
Final Work Plan

**Former Lockbourne AFB
Landfill Site Investigation
Work Plan**

Former Lockbourne Air Force Base

U.S. Army Corps of Engineers

August 2008

CH2MHILL

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Acronyms and Abbreviations

ANG	Air National Guard
APP	accident prevention plan
ARW	air refueling wing
BGS	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminant of concern
COR	Contracting Officer's Representative
CRAA	Columbus Regional Airport Authority
DoD	Department of Defense
EEG	Ellis Environmental Group
EM	electromagnetic induction
EPA	Environmental Protection Agency
FDEM	Frequency-Domain Electromagnetic Induction
FID	flame ionization detector
FS	Feasibility Study
FUDS	formerly used defense sites
GPS	global positioning system
HASP	health and safety plan
HAZWRAP	Hazardous Waste Remedial Action Program
HS&E	health, safety, and environment
HSM	health and safety manager
JHA	Job Hazard Analysis
LAFB	Lockbourne Air Force Base
MNA	monitored natural attenuation
MCL	maximum contaminant level
NERI	Northeast Research Institute, LLC
NFA	no further action
NPDWS	National Primary Drinking Water Standards
OAC	Ohio Administrative Code
OHANG	Ohio Air National Guard
Ohio EPA	Ohio Environmental Protection Agency
OUPS	Ohio Utilities Protection Service
PAHs	polycyclic aromatic hydrocarbon
PDOP	position dilution of precision
PPM	parts per million

PPB	parts per billion
PPT	parts per trillion
PRGs	preliminary remediation goals
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
RA	Remedial Alternatives
RD	Remedial Design
SAP	Sampling and Analysis Plan
SI	site inspection
SNR	signal-to-noise ratio
SOP	standard operating procedure
SOW	scope of work
SP	Sampling Plan
SVOC	semi-volatile organic compound
TSD	treatment, storage, and disposal
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WP	Work Plan

SECTION 1

Introduction

A military air base began operation in the early 1940s in central Ohio near Columbus, Ohio. The installation was officially activated in 1942 as a pilot training center for the U.S. Army Air Corps. Originally known as the Northeastern Training Center of the Army Air Corps, this military facility officially changed its name to the Lockbourne Air Force Base.

In 1942, the base encompassed 1,574 acres. In 1949, the base was deactivated and used as an Ohio Air National Guard (OHANG) training base for 18 months. In January 1951, the installation became an active Air Force installation in support of the Korean Conflict. In the following years, the installation supported a variety of military missions: aircrew training, aircraft maintenance, personnel support, housing facilities, equipment storage, cargo handling, aerial reconnaissance, combat support, and air-to-air refueling operations.

CH2M HILL has been tasked by the U.S Army Corps of Engineers (USACE); Louisville District (CELRL) to conduct field investigation work at the former Lockbourne Air Force Base (AFB) landfill, formerly used defense sites (FUDS) Site Number G05OH0007. The principal stakeholders for this site are the Columbus Regional Airport Authority (CRAA) and the Ohio Environmental Protection Agency (Ohio EPA).

CH2M HILL prepared this Site Investigation Activities Work Plan (WP) on behalf of the CELRL to provide field investigation plans and procedures for trenching, geophysical investigation, seep sampling, and methane evaluation at the former Lockbourne Air Force Base (LAFB). The objective of this work is to 1) better characterize the limits of waste disposal in the areas believed to have been used for waste disposal; 2) evaluate other areas historically cleared of vegetation where construction and demolition debris may have been placed; 3) further evaluate and sample seeps on the western side of the former landfill; and 4) to evaluate methane in soil vapor in former landfill and adjoining areas.

1.1 Background

The former LAFB is located in the Columbus, Ohio, metropolitan area, in both Franklin and Pickaway counties, just east of the Village of Lockbourne, Ohio (Figure 1-1). The former LAFB covered about 4,371 acres; portions of the property are now occupied by the Columbus Regional Airport Authority (CRAA), the 121 Air Refueling Wing (ARW) of the Ohio Air National Guard (ANG), the Ohio Army National Guard, Lane Aviation, various retail and service businesses, and a Navy Reserve Center. Additional parcels at the former LAFB are privately owned and used for housing (apartment rentals) and recreation (a golf course). Military activities at the former LAFB site date back to 1942, and include aircraft staging, fueling, preparation, supplying, arming, and air-delivered ordnance handling.

The former landfill parcel involves 135 acres, although not all of that area had been used for waste disposal. The Phase I Site Investigation (Law 1995) indicates that of the 135 acres, 51 acres were “heavily used” for landfilling operations and 84 acres were “unused-to-moderately used” for “surface disposal of various wastes, mostly construction debris.” The

draft remedial investigation report prepared by Ellis Environmental (May, 2007) and submitted to OEPA for review referred to these areas as the “heavily used” area and the “unused to moderately used” areas, as well. Disposal activities are indicated to have occurred between 1951 and 1979. Evaluation of aerial photos during the preparation of this workplan document, discussed below, indicate that the area of waste disposal within the previously identified heavily used area may be considerably less than 51 acres.

Phase I historical aerial photo analysis and geophysical survey work, involving electromagnetic induction (EM) and magnetometry conducted during the original site investigation activities (Law, 1995) indicate that areas exist within the “heavily used” area where waste disposal likely occurred and other areas where disposal was limited or there was no waste placement. Figure 1-2 depicts the areas that were historically cleared of vegetation and or disturbed, as indicated by aerial photograph analysis; those believed to have been used for waste disposal (designated heavily used) and those that are believed to consist of construction debris (designated unused to moderately used) are combined in this figure and presented as a single waste disposal area. The combined waste disposal area is to be further evaluated under this work plan.

Appendix A provides copies of aerial photographs from 1950 through 2006 that were evaluated by CH2M HILL during development of this work plan. Appendix B provides copies of contoured EM and magnetometry data from the 1995 site investigation that was used in developing this work plan.

1.1.1 Waste Disposal Activities

No disposal records are known to exist for the former landfill but historical information indicates that it received lime sludge from the water treatment plant, residential waste, and construction debris. Pavement debris is visible on the surface in some areas of the landfill. Remnants of empty metal drums have been observed in a few areas of the landfill. Material that appears to be fly ash has also been observed.

1.1.2 Site Soils, Geology, and Hydrogeology

The Phase I Site Investigation (Law, 1995) describes site soils as follows:

The United States Department of Agriculture and Soil Conservation Service has described the soils in the vicinity of the landfill at the former Lockbourne AFB as including two series (National Cooperative Soil Survey, 1980). The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils formed in high-lime glacial till on uplands. Slopes range from 0 to 6 percent. Also present in the vicinity of the landfill are soils of the Kokomo series. The Kokomo series consists of deep, very poorly drained, moderately slowly permeable soils formed in high-lime Wisconsin age glacial till on uplands. The slope is 0 to 2 percent.

