

2. REGIONAL CONTEXT RBES DESCRIPTION

This chapter presents the regional context RBES description. This description is intended to place PGDP within its larger contiguous regional area and depict its relationship to possible off-site pathways and ecological or human receptors of concern. The maps presented in this section depict the boundaries of all contiguous local and county governments and encompass all regional watersheds (e.g., the Ohio River), habitat and ecology areas, and other off-site areas that could be affected by contamination migrating from the site. Regional maps are presented for both the current state and RBES.

2.1 PHYSICAL AND SURFACE INTERFACE

This section discusses and depicts the regional administrative boundaries, major transportation and infrastructure features, major surface configuration features, and significant hazard areas at PGDP under both the current state and RBES. Administrative boundaries included are those for city, county, and state governments; federal and state properties, including the PGDP property boundary; and legal ownership (i.e., private versus governmental ownership). Transportation and infrastructure features included are major highways, roads, and railroads; dams and power plants; and major lakes, streams, and rivers.

2.1.1 Current State

Figure 2.1a depicts all physical and surface features under current conditions on a single map. The following narrative references this map.

Administrative Boundaries: As depicted in Fig. 2.1a, PGDP is located in western McCracken County, Kentucky, approximately 3 miles south of the Ohio River and approximately 10 miles west of the city of Paducah. The DOE-owned property at PGDP encompasses 3,556 acres. The industrial portion of PGDP is situated within a fenced security area consisting of approximately 748 acres. Within this area are the numerous buildings and offices, support facilities, equipment storage areas, and active and inactive waste management units that comprise the GDP. Outside the fenced security area are approximately 822 acres that are not surrounded by the main security fence but are controlled for security purposes. The remaining 1,986 acres is leased to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). The entire WKWMA covers approximately 6,823 acres. A second wildlife management area, the Ballard Wildlife Management Area (BWMA) is in Ballard County, Kentucky, approximately 11 miles west of PGDP. The Shawnee Steam Plant, a Tennessee Valley Authority-owned (TVA-owned) power plant, is immediately north of PGDP.

Another administrative boundary shown on Fig. 2.1a is that for the PGDP Water Policy. The PGDP Water Policy is a removal action completed under the ACO (DOE 1994). Through this action, DOE offered municipal water to all existing private residences and businesses within the area affected by contaminated groundwater originating at PGDP. In return, the affected residences and businesses agreed not to drill new water supply wells or use existing water wells and to allow PGDP personnel property access to sample groundwater.

In addition to Paducah, cities and towns in Kentucky near PGDP are Barlow, La Center, and Kevil. Counties surrounding McCracken County are Ballard County (KY) to the west, Carlisle County (KY) to the southwest, Graves County (KY) to the south, Marshall County (KY) to the east, Livingston County (KY) to the northeast, Massac County (IL) to the north, and Pulaski County (IL) to the northwest. Property surrounding the DOE-owned PGDP, Kentucky-owned WKWMA, and TVA-owned steam plant is privately owned. The nearest schools are Heath Elementary, Middle, and High Schools. These are 1.86

miles southeast of the plant in the unincorporated community in Heath, KY. The nearest hospitals are in Paducah.

Transportation and Infrastructure: As depicted in Fig. 2.1a, PGDP is near the following major roads: U.S. Highway 60 and Kentucky Highways 356, 725, and 996. Additional major roads at greater distance are Interstate 24 and U.S. Highway 62. A rail spur services PGDP and connects to the Illinois Central Gulf Railroad. The nearest airport is Barkley Regional Airport located approximately about 3.7 miles southeast of the site.

As noted above, PGDP is approximately 3 miles south of the Ohio River. This river is navigable along its entire length, and near PGDP has a downstream connection to the Mississippi River and an upstream connection to the Tennessee River. Dams (i.e., Lock and Dams No. 52 and 53) are located on the Ohio River both upstream and downstream from PGDP. In addition, the Kentucky Lock and Dam is located on the Tennessee River near its confluence with the Ohio River.

Surface Configuration: PGDP is located in the Jackson Purchase Region of western Kentucky, at the northern tip of the Mississippi Embayment portion of the Atlantic Coastal Plain physiographic province. The area is bounded on the north and east by the Highland Rim portion of the Interior Low Plateau physiographic province, an area of low plateaus. The Mississippi Embayment is a large sedimentary trough oriented north-south that received sediments from the middle of the North American continent. Major rivers running across this region are the Mississippi River to the west of PGDP, the Ohio River to the north of PGDP, and the Tennessee and Cumberland Rivers to the east of PGDP. Wetlands are found along the Ohio and Mississippi Rivers.

