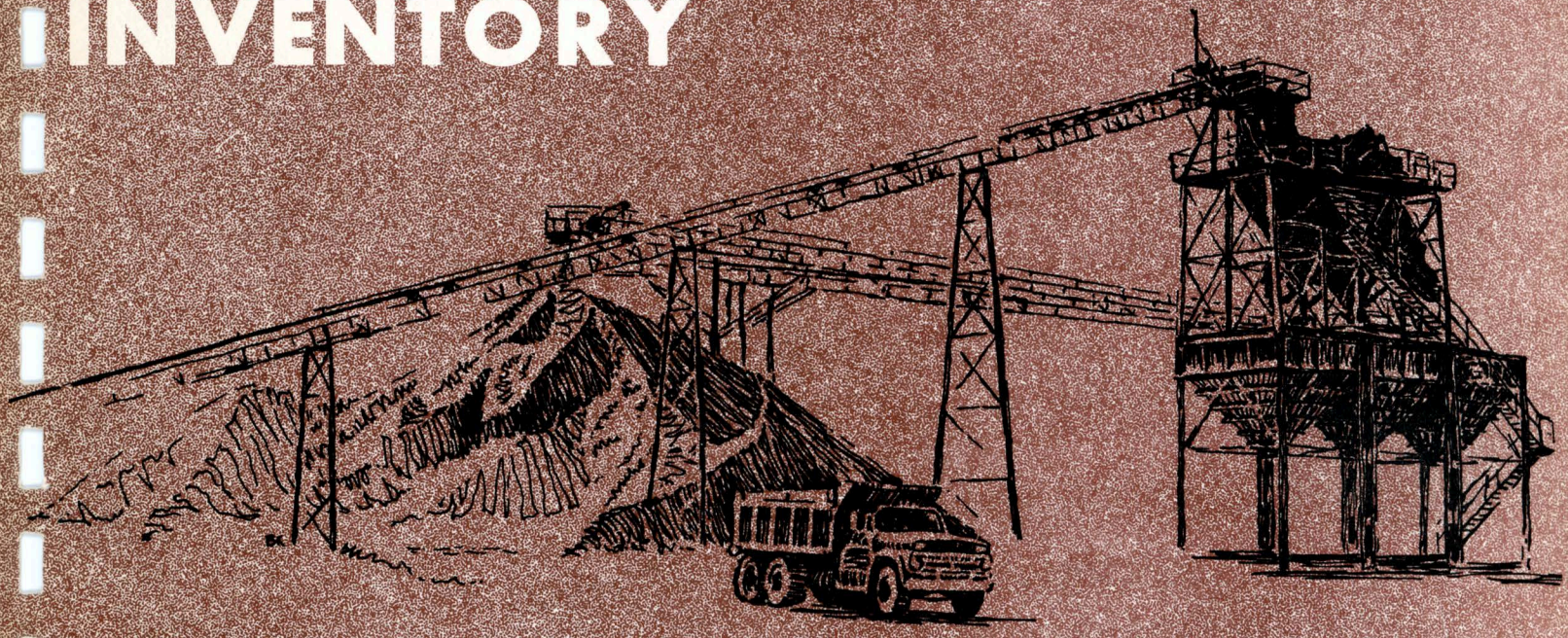
REPORT NO. 25

CONSTRUCTION MATERIALS INVENTORY



DOUGLAS COUNTY, KANSAS

STATE HIGHWAY COMMISSION OF KANSAS

State Highway Commission of Kansas
Location and Design Concepts Department
Planning and Development Department

CONSTRUCTION MATERIALS INVENTORY

OF

DOUGLAS COUNTY, KANSAS

by

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Prepared in Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

1972

Construction Materials Inventory Report No. 25

the **Why ?** **What ?** & **How ?** **of This Report**

This report was compiled for use as a guide for locating construction material in Douglas County.

> *Construction materials include all granular material, consolidated rock, and mineral filler suitable for use in highway construction.*

Known open and prospective sites, both sampled and unsampled, and all geologic deposits considered to be a source of construction material are described and mapped.

> *Prospective sites are select geologic locations where construction materials may be found.*

