alternative - Soil

For impacted soil at the Old Hospital Area, Alternative 3, excavation and disposal, is selected as the recommended alternative. Due to the low risk factors, low level COPC concentrations, and the localized extent of impacts, this alternative will be effective in meeting RAOs, is implementable, is reasonable with respect to present- worth cost, and provides more certainty on time to achieve remedial goals.

Based on the information available at this time, HAAF and the State of Georgia believe the preferred alternatives would be protective of human health and the environment, would comply with ARARs, would be cost- effective, and would utilize permanent solutions to the maximum extent practicable. The Preferred Alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

HAAF and GAEPD will provide information regarding the cleanup of the HAA-15 MCA Barracks Site to the public through public meetings, the Administrative Record file for the site, and announcements published in the Savannah, GA newspaper. HAAF and the State encourage the public to review these documents pertaining to investigative activities that have been conducted at the site to gain a more comprehensive understanding of HAA-15 and its activities.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan.

For Further Information on the MAA-15 MCA Barracks Site, Please Contact:

Algeana L Stevenson
Remediation Section Leader/Chemical Engineer

DPW Prevention & Compliance Branch
1550 Veterans Parkway, Building 1137,
Fort Stewart, Georgia 31314
(912) 315-5144

Hours: Mon. – Fri.
8:00 a.m. – 4:00 p.m.

The Administrative Record is also available online at:

https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

GLOSSARY OF TERMS

Administrative Record - The collection of documents that is utilized and provides logic for the selection of a particular response at a site. Documents that are included are applicable documents that were relied upon in choosing the response action, as well as applicable documents that were considered, but were rejected after evaluation. This file is available for public review and a copy maintained near the Site. The Hunter Army Airfield Administrative Record file is maintained at the DPW Prevention & Compliance Branch at Fort Stewart, 1550 Veterans Parkway Bldg. 1137, Fort Stewart, GA. Online:

https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

Applicable or relevant and appropriate requirements (ARARs) - Applicable requirements mean those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the subject site. Relevant and appropriate requirements mean those cleanup standards that address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. These requirements may vary among varying sites and alternatives.

Comprehensive Environmental Response, Compensation Liability Act (CERCLA) – Also known as “Superfund”, this act was passed in 1980 to respond directly to releases or threats of release of hazardous substances that may endanger public health or the environment.

Contaminant of Potential Concern (COPC) - Any chemical that has proven to pose a possible risk to a site. COPCs are typically contaminants which may or may not have the likelihood to have adverse effects to surrounding plants or animals, and to human health.

Ecological Receptors - Plants and animals, apart from humans, that could be harmfully affected by constituents of potential concern or constituents of concern.

Emulsified Vegetable Oil (EVO) - Utilized as an energy provider for microbes that process and degrade the constituents of concern identified within an area identified to have environmental contamination.

Enhanced Reductive Dechlorination (ERD) - A variation of in situ bioremediation used to promote anaerobic organic dechlorination of volatile organic compounds within the subsurface by cometabolic and direct degradation processes.

Feasibility Study - A document that evaluates, assesses, and identifies in detail remediation options for a site. The Remedial Investigation is completed prior to drafting the Feasibility Study.

Hazard Quotient (HQ) - The calculated potential exposure ratio to a material and the level at which no negative effects are anticipated.

In Situ Chemical Injection (ISCO) - Occurring at the site of contamination or pollution, an advanced oxidation process and design utilized to decrease the amount of targeted environmental contaminants.

In Situ Reductive Zone (IRZ) - a location in a groundwater system where anaerobic conditions have been identified and created to reduce volatile organic compounds in groundwater.

Maximum Contaminant Level (MCL) - Standards that are established by the USEPA for drinking water quality. This provides the permissible limit on the amount of a material that is allowed in public water systems under the Safe Drinking Water Act.

Monitored Natural Attenuation (MNA) - A variety of biological, chemical, or physical processes that enable the reduction of the mass, mobility, toxicity, volume, or concentration of contaminants in soil or groundwater without human interaction. MNA processes are enacted under favorable conditions.

National Oil and Hazardous Substances Pollution Contingency Plan, (NCP) or National Contingency Plan (40 Code of Federal Regulations [C.F.R.] Part 300) - Delivers an organized structure and procedure for responding to releases of oil and hazardous chemicals, pollutants, and contaminants into the environment.

Polycyclic Aromatic Hydrocarbons (PAHs) – A neutral/basic subset of semi-volatile organic compounds, PAHs are derived from the burning of organic materials such as coal and oil.

Preliminary Remediation Goals (PRGs) - contaminant- specific primary cleanup goal that protects the environment and human health and complies with ARARs.

Proposed Plan - A document released to the public in which the findings of the Remedial Investigation and Feasibility Study are summarized to identify the preferred cleanup plan for a site. The reasoning for the publication of the proposed plan is to provide the public with an opportunity to comment on the preferred cleanup plan, as well as alternative plans that are under consideration and to participate in the selection of the cleanup plan at a site.

Remedial Action Objective (RAO) - A goal that is site-specific with the intention of protecting the environment and human health. Remedial Action Objectives provide guidance for the development of options for cleanup and must be met by cleanup plans selected for a site. Remedial action objectives also provide assistance in attaining a satisfactory level of protection for human health and the environment.

Remedial Investigation - Conducted prior to a feasibility study; a detailed study designed to determine the location of contaminants and identify the amount of constituents of concern at an environmental contamination site. The remedial investigation establishes site cleanup criteria, as well.

Regional Screening Level (RSL) - USEPA standards established to identify acceptable and safe soil screening values for contaminants at environmental sites.

Semi-Volatile Organic Compounds (SVOCs) – A subsection of volatile organic compounds that have a higher boiling temperature and molecular weight.

Volatile Organic Compound (VOC) - Organic chemicals that easily evaporate under normal temperature and pressure conditions found in the atmosphere. VOCs are usually found in petroleum products such as gasoline and cleaning solvents.

REFERENCES

Arcadis. 2018. Remedial Investigation/Feasibility Study, HAAF MCA Barracks Site, Savannah, Georgia. November.

CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980. 42 United States Code 9601 et seq.

NCP. National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Overview. 40 CFR 300.

USEPA. 2020. Regional Screening Level Summary Table. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls- generic-tables.