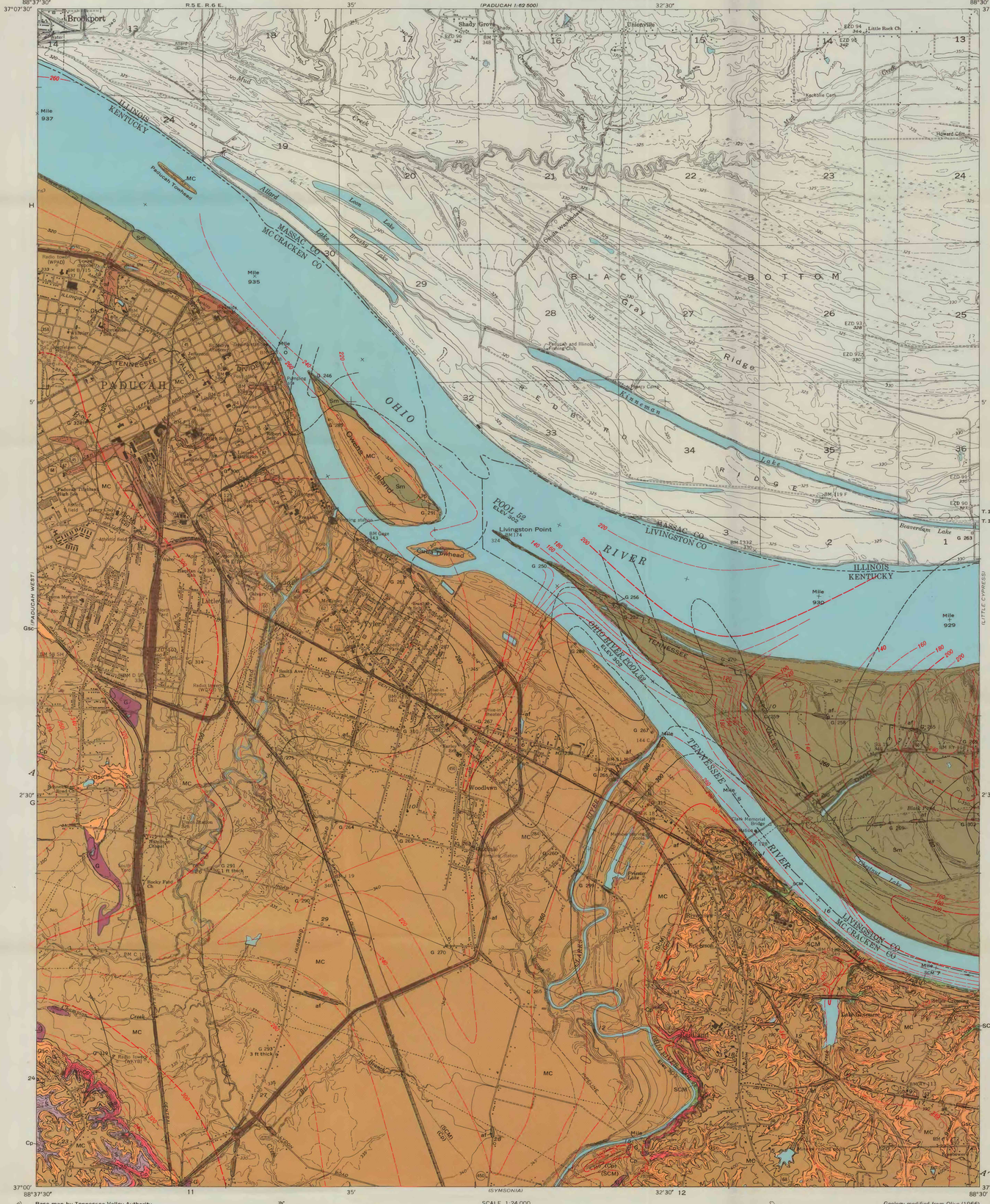
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
KENTUCKY GEOLOGICAL SURVEY