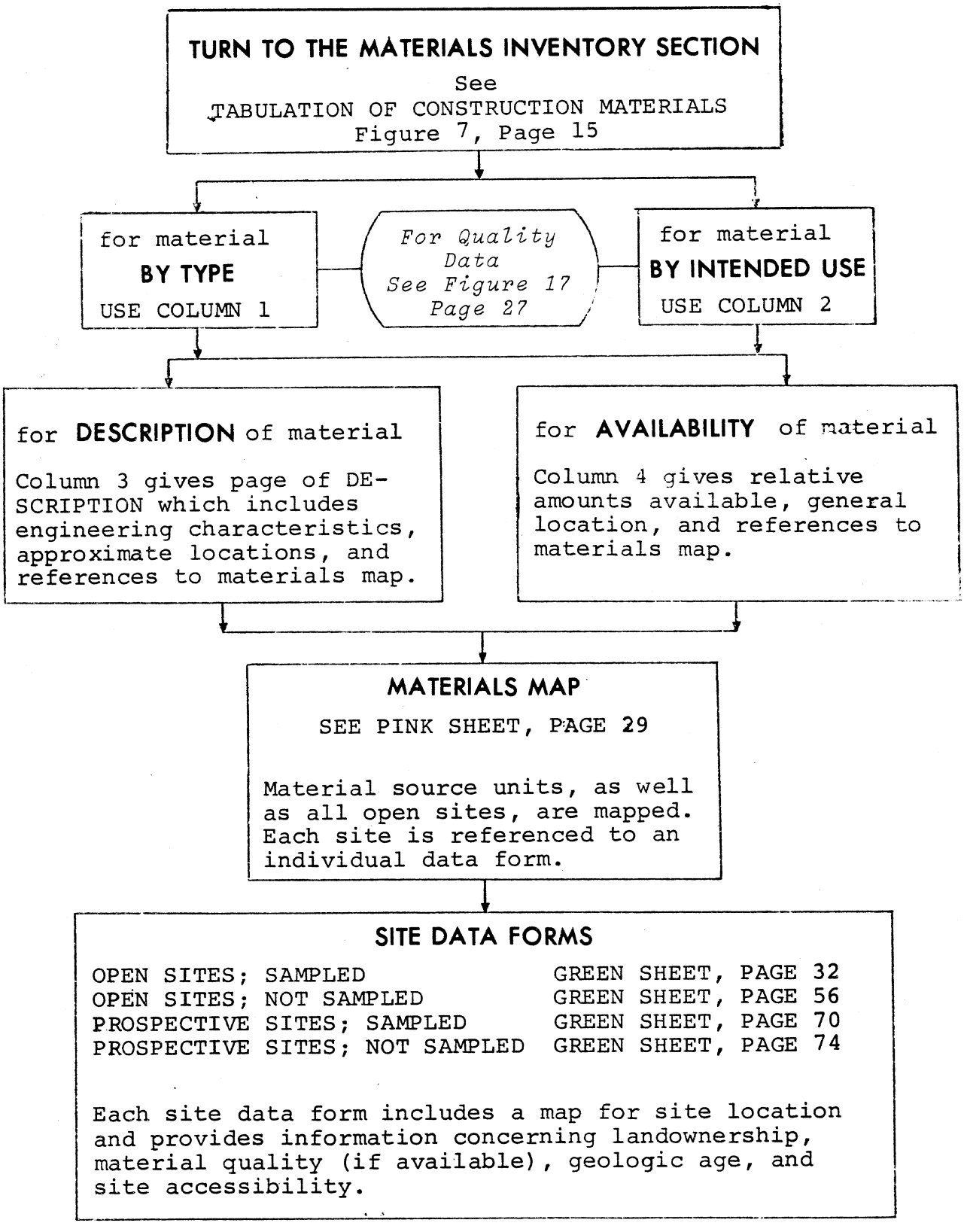
The diagram opposite shows how the MATERIALS INVENTORY SECTION may be used to evaluate and locate mapped sites.

The individually mapped sites certainly do not constitute the total construction materials resources of the county. And, the data outlined in the diagram may be used for purposes other than the evaluation and location of these sites.

Beginning on page 5 is a section explaining the geology of the county. This information (along with the maps, descriptions, and test data) provides the means of evaluating and locating additional construction materials sources in the geologic units throughout Douglas County.

TO LOCATE AND EVALUATE

A MAPPED SITE OF CONSTRUCTION MATERIAL IN DOUGLAS COUNTY



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PREFACE

This report is one of a series compiled for the Highway Planning and Research Program, "Materials Inventory by Photo Interpretation." The program is a cooperative effort of the Federal Highway Administration and the State Highway Commission of Kansas, financed by highway planning and research funds. The objective of the project is to *provide a statewide inventory of construction materials*, on a county basis, to help meet the demands of present and future construction needs.

Several publications issued by the State Geological Survey of Kansas, concerning Douglas and surrounding counties, provided the basis geologic information used in this investigation. Detailed geologic and soil data were obtained from soil surveys and centerline geologic profile prepared for design of major highways in the county by the State Highway Commission.

Appreciation is extended to L. D. Rice, Douglas County Engineer, and John Griffith, First Division Materials Engineer, for verbal information concerning construction materials discussed in this report.

This report was prepared under the guidance of R. R. Biege, Jr., Engineer of Location and Design Concepts; Walter Fredericksen, Regional Geologist; and A. H. Stallard, of the Location and Design Concepts Department.

