Waldron Shale, Laurel Dolomite, Osgood and Brassfield Formations

Clays Ferry Formation

**Drakes Formation** 

Grant Lake Limestone

Calloway Creek Limestone

Clays Ferry Formation

The geology of the Louisville 30 x 60 minute quadrangle was October, giving accessibility to over 220 acres of fossil beds in the

Limestone and dolomite suitable for construction aggregate, dimension

at the Brownsboro and Liter's operations in Oldham County, and the

ew Providence Shale Member of the Borden Formation, and soil

derived from weathered Devonian limestone. Portland and masonry

southwestern Jefferson County at the Kosmosdale plant. Sand and

gravel are dredged from the bed of the Ohio River, and occur in

gravel operations in Jefferson, Oldham, and Bullitt Counties, were

Man-made lime and gypsum are industrial by-products resulting

from the use of mineral resources from the Louisville area. The

nanufacture of acetylene from calcium carbide produces hydrate

mestone at the Louisville Gas and Electric Energy's (LG&E) Mill

Oldham County was discovered in 1912 and produced minor gas

ry Formation in the Shelbyville Ġas Field at a depth of 240 t

between 1929 and 1950 (Wilson and Sutton, 1973). Meadow Gas

Field in southwestern Jefferson County produced domestic gas from

the New Albany Shale at depths of 200 to 375 ft below the surface

surfaces of the Jeffersonville Limestone (Kepferle, 1974).

between 1890 and 1924 (Dever, 2001). A few deep wells in the

County as a storage facility for LG&E. Gas was discovered in the

Garrard Siltstone in 1931 at a depth of 240 ft. In 1964 the field was

converted to gas storage in the Knox Dolomite at an average depth

Fault to the southwest limited the field's extent and storage potential

1.255 ft (Wilson and Sutton, 1973). The proximity of the Ballardsville

Exercise (epferle, 1977), and LG&E eventually abandoned the storage field

Slope instability in the shale-dominant units affects construction

shale Member of the Borden Formation can lead to foundation failure

and engineering projects. The high clay content in the Waldron Shale.

under roads and buildings. Water saturation will cause the clay

minerals in these shales to shrink and swell, which results in heaving

have adequate drainage to channel water away, and buildings ma

need pilings down to bedrock. Slope cuts should not be oversteepened

because these clay-rich units are prone to slumping. The clay conter

The Louisville quadrangle covers parts of the Ohio River, Salt River,

Kentucky River Basin watersheds. The availability and quality

roundwater in this area is discussed in U.S. Geological Surve

lydrologic Investigations Atlases 22, 23, 24, 97, 111, and 130 (Hall

Major floods along the Ohio River Basin have gravely affected the

/ Corps of Engineers, 2002). The increase in urban growth and

area. In January 1937, the Ohio River crested 52 ft above flood

stage to an elevation of 460 ft, flooding as much as 60 percent (3)

alterations in land use and land cover can drastically alter and

entucky counties along the Ohio River and its tributaries were declared federal disaster areas (Federal Emergency Managemen

gency, 1997), is another reminder of the need for adequate floo

Most groundwater in the Louisville quadrangle is obtained from

wells less than 100 ft deep in shallow alluvial deposits or fractured

bedrock. Wells in valley bottoms of the Salt or Kentucky Rivers or

neir major tributaries máy provide adequate water (up to 500 gal/day

lomite, and Drakes Formation. Water from all wells and spring

karst aquifers should be sanitized before human consumption

nkholes are common in the Saluda Dolomite Member and Rowland

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puisville West and Lanesville quadrangles, Jefferson County, Kentuc

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Member of the Drakes Formation, and occur occasionally in the