BULLETIN 1258-A
PLATE 1

SYSTEM	SERIES	GROUP AND FORMATION	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION
QUATERNARY	Pleistocene and Recent	Lacustrine and fluviatile deposits		0–200	Silt, sand, and gravel, intermixed and interlensing. Silt is yellowish brown, generally becoming medium to dark gray at depths below 10 feet, argillaceous, micaceous; sparingly to abundantly fossiliferous; contains small quantities of angular to spherical fine to medium sand, coal particles, vivianite, and chert and quartz pebbles. Locally calcareous at depths below 8 feet south of Tennessee River, and rarely calcareous north of river; irregular-shaped calcareous concretions as much as 1 inch across occur in exposures along Garrison Creek and along left bank of Ohio River at mouth of Island Creek. Generally 50 or more feet thick beneath broad alluvial plain south of Tennessee River, and 20 feet thick or less north of river. Most silt below altitude of 355 feet is probably lacustrine in origin, derived in part from loess which fell into a lake (Finch and others, 1964) during late Pleistocene time and in part from loessal silts transported by streams pouring into the lake. Sand is moderate yellowish brown, silty, usually micaceous; consists of angular to well-rounded quartz and chert grains; contains dark minerals and particles of bituminous coal in various amounts; sand generally fine near surface, becoming coarser with depth. Occurs as thin lenses in silt south of Tennessee River and as narrow levee deposits along bank of Tennessee River. As much as 40 feet of fine sand grading downward into fine to coarse sand penetrated in holes drilled between Tennessee and Ohio Rivers. Gravel or gravelly sand and silt, penetrated in test holes, occur at depths of 30 to 85 feet below lacustrine deposits in the areas between Clarks River and Island Creek and between Ohio and Tennessee Rivers. Within these areas upper limit of gravelly sediments ranges between 250 and 300 feet in altitude. Gravel mostly consists of chert and quartz granules and pebbles; south of Tennessee River in an argillaceous, sandy, medium-gray silt matrix; north of the Tennessee matrix is fine to very coarse sand. Both north and south of the Tennessee, sand consists chiefly of quartz, chert, mica, coal, and magnetite with authigenic vivianite. Gravel sample from depth of 165 feet (altitude also 165 feet) in test hole ½ mile east of Livingston Point consists of angular to well-rounded pebbles, granules, and sand composed of quartzite, gneiss, schist, shale, augite, pyrite or marcasite, vivianite, and coal. A similar suite was obtained from a sample recovered from a depth of 135 feet (altitude 191 feet) in a hole drilled in Illinois ¼ mile north of Ohio River at eastern quadrangle boundary. These sediments were derived from glacial outwash. The relatively low altitudes at which they occur and the absence of similar deposits in other wells in the area suggest they were transported into the area by floodwaters of the Ohio River at a time when the Ohio occupied the Cache River lowland (Fisk, 1944, p. 26, fig. 32) 15 to 20 miles to the north. Gravel ridges with concordant crests at altitude of about 355 feet bordering upland areas were deposited as a spit and as beach deposits and offshore bars in a lake (Finch and others, 1964) that occupied a part of western Kentucky and southern Illinois. Two well-rounded possibly ice-rafted cobbles, one of silica-cemented sandstone and the other of aplitic quartz that contains very sparse magnetite and biotite, each about 10 inches long, were found at the base of alluvium east of Clarks River near mile 5. Exposure in the right bank of Clarks River ½ mile east of mouth of Horse Branch consists of about 20 feet of alternating layers of medium-gray micaceous sandy clay and rusty-brown fine sand. Clay layers average 5 inches in thickness; sand, 3½ inches; lens of chert gravel about 3 feet long and 8 inches thick occurs in sequence about 10 feet above water level. Mollusk shells from fossil locality A were identified by Dr. J. P. E. Morrison (written communication, 1964) as the following: *Amnicola limosa* (Say), *Amnicola walkeri* Pilsbry(?), *Cincinnatia cincinnatiensis* (Anthony), *Physa* species (juvenile), *Valvata tricarinata* Say, *Gyraulus parvus* (Say), *Pisidium* species cf. *variabile* Prime, *Pisidium compressum* Prime, and *Pisidium* species. According to Morrison, "all identifiable species of mollusks are Recent; not assignable to any particular glacial time." I. G. Sohn (written communications, 1963 and 1964) examined ostracode specimens from the same locality and identified *Limnocythere ornata sohnkekensis* Staplin, 1963. According to Staplin (1963, p. 1195) this "variety occurred in localities . . . [that are] all Wisconsin in age (Tazewell-Mankato)." Sohn also recognized "a species of *Cyprideis*(?) and a species of the *Candona* group." According to Sohn, "*Limnocythere* and *Candona* live on mud in ponds and slow moving streams. *Cyprideis* is a swimmer, and lives on plants. This assemblage could have lived in a lake." In reference to the occurrence of *Limnocythere ornata sohnkekensis* Staplin in the Wabash-Ohio River watershed, Staplin (1963, p. 1195) states that "It appears to be an inhabitant of cool slightly alkaline lakes in all cases." According to Meyer Rubin, Isotope Laboratory of the U. S. Geological Survey, report on sample No. W-1353, dated February 13, 1964) radiocarbon age determination indicates that shells collected from fossil locality A are 21,080 ± 400 years B. P. (before 1950).
	Pleisto-cene	Loess		8–15	Silt, yellowish-brown, noncalcareous, nonstratified; contains small amounts of clay and fine sand, mostly of angular to rounded quartz. Micaceous in southeastern part of quadrangle; nonmicaceous in southwestern part. Distribution pattern suggests source of mica is from micaceous Paleocene and Cretaceous sediments, or possibly alluvium in Clarks River area, and that transporting winds were westerly. Deposited contemporaneously, at least in part, with lacustrine and fluviatile deposits.