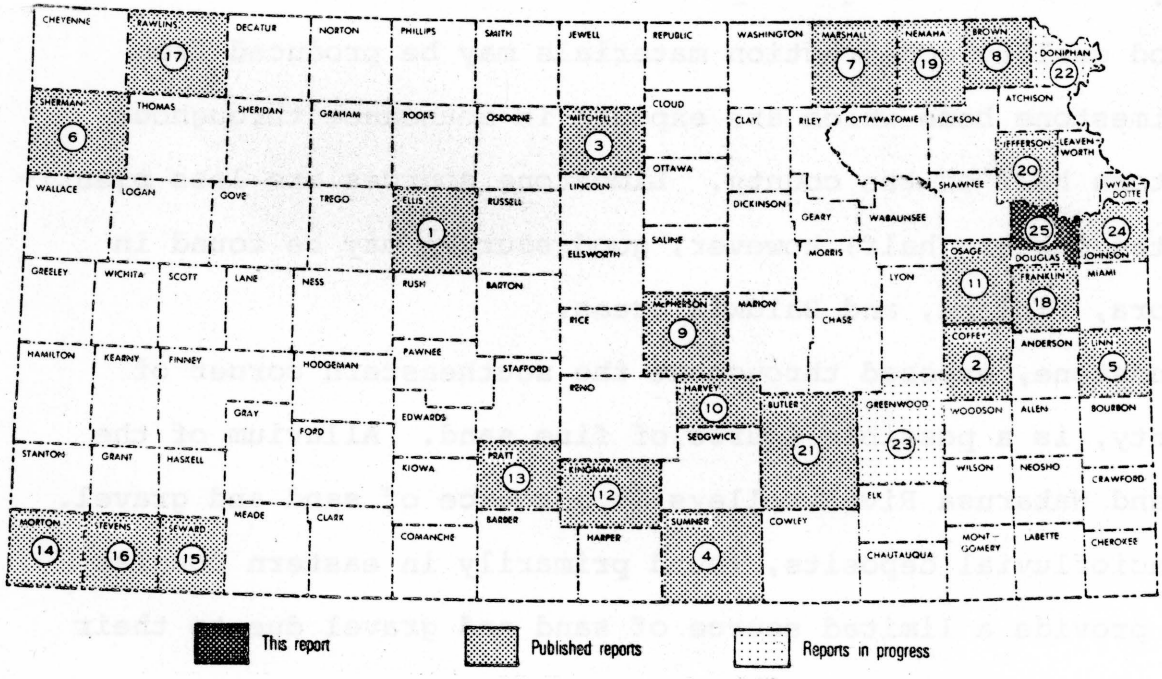


Figure 1. Index map of Kansas showing the location of Douglas County along with the report numbers and locations of counties for which reports have been or are being completed.

ABSTRACT

Douglas County lies within the Dissected Till Plains and the Osage Plains of the Central Lowlands physiographic province. Major topographic features are the east-trending Kansas and Wakarusa River valleys and the upland cuestas formed by differential erosion of limestone, shale, and sandstone beds.

The Kansas River and its tributaries drain the majority of the county and tributaries of the Marais Des Cygnes River drain the southern quarter.

The primary sources of construction materials in Douglas County are Pennsylvanian limestones and unconsolidated deposits of Pleistocene age. Pennsylvanian sandstones may be encountered in quantity in the extreme southeastern part of the county, but they may be limited in quality.

Good quality construction materials may be produced from thick limestone beds which are exposed in abundance throughout the western half of the county. Limestone sources are less plentiful in the eastern half; however, good sources may be found in the Eudora, Vinland, and Baldwin areas.

Sandstone, exposed throughout the southeastern corner of the county, is a possible source of fine sand. Alluvium of the Kansas and Wakarusa River valleys is a source of sand and gravel.

Glaciofluvial deposits, found primarily in eastern Douglas County, provide a limited source of sand and gravel due to their poor sorting.

The best aquifer in the county is Kansas River alluvium, which yields up to 100 gpm in some wells; however, a highly mineralized water is produced. Large quantities of water are produced from the alluvium of tributaries of the Kansas River, except in the Wakarusa River valley where wells yield 50 to 100 gpm. Water for domestic use can be produced from limestones and shales and from sandstones in the Douglas Group; however, the distribution of sandstone aquifers is erratic and the quality of water variable. Surface water from the Kansas River is used by the city of Lawrence, and other sources are available in other streams and reservoirs.

Geo-engineering problems encountered in Douglas County are typical of those encountered elsewhere in eastern Kansas. Highway improvements will encounter problems associated with thick clay shales, slides, sinks, and ground water.