and Palmouist, 1960a, b. Palmouist and Hall, 1960; Price, 1964a-c

and in Kipp (1997). Carey and Stickney (2001a-f, 2002) have created

oil and gas were recorded. Oil seeps were noted in exposed

cements are produced from the clay in nearby glacial deposits in

Pleistocene glacial deposits (loess and outwash) and Holocene

digitally compiled from U.S. Geological Survey 7.5-minute geologic quadrangle maps (GQ's), as cited in the references. The GQ's are products of a cooperative mapping project between the U.S. Geological Survey and the Kentucky Geological Survey from 1960 to 1978. Several regional geologic studies on mapping and stratigraphy ECONOMIC AND ENGINEERING GEOLOGY (Cressman, 1973; Dever, 1974; Cressman and Noger, 1976; Amaral, Limestone, dolomite, sand, gravel, clay, shale, and siltstone are the principal industrial mineral resources in the Louisville guadrangle and correlation. The 7.5-minute quadrangles that make up the puisville 30 x 60 minute quadrangle are shown in the index map. stone, and agricultural products have been mined from the Louisville The data files resulting from the digitization of the GQ's are part of a comprehensive relational and spatial data set being developed by Member of the Drakes Formation, and High Bridge Group. Annual e Kentucky Geological Survey. The data files will be available on production from these mines is estimated at about 3 million tons a e KGS Web site in the near future (Anderson and others, 1999). vear. Three underground mines operate in the guadrangle, one each Users will have at their disposal a spatial database from which to select any map or particular map themes to create custom maps and add supplemental oil, mineral, coal, or water information. This powerful dimension stone from the Kenwood Siltstone Member of the Borden database of geologic information can be used in a geographic Formation in the Brooks 7.5-minute quadrangle in northern Bullitt information system (GIS) for analysis or manipulation of the data.

County. Clay for brick, tile, expanded aggregate, and cement manufacture is produced from Pleistocene outwash deposits, the

The 7.5-minute quadrangle maps were digitally compiled using a maps into digital format. Compiling 7.5-minute maps into a 30 x 60 minute map required the resolution of significant problems, such as ) correlating geologic formations across quadrangle boundaries, 2) resolving nonuniform structure-contour datums or intervals, and alluvium, in Oldham and Jefferson Counties. The clay, sand, and contacts. The metadata portion of the digital file provides detailed 
The locations of industrial mineral resources, including sand and information about the conversion process. Formation codes were assigned using the American Association of Petroleum Geologists' mapped and described by Anderson and Dever (2001) and Stone standard stratigraphic code (Cohee, 1967), which was modified by the Kentucky Geological Survey for state-specific use. Formations and formation boundaries were not mapped the same way on each of the 7.5-minute guadrangle maps, since they were compiled by various authors between 1960 and 1978. Resolution of the differences between quadrangles was necessary for efficient topological analysis in a GIS environment. In addition, numerous small members mapped on individual 7.5-minute quadrangle maps are too small to be mapped at a scale of 1:100,000 on a 30 x 60 minute quadrangle map. These

Creek coal-fired power plant. The gypsum is then sold to U.S. Gypsum Company for wallboard (Dever, 2001). problems were resolved by adhering to geologic, cartographic, and GIS standards appropriate for the scale of the map. Minor gas fields (now abandoned) occur in the Louisville quadrangle Shallow wells in the quadrangle have had shows of oil or gas and This map is a compilation of existing maps, and no additional have produced small amounts for domestic use; but no othe geologic field work took place. When there were problems in ommercial reservoirs were encountered. The La Grange Gas Field ntil it was later abandoned. Gas was produced from the lower Clay

stratigraphic correlation between quadrangles, the best current data available were used to resolve these differences.

GEOLOGIC SETTING AND STRUCTURAL GEOLOGY The geology of the Louisville 30 x 60 minute quadrangle consists age and unconsolidated sediments of Tertiary(?) and Quaternary These rocks occur along the western flank of the north-trending ncinnati Arch, a structural feature that extends from Ohio through central Kentucky to Tennessee. The dominant rock types for the mapped area are limestone, shale, and siltstone for the Ordovicial strata; limestone, dolomite, and shale for the Silurian strata; shale and limestone for the Devonian strata; limestone, shale, and siltstone

for the Mississippian strata; and terrace and lacustrine deposits, glacial outwash, and alluvial deposits for the Tertiary(?) and Quaternary strata. The Quaternary sediments are mainly unconsolidated or semiconsolidated; they contain clay, silt, sand, and gravel deposits and may be locally cemented. The crest of the Cincinnati Arch is east of the mapped area and trends north across the Harrodsburg and Lexington quadrangles (Sparks and others, 2001, 2002). The western flank of the arch is best illustrated in the Louisville quadrangle by the bedrock pattern in which successively older formations crop out toward the east as they approach the crest of the arch. The associated structure contours demonstrate an apparent dip to the west and a predominant north-south-trending strike. A deviation in the structure is evident and movement of sediments. Roads built on these sediments should south of the Ballardsville Fault in the Crestwood 7.5-minute quadrangle