The region encompassing PGDP is characterized by low relief. Elevations vary 350 to 400 ft above mean sea level (amsl). Streams are common throughout the region with many having eroded small valleys that are up to 20 ft below adjacent areas. Near PGDP, the two principal streams are Bayou Creek and Little Bayou Creek.

Hazard Areas of Concern: As depicted in Fig. 2.1a, the hazard areas associated with PGDP include two major groundwater plumes that exist off DOE-owned property and four landfills located outside the main industrialized area of PGDP. Contamination also has been found in sediments along Bayou and Little Bayou Creeks in off-site areas.

The only active National Priorities List (NPL) sites near PGDP are found to the east in Calvert City, KY. These are the 2.75-acre Airco site and the 2-acre B.F. Goodrich site. These NPL sites are approximately 22 miles from PGDP. Please see the text box for information about these sites.

An additional, much larger NPL site was previously located in Mayfield, KY approximately 15 mi. from PGDP;

NPL Sites near PGDP

Airco site - An industrial landfill located approximately 2 miles northeast of Calvert City, Marshall County, KY, near the southern bank of the Tennessee River. From the mid-1950s until 1971, it is estimated that the landfill accepted 18,000 tons of caustics, acids, volatile organic compounds, zinc, mercuric acetate, and mercuric chloride. Disposals from 1971 to 1980 consisted of 14,000 tons of metal-contaminated coal ash, as well as polyvinyl chlorides, ferric hydroxide sludge, and construction wastes. The landfill was capped and closed in 1981. Groundwater, sediments, and soil are contaminated with PCBs, PAHs, and solvents from the former waste disposal practices.

The B.F. Goodrich site is a 2-acre industrial landfill that lies adjacent to the Airco site. Wastes disposed of from 1969 to 1972 consisted of 54,000 tons of construction waste and plant trash, 370 yd³ of salt-brine sludge, and 2 million gallons of liquid chlorinated organics (in several burn pits). From 1973 to 1980, the only waste disposed of at the site was excavation dirt. The landfill was closed under a state-approved closure plan in 1980. Groundwater, soil, and sediments are contaminated with solvents from the former waste disposal activities.

however, this NPL site was determined to require no further action by the U.S. EPA in October 2000. This site is a 58-acre landfill located near a tire manufacturing plant. The landfill received approximately 152 tons of hazard wastes between 1970 and 1979. The investigation and risk assessment of the site was completed in the summer of 1993. Based on this study, EPA determined that no cleanup action was necessary because the site did not exhibit a threat to human health or the environment; however, the landfill continues to be monitored by the Commonwealth of Kentucky.

A closed municipal landfill is found to the east of PGDP. This landfill was used by McCracken County until it was closed, and it is now a park containing soccer fields.

A coal-fired power plant, the Shawnee Steam Plant, is located to the north of, and is contiguous with, PGDP. Another steam plant, Electric Energy Inc., is located across the Ohio River in Joppa, Illinois. (See also Fig. 2.1a.) The Shawnee Steam Plant could be a source of some air pollution at PGDP.

The sediments found in water taken from the Ohio River for use as cooling water are a source of potential contamination at PGDP. These sediments have been contaminated with PCBs through upstream industrial discharges, and flocculated materials (i.e., sludge) at the PGDP water treatment plant, which treats the water taken from the Ohio River, often contain levels of PCBs and metals above PGDP-specific no action levels taken from DOE 2000a.

2.1.2 RBES

Figure 2.1b depicts all physical and surface features under RBES conditions on a single map. The following narrative references this figure.

Administrative Boundaries: As depicted in Fig. 2.1b, DOE-owned property is not expected to increase under the RBES. However, the RBES includes enhanced institutional controls that would replace the existing PGDP Water Policy and be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use.

Transportation and Infrastructure: As depicted in Fig. 2.1b, three significant changes in transportation and infrastructure are anticipated. These are construction of the Olmstead Dam on the Ohio River, the completion of I-69, and the construction of I-66. The Olmstead Dam will replace Ohio River Lock and Dams No. 52 and 53 and be located near Olmstead, IL. I-69 will cross north to south across western Kentucky, running from Fulton, KY to Evansville, IN. Near PGDP, I-69 is planned to follow the current Purchase Parkway until the Parkway's end at I-24. I-66 is planned to run from east to west across all of Kentucky. Near PGDP, I-66 will follow a corridor that exits from I-24 near Paducah, KY and crosses the Mississippi River south of its confluence with the Ohio River. In Missouri, I-66 will intersect with I-57.

Surface Configuration: As depicted in Fig. 2.1b, no changes in surface configuration are expected by the end of the current planning horizon.