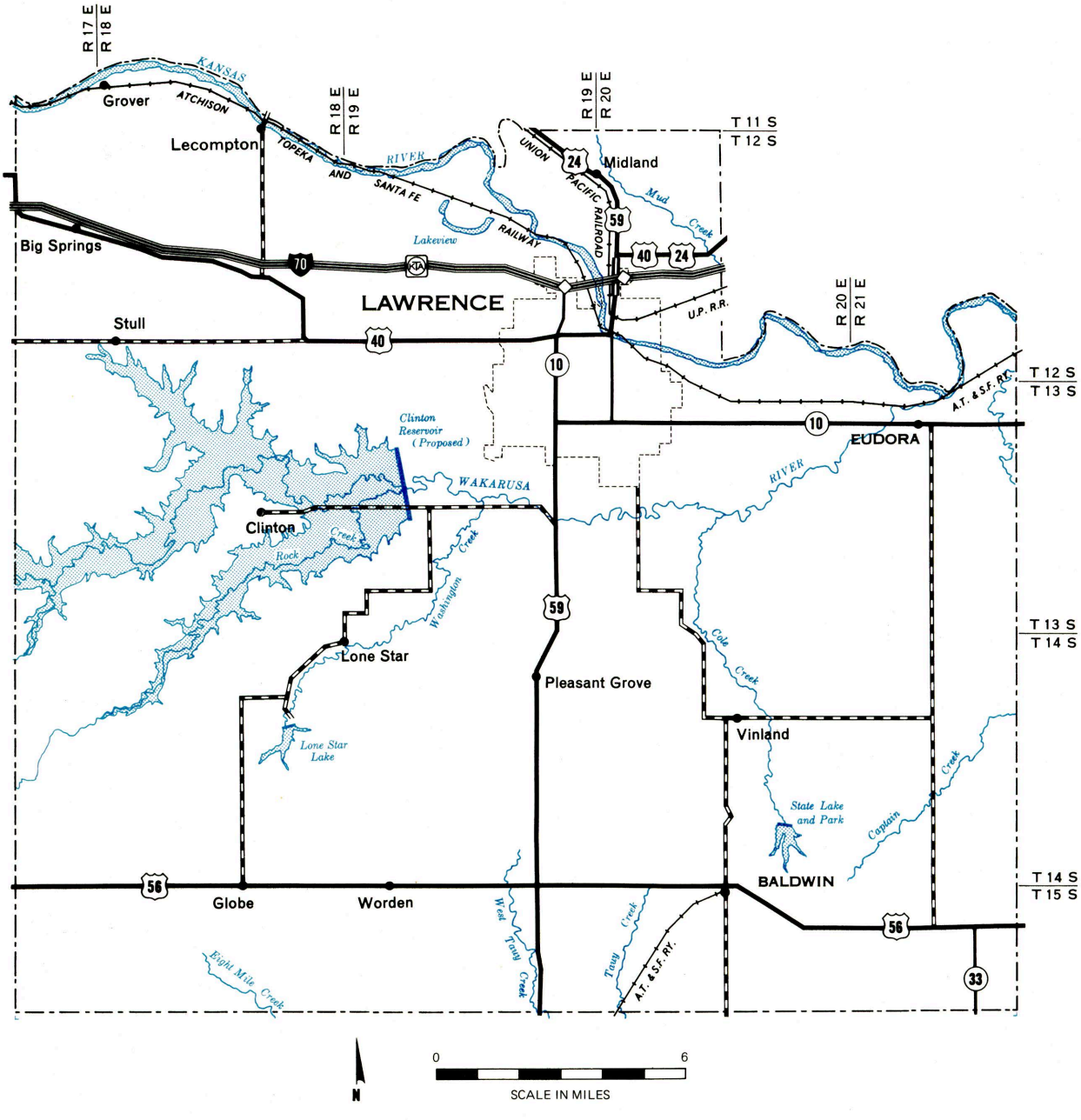


Figure 2. Drainage and major transportation facilities in Douglas County.

FACTS ABOUT DOUGLAS COUNTY

Douglas County, located in eastern Kansas, has an area of 465.4 square miles and according to the 1970 federal census, a population of 57,932.

The highest point in the county, located in the southwestern part, is 1,200 feet in elevation. The lowest point, along the Kansas River at the east edge of the county, is about 778 feet above mean sea level.

A primary road system connects all major communities, and a well developed secondary road system provides access to all small communities. Figure 2 illustrates major drainage and transportation tion facilities in the county.

METHODS OF INVESTIGATION

Investigation and preparation of this report consisted of three phases: (1) research and review of available information, (2) photo interpretation, and (3) field reconnaissance.

During phase one, relevant information concerning geology, soils, and construction materials of the county was reviewed and the general geology determined. Quality-test results of samples taken in Douglas County were then correlated with the various geologic units and unconsolidated deposits.

