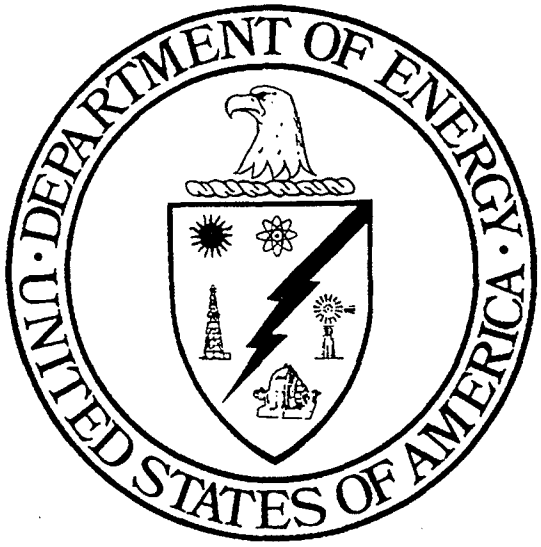
DOE/EA-1046

ENVIRONMENTAL ASSESSMENT

FOR THE CONSTRUCTION, OPERATION, AND CLOSURE OF THE SOLID WASTE LANDFILL AT THE PADUCAH GASEOUS DIFFUSION PLANT PADUCAH, KENTUCKY



U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

Oak Ridge, Tennessee

March 1995

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ACRONYMS AND ABBREVIATIONS

ACMs	asbestos containing materials
AEC	Atomic Energy Commission
BMPs	Best Management Practices
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
DOE	U.S. Department of Energy
EA	environmental assessment
EIS	environmental impact statement
Energy Systems	Martin Marietta Energy Systems, Inc.
EPA	Environmental Protection Agency
ERWM	Environmental Restoration Waste Management
KAR	Kentucky Administrative Regulations
KDEP	Kentucky Department for Environmental Protection
KDWM	Kentucky, Department for Environmental Protection, Division of Waste Management
KDFWR	Kentucky Department of Fish and Wildlife Resources
KHC	Kentucky Heritage Council
KOW	Kentucky Ordnance Works
KPDES	Kentucky Pollutant Discharge Elimination System
KRS	Kentucky Revised Statutes
KSNPC	Kentucky State Nature Preserves Commission
LCD	Lower Continental Deposits
MMUS	Martin Marietta Utility Services, Inc.
MSL	mean sea level
MWSF	mixed waste storage facility
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PGDP	Paducah Gaseous Diffusion Plant
PVC	polyvinyl chloride
RA	risk assessment
RCRA	Resource Conservation and Recovery Act
RGA	Regional Gravel Aquifer
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
SWL	solid waste landfill
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
TWSF	TSCA Waste Storage Facility
UCD	Upper Continental Deposits
UCRS	Upper Continental Recharge System
UE	uranium enrichment
USEC	United States Enrichment Corporation
UF_6	uranium hexafluoride
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WKWMA	West Kentucky Wildlife Management Area
WSF	waste storage facility

SUMMARY

The Paducah Gaseous Diffusion Plant (PGDP) was constructed by the U.S. Atomic Energy Commission (AEC) and has operated continuously since 1952. The plant enriches uranium for use in commercial nuclear power reactors in the United States and abroad. The plant is currently operated by Martin Marietta Utility Services, Inc. (MMUS) for the U.S. Enrichment Corporation (USEC). USEC, a government corporation, leased the PGDP facility from the U.S. Department of Energy (DOE) on July 1, 1993. DOE owns PGDP, and is responsible for waste management, decontamination and decommissioning, response actions, and/or corrective actions for conditions existing before the transition date.

The U.S. Department of Energy proposes to construct and operate a solid waste landfill (SWL) at PGDP that would be designed in accordance with new Commonwealth of Kentucky landfill regulations (401 Kentucky Administrative Regulations Chapters 47 and 48 and Kentucky Revised Statutes 224.855). DOE will allow USEC to dispose of nonhazardous materials at the SWL. The operation of PGDP produces approximately 7,200 yd^3/year of nonhazardous, nonradioactive solid waste that had been disposed of in a residential landfill cell that recently reached capacity and was closed and capped. An interim, transitional, contained landfill cell (Cell #3) is currently in operation. New Kentucky landfill regulations mandate that all existing landfills be upgraded to meet new regulatory requirements or be closed by June 30, 1995. The interim contained landfill cell that is currently in operation would be closed at that time.

The proposed action consists of construction, operation, and closure of a new SWL that would be located on a 60-acre site immediately north of the existing, interim landfill. Best Management Practices would be used during the construction and operation of the SWL to minimize the potential for environmental impacts. Alternatives such as incineration, compaction and baling, and off-site disposal were considered, but eliminated from detailed consideration in this environmental assessment (EA). Under a no-action scenario, the interim cell would be closed as planned in 1995 per Kentucky Solid Waste Regulations, and nonhazardous waste would accumulate at PGDP until a suitable management strategy is developed and implemented.

Analysis conducted during preparation of the EA resulted in the following findings for the proposed action:

Air Quality: Short-term increases in concentrations of airborne particulates (fugitive dust), sulfur dioxide, nitrogen oxides, and hydrocarbons would occur in the immediate area of earth moving activity and daily landfill operations. Dilution and dispersion of these pollutants in the atmosphere would reduce concentrations to immeasurable levels outside the immediate area of activity.

Cultural Resources: Consultation with the Kentucky State Historic Preservation Officer (SHPO) has confirmed that no significant cultural resources would be impacted by the proposed action (Appendix A).

Biological Resources: Consultation with the U.S. Fish and Wildlife Service (USFWS) has confirmed that no threatened or endangered species and no critical habitat would be affected by the proposed action (Appendix A).

Geology and Soils: The geology of the area would not be altered by construction of the proposed landfill. Approximately 25 acres of soils classified as prime farmland by the Soil Conservation Service (SCS) would be converted to nonagricultural use by development of the proposed SWL. This represents less than 1% of the prime farmland available in McCracken County (Appendix A).

Land Use: The 60-acre area proposed for the SWL is on property owned by DOE and licensed to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). This land, which would be permanently removed from public access, is now used for public recreation and farming.

Noise: A temporary increase in local noise levels would occur during construction activities, and intermittent increases in noise levels would occur over the projected life of the landfill due to the construction of additional phases as the area is developed. Noise levels during operational activities at the proposed SWL would be similar to levels currently existing at the adjacent, operating landfill. Off-site receptors would not be impacted by increased noise.

Socioeconomics: Construction of the proposed landfill is not expected to have a long-term effect on the local economy. No change in transportation requirements would result, because the proposed landfill would replace the adjacent, operating landfill.

Floodplain: The proposed SWL location lies above the 100- and 500-year floodplain of streams mapped on U.S. Geological Survey (USGS) topographic maps.

Wetlands: There are no wetlands on the site of the proposed SWL, and the Army Corp of Engineers concurs that wet areas along a tributary of Little Bayou Creek would not be affected by landfill construction and operation (Appendix A). Best Management Practices (BMPs) would be employed, the perimeter fence would be installed at least 50 feet from the wetland, and wastes would not be placed within 250 ft of the stream associated with this wetland.

Water Resources: Cells would be excavated to at least 4 ft above the seasonal high water table per Kentucky regulations. Small tributaries of Little Bayou Creek may receive small amounts of surface water runoff/sedimentation during construction and operation, however, two sedimentation basins within the SWL would receive most runoff from the site. The potential exists for nonhazardous leachate to enter the groundwater or surface water if there is a breach in the landfill liner or a failure of the leachate collection system.

Health & Safety: Worker health and safety concerns would be typical of any construction project. All aspects of the project would be addressed by a health and safety plan and monitored by appropriate personnel. Operational concerns for worker health and safety would be related to equipment operation, as no hazardous or radioactive materials would be permitted in the landfill. All operators would be trained on the equipment necessary for day to day operations and per Commonwealth of Kentucky requirements.

1.0 INTRODUCTION

1.1 BACKGROUND

Paducah Gaseous Diffusion Plant (PGDP) occupies 749 acres of a 3423-acre DOE reservation 10 miles west of Paducah, Kentucky (Fig. 1-1). It was built by the AEC in the early 1950s on the site of the former Kentucky Ordnance Works (KOW), and has operated continuously since then. PGDP is operated by MMUS for the USEC, a government corporation established July 1, 1993, which leases the plant from DOE. The plant enriches uranium for use in commercial nuclear power reactors in the United States and abroad.

The operation of PGDP produces approximately 7,200 yd^3/year of nonhazardous solid waste (Beach and Redfield 1992). Management of this waste is regulated by the Commonwealth of Kentucky, Department for Environmental Protection, Division of Waste Management (KDWM). Kentucky solid waste management regulations are provided in 401 Kentucky Administrative Regulations (KAR), Chapters 47 and 48. PGDP operates a transitional "contained" landfill (current terminology for landfill cells that accept "residential-type" solid wastes) under Kentucky Permit No. 073.14. PGDP's former residential landfill (Cell #2) reached capacity in July 1993 (Vander Boegh 1992) and was closed and capped in accordance with Commonwealth of Kentucky requirements. An interim transitional contained cell (Cell #3) is currently in operation.

1.2 PURPOSE AND NEED

Measures were taken to extend the short-term life of the recently closed and capped residential landfill (Cell #2), including: (1) installation of a waste compacting and baling system to increase waste density; (2) construction of the new interim contained landfill cell (Cell #3) within the existing landfill permitted boundary to provide landfill capacity through June 30, 1995; and (3) initiation of a committee to study waste minimization and recycling opportunities. Cell #3 can only receive wastes under the existing solid waste landfill permit through June 30, 1995. Due to state regulations, it must then be closed and capped within 180 days, leaving PGDP with no means of solid waste disposal. Security and liability considerations, including a DOE moratorium on off-site waste shipments, preclude sending wastes to off-site landfills and necessitates the development of additional solid waste landfill capacity (Lytle 1991). Thus, DOE proposes to construct and operate a new SWL at PGDP for the disposal of nonhazardous wastes.

The term "solid waste" is used in this EA to refer to (1) nonhazardous, nonradioactive contained waste and (2) nonhazardous, nonradioactive construction/demolition debris. To provide the additional capacity needed to dispose of solid waste, DOE proposes to construct, operate, and ultimately close a new SWL at PGDP. As shown in Figure 1-2, the SWL is proposed for a 60-acre site adjacent to the existing, interim landfill (Cell #3, whose area includes the closed and capped Cell #2). The SWL would accept solid waste generated at PGDP only, using an area fill method. Construction of the initial SWL phase and support facilities is expected to take 10 months and would be completed in 1996. Until the SWL is ready to receive waste, waste will be held temporarily in accordance with applicable regualtions.

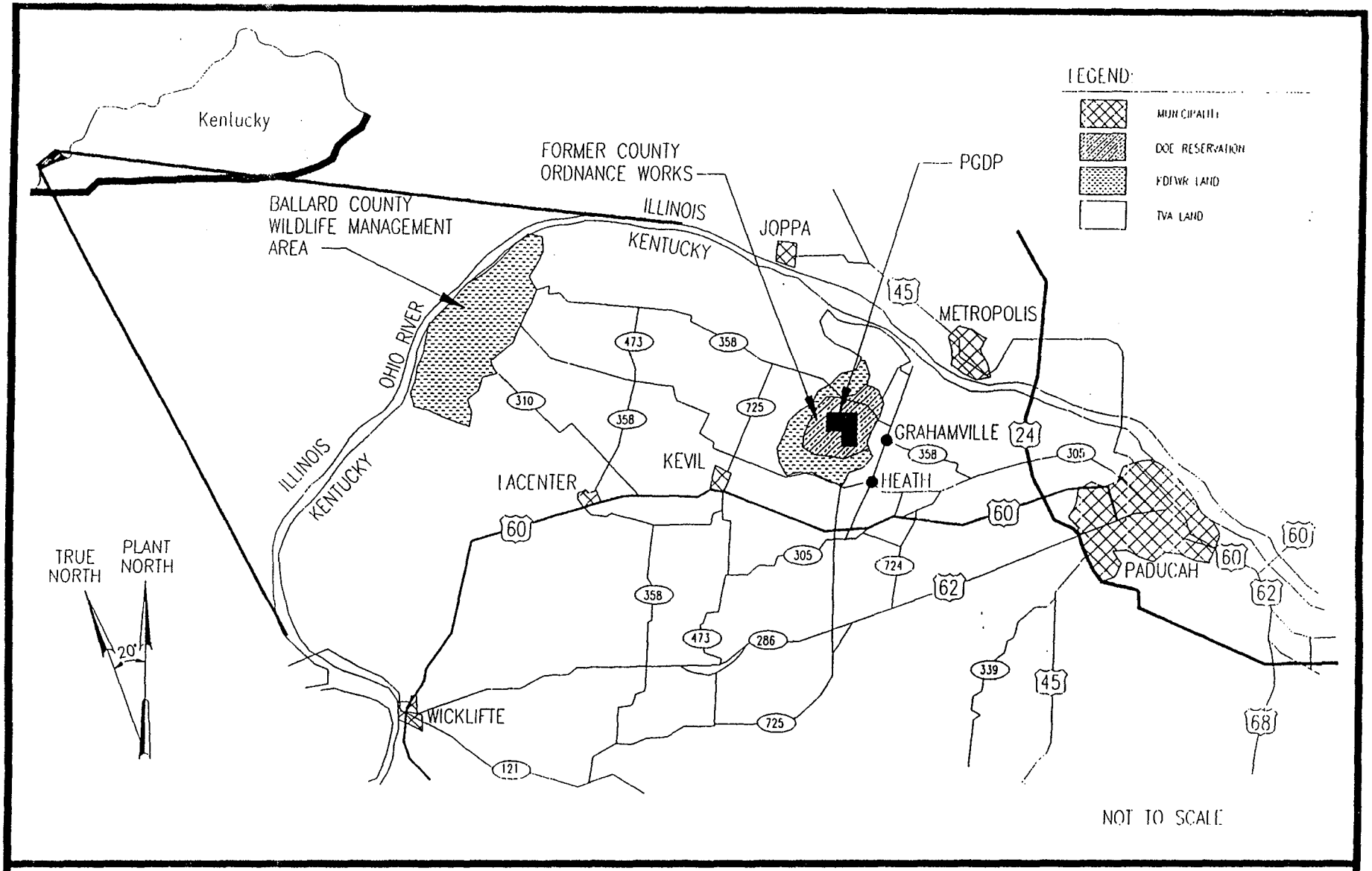

Figure 1-1. Location Map, Paducah Gaseous Diffusion Plant, Paducah Kentucky.

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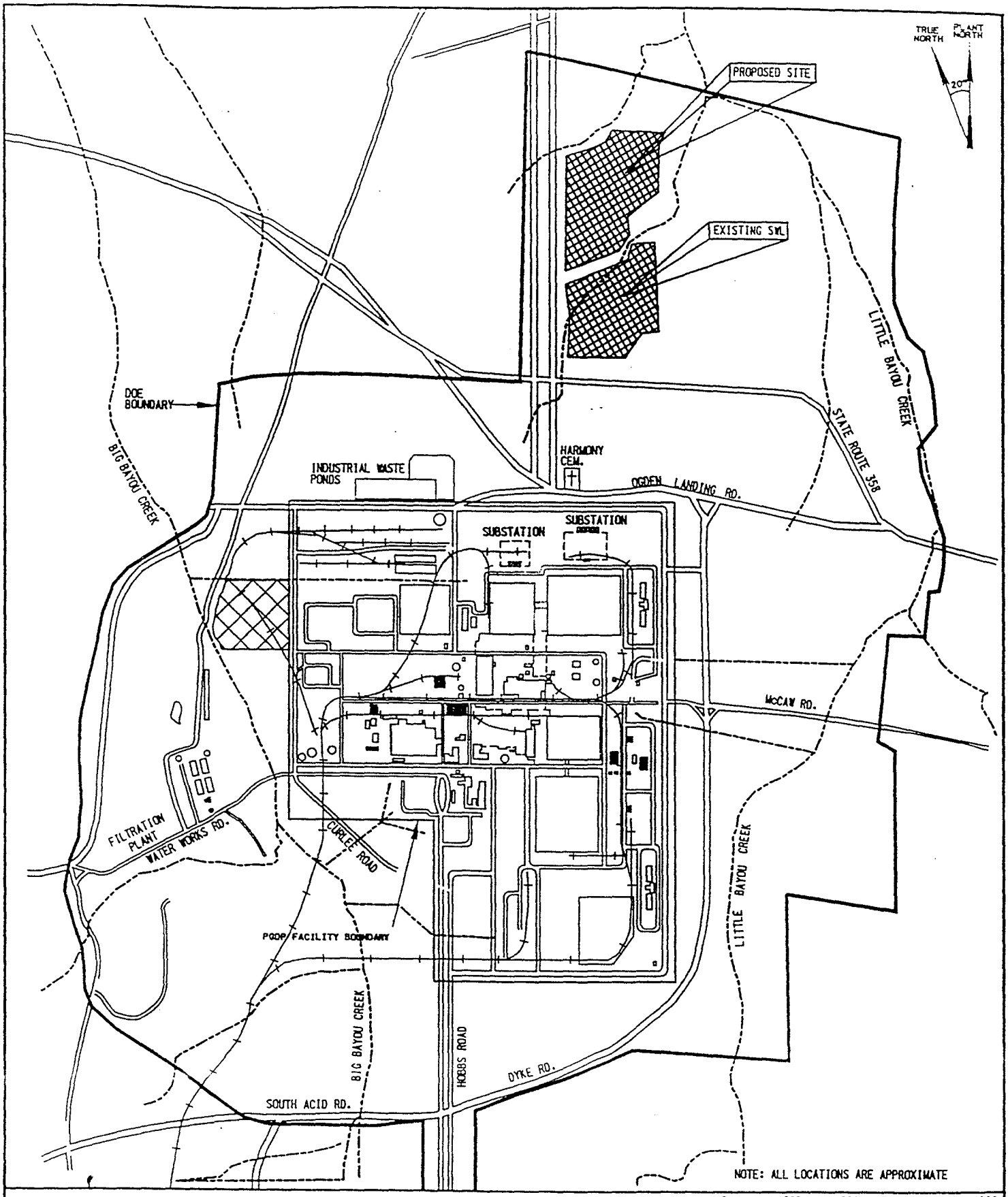

Figure 1-2.
Proposed Site of Solid Waste Landfill
Paducah Gaseous Diffusion Plant
Paducah, Kentucky.

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1.3 SCOPE OF EA

This EA describes the proposed action, reasonably foreseeable alternatives to the proposed action, and the potential impacts of the proposed action and no action. Based on the potential for impacts described herein, DOE will either publish a Finding of No Significant Impact or prepare an environmental impact statement (EIS).

This EA was prepared pursuant to the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations for the implementation of NEPA (40 CFR Parts 1500-1508), DOE's NEPA Implementing Procedures (10 CFR Part 1021, 57 *Federal Register* 15122, [April 24, 1992], DOE Order 5440.1E: NEPA Compliance Program, and *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* [Office of NEPA Oversight, U.S. Department of Energy, May 1993]).

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO ACTION

Under this no action alternative, DOE would not construct the proposed SWL, but would continue to place waste in the existing interim landfill (Cell #3) until capacity is reached or until July 1, 1995, when more stringent Kentucky regulations become effective. Waste would continue to accumulate indefinitely.

2.2 PROPOSED ACTION

The proposed action would consist of construction, operation, and closure of a new landfill with a final developed capacity of approximately 1.5 million cubic yards (yd^3). The proposed SWL, using an area fill method, would ultimately cover approximately 25 acres of a 60-acre site. Contained waste units would be developed in phases. The proposed landfill would accept "residential-type" waste consisting of cardboard, paper, canteen (cafeteria) waste, plastic, and glass. Construction/demolition debris would consist of small quantities of wood, metal materials, and construction debris (building materials, asbestos-containing materials [ACMs], concrete, bituminous concrete [asphalt], masonry, wood scrap, and fly ash). No off-site waste would be accepted. Wastes would be segregated by waste type (a continuation of current operations and procedures) and placed in a specially designed contained unit, which would be underlain by a leachate drainage and collection system and a low permeability liner. No waste containing free liquids or hazardous wastes would be placed in the landfill. ACMs would be bagged and placed in the landfill and covered with a minimum of 2 ft of material in accordance with the Commonwealth of Kentucky landfill permit requirements to comply with 40 CFR Part 61:154.

Initial development of the SWL contained waste storage area would consist of 5 one-acre phases for solid waste disposal and a 3-acre area for support facilities and roads. In addition, sedimentation basins and other support areas will be developed to total approximately 25 acres of the 60-acre site. Initial development would also include extension of a 10-inch diameter fire water line and pressure boost system and a 2-inch potable water line extended from the C-535 switchyard (approximately 4,000 ft), extension of overhead electrical and communication lines (approximately 1,600 ft), and paving the existing gravel road. This paving project will result in approximately 1,700 ft of the gravel road base extending from Kentucky Highway 358 being surfaced with asphalt and widened 4 ft with gravel shoulders. Several ancillary structures would be necessary to support the landfill facility. These include, but are not limited to, a personnel building, equipment storage shed, leachate storage area, computerized scale, and equipment refueling area which would be designed to meet all applicable National Fire Prevention Act (NFPA) Codes. Sedimentation basins, 1-acre or smaller in size, would also be constructed to collect surface water runoff from the landfill working surface and reduce siltation in adjacent streams.

The proposed site is located immediately north of the existing, interim landfill (Fig. 1-2) on DOE property and is bounded by Old Waterworks Road to the west and a power line corridor and intermittent tributaries of Little Bayou Creek to the east and west. A complete description of the existing environment at the proposed site is given in Section 3.0.

2.2.1 Construction

The design, construction, and operation of the facilities would adhere to all applicable codes, standards, DOE Orders, and environmental regulations. Wastes would be placed in the units to the required final contour, which would provide sufficient height for adequate drainage and required slope upon closure. Fig. 2-1 shows the layout of the proposed SWL, including fences, roads, and support facilities.

All-season gravel roads would be constructed around the perimeter of the waste disposal area to provide access to all monitoring and sediment control structures. Internal roads would be a minimum of 18 ft wide to allow the passage of two vehicles traveling in opposite directions. Roads would be designed to both carry normal traffic and to provide space for trucks awaiting entry to the landfill site. Typical, flat-bottomed surface run-off ditches approximately 4 ft wide and 3 ft deep would be provided to intercept surface drainage and route it to roadside ditches. The roadside ditches would collect site and road drainage and direct it to sedimentation basins (sized to hold a 25-year, 24-hour storm) where the surface drainage would be released via an existing permitted Kentucky Pollutant Discharge Elimination System (KPDES) outfall to Little Bayou Creek. The effluent would be sampled quarterly and analyzed for chlorides, sulfate, iron, sodium, total organic carbon, specific conductance, total suspended solids, total dissolved solids, total solids, and pH (at a minimum) to ensure compliance with 401 KAR 48:300 Section 2.

Contained Waste Disposal Units. Cells would be excavated to a maximum depth of 350 feet above mean sea level (MSL), 10 ft above the maximum seasonal groundwater elevation of 340 feet MSL (Davis 1994). A multimedia liner meeting the requirements of 401 KAR 48:080 would be placed in the bottom and on the sides of each waste unit after the subgrade has been established. The liner, shown in Figure 2-2, would consist of alternate layers of the following, listed from bottom to top:

1. a 36-in. clay layer with permeability of 1×10^{-7} cm/s;
2. the primary 60-mil synthetic liner;
3. filter fabric;
4. a 12-in. drainage layer with permeability of 1×10^{-2} cm/s;
5. filter fabric; and
6. a soil fill cover.

The bottom of the waste storage units would be sloped at a minimum of 10% toward a leachate collection system. The leachate would then be carried through a polyvinyl chloride (PVC) collection pipe and collected in two above-ground, 30,000 gallon (minimum) leachate collection tanks and eventually pumped into tanker trucks at each leachate collection facility. Each facility consists of approximately 2800 sq ft of enclosed space containing the above ground tanks, piping, valves, and transfer station. This enclosure protects the system from the elements while providing secondary containment.

Leachate would be sampled and disposed of in accordance with the requirements of the landfill permit. Possible disposal methods include spraying the leachate back on the landfill working face or discharging it to the existing PGDP sewage treatment plant. No local ordinances prohibit such discharge. The leachate collection tanks would be inspected at least once a month, based on expected levels of leachate production, and would be equipped with secondary containment to ensure against accidental release. The inspection would ensure that the tanks are not overfilled and that there are no leaks in the system.

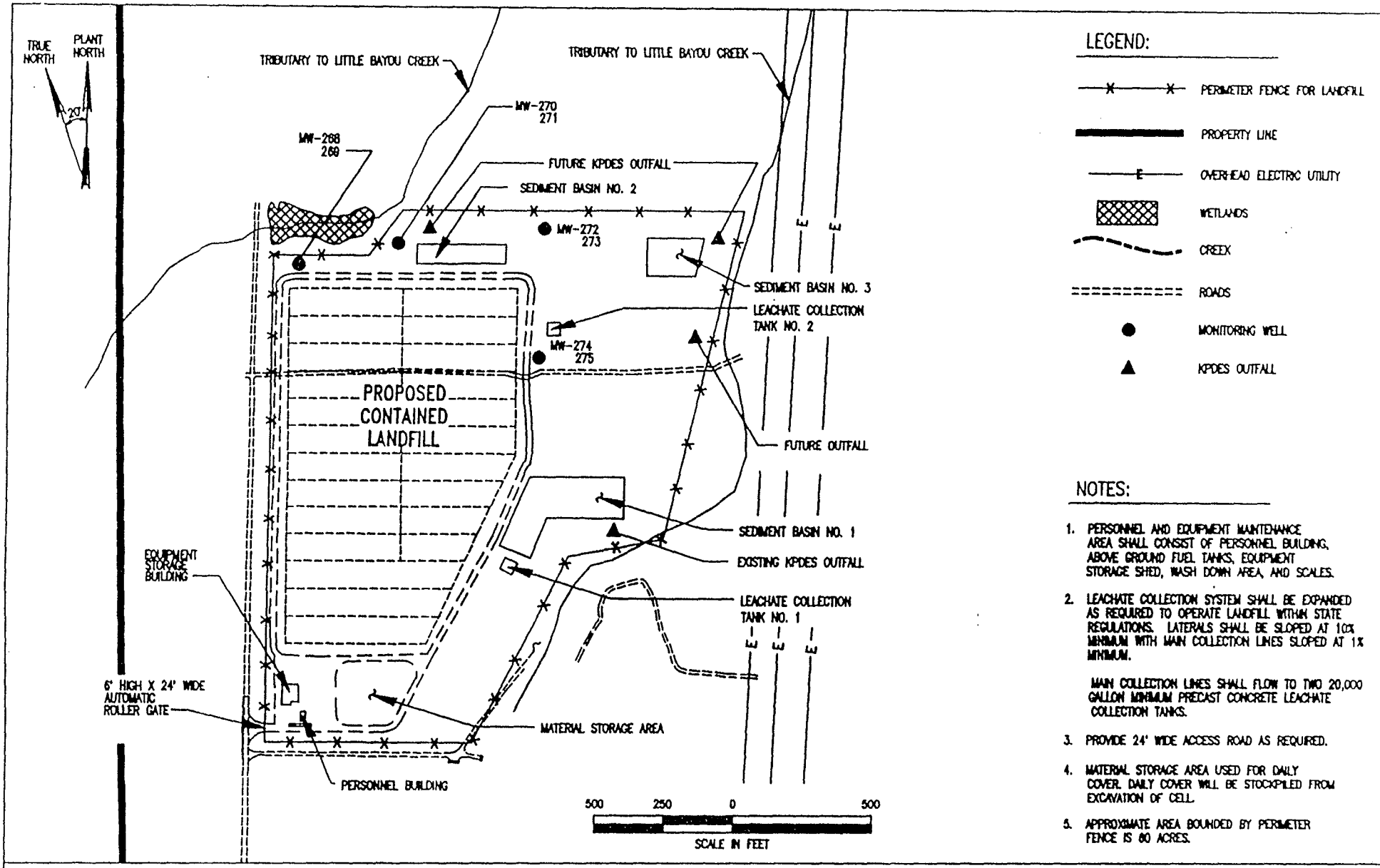

Figure 2-1. Layout of Proposed Contained Waste Landfill
Paducah Gaseous Diffusion Plant,
Paducah, Kentucky.