Hazard Areas of Concern: As depicted in Fig. 2.1b, on a regional scale, the surface hazard areas found at PGDP will change significantly by the end of the current planning horizon under the RBES. By that time, all potentially contaminated sediments in Bayou and Little Bayou Creek will be addressed; all potentially contaminated surface soils and sediments in the secure area of PGDP will be addressed; and the GDP, including those facilities that currently are inactive and those that currently are operating, will undergo D&D. Hazard areas not at PGDP (i.e., NPL sites, Shawnee Steam Plant, and Ohio River

sediments) should change little in this time frame. The NPL sites are expected to change little because each of the NPL sites consists of a landfill that is not targeted for excavation. Furthermore, the Shawnee Steam Plant can be expected to be upgraded, as appropriate, and to continue to operate. Finally, some improvements in Ohio River sediments can be expected if regional releases of contaminants are kept at a low level; however, significant improvement in PCBs is unlikely, given their persistence in the environment.

2.2 HUMAN AND ECOLOGICAL LAND USE

Material in this section discusses and depicts the human activities, land cover, and ecological activities at PGDP under both the current state and RBES. Human activities included are limited to a regional representation of population centers (i.e., locations of towns and cities) and density. Land cover depictions are based on area usage and include residential, commercial, industrial, agricultural, nonagricultural vegetated, and wetlands/water uses. Ecological activities included are conservation and ecological areas, watershed delineations, and biota habitats. Note that hazard areas of concern are discussed in Section 2.1 and are not discussed further here.

2.2.1 Current State

The figure in this section depicts the human and ecological land use information under current conditions.

Human Activities: As depicted in Fig. 2.2a, and discussed earlier, cities and towns in Kentucky near PGDP are Paducah, Wickliffe, Barlow, La Center, and Kevil. Populations of these and other incorporated cities and towns in Ballard and McCracken Counties in the 2000 census (DOC 2003) are listed in Table 2.1. Population and density of McCracken County and surrounding counties is in Table 2.2.

As depicted in Fig. 2.2a and shown in Tables 2.1 and 2.2, population density and total population in areas near PGDP were low, relative to the average for the Commonwealth of Kentucky and the U.S. in the 2000 census. Except for McCracken County, which includes the city of Paducah, and Marshall County, which includes several small cities, population density is less than the Kentucky and U.S. average. For McCracken County, approximately 41% of the total population lives within the boundaries of Paducah.

Table 2.1. Population of cities in Ballard and McCracken Counties, Kentucky (DOC 2003)

County	Population
Ballard Cty	8,158
Barlow	715
Blandville	99
Kevil	574
La Center	1,038
Wickliffe	794
McCracken Cty	64,790
Lone Oak	454
Paducah	26,307

Table 2.2. Population density and total population for counties near PGDP (DOC 2003)

County	Density	Population
Kentucky	101.7	4,065,556
Ballard	33.0	8,158
Carlisle	27.8	5,345
Graves	66.6	36,900
Livingston	31.0	9,769
McCracken	261	64,790
Marshall	96.8	30,808
Illinois	223.4	12,482,301
Massac	63.4	15,081
Pulaski	36.6	7,167

The total population within a 10-mile radius of PGDP was estimated at 32,292 in 2003 (DOC 2003). The closest communities near PGDP are the unincorporated communities of Grahamville and Heath, located 1 to 2 miles east. The closest residences to the site are approximately 3,280 ft north and 3,609 ft east of PGDP.

Land Cover: As depicted in Fig. 2.2a, land cover in the region near PGDP is dominated by agricultural and recreational use. With the exception of PGDP and TVA's Shawnee Steam Plant, little industrial land use occurs near PGDP. Several commercial properties are found in and near to Paducah.

Within a 5-mile radius of the plant, approximately 90% of the area was identified as being agricultural or forested land in a PGDP environmental report (MMES 1993). This report also noted that urban and industrial lands comprise less than 4% of the surrounding area, and surface-water bodies cover approximately 5%. A public health assessment produced by the Agency for Toxic Substances Disease Registry (ATSDR) (2002) for PGDP notes that there are approximately 400 active farms in McCracken County, Kentucky, with 45 to 50 operating in the area near PGDP.

Ecological Activities: As depicted in Fig. 2.2a, ecological activities near PGDP are dominated by agricultural use, recreational use, and wetlands. As discussed above, approximately 90% of the area is agricultural land or forested. Wetlands of significant size are found along the Ohio, Mississippi, and Tennessee Rivers.

Hazard Areas of Concern: Please see Sect. 2.1 for a depiction and discussion of hazard areas of concern under current conditions.