Phase two consisted of study and interpretation of aerial photographs taken by the Kansas Highway Commission at a scale of one inch equals 2000 feet. Figure 3 illustrates aerial photographic coverage of Douglas County. Geologic-source beds and all open materials sites were mapped and classified on aerial

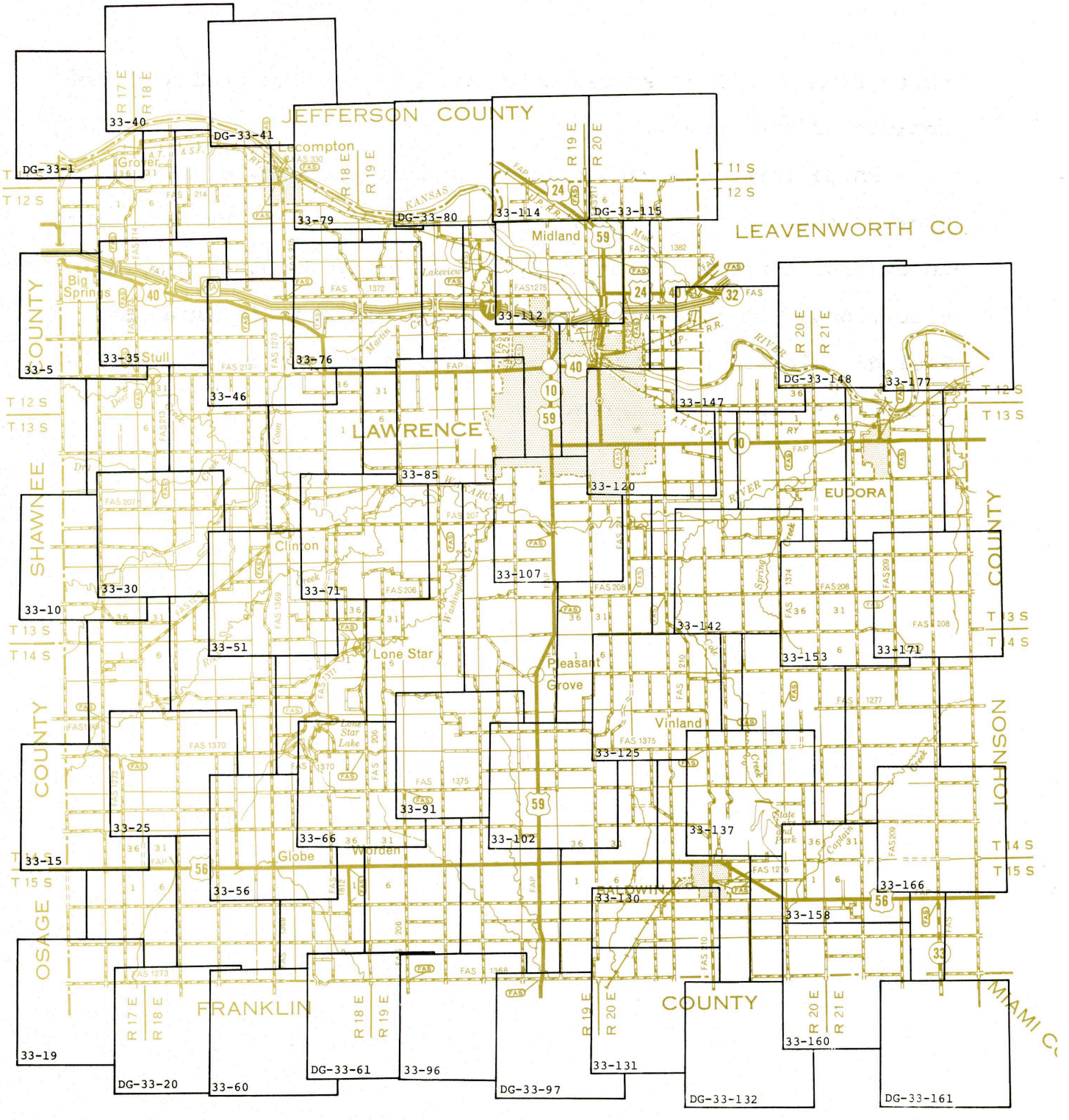
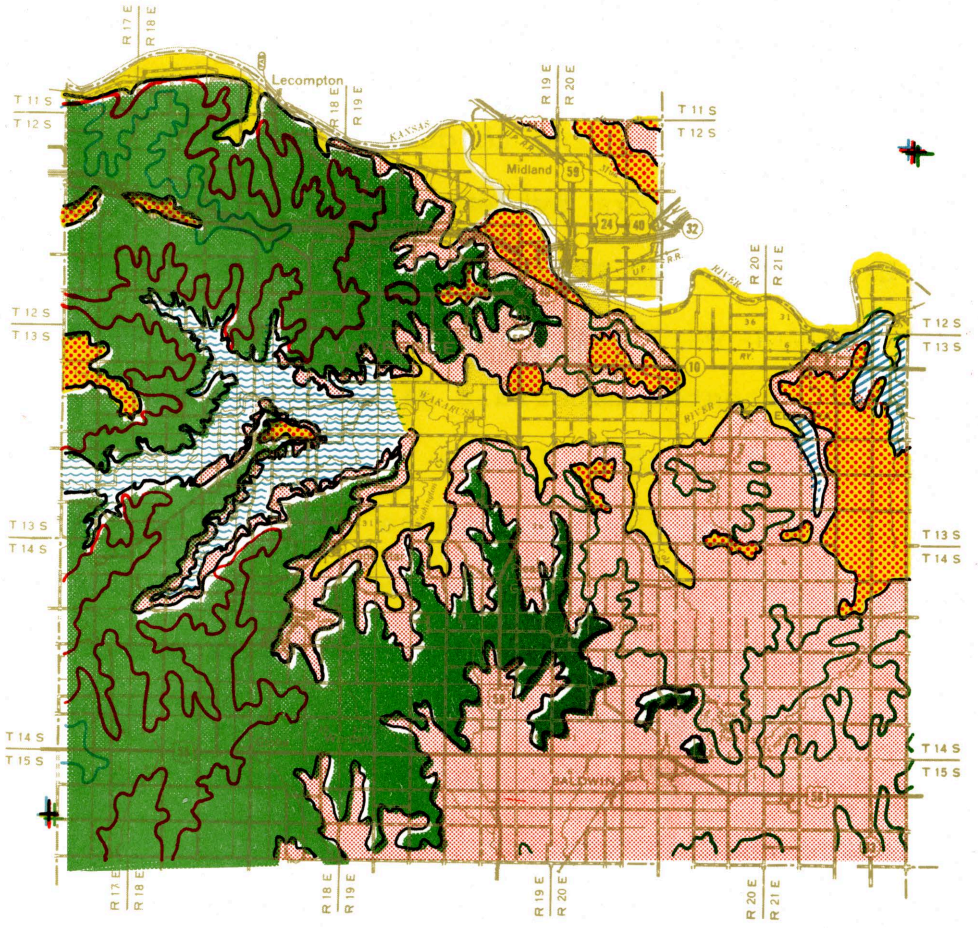