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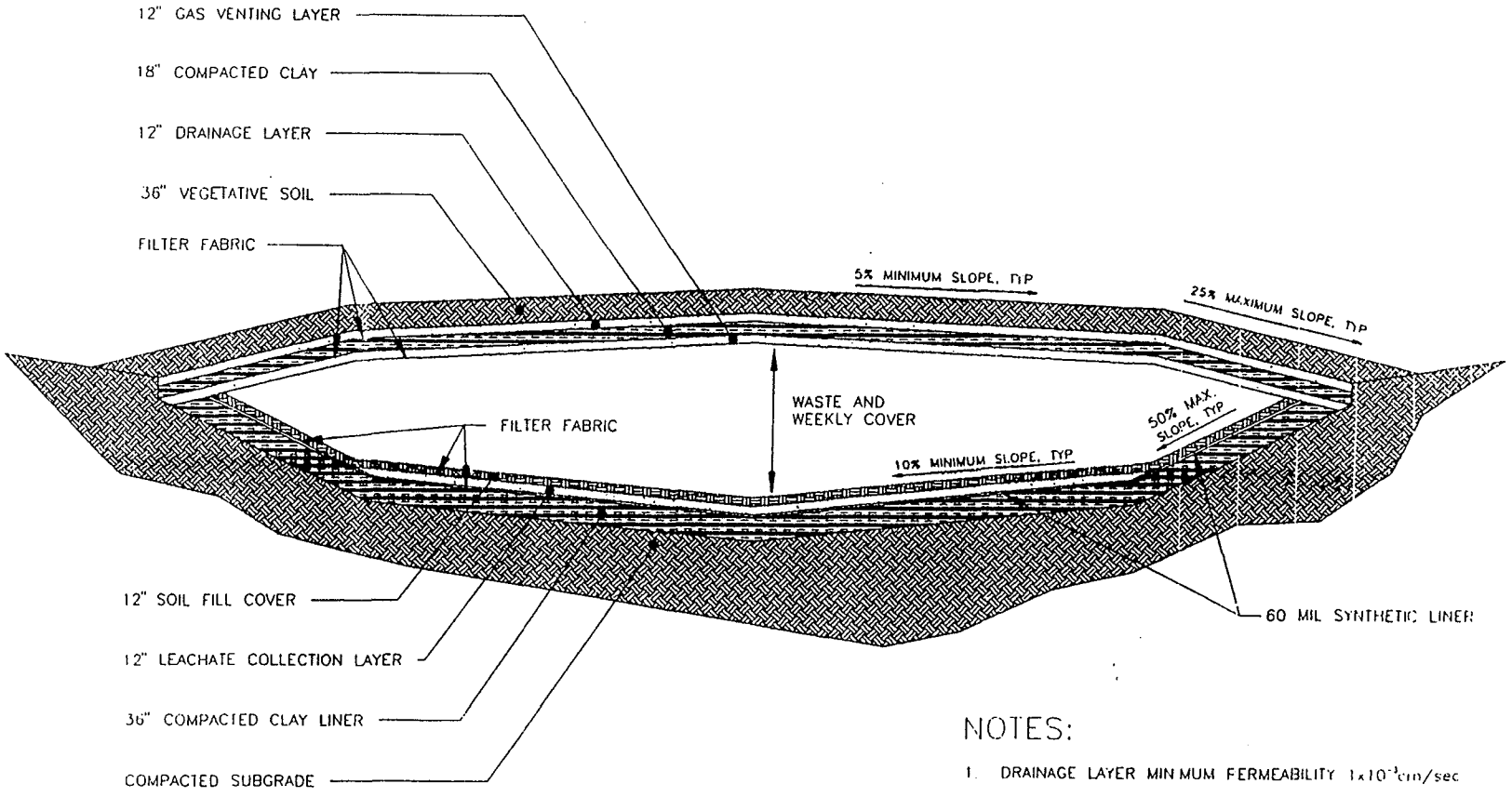

NOTES:

1. DRAINAGE LAYER MINIMUM PERMEABILITY 1×10^{-3} cm/sec
2. COMPACTED CLAY MAXIMUM PERMEABILITY 1×10^{-7} cm/sec
3. GAS VENTING LAYER MINIMUM PERMEABILITY 1×10^{-3} cm/sec
4. LEACHATE COLLECTION LAYER MINIMUM PERMEABILITY 1×10^{-1} cm/sec
5. SYNTHETIC LINER MAXIMUM PERMEABILITY 1×10^{-13} cm/sec
6. LEACHATE COLLECTION SYSTEM SHALL BE SCHEDULE 80 PVC. MAIN COLLECTION LINE SLOPES 1% MINIMUM TO 1000 GALLON MINIMUM PRECAST CONCRETE LEACHATE COLLECTION TANK

Figure 2-2. Proposed Residential Contained Landfill Cross-Section Paducah Gaseous Diffusion Plant, Paducah, Kentucky.

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2.2.2 Operation

Contained Waste. Waste would be screened, per current operational procedures, by health physics and industrial hygiene technicians so that no hazardous or radioactive waste would be accepted at this facility. All contained wastes would be inspected, compacted, and baled before placement in the landfill. Solid waste would be collected in clear plastic bags and sent to the existing Trash Sorting and Processing Facility located at the C-746A warehouse. PGDP workers would visually inspect incoming wastes to ensure that non-permitted wastes and wastes containing free liquids are not present. Then, the bags would be compacted, baled, weighed, and the driver given a ticket indicating the weight, time, and cell location where the waste is to be placed. Waste would be further compacted by a diesel-powered waste compactor after placement in the landfill to meet the requirements of 401 KAR 48:070. A 6-in. minimum soil cover, from soils stockpiled from excavation, or an approved alternative daily cover material, would be placed over all exposed solid waste at the end of each working day to minimize the potential for fires, blowing litter, and nuisance vectors (i.e., disease-carrying organisms). An 18-in. layer of cover would be placed over all areas that do not receive additional waste within a period of 4 months.

The SWL would be closed to the public, and would only be used by PGDP. No off-site waste would be brought to this facility. Site access would be controlled by a 6-foot security fence around the perimeter of the landfill and two security gates. Warning signs would be posted around the perimeter of the landfill and would be visible and readable at a distance of 100 feet.

Construction/Demolition Debris. Construction/demolition debris would be spread and compacted in lifts (i.e, maximum heights achieved during operation) of sufficient thickness to minimize void spaces during placement of the material. The layers would be limited to a maximum of 8 ft in height for any one placement. Construction/demolition debris is difficult to compact; therefore, special requirements would be stipulated to prohibit large, bulky items of waste. For example, large, bulky pieces of waste would be required to be broken into more manageable sizes before placement in the landfill. ACMs would be bagged and placed in the landfill and covered with a minimum of 2 ft of material in accordance with Commonwealth of Kentucky permit requirements to comply with 40 CFR Part 61:154.

Fly Ash. Fly ash from the PGDP Steam Plant coal-fired boilers would be placed in the landfill operating units. The operator would be required to follow these additional special precautions:

1. Fly ash would not be placed in the landfill on a windy day.
2. Fly ash would be sprayed with water from the water truck to suppress airborne particulate emissions.
3. Fly ash would not be placed during rainfall events.
4. Soil cover would be placed over the material immediately.
5. Fly ash would be disposed of within the landfill unit immediately upon receipt if there is no wind or rain in the forecast.

2.2.3 Closure

Closure of the landfill would follow the regulations specified in 401 KAR 48:090, Section 13. The closure plan would include a description of the final cap, a groundwater monitoring program, and post-closure maintenance, including maintenance and operation of the leachate system and the explosive gas monitoring system.

After final contours are achieved, a multimedia cap would be installed to cover the waste and direct the surface flow away from the capped area. Diversion ditches would be placed as required to direct site drainage around the cap. The final multimedia cap (Fig. 2-3) would meet the requirements of 401 KAR 48:080 and would consist of alternate layers of the following (from bottom to top):

1. filter fabric;
2. 12-in. sand layer with permeability of 1 x 10^{-3} (0.001) cm/s for gas venting layer (required for contained waste cells);
3. filter fabric;
4. 18-in. clay layer with permeability of 1 x 10^{-7} cm/s;
5. filter fabric;
6. 12-in. sand drainage layer with permeability of 1 x 10^{-3} cm/s; and
7. 36-in. vegetative layer.

Final cap slopes would range between 5% and 25% with each layer having the same slope. Grass would be planted on the cap to prevent erosion of the cap surface.

The leachate system would continue to operate as described in Sect. 2.2.1. The leachate system would continue operating until leachate is no longer generated.

Groundwater monitoring would continue on a quarterly basis for the time period specified in the closure plan. The groundwater monitoring system would be installed before landfill operation and be designed to monitor the waste boundary area. The monitoring system would have a minimum of one upgradient monitoring well and three downgradient monitoring wells (401 KAR 48:300). The Groundwater Monitoring Plan as described in the SWL application was approved by KDWM in September, 1994.

A passive gas venting system would be an integral portion of the final cap and would be monitored at least quarterly for explosive gases in accordance with 401 KAR 48:070 Section 10. A minimum of one vent shall be required per acre of waste containment area in accordance with these regulations.

2.3 ALTERNATE SITES

Potential SWL sites were screened in accordance with the requirements of 401 KAR 48:050, "Siting Requirements for Solid Waste Landfills." These requirements prohibit placement of wastes in specific areas which include, but are not limited to: (1) within 250 ft of an intermittent stream; (2) within 1,000 ft of any public highway or park; (3) within 250 ft of karst (limestone) terrain; (4) within 250 ft of property lines or residences; (5) within 4 ft of the seasonal high water table; (6) within the 100-year floodplain; and (7) within 200 ft of a fault that has had displacement in Holocene time.

Several potential alternate sites were identified based on the above requirements and assuming utilization of a waste cell method on a 40-acre site. As described in Section 2.2, however, it was determined that a SWL utilizing the area fill method on a 60-acre site will be necessary to meet landfill needs. Of the potential sites identified, only the proposed site meets those criteria. Relocating the proposed site boundary inward an additional 50 ft from an intermittent tributary to Little Bayou Creek also ensures compliance with the requirements of 401 KAR 48:050, listed above. Therefore, sites initially identified as potential alternatives were considered and eliminated, and do not warrant evaluation in this EA.

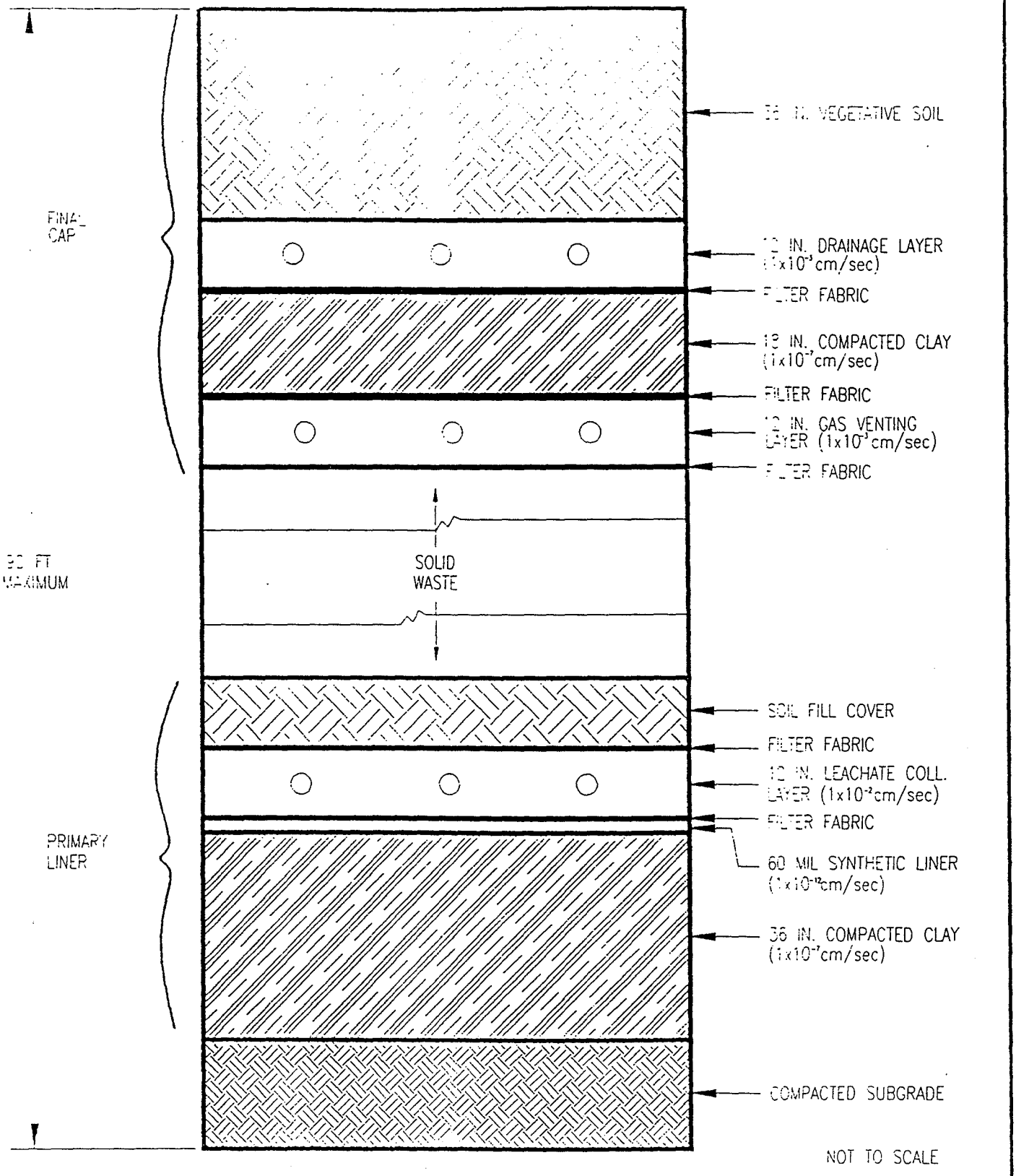

Figure 2-3. Typical Cross-Section of Contained Landfill After Closure with Final Cap Meeting Requirements of 401 KAR 48.080.

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2.4 OTHER ALTERNATIVES

A Feasibility Study (Lockwood Greene 1990) identified several other waste management alternatives, including incineration, compaction/bailing, boiler conversion from coal to natural gas, and off-site disposal and recycling. Under the current operating permit, PGDP could dispose of fly ash in an off-site facility. Along with the practices of compaction/baling, incineration, and boiler conversion, this practice might reduce the required landfill area, but would not entirely eliminate the need for additional capacity. While these options may be pursued at PGDP to reduce the total amount of waste going into the proposed landfill, they were eliminated from consideration in this EA as reasonable alternatives.

Off-site disposal of waste and recycling were also considered as alternatives to on-site disposal, but were eliminated from consideration in this EA for several reasons. Current DOE administrative and security policies restrict the off-site disposal of administrative and contained waste (Lytle 1991). The long-term availability of acceptable commercial or municipal landfills is also uncertain. Because DOE would not have control over the operation of an off-site facility, there is a potential for DOE to be named as a responsible party should the landfill have a future adverse impact upon human health or the environment. Even the probability of a motor vehicle accident would increase with the transportation of waste over a greater distance on public roadways.

Recycling would not be a viable option at this time either, because due to security constraints, any paper shipped off-site would have to be shredded to such a small size (cellulose fibre size insufficient) that it would not be suitable for recycling.

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

The PGDP is located within the Jackson Purchase Region of western Kentucky in McCracken County, approximately 3.5 miles south of the Ohio River and 20 miles east of the confluence of the Ohio and Mississippi rivers. The city of Paducah is the closest municipality to the PGDP, located approximately 10 miles to the east (Fig. 1-1). Several small towns are situated within a 5-mile radius of the DOE property boundaries, including Heath and Grahamville to the east and Kevil to the southwest. Bordering the DOE property to the northeast is the Shawnee Steam Plant, which is owned and operated by the Tennessee Valley Authority (TVA). The area surrounding PGDP is predominantly rural, with residences and farms scattered throughout the region. The WKWMA encompasses approximately 7,000 acres immediately surrounding the plant.

3.1 GEOLOGY

The near surface geology at PGDP, to a depth of approximately 100 feet, consists of clastic (made up of fragments) continental and marine deposits. The clastic continental deposits are represented by two sedimentary sequences from two distinct depositional periods (Olive 1980). The younger clastic sequence, known as the Upper Continental Deposits (UCD), is a silt and clay lacustrine deposit with isolated sand and gravel lenses. The UCD exhibits variable thickness ranging from approximately 40 to 65 ft in the areas of the proposed site. The older clastic sequence, known as the Lower Continental Deposits (LCD), contains a 20- to 40-ft thick sand and gravel facies that forms the Regional Gravel Aquifer (RGA), the primary source of drinking water near PGDP. No residences in the immediate vicinity of PGDP rely upon the RGA for groundwater supply, as most have been supplied with municipal water (Energy Systems 1991). Approximately 32 soil borings would be performed during the permit process to generate a more detailed geological data base. A columnar section of the Jackson Purchase Region is shown in Figure 3-1. No economic geological resources (e.g., mineral deposits) have been identified at PGDP.

PGDP is located in an area with a seismic risk rating of 3, on a scale of 1 to 3, with 3 being the most severe rating. Several minor seismic tremors have been recorded at PGDP since the early 1950s. However, a release of contaminants or structural failure at PGDP as the result of seismic activity has never occurred, and the potential for releases of contaminants from PGDP resulting from seismic events has not been quantified (Murray State University 1990).

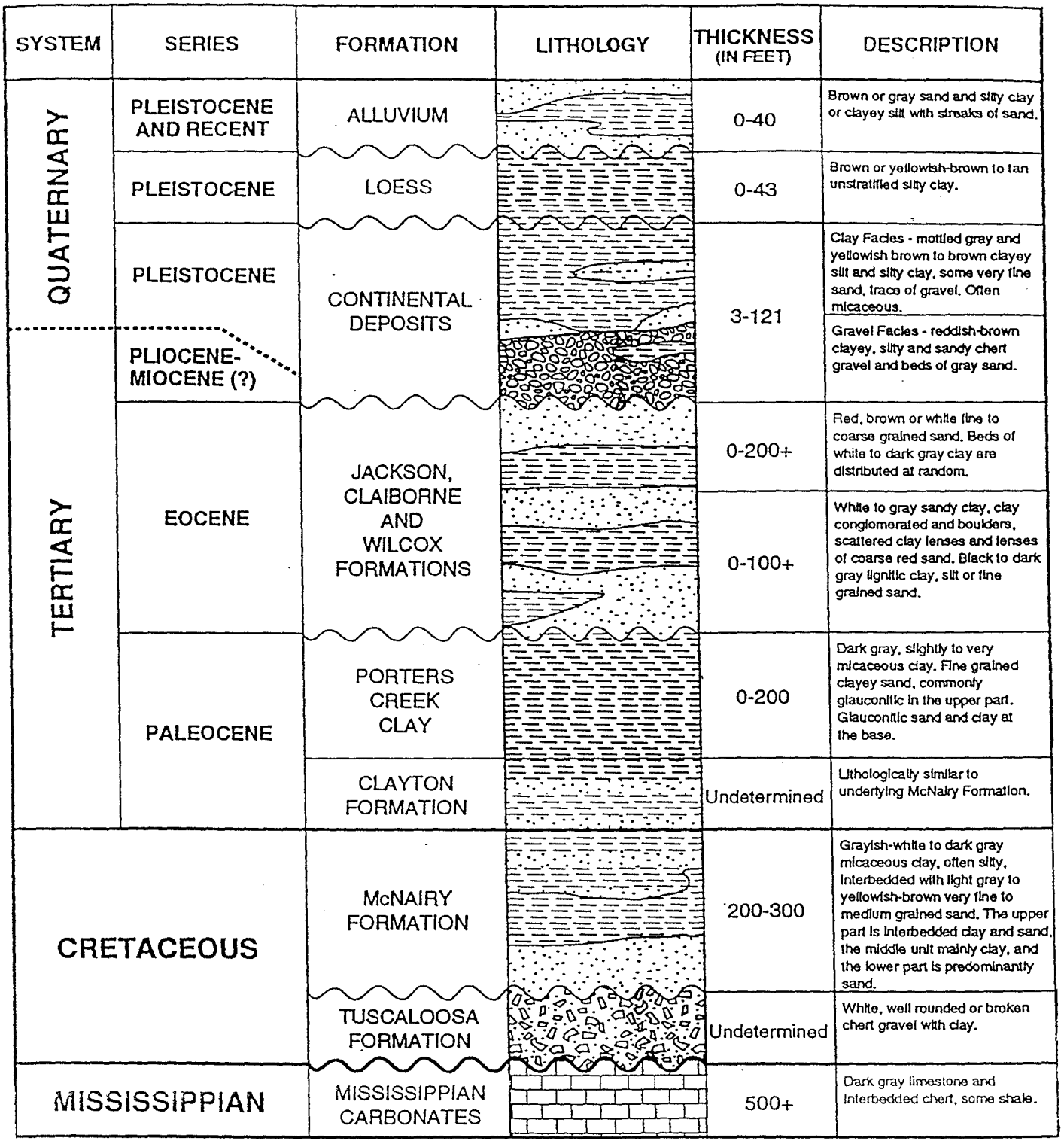

Figure 3-1. Columnar Section of the Jackson Purchase Region of Kentucky.

3.2 HYDROLOGY

3.2.1 Surface Water

PGDP is located in the western part of the Ohio River Basin. The confluence of the Ohio and Tennessee rivers is approximately 10 miles upstream of the site. The confluence of the Ohio River with the Mississippi River is approximately 20 miles downstream of the site.

PGDP is located on a local drainage divide; surface flow is to the east and northeast toward Little Bayou Creek and to the west and northwest toward Big Bayou Creek. The proposed site and alternate sites are located within the drainage basin of Little Bayou Creek. Little Bayou Creek originates in the West Kentucky Wildlife Management Area (WKWMA) and flows north toward the Ohio River along a 6.5-mile course through the eastern portion of the DOE reservation (see Fig. 1-2).

Little Bayou Creek has not been formally classified by the Kentucky Department for Environmental Protection (KDEP). However, according to state regulations (401 KAR 5:026), any waters not specifically classified by the KDEP are otherwise designated for the following uses: warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply (KDEP 1990). Thus, by default, Little Bayou Creek is classified for these uses.

Little Bayou Creek receives point and non-point source effluent discharges from PGDP, including process effluent, treated sewage, and storm water discharge under KPDES permit KY00040. PGDP effluent discharges account for nearly all of the flow in Little Bayou Creek (CH2M HILL 1991).

An intermittent tributary of Little Bayou Creek flows approximately 100 ft from the eastern boundary of the proposed SWL site. Another intermittent tributary flows approximately 50 ft from the northwest corner of the site boundary (see Fig. 2-1).

3.2.2 Groundwater

Commonwealth of Kentucky regulations require that the base of a landfill be located at least four feet above the seasonal high water level. The proposed SWL would meet this requirement. Cells would be excavated to a maximum depth of 350 feet above MSL, 10 ft above the maximum seasonal groundwater elevation of 340 feet MSL.

Groundwater flow through the loess and clay-silt facies of the UCD is predominantly downward in the PGDP area. Seasonally saturated perched zones occur in the surficial soils above fragipans and in isolated sand lenses of the UCD. These sand lenses can produce only limited quantities of water during wet seasons.

Other than an erosional surface at approximate elevation 340 ft above MSL in the area of the proposed site, soil borings in the UCD penetrate sand lenses at various elevations. These sand lenses appear to be isolated laterally and vertically. Variations in thickness and texture of sands commonly occurring near elevation 340 ft above MSL suggest the sands have little lateral continuity and less vertical connection with other sands. The limited extent of sands in the UCD offers little enhancement of pathways for pollution migration. Use of perched aquifers for water supply is unknown in the PGDP area but cannot be ruled out.

Sands in the UCD at the existing, interim landfill south of the proposed site typically do not offer potential for groundwater monitoring. Perched zones exist only locally. Groundwater flow through the UCD is predominantly vertically downward rather than horizontally outward, so groundwater monitoring at the perimeter of the contained waste area would not detect a release from the landfill base. The sands are generally saturated only seasonally. Monitoring wells in these sands could not be relied upon to yield samples for water quality monitoring due to this seasonal variation in water levels.

The uppermost aquifer in the PGDP area, the Regional Gravel Aquifer (RGA), is developed in the lower gravel facies of the Continental Deposits. Recharge occurs as leakage from the UCD. In general, flow in the RGA is to the north, to discharge into the Ohio River or alluvial deposits along the river (Energy Systems 1992).

The predominantly fine-grained deposits of the Porters Creek Clay and the McNairy Formation act as a basal confining layer for the RGA and Eocene sands. Groundwater movement within the McNairy aquifer is north toward the Ohio River (ERC/EDGe 1989).

Due to existing groundwater contamination from PGDP, several nearby private wells have been taken out of service. All potentially affected residences and businesses have been supplied with potable water via connection to municipal water supply lines (DOE 1994).

3.2.3 Floodplain

Flooding in the vicinity of the proposed site is caused by headwater flooding from Little Bayou Creek and is not affected by backwater flooding from the Ohio River for a 500-year or lesser flood (Cross 1993). The 100-year flood elevation for Little Bayou Creek ranges from about 355 to 360 feet above MSL nearest the proposed site; however, this distance is over a mile east of the site (COE 1994). The elevation of the nearest tributary to Little Bayou Creek is approximately 345 ft MSL. Ground surface elevations at the proposed site are approximately 365 ft MSL, well above the 100-year and 500-year flood elevations (COE 1994).

3.2.4 Wetlands

According to the COE Wetlands Investigation Report (Volume II of COE 1994), there are no wetlands within the boundaries of the proposed site. However, a small wetland, approximately 1 acre in area, is mapped near the northwest corner of the site (COE 1994). The SWL design ensures that the perimeter fence would be installed at least 50 feet from this wetland, and that wastes would not be placed within 250 ft of the intermittent stream responsible for this wetland.