2.2.2 RBES

The figure in this section depicts the human and ecological land use information under RBES conditions.

Human Activities: As depicted in Fig. 2.2b, the location of cities and towns and population density are expected to change little within the planning horizon used. This projection is consistent with the past population counts for Ballard and McCracken Counties shown in Table 2.3, which presents total population from 1960 to 2000 and with population changes between 1980 and 2000 for Paducah, shown in Table 2.4. However, ATSDR reports (ATSDR 2002) that information obtained from the Census Bureau and McCracken County Seat suggests that McCracken County's population is expected to keep growing, with the addition of new housing subdivisions west of Paducah City toward Ballard County providing the bulk of the growth. ATSDR also notes that there also is an ongoing initiative to bring new

industries into the area. These changes undoubtedly will affect the make-up of the population near PGDP, but the rate of change is uncertain given the lack of previous population changes.

Table 2.3. Historical total population of Ballard and McCracken Counties, Kentucky (DOC 2003)

County	1960	1970	1980	1990	2000
Ballard	8,618	8,276	8,798	7,902	8,286
McCracken	57,306	58,281	61,310	62,839	65,514

Table 2.4. Historical total population of Paducah, Kentucky (ATSDR 2002; DOC 2003)

County	1980	1990	2000
Paducah	29,315	27,256	26,307
% Change		-7%	-3%

Land Cover: As depicted in Fig. 2.2b, little change is expected in the land use in the region near PGDP within the period considered. As discussed in ATSDR 2002, however, a gradual transition from agricultural use to low-density housing (i.e., residences on lots averaging from 1 to 5 acres) and recreational use is possible. In that report, ATSDR states that this transition is indicated by the increasing subdivision of farmland for residential development along U.S. 60, west of Paducah, and the recent expansion of that road into a four-lane highway.

Ecological Activities: As depicted in Fig. 2.2b, little change is expected in ecological activities. As noted above, the only changes expected in the long-term are a decrease in agricultural land and an increase in low-density housing.

Hazard Areas of Concern: Please see Section 2.1 for a depiction and discussion of hazard areas of concern under end-state conditions.

2.3 CUSTOM CONFIGURATION – SEISMIC ISSUES AT PGDP

Fig. 2.3 depicts the regional tectonic map for PGDP. This map is pertinent to PGDP because the site is close to the New Madrid and Wabash Seismic Zones. PGDP’s proximity to these zones makes the potential for earthquakes an important consideration when evaluating and selecting the future use of the PGDP site. The importance of the consideration of seismic issues is highlighted by the recently completed *Seismic Investigation Report for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003). In that report, recent faulting at and near PGDP was confirmed.

Protection: NAD 1983 Lambert Conformal Conic
Map Date: 1/27/2004

Paducah Gaseous Diffusion Plant

References: ESRI 2003; Kentucky Geographic Explorer 2003; Illinois DNR 2003; BJC 2003