The site geology consists of unconsolidated deposits of glacial origin underlain by bedrock. The uppermost unconsolidated unit consists of about 80 feet of clayey, silty till with alternating sandy lenses (Engineering-Science, 1992). This till is underlain by two sand-and-gravel deposits, which are approximately 50 to 100 feet thick and separated by a clay and silt layer that is up to 60 feet thick. Devonian shale underlies the unconsolidated deposits. Figure 1-3 presents a conceptual site hydrogeologic model for the area of the landfill based on the geologic investigation work conducted by Engineering Science (1992) and Law

(1995). Shallow wells screened in the uppermost, unconsolidated geologic unit reveal the presence of a shallow water table with flow directed west and southwest.

1.2 Previous Investigations

In order to understand the Site's history for this work plan WP, CH2M HILL reviewed the RI Report produced by Ellis Environmental Group (EEG, 2007) and the Phase I Site Investigation Report (Law, 1995). The EEG report contains summaries of both the Phase I and II Investigations conducted by Law Engineering and Program Management Company, respectively.

EEG conducted the RI at the AFB during July and August of 2003. The Scope of Work included the collection of surface soil samples from the "Heavily Used Area" and the "Unused to Moderately Used Area," plus sampling of surface water and sediment, seep, subsurface soil outside the landfill area, and groundwater. EEG also conducted geotechnical analysis of soil outside the landfill.

EEG concluded in the RI Report that the components of the USEPA's presumptive remedy are applicable to the landfill's "Heavily Used Area," where its heavy use, large area, and presumed trench disposal suggest that containment is an appropriate remedial solution.

Findings of the Phase I Site Investigation Report (Law, 1995) include:

- In 1995, Law Engineering completed the Phase I SI that included a records review, screening survey, and field activities. The records review found that the landfill had been inspected by the Ohio Environmental Protection Agency (Ohio EPA) in 1978. This included a field inspection and an evaluation of the existing landfill. About 4,200 cubic yards of refuse had been deposited in the landfill using a trench-type method of disposal. The trench depths were reported to typically vary between 8 to 10 feet below ground surface, which may have been as much as 2 to 3 feet below the water table. The recommended action made by the Office of Public Water Supply was to cease landfill operations immediately because of the permeable sand and gravel layers found just below the landfill. The reviewers stated that some portions of the landfill may sit directly atop the underlying sand and gravel aquifer, and that the Village of Lockbourne water supply wells less than a quarter mile west of town could be impacted.
- In 1995, Northeast Research Institute, LLC (NERI) performed a passive soil gas screening survey as a part of the Phase I investigation on behalf of the USACE. Elevated levels of hydrocarbons and halogenated organics were detected in soil gas, but only in small zones distributed sporadically across the site. The survey found that "hydrocarbons from petroleum products and halogenated organics found in common solvents exist in the subsurface within both the Heavily Used Area and Non- or Moderately Used Area of the Closed Landfill." NERI theorized that the zones derive from "numerous independent localized surface or subsurface releases of common commercial petroleum products and chemical agents."
- Other field activities performed as part of the Phase I SI included soil sampling, sediment sampling, surface-water and seep water sampling, groundwater sampling, and hydraulic conductivity testing. Potential COCs identified in the Phase I SI included 4,4'-

DDT, arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, cadmium, dibenzo(a,h)anthracene, diethylphthalate, lead, manganese, and silver. The recommendations of the Phase I SI included a more thorough comparison of groundwater to background values, as well as additional monitoring wells to supplement and strengthen the groundwater monitoring network. Other recommendations included conduct of a landfill gas survey and additional sampling of soil, sediment, surface-water, and groundwater to include analyses not utilized during the Phase I SI. The Phase I SI also included specific recommendations that no invasive soil sampling to characterize landfill contents be performed because of the “heterogeneous nature of the landfill contents, the lack of reliable information concerning disposal history, and the problems/health and safety considerations of drilling/excavating through landfill material.”

Findings of the Phase II Site Investigation Report as reported in the Draft RI Report include:

- As part of this Phase II investigation, Project Management Company conducted groundwater, soil, surface water, sediment, and seep-water sampling at the site. One volatile organic compound (VOC), carbon disulfide, was detected in a surface-water sample at the site, and SVOCs were detected in nine soil samples. Arsenic was detected at concentrations exceeding screening values in all sampling media. Soil samples collected throughout the landfill and the Village of Lockbourne were found to contain levels of dioxin in the parts per trillion (ppt) range. The investigation recommended further site investigation to determine the boundaries of the waste disposal within the “Unused to Moderately Used” and “Heavily Used” areas.
- In the Draft RI, EEG compared the detected results for all media sampled against readily available health-based criteria; specifically, the soils, sediment, and surface water were compared against USEPA Region 9 preliminary remediation goals (PRGs). Results were as follows:
 - Arsenic was in exceedance of residential or industrial PRGs in surface soil samples, two subsurface soil samples collected during monitoring well installation, four sediment samples, seep water samples, and one groundwater sample. SVOC detections, particularly of polycyclic aromatic hydrocarbon (PAH) compounds, were in exceedance of PRGs in surface soil samples, one sediment sample and two groundwater samples. Several metals were detected in exceedance of the USEPA Region 9 PRGs tap water criteria in surface water samples, seep water samples, one sediment sample and two groundwater samples. Surface soil samples collected were found to contain levels of dioxin in exceedance of residential soil PRGs, while seep water samples found one dioxin in exceedance of USEPA Region 5 ESL for surface water, and one groundwater sample detected dioxin in exceedance of MCLs.

1.3 Historical Aerial Photograph Evaluation

CH2M HILL conducted an historical aerial photograph evaluation, involving 10 aerial datasets that best represented the timeframe between 1950 and 1989 and identifying surface features potentially relevant to the historic landfill activities. The goal of this evaluation was to help identify areas for further field investigation. During this comprehensive review,

CH2M HILL compared the historical aerial photographs with the results of the previous geophysical and magnetometry work. This work was the basis for the selection of trench locations. Appendix A provides the aerial images.

1.4 Trenching and Supplemental Sampling Objectives

To provide data to support a feasibility study, the following sampling activities are proposed:

- CH2M HILL selected trench locations to provide for: 1) better characterization of the limits of waste disposal in the northern part of the heavily used area and its relationship to EM anomalies, 2) evaluation of the extent of waste disposal in the south end of the heavily used area, and 3) evaluation of EM anomalies in the areas identified as being unused-to-moderately used and possibly involving disposal of construction debris (e.g. concrete, asphalt). Section 2 provides further discussion of the rationale for each proposed trench location.
- Geophysical survey work involving electromagnetic induction (EM) is planned to be repeated in a few areas such that recent geophysical data may be compared with results from trenching, potentially allowing EM data to be used to map waste disposal. The information gathered during this investigation will be used to help delineate and revise the estimated “heavily used area” and the estimated “unused to moderately used areas”.
- Methane gas samples will be used to determine if the landfill is generating methane gas, and also will be used in the FS study to determine the type of landfill cover or cap required; and
- The seep samples will be collected to evaluate the existence or potential of fluid leaching from the landfill via groundwater; seep sample analytical results will be used in the Feasibility Study (FS) to determine the type of cover or cap appropriate for the landfill.

1.5 Community Relations

It is CH2M HILL’s goal to coordinate, cooperate, and communicate with key stakeholders of the former LAFB, as practical. To achieve this goal, CH2M HILL will provide USACE copies of certified-mail receipts and statements certifying that letters of notice of the field work were sent to the local police and fire department, the Ohio EPA, and the Columbus Regional Airport Authority (CRAA). When the resulting study document is completed, CH2M HILL will communicate with and provide the results to the key stakeholders.