3.3 SOILS AND PRIME FARMLAND

Prime farmland, as defined by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS), is land that is best suited to food, feed, forage, fiber, and oilseed production. It does not include "urban built-up land or water" (7 CFR Parts 657 and 658). SCS determines prime farmland primarily on the basis of soil types found to exhibit desired soil properties. Soil properties include soil quality, growing season, moisture supply, and other properties needed to produce sustained high yields of crops in an economical manner.

The soils in the vicinity of PGDP consist of silty loam and silty clay loam lying above the loess and alluvium surficial deposits. Six soil series are mapped in close proximity to PGDP (USDA 1976). These soil series include the Calloway silt loam, Grenada silt loam, Loring silt loam, Falaya-Collins silt loam, Vicksburg silt loam, and the Henry silt loam. The Calloway-Henry association is the predominant soil association found in the vicinity of PGDP. All but the Henry series can be considered prime farmland based on general soil properties (Froedge 1994).

The SCS has determined that approximately 25 acres of prime farmland exist at the proposed site. A Farmland Conversion Impact Rating for the proposed location has been completed by SCS and DOE (see Appendix A).

3.4 CLIMATE, AIR QUALITY, AND NOISE

3.4.1 Climate

PGDP is located in the humid continental climate zone, which is characterized by moderately cold winters and warm summers (Energy Systems 1991). The average monthly temperature is 57.6°F, ranging from a low monthly average of 32.6°F in January to a high monthly average of 79.1°F in July. On average, the maximum daily temperature is below 32°F 14 days of the year. Summers are typically warm and humid, with the maximum daily temperature exceeding 90°F an average of 40 days per year. The relative humidity varies between 60% and 85% throughout the year.

Precipitation averages 50.3 in. annually, with the greatest volumes occurring during the periods of March-July and November-December. Thunderstorm activity is common in the summer months. On average, a precipitation event of up to 3.6 in. within 24 hours occurs every 2 years, and a precipitation event of up to 6.6 in. within 24 hours occurs every 50 years. The driest period of the year is August through October. Approximately 2% of the precipitation occurs in the form of snow, with an annual snow average of 13.1 in., which equals approximately 1.3 in. of liquid precipitation.

The prevailing wind direction is from the south to the southwest with an average speed of approximately 10 miles per hour. Stronger winds occur in the late fall and winter and are generally associated with weather fronts originating from the southwest or northwest.

3.4.2 Air Quality

McCracken County (which includes PGDP and the city of Paducah) is an attainment area for all measured pollutants. The Kentucky Division for Air Quality measures air quality at nine monitoring stations in McCracken County. Monitored pollutants include particulate matter, sulfur dioxide, carbon monoxide, ozone (hourly average), and nitrogen dioxide. Measurements are taken to establish values for annual arithmetic means, maximum 24-hour averages, maximum 3-hour averages and hourly averages, as required. In 1993 and 1994, none of these standards (primary or secondary) were exceeded at any of the McCracken County monitoring stations (Ashburn 1994).

3.4.3 Noise

Ambient noise levels are not measured at PGDP or at any nearby facilities. There are currently no local ordinances concerning noise regulation. The Commonwealth of Kentucky has a law concerning

noise regulation, but no enforcement or monitoring program exists and no regulations governing the implementation of this law have been promulgated.

Noise from industrial processes taking place at the plant are generally restricted to the interior of the plant buildings. Noise levels beyond the plant security fence are generally the result of vehicular traffic moving through the area. Noises at the proposed SWL site result from wildlife, recreation activities (e.g., hunting), nearby traffic, and operations at the existing PGDP landfill just to the south. Although no measurements have been taken, noise levels from the existing landfill are obviously higher at the south end of the proposed site and lowest (generally inaudible) at the north end.

3.5 BIOLOGICAL RESOURCES

3.5.1 Vegetation

The DOE Reservation at Paducah is a highly disturbed area. Vegetation communities are indicative of old field succession (i.e., grassy fields, field scrub-shrub, and upland mixed hardwoods).

Open grassland areas, managed by the WKWMA personnel, are periodically mowed or burned to maintain early successional vegetation, which is dominated by members of the composite family and various grasses. Management practices of the WKWMA encourage re-establishment of once common native grasses such as eastern gama grass (*Tripsacum dactyloids*) and Indian grass (*Sogastrum* sp.). Commonly cultivated for wildlife forage are corn, millet, milo, and soybean (Birge 1990).

Field scrub-shrub communities consist of sun-tolerant wooded species such as persimmon (*Diospyros virginiana*), maples (*Acer* sp.), black locust (*Robinia pseudoacacia*), sumac (*Rhus* sp.), scattered oaks (*Quercus* sp.), and mixed hardwood species (Birge 1990). The understory may vary depending on the location of the woodlands. Wooded areas near maintained grasslands may have an understory dominated by grasses. Other communities may contain a thick understory of shrubs, including sumac, pokeweed (*Phytolacca americana*), honeysuckle (*Lonicera japonica*), blackberry (*Rubus* sp.), and grape (*Vitis* sp.).

Upland mixed hardwoods contain a variety of upland and transitional species. Dominant species include oaks, shagbark and shellbark hickory (*Carya ovata, C. laciniosa*), and sugarberry (*Celtis laevigata*) (Birge 1990). Understory may vary from very open, with limited vegetation for more mature stands of trees, to dense undergrowth similar to those described for a scrub-shrub community.

The proposed SWL site consists primarily of open fields, which cover approximately 80% of the area. A variety of crops, including soybeans, were grown here in the past by local farmers with permission of the WKWMA. The fields are divided by rows of trees delineating old fencerows. These relatively isolated wooded areas are characterized by mixed hardwood and scrub-shrub communities. Intermittent streams are located near the northwest corner of the proposed site and just east of this site. Vegetation bordering the streams consists of black locust, black willow (*Salix nigra*), sweetgum (*Liquidambar styraciflua*), maple, elm, and oak.

3.5.2 Wildlife

Wildlife species indigenous to hardwood forests and open grassland communities occur in the PGDP vicinity. Grassy fields are frequented by rabbits, mice, song birds, and a variety of other small mammals and birds (Birge 1990). The red-winged blackbird (*Agelaius phoeniceus*), killdeer (*Charadrius rociferus*), cardinal (*Cardinalis cardinalis*), mourning dove (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), meadowlark (*Sturnella* sp.), warblers, sparrows, and red-tail hawk (*Buteo jamaicensis*) have been seen in these grasslands.

Shrub-scrub communities support a variety of wildlife, including opossum (*Didelphis virginiana*), vole (*Microtus* sp.), mole (*Scalopus* sp.), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), killdeer, bluejay (*Cyanocitta cristata*), red-winged blackbird, bluebird (*Sialia* sp.), cardinal, mourning dove, shrike (*Lanius* sp.), warblers, turkey (*Meleagris gallopavo*), and meadowlark (Birge 1990). Deer, squirrel, raccoon, turkey, songbirds and great horned owls (*Bubo virginianus*) are found within mature woodlands of PGDP (Birge 1990). The Ohio River, approximately three miles north of the proposed site, serves as a major flyway for migratory birds (SAIC 1992). Migratory birds and transient residents are occasionally seen on the DOE reservation.

Amphibians and reptiles are common throughout the DOE reservation (SAIC 1992). Amphibians likely to occur include American and Woodhouse's toads (*Bufo americanus* and *Bufo woodhousei*). Reptiles include eastern box turtles (*Terrapene carolinia*) and several species of snakes (SAIC 1992).

The proposed site is located near Little Bayou Creek, which is not considered ecologically unique and does not support federally listed endangered or threatened species (KDEP 1990 and COE 1994). Fish populations are numerically dominated by various species of sunfish (CH2M HILL 1991).

Wildlife habitat at the proposed site is disturbed and is poor quality for supporting a variety of terrestrial wildlife species. Open cultivated fields provide poor habitat for small mammals because of the lack of protective vegetative cover and the constant disturbance of the area by farm equipment. Large mammals, such as deer, use the open fields as a transportation corridor from one area to another. Small mammals would be limited to the wooded areas of the site, which provide protective cover from predators. The animals found within the wooded area would be those previously described for the shrub-scrub community.

3.5.3 Threatened and Endangered Species

The potential occurrence of federally and state-listed threatened and endangered species at the proposed site was determined by contacting the USFWS, Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Kentucky State Nature Preserves Commission (KSNPC). None of the agencies have conducted surveys for listed species on the DOE reservation. However, the agencies did provide listings of species here reported for McCracken County, some observed near PGDP. The COE Threatened and Endangered Species Investigation (Volume III of COE 1994) provides a complete report of listed species potentially occurring at or near PGDP.

Federal In consultation with the FWS, the Indiana bat (*Myotis sodalis*) was determined to be the only federally-listed species requiring evaluation for potential impacts by the proposed action. Indiana bats hibernate in caves during the fall and winter months. In spring, they migrate to forested habitats where they forage throughout the summer and the adult female bats establish maternity roosts in hollow trees and under the loose bark of various species of trees.

The FWS evaluated the proposed action in 1993 and concluded that there are no federally-listed or proposed endangered or threatened species in the proposed project impact area (Barclay 1993). However, the project scope changed to include additional area for the proposed site. A subsequent evaluation indicates that the proposed site includes approximately six acres of suitable summer habitat for the Indiana bat (see correspondence in Appendix A). Approximately five acres are rated as "poor" habitat and once acre is rated as "good" habitat. There is no federally-designated "critical habitat" near PGDP.

State There is no official listing of threatened or endangered species for the Commonwealth of Kentucky. However, a list of plant and animal species identified for monitoring purposes is maintained by the KSNPC. There are currently no compliance requirements for these "state-listed" species.

Potential habitat exists at the proposed site for some state-listed species (COE 1994). Consultation with KSNPC, KDFWR, and WKWMA staff indicate that there have been no recent sightings of state-listed species at the proposed SWL site (Evans 1992; Pelren 1992; Logsdon 1994).

3.6 LAND USE

The PGDP is on a 3,423-acre site owned by DOE. Fig. 3-2 illustrates the current land ownership in the vicinity of PGDP. Most plant facilities (with the exception of the existing, interim landfill) lie within a fenced security area consisting of 749 acres. DOE maintains a buffer zone of approximately 595 acres surrounding the security area, which is used for support services, including the wastewater treatment plant, lagoons for process wastewater plant, and contained and construction/demolition debris landfills. The remaining 2,079 acres are licensed to the Commonwealth of Kentucky for the purpose of wildlife management in the WKWMA. The property within the buffer zone is not licensed to the Commonwealth of Kentucky, although some is managed by KDFWR with the permission of DOE. DOE maintains the right to assume possession of any property within the buffer zone immediately if deemed necessary. The proposed site is on land currently owned by DOE and licensed to KDFWR. The majority of the site (approximately 80%) is currently idle, and the remaining 20% is comprised of isolated wooded areas. Farming, dog training, field trials (competitions), small game hunting, and bowhunting for deer are permitted at the proposed site.

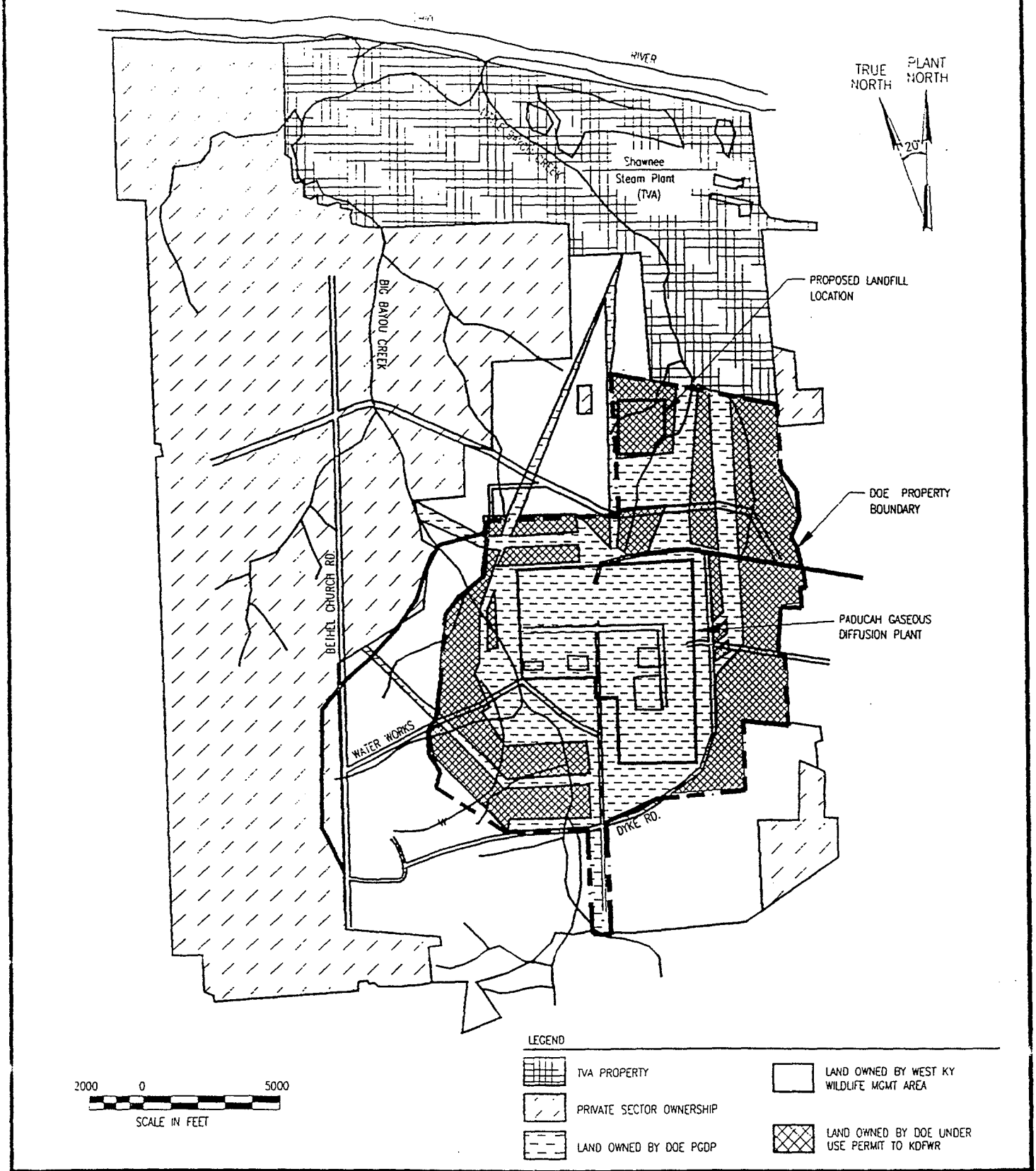

Figure 3-2. Current Land Ownership Map for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.

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3.7 CULTURAL RESOURCES

A cultural resources Phase I survey was conducted and a report prepared and submitted to the SHPO for concurrence (Appendix B). Although the entire proposed site was included in the survey, the report incorrectly refers to the survey area as being only 40 acres in size. The SHPO has concurred that areas of cultural or archaeological significance do not exist in the area proposed for the SWL (Appendix A).

3.8 SOCIAL AND ECONOMIC CONDITIONS

Socioeconomic conditions relating to the construction, operation, and closure of the Paducah SWL have been reviewed. No disproportionally high or adverse affect on minority or low income populations would result.

3.8.1 Demography

The location of PGDP in relation to surrounding communities in McCracken and Ballard Counties, Kentucky, and Massac County, Illinois, across the Ohio River, is shown in Fig. 1-1. The small communities of Grahamville, Heath, and Kevil are within 3 miles of the DOE property boundary; and the larger municipalities of Paducah and La Center, Kentucky, and Joppa and Metropolis, Illinois, are within a 15-mile radius of the site.

The 1990 census population for McCracken County was 62,879 persons with 27,256 persons residing in Paducah. Ballard County reported a population of approximately 7,920 persons; La Center's population was 1,042; and 337 persons live in Kevil. Massac County, Illinois, reported 14,752 persons, with 6,734 living in Metropolis and 492 living in Joppa. Total population within a 50-mile radius of the plant is approximately 500,000 with approximately 66,000 people residing within 10 miles of PGDP (U.S. Department of the Interior 1990).

3.8.2 Economic Activities

The total labor force for McCracken County in July 1991 was recorded at 28,684 persons (Slater and Hall 1992). Total employment was recorded at 27,063 persons and 1,621 persons registered as unemployed (Slater and Hall 1992). Unemployment in the county was 5.7% at that time as compared to 6.7% for the Commonwealth of Kentucky and 7.7% for the United States as a whole (Hayghe 1992). Construction and retail sales account for almost 50% of all employment (24% and 23%, respectively). Fifteen percent of employment is concentrated in manufacturing and 13% in mining (Dunning 1992). PGDP employs approximately 1,800 workers, and the TVA Shawnee Steam Plant employs 500 workers. The average 1992 per capita income in McCracken County was $17,450 as compared with an average income of $14,992 per capita in Kentucky and an average income of $18,692 in the entire United States.

3.9 TRANSPORTATION

Interstate I-24 passes through Paducah, Kentucky, approximately 10 miles east of PGDP. Four federal highways (US 45, 60, 62, and 68) and many state highways traverse the area. Main access to

the plant is via US Highway 60. Because PGDP is located in a secured area, traffic is minimal within the plant and surrounding area and is generally limited to vehicles traveling into or out of two gates. Vehicles are screened by security before entering the secure area of the plant. PGDP traffic within the plant is generally limited to trucks and service vehicles that must move equipment and supplies within the facility. Traffic north of the plant is generally comprised of trucks hauling refuse to the existing landfill facility. Traffic near the proposed site consists chiefly of infrequent visits by recreationists, PGDP personnel, and WKWMA personnel traveling on existing gravel roads in the area.

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4.0 ENVIRONMENTAL IMPACTS

The environmental impacts associated with the proposed action and the no-action alternative are discussed in this section. The environmental impacts are evaluated relative to the existing environment described in Section 3.0.

4.1 IMPACTS OF NO-ACTION

The no-action alternative would have no immediate additional impact on the physical and biological resources currently existing at PGDP. However, the no-action alternative would ultimately result in curtailment or suspension of operations at PGDP, as remaining waste storage space is consumed and waste begins to accumulate on site. The unrelieved accumulation of solid waste in dumpsters and similar receptacles at PGDP would also pose potential risks to human health and to the environment through generation of animal and disease vectors.

4.2 IMPACTS OF PROPOSED ACTION: CONSTRUCTION, OPERATION, AND CLOSURE OF A SOLID WASTE LANDFILL

4.2.1 Geology

The construction, operation, and closure of the SWL at the proposed site would have no impact on the geology of the site because excavation of the landfill cells would be limited to the upper 10-15 ft of overburden. The SWL containment structures, liners, leachate collection system, and surface water control system would be designed to resist seismic impact in accordance with regulations such as 401 KAR 48:070, Section 3. The landfill slopes and embankments would be designed to resist deformation along slip surfaces that pass through or along the landfill liner or cover system. The sedimentation pond slopes and embankments would be designed in like manner. The leachate collection system and piping supports would be designed to function when subjected to any deformations induced by settlement resulting from seismic events or other design forces.

4.2.2 Hydrology

Surface Water. Construction and operation of the SWL at the proposed site would have a minimal impact on surface water quality. Kentucky Solid Waste Landfill regulations outlines detailed requirements for landfill construction (401 KAR 48:070 Section 2) and operation (401 KAR 48:090 Section 7) to prevent the discharge of pollutants into surface waters.

The potential exists for a short-term siltation in Little Bayou Creek as a result of uncontained surface runoff during precipitation events. However, BMPs and compliance with the Commonwealth of Kentucky storm water permit during construction are expected to minimize this effect. Sedimentation basins would be used to control runoff and minimize impacts during operation. Runoff from the site would be directed via the sedimentation basins to new KPDES permitted outfalls (see Figure 2-1).

Closure of the landfill would not impact surface waters, since the vegetative cover and maintenance requirements for the cell caps would prevent future erosion and sediment transport. Neither would the hydrology be affected, due to maintenance requirements for the sedimentation basins.

Groundwater. No effects to groundwater resources at any of the sites would be expected during construction of the landfill. Impacts to groundwater resources during operation of the proposed landfill would be minimized by engineering controls, which include a low permeability liner, a leachate collection system, and a groundwater monitoring system. Also, the landfill phases would be constructed such that the base of the liner is at least four feet above the seasonal high water level, as required by Commonwealth of Kentucky regulations. Cells would be excavated to a maximum depth of 350 feet above MSL, above the maximum seasonal groundwater elevation of 340 feet MSL. Long term groundwater monitoring (30 years) is required by the Commonwealth of Kentucky after closure to monitor for continued landfill liner integrity.

Floodplain. Ground surface elevations at the proposed site are approximately 365 ft MSL, well above the 100-year and 500-year flood elevations (COE 1994). Therefore, no floodplain would be affected by construction, operation, or closure of the proposed solid waste landfill at any of the sites.

Wetlands. The COE concurs that no wetlands exist at the proposed site (Appendix A). Impacts to the small wetland located near the northwest corner of the proposed site would be avoided by maintaining a minimum 50-ft buffer between the wetland and the site boundary, and a 250-ft buffer between the intermittent stream responsible for this wetland and deposited wastes. SWL design, BMPs, and operating procedures would incorporate methods to avoid impacts to this wetland.

4.2.3 Soils and Prime Farmland

Construction, operation and closure of the SWL would remove approximately 25 acres of prime farmland from potential agricultural use. A Farmland Conversion Impact Rating form was completed by DOE and the SCS (see Appendix A), showing that this is conversion of less than 1% of prime farmland available in McCracken County. The impact rating is below the level where consideration for protection or mitigation is required (7 CFR 658.4).

4.2.4 Climate, Air Quality, and Noise

Excavation and grading would temporarily increase dust emissions in the vicinity of the proposed SWL. Particulate matter, carbon monoxide, and other pollutants discharged as exhaust from combustion-powered heavy equipment would cause sporadic, localized air quality degradation. BMPs such as wetting the ground surface before excavating, would minimize much of the impact from fugitive particulate matter. BMPs would be incorporated into design.

Daily operations would result in fugitive particulate emissions from movement of soils and emissions from combustion powered landfill equipment. These emissions are expected to be minimal and would represent no net gain over existing landfill emissions because the existing landfill would be closed and capped, and operations from the proposed SWL would not be significantly greater. To minimize emissions, BMPs would be incorporated into operating procedures.

A gas collection and venting system would be installed upon closure to prevent the buildup of explosive gases (methane) in the landfill. Methane is produced by anaerobic bacteria digesting

organic wastes in the landfill. Closure activities would again create temporary, minor increases in fugitive particulate emissions due to placement of clay and topsoil for the final cap. No long-term air quality impacts resulting from landfilling solid waste, or from methane emitted from the gas venting system installed at closure, are anticipated.

A short-term increase in noise levels would occur in the immediate vicinity of the site due to construction activities. Standard construction equipment would be used at the proposed SWL. There would be no long-term increase in noise above present levels, since the existing, interim landfill would be closed, and the types of noise and frequency of occurrence would remain constant but be shifted north to the proposed SWL site.

4.2.5 Biological Resources

Construction and operation of the landfill at the proposed location would result in the loss of approximately 60 acres of wildlife habitat of which approximately 80% is cultivated land and approximately 20% scattered woodlands located along fencerows or riparian zones. None of the vegetation communities would be considered unique to the area since the WKWMA consists of several such communities. The loss of this 60 acres of habitat represents less than 1% of similar habitat within two miles of the site. Fauna near the site may move away from the area as a result of the noise and the increased human activity; however, there is an abundance of similar habitat nearby. Overall, the proposed action is expected to have a minimal impact on local flora and fauna.

An evaluation of the federally-listed Indiana bat summer habitat indicates that potential habitat would be disturbed by the proposed activity. However, less than 6 acres of mostly poor habitat would be affected. The FWS concurs that this is less than 1% of summer habitat available in the area; therefore, the proposed action is not likely to adversely affect the Indiana bat (Appendix A). The USFWS concurs that requirements of Section 7 of the Endangered Species Act have been met, and that the proposed activity should not impact federally-listed or proposed species (Appendix A).

4.2.6 Land Use

The entire proposed site, currently owned by DOE and licensed to KDFWR, would eventually be enclosed by a security fence. In the past, 80% of the site was under cultivation for soybeans. The individual who farms this area also farms approximately 1000 additional acres. This individual has indicated that loss of use of this area would not be a major inconvenience, and only requested that sufficient lead time be given to prevent the loss of any crop. This year the KDFWR suggested that the farmer not plant anything, and the field has been left idle. There is an abundance of similar land available near the site.

The proposed action would also result in the loss of recreational opportunities at the proposed site. However, the 60-acre area lost would be less than 1% of the total available in the WKWMA. No unique recreational opportunities would be lost except that two field trial courses which traverse the proposed site would need to be rerouted (Logsdon 1994).

4.2.7 Cultural Resources

No cultural or archaeological resources of historical significance exist at the proposed location. The SHPO has concurred that this project would not adversely affect archeological, historic, and cultural resources (Appendix A).

4.2.8 Social and Economic Conditions

The proposed action would have a small positive effect on the local economy because the SWL would most likely be constructed by a local firm. The proposed action would not result in any permanent increase in employment or income, as PGDP personnel that operate the existing facility would operate the new facility.

4.2.9 Transportation

Construction at the SWL would create a short-term, small increase in traffic flow north of the facility, primarily from movement of equipment and construction materials. No long-term change in traffic flow would be expected from the proposed activity because traffic patterns, vehicle types, and traffic frequency would be essentially the same as for the adjacent landfill.

4.2.10 Health and Safety

A risk assessment (RA) was conducted (Lockwood Greene 1990) to evaluate the hazards associated with construction and operation of the proposed SWL. Waste would be screened, per current operational procedures, by health physics and industrial hygiene technicians so that no hazardous or radioactive waste would be accepted at this facility. In addition, no unusual operating hazards exist at either the current or the proposed SWL. Methane gas production from the closed landfill, disease vectors, and equipment malfunctions were reported as the most likely sources of hazards (Lockwood Greene, 1991).

Methane gas, if not vented properly, could build up in a closed landfill and create an explosion hazard. Monitoring of the closed SWL for methane gas production has not detected any abnormal methane concentrations. Methane monitoring is a requirement of 401 KAR 48:090, Section 4, and is designed to control explosive gases and minimize this risk. Occupational and public exposure to disease or animal vectors would be limited by the daily cover placed on exposed contained wastes, and should not be a public hazard at the facility, since access would not be allowed. Improper operation of heavy equipment, both during construction and operation, could result in injury or death. Equipment would not be unique and hazards would be those common to routine construction activities. Institutional and engineering controls would be included in design and operational procedures to minimize the potential for accidents. Additionally, approved health and safety plans are required of all PGDP workers, and construction activities are carefully monitored by PGDP safety and engineering personnel.

4.3 CUMULATIVE IMPACTS

Cumulative impacts are the effects of the proposed action considered in combination with plant operations and the impacts of other similar proposed actions to be completed in the vicinity of PGDP within the same time frame. Other PGDP actions considered along with the proposed action include:

- operation of the PGDP,
- construction and operation of a proposed 200,000 ft^2 Mixed Waste Storage Facility and two approximately 42,000 ft^2 RCRA/TSCA Waste Storage Facilities,
- bridge demolition and replacement,
- construction and operation of a DOE office facility,
- an upgrade of Dyke Road,
- construction of a groundwater barrier wall and pump and treat facility,
- several groundwater monitoring well installations,
- development of a subcontractor staging area, and
- expansion of the uranium hexafluoride (UF_6) cylinder storage yards.