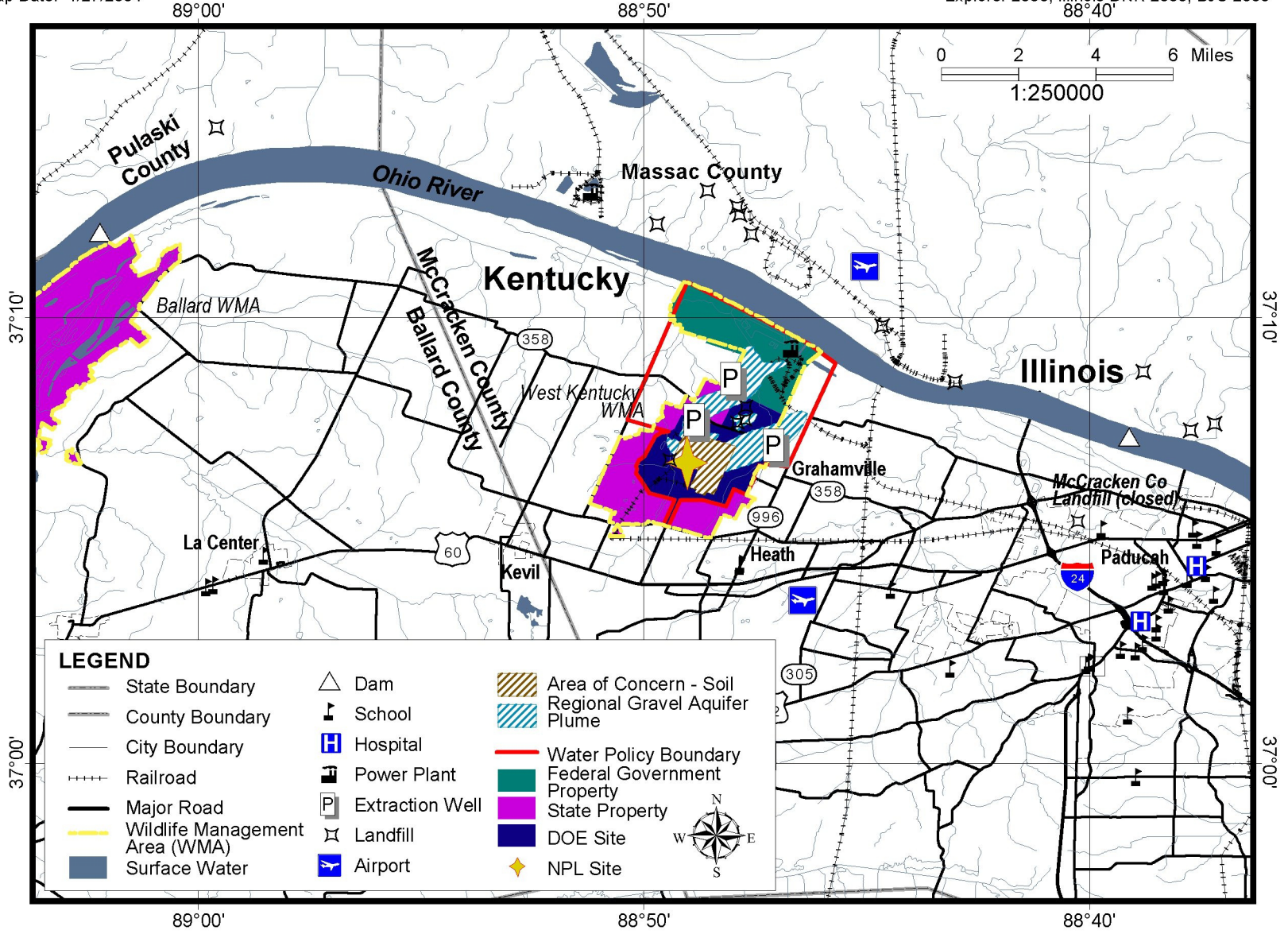


Fig. 2.1a. Regional physical and surface interface – current state.

Protection: NAD 1983 Lambert Conformal Conic
Map Date: 1/27/2004

Paducah Gaseous Diffusion Plant

References: ESRI 2003; Kentucky Geographic Explorer 2003; Illinois DNR 2003; BJC 2003; KTC 2002