1.6 Rapid Response Plan

CH2M HILL understands that there is inherent risk involved with excavation activities associated with a landfill. In recognition of these risks, contingency plans have been established to prevent a catastrophic release of any hazardous material encountered into air, groundwater, or the soils at the Former Lockbourne Air Force Base landfill.

CH2M HILL in concert with the Corps of Engineers Louisville District can safely perform the planned trenching and geophysics and can call on the Corps of Engineers Rapid Response Center of Expertise if an unforeseen situation develops.

In the event that an unforeseen condition is uncovered such as a buried container or the presence of liquid petroleum or fuel or a similar unforeseen condition requiring special handling, CH2M HILL will immediately stop work at the location, safely place warning tape or sign at the location, and inform the Corps of Engineers Louisville District, Contracting Officer's Representative (COR). For any unforeseen situations that may have significant impacts on, human life, public health or the environment the Rapid Response Center of Expertise of the Army Corps of Engineers is responsible for rapid response activities.

The Rapid Response Center of Expertise of the Army Corps of Engineers has the mission of responding where rapid or immediate response action is necessary to protect human life, public health or the environment. If there is an urgent need for response, heavy equipment can be at the site within 72 hours of the incident discovery. The contractors that currently support the Rapid Response Center of Expertise are the Shaw Group Inc., Conti Environmental, Inc., and Project Resources, Inc.:

- The Shaw Group, Inc. has locations in Cincinnati and Cleveland Ohio, and locations in Tennessee, Illinois, Florida, Virginia, New Jersey, and Louisiana.
- Conti Environmental, Inc. has locations in New Jersey, New York, Pennsylvania, Virginia, and Massachusetts.
- Project Resources, Inc. is located in San Diego, California.

The contractors can provide excavation, and restoration, sampling and analysis, contaminant removal actions, placement of barriers, segregation, and packaging and shipping of hazardous materials. If necessary the work can involve air monitoring, inspection of shipping containers and/or community relations.

Trenching and Supplemental Sampling Work Plan

2.1 Background

The proposed work to be completed at the Former Lockbourne Air Force Base landfill involves subsurface investigation within and adjacent to the area east of the existing rail lines and south of Vause Road where waste was placed between about 1950 to about 1978. The site also had limited use for construction staging and possible placement of construction-related debris between 1979 to about 1984.

The investigation consists of a series of trenches, non-intrusive geophysical sensing, soil vapor methane gas sampling, and seep sampling in selected areas. The proposed trenching and geophysical sensing activities are intended to improve definition of the limits of waste at the property, supporting a focused feasibility assessment and remedial design. In addition, soil vapor methane gas sampling and seep sampling will improve the site conceptual model, supporting the Remedial Design (RD) and Remedial Alternatives (RA) process.

2.1.1 Site Visit Observations

To better understand existing conditions, Doug Meadors, the USACE COR, and Rob Frank and Spence Smith, representing CH2M HILL, conducted a site visit at the former LAFB on September 28, 2007. These individuals located and photographed areas of interest within the site, and noted their observations on site access and wooded cover density and extent.

2.1.2 Notifications

A written right of entry agreement exists between USACE and the CRAA. The property owner, CRAA through their contact, Paul Kennedy, is kept informed of progress on the landfill remedial investigation project. Documents relating to field work and other activities are submitted to Mr. Kennedy's office.

Before initiation of any field work, CH2M HILL will provide notifications to the following stakeholders:

- Columbus Regional Airport Authority (owner);
- Ohio Environmental Protection Agency;
- Local board of health;
- Governments of the general purpose political subdivisions where the site is located (such as county commissioner, legislative authority of a municipal corporation, board of township trustees, etc.);

- Local zoning authority;
- Single or joint county waste management district;
- Local fire department; and
- CH2M HILL also will notify the Ohio Utilities Protection Service (OUPS) (1-888-258-0808) at least 10 days before any field activities begin at the site for clearance of any public utilities areas on the base. For privately installed utilities, such as those at the airport, the appropriate property contact will be contacted and utilized to conduct a utility survey.

2.2 Trenching

CH2M HILL will install trenches to better characterize the limits of waste disposal at the site. Table 2-1 identifies and summarizes the general approach to be utilized, consistent with regulatory provisions of Ohio Administrative Code (OAC) Rule 3745-27-13 ("Rule 13"), and contingencies that are in place to ensure that the work is completed in a manner protective of human health and the environment.

TABLE 2-1
General Approach and Rule 13

Rule 13 Section	Relationship with Planned Activities	Comment
3745-27-13(F)(1)	Name and Type of Facility	The facility is the Former Lockbourne Air Force Base Landfill and it was not licensed or permitted. The Columbus Regional Airport Authority (CRAA) is the current owner of the property. The Site has not been in operation since 1978 when it was part of the Lockbourne Air Force Base. The Department of the Air Force was the owner at the time of waste placement. The property is currently in operation as Rickenbacker International Airport, FAA Identifier LCK. The owner address is Columbus Regional Airport Authority, 4600 International Gateway, Columbus, OH 43219, Phone 614-239-4000. The operator address is Charles J. Goodwin, 7161 2nd Street, Columbus, OH 43217, Phone 614-409-3636.
3745-27-3(F)(2)	Address of the Site	The site is located within the former Lockbourne Air Force Base between Vause Road and the airfield.
3745-27-13(F)(3)	County and Township Location of Site	The landfill area is in Franklin County. The boundary between Franklin and Pickaway Counties is nearby, to the south. The townships nearby include Hamilton Township (Village of Lockbourne) and Harrison Township.
3745-27-13(F)(4)	Contact Person for Information Regarding Activities at the Site	The USACE contact for the project is: Douglas Meadors, PE Environmental Engineer US Army Corps of Engineers PO Box 59 Louisville, KY 40201-0059 doug.a.meadors@usace.army.mil 502.315.6345
3745-27-13(F)(5)	Size of Site	The former landfill is included in a 246.6 acre parcel (#150-002437) owned by the Columbus Regional Airport Authority (CRAA). This area includes both property of the landfill area and property to the north of Vause Road. The former landfill parcel, south of Vause Road involves 135 acres,