Figure 3. Aerial photographic coverage of Douglas County. The numbers refer to photographs taken by the Photogrammetry Section, State Highway Commission of Kansas on February 25, 1970 at a scale of 1" = 2000'. Aerial photographs are on file in the Photogrammetry Laboratory, State Office Building, Topeka, Kansas.

photographs. All materials sites were then correlated with the geology of the county.

Phase three was conducted after initial study of aerial photographs. A field reconnaissance was conducted by the author to examine construction materials, to verify doubtful mapping situations, and to acquire supplemental geologic information. Geologic classifications of open sites were confirmed, and prospective sites were observed.

GEOLOGY SECTION



LEGEND

- Alluvium
- Glacial Drift
- Lansing Group
- Clinton Reservoir
- Shawnee Group
- Base, Lecompton Ls. Fm.
- Base, Deer Cr. Ls. Fm.
- Douglas Group
- Base, Lawrence Formation

GENERAL GEOLOGY

GEOLOGY is the basis for this materials inventory. Knowledge of the geology makes it possible to: (1) ascertain the general properties of the material source, (2) identify and classify each source according to current geologic nomenclature, and (3) establish a uniform system of material-source-bed classification. By knowing the geologic age, origin, landform, and quality information of the source units, one can derive general information for untested materials sites and prospective locations.

The geologic timetable, figure 4, shows in graphic form the major time periods and the approximate duration of each. Since the materials source units are exposed or near the surface, only a small part of the geologic time portrayed in figure 4 is represented in the surface geology of Douglas County. Figure 5, page 9, illustrates the surface geology and stratigraphic position of each materials source unit in Douglas County.

Rocks which occur in the subsurface, but do not crop out in Douglas County, range from Precambrian to Pennsylvanian age. As much as 3,000 feet of Paleozoic rocks, composed of limestone, dolomite, sandstone, and shale, overlie the older Precambrian rocks. Marine deposits of late Pennsylvanian age are the oldest rocks exposed in Douglas County. Most limestone, shale, and discontinuous sandstone beds were deposited in shallow-sea environments. Erosion occurred during brief periods of land emergence, and it is believed that during this time thick sandstone beds, such as the Ireland, were deposited in deep channels. Swampy conditions characterized this age, as evidenced by thin, discontinuous coal beds. Limestones