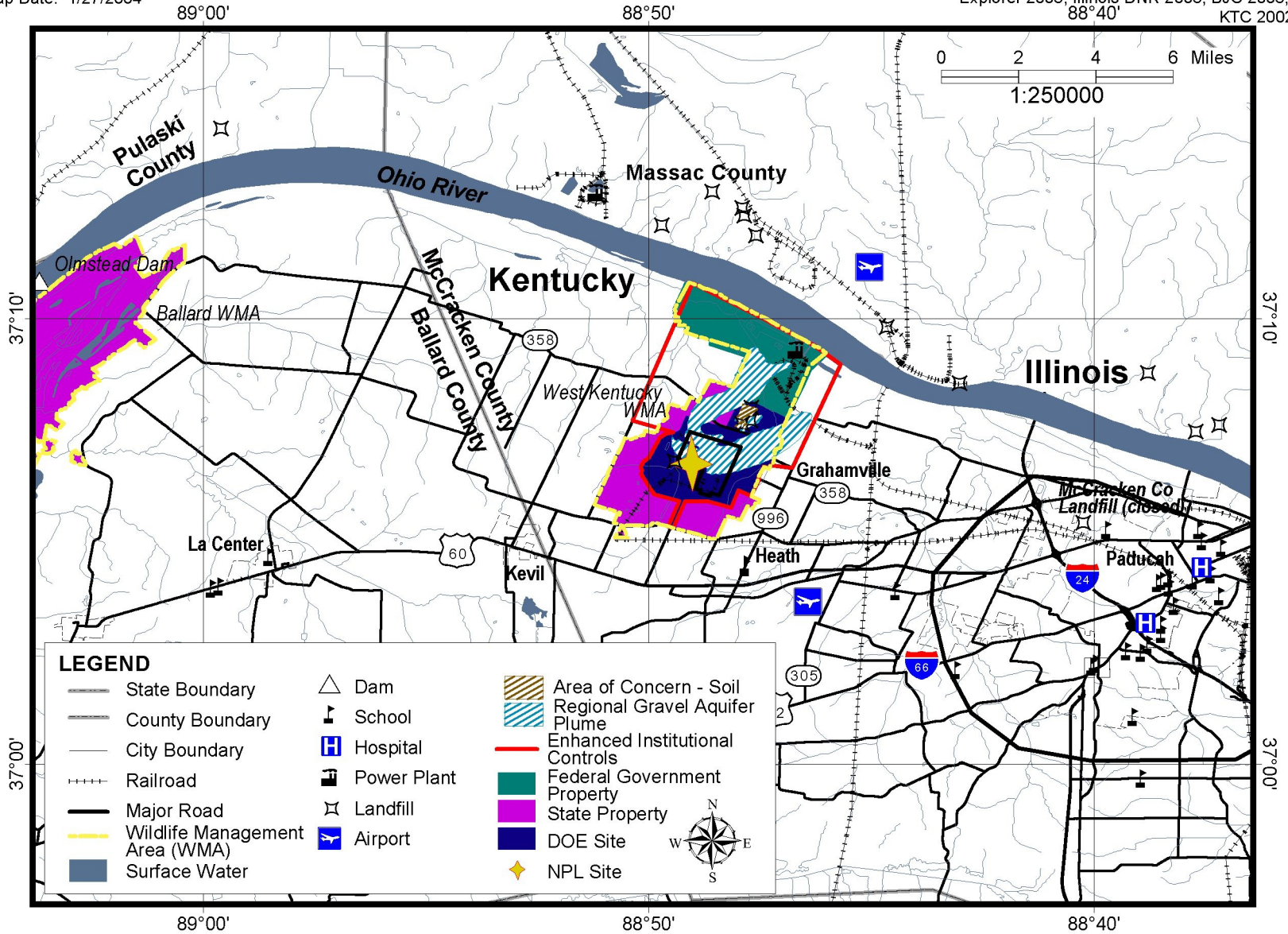


Fig. 2.1b. Regional physical and surface interface – RBES.