area, of southern Oldham County. This anomaly, the Lyndon Syncline, egins as a pronounced structural depression with over 260 ft of local relief, as mapped on the base of the Drakes Formation. This renders the soil relatively impermeable, and percolation rates are syncline and its associated Springdale Anticline plunge to the southwest too low for adequate septic-tank drainage. Glacial lacustrine and across Jefferson County for approximately 25 mi. Offsets in the strike outwash deposits may also have a high clay content and can be and the dip direction in the Louisville East and Jeffersontown 7.5- unstable. minute quadrangles indicate that an unmapped subsurface fault may extend across the area from the Ballardsville Fault to an unnamed fault in Bullitt County. This inferred fault is in line with a subsurface fault encountered in a limestone mine in eastern Jefferson County near Avoca, in the southeastern part of the Anchorage 7.5-minute quadrangle. This north-trending subsurface fault contains ostmineralization slickensides, suggesting post-Paleozoic fault novement. The fault has 1 to 2 ft of displacement and is mineralized in the Middle Ordovician Lexington Limestone and High Bridge Group. The mineralized zone contains barite, orange and black sphalerite, Bullitt, Henry, Jefferson, Oldham, Shelby, and Spencer Counties. galena, and calcite (Anderson and others, 2002)

Jeptha Knob Structure The most significant structure in the Louisville 30 x 60 minute quadrangle is Jeptha Knob, a circular dome 14,000 ft in diameter located in Shelby County. Jeptha Knob is characterized by a central core of uplifted, brecciated, and dolomitized Ordovician rocks surrounded by a concentric and radial fault belt. The timing of the event is Late Ordovician to Early Silurian, since the disturbed event is Late Ordovician to Early Silurian, since the disturbed Ordovician rocks are capped by planar-bedded rocks of the Brassfield Formation (Early Silurian). Jeptha Knob was first described by Bucher magnetic surveys indicated no basement uplift and Seeger proposed an "exogenic" origin or high-velocity impact from a meteorite or comet. Cressman (1975a, b, 1981) mapped Jeptha Knob in detail and also concluded an impact origin. Ehmann (2000, p. 31) determined that, ased on lack of shatter cones or meteorites, a meteorite-impact origin for Jeptha Knob was "possible to doubtful."

The Falls of the Ohio State Park is located on the banks of the and Oldham Counties may produce as much as 1,000 gal/min Ohio River across from Louisville at Clarksville, Ind. The site is among ne largest naturally occurring exposures of Middle Devonian fossi in the world; over 200 fossil species have been reported at this loca ne Falls of the Ohio is a limestone bedrock ridge forming a series of rapids across the Ohio River channel. The rapids were repeatedly scoured by glacier meltwater floods during the Pleistocene. They are now only periodically exposed since McAlpine Locks and Dam was completed in 1961. The river is at its lowest level from August through

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Grant Lake Limestone

Calloway Creek Limestone

-0 (sea level)

-Wells Creek Formation and St. Peter Sandstone

Copper Ridge Dolomite of Knox Group

Drakes Formation

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ained calcite matrix. Shale, calcareous, generally as thin partings in limeston ut locally as distinct beds as much as 15 cm thick. Unit mapped in northeast part Olu UPPER PART OF LEXINGTON LIMESTONE—Unit includes Millersburg Member in Waddy 7.5-minute quadrangle and Sulphur Well Member in Classic in Waddy 7.5-minute quadrangle and Sulphur Well Member in Glensboro 7.5-minute quadrangle. Limestone, fossiliferous, irregular to lenticular beds separated by shale artings. Unit intertongues with fossil-fragmental Tanglewood Limestone Member.

ANGLEWOOD LIMESTONE MEMBER OF LEXINGTON LIMESTONE—Limestone,

phosphatic; medium- to coarse-grained, fossil-fragmental, well-sorted, even to irregular beds and crossbedded sets. Upper part of the unit intertongues with basal

Ohio River

Clays Ferry Formation

(sea level) 0

Sellersburg and Jeffersonville

- Wells Creek Formation and St. Peter Sandstone

art of Clays Ferry Formation; lower part grades into upper part of Lexington OWER PART OF LEXINGTON LIMESTONE—Unit consists of three members: in cending order, Curdsville Limestone, Logana, and Grier Limestone Member nestone and shale. Limestone, micrograined to coarse-grained, fossil-fragmental rly sorted; interbedded with shale in middle part. Upper part intertongues with

ARTIFICIAL FILL—Compacted rock debris from highway and railroad construction.