TERTIARY(?) AND QUATERNARY	Pliocene(?) and Pleistocene	Continental deposits		20–30	Sandy gravel and gravelly sand: Gravel, yellowish-brown to reddish-brown; predominantly subrounded and subangular chert pebbles, small amount of ellipsoidal quartz pebbles, and sand matrix; chert pebbles generally less than 2 inches long but some cobbles as much as 5 inches long; quartz pebbles generally less than ½ inch long; commonly cross-bedded; at places contains ledge-forming layers of gravel and sand as much as 2 feet thick, cemented with ferruginous material. Sand, yellowish-brown, poorly sorted; predominantly quartz and subordinately chert, micaceous in part; commonly contains small amount of dark minerals; occurs in discontinuous lenses. Unit commonly includes at top, below loess, a bed 1 to 3 feet thick of light-brown pebbly, argillaceous sand containing much loess like silt.
TERTIARY	Eocene	Wilcox Formation		15–25+	Sand and clay: Sand, weathers reddish orange, fine to coarse, argillaceous; in part micaceous; crossbedded in places; locally contains pellets of yellowish-orange silt and pellets and balls up to 4 inches in diameter of light-grayish-brown silty clay. Clay, light-grayish-brown, silty; occurs in lenses from a few inches to as much as 4 feet thick. Mapped by Pree and others (1957, p. 59–60) as part of the Holly Springs Sand of Claiborne Group.
	Paleocene	Midway Group: Porters Creek Clay		150–215	Clay and sand: Clay, dark-gray and dark-grayish-brown, mostly montmorillonitic; contains mica in various quantities, glauconitic in part; commonly slightly sandy; conchoidal fracture; weathers typically into chips and blocks that are moderately resistant to weathering. Sand, light-gray to grayish-yellow, fine to medium, quartzose; micaceous and glauconitic in part; ordinarily contains moderate amount of dark minerals. In southwestern part of quadrangle upper 25 to 30 feet consists of medium-bedded dark-gray and dark-grayish-brown slightly sandy glauconitic clay and light-grayish-brown fine micaceous sand that in part is glauconitic. Weathered surface of sand exhibits irregular ridges ½ inch high, 1 inch wide, and as much as 8 inches long. Sand of the ridges contains glauconite pellets as much as 1½ mm in diameter, whereas glauconite in surrounding sand is commonly in angular pieces less than 1 mm long. Lower 40 to 50 feet, exposed along Clarks River, consists of interlensing medium- to dark-gray montmorillonitic and kaolinitic, glauconitic and nonglauconitic, slightly micaceous clay; and dark- to greenish-gray and yellowish-gray, fine to medium, glauconitic and nonglauconitic, argillaceous quartzose sand that is locally crossbedded. Clastic dike in steep bank 1,000 feet southwest of school at Reidland is about 4 inches wide, composed of grayish-yellow fine to medium quartz sand that contains angular clay fragments of Porters Creek Clay. The dike is nearly vertical but irregular. Middle part of unit concealed by alluvium. Thickness determined from drill-hole data. Tests of foraminifers occur in thin glauconitic sand beds exposed at fossil locality B and at isolated exposure near mile 5 on Clarks River. Sohn and others (1961) have determined that the tests at locality B have been replaced by barite and a zeolite(?). Browne and Herrick (1963, p. 247–264) identified a large assemblage of foraminifers collected from locality B and refer to containing bed, a sandy glauconitic clay 2½ feet thick, as the Clayton(?) Formation, citing T. W. Lambert (Browne and Herrick, 1963, p. 247) as source of identification of unit. This unit is in a sequence which lithologically more closely resembles sediments above than those below, and for this reason the unit is here included in lower part of Porters Creek Clay. Contact with underlying unit placed at base of lowest clay bed that exhibits conchoidal fracture, a characteristic feature that typifies clays of the Porters Creek in Kentucky. According to R. H. Tschudy (written communication, 1965) a pollen assemblage from a clay bed 30 feet below the unit that contains foraminifers at fossil locality B "is definitely of early Paleocene age, and probably is from the Clayton Formation."
CRETACEOUS AND TERTIARY	Upper Cretaceous and Paleocene	McNairy and Clayton Formations		185–300	Clay and sand. Clay, light- to dark-gray, micaceous, commonly thin-bedded; usually contains thin laminae and blebs of fine angular micaceous quartz sand and, at places, fragments of lignite and nodular and discoidal marcasite or pyrite concretions as much as 1 inch thick and 2 inches in diameter. Sand blebs and laminae in outcrops along Clarks River near Reidland contain sparse fine angular and rounded grains of glauconite. Sand, yellowish-gray to medium-gray, fine to medium, usually micaceous; argillaceous or silty in part; contains very fine grains of dark minerals in various quantities; medium sand most common in upper part. Most of unit concealed by alluvium. Thickness determined from drill-hole data. According to R. H. Tschudy (written communication, 1963) a pollen assemblage from a clay sample collected at fossil locality C "is limited to the McNairy Formation." Equivalent to the Ripley Formation of Pree and others (1957, p. 52). Published and unpublished drill-hole data indicate that Cretaceous rocks of this quadrangle are underlain at altitudes ranging from 25 feet below to about 75 feet above sea level by a thick sequence of limestone, chert, and shale of Paleozoic age. Loughridge (1888, p. 321–326) reports about 1,000 feet of rocks of Chester and St. Louis age, mostly limestone, in a well drilled for gas at Paducah and Jillson (1930, p. 510), reports an incomplete log of a well drilled at Reidland that shows 850 feet of Mississippian and Devonian limestone and shale. A black shale designated as "Chattanooga" occurs at depths between 740 and 982 feet (about 340 to 580 feet below sea level).