TABLE 2-1
General Approach and Rule 13

		although not all of that area has been used for waste disposal, historically. A Phase I Site Investigation (Law 1995) indicates that of the 135 acres, 51 acres were classified as “heavily used”, relating to landfilling.
3745-27-13(F)(6)	Type, Amount, and Time Period of disposal of Waste	The proposed work to be completed at the Former Lockbourne Air Force Base involves subsurface investigation within and adjacent to the area east of the existing rail lines and south of Vause Road where waste was placed between about 1950 to about 1978. The types and amounts of waste deposited in the landfill are not entirely known. The site also had limited use for construction staging and possible placement of construction-related debris between 1979 to about 1984. Additional information is provided in Sections 1.1 and 1.2
3745-27-13(F)(7)	Description of Activities	Please refer to applicable sections of this workplan for descriptions of trenching, non-intrusive geophysical investigation, soil-vapor to methane monitoring, and seep sampling to be conducted.
3745-27-13(F)(8)	Description of Institutional Controls	The area of the landfill and surrounding land is generally undeveloped and is not currently in use. The land is bounded by the airfield on the south, a drainage channel and railroad right-of-way on the west, and Vause Road to the north. The property has been transferred to CRAA but it is not currently under development.
3745-27-13(F)(9)	Description of Investigation Controls	<p>Investigation activities have been ongoing at the site for many years and the proposed work is an extension of past CERCLA remedial investigative work and is not expected to have deleterious impacts to the environment relating to air emissions, control of leachate, surface water run-on and runoff, explosive and toxic gas migration and protection of groundwater. Landfill area topography is generally flat to low relief and proposed trenching is not expected to impact surface water because of the low gradients and considerable distance of proposed trenches from surface water resources. Past soil gas investigations, evaluating volatile organic compounds (VOCs) do not indicate significant soil-gas generation at the landfill. This may be due to the age of the landfill and type of materials contained within. However, a methane gas investigation is proposed to characterize methane concentration and distribution in soil gas, particularly in the area of where trench and fill disposal is believed to have occurred. The landfill is developed in an area atop fairly significant thicknesses of low conductivity silty clays. Based on past investigations and groundwater monitoring, it is not expected that leachate generation and migration are significant; however, seep monitoring is proposed to provide additional understanding of seeps along the western edge of the landfill. Fugitive dust will be controlled and minimized by focusing investigation trenches in key areas, based on previous geophysical survey work, and ensuring that each trench is closed immediately following excavation at the end of each day.</p> <p>Trench excavation activities will be conducted in the manner that will ensure that there is no migration of air contaminants or contaminated liquid from the investigation areas. In addition, flame ionization detector (FID) monitoring will be performed during the investigation work. If FID sensing indicates the potential for uncovering a known or suspected hazardous material, landfill-limits trenching in that particular area will cease. If landfilled materials encountered are known or suspected to be hazardous, landfill-limits trenching in that particular area will cease. Any material suspected to be hazardous will be stored in accordance with Chapter 3734 and sampled for potential disposal at a licensed, permitted treatment or disposal facility. In the event that materials known or suspected to be hazardous are uncovered, CH2M Hill will immediately inform the Corps of Engineers Louisville District, Contracting Officer’s Representative (COR).</p>

TABLE 2-1

General Approach and Rule 13

		<p>CH2M Hill will stop work at the location and take appropriate action to secure the area. The Corps of Engineers Omaha District, Rapid Response Center of Expertise (RRCE), is teamed with the Corps of Engineers, Louisville District for the execution of this investigation is the designated center for rapid response for Corps projects. The RRCE has the capability to handle, package and temporarily store material suspected to be hazardous and to sample and analyze for potential disposal at a licensed, permitted, treatment or disposal facility.</p> <p>Field work will be conducted in such a manner that trench excavations will be closed by the end of each work day, if not sooner, as field description work progresses. This will ensure that unsafe open excavations are not left in the area and that they do not become areas for accumulation of rainfall overnight.</p>
3745-27-13(F)(10)	Letters of Acknowledgement from the Owners	<p>A written right of entry agreement exists between USACE and the CRAA. The property owner, CRAA through their contact, Paul Kennedy, is kept informed of progress on the landfill remedial investigation project. Documents relating to field work and other activities are submitted to Mr. Kennedy's office.</p>
3745-27-13(F)(11)	Statement that Requirements Contained in Paragraphs (H)(2) to (H)(6) Will be Followed	<p>The requirements contained in the Paragraphs (H)(2) through (H)(6), relate primarily to waste handling, storage, and characterization prior to off-site disposal, will be followed, as applicable. The request to conduct this work is deemed to have been submitted previously with submission of the draft workplan. The work will be conducted in a manner protective of the environment.</p>
3745-27-13(F)(12)	Statement that the Applicable Requirements in Chapter 3734 will be Followed	<p>Work will be conducted in accordance with applicable requirements contained in Chapter 3734 of the Revised Code.</p>

Specific test pit and trench locations have been determined based on the results of evaluation of historic aerial photography, including the identification of historic ground-surface scars, and the results of the past geophysical investigation. An explanation of the rationale for each of the trenching locations is provided in Table 2-2. Trenching will be conducted such that visual observations of native materials and landfilled materials may be made to identify the limits of waste to support the feasibility study work and remedial design. No sampling of materials is planned and no excavation within groundwater will be conducted.

Prior to mobilization, CH2M HILL will identify the areas in which trees and shrubs will be cleared to perform trenching in linear segments, so as not to unnecessarily disturb any more vegetation than is required. Cutting of existing woody vegetation will be avoided to the maximum extent possible; however, some tree clearing is anticipated to enable exploratory trenches to be excavated in some areas that have revegetated since landfilling occurred. CH2M HILL understands that the majority of the tree clearing to be performed will be on the periphery of the "heavily used area" and will limit the amount of tree clearing in the "unused to moderately used area." CH2M HILL's subcontractor will remove and dispose of all debris related to tree clearing activities from the site. Selective tree removal will be accomplished with equipment mobilized for the excavation project by the subcontractor. The contractor is responsible for chipping and/or offsite removal of woody material, with

the exception of root balls. Trees will be cut flush to the ground with root balls left intact. Stumps/roots will be left in place in access corridors, to the maximum extent possible, unless they are within the trench excavations.

Based on CH2M HILL's review of aerial photographs of this area, it has been determined that approximately 1,000 linear feet of tree covered trench alignment will need to be cleared and that none of these trees are larger than about 16 inches in diameter. The width of the cleared area will be sufficient to enable an excavator to maneuver safely and place excavated material adjacent to the trench for inspection and recording.

Trenching will be conducted in a manner minimizing volumes of material excavated and handled while providing information relating to the limits of waste disposal. This will be accomplished by 1) using shallow excavation lifts (0-3 ft, 3-6 feet, etc); 2) minimizing the depth and length of trenches, as much as possible, based on field judgment; 3) segregating waste and native materials such that they may be replaced within the horizons from which they came immediately after field descriptions are completed; 4) ensuring no excavation occurs beyond the lesser of 10 feet depth, the depth of groundwater, or the depth of the bottom of the waste.

Previous drilling work in the vicinity of the landfill conducted during the site investigation and remedial investigation indicates that waste is located within silty-clay deposits (with sand lenses) having low transmissivities. These native glacial materials will be minimally disturbed during the investigation work. Trenching outside the limits of waste to confirm the presence of native materials will be conducted in a manner ensuring that native materials are placed back in the trench and that it is not backfilled with landfilled materials.

Using an excavator or similar-type of equipment, CH2M HILL will excavate test trenches in accordance with Field SOP-1 *Test Pit Excavations* (Appendix C) to a depth of between 9 and 10 feet. If CH2M HILL observes the water table before reaching that depth, excavation activities will be discontinued at that location. CH2M HILL will conduct excavations in 3-foot lifts, and record soil observations at intervals of 0-to-3, 3-to-6, and 6-to-9 feet.