The potential cumulative effects of the proposed action in conjunction with these other activities are discussed below. Only *storage areas* proposed for construction and operation are shown in Fig. 4-1.

Land Use. The proposed action would remove approximately 60 acres from farming and recreational uses. Construction of the WSFs and MWSF would remove another 26 acres from other land use; 6 acres from other industrial uses within existing plant boundaries, and 20 acres immediately adjacent to the existing plant boundary. Construction and operation of the proposed UF_6 cylinder storage yards would remove approximately 15 acres of area from other industrial uses. The cumulative effect is the combined removal of industrial land within the security area from other uses and approximately 60 acres of land from other uses outside the plant would impact less than 2% of the total available DOE property.

Wetlands and Floodplains. Construction in the area of the SWL, the WSFs, or the cylinder yards would not impact wetlands. There is approximately one acre of isolated, woodland wetlands in the area of the 60-acre site, and construction on this site would not result in filling of the described wetland. None of the proposed projects would be located in a floodplain.

Water Resources. Construction in the area of the SWL, the WSFs, or the cylinder yards would involve grading and the use of earth moving and construction equipment. Small tributaries of Little Bayou Creek may receive surface water runoff/sedimentation during construction and operation; however, sedimentation basins would be constructed at the SWL site prior to development to mitigate runoff from the site. The terrain where the WSFs and cylinder yards are located is flatter than that at the SWL site, and less sediment would be transported. In addition, BMPs such as using silt fences, hay bales, and prohibiting construction equipment near the streams would be implemented. Any runoff leaving the sites during construction would cause minimal impact to surface waters near these construction areas.

Soils and Prime Farmland. The proposed action would disturb 60 acres of soil, 25 acres of which has been classified as prime farmland. The proposed WSFs and MWSF would disturb 26 acres of land, none of which is considered prime farmland. The UF_6 cylinder storage yards would disturb soils that have been previously disturbed and are not considered prime farmland. The proposed action would convert less than 1% of available prime farmland in McCracken County.

Air Quality. The proposed action would contribute to a short-term degradation of air quality during construction activities. Windblown dust and particulate air emissions from construction or other actions could contribute to the short-term increase in fugitive emissions. A worst-case scenario would be for all of the proposed construction events to occur simultaneously. All construction activities

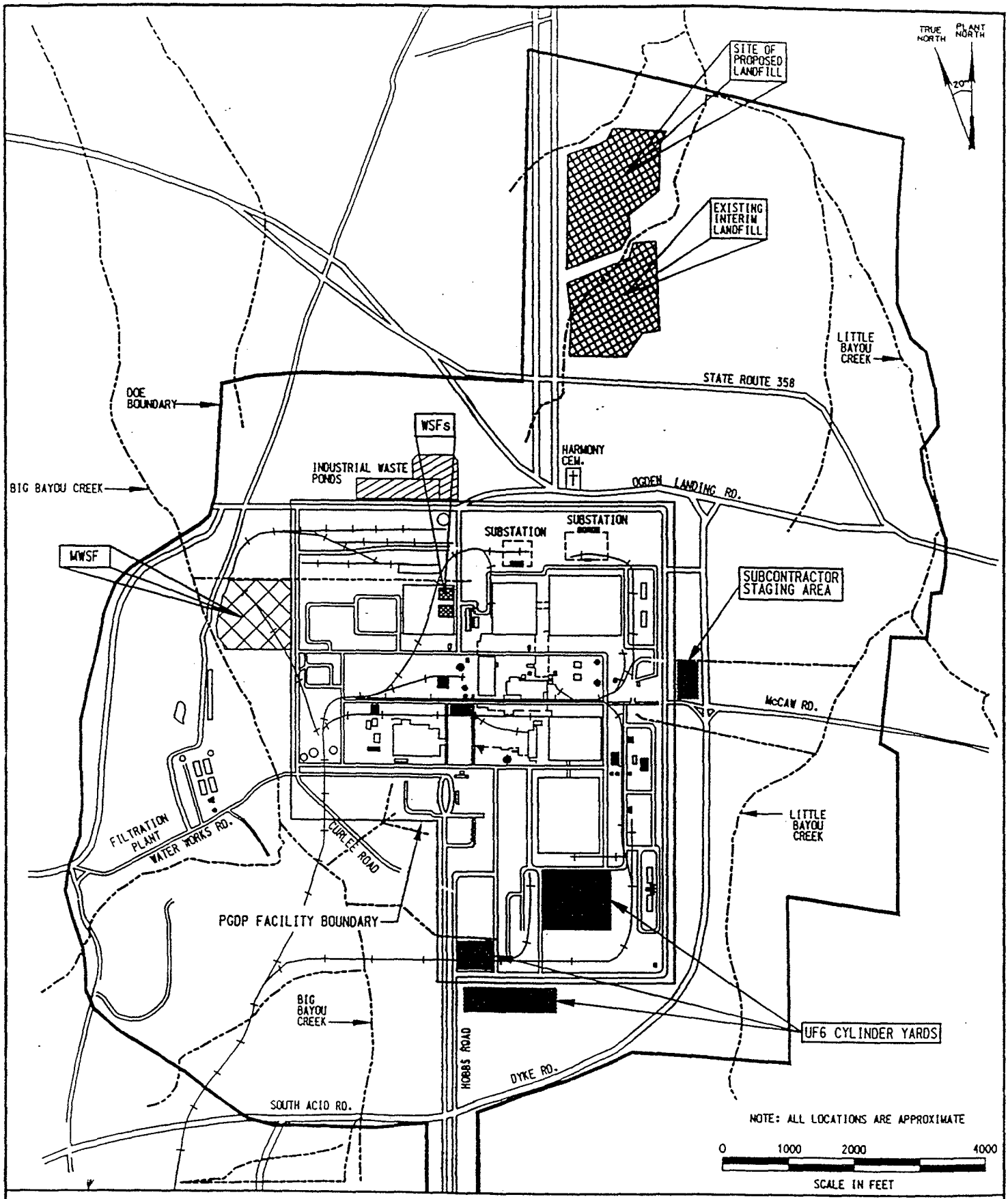

Figure 4-1.
Location Plan for Proposed Storage Areas
Paducah Gaseous Diffusion Plant
Paducah, Kentucky.

F:/PADUCAH/DGN/PADH00T.DGN 11/23/94

would include measures to minimize the amount of fugitive dust emissions, and simultaneous construction would not be expected to significantly degrade air quality due to dispersion and the widely spaced nature of the activities. Operation of the SWL would contribute slightly to cumulative degradation of air quality in the vicinity of PGDP because of wind-blown dust and equipment emissions. No other proposed activities would contribute operational air emissions, and fugitive emissions from these activities would cease upon completion of construction. Closure of the existing SWL would have a positive effect on the air quality. The net effect on air quality would be a slight improvement due to better emissions controls at the new facility.

Noise. The proposed action would contribute to a short-term cumulative increase in site noise during construction activities. Assuming a worst-case scenario of all construction events occurring simultaneously, noise levels would not increase greatly beyond the plant boundary. Due to the widely spaced nature of the projects, noise levels outside the immediate construction area should not change. Operation of the SWL would not contribute to the cumulative increase of noise levels at PGDP because noise levels at the proposed SWL would be similar to levels currently existing at the adjacent operating landfill. Off-site receptors would not be impacted by increased noise.

Biological Resources. The proposed action would remove about 60 acres of habitat consisting primarily of farm fields and fencerow habitat. The proposed WSFs and MWSF and UF_6 storage yards would affect approximately 36 additional acres of which approximately 10 acres is wooded, 10 acres is open field, and the remainder mowed fields within the plant security fence. All proposed activities would affect less than 1% of available similar habitat in the vicinity of PGDP. No critical habitat, including that of the Indiana bat, would be affected as a result of these actions.

Social and Economic Conditions. The proposed action should have a minor, positive, short-term effect on the local economy in the form of an increased construction work force. The other actions should also contribute to an increase in local short-term employment. No long-term increases in employment are foreseen.

Health and Safety. The proposed action may result in an increased exposure of workers to health and safety hazards. Improper operation of heavy equipment during construction and operation of could result in injury or death; however, the equipment used would not be unique and hazards would be those common to routine construction activities. Institutional and engineering controls would be included in design and operational procedures to minimize the potential for accidents. Approved health and safety plans are also required of all PGDP workers, and construction activities are carefully monitored by PGDP safety and engineering personnel.

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5.0 PERMITS AND REGULATORY REQUIREMENTS

DOE policy is to perform its operations in compliance with all existing applicable federal, state, and local laws and regulations, and DOE Orders. This section discusses the major regulatory permit programs that would be applicable to the proposed action.

SWLs are regulated by Subtitle D of RCRA. Kentucky is authorized by the EPA to execute RCRA statutes. Landfill permits must be obtained from the state and the landfill must meet all of the state's technical requirements for landfills (401 KAR Chapters 47 through 48). ACMs may be landfilled in accordance with state and federal regulations, and the Commonwealth of Kentucky regulates disposal of ACMs under the National Emission Standards for Hazardous Air Pollutants.

The Clean Air Act requirements have been adopted and are administered by the Kentucky Division for Air Quality. No regulations directly pertain to sanitary landfills. Regulation 401 KAR 63:010, Section 3(1), "Fugitive Emissions," pertains to air contaminants emitted into the open air other than from a stack or air pollution control equipment exhaust. This regulation establishes standards and requirements to take reasonable precautions to prevent particulate matter from becoming airborne. Section 4(3) of the same regulation states that the provision of Section 3(1) shall not be applicable to temporary blasting or construction operations. Additional guidance is found in Chapter 11, "Miscellaneous Sources," of EPA publication AP-42, which establishes recommended controls and emission factors to estimate particulate emissions during construction operations and for the use of paved and unpaved roads.

Kentucky is a delegated state under the Clean Water Act and has a general storm water permit program. A surface water and groundwater monitoring plan is required to be submitted to the state for approval (401 KAR 48:300.2). Leachate would be collected and, based on analytical results, be either treated or discharged through the present outfall system.

The Endangered Species Act requires consultation with appropriate federal wildlife authorities before committing resources to specific types of projects. The National Historic Preservation Act requires that any federal agency afford the State Historic Preservation Officer and the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed action. Informal consultation with the USFWS and the Kentucky Historical Preservation Council has been completed regarding the proposed action and requirements under the Endangered Species Act (16 USC 1531 *et seq.*) and the National Historic Preservation Act [16 USC 470(f)], respectively. There are no permitting requirements under these laws. Correspondence with these agencies is included in Appendix A.

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6.0 AGENCY CONSULTATION

The following agencies and persons were contacted during preparation of this EA.

Hal Bryan, President
ECO-TECH, Inc.
Frankfort, Kentucky 40602

Kentucky Department of Employment Services
Paducah, Kentucky
David Dunning

Kentucky Department of Fish and Wildlife Resources
Frankfort, Kentucky
David W. Pelren

Kentucky Heritage Council
Frankfort, Kentucky
David Pollack

Kentucky State Nature Preserves Commission
Frankfort, Kentucky
Brainard Palmer-Bell
Debbie White

U.S. Army Corps of Engineers
Louisville District
Louisville, Kentucky
Dan Evans

U.S. Army Corps of Engineers
Nashville District
Nashville, Tennessee
Kim Cross

U.S. Bureau of Labor Statistics
Washington, D.C.
Howard Hayghe

U.S. Department of Agriculture
Soil Conservation Service
Paducah, Kentucky
Bob Abell
Ron Froedge

U.S. Department of Commerce
Bureau of Economic Analysis
Washington, D.C.
Susan Trevathen

U.S. Department of the Interior
Fish and Wildlife Service
Cookeville, Tennessee
Lee A. Barclay

West Kentucky Wildlife Management Area
McCracken County, Kentucky
Charlie Logsdon

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7.0 LIST OF PREPARERS

This EA was prepared by CDM Federal (Oak Ridge, TN) for Martin Marietta Energy Systems, Inc. (Paducah, KY). The following personnel contributed to its preparation:

NAME	DEGREE	YEARS EXPERIENCE
Del Baird	M.S., Civil Engineering B.S., Agricultural Engineering A.S, Engineering Science	7
Anne Bolling	B.A., Environmental Studies/Biology	3
Constance Braun	M.S., Ecology B.S., Biology	19
Linda Brown	Ph.D., Environmental Biology M.A., Environmental Biology B.S., Biology	10
James Dee	MSPH, Environmental Health Science B.S., Biology and Environmental Science	12
Robert Harvey	B.S., Chemical Engineering	6
Brian Jenks	Masters, Business Administration B.S., Geology	7
Mary Leslie	M.S., Environmental Engineering Sciences B.S., Microbiology	12
Angie Luckie	B.C.E., Civil Engineering	1
Cecilia Masson	M.A., Economics B.A., Economics	12
John Young	M.S., Geology B.S., Geology	14
Brian Bowers (Energy Systems)	B.S., Geology	5
William Osburn (Analysas Corp.)	B.S., Chemical Engineering	15

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REFERENCES

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Barclay, Lee (U.S. Fish and Wildlife Service) March 5, 1993. Personal Communication with James Dee, CDM Federal, Paducah, Ky.

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Code of Federal Regulations. 40 CFR Part 261, "Resource Conservation and Recovery Act."

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Code of Federal Regulations. 49 CFR Parts 175-178, "Hazardous Materials Transportation Act."

Cross, Kim (U.S. Army Corps of Engineers, Nashville District) September 23, 1993. Personal communication with Brian Bowers, Martin Marietta Energy Systems, Inc., Paducah, Ky.

Davis, Ken (Martin Marietta Energy Systems, Inc.) September 28, 1994. Personal communication with William Osburn, Analysas Corporation, Oak Ridge, Tn.

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White, Debbie (Kentucky State Nature Preserves Commission) October 16, 1992. Personal communication with James Dee, CDM Federal, Paducah, Ky.

APPENDIX A

CORRESPONDENCE WITH GOVERNMENT AGENCIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

September 29, 1994

Mr. J.C. Hodges
Department of Energy
Paducah Site Office
P.O. Box 1410
Paducah, Kentucky 42001

Re: FWS #94-2611

Dear Mr. Hodges:

Thank you for your letter and enclosures of August 18, 1994, regarding the proposed increase in size of the solid waste landfill at the Paducah Gaseous Diffusion Plant (PGDP) in McCracken County, Kentucky. The Fish and Wildlife Service (Service) has reviewed the information submitted and offers the following comments.

According to a Corps of Engineers' evaluation of 11,719 acres of PGDP lands, 2,330 acres were identified as potential habitat for the federally endangered Indiana bat. Approximately 0.24 percent, or 5.55 acres, would be affected by construction of the proposed landfill, 4.77 acres of which were rated as poor habitat and 0.78 acre as good habitat. You have determined that the proposed landfill is not likely to adversely affect the Indiana bat based on the fact that construction is scheduled to occur during the non-maternity season in October.

The Service concurs with your finding, provided that three additional conditions are included and implemented as part of the proposed project: (1) measures will be implemented to maintain water quality in all streams and water bodies in the project area--i.e., equipment will be kept out of water bodies to the maximum extent possible, equipment staging areas will be established well away from water bodies, adequate silt control will be used as needed, and removal of riparian and upland forest will be kept to the absolute minimum needed to accomplish the project objectives, (2) suitable maternity habitat will be created or maintained in areas adjacent to the project area--e.g., a number of suitable maternity trees equal to that removed from the project area will be girdled on adjacent areas, or approximately 5.55 acres of habitat similar to that affected will be maintained as habitat for the Indiana bat, and (3) the project area will be inspected regularly to ensure that these conditions are properly implemented.

Thank you for the opportunity to comment on this action. If you have questions, please contact me at 615/528-6481.

Sincerely,

James C. Widlak

James C. Widlak
Acting Field Supervisor

xc: Wayne Davis, KDFWR, Frankfort, KY
Director, KSNPC, Frankfort, KY

CO 94 001019

Department of Energy
Oak Ridge Operations
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

August 18, 1994

Mr. Jim Widlak
Fish and Wildlife Service
United States Department of Interior
446 Neal Street
Cookeville, Tennessee 38501

CONSULTATION FOR THE PROPOSED SOLID WASTE LANDFILL AT THE PADUCAH GASEOUS DIFFUSION PLANT (PGDP) ON THE FEDERALLY ENDANGERED INDIANA BAT

Dear Mr. Widlak:

The project area for the proposed solid waste landfill has increased from 40 acres to 60 acres due to scope changes and comments received from the Kentucky Department of Waste Management (KDWM) during the Administrative Application process. Due to the changes, we request a reevaluation of your initial "no effect" determination that the proposed solid waste landfill is not likely to adversely affect the Indiana bat or another federally-listed species, and that DOE has fulfilled all requirements of Section 7 of the Endangered Species Act (ESA).

Enclosed are copies of two maps showing potential habitat for the Federally endangered Indiana bat (Myotis sodalis) and your initial review of March 5, 1993. The maps are from a study conducted by the Army Corps of Engineers (COE) entitled, "Environmental Investigations at the Paducah Gaseous Diffusion Plant (PGDP) and surrounding area, McCracken County, Kentucky - Threatened and Endangered Species Investigation" (Volume III, May 1994). The COE study examined 11,719 acres and evaluated 2,330 acres as potential summer habitat for the Indiana bat. Construction of the solid waste landfill would consume 5.55 acres (0.78 acres good habitat and 4.77 acres poor habitat) or 0.24% of the total 2,330 acres. In addition, hibernacula does not occur on PGDP and construction is scheduled for October which is outside of the maternity season for the bats so no individuals of the species would be lost.

The proposed project would impact a very small percentage of mostly poor potential summer habitat for the Indiana bat and no individual bats are likely to be affected. Our review of the proposed landfill project with regard to endangered species and the COE study indicates no other federally-listed or candidate species (or critical habitat of such) would be affected. Therefore, your concurrence with this evaluation is requested.

If you have any questions or require additional information, please call W. David Tidwell at (502) 441-6807.

Sincerely,

Robert C. Edwards

for J.C. Hodges, Site Manager
Paducah Site Office

EF-22:Lamb

Enclosure

cc: C. E. Bradley, NE-33
W. L. Davis, KDFWR/Frankfort
C. S. Gist, EW-91
P. J. Gross, SE-31
D. R. Guminski/B.A. Bowers, MMES/PGDP
S. M. Leone, MMES/PGDP
C. W. Logsdon, WKWMA/Kevil
J. C. Massey, MMES/PGDP
R. L. Nace, EM-423
W. L. Osburn, EW-91
J. W. Parks, EO-20
T. T. Slack, CC-10

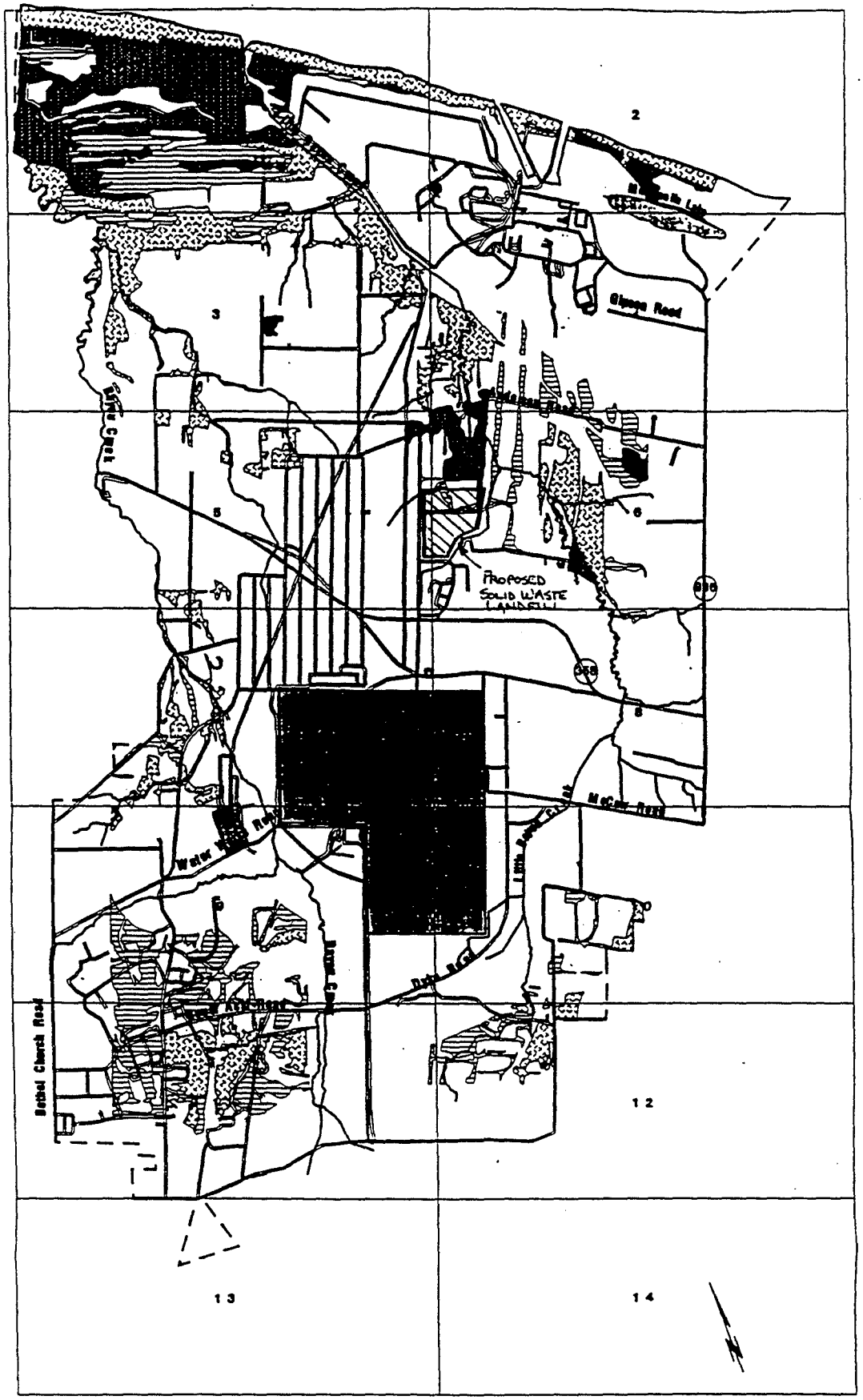
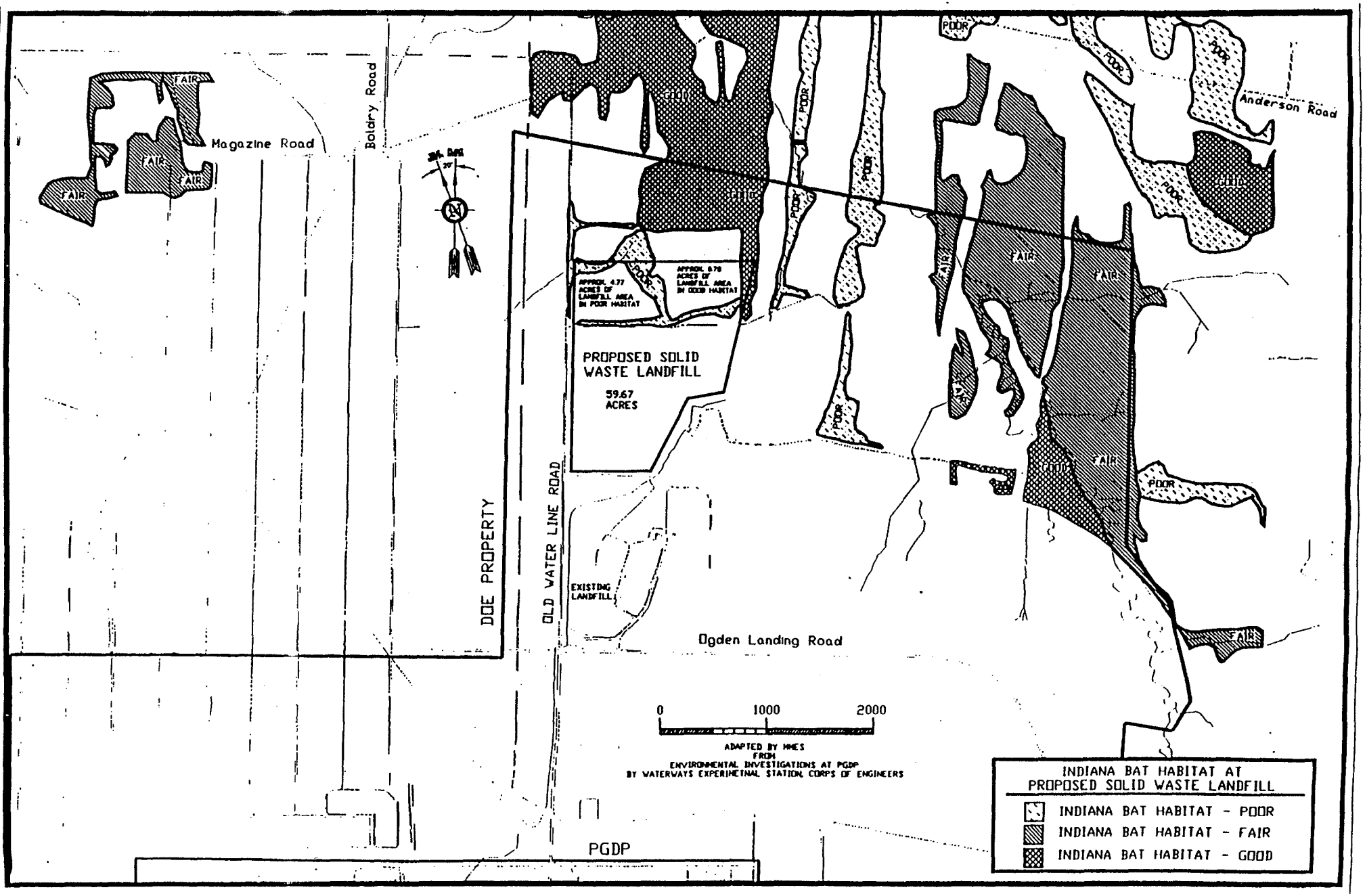


Figure 4. Indiana bat potential habitat quality on the PGDP


Magazine Road
Baldry Road
Anderson Road
Ogden Landing Road
OLD WATER LINE ROAD
DOE PROPERTY
PROPOSED SOLID WASTE LANDFILL
59.67 ACRES
EXISTING LANDFILL
APPROX. 4.77 ACRES OF LANDFILL AREA IN POOR HABITAT
APPROX. 6.78 ACRES OF LANDFILL AREA IN GOOD HABITAT
PGDP
FAIR
POOR
GOOD
0
1000
2000
ADAPTED BY MMES FROM ENVIRONMENTAL INVESTIGATIONS AT PGDP BY WATERWAYS EXPERIMETNAL STATION, CORPS OF ENGINEERS
INDIANA BAT HABITAT AT PROPOSED SOLID WASTE LANDFILL
INDIANA BAT HABITAT - POOR
INDIANA BAT HABITAT - FAIR
INDIANA BAT HABITAT - GOOD

Education and Humanities Cabinet

KENTUCKY HERITAGE COUNCIL
The State Historic Preservation Office

Brereton C. Jones
Governor
Sherry K. Jelsma
Cabinet Secretary

David L. Morgan
Executive Director
and SHPO

July 2, 1993

Mr. John Young
CDB Federal Programs Corporation
4331 Cairo Road
Paducah, Kentucky 42001

Re: "A Phase I Archaeological Reconnaissance on the Solid Waste Landfill (ESO-18007) at the Paducah Gaseous Diffusion Plant in McCracken County, Kentucky" By Martin C. Evans

Dear Mr. Young:

We have completed our review of the above referenced revised archaeological report. During the course of his investigation the author recorded two archaeological sites (15Mcn92 and 15Mcn93). Based upon the results of his study the author concluded that archaeological site 15Mcn92 is not eligible for listing in the National Register of Historic Places and warrant no further work. He also concluded that archaeological site 15Mcn93 is potentially eligible for listing in the National Register of Historic Places but is located just outside the project area and therefore will not be impacted by the proposed undertaking. I concur with the author's findings and recommendations.