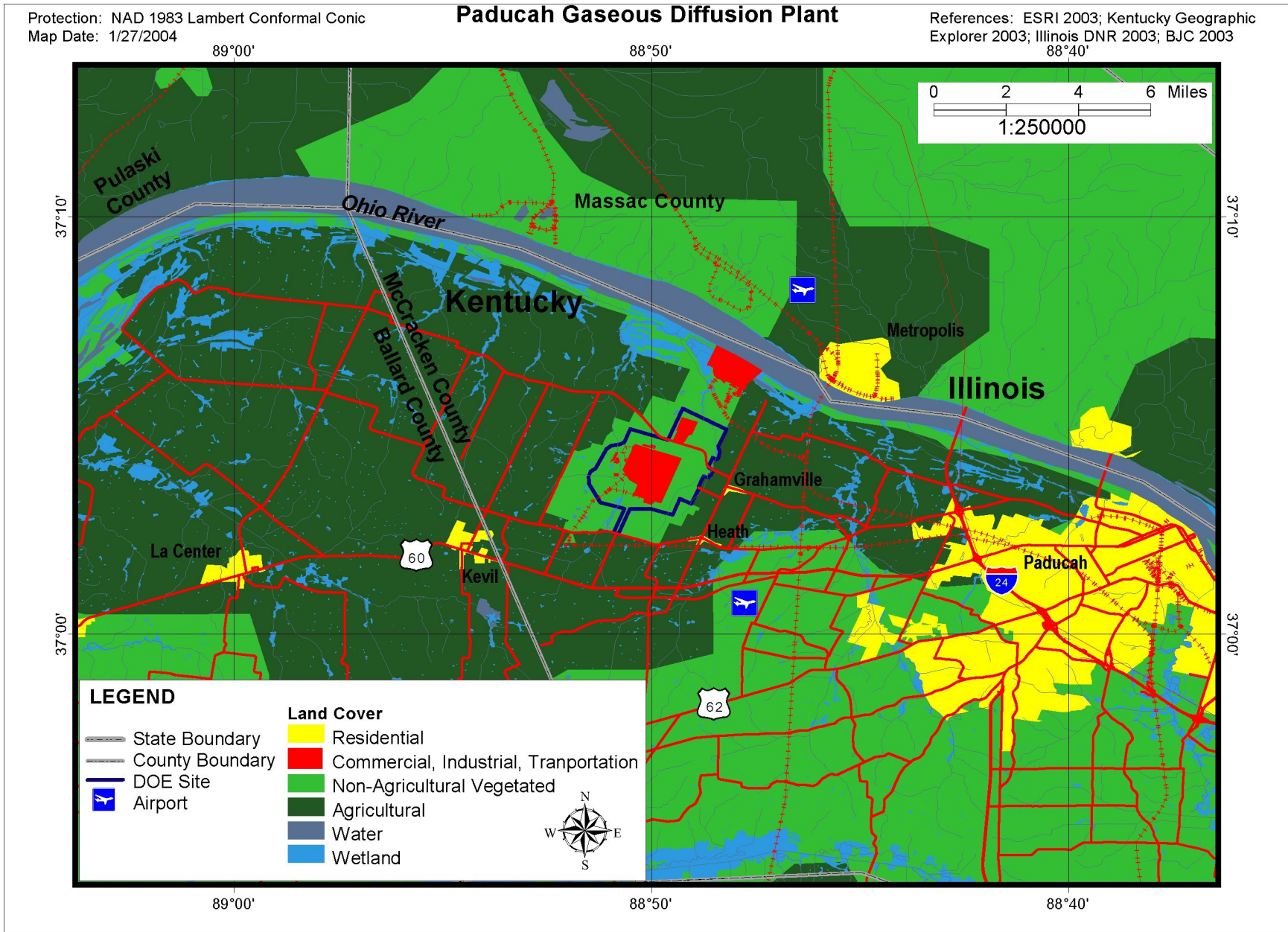


Fig. 2.2a. Regional human and ecological land use – current state.

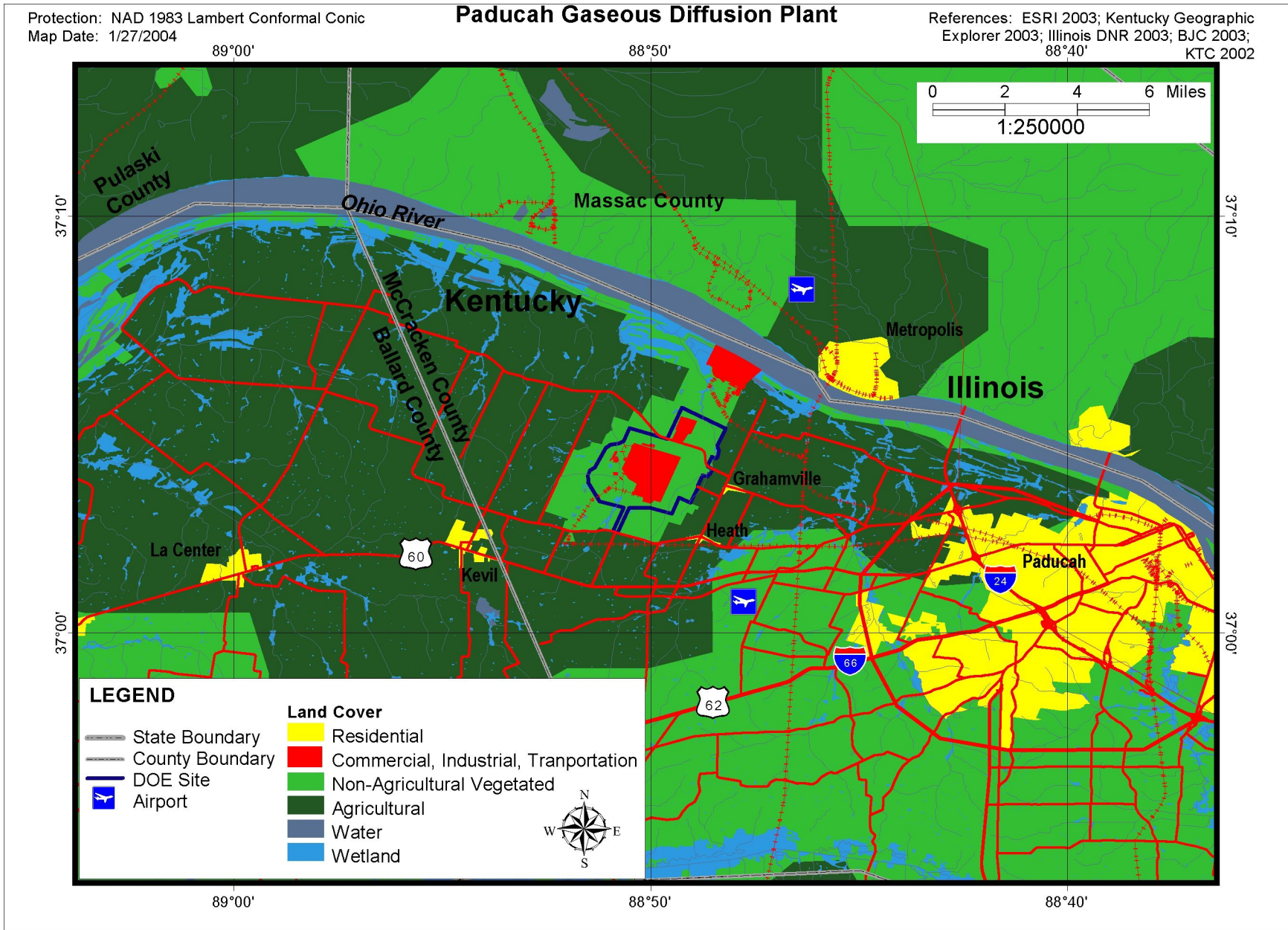


Fig. 2.2b. Regional human and ecological land use – RBES.