ERAS	PERIODS	ESTIMATED LENGTH IN YEARS	TYPE OF ROCK IN KANSAS	PRINCIPAL MINERAL RESOURCES
CENOZOIC	QUATERNARY (PLEISTOCENE)	1,000,000	Glacial drift; river silt, sand, and gravel; dune sand; wind-blown silt (loess); volcanic ash.	Sand and gravel; volcanic ash; agricultural soils; water.
	TERTIARY	59,000,000	Silt, sand, and gravel; fresh-water limestone; volcanic ash; bentonite; diatomaceous marl; opaline sandstone.	Sand and gravel; volcanic ash; diatomaceous marl; water.
MESOZOIC	CRETACEOUS	70,000,000	Chalky shale, dark shale, vari-colored clay, sandstone, conglomerate; outcropping igneous rock.	Concrete and bituminous aggregate, light type surfacing, shoulder and subgrade material, riprap, and building stone; ceramic materials; water.
	JURASSIC	25,000,000	Sandstone and shale, chiefly subsurface.	
	TRIASSIC	30,000,000		
PALEOZOIC	PERMIAN	25,000,000	Limestone, shale, evaporites (salt, gypsum, anhydrite), red sandstone and siltstone, chert, and some dolomite.	Concrete and bituminous aggregate, light type surfacing, shoulder and subgrade material, riprap, and building stone; natural gas, salt, gypsum, water.
	PENNSYLVANIAN	25,000,000	Alternating marine and non-marine shale; limestone, sandstone, coal, and chert.	Concrete and bituminous aggregate, light type surfacing, shoulder and subgrade material, riprap, and limestone and shale for cement; ceramic materials; oil, coal, gas, and water.
	MISSISSIPPIAN	30,000,000	Mostly limestone, predominantly cherty.	Chat and other construction materials; oil, zinc, lead, and gas.
	DEVONIAN	55,000,000	Subsurface only. Limestone and black shale.	Oil.
	SILURIAN	40,000,000	Subsurface only. Limestone.	Oil.
	ORDOVICIAN	80,000,000	Subsurface only. Limestone, dolomite, sandstone, and shale.	Oil, gas, and water.
	CAMBRIAN	80,000,000	Subsurface only. Dolomite and sandstone.	Oil.
PRE-CAMBRIAN	(Including PROTEROZOIC and ARCHEOZOIC ERAS)	1,600,000,000+	Subsurface only. Granite, other igneous rocks, and metamorphic rocks.	Oil and gas.

Figure 4. Geologic timetable

of Pennsylvanian age are the most abundant and important materials source units.

The Mesozoic Era was characterized by extensive erosion, and deposits of this age are not known in the county. If any sediments were deposited during this time, they were removed by subsequent erosion.

Unconsolidated sand and gravel were deposited during the Cenozoic Era; however, only late Cenozoic (Quaternary System) deposits are found in Douglas County.

The Pleistocene Epoch of the Quaternary Period was a time of repeated glacial and interglacial cycles. Glacial activities in Kansas were restricted to the northeast corner of the state, and the sequence of glaciation played a controlling role in the stream activity in Douglas County. Figure 6 is a geologic timetable showing the divisions of the Quaternary Period and the approximate length of each. The glacial ages (Nebraskan, Kansan, Illinoisan, and Wisconsinan) represent the advance of the glaciers, while the three interglacial ages (Aftonian, Yarmouthian, and Sangamonian) represent periods of major glacial recession. The Recent Age represents the time which has elapsed since the last retreat of the Wisconsinan glacier. Only the Kansan glacier reached Douglas County, advancing as far south as the Wakarusa valley. Glacial drift, glaciolacustrine, and glaciofluvial deposits were laid down during this time. Remnants of these deposits are present locally in the subsurface and along the south bluff of the Kansas River valley. Alluvium of the Kansas River and other streams in Douglas County is comprised of gravel, sand, and silt of Recent and late Wisconsinan age.