As the material is removed from the trench, it will be scanned with a FID and then placed on polyethylene sheets adjacent to the trench, and covered. CH2M HILL will scan material in accordance with Field SOP-2 *Soil Screening with Flame Ionization Detector*. If the readings on the FID are above action levels (as dictated by the project-specific accident prevention plan (APP) consistent with the USACE Safety and Health Requirements Manual (EM 385-1-1, November 2003; and ER 385-1-92, Appendix C, Safety and Health Elements for Hazardous Toxic Radioactive Waste Activities, 1 September 2000) then excavation activities will immediately stop. Action levels are included in the Section 14.0 of the site-specific APP, which is referenced in Section 2.7 of the Workplan.

The material removed during trenching will then be replaced in the reverse order of its removal, so that the last lift (6-9 feet) is replaced first and the first lift (0-3 feet) is replaced into the trench last. The excavated material will be replaced in the trenches, presuming that the work will not require any additional backfill to restore the site to the approximate existing grade. As trenches are backfilled, surveyors ribbon will be placed in the holes to bound the bottom of the excavations such that, if for any reason (e.g. sampling), they may be reopened

in the future. As appropriate, CH2M HILL will seed these areas, covering them with straw, so as to encourage the re-growth of grass.

All trenches will be documented activities using field logs and photographs (Appendix C, Field SOP-3 *Digital Camera Documentation Procedures*). All site work will observe safe work practices around the trenches, and will select photography direction depending on safety concerns. Hazards and safety concerns specific to this project, and planned safe work practices, are detailed in the project HASP.

CH2M HILL will survey the four corners of each trench to sub meter accuracy using GPS technology, and will map those using Ohio state plane coordinates. This will most efficiently meet the project needs for recording and documenting test pit locations. Uncovered buried trash will be GPS surveyed and manually measured from the GPS surveyed corners of the test pit. GPS Surveying will be conducted in accordance with Field SOP 4 *Global Positioning System (GPS) Survey* (Appendix C). Field trench log descriptions and copies of key photographs will be provided to OEPA within 7 days of completion of fieldwork.

2.3 Methane Gas Sampling

Within the area of the landfill and perimeter areas, 20 locations will be sampled twice for methane gas. Figure 2-2 depicts proposed locations for collection and field analysis of methane samples. The locations may be modified based on field conditions and physical access during collection.

The samples will be collected using temporary gas probes constructed with expendable shield points and driven by hand to depths of 1 to 2 feet and sealed. CH2M HILL will construct the temporary soil gas probes according to Field SOP 5 *Temporary Soil Gas Probe Installation and Sampling* (Appendix C). Testing for methane will be done by pumping soil gas into a 1-liter Tedlar® bag and taking a reading with a portable infrared detector (LandTec GEM 500 or equivalent). Calibration of the meter will be checked with standard gas each day of testing according to Field SOP 6 *Landfill Gas Probe Monitoring- GEM 2000 Operation* (Appendix C). CH2M HILL will conduct all methane gas sampling in accordance with Field SOP 7 *Landfill Gas Probe Monitoring* (Appendix C).

CH2M HILL will survey each methane sample location to sub meter accuracy using GPS technology, and will map those using Ohio state plane coordinates. GPS Surveying will be conducted in accordance with Field SOP 4 *Global Positioning System (GPS) Survey* (Appendix C).

TABLE 2-2
 Summary of Proposed Investigation Trench Locations and Rationale
Former Lockbourne Landfill Site Investigation

Trench Location	Rationale/Comment
<i>Heavily Used Area(1)</i>	
HU-A-1 through HU-A-4	Confirm the edges of waste disposal in the north as indicated in the March/1979, November/1979, and July/1983 Office of Aerial Engineering (OAE) aerial photos and geophysical survey (EM terrain conductivity) results. Aerial photos indicate that in the early to mid 1970's, expansion of disposal activities occurred in this area over former agricultural land. This work will help to establish the relationship between geophysical anomalies and past waste disposal, enabling a determination of whether geophysical data in combination with limited trenching/test pitting may be used to define areas for closure.
HU-B-1 through HU-B-4	Historic aerials indicate this area may have been the first area cleared for landfilling as indicated in the June/1960 OAE photo. In addition, the area may have served as an entry point for the active landfill in later years and may have been used for material staging related to extensive airfield improvements that occurred between 1950 and 6/1960 (indicated by comparison of these aerial photos). The 1950 photo indicates that much of this area was vegetated and not actively used as agricultural fields. Terrain analysis indicates that it was likely topographically higher in elevation than the surrounding areas that were agricultural fields at the time.
<i>Unused to Moderately Used Area</i>	
UMU-A-1 through UMU-A-3	This area has elevated terrain conductivities similar to those observed in the heavily used area. The OAE photo dated April/1972 shows ponded water in the area, possibly relating to material borrow activities. The area appears to be healed over by the time of the OAE photo dated November/1979. It also appears to have been used for staging of equipment and materials associated with the landfilling activities to the west.
UMU-B-1 through UMU-B-3	This area appears to be first disturbed around April, 1964, as indicated by the OAE photo of that date. Elevated terrain conductivities similar to those observed in the heavily used area are also present here. The area involved expands through the 1970s and early 1980's; however, by the time of the April, 1986 OAE photo the area appears to have been graded out and re-vegetated. By the OAE photo of December, 1989 the area has developed a healthy stand of vegetation. The area is interpreted to be a borrow area and or materials staging area possibly supporting air field projects or the landfill operation.
UMU-C-1 and UMU-C-2	Geophysical anomalies in this area are similar to those in the heavily used area to the north; however, they are more subtle. The OAE April, 1964 aerial indicates scars similar to those in the heavily used area to the north .
UMU-C-3	June, 1960 OAE aerial photo indicates that trenching and/or staging of piles of fill materials may have occurred in this area. The geophysical data indicate that the area has readings consistent with background; however, the aerial photo evidence indicates further evaluation is needed.

Notes:

(1) The "heavily used area" and "unused to moderately used areas" are general areas identified in the Phase I Site Investigation (Law, 1996) and the subsequent remedial investigation work conducted by Ellis Environmental. These designations are used here for reference purposes only. These designations may not adequately define the historic waste placement.

2.4 Seep Sampling

CH2M HILL will collect seep water samples from approximately six (6) locations, with exact coordinates to be determined, along the perimeter of the “Heavily Used” landfill area. Figure 2-3 depicts the locations that have been sampled historically during the Site and Remedial Investigations. Attempts will be made to locate these seeps or others that may be present during the fieldwork. The past sampling locations likely cannot be replicated with sub meter certainty.

The objective of the seep water sampling and analysis is support an understanding of the conditions of the seep water and whether the water shows characteristics of liquid associated with waste decay. Seep sample collection is to help USACE determine if the sample locations called seeps within historical documentation are seeps associated with the groundwater, or if they are points where rainwater from meteorological events exit the landfill. The monitored natural attenuation (MNA) parameters (dissolved metals (Mn/Fe), NO₂/NO₃ as nitrogen, sulfate, chloride, methane, ethane, ethane, alkalinity, and total organic carbon) have been proposed because they will help determine if the seep water is associated with meteorological events of the underlying groundwater by showing whether or not the byproducts of waste degradation are present within the samples collected.

During site work samples will be collected by manually driving temporary sampling probes constructed with expendable shield points or 1 inch diameter piezometers to depths of 1 to 2 feet into the seep location. These are expected to be driven horizontally along the fairly steep embankment between the landfill and the drainage channel on the west. Piezometers are proposed as an option to attempt to enhance flow with a greater wetted screen area.

A water sample will be collected through use of a peristaltic pump sampling system for shield points with tubing or through sampling of flow coming off driven (horizontal) piezometers. The samples will be analyzed for compounds of potential concern (COPCs) as defined in worksheet 15 of the project specific Quality Assurance Project Plan (QAPP) which will include the following compound types; metals (dissolved and total), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), dioxin/furans, and parameters for MNA. Table 2-3 contains a sample analytical summary.

Analytical reporting levels are presented in the project specific QAPP included in Appendix D. Seep water sampling will be conducted in accordance with Field SOP 8 *Low-Flow Seep Water Sampling* (Appendix C) and Field SOP 9 *Field Filtering Water Samples* (Appendix C).

CH2M HILL will survey each seep location to sub meter accuracy using GPS technology, and will map those using Ohio state plane coordinates. GPS Surveying will be conducted in accordance with Field SOP 4 *Global Positioning System (GPS) Survey* (Appendix C).

TABLE 2-3
 Sample Analytical Summary
 Former Lockbourne Air Force Base – SI

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference ¹	No. of Sampling Locations	No. of Field Duplicates/QA Split Samples	No. of MS/MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks	Total No. of Samples to Primary Lab/QA-Split Lab
Water	VOCs	NA	SW8260B/VOCs	6	1/1	1	0	0	1 per VOC shipment	9/1
Water	SVOCs and PAHs	NA	SW8270C SIM/Semivolatiles	6	1/1	1	0	0	NA	8/1
Water	Dioxins/furans	NA	SW8290/Dioxins Furans	6	1/1	1	0	0	NA	8/1
Water	Metals (as defined in Worksheet 15 of the QAPP)	NA	SW6010B/SW7060A/ Dissolved or total metals prep for ICP, Arsenic prep, Metals by GFAA, Metals by ICP	6	1/1	1	0	0	NA	8/1
Water	Dissolved metals (MN, Fe) for MNA	NA	SW6010B/ Dissolved or total metals prep for ICP, Metals by ICP	6	1/0	1	NA	NA	NA	8/0
Water	Nitrate/nitrite as nitrogen for MNA	NA	SW9056/100-03-4 NO2-NO3	6	1/0	1	NA	NA	NA	8/0
Water	Sulfate and chloride for MNA	NA	SW9056/Anions	6	1/0	1	NA	NA	NA	8/0
Water	Alkalinity for MNA	NA	EPA 310.2/Alkalinity	6	1/0	1	NA	NA	NA	8/0
Water	Methane, ethane and ethane for MNA	NA	RSK175/Dissolved Gasses	6	1/0	1	NA	NA	NA	8/0
Water	Total organic carbon for MNA	NA	SW9060/TOC	6	1/0	1	NA	NA	NA	8/0

TABLE 2-3
 Sample Analytical Summary
 Former Lockbourne Air Force Base – SI

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference¹	No. of Sampling Locations	No. of Field Duplicates/QA Split Samples	No. of MS/MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks	Total No. of Samples to Primary Lab/QA-Split Lab
Soil gas	Methane	NA	Field Screening/ SOP -6	20	2/0	0	NA	NA	NA	0

2.5 Geophysical Survey

Two to three days of geophysical survey work will be conducted utilizing a Geophysical Survey Systems Profiler EMP-400 or GEM-300. Both of these systems are Frequency-Domain Electromagnetic Induction (FDEM) instruments that enable (1) soil electrical conductivity (quadrature phase) and (2) in-phase (high-conductivity or metal sensitive) measurements at multiple frequencies. The range of selectable frequencies is 325 Hz up to 19,975 Hz. These data will be integrated with GPS readings to effectively locate stations during data collection.

Data will be collected continuously by methods deemed most appropriate for site-specific conditions, as determined by the CH2M HILL team, and to produce data comparable to that previously collected. Collected data will be referenced to GPS benchmarks installed previously or during clearing for trenching activities. Due to access considerations, data will be collected by survey methods deemed most appropriate (that is, at a station or continuously) for site-specific conditions, as determined by the geophysics subcontractor during field survey work. The objective of this work is to evaluate areas where previous geophysical anomalies were observed. Comparison of geophysical work during site work with previous geophysical work conducted in 1995 will likely lead to better spatial presentation of the disposal and non-disposal impact areas. Figure 2-1 depicts the areas to be evaluated with geophysics either immediately prior to or during trenching.

2.6 Quality Assurance/ Quality Control and Data Verification/Validation

The numbers of samples to be collected for laboratory analysis are included in Table 2-3. Primary samples will consist of 100 percent of the normal environmental samples collected. Quality assurance/quality control (QA/QC) samples will be collected in the same manner as the primary samples. Field duplicates will be collected at a frequency of 10 percent of the normal environmental samples. Matrix spike/matrix spike duplicates will be collected at a frequency of 5 percent of the normal environmental samples collected. Equipment blanks will not be required for the seep sampling. Per SOPs referenced in Section 2.4 Seep sampling, all sampling equipment will be dedicated to its own unique sample location, or be disposable in nature. One trip blank will accompany the samples that are submitted for VOC analysis. Quality assurance (QA) split samples will be collected with this effort at a rate of 10 percent.

Analytical data will be validated by Laboratory Data Consultants (LDC) Inc. staff experienced in the analysis and review of data from environmental matrices as follows.

One-hundred percent of the samples from the primary laboratory will be validated in accordance with the latest version of the Louisville Department of Defense (DoD) Quality Systems Manual (QSM) Supplement. Validation will consist of EPA Level IV data review. QA split laboratory sample results will not be validated however they will be evaluated for precision in comparison with the primary laboratory data. Significant errors noted during the data validation review may determine a need for corrective action based on

recommendation of the project chemist and with concurrence of the USACE. Data validation shall include but may not be limited to the following parameters.

- Data completeness
- Holding Time
- Instrument calibration, initial and continuing
- Laboratory control samples
- Method blanks
- Surrogate spikes
- Matrix spikes and matrix spike duplicates
- Laboratory and field duplicates
- Sample results verification

Laboratory Data Consultants (LDC), Inc. will be conducting third party validation of the seep sampling results. LDC will provide a data validation report at the end of the project to summarize the results of the data validation findings and to present conclusions regarding the usability of the data for project objectives. The report will assess the accuracy, precision, representativeness, comparability, and completeness of the data generated. The report will focus on out of control data results and present a table of non-compliant results that exceeded some QC requirement.

2.7 Health and Safety

CH2M HILL has prepared a project-specific accident prevention plan (APP) consistent with the USACE Safety and Health Requirements Manual (EM 385-1-1, November 2003; and ER 385-1-92, Appendix C, Safety and Health Elements for Hazardous Toxic Radioactive Waste Activities, 1 September 2000). The APP includes a Job Hazard Analysis (JHA) for the proposed tasks. CH2M HILL's Health and Safety Manager has approved the APP (CH2M HILL, 2007).

SECTION 3

Trenching and Supplemental Sampling Report

At the conclusion of the field activities, a Trenching and Supplemental Sampling Report will be completed. The Trenching and Supplemental Sampling Report will include text, tables, and figures including a description of the field activities, tables presenting data collected, and figures presenting locations of associated relevant activities.

A photograph documentation log will also be included along with this report. Each photograph will include the date and time the photograph was taken, the photographer's name, the direction of the photograph, the photograph's electronic file name, and any relevant comments.

SECTION 4

Project Schedule

Initial project schedule dates will be provided to stakeholders upon release of the Final Work Plan. Changes and updates to the project schedule will be communicated to stakeholders throughout the course of the project. Schedule changes will be discussed and agreed upon with the USACE and Ohio EPA.

TABLE 4-1
Project Schedule

Task	Planned Date
Submit Draft Work Plan	Late 04/2008
Submit Final Work Plan	Early 09/2008
Field Activities	Late 09/2008 through Early 10/2008
Submit Preliminary Trench Field logs to USACE and OEPA within one week following field activities	Mid 10/2008
Submit Draft Trenching Delineation and Supplemental Sampling Report	Late 11/2008
Submit Final Trenching Delineation and Supplemental Sampling Report	Late 03/2009

SECTION 5

References

CH2M HILL. 2007. Accident Prevention Plan. December.

Ellis Environmental Group (EEG). 2007. *Remedial Investigation Report: Former Lockbourne Air Force Base Landfill*. May.

Engineering Science, Inc. 1992. *Final Site Investigation Report, Rickenbacker Air National Guard Base, Columbus, Ohio*. May 1992.

Law Engineering and Environmental Services (Law). 1995. *Final Site Investigation for Site Investigation – Phase I, Former Lockbourne Air Force Base Landfill, Rickenbacker Port Authority, Lockbourne, Ohio*. November.

Figures

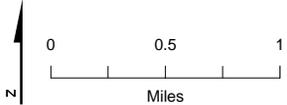
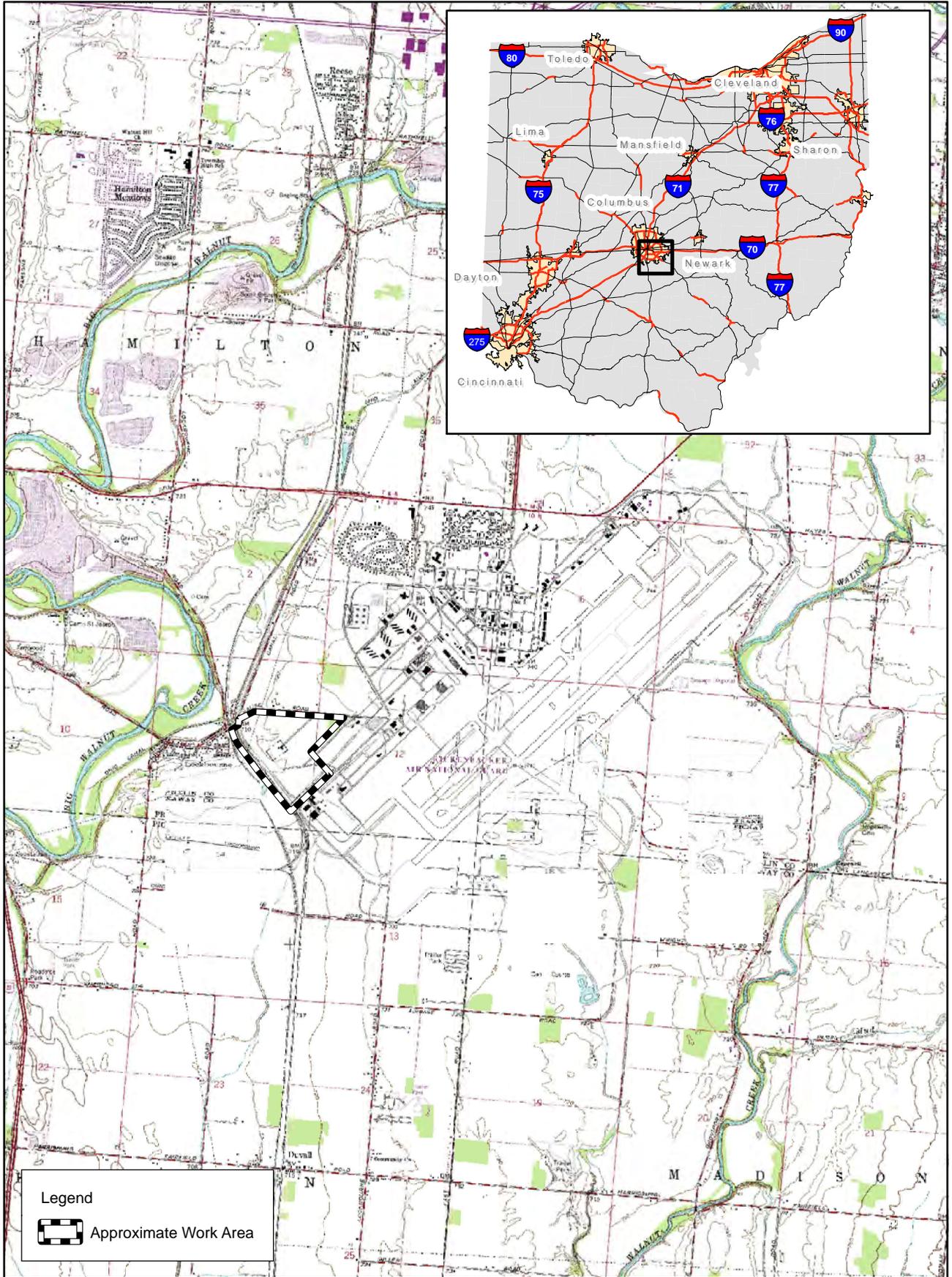


Figure 1-1
 Site Location Map
 Site Investigation Work Plan
 Former Lockbourne Air Force Base

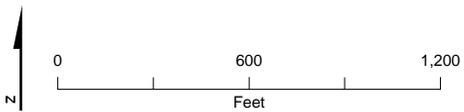
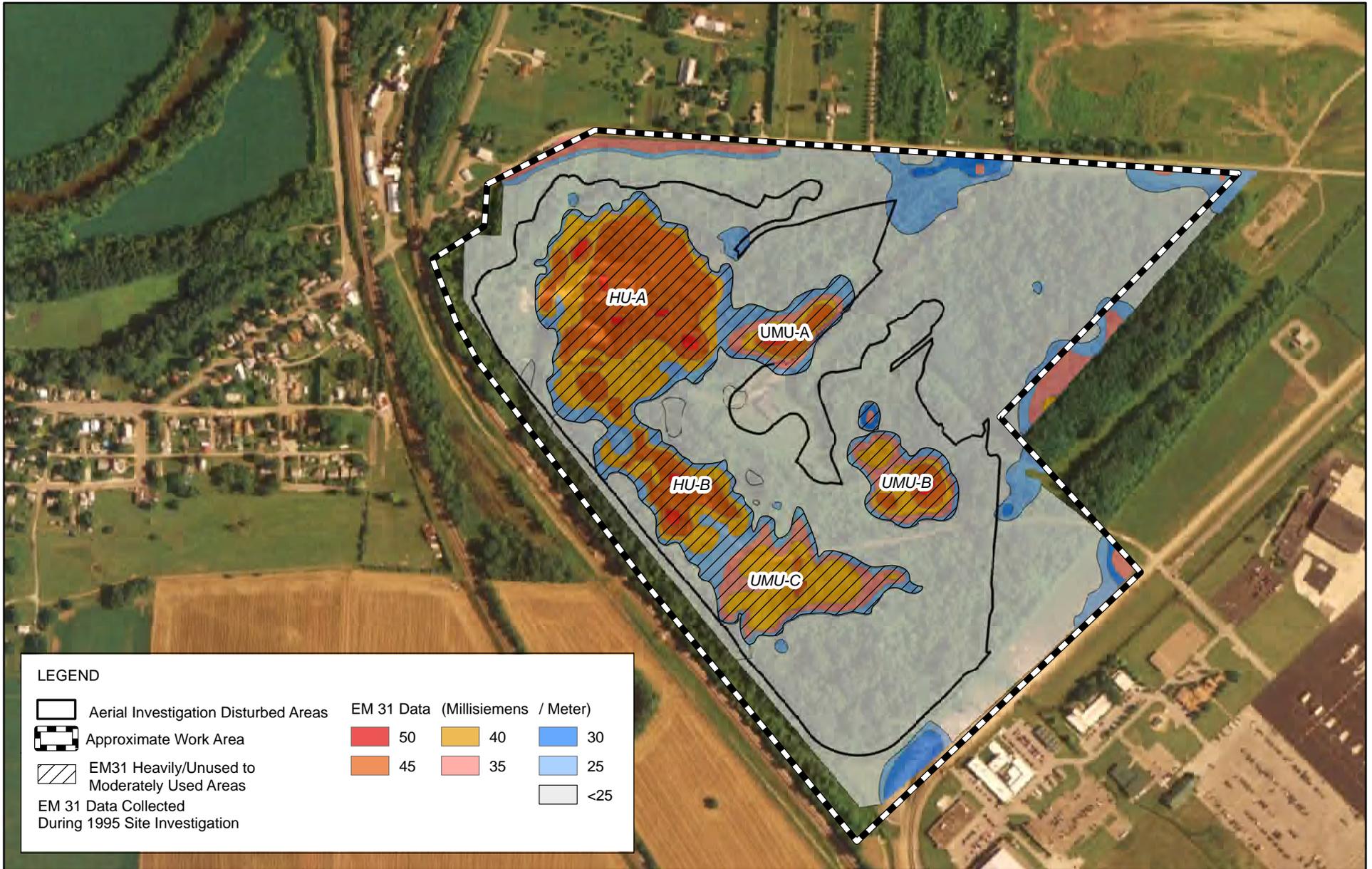


Figure 1-2
 Site Layout
 Site Investigation Work Plan
 Former Lockbourne Air Force Base

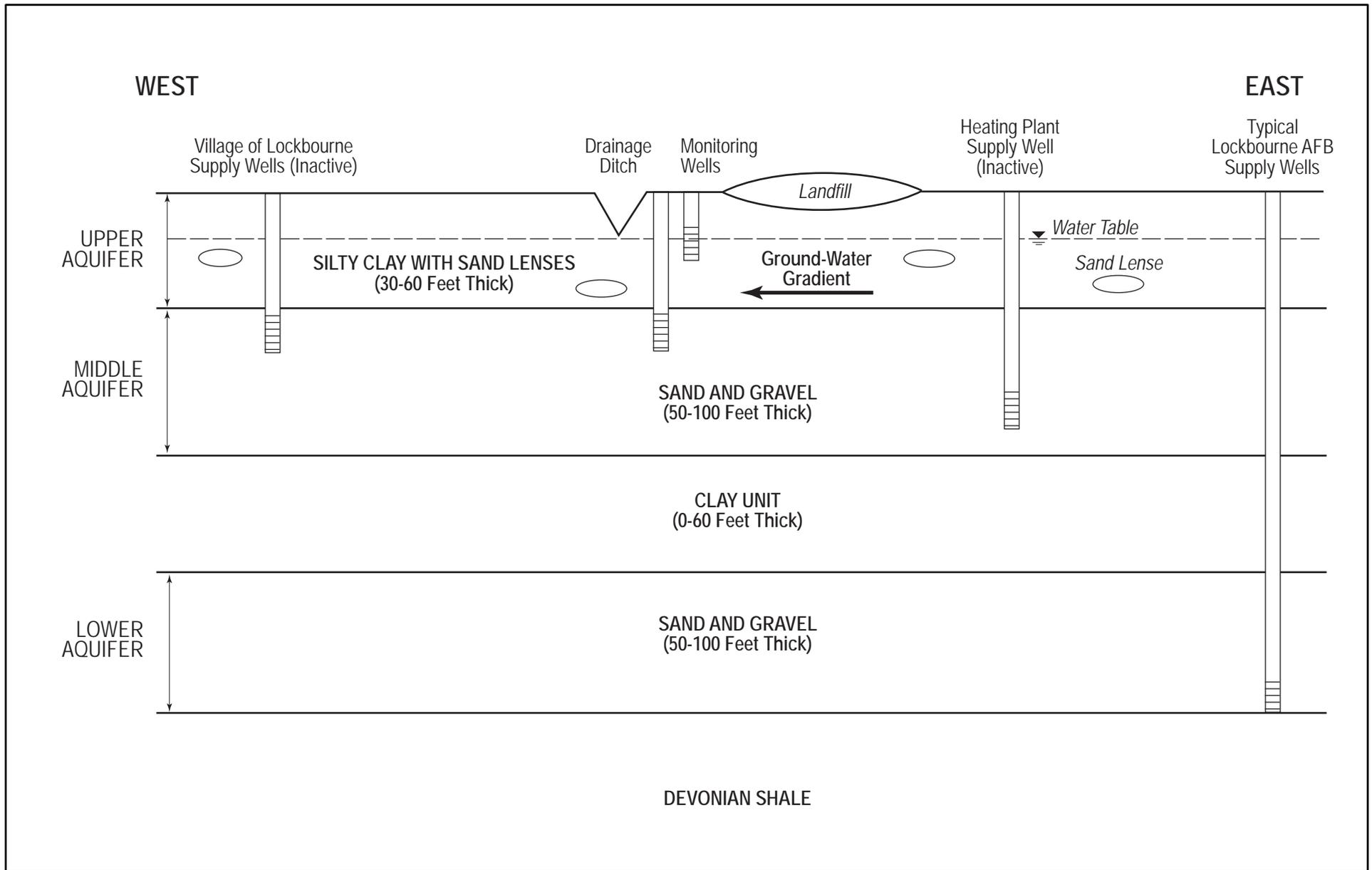


Figure is not to scale
 Source: Final Site Investigation Report (1992, Engineering Science) and Final Site Investigation Report Phase I (1995, Law)

Figure 1-3
 Conceptual Site Hydrogeologic Model
 Site Investigation Work Plan
 Former Lockbourne Air Force Base