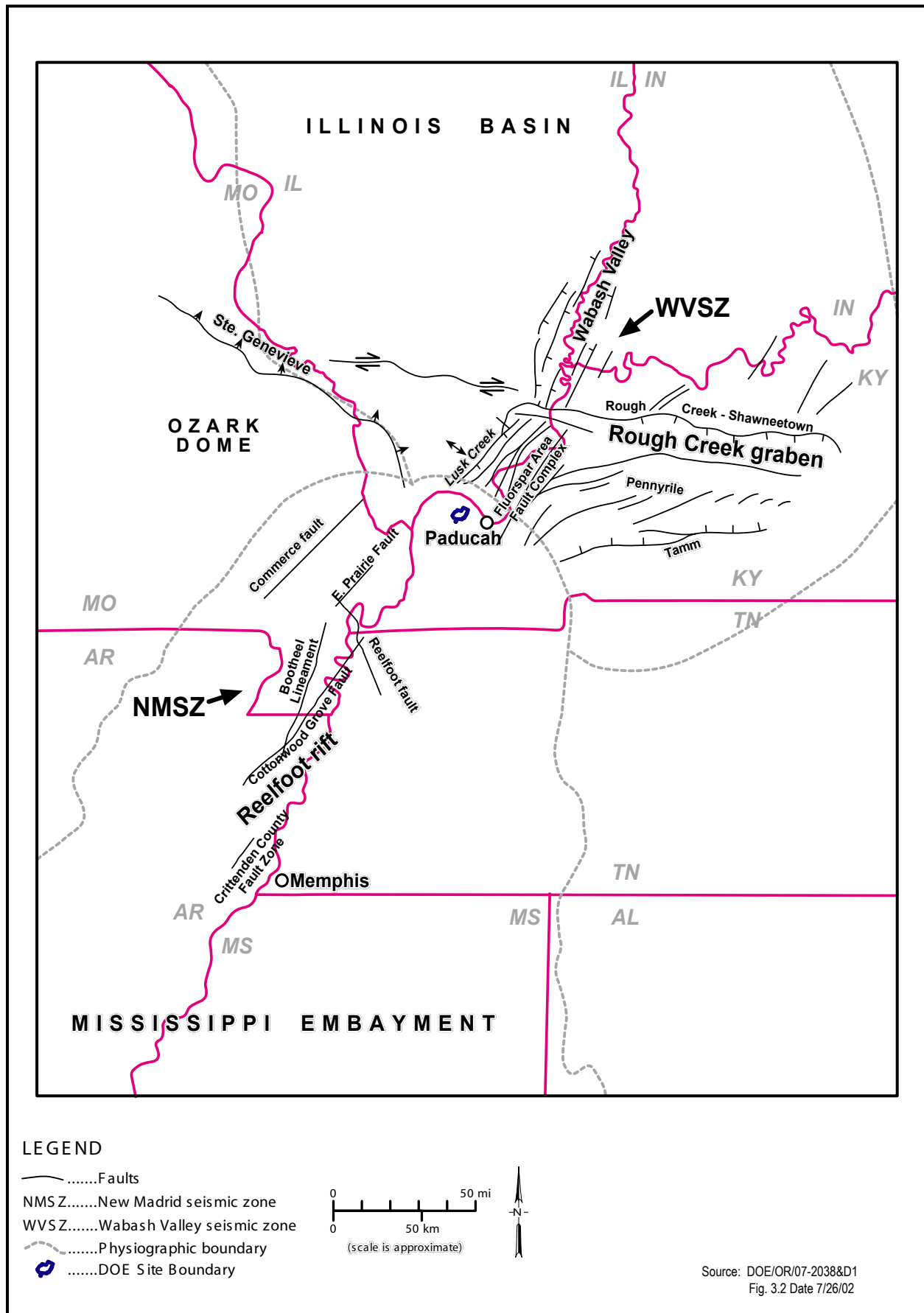


Fig. 2.3a. Regional custom configuration – regional tectonic map.