SYSTEM	SERIES	STAGE OR GROUP	Graphic Legend	Formations and Members		Map Symbo	Thickness in Feet	General Description	Construction Materials
QUATERNARY	PLEISTOCENE	RECENT WISCONSINAN AND ILLINOISAN		Alluvium and Terrace Deposits		Qal	0-150	Clay, silt, and sand grading downward to coarse gravel in the Kansas River valley.	Concrete and bituminous aggregate, light type surfacing material, filler material.
		KANSAN		Glacial Deposits		Qgd	0-100	Predominantly clay, silt, and sandy clay. Locally contains zones of good cementation, locally contains zones of sand, gravel, cobble, and boulders.	Construction aggregate, light type surfacing material.
PENNSYLVANIAN	UPPER PENNSYLVANIAN	SHAWNEE GROUP		Topeka Limestone Formation	Jones Point Shale Member		0-1		
					Curzon Limestone Member		12		
					Iowa Point Shale Member		2-3		
					Hartford Limestone Member		6-8		
				Calhoun Shale Formation			60-68		
				Deer Creek Limestone Formation	Ervine Creek Limestone Mbr.	Pdc	13-17	Thin, wavy bedded with numerous shale partings. Light gray, dense, crystalline.	Light type surfacing. Crushed aggregate base. Coarse material.
					Larsh & Burroak Shale Mbrs.		2.5-5		
					Rock Bluff Limestone Member		2		
					Oskaloosa Shale Member		3-5		
					Ozawkie Limestone Member		5-11		
				Tecumseh Shale Formation			58-65		
				Lecompton Limestone	Avoca Limestone Member		3-4.5		
					King Hill Shale Member		8-9		
					Beil Limestone Member		9-10		
					Queen Hill Shale Member		2-5		
					Big Springs Limestone Member		2-5		
					Doniphan Shale Member		2-5		
					Spring Branch Limestone Mbr.		8-14		
				Kanwaka Shale	Stull Shale Member		18-28		
					Clay Creek Limestone Member		3-6		
					Jackson Park Shale Member		33-52		
				Oread Limestone	Kereford Limestone Member	Po	2.5-9		
					Heumader Shale Member		2-4		
					Plattsmouth Limestone Member		18	Light gray limestone, wavy bedded, thin bedded. Thin shale seams are prevalent. Contains scattered chert nodules.	Light type surfacing material. Riprap. Crushed aggregate for most types and phases of highway construction.
					Heebner Shale Member		3-18		
					Leavenworth Limestone Member		1-2		
					Snyderville Shale Member		1-45		
					Toronto Limestone Member		0-13	Massive gray limestone. Also, thin bedded; wavy. Shale partings.	Light type surfacing material. Riprap. Crushed aggregate f for most types and phases of highway construction.
		DOUGLAS GROUP		Lawrence Formation	Upper Williamsburg Coal Bed	Pli			
					Amazonia Limestone Member				
					Ireland Sandstone Member		0-150	Light gray, well sorted sandstone. Locally absent, well cemented. Coarser nearer base.	Fine sand for base course and filler material.
					Robbins Shale Member				
					Haskell Limestone Member				
				Stranger Formation	Vinland Shale Member				
					Westphalia Limestone Member		100-200		
					Tonganoxie Sandstone Member				
					Iatan Limestone Member				
					Weston Shale Member		0-100		
		LANSING GROUP		Stanton Limestone Formation	South Bend Limestone Member	Ps	1-4		
					Rock Lake Shale Member		4-15		
					Stoner Limestone Member		15-17	Light gray, fine grained, thin to medium bedding with thin shale partings.	Light type surfacing. Base course aggregate. Shoulder material. Concrete and bituminous aggregate.
					Eudora Shale Member		7		
					Captain Creek Limestone Mbr.		6-7	Fine to medium grained, massive bedding.	Construction aggregate, light type surfacing material. Riprap.
				Vilas Shale Formation			10-26		
				Plattsburg Limestone Formation	Spring Hill Limestone Member		13-22		

Figure 5. Generalized geologic column of the surface geology in Douglas County.

Divisions of the Quaternary Period				
Period	Epoch	Age	Estimated length of age duration in years	Estimated time in years elapsed to present
Quaternary	Pleistocene	Recent		10,000
		Wisconsinan Glacial	45,000	55,000
		Sangamonian Interglacial	135,000	190,000
		Illinoisan Glacial	100,000	290,000
		Yarmouthian Interglacial	310,000	600,000
		Kansan Glacial	100,000	700,000
		Aftonian Interglacial	200,000	900,000
		Nebraskan Glacial	100,000	1,000,000

Figure 6. Geologic timetable of the Quaternary Period.

GEO-ENGINEERING

This section is a general appraisal of the materials available in Douglas County for use in highway construction. Potential ground-water problems and the quality of water available for concrete are briefly reviewed. *Detailed field investigations may be necessary to ascertain the severity of specific problems and to make recommendations in design and construction procedures.*

Because of the diversification of Douglas County geology, the nature of geo-engineering problems varies from one part of

the county to another.

The alluvium of the Kansas River valley is an excellent source of sand and gravel and is the best source of water in the county. The Wakarusa's alluvium provides a limited source of water, but no commercial quantities of sand and gravel are available.

Deep cuts and rock excavation will be necessary in western Douglas County, especially in the northwest corner. Locally, sinkholes will be encountered in the Plattsmouth Limestone, and most shales have high clay content and exhibit high swell values. Most soils in the area are residual, having a high clay content, and would be classified as A-6 or A-7 according to A.A.S.H.O. standards. Wells in the area yield low quantities and a highly variable quality of water.

Cuts will be less severe in southeast Douglas County, which is characterized by low to moderate relief. Severe slide problems are common in the Weston Shale which crops out in the area. Soils derived from the sