

## SELECTED REMEDY: Cap Maintenance, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers, and Monitored Natural Attenuation

### **Site History**

LHAAP-16 is a capped landfill located in the south-central portion of the Longhorn Army Ammunition Plant (LHAAP). The site encompasses approximately 20 acres, of which approximately 13 acres are covered by the landfill cap. The landfill was established in 1940s and was used for disposal of solid and industrial wastes until the 1980s when disposal activities were terminated. The Army and the USEPA signed a Record of Decision (ROD) in 1995 approving an interim remedial action which included the construction of a multilayer landfill cap that was completed in 1998. In 1996 and 1997, a groundwater extraction system was installed by the Army to prevent the groundwater plume from migrating to Harrison Bayou. After resolution of a dispute between Army and EPA in March 2016, the 2011 Draft Final ROD was revised and the final ROD was finalized in September with a selected remedy of Cap Maintenance, Land Use Controls (LUCs), In Situ Enhanced Bioremediation, Biobarriers, and Monitored Natural Attenuation (MNA).

### **Site Characteristics**

Harrison Bayou runs along the northeastern edge of LHAAP-16. Much of the site is relatively flat, though land becomes steeper near Harrison Bayou. Surface drainage from LHAAP-16 flows mostly through small gullies and ditches to Harrison Bayou which discharges into Caddo Lake to the northeast of the site. The subsurface at the site is composed of medium plastic sandy silt, fine sands, and clay. The clay layers tend to separate the groundwater into shallow, intermediate, upper deep, and deep zones. The groundwater flow direction is northeast toward Harrison Bayou in the shallow, intermediate and deep zones, while flow direction is southeast toward Harrison Bayou in the upper deep groundwater zone. Groundwater flow between the landfill and Harrison Bayou is also influenced by the presence of an extraction well system.

### **Remedial Action Objectives (RAOs)**

- Protection of human health and the environment by preventing exposure to landfill contents;
- Protection of human health and the environment by reducing leaching and migration of landfill hazardous substances into the groundwater;
- Protection of human health by preventing human exposure to the contaminated groundwater;
- Protection of human health and the environment by preventing COCs and COC by-products from migrating into Harrison Bayou at levels that cause surface water in Harrison Bayou to exceed surface water criteria and;
- Return of groundwater to its potential beneficial uses as drinking water, wherever practicable

### **Chemicals of Concern**

In the groundwater, the COCs are trichloroethene [TCE], cis-1,2-dichloroethene [DCE], vinyl chloride [VC], perchlorate, and five metals (arsenic, chromium, manganese, nickel and thallium).

### **Description of the Selected Remedy:**

#### **Cap Maintenance:**

Maintenance and repair of the existing landfill cap.

#### **LUCs include:**

- preserve the integrity of the landfill cap, and restrict intrusive activities (e.g., digging) that would degrade or alter the cap, as long as the landfill waste remains at the site or until the levels of COCs allow for unlimited use and unrestricted exposure.
- restrict the use of groundwater to environmental monitoring and testing only and restricting land use to nonresidential will remain in place until the levels of COCs in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure.
- maintain the integrity of any current or future remedial or monitoring systems will remain in place until groundwater cleanup levels of COCs are met.
- prohibit groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.

#### **In Situ Enhanced Bioremediation:**

In situ enhanced bioremediation in the most contaminated portion of the shallow and intermediate groundwater zones to reduce contaminant mass and lower the contaminant concentrations.

#### **Biobarriers:**

Installation of a biobarrier in the downgradient portion of the contaminant plume to prevent contaminated groundwater from seeping into Harrison Bayou at concentrations that would cause surface water to exceed Texas Surface Water Quality Standards, the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), and in the absence of federal drinking water standards, cleanup levels based on Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Levels (PCLs). A second biobarrier will be installed at the edge of the landfill to control potential migration of volatile organic compounds (VOCs) from the landfill.

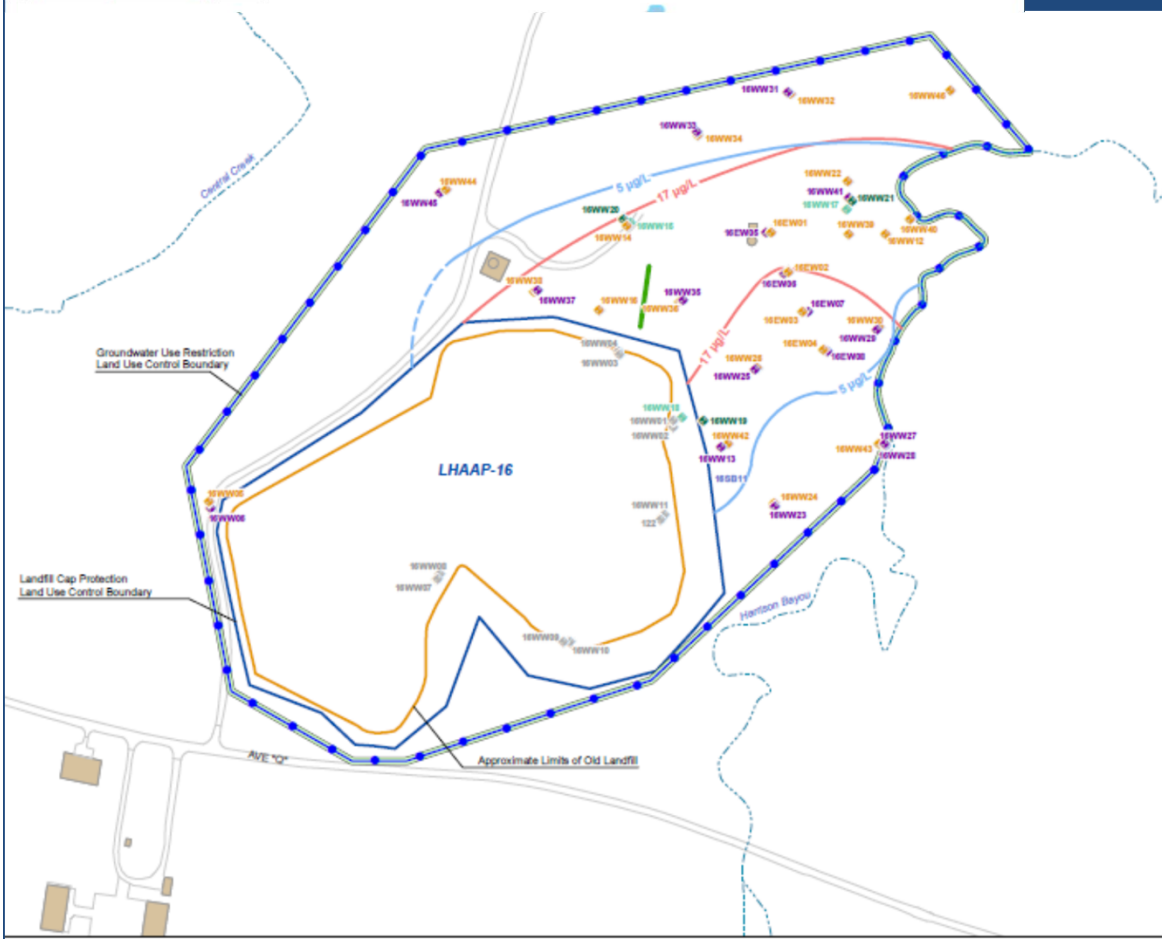
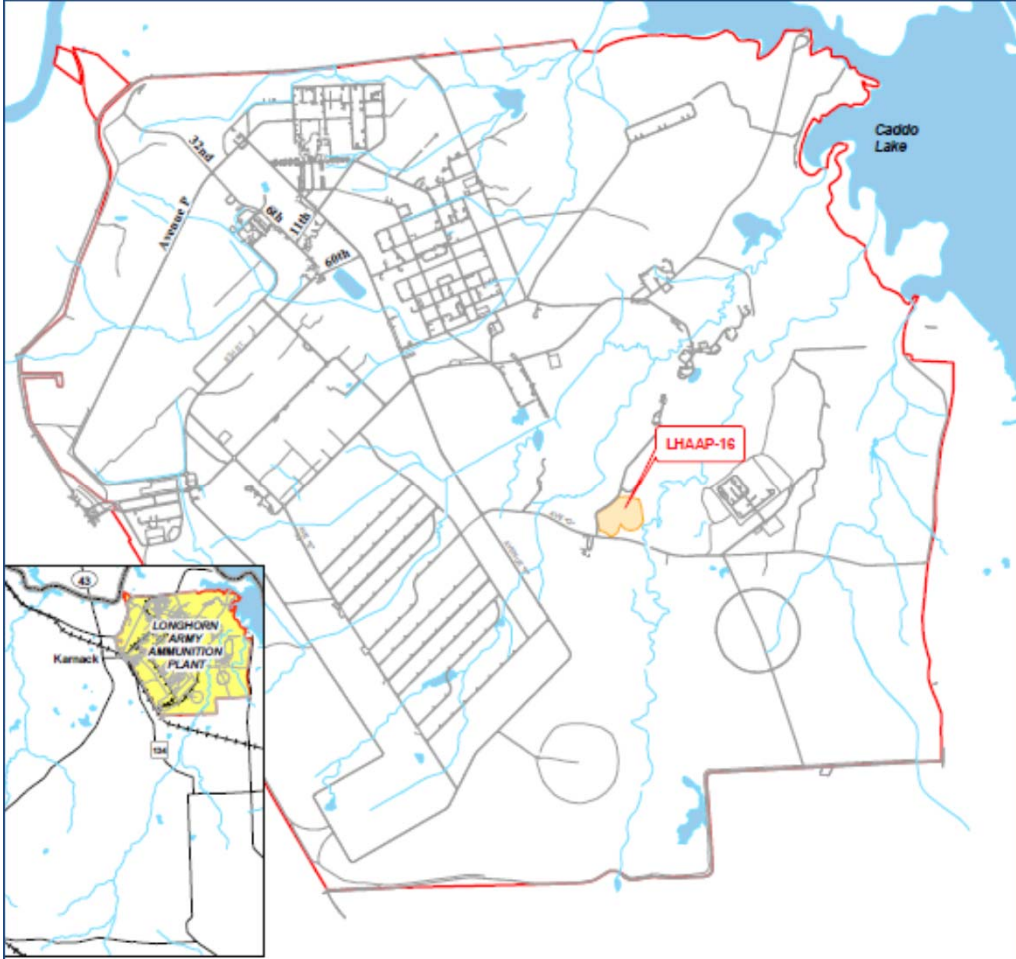
#### **MNA:**

MNA will be implemented for areas outside the influence of the active remedies to assure protection of human health and the environment by documenting that further reductive dechlorination is occurring within the plume and that contaminant concentrations are being reduced to cleanup levels. MNA will also be implemented in the areas of active remediation following successful implementation of in situ bioremediation and the biobarriers.

### **CERCLA Five Year Reviews and inspections of physical mechanisms at LHAAP-16.**

# LHAAP-16, Landfill

## SELECTED REMEDY: Cap Maintenance, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers, and Monitored Natural Attenuation



- Legend**
- Existing Shallow Monitoring Well
  - Existing Intermediate Monitoring Well
  - Existing Upper Deep Monitoring Well
  - Existing Lower Deep Monitoring Well
  - Abandoned or Plugged Well
  - Extent of Perchlorate Contamination > 17 ug/L in Intermediate and Shallow Zones
  - Extent of TCE Contamination > 5 ug/L in Intermediate and Shallow Zones (Dashed Where Inferred)
  - Location of Semi-Passive Biobarrier Demonstration (February 2004 through June 2006 (ESTCP 2009)).
  - Road
  - Stream
  - Remedial and Monitoring System Boundary
  - Groundwater Use Restriction Land Use Control Boundary
  - LHAAP-16 Landfill Fence