If you have any questions please feel free to contact David Pollack of my staff at 502-564-7005.

Sincerely,

David L. Morgan, Director
Kentucky Heritage Council and
State Historic Preservation Officer

DLM-DP/kd

cc. Joe Granger

300 Washington Street
Frankfort, Kentucky 40601

Telephone (502) 564-7005
FAX (502) 564-5820

United States Department of Agriculture
Soil Conservation Service
320 Traylor Avenue
Princeton, KY 42445
(502) 365-0010

Subject: Farmland Conversion Impact Rating Date: August 29, 1994

To: Mark Claxton
District Conservationist
Soil Conservation Service
Paducah, Kentucky 42001

File Code:

Attached I am returning to you the information requested by Bill Osborne in regard to the proposed solid waste landfill site for the Paducah Gaseous Diffusion Plant. This Farmland Conversion Impact Rating supercedes the one done on July, 1993.

The approximate boundary of this proposed site is outlined in red on the attached soil survey sheet. According to my measurements, this site is about 59 acres in size.

Rudy Forsyth

Rudy Forsythe
Resource Soil Scientist

Attachments

* U.S. GOVERNMENT PRINTING OFFICE: 1984-451-159/1324

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 8/16/94
Name Of Project: Paducah Gaseous Diffusion Plant	Federal Agency Involved: Department of Energy
Proposed Land Use: Solid Waste Landfill	County And State: McCracken, Kentucky
PART II *(To be completed by SCS)*	Date Request Received By SCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).*	Yes ☒	No ☐	Acres Irrigated: 0	Average Farm Size: 126
Major Crop(s): Corn-Soybeans	Farmable Land In Govt. Jurisdiction: Acres: 144,545	%: 90.5	Amount Of Farmland As Defined in FPPA: Acres: 102,390	%: 64
Name Of Land Evaluation System Used: SCS - McCracken County	Name Of Local Site Assessment System: N/A		Date Land Evaluation Returned By SCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	59			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	59			
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	24.6			
B. Total Acres Statewide And Local Important Farmland	19.2			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	.043			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	58			
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	75			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	7			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	0			
5. Distance From Urban Builtup Area	15	5			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	0			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	0			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	57			
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	75			
Total Site Assessment *(From Part VI above or a local site assessment)*	160	57			
TOTAL POINTS *(Total of above 2 lines)*	260	132			

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

AGRICULTURAL EVALUATION WORKSHEET #4

AVERAGE SITE RELATIVE VALUE

McCracken COUNTY OR TOWNSHIP

AGRICULTURAL GROUP (1)	RELATIVE VALUE FOR EACH GROUP (2)	NUMBER OF ACRES IN SITE FOR GROUP (3)	PRODUCT OF RELATIVE VALUE AND NO. OF ACRES (4)
1	-	-	-
2	90	4.8	432
3	87	1.0	87
4	79	18.8	1485
5	75	19.2	1440
6	-	-	-
7	67	11.2	750
8	62	4.0	248
9		T= 59	T= 4442
10			

AVERAGE SITE VALUE = $\frac{\text{PRODUCT OF RELATIVE VALUE AND ACRES}}{\text{ACRES IN SITE}}$

AVERAGE SITE VALUE = $4442/59 = 75$

8/29/94

Paducah Gaseous Diffusion Plant

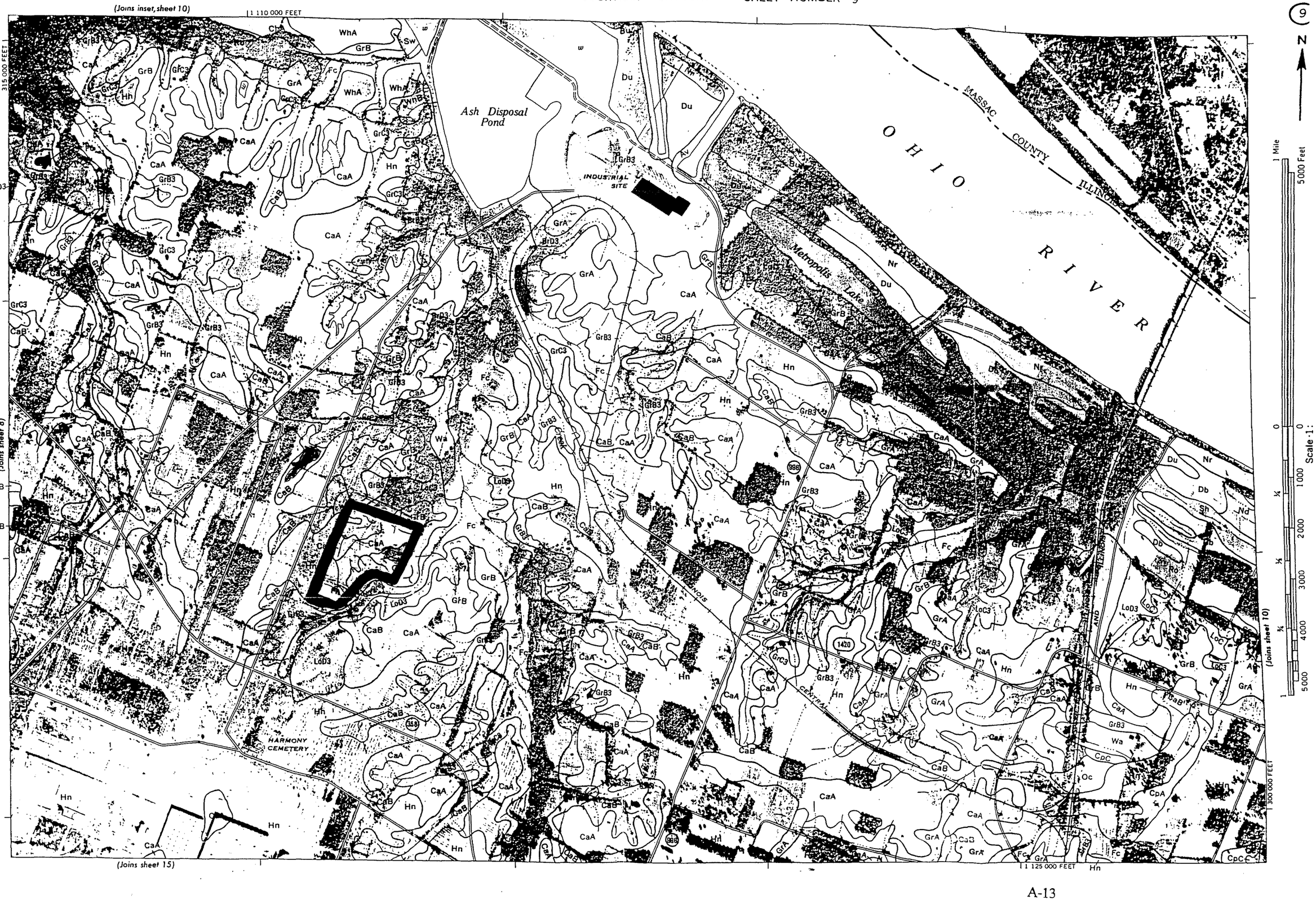
Map Symbol	Acres	Farmland Det.	Ag. Group	Rel. Value
GrB	4.8	P	2	90
Fc	1.0	P	3	87
CaA	16.1	P	4	79
CaB	2.7	P	4	79
GrB3	19.2	S	5	75
Hn	11.2	NC	7	67
LoC3	4.0	NC	8	62

P = Prime Farmland

S = Statewide Important

NC = Not classified

BALLARD AND McCRACKEN COUNTIES, KENTUCKY — SHEET NUMBER 9



Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Kentucky coordinate system, south zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Kentucky Agricultural Experiment Station

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Kentucky coordinate system, south zone

A PHASE I ARCHAEOLOGICAL RECONNAISSANCE ON THE SOLID WASTE LANDFILL (ESO-18007) AT THE PADUCAH GASEOUS DIFFUSION PLANT IN McCRACKEN COUNTY, KENTUCKY

By:

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Submitted to:

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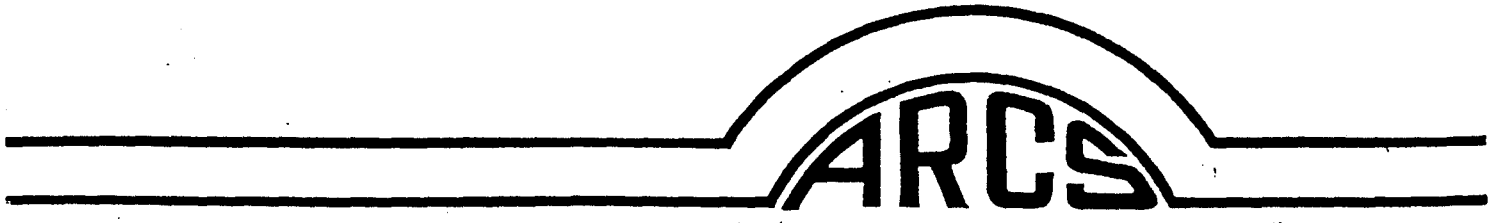
April 20, 1993
(Revised: June 9, 1993)

ARCHAEOLOGY RESOURCES
CONSULTANT SERVICES



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ABSTRACT

This report describes the results of a Phase I archaeological reconnaissance conducted on April 7th, 8th, and 9th, 1993 in McCracken County, Kentucky by Archaeology Resources Consultant Services Inc. of Louisville Kentucky. This reconnaissance is part of an Environmental Assessment by Martin Marietta Energy Systems, Inc. which is proposing to design and construct a Solid Waste Landfill at Paducah Gaseous Diffusion Plant (PGDP). CDM Federal has been tasked to complete the Environmental Assessment on the Solid Waste Landfill (ESO-18007) at the Paducah Gaseous Diffusion Plant (PGDP). The entire project area is approximately 40 acres in size and is located north of the PGDP and is directly north of a present Solid Waste Landfill. One historic site, the Deep Well Site 15Mcn92, was located in the project area during the survey. Due to the obvious disturbance at this site and the lack of historical data, this site was determined to be of no archaeological significance. Another site was located just outside the project area. This site was named the Jet Black Pond Site 15Mcn93, which was also an historic site. No further archaeological work is recommended for this project.

ACKNOWLEDGEMENTS

The author would like to take this time to thank those that helped in this project. First of all I would like to thank the other members of the field crew which included Tim Atwell and Tom Nohalty. John Young and Vernon Wimberly of CDM Federal Programs Corporation were also very helpful in coordinating the project. This can also be related to the help extended by Mark Walker of Martin Marietta during the field work portion of the project. It should also be noted that Charlie Logsdon was a reliable resource for his knowledge and history of the area. Special thanks goes to Anne Bolling of CDM Federal Programs Corporation for her help and suggestions on this project.

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CHAPTER ONE
INTRODUCTION

On April 7th, 8th, and 9th, 1993 a Phase I archaeological reconnaissance was conducted in McCracken County, Kentucky by Archaeology Resources Consultant Services Inc. of Louisville Kentucky. This reconnaissance is part of an Environmental Assessment by Martin Marietta Energy Systems, Inc. which is proposing to design and construct a Solid Waste Landfill at Paducah Gaseous Diffusion Plant (PGDP). CDM Federal has been tasked to complete the Environmental Assessment on the Solid Waste Landfill (ESO-18007) at the Paducah Gaseous Diffusion Plant (PGDP). The entire project area is approximately 40 acres in size and is located north of the PGDP and is directly north of a present Solid Waste Landfill.

The project area prior to March 1942 was used primarily for agricultural purposes. In 1942 the U.S. Army Corps of Engineers began acquiring land for the Kentucky Ordnance Department for the construction of a TNT production facility. The facility was composed of 240 separate tracts of land comprising a total of 16,126 acres.

The State Historic Preservation Office as well as the Office of the State Archaeologist was consulted to find known archaeological sites within the project parameters. Those sites that are applicable to the evaluation of this project are mentioned in the chapter of the report titled Previous Archaeology. All cultural materials found will be curated at the University of Kentucky Archaeology Archives or other standard curation facilities.

COMPLIANCE REQUIREMENTS

The investigations described herein were conducted in accordance with Public Law 89-665, Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 f), and the Procedures for the Preservation of Historic and Cultural Properties (36 CFR, Part 800). Specifications for field investigations and National Register Assessment are presented in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 447116-42). (Federal 190/Thursday, September 19, 1983). In addition, the project follows the cultural resources investigation guidelines of the National Environmental Policy Act (NEPA) of 1969 that requires all federal agencies to evaluate the effects of agency actions on the natural and human environment. These standards are supplemented by Specifications for Archaeological Fieldwork and Assessment Reports, approved by the Kentucky State Historic Preservation Office, Frankfort.

PERSONNEL AND SCHEDULING

The Principal Investigator for this project was Dr. Joseph E. Granger, SOPA. The crew was supervised by Martin C. Evans, and included Tim Atwell and Tom Nohalty. Also accompanying the survey team was Anne Bolling of CDM Federal. A total of three field days were needed to complete this project. Those days being April 7th, 8th, and 9th, 1993.

PROJECT LOCATION

The project area investigated was approximately a 40 acre tract located north of the PGDP and directly north of a present Solid Waste Landfill. This area is west of Paducah in western Kentucky and approximately two miles south of the Ohio River as seen on the Joppa, Illinois-Kentucky 7.5' USGS Topographic Quadrangle (FIGURE 1.1). The project area has several hogback ridges and knolls which overlook Little Bayou Creek and has an elevation of about 370 feet (113 meters) AMSL. The immediate project area is drained by Bayou Creek and Little Bayou Creek, which flow to the north toward the Ohio River. The soils in the area have developed in loess or alluvially deposited loess and are placed in the Calloway-Henry soil association (Humphrey 1976). The Calloway and Henry soil series consist of silt loams that are typically of being poorly drained.

SCOPE OF SERVICES

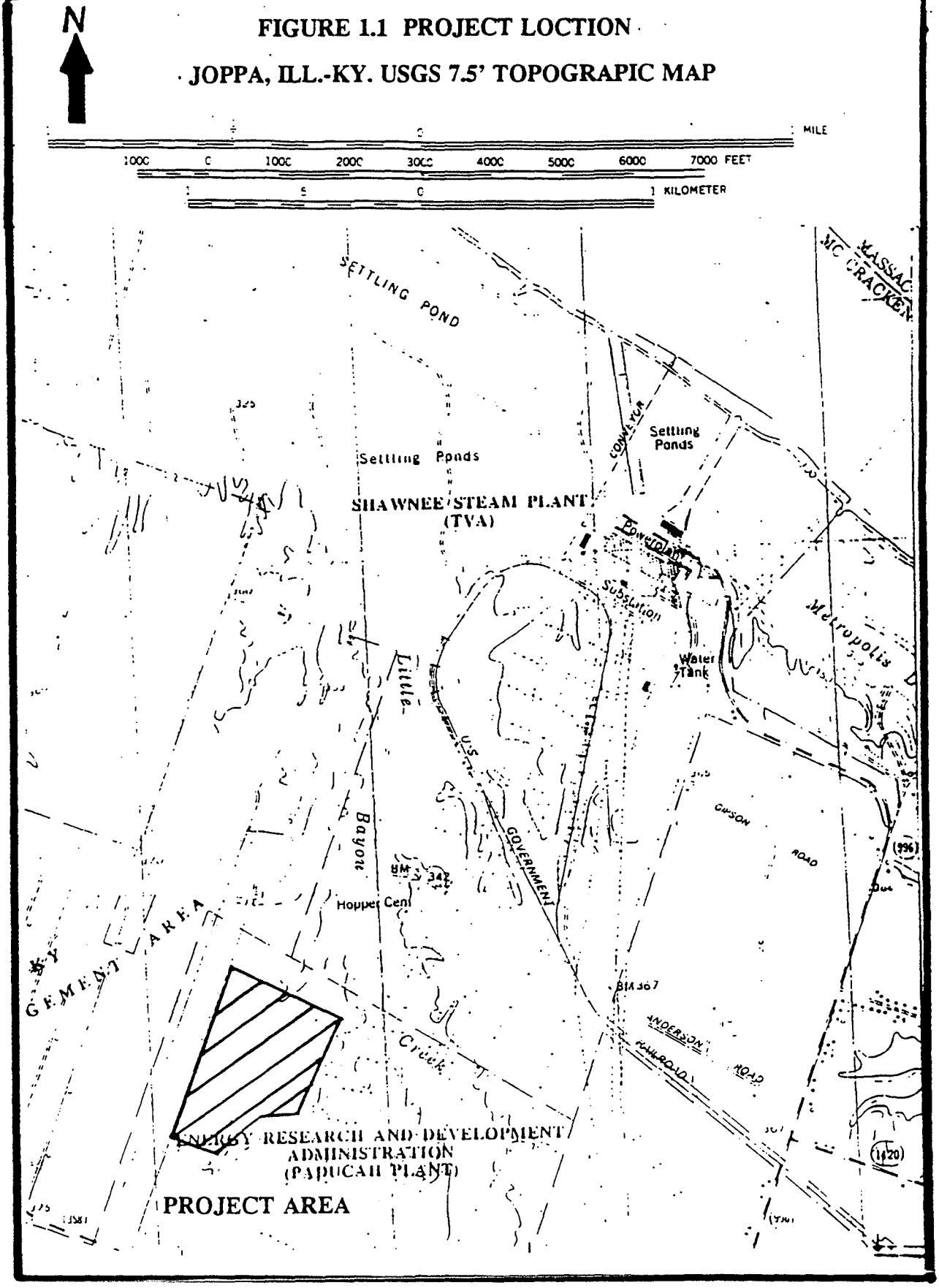
The investigation was conducted to determine if cultural material was present within the project boundaries. The investigation will consist of a field survey to determine if any previously unrecorded archaeological sites are present at the preferred site. The field survey was conducted by using a 15 meter interval shovel test pits (STPs) program. A total of 1066 STPs were placed during the work on this project. The results of the field survey are to be fully discussed in an Archaeological Report. The Archaeological Report will discuss the methods used to conduct the investigation, the identification of any resources found and an assessment of the significance of any resources found and their individual and cumulative impacts upon the natural and human environment.

SURVEY PREDICTIONS

The occurrence of locating archaeological sites during this project was theorized as being moderate. This hypotheses was acclaimed due to the knowledge of no less than 25 known recorded sites along the Ohio River just north of the project area. These sites reviewed in another section of this report are from different cultural periods and demonstrate the utilization of the immediate region by groups of people. Specific areas that held potential for archaeological sites are the hogback ridges and knolls that are present in the project area. In general, the most important requirement of prehistoric and historic peoples for their habitation sites were proximity to water, slope angle, availability of natural resources, and well drained soils. Prehistoric groups in the Ohio Valley favored living near the advantageous fishing waters of large streams. Also Woodland Period horticultural villages were mainly located on wide, fertile bottomlands where crops were most productive. When floodplains were too narrow or unsuitable for habitation, terraces and slope benches above the drainages were sometimes inhabited instead. Prehistoric sites also may be situated at stream confluences, which may provide for resources, travel, trade, and communications.

FIGURE 1.1 PROJECT LOCTION

JOPPA, ILL.-KY. USGS 7.5' TOPOGRAPIC MAP



CHAPTER TWO
NATURAL ENVIRONMENT

The physiographic, geology, pedology, climate, flora, and fauna of the area will be discussed below. The physiographic regions of Kentucky are shown in Figure 2.1.

Physiography and Geology

The project area is located in northern McCracken County, Kentucky. This part of the state is in the Jackson Purchase Physiographic Region. The geologic formations of this area are the youngest in Kentucky. They contain gravels, sand, and clay which were left during the Cretaceous, Tertiary, and Quaternary geological periods when the Gulf Coastal Plain enclosed much of the area. The uplands of the county are covered with a moderately thick to thick mantle of loess. Below this is unconsolidated Coastal Plain deposits (Humphrey 1976). These deposits are dominantly gravelly loamy material but at 380 feet AMSL they are mostly sand, clay, or silt. Below 380 feet AMSL on the level uplands of the Calloway-Henry soil association in the north part of the county, they are underlain by clayey silt of the Pleistocene series of the Quaternary system that contains little gravel. This area seems to be a high, large stream terrace covered by loess (Humphery 1976). This part of western Kentucky is characterized by low rolling hills. The drainage systems in this area are generally marked by medium to wide streams cut into the Pennsylvanian shales.

Pedology

The Calloway-Henry association soils consists of somewhat poorly drained and poorly drained, medium textured soils on uplands. Elevations range from 360-380 feet AMSL. There are some natural drainageways that dissect the area, but they are not deep. This association occupies a large and continuous area in the northwestern part of McCracken County.

The somewhat poorly drained Calloway soils are mainly nearly level, but in some areas near the natural drainageways these soils have slopes of as much as four percent. They have a surface stratum of dark grayish-brown silt loam. The upper portion of the subsoil is yellowish-brown silt loam that has gray mottling. Between 19 and 26 inches in depth the soil is a light brownish-gray silt loam mottled with brown. Below this depth is a compact fragipan of dominantly gray silty clay loam (Humphrey 1976). The Henry soils have a surface layer of grayish-brown silt loam mottled with gray. The subsoil is gray or light gray silt loam to a depth of about 26 inches. A compact and brittle fragipan of silty clay loam is below that depth.

Climate

The climate of the county is temperate. The winters are moderately cold and summers are warm and humid. Limits are agreeable for man and plant and animal life, in the aspects of temperature, rainfall, and humidity. The seasons are from passing weather fronts and associated centers of low and high pressure. The growing season averages between 205 and 220 days. Temperature

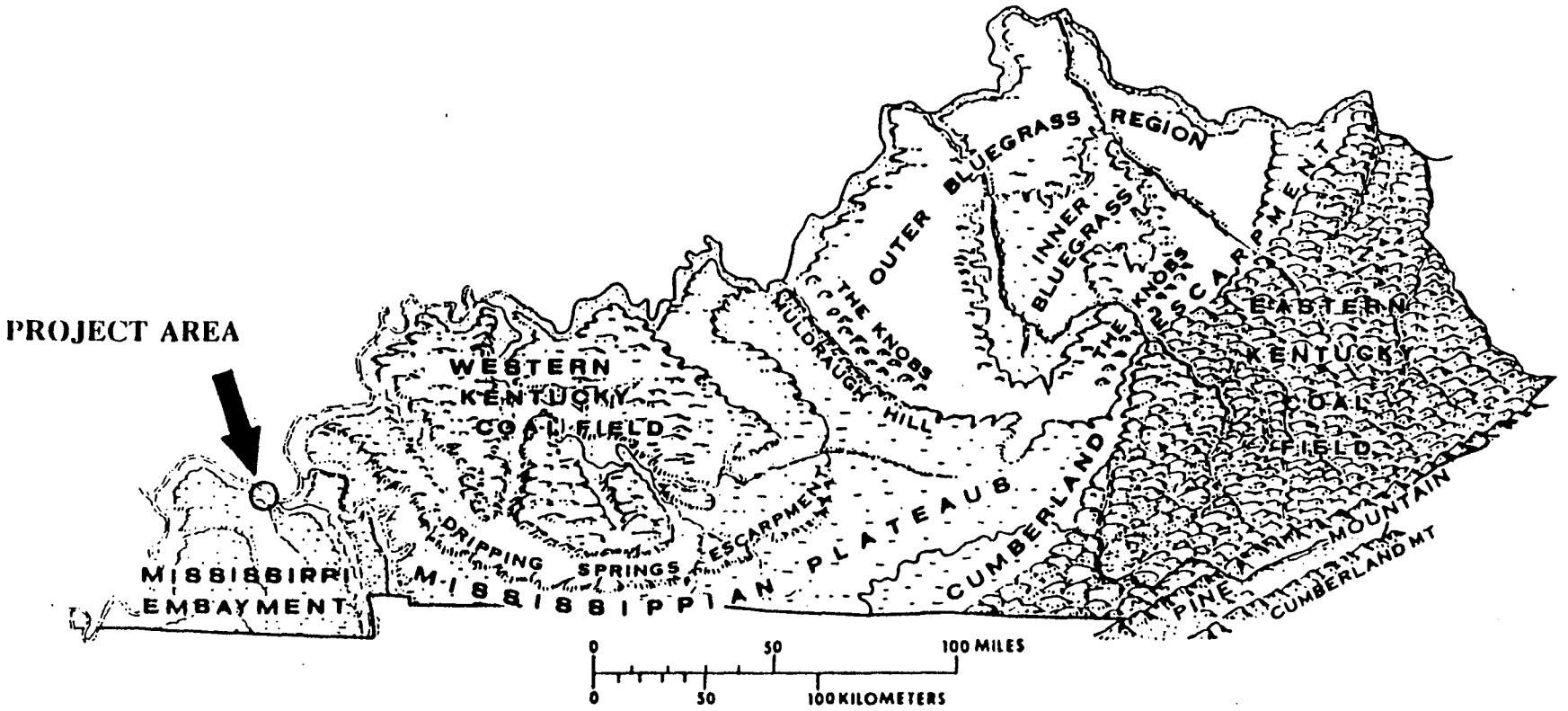


FIGURE 2.1

Physiographic regions of Kentucky

varies from 2 degrees and 100 degrees Fahrenheit. The mean temperature in July is 78 degrees Fahrenheit, and January 35 degrees Fahrenheit. Mean annual rainfall is approximately 46 inches (Humprey 1976).

Flora and Fauna

The project area lies within the Western Mesophytic Forest Region (Braun 1950). Indigenous vegetation in the region consists of oak and oak-hickory along the rolling hills and associated ecozones. Beech, poplar, sugar maple, hickory, elm, sweet gum, and black gum characterize the ravine slopes along the streams. Some broad leaf species and cypress are found in alluvial sediments associated with the larger drainages. Most of the alluvial areas and low-lying marshes near the larger streams are now under cultivation (Braun 1950).

Western Kentucky falls within the Carolinian biotic province (Dice 1943). The larger indigenous fauna are listed as eastern cottontail, gray fox, raccoon, bobcat, white-tailed deer, gray wolf, black bear, mink, otter, muskrat, mouse, and a variety of squirrels. Numerous small animals, such as hawk, owl, eagle, duck, frog, and turtles are also abundant (Cleland 1966).