~ glauconite



Base map by Tennessee Valley Authority and U.S. Geological Survey, 1958

The Carter Coordinate System letters and numbers used to designate five-minute divisions of latitude and longitude are shown along the margins; tick marks indicate one-minute divisions

SCALE 1:24 000

1 0 1 MILE

1 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT HALF-INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1958

KENTUCKY
QUADRANGLE LOCATION

Geology modified from Olive (1966)

EXPLANATION

Map symbols enclosed in parentheses indicate bedrock materials concealed by surficial deposits
The term consolidated is used here to mean firm and coherent

Surficial materials (Unconsolidated to poorly consolidated)

Sm — Silty sand
Chiefly gray to yellowish-brown silty, angular to well-rounded quartz sand; calcareous in places at depths below 8 feet

G — Gravel
Gravel or gravelly sand and silt of fluvial and lacustrine origin, consisting mostly of chert and quartz pebbles in a matrix of sandy silt to coarse sand. All exposed deposits are bars that formed in an ancient lake. Mostly occurs at depths of 30–85 feet below the silt and clay deposits in the areas between Island Creek and Clarks River and between the Ohio and Tennessee Rivers

MC — Silt and clay
Chiefly massive yellowish-brown to gray clayey micaceous silt; locally calcareous at depths below 8 feet south of the Tennessee River, and rarely calcareous north of the river. Thin lenses and levee deposits of fine silty quartz and chert sand south of and along the banks of the Tennessee River. Silt in the lowlands generally of fluvial or lacustrine origin whereas silt in the upland areas is of eolian origin. Generally 50 feet or more thick south of the Tennessee River and 20 feet or less thick north of the river

Gsc — Sandy, clayey gravel
Yellowish-brown to reddish-brown, generally poorly sorted, predominantly chert and quartz gravel with sand and clay matrix. Poorly consolidated, commonly cemented with ferruginous material. Commonly crossbedded

Bedrock materials (Poorly to moderately consolidated)

S — Sand
Red to orange, fine to coarse quartz sand. Poorly consolidated and locally crossbedded. Light-grayish-brown silty clay occurs in lenses from a few inches to as much as 4 feet thick