CHAPTER THREE
GENERAL CULTURE HISTORY OF THE STUDY AREA

In this section is to be found a general overview of cultural developments for a broad portion of Kentucky, including the current project area. This presentation is divided into culture periods which may or may not be further modified into other units such as "phases" in certain sections of the state based upon the availability of knowledge.

Paleo-Indian Culture (13,000-6,000 B.C.)

The Paleo-Indians were nomadic hunters who followed terminal Wisconsin herd mammals into Kentucky at the close of the Wisconsin Glacial period. While in the areas surrounding the lower Ohio Valley they exploited tundra and coniferous forest edge dwelling mammals such as the mammoth, mastodon, bison, horse, giant peccary, giant ground sloth and other now extinct animals, as well as the elk, deer and beaver (Wayne and Zumberge 1965, Shelford 1963). Their hunting equipment was characterized by a distinctive fluted form of projectile point formed of flint or chert and associated lithics. Over 300 of these Clovis or Cumberland fluted points are known from various areas in Kentucky. Fluted points have been found in situ only at one site in Western Kentucky, the Parrish Village (Rolingson and Schwartz 1966). The fluted point complex has yet to be fleshed out by discoveries of associated tools. Also, little is known about the distinction between the peoples who produced the various types of fluted points such as the Clovis and Cumberland points of Kentucky. Heaviest distribution of these and later unfluted lanceolate points is from surface collections in the Jackson Purchase, with lesser indications from the Central and Northern area of Kentucky and the Ohio Valley (Rolingson 1964 Dorwin 1966 and Hockensmith et.al. 1988).

Unfortunately, only very few occupation sites are known in the Eastern United States, none of them producing more than fragmentary evidence of settlement (Griffin 1967 and Rolingson and Schwartz 1966). These people probably lived in small mobile bands utilizing temporary shelters. They used the spear-thrower tipped with compound darts to acquire the large game the caloric content of which formed a staple of their diet, and was probably supplemented by the gathering of wild vegetable foods and nuts (Neusius 1986). Their clothes were probably of tanned and sewn leather, but any ornamentation they used is unknown. Although little is known of Paleo-Indian utilization of the portions of the study area and surrounding areas, several mammoth have been found in alluvial deposits in Kentucky.

One such find on Lee Street in Louisville showed that the animal was located at great depth, circa 6 meters. It is quite possible that Paleo-Indian kill and butchering stations exist in Kentucky but are undiscovered due to sampling error caused in at least one instance by great depths of alluviation. A tantalizing example of what may await was the Kentucky Mastodon Site reported by Bennett Young (1910).

A reputed mastodon was found in a deep excavation with associated "stone tools". It is not now possible to assess this discovery because both the mastodon and the tools have disappeared,

however, the depth and mastodon (or mammoth) seem to be consistent facets of more recent discoveries. Tool associations have yet to be proven.

Archaic Culture (6,000 - 1,000 B.C.)

With the advance of deciduous forests and a decline in the large postglacial mammal populations a more intensive way of life ensued with very efficient exploitation of the forested areas of Kentucky and the Mid-West (Phillips and Brown 1983). This period is known as the Archaic and is roughly divided into the Early (6000 - 5000 B.C.), Middle (5000 - 3000 B.C.) and Late (3000 - 1000 B.C.) subperiods.

Evidence of Archaic peoples is extensive over the entire state (Jeffries 1988). The types of site occupied by these people are generally rockshelters, open sites and shellmounds usually located near major streams. Early Archaic hunters appear to have clustered near and utilized stream valleys to penetrate upland zones (Chapman 1975). Most Archaic sites were usually only seasonally occupied since the Archaic subsistence settlement cycle was not sedentary but rather involved a cyclical movement in a transhumant seasonal pattern in order to exploit various subsistence resources of the area (Binford 1983, Cleland 1976, and Winters 1969).

By Middle Archaic times a broad hunting, fishing and gathering spectrum, and in the later phases of the Archaic Period a very efficient form of incipient horticulture was locally practiced with certain nuts, wild plants, fowl, deer and shellfish forming major items of the diet consistent with their local availability (Neusius 1986, Jefferies and Lynch 1983, Bareis and Porter 1984, and Caldwell 1958). Agriculture was not practiced at this time of "primary forest efficiency" (Caldwell 1958, Janzen 1978, and Granger 1988). Cooking was probably accomplished in baskets by rocks heated in small hearths. This firecracked and broken rock often forms one of the critical indicators of intensity of occupation (Bareis and Porter 1984).

Pottery was made during the latter portion of this period but did not become widespread until Adena or Early Woodland times. The tools and weapons reflect the broad spectrum of Archaic subsistence and technology. Flint projectile points, hide scrapers and drills are found with ground stone axes, hammerstones, and spear-thrower weights (Cook 1976). The large bone industry included fishhooks, spear-thrower hooks, engraved awls and pins, and even flutes and rattlers also with decoration (Ibid). Other artifacts such as copper and Gulf coast marine shell ornaments and those made from nonnative lithic or other materials give evidence of extensive trade network in the Ohio River Valley which was operating widely by Late Archaic times (3000 B.C.) (Winters 1968 and 1974).

Archaic bands were fairly large with task groups probably dispersing to acquire specific resources such as food or chert (Vickery 1974 and Vehik 1985). Although houses are not completely known in the archaeological record they were probably not of a permanent construction, either being made of poles and bark or thatch or built as lean-tos over the face of caves or rockshelters. The dead were interred within the settlement or camp and were flexed and emplaced in small round pits often excavated into nearby middens (Winters 1964). Somewhat inconsistent with this

relatively mundane treatment of most burials is the inclusion of ceremonial grave goods, especially those ornaments such as bracelets, necklaces, pins, rings, beads, gorgets, and ear plugs often made from exotic materials. They are found generally with burials of infants or females. It is also quite common to find male burials with wounds and even associated projectile points embedded in the bone. Ceremonialism is also shown in the deliberate interment of dogs especially in the latter phases of the Archaic.

Adena Culture (800 B.C.- 0 AD)

The Adena culture is a specialized form of the Late Archaic and Early Woodland cultures and is concentrated in central and northern Kentucky with extensions toward and into other areas of the state (Swartz [Ed.] 1971). This culture was defined in its Ohio-West Virginia hearth area primarily on the basis of the ceremonialism associated with the dead, ritual equipment and the principal form of interment in large conical burial mounds (Dragoo 1959). It is thought that these specializations indicate a stratified or ranked society, but this has yet to be proven (Dragoo 1959, Swartz 1971, Seeman 1979, and Clay 1986).

The economy of the Adena people probably consisted of a mixture of horticultural gathering, hunting and fishing. Seeds, nuts and squashes formed the staples of the diet (Young 1985). The people probably lived in small semi-sedentary villages. However, finds of circular, double-post structures with four center supports holding up conical thatched roofs and everted walls have been questioned as "houses" and they have ben called "ceremonial enclosures" (Clay 1986). Later, these structures were burned and covered with earth forming the distinctive Adena conical mound. Some villages may have been surrounded by earthen enclosures after abandonment and intentional destruction (Dragoo 1959).

During the latter stages of Adena and in the succeeding Hopewell Period death was associated with elaborate rituals and equipment for some of this culture's members. They were placed in log tombs and buried under the large conical mounds (Dragoo 1959). Ceremonial paraphernalia included cut animal jaw mouthpieces, mica ornaments and tubular clay pipes. The dead were often decorated with shell, bone, copper and galena beads, red ochre, earrings, bone combs, bracelets, necklaces, multiform gorgets and pins.

These offerings were often made from or found with caches of exotic materials traded from long distances. Mass cremation is suspected to have been the means of disposing of the less favored individuals in this culture (Seeman 1979).

The tools of everyday life included projectile points with lobate bases, celts, drills, scrapers, hoes, shell spoons, gourd cups and very thick boat-shaped lugged pottery vessels of a characteristic type known as Fayette Thick. Art was represented by tablets and petroglyphs which featured conventionalized animal and bird forms thought by some to have indicated clan or village totems. Toward the end of Adena period in Kentucky it appears to have become more dispersed and less ceremonial, with small groups once again portraying a generalized Woodland pattern and living in small rockshelters in isolated areas above fertile bottomlands (Seeman 1979).

In Kentucky it has not yet been fully possible to separate the sites of Adena culture from those of the more generally defined Early Woodland at present (Clay 1981). A large number of components including many findings of "burial mounds" and typical, if exotic artifacts, are known which show definite affiliation to this period. However, few habitation sites of unquestioned Adena affiliation are known other than Peter Village in Fayette County which is currently undergoing archaeological exploration. Several sites have been investigated with interesting results on the ceremonial aspects of Adena but the spectre of a "culture" with no everyday living people persists. The nearly ubiquitous distribution of "Adena-like" occupations in the rockshelters of Eastern Kentucky has yet to be satisfactorily investigated as has the question of Early Woodland/Adena overlap in habitation. The lack of definition and any clear distinction in this hearth area leaves this the largest open problem facing archaeological interpretation in the State of Kentucky.

In Early Woodland times a general tendency toward settlement in large villages or semi-sedentary camps on terraces of the Ohio River is seen. The finding of curcurbits in Eastern Kentucky and, although provenience is questionable, corn (maize) at the Hornung Site on the Ohio River at least adds the suspicion that some incipient agriculture may have been involved. Watson (1974) reports in her work on paleofecal samples and other data from Salt and Mammoth Caves that squash, chenopodium, sunflower, gourds (several varieties), marsh elder and nuts (several varieties) were all dietary items. Some items may have been acquired through a transitional horticultural base (squash) while other items clearly show simple gathering (nuts). Data on incipient horticultural or practices, aside from the Hornung Site, may become known when paleobotanical samples acquired from Eastern Kentucky, the Green River area and the Jackson Purchase are reported (Neusius 1986 and Muller 1986). It has also been noted that there is a tendency of the Adena/Early Woodland inhabitants to prefer the high grade Harrison County, Indiana or Kentucky Galconda cherts known collectively as St. Genvieve Chert over the poorer quality local varieties for tool making as seen in the Late Archaic (Vehik 1985). Obviously, the existence of a burgeoning trade network is inferred (Seeman 1979).

Possibly the most important late Adena habitation site known is from the Louisville vicinity and it was a tragic loss. The Zorn Avenue Site (15Jf250) was located on the bluffs above the Ohio River and contained burials of definite Adena association. More importantly, however, it appears to have been a large village with deep storage pits, hearths, houses and middens which gave up large quantities of pottery very characteristic of the Adena culture but also representing a great degree of sedentatization in the size and weight of vessels. To the east on a high point of land above a bend in Harrods Creek was the contemporary the Hunting Creek site (15JF268). Although almost totally obliterated in a housing development the site once had a series of three low mounds at the base of the triangularly shaped point and numerous Adena projectile points have been found with characteristic pottery. Both of these sites along with Peter Village were exceptions to the patterns seen elsewhere in the Outer Bluegrass section of Kentucky where Adena/Early Woodland manifestations are seen in rockshelters and small sites.

This aspect of small site settlement is ephemeral with a large frequency of very short duration occupations observed. However, these components when better known may well be the more

specific task related camps from which a model of settlement in this period can be drawn in association with the larger "villages" and "ceremonial centers".

Woodland Culture (1000 B.C. - 1200 A.D.)

The Woodland period is most often divided into Early (1000 B.C. - 300 B.C.), Middle (300 B.C. to 300 A.D.) and Late (300-600 A.D. to circa 1200 A.D. segments. The Early Woodland period is currently inseparable from the Adena which was discussed above. As discussed there, the stage saw the introduction of pottery as a widespread cultural trait. An early form of horticulture or incipient agriculture was practiced and "cultivated" plants included squash, marsh elder, giant ragweed, sunflowers and some early forms of maize (Streuver 1968).

Hunting and fishing continued to be a dominant activity since deer meat, fish and shellfish remained major items of the diet. Weapons for hunting at this time included the bow and arrow and during the late portion of this period the flint and shell hoe, used in agriculture, came into their own. Little is known of the settlements, burials or houses of the Woodland people. Primary evidence for occupation has been excavated mainly from rockshelters and caves such as Mammoth and Salt Caves (Watson 1974). Houses are thought to have been small and round and constructed of poles criss-crossed over each other to form a framework for bark construction.

North of the Ohio River, a culture-climax was reached in the Hopewell Culture (0 A.D. - 300 A.D.) (Seeman 1979). This culture, nominally considered to be a development from the Adena in Ohio, Indiana and Illinois (Swartz 1971 and Brose and Greber 1979), was characterized by burial mounds, enclosures and an elaborate ritualism which was transferred in an interaction sphere to peoples outside the area (Seeman 1979). Zone incised, fingernail punctated and crudely stamped ceremonial pottery, large heart-shaped cache blades, prismatic flake knives, platform pipes, mica cut-offs, copper ear spools and corner-notched projectile points, some of obsidian are items found distributed outside the hearth area and in Kentucky. Zorn Avenue and the Hunting Creek site in Jefferson County have some of these Hopewellian elements as do several sites in northern Kentucky in the Licking River Drainage (Seeman 1979).

Recent work on several open sites near the Ohio River in Jefferson County has shown that a particular species of shellfish from the Lower Mississippi River was carried into Kentucky. Studies of this species distribution indicates that it may have traveled along the same route as the concept of intensive agriculture which came to characterize the last portions of the Woodland stage. Ceramics of the Crab Orchard (Baumer) series from Illinois apparently accompany this distribution into the Ohio River Valley. The most prominent of the sites with these shellfish is Arrowhead Farm where the Middle Woodland midden yielded large amounts of pottery related to Crab Orchard types.

The Mann Site located downriver and on the Indiana side also portrays this same Middle Woodland derived Hopewell (Kellar 1973; Brose and Greber 1979; Muller 1986 and Seeman 1979). The component at Arrowhead contained numerous features, most nonspecific hearths or storage pits. This component was dated at 665 A.D. + 70 (UGa). Excavations were not sufficient

to expose enough settlement data to determine the size of this late Hopewell village site (Granger 1978).

There are other sites of this age on the Ohio River floodplain but they have not yet been explored. At Hunting Creek Site in eastern Jefferson County, the Middle to Late Woodland component shows some Hopewellian traits such as prismatic flake blades and dentate stamped sherd tempered pottery. In the absence of secure dating, it is possible that the three mounds at Hunting Creek are similar to the limestone (slab) mounds seen on hills in southern Indiana (Kellar 1973). Five features were found. Three were earth ovens filled with fired rock (limestone) while another was a hearth from which a charcoal sample currently under analysis was taken. One large deep pit was apparently connected with storage.
There appears to be a smooth, if poorly defined Late Woodland transition in Kentucky (Muller 1986). Generally it is seen in the pottery bearing sites of the Newtown Phase of central and northern Kentucky and in the proto-Mississippian groups of the southwest of the state.

The loosely defined expressions are recognized by Lowe Projectile Points and numbers of the triangular forms which signal full usage of the bow and arrow. The multi-form and almost ubiquitously smooth pottery is usually left untreated by design or may be negative resist painted on the body, while the necks and rims are decorated by incising in zones and the addition of punctations, fillets and straphandles.

There is some evidence that the Late Woodland period saw the introduction of stone box burials which become quite characteristic of later phases. These burial sites feature extended burial of individuals laid in prepared graves composed of thin limestone slabs arranged in the form of a rectangular box. At the SP-3 site in Spencer County, the numerous stone boxes showed that the individuals therein all had vessels at their left or right shoulders next to the skull yet at several roughly contemporary sites in the Barren River reservoir the boxes were devoid of grave goods. This suggests quite clearly that, while a particularly unique trait was shared, this form of mortuary treatment was widely variable on a regional basis.

Mississippian/Fort Ancient Culture (circa 900 A.D. - 1650 A.D.)

Mississippian/Fort Ancient appears as a new form of cultural organization specializing in intensive agriculture in restricted but very fertile river bottom soils. This broadly defined cultural appears to have emerged from the Lower Mississippi area and been fully developed in the large sites clustering in the middle Mississippi River Valley (Smith 1978 and Muller 1986). The Cahokia site near St. Louis is the largest ceremonial center of this culture and integrated large number of villages in the adjacent American Bottoms into a coherent stable society (Bareis and Porter 1984). This village ceremonial center integration pattern spread to the Ohio River Valley (up to the Angel Mounds at Evansville, Indiana), the Tennessee River Valley and Cumberland river bottoms in Kentucky. Some investigators believe it permeates the Ohio Valley to the Salt River but recent soil preference analyses of Mississippian agriculture would tend to refute this concept at present (Muller 1986).

Large palisaded villages replicated the pattern of the large ceremonial centers with plazas, temple and burial mounds and smaller satellite communities. Houses were rectangular, of wattle and daub construction, had wall trenches, log foundations and thatched roofs.

Subsidiary settlement types below the village level, at least in the Mississippian were the hamlet consisting of several houses and families and the isolated farmstead with attendant dependencies but only one extended family in residence (Muller 1986). As more investigation is accomplished in the Mississippian the integration of all the segments of the exceptionally complex settlement and community pattern are becoming understood. In Kentucky as in other states in the Mississippian hearth and near periphery it is no longer possible to consider any single Mississippian expression exclusive of the network of it's systemic relationships (Muller 1986).

The Mississippian people used many forms of ornamentation such as gorgets, bracelets and necklaces of various types of beads and pendants. Artifacts head deformation was also practiced. Burials gave evidence of social stratification or status rank in the numbers of grave goods, retainer sacrifice and even effigy figurines of those of high status. Others were interred without goods, extended in shallow stone box graves or within the floors of the houses, usually below the hearth (Griffin 1967 and Morgan 1952).

Subsistence was by intensive cultivation of maize, beans and squash, supplemented by some hunting and/or fishing (Powell 1985). The principal weapon was the bow and arrows tipped with small triangular points. Pottery vessels were made in many specialized forms of a fine shell-tempered paste. Bottles, dishes, bowls, cups and other forms were decorated by painting, incising or molding effigy forms, as were the elbow pipes used for smoking the tobacco which was also regularly grown.

The population supported by the economy and organized by the centralization of authority was large and craft specialization was probably practiced. This is shown by the burial caches of the tools or effigys found in large groupings of almost perfect duplication on pre-selected materials which were regularly procured from specific sources. The finely, shell-tempered pottery also indicates craft specialization in the clear distinction between ceremonial and utilitarian wares.

The Woodland cultural pattern over most of Kentucky was a highly variable one, and the Fort Ancient Culture found in the upper Ohio Valley in north central Kentucky represents the developed culmination in a Woodland/Mississippian blend at approximately 1200 A.D. (Henderson and Turnbow 1987, Griffin 1967 and Smith 1978 [See Eisenpreis]). This archaeological culture which is equated in its later stages with the historic Shawnee (Clark 1977), is one which was heavily influenced by the heavy concentration of Mississippian upriver groups to the west and slightly down river from the Falls Region. While materials quite similar to the Fort Ancient types are common in the Salt River drainage little clear Fort Ancient, is seen in the Falls Region which has a poorly defined Newtown-like phase based upon several weak components in the area but no solid fully investigated occupations. Further upriver the more complete emergent pattern is seen in those areas of Kentucky immediately adjacent to the state

of Ohio across the river of that name. There is some major penetration of the Kentucky and Licking River drainages as well.

Intensive agriculture of maize, beans, and squash was practiced and supplemented by hunting and fishing. Much of the cultural inventory is similar to that of the Mississippian peoples. Projectile points were small and triangular, shell and flint hoes were made, and shell-tempered pottery in a multitude of forms and decoration is found. One form, the large flat dish known as the salt pan is especially common in the sites such as Fox Farm (Funkhouser and Webb 1928 and Webb and Funkhouser 1932) located near the various salt licks in central and eastern Kentucky and along the Salt River. Villages were usually located near larger streams and supported smaller populations than those of the Mississippians. Some were palisade and contained rectangular or round houses of wattle and daub or pole and bark construction. Many large storage pits and rockfilled earth ovens also characterize these villages.

Ceremonialism seems to have been derived from that of the Mississippian culture and from cultures far to the south which participated in the Southern Cult. Incised shell gorgets and other decorated items with the buzzard, swastika, kneeling man, human face and weeping eye motifs demonstrate this association. Temple mounds are rare and small but parallel those found more frequently in the Mississippian sites elsewhere (Morgan 1952). Ornamentation was dominated by shell and bone beadwork allied with beads made of local coals. Burials were in stone slab boxes and placement of pottery vessels near the hips and head of the extended burials was quite common. Cranial deformation was practiced. Artistic expression was limited to incised decoration of pottery vessels in gilloches and to some effigy elbow pipes of stone or pottery. Trade does not appear to be widespread and although some intertribal contacts are evident, the Southern Cult and European trade goods appear to be the best indications of the limited network of exchange.

Historic Stage (1650 A.D. - 1930 A.D.)

Just prior to this period the resident populations of Kentucky were in a state of flux. Introduction of European trade goods through the coastal and Appalachian tribal middle men caused economic warfare when power was shifted to the advantageously situated tribes. White contacts with the Iroquois, Shawnee, Miami, Potawattami and Cherokee exacerbated rivalry and trade conflict (Clark 1977 and Muller 1986). The "dark and bloody ground" legend had origins in the disruption of settlements of the indigenous groups such as the Shawnee, during dominance related strife between tribes (Clark 1977).

The villages of this period were heavily fortified often with loopholes for use of the gun, now a stock trade item. Village stability increased with towns acting as trade centers with white trading posts. As white settlement took place these aboriginal towns, such as the Shawnee Village at the current site of Louisville, were strategically placed for trading or raiding settler's stations, such as Fort Boonesbourough in Kentucky. However, soon after 1750 A.D. the stockaded log cabin of the settlers was adopted as a house type in most Indian towns. Common trade goods were the copper kettle or bucket which displaced pottery vessels, Venetian glass trade

beads, brass rings, kaolin pipes, steel knives or tomahawks, scissors, needles and various other metal tools and ornaments which almost wholly displaced the lithic and bone tool industries of the Indian. By 1750 A.D. Indian settlements were virtually indistinct from the white frontier settlements now known as stations. Indian populations rapidly declined through disease, displacement or warfare, stimulated by increasing white contacts before full scale settlement from the Atlantic coastal states began at circa 1783, or just at the conclusion of the American Revolution.

The central Kentucky area was settled just before the Revolutionary War in 1774-75 by Colonial Euro-Americans who had travelled over the Appalachian Mountains by land and by way of Cumberland Gap. Other settlers began moving down the Ohio River from Fort Pitt past the Indian towns toward the Falls of the Ohio River. Louisville was founded in 1778 when a period of intermittent travel interruption at the Falls was ended and a period of pioneer farmstead began continuing until 1796 with Louisville as a center. Commencing about 1796, rapid growth took place with Louisville becoming a commercial center of river traffic by the 1830's. Developments outside Louisville continued to be farmsteads with small towns or villages on the navigable streams and county seats serving as entrepots for agricultural products (O'Malley 1987). Construction of a canal in 1831 hastened and enhanced this growth which was not interrupted until the Civil War (1861-65). Following this period, expansion of commercial and urban activities continued to the present time pushing agrarian activity to the periphery of the Falls area.

Elsewhere in Kentucky the cycles of historic growth and development were more or less accelerated or retarded based upon proximity to the major resources of the state such as coal, production of burley tobacco or participation in the horse industry. The Civil War produced a significant period of reappraisal and modification of Kentucky's agrarian base. Light or specialized agriculture such as viniculture, hemp growing, horse breeding and the like could not sustain development or even a no growth economy. These early industries, for the most part, prospered for a while and later faltered (Granger 1984).

The rivers which up to 1860 had sustained the transportation network began after this date to yield to the toll roads and railroads which by the 1880's had reached almost all portions of the state and which carried almost exclusively the extracted resource products of the state. Despite some urban entrepreneurial development, the city core served primarily the rural periphery (Granger 1987).

Only with the twentieth century did heavy industry penetrate lightly into the state. Residentially, urban areas grew along the usual concentric patterns and out in the downstate areas, patterns of large farms or "plantations" with many tenants persisted as an outgrowth of the stations. In more agriculturally peripheral areas small farmsteads expanded (O'Malley 1987). Workers in the Eastern Mountain' coal industry clustered into the more northeastern pattern of company dominated towns centered around the mines. Very little diversification of Kentucky's economy took place until after the Second World War and therefore very little modification of

exceptionally old traditional patterns of folklife, settlement and economy took place in the state until after 1930.

CHAPTER FOUR
PREVIOUS ARCHAEOLOGY

The previous archaeology near the project area is very significant in determining the potential likelihood of discovering unknown sites in this area. Previous archaeological surveys to the immediate north of this project area which are listed below helped shape the structure of testing and the expectations of this project.

Some of the first sites recorded in the McCracken County area were noted by Funkhouser and Webb (1932). Site 15Mcn6 was a 20 foot high mound that was three miles south of Paducah. This excavation of this mound by Fain King revealed bones, ashes, charcoal, and chert flakes. This mound is now destroyed. Another site noted by Funkhouser and Webb was located on the Clarks River one mile southeast of Woodlawn. This was considered a village site with graves. Funkhouser and Webb claimed this site yielded the best artifact in the county, including a copper axe and numerous lead beads (1932). Located south of the PGDP is site 15Mcn9, located at the Heath High School where it was reported a village site stood. It was reported that chert, pottery and bones were abundant from the surface. Located west of the project area is a site known at that time as "Cemetery Ridge" about four miles northwest of Rossington on a knoll which stood over the Ohio River bottoms. Stone graves with many burials, a large number of artifacts, including bannerstones were found at this site (1932).

During the survey for the Shawnee Steam Plant for the Tennessee Valley Authority in 1981, Butler, Penny and Robison recorded 17 archaeological sites that ranged from Archaic Periods to the Historic Period. Site 15Mcn39 located north of the project area was a Late Archaic lithic scatter with the possibility of Saratoga points with one possibly being a Wade style point. Site 15Mcn20 consisted of an occupation range from the Late Archaic to the Mississippian Period. This site located near the Ohio River, this site include almost 1500 artifacts along with a vast amount of fire cracked rock and a small amount of pottery. Site 15Mcn38 located 2.6 kilometers from the project area was determined to be a Mississippian short term occupation camp. This circular shaped site produced 915 pieces of chert along with 69 ceramic sherds that were shell tempered. One feature from this site may have been a house basin pit. Another Mississippian site was 15Mcn24 is located just west of 15Mcn38. This site produced about 5000 pottery sherds with the shell temper and plain variety being the most dominant. A radiocarbon date of 1400 AD from this site was obtained but the investigator is unsure of the validity of this sample. During the 1981 survey (Butler et. al 1981) also discovered five historic sites, 15Mcn41-45, that were to the north of our project. These sites were small scatters of artifacts with no integrity for further study.

During their surface reconnaissance for the location of the Paducah Water Plant Site (1981), Carstens and Hensley discovered three prehistoric sites in Paducah. Site 15Mcn66 was located near the northwest corner of the water plant. They recovered eight pieces of chert ar an immature deer mandible. At about 100 meters south-southeast of this site they disco ed 15Mcn67 a site that yielded only four pieces of chipped stone debitage. Site 15Mcn68 yielded chipped stone cores, bifaces, uniface tools and debitage.

CHAPTER FIVE
METHODS

General Field Methods

During the preliminary phases of any study, topographic map reference checks, landowner interviews, literature survey and collection evaluation are all accomplished. Landowner (leasee) interviews where appropriate and are made with a view toward determination of any specific knowledge possessed by residents of any "Indian relics" from their land and toward gaining their permission to walk the lands.

Once the project area is delineated on the ground by use of map, compass, rangefinder and relative bearings on appropriate landmarks an examination is made by walkover and close ground surface inspection usually by trained field assistants at 5 meter intervals. At times on smaller areas, closer intervals are used, while more extensive tracts may be covered in wider intervals, in no case exceeding 10 meters. Surface examination is usually most productive in plowed fields, whereas those areas with surface cover which obscures the soil may require additional steps, such as use of rakes to clear a viable sample surface. Artifact or other surficial cultural material locations are marked by flag and concentrations are further identified by bearings on appropriately mapped landmarks. These concentrations of cultural materials are measured to determine their surfacial extent, and are plotted on maps using latitude and longitude and/or Universal Transverse Mercator location.

All sites are designed by the State serial code 15 - County abbreviation - Serial number, if cultural materials are present. Two basic identifications of archaeological manifestations are made. Archaeological sites are loci of past human activity and are so identified if cultural materials of historic or prehistoric affiliation are present in general context (i.e., not in fill or other redeposited context). These materials and sites, if identified, may be presumed to be greater than fifty years in age. Survey **Test Localities** are distinguished from archaeological **Sites** by the absence of cultural materials but because they display the favorable juxtaposition of environmental and topographic features conducive to prehistoric occupation. All sites yielding cultural materials may be designated to be tested in addition to certain favorable localities.

In the secondary stages of the initial reconnaissance of more intensive examination, minor test soundings are completed on all sites and localities according to a standard procedure. The initial steps of this form of reconnaissance consists of ground surface inspection using a specific set of methods are utilized based upon Shovel Test Pits (STPs). These are small holes usually no greater than 40 centimeters in depth with a diameter generally the width of the shovel blade. STPs assist site discovery or evaluation in an area where high site productivity is suspected but where there is very low surface visibility to be expected at the time of the investigation. Patterns of variable width can be carefully tested by STPs to discover site locations and are sufficient to cover knolls and ridges depending upon the topographic situation. However,it must be reiterated that the STP method is only appropriate for very gross inspection and is actually not finegrained enough for accurate feature or even final site delineation. This is especially true in upland

situations where there may be a depth below circa 40 centimeters to midden deposits and absolutely true in floodplain situations where deep testing should always be required. Precise site definition and determination of contextual integrity is an activity for intensive testing by plowing, disking, strictly controlled surface sampling and other excavated units both by hand and machine.

Finally, it should also be noted that any surface reconnaissance method has somewhat conflicting results if observed uncritically. When an archaeological site is disturbed by plowing large numbers of artifacts may be brought to the surface and exposed for collection whereas less disturbed, possibly deeper, sites in similar circumstances may produce very little on the surface. Where the surface is not visible, and small STPs must substitute for the lack of visibility, the production of cultural material in the units may be doubly significant because these items are possibly being derived from an intact context as opposed to larger disturbed surfacial frequencies. It is, therefore, completely wrong methodologically to rely upon the absolute frequencies expressed in chart or tabular form to determine the "significance" or "worthiness" of a site to qualify for testing. While it is necessary to recommend the high frequency sites for testing it is also vital to recommend those sites for testing, where there are very low frequencies produced in very different circumstances.

Where practical, to cover large areas, either 1 inch bore soil sampling augers or mechanical auger tests (8 inch bit), excavated to a depth of 1.5 meters in subsoil and spaced by an interval of several stated meters, may be substituted to criss-cross a project location on transects or as points in a grid. These borings are treated in much the same way as STPs, except that they have greater depth and presumably greater reliability in sampling subsurface conditions.

Occasionally, small hand-excavated test units not exceeding 2 X 2 meters may be excavated in areas of particular interest or importance. To standardize all the measurements within the borings and/or unit excavation all of the depth measurements are taken from actual surface and in the southwest corner of any unit. If an object is located within a unit excavation, its relative position is triangulated from the northwest and southwest corners and a depth is taken from the southwest corner. Cultural material from auger holes is only given depth and location provenience from that sounding. Within hand excavated tests the soil is either skinned with a shovel or removed with a trowel in order that no object will be missed. As an extra precaution the soil removed from the test excavation is examined as its passes through a one-quarter inch mesh screen sifter. Auger tests, hand units and those described below are directly triangulated by azimuth bearing to prominent topographic or modern cultural features or a temporary test datum is so correlated.

The standard larger focus discovery technique in alluvial or colluvial contexts is trenching by backhoe or other form of earth moving machine using a toothless sharpened blade on the bucket. Bucket width may vary from 30 centimeters (1 foot) to 1 meter (circa 3 feet). Trenches from 3 meters to any number of meters in length are dug, often to depths of 4 meters with appropriate shoring to U.S. Army Corps of Engineers safety criteria. Full depth profile soil observations and drawings are made for a 1 meter width in every 5 meters of length. Where buried cultural horizons are encountered (e.g. features or midden) a directly adjacent 2 meter by no more than

4 meter unit is emplaced by machine to 10 centimeters above the observed inception of the floor(s) and excavations are carried on by hand as described above. In the discovery phase these larger units are kept to an absolute minimum to avoid major site impacts, however during later testing or data recovery phases, units of this type may be utilized more extensively.

Tests from STPs to the largest machine emplaced units are recorded in the following natural stratigraphic levels within the soil, if possible from direct observation. Natural levels are determined by their texture and color which is obtained from a Munsell Soil Color Chart. Otherwise, arbitrary units are used and are generally measured in decameters. Generally, in agricultural areas there are basically only two natural stratigraphic levels. These are the plowzone (A Horizon) and the underlying subsoil (B Horizon) with or without levels of cultural occupation. The plowzone is the level in which successive plowings have churned the soil disturbing precise context but not general context. In the plowzone cultural material may be found, but it has no precise context. If the plowing has not gone too deep, there may be a relict segment of occupation level where precise provenience is undisturbed. If there has been much deposition of soil through alluviation or other process, there can be undisturbed occupation zones. Sterile subsoil of the B Horizon is that zone which contains no cultural material whatsoever. Once a continuously sterile zone is located, test excavations continue only ten centimeters into it, except in special cases where very deeply buried occupation zones are suspected. Tests for these zones may require power assisted test excavations of greater extent. If these are a part of the project they are described in the following section (B) of this part. All excavation halts at bedrock (C Horizon).

Historic site contexts are examined in the general area historical background (See Chapters Three and Four). In this study those observed archaeological manifestations termed historic are defined in much the same way as any other archaeological sites considered, with some exceptions where informant information and historical background studies at times produce additional data. Historical archaeological sites are looked at as unit structural complexes. Thus a "Main House" does not necessarily constitute the "site" but rather a single structure of a complex and all of the dependencies (e.g. barn, slave quarters, smokehouse, well, cemetery, access road, ice house etc. etc.) constitute the site. Urban historic archaeological sites carry this principle to its most extensive manifestation.

Another principle in this type of survey is that a **detailed site** history is considered as precisely the same activity as is intensive testing by enlarged excavations on an undocumented archaeological expression. Such additionally researched detail usually consists of Deed Searches, Primary Document Evaluation, Archival Searches, Informant Interviews, Oral History Analysis and other specific methods. **Detailed Historical Analysis** (DHA) is the work of a secondary phase study and is usually not done in an initial reconnaissance beyond sufficient levels to identify site location. The recommendation for such work is equal to that of archaeological testing for a Determination of Eligibility to the National Register of Historic Places and is **not** an **a priori** requirement in order to make the recommendation.

Historic cemeteries, if found, are left totally undisturbed with only those gravestone inscriptions which are exposed being recorded. Cemeteries are entities which may not qualify for the National Register of Historic Places except in the event of unusual qualifying criteria and cannot really be tested or, in fact, disturbed to record all of the demographic data on the stones without an appropriate coroner's permit. Therefore, cemeteries become immediate examples of the need for a more intensive DHA.

All cultural materials recovered are returned to the Principal Investigator's laboratory and washed, separated and catalogued by site. All artifacts are described and recorded. Analysis is completed in order to assign sites to a particular cultural horizon where possible and to determine the significance of the site to prehistory and eligibility for inclusion on the National Register of Historic Places. Once these determinations are made, recommendations are prepared for this report. Curation of all files and collections of cultural materials recovered from Kentucky is generally housed with a state accredited facility, and unless otherwise stipulated.

Field Methods Specific To Project

Prior to any field work, locations within the project area which appeared the most favorable for prehistoric/historic occupation were identified by means of evaluation of topographic data on a 7.5' USGS map with the intention of conducting especially careful field examination in these locales. Reports of archaeological projects conducted in the vicinity were consulted in order to isolate types of environmental situations in which prehistoric sites had been discovered previously. Knolls, ridgetops, uplands, and floodplains were targeted as requiring special attention.

Survey methods included surface walkovers, shovel test pits (STPs), examinations of profiles by stream banks and erosion. Along the entire project area, no substantial ground surface visibility was possible.

Subsurface examination consisted of emplacing STPs on a 15 meter grid within the project area. Four field technicians conducted the survey. The 15 meter grid was established by pacing. A 15 meter long tape was stretched out on the ground, and each crew member counted their paces as they walked along the tape. This was done several times for accuracy. At the starting point of the project on the southwest end each crew member was given a letter to signify his/her transect row during the STP investigation, each individual STP had this letter and a number to relate its position along the grid.

The 15 meter STP interval was not completely rigid. Whenever an apparently ideal juxtaposition terrain feature conducive to human settlement occurred, the interval was tighten to five or ten meters depending upon site detection probability. When a STP containing cultural material was excavated, a series of STPs were excavated in the four cardinal directions at five meter intervals to determine the extent of the possible site. These additional tests were excavated until a negative STP was encountered at which point intrasite testing was terminated.

The size of the STP averaged between 30-40 centimeters in depth, and were approximately 30 centimeters in diameter. All dirt returned to the STP was trowel checked for artifactual content. Specific observation on the STP included soil color using the Munsell color charts, soil texture, and stratigraphy. This data was recorded in field notebooks. All material within the STPs were collected and bagged separately according to STP, and returned to the ARCS Lab for curation preparation and analysis.

CHAPTER SIX
FIELD INVESTIGATIONS

This chapter explains the extent of investigations and the methodology used in the field. The method of running transects through the project area resulted in a total of 22 different transects (A-V). To simplify this section of the report the project area will be divided up into parcels (I-IV) as addressed in Figure 6.1. These boundaries existed in the field and were manmade such as roads or man-controlled such as tree lines that separated fields.

Parcel I: Parcel I was on the south edge of the project area (FIGURE 6.1) that was north of the present landfill and of a service road. Parcel I is the smallest of the four parcels in the project. This area was bounded by the service road on its south, another road to the west and a tree line on the north that separated this parcel from the next. This parcel consisted of several clusters of trees and tall grass. The soil in this parcel generally consisted of a topsoil of about 24 centimeters in depth consisting of a dark grayish brown (Munsell 10YR4/2) loam. The subsoil was a yellowish brown (Munsell 10YR5/4). No cultural material was found in this parcel.

Parcel II: Parcel II is the next tract of land north of Parcel I (FIGURE 6.1). This area is bounded by a treeline to the south, a road to the west, a road to the north, and was flagged in the east. This area consisted of short grasses that have grown since the last harvest. This parcel consisted of a small rise in the western third of the area and another in the eastern third. Within this tract there was a few small clusters of trees in the eastern portion. The plowzone had a range of 10-18 centimeters with the deeper plowzone prevalent in the southern portion. The soil colors in this area were from a dark grayish brown (Munsell 10YR4/2), a brown to dark brown (Munsell 10YR5/3, 10YR4/3) to a dark yellowish brown (Munsell 10YR4/4) loam. The subsoils were also slightly varied form a very pale brown (Munsell 10YR7/3), a pale brown (Munsell 10YR6/3), a light yellowish brown 10YR6/4) to a brown (Munsell 10YR5/3) silty clay. No cultural material was found in this parcel.

Outside the proposed project area on its eastern boundary is the remains of a structure of some sort (FIGURE 6.2). This area was discovered by the presence of concrete supports possibly piers and plumbing pipes exposed from the ground surface, it should also be noted that daffodils were also found in this area. To the northeast by 47.20 meters of this structure is a manmade pond and between the two is a long depressed area that may possible been a road. The STP interval near this structure was tighten to a five meter grid (FIGURE 6.3). One STP on the western side of the concrete supports yielded two pieces of earthenware used for drainage pipe and another STP south of the supports uncovered a bottle. It should be reiterated again that this site, The Jet Black Pond Site 15Mcn93, lies outside the proposed boundary.

Parcel III: Parcel III is located north of Parcel II (FIGURE 6.1). This area is bounded by a treelines to the north and west, and roads to the south and east. This area consisted of short grasses left fallow after the last harvest and a treeline stand that ran in a northerly-southerly direction near the middle of the parcel. This area also consisted of more knolls and rises along with a small intermittent stream in its northwest portion. STP profiles in this area consisted of

FIGURE 6.1 PROJECT LOCATION AND LOCATION OF SITES 15Mcn92 AND 15Mcn93.

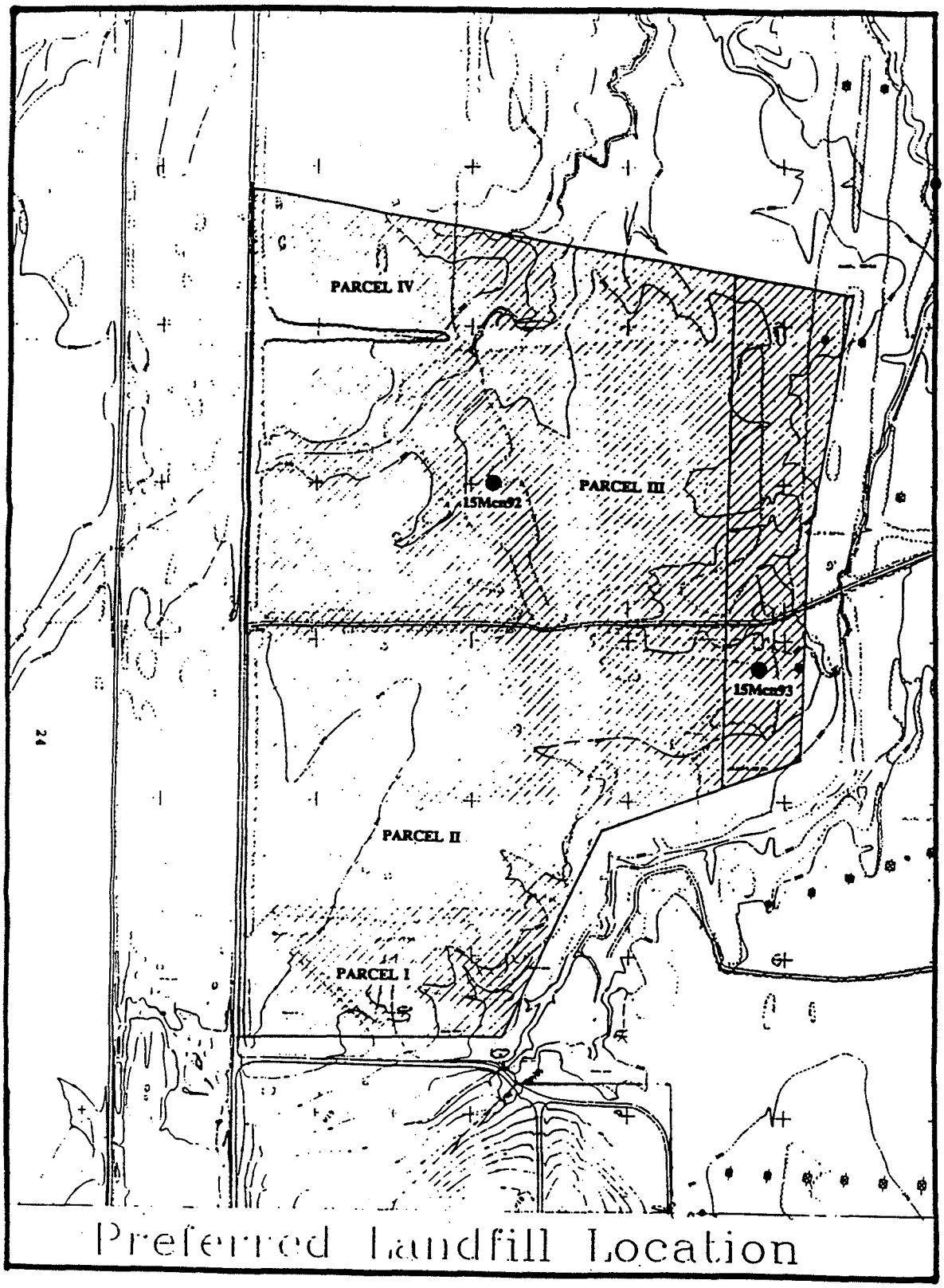


FIGURE 6.2 TESTING AT DEEP WELL SITE 15Mcn92

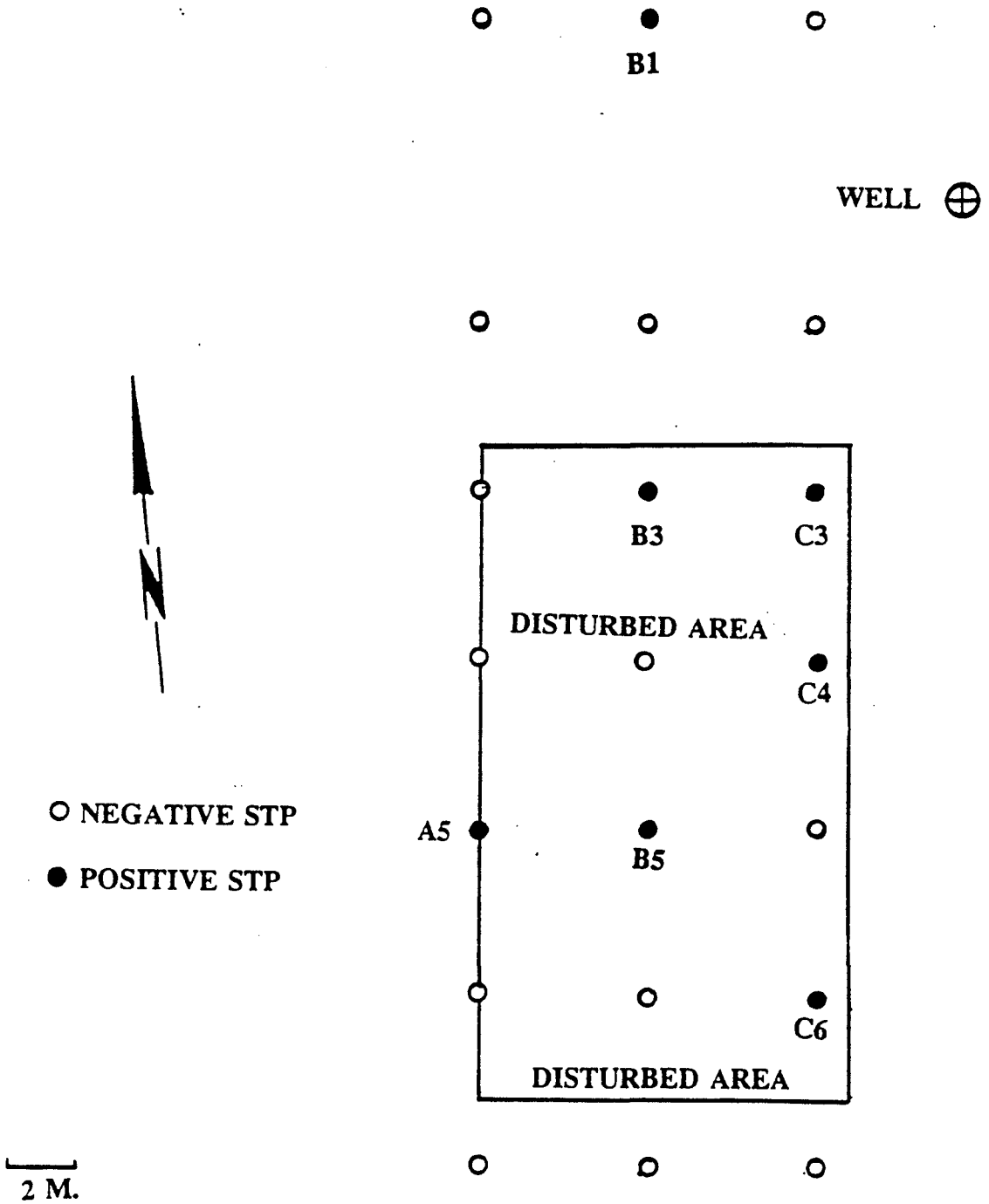
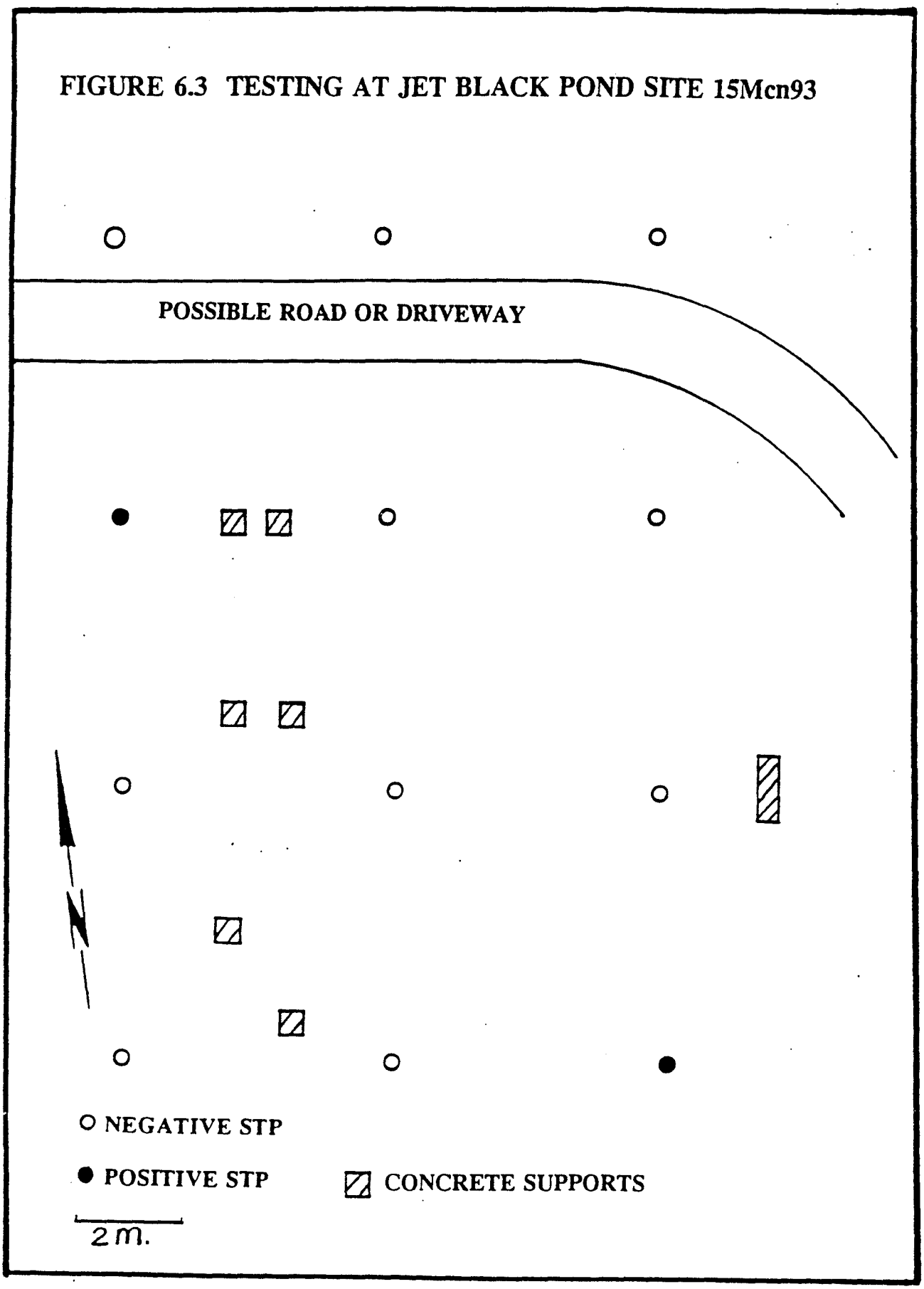


FIGURE 6.3 TESTING AT JET BLACK POND SITE 15Mcn93



a plowzone of 13-21 centimeters with a soil matrix of a brown (Munsell 10YR5/3) loam and a brown to a dark brown (Munsell 10YR4/3) loam. The subsoils tended to be varied between a light yellowish brown (Munsell 10YR6/4) clay silt and a yellowish brown (Munsell 10YR5/8) clay silt.

Near the middle of this parcel a brick line well was discovered in an area of grass and trees. This well had a very thick piece of wood on top to cap the opening. This was done by the wildlife management to avoid accidents of animals and humans from falling in the well. This well could not be measured due to its great depth but was estimated to be over 50 feet deep. To the south of the well was an area of tall trees and disturbed soil that appeared to be left after a bulldozing episode or as a dumpsite. Also the area was bountiful in the amount of daffodils and a possible road now over grown with brush approaches the area from the south. A five meter STP interval was conducted in this disturbed area (FIGURE 6.2). STPs revealed a soil matrix very similar to a compost because of the texture of the soil in this area. Artifacts recovered in this area are refer to below. Though there were brick fragments found on this area no structure was found on the surface or by the subsurface probes. Other STPs were generously placed in other areas of tall trees that were nearby and along the southern rise over a small stream that was north and northwest of this area. One STP north of the area in the wooded area along the rise revealed two pieces of curved clear glass just below the surface but other probes proved it was an isolate find. Just east of this area by 60-70 meters in a field that was left in short grasses after a harvest a piece of amethyst glass was found in a STP. This immediate area mentioned above yielded the only artifacts from Parcel III. This site has been named the Deep Well Site 15Mcn92.

POSITIVE SHOVEL TEST PITS (STPs) AT POSSIBLE STRUCTURE 1

STP	PIECES	ITEM
B1	3	FLAT GLASS (GREEN)
B3	2	BRICK FRAGMENTS
	2	FLAT GLASS (LIGHT BLUE)
C3	4	BRICK FRAGMENTS
C4	1	METAL OBJECT
	3	FLAT GLASS (LIGHT BLUE)
A5	1	FLAT GLASS (CLEAR)
B5	1	BRICK FRAGMENT
C6	1	CURVED GLASS (BLUE)

Parcel IV: Parcel IV was located north of Parcel III (FIGURE 6.1). This was a narrow tract of land that in the western half existed in a clear field with a few trees and grass. The western portion was in a wooded area that had a stream cutting through the middle of this portion. The plowzone in this area ranged from 11-20 centimeters in depth below the surface. This plowzone was a brown to a dark brown (Munsell 10YR4/3) and a dark yellowish brown (Munsell 10YR4/4) loam. The subsoils were from a light yellowish brown (Munsell 10YR6/4) to a yellowish brown (Munsell 10YR5/8). Within the wooded area of this parcel the streambanks were cut back to examine the profiles for archaeological evidence. No cultural material was found in this parcel.