Cp — Plastic clay
Dark-gray to dark-grayish-brown micaceous plastic clay; locally glauconitic and sandy. Moderately consolidated and weathers with conchoidal fractures into blocks and chips that are moderately resistant to further weathering. Interlensing fine to medium micaceous glauconitic and nonglauconitic quartz sand. Upper 25–30 feet consists of sandy glauconitic clay and fine micaceous sand

SCM — Interlayered sand, clay, and silt
Light- to dark-gray micaceous silt and clay; commonly thin bedded with intercalated thin laminae and blebs of fine micaceous quartz sand. Poorly to moderately consolidated. In places, sand is thickbedded and moderately consolidated, forming vertical bluffs

Artificial fill
Obtained chiefly from silt and clay (MC)

Contact
Dashed where approximately located; short dashed where inferred; dotted where concealed

Fault, bounding landslide block
Dotted where concealed. U, upthrown side; D, downthrown side

300 — Contours drawn on bedrock surface
Dashed where approximately located. Shown only where extensively concealed by younger deposits. Data based on subsurface information. Contour interval 20 feet

300 — Contours drawn on surface of gravel (G)
Dashed where eroded by modern streams. Shown only where concealed by alluvial and lacustrine deposits (MC). Contour interval 20 feet

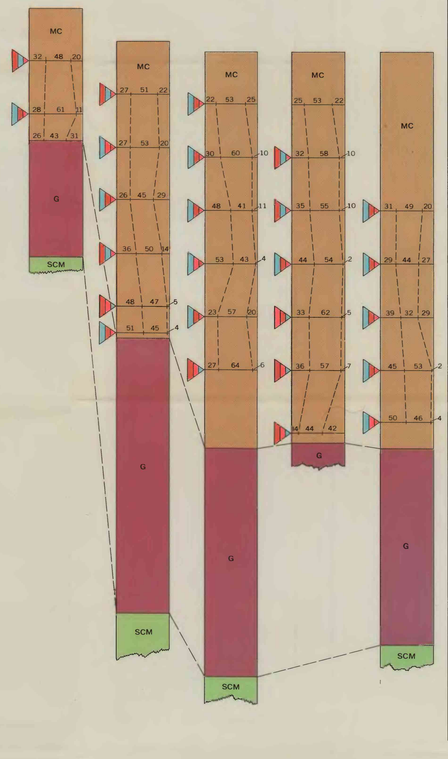
$^{2}_{G}$ 310 — Samples from surface to a depth of 6 feet taken by hand auger or hand implements

$^{8}_{G}$ 324 — Samples from 6 to 120 feet taken by power auger

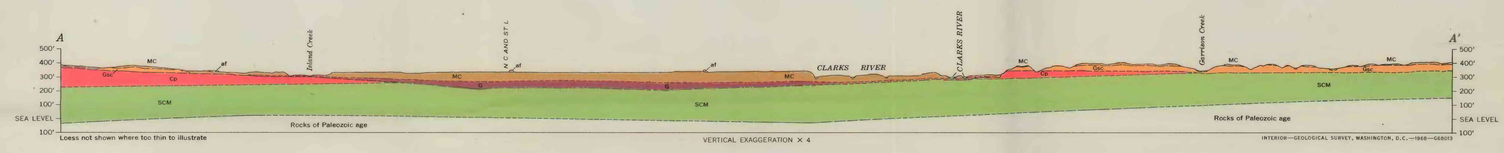
Sample locality
Number with G is altitude of upper surface of gravel; identification number refers to table 2

G 258 — Dry oil or gas test sample location
Number with G is altitude of upper surface of gravel

Approximate location of percolation test site
Identification number refers to table 2



COLUMNAR SECTIONS FROM AUGER HOLES DRILLED ALONG LINE *B-B'*
Percentage composition of clay, silt, and sand is indicated numerically for map unit MC. (Percentage of clay given to left, silt given in center, sand given to right.) Horizontal line marks altitude of sample. Grain-size classification according to Wentworth (1922). Order of abundance of clay minerals is indicated by size of colored triangle segments: blue, illite and mica; red, kaolinite; orange, mixed-layer clay, predominantly montmorillonite and vermiculite



ENGINEERING GEOLOGIC MAP AND SECTIONS OF THE PADUCAH EAST QUADRANGLE IN KENTUCKY

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1968—G68013