CHAPTER SEVEN
ARTIFACT DESCRIPTION

A total of twenty-two historic artifacts were recovered in the proposed project area of the solid waste landfill. Eighteen of these historic artifacts were recovered from the Deep Well Site 15Mcn92. These included seven brick fragments that were discarded in the field. Nine pieces of flat glass was also recovered from the shovel probes in the area. Five of these were light blue in color, three were a shade of green and the last was clear glass. One piece of blue curved glass was also found and the last artifact was an unidentified piece of metal that was badly rusted. No diagnostic data was recovered from the specific area around the site, but to the east by about 60-70 meters a piece of amethyst glass was found. This piece was recovered within the plowzone layer of this field. Amethyst glass has manufacturing dates of 1880-1924 (Newman 1970).

Three historic artifacts were recovered from the Jet Black Pond Site (15Mcn93). These were recovered from two separate STPs during a five meter interval plan installed due to the presence of the concrete foundations found in the area. Two of the artifacts were fragments of earthenware pipe used for plumbing or other form of drainage. The last artifact was a clear glass bottle with manufacturing dates from 1900 to Present (Kendrick 1966). No other structural remains were encountered other than those mentioned above that were above the surface.

CHAPTER EIGHT
SITE DESCRIPTION

The Deep Well Site, 15Mcn92, is located at UTM coordinates Easting 340500 and Northing 4111050 on a terrace of the Ohio River in McCracken County, Kentucky (FIGURE 6.1). The site is located within the parameters of the proposed Solid Waste Landfill at the Paducah Gaseous Diffusion Plant (PGDP). Located near the center of the proposed project at an elevation of about 370 AMSL which rests on the south side of an intermittant stream which is a tributary of Little Bayou Creek. The site is an estimate 500 square meters in size and lies in a tree grove area surrounded by plowed fields that are covered in very short grasses. The method of testing was the implementation of shovel probes at a five meter interval. To the northeast of this intensive testing was found a very deep well which was brick lined. This well could not be measured due to its depth but is estimated to be over 50 feet deep. To the south of the well was an area of tall trees and disturbed soil that appeared to be left after a bulldozing episode or as a dumpsite. Also the area was bountiful in the amount of daffodils and a possible road now over grown with brush approaches the area from the south. A five meter STP interval was conducted in this disturbed area (FIGURE 6.2). STPs revealed a soil matrix very similar to a compost because of the texture of the soil in this area. Artifacts recovered in this area are refer to above in the artifact section. Though there were brick fragments found on this area no structure was found on the surface or by the subsurface probes. Other STPs were generously placed in other areas of tall trees that were nearby and along the southern rise over a small stream that was north and northwest of this area. One STP north of the area in the wooded area along the rise revealed two pieces of curved clear glass just below the surface but other probes proved it was an isolated find. Just east of this area by 60-70 meters in a field that was left in short grasses after a harvest a piece of amethyst glass was found in a STP. This immediate area mentioned above yielded the only artifacts from Parcel III.

The Jet Black Pond Site, 15Mcn93, is located at UTM coordinates Easting 346750 and Northing 4111700 on a terrace of the Ohio River in McCracken County, Kentucky (FIGURE 6.1). The site is located just outside the parimeters of the proposed Solid Waste Landfill at the Paducah Gaseous Diffusion Plant (PGDP). Located to the east of the proposed project at an elevation of about 370 AMSL and is on the west side of an intermittant stream which is a tributary of Little Bayou Creek which is farther to the east. The site is an estimate 3600 square meters in size and lies in a tree grove area surrounded by plowed fields that were covered in very short grasses. All that remains of the structure are the remains of concrete piers and ceramic pipeing, used for drainage, exposed from the ground. The method of testing was the implementation of shovel probes at a five meter interval. To the northeast of this intensive testing was found a man-made pond that has a very black color. A five meter STP interval was conducted in this area (FIGURE 6.3). Artifacts recovered were two pieces of earthenware used for drainage pipeing found on the west side of the site and a bottle found on the south side. The pond is located 47.20 meters from the structural remains and in between there is a possible road due to the presence of a long depression similiar to a road.

An archival research was attempted on both sites, but was ineffective due to the fact that little historic data could be acquired for this area. This was due to the McCracken County Courthouse records being destroyed during tyhe major floods that the McCracken County Courthouse has been subjected to in the early part of the twentieth century. The presence of disturbance where the majority of the artifacts were recovered further reinforces the argument that the archaeological integrity of the site has been lost to the destruction of the structure prior to the 1950s as the evidence of an aerial map (From McCracken County Property Value Commission) from 1950 showing no structure attests (FIGURE 8.1). During the purchase of the surrounding land in 1942 for the Kentucky Ordinance Works by the U.S. Army Corps of Engineers the last property owner in this immediate area were the Heirs of J.M. Warford.

We feel that the Deep Well Site, 15Mcn92, is not elgible for the National Register due to the reasons of the presence of disturbance where the majority of the artifacts were recovered further reinforces the argument that the archaeological integrity of the site has been lost to the destruction of the structure prior to the 1950s as the evidence of an aerial map (From McCracken County Property Value Commission) from 1950 showing no structure attests (FIGURE 8.1). In the concern of site 15Mcn93, The Jet Black Pond Site, we feel that additional data is needed to evaluate its standing with the National Register. With the fact that less than 100 known recorded sites have been found in McCracken County it may prove necessary to further test this site if it is threaten because of the data it may provide of a community that was removed from an area of the county at the same time. And also for the reason that little is known in the county archaeologically. In this case this site would fall under criteria D of the National Register.

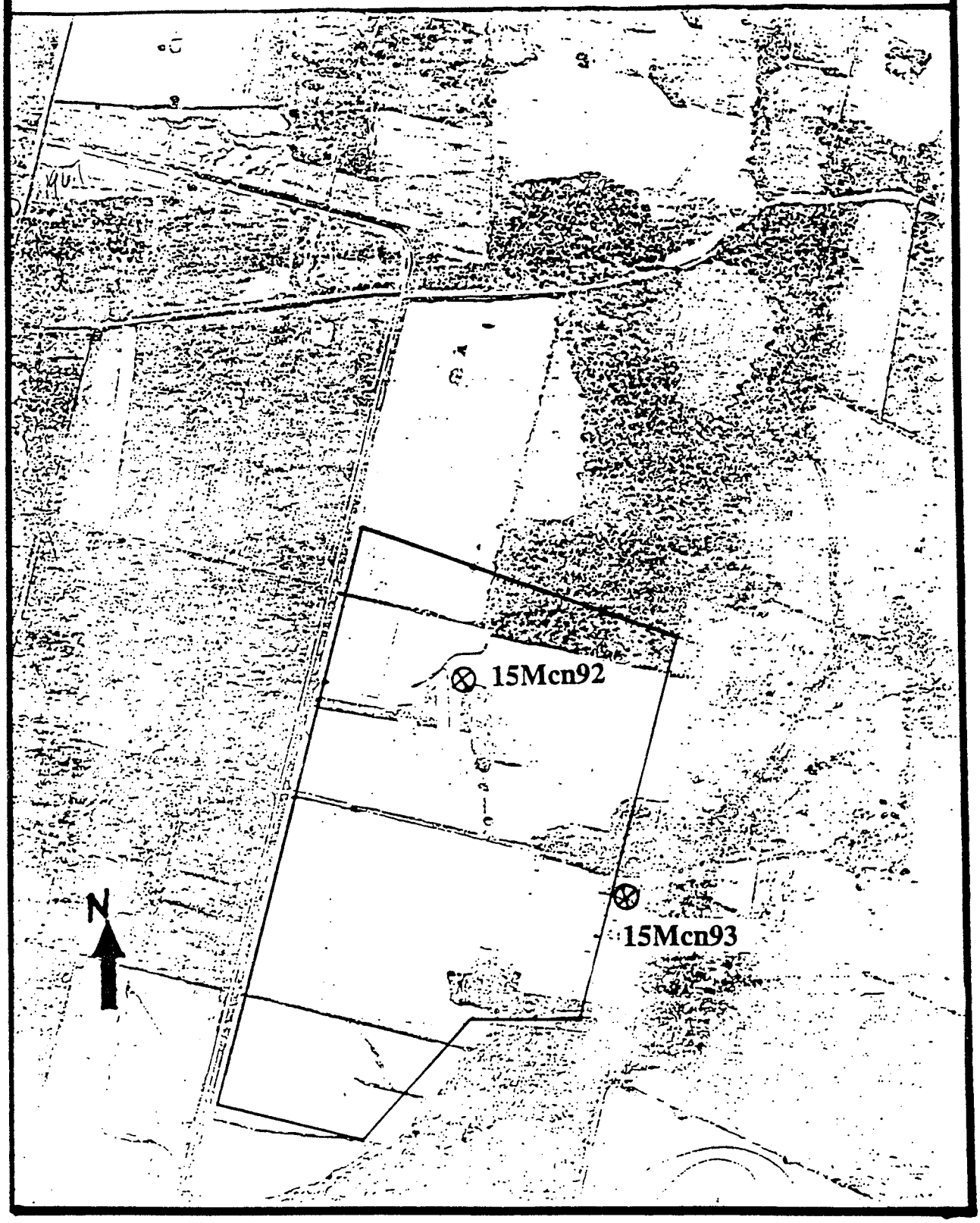
CHAPTER NINE
CONCLUSIONS AND RECOMMENDATIONS

Archaeology Resource Consultant Services, conducted a Phase I literature search and archaeological field reconnaissance investigation in a proposed 40 acre Solid Waste Landfill at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky in April of 1993. The objectives of the literature search and reconnaissance were to locate and identify all cultural resources within the proposed project area, and if possible to assess their significance in terms of the criteria for eligibility for inclusion on the National Register of Historic Places.

The Deep Well Site (15Mcn92) contained a small amount of late nineteenth-early twentieth century residential artifacts. However despite the well, no other intact remains are to be found on the site. The presence of disturbance where the majority of the artifacts were recovered further reinforces the argument that the archaeological integrity of the site has been lost to the destruction of the structure prior to the 1950s as the evidence of an aerial map (From McCracken County Property Value Commission) from 1950 showing no structure attests (FIGURE 8.1). During the purchase of the surrounding land in 1942 for the Kentucky Ordnance Works by the U.S. Army Corps of Engineers the last property owner in this immediate area were the Heirs of J.M. Warford. Very little historic data could be acquired for this area due to the McCracken County Courthouse records being destroyed.

It is recommended here that the Deep Well Site (15Mcn92) does not meet the criteria for the National Register of Historic Places and should require no further archaeological testing due to the loss of the archaeological integrity by the massive disturbance of the area. Due to this finding the proposed project should proceed as planned with no further delays.

FIGURE 8.1 1950s AERIAL OF PROJECT AREA



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APPENDIX A

RESUMES

RESUME -- JOSEPH E. GRANGER PHD, SOPA

NAME & ADDRESS: Joseph E. Granger, PhD, SOPA
8708 Eton Road, Louisville, Kentucky 40241

YEARS OF EXPERIENCE:

Archaeology:	Field Research--31	Graduate Work--12	Total 31
Research:	Part-Time--10	Full-Time--11	Total--21
Teaching:	Undergraduate--26	Graduate--12	Total--26
Administration:	Director, Archaeological Survey (1968-1986)		Total--18

EDUCATION:

BA--(History)-	University of Rhode Island	1961
MA--(Anthropology)-	State University of New York at Buffalo	1966
PhD--(Anthropology)-	State University of New York at Buffalo	1974

MEMBERSHIP(S):

Society of Professional Archaeologists (SOPA)--[Certification]
Society for American Archaeology
Society for Historical Archaeology
American Anthropological Association (Fellow)
New York Archaeological Council--[Certification]
Kentucky Organization of Professional Archaeologists--[Certification]
American Association of University Professors

PROFESSIONAL CERTIFICATION/REGISTRATION (& AREAS):

Society of Professional Archaeologists:

Field Research	Cultural Resource Management
Teaching Archaeology	Theoretical/Archival Research
Collections Research	Archaeological Administration
Historical Archaeology	

New York Archaeological Council: (Same)
Kentucky Organization for Professional Archaeologists: (Same)

ASSIGNMENT(S) & LOCATION(S):

ACADAMIC:	CONSULTING:
Professor	President
Anthropology Department	Archaeology Resources Consultant Services Inc. (ARCS)
University of Louisville	1719 Watterson Trail
Louisville, Kentucky 40292	Louisville, Kentucky 40299
Telephone: (502) 588-6864	Telephone: (502) 266-6789 or 6193

ARCHAEOLOGICAL SPECIALTY TOPICS & GEOGRAPHIC AREAS:

SPECIALTY TOPICS:	GEOGRAPHIC AREAS:
Settlement Pattern Analysis	Eastern North America--
Lithic Analysis	Lower Great Lakes-(New York/Canada)
Urban/Historical Archaeology	New England (Rhode Island)
Ethnohistory	Middle Atlantic Coast (Virginia)
Cultural Resource Management	Ohio River Valley (Kentucky)
	Britain/British Isles

ADDITIONAL INFORMATION:

A complete Curriculum Vita listing all publications and other personal data is available upon written request to the above address.

DIGEST SUMMARY OF EXPERIENCE:

In the past thirty-one years Dr. Granger has conducted basic anthropological and archaeological research into prehistoric and historic questions in the Lower Great Lakes, New England, the Middle Atlantic Coast, the Ohio River Valley region and Britain. Over 50 scholarly monographs, journal articles, chapters and presented papers have been authored regarding this research. He is considered an expert on Archaic and Early Woodland cultures of the Northeastern United States and has served as referee, reviewer and speaker on various topics in these subject areas and in Urban-Historic Archaeology.

In the field of Cultural Resource Management, during the past twenty-one years Dr. Granger has served as Principal Investigator on no less than 125 sponsored investigations into the conservation archaeology of the central Ohio River Valley and elsewhere. This activity has coincided with his Directorship of University of Louisville Archaeological Survey (1968-1986) and also in his private consulting. Sponsorship of these activities has exceeded $2,000,000.00 in total and resulted in the sole or joint authorship of over 120 reports, papers, or monographs concerning cultural resource studies.

Dr Granger has also been involved in various activities at all governmental levels including testimony on bills (U.S. Congress), reviewer for National Science Foundation grants, member of the State Historic Preservation Officer's Task Force on Archaeology and in the drafting of legislation (state Antiquities Act and local Historic Preservation Ordinance). As Adjunct Curator of Archaeology, he has assisted in re-structuring of the collections and prehistory displays of the Louisville Museum of History and Science.

Dr. Granger has been a Regional Advisory Editor of the journal North American Archaeologist and is currently President-Elect of the Eastern States Archaeological Federation. He was a founding member of Society of Professional Archaeologists (1977) and also a founder of the Symposium on Ohio River Valley Urban and Historic Archaeology (1983). He

has been awarded the Arthur C. Parker Research Fellowship at Rochester Museum and Science Center (1984) for Early Woodland studies and served as Kentucky Representative to the Committee on Public Archaeology of the Society for American archaeology for twenty years (1979-1989) He is a member of 25 national or state professional and archaeological organizations.

At University of Louisville, an essentially undergraduate institution, Dr. Granger has been a member of the Graduate Faculty (recognizing research quality) since 1977 and he has served on College of Arts and Sciences Planning Committee and Legislative Council (1988-1991). He also served on the Executive Committee of the local chapter of the American Association for University Professors (1977-1979). Five of Dr. Granger's students have gone on to acquire professional degrees (PhDs) in archaeology at other graduate institutions. He has served as chair of 4 Masters Thesis and one PhD Committee for interdisciplinary degrees.

In a private consulting capacity, Dr. Granger has conducted or served as Principal Investigator on well over 150 projects or contracts in archaeological field reconnaissance survey, monitoring, testing and mitigation by data recovery through excavation. He has extensive experience in project design, management, documentation and negotiation situations with Federal, State, County, City and private agencies or firms on legal and regulatory requirements. After founding Granger Associates Inc.(1980) and Granger Consultants (1986), Dr. Granger joined several partners in the firm Archaeology Resources Consultant Services Inc. (ARCS) which he serves as President.

Martin C. Evans
212 Southwood Terrace
Louisville, Kentucky 40214

EDUCATION:

BA in Anthropology, 1988, University of Louisville Post-Baccalaureate work in Secondary Education

YEARS OF EXPERIENCE:

Archaeological Fieldwork - 6
Cultural Resource Assessment - 5
Assistant Field Supervisor - 2
Field Supervisor - 2
Lab Technician - 1

SUMMARY OF EXPERIENCE:

Martin has performed archaeological fieldwork for the past six years. In that time he has worked on both prehistoric and historic sites in the Ohio River Valley and in the state of Virginia. He has also worked on two projects in western New York where he preformed the duties of field supervisor.

Since his employment at ARCS. and MAAR he has continued the tasks of field supervisor and field technician along with those of lab technician and Project Manager.

TECHNICAL REPORTS:

Bader, Anne T. and Martin C. Evans
1992 Phase I Archaeological Investigations On The Little Goose Creek, Upper Goose Creek, Old Brownsboro And The Falls Creek/Glenview Woods Segments Of The North County Wastewater Facilities In Jefferson County, Kentucky. Archaeology Resources Consultant Services (ARCS.) Louisville, Kentucky.

Bader, Anne T. and Martin C. Evans
1992 Phase I Archaeological Investigations On A Dopplar Rader Site Near The Confluence Of Bethel Run And Floyd's Fork In Bullitt County,

Kentucky. Archaeological Resources Consultant Services. Louisville, Kentucky.

Evans, Martin C., Anne T. Bader, Patsy J. Wilson and J.E. Granger.
1992 Phase III Archaeological Investigations On The Lebanon Corrections Farm Site No.1 (33Wa336) Transco/Texas Gas/Cng Northeastern Project (Main Line System Expansion) In Warren County, Ohio. Archaeological Resources Consultant Services. Louisville, Kentucky.

Evans, Martin C.
1992 Phase I Archaeological Reconnaissance On Miscellaneous Tracts On A Section Of The Russellville-Bowling Green 8" Pipeline In Logan County, Kentucky And On A Section Of The Franklin 4" Pipeline In Warren County, Kentucky. Archaeology Resources Consultant Services. Louisville, Kentucky.

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1992 Phase I Archaeological Reconnaissance on Miscellaneous Tracts on Sections in Hardinsburg, Kentucky of the Transco/Texas Gas/CNG Northeastern Project Mainline System Expansion. Archaeology Resources Consultant Services. Louisville, Kentucky.

Analysas CORPORATION

TECHNICAL SERVICES AND INFORMATION SYSTEMS
Paula K. Simmons, President
Ann Snyder, Executive Vice President

August 16, 1994

Mr. Bob Abell
U.S. Department of Agriculture
Soil Conservation Service
2715 Olivet Church Road
Paducah, Kentucky 42001

Dear Bob,

Thank you for your review of the area for the Solid Waste Landfill (SWL) to be constructed by the U.S. Department of Energy (DOE) at the Paducah Gaseous Diffusion Plant (PGDP). I recently received a copy that you sent to David Tidwell at DOE. Adequate maps were not available at the time we visited you and have since been developed delineating the site. After review of your rating form and map, we determined the area is significantly smaller than the area you reviewed.

Enclosed is a copy of the Soils Conservation Map for the proposed area and the SWL site has been drawn on the map. Please revise the Farmland Conservation Impact Rating form that was previously provided to the DOE Site Office. Please resend this information to David Tidwell by August 24, 1994.

We apologize for the confusion and we appreciate your efforts for this task. Please call me at (615) 241-2051 if you have any questions.

Sincerely,

William L. Osburn

William L. Osburn, REM
Senior Environmental Engineer

cc w/enclosure
David Tidwell, DOE Paducah Site Office
Brian Bowers, PGDP

Enc.

151 Lafayette Drive, Suite 110, Oak Ridge, Tennessee 37830 (615) 576-1650

APPENDIX B

ARCHAEOLOGICAL REPORTS

FINDING OF NO SIGNIFICANT IMPACT

CONSTRUCTION, OPERATION, AND CLOSURE OF
THE PROPOSED SOLID WASTE LANDFILL (SWL)
AT
PADUCAH GASEOUS DIFFUSION PLANT (PGDP),
PADUCAH, KENTUCKY

AGENCY: Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: DOE has prepared an environmental assessment (EA) for the proposed construction, operation, and closure of a Solid Waste Landfill (SWL) that would be designed in accordance with Commonwealth of Kentucky landfill regulations (401 Kentucky Administrative Regulations Chapters 47 and 48 and Kentucky Revised Statutes 224.855). The operation of PGDP produces approximately 7,200 cubic yards per year of non-hazardous, non-radioactive solid waste that is currently being disposed of in a transitional contained (residential) landfill cell (Cell #3). New Kentucky landfill regulations mandate that all existing landfills be upgraded to meet the requirements of the new regulations or stop receiving wastes by June 30, 1995. Cell #3 must stop receiving wastes at that time and be closed and capped within 180 days after final receipt of wastes. The proposed SWL would occupy 25 acres of a 60-acre site immediately north of the existing PGDP landfill (Cell #3). The EA evaluated the potential environmental consequences of the proposed action and reasonable alternative actions. Based on the analysis in the EA, DOE has determined that the proposed action does not constitute a major Federal action which will significantly affect the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA), 42 USC 4321 et seq. Therefore, it is determined that an environmental impact statement will not be prepared, and DOE is issuing this FONSI.

COPIES OF THIS ENVIRONMENTAL ASSESSMENT ARE AVAILABLE FROM:

U.S. Department of Energy
Public Reading Room
55 Jefferson Circle
Oak Ridge, Tennessee 37830

U.S. Department of Energy
Environmental Information Center
West Kentucky Technology Park
Highway 60
Kevil, Kentucky 42053

FOR FURTHER INFORMATION ON THE NEPA PROCESS, PLEASE CONTACT:

Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Assistance, EH-4.2
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585
Tel: (202) 586-4600 or leave a message at (800) 472-2756

SUPPLEMENTAL INFORMATION:

PROPOSED ACTION: To provide the additional capacity to dispose of contained waste and construction/demolition debris, DOE proposes to construct, operate, and ultimately close, a new SWL at PGDP. The proposed SWL, which would be operated under an area-fill method, would occupy 25 acres of a 60-acre site immediately north of the existing PGDP landfill and would accept both contained and construction/demolition debris waste generated at PGDP. Initial construction of three one-acre phases of the proposed SWL and associated support facilities for a total of 25 acres would be completed in 1995. Future expansion would be conducted in phases as necessary to provide adequate solid waste disposal capacity for PGDP. The proposed landfill would accept only solid non-hazardous, non-radioactive wastes. The contained waste would consist of cardboard, paper, canteen (cafeteria) waste, plastic, and glass. Construction/demolition debris would consist of small quantities of wood, metal materials, and construction debris (building materials, concrete, bituminous concrete [asphalt], masonry, wood scrap, and fly ash). No off-site waste would be accepted. Wastes would be placed in a specially designed working face, which would be underlain by a leachate drainage and collection system and a low permeability liner. The wastes would be covered each day with a soil layer, or other approved cover material, to keep rainfall and vectors (animal and disease) from contact with the waste. After the landfill has reached capacity, a final cap, consisting of soil, a low permeability layer, gas venting system, and a drainage layer, would be placed over the waste to close the cell in accordance with applicable state regulations. A groundwater monitoring system would be installed prior to landfill operation. The groundwater monitoring system would have a minimum of one upgradient monitoring well and three downgradient monitoring wells. Upon closure of the landfill, groundwater monitoring would continue on a quarterly basis for the time period specified in the closure plan.

ALTERNATIVES: Alternatives to the proposed action are no-action, alternative technologies, and off-site disposal. Alternative technologies (incineration, recycling), and off-site disposal were considered but not evaluated due to security, liability, and environmental considerations.

ENVIRONMENTAL IMPACTS: Based on the following findings, no significant adverse impacts are expected to result from the proposed action.

- Air Quality Short-term, minor air quality degradation in the immediate area of earth moving activity and daily landfill operations would be expected. These activities would result in slightly increased concentrations of airborne particulates (fugitive dust) and sulfur dioxide, nitrogen oxides, and hydrocarbons. Dilution and dispersion of these pollutants in the atmosphere would reduce concentrations to immeasurable levels outside the immediate area of activity.
- Cultural Resources Consultation with the State Historic Preservation Officer has confirmed that no historic properties or cultural resources of significance would be affected by the proposed action.
- Geology and Soils The geology of the area would not be affected by construction of the proposed facilities. Approximately 25 acres of prime farmland would be converted to other use by the proposed action. This is less than 1% of the prime farmland of McCracken County.
- Land Use The area proposed for the SWL is owned by DOE but available

for public access, farming, or recreational activities. Minor disruption to field dog trials (competitions) would result from the proposed action. Development of this area as a landfill site is consistent with adjacent site development.

- Noise A temporary increase in local noise levels would occur due to construction activities. Intermittent increases in noise levels would occur over the projected life of the landfill due to the construction of additional phases as the area is developed. Operational activities would be limited to the active areas and would be similar to noise levels occurring at the adjacent existing landfill. Off-site receptors would not be impacted by increased noise.
- Socioeconomics Construction of the proposed SWL is not expected to affect the local economy on a long-term basis. The SWL would be operated by existing PGDP personnel and only short-term construction employment would be created. Transportation requirements would not change since the SWL would be located adjacent to the existing landfill facilities.
- Water Resources Small streams may be impacted by surface water runoff and additional siltation during construction and potentially during operation of the landfill, however, measures such as creation of sedimentation basins would be taken to mitigate runoff from the site. Therefore, runoff is not expected to affect aquatic biota. A potential exists for inadvertent discharge of landfill leachate to either the groundwater due to a breach in the landfill liner, or to surface water due to failure of the leachate collection tank. The leachate, however, would not be radioactively contaminated, and may be discharged to the existing PGDP sewage treatment plant, if necessary. Cells would be excavated to at least 4 ft above the seasonal high water table per Kentucky regulations.
- Wetlands No wetlands would be affected by the proposed action.
- Floodplains No floodplains would be affected by the proposed action.
- Threatened and Endangered Species Consultation with the U.S. Fish and Wildlife Service has confirmed that no federally listed threatened or endangered species would be affected by the proposed action.
- Health & Safety Worker health and safety concerns would be typical of any construction project. All aspects of the project would be monitored by health and safety personnel for concurrence with the Health and Safety Plan that would be required for the project. Operational concerns for worker health and safety would be related to equipment operation, as no hazardous materials would be permitted in the landfill. All operators would be trained on the equipment necessary for day to day operations and per Commonwealth of Kentucky requirements.

DETERMINATION: The construction, operation, and ultimate closure of the proposed Solid Waste Landfill at PGDP does not constitute a major federal action that would significantly affect the quality of the human environment within the meaning of NEPA. This finding is based on the analyses presented in the EA. Therefore, an environmental impact statement will not be required.

Issued at Oak Ridge, Tennessee, this 27th day of March , 1995.

Joe La Grone
Manager
Oak Ridge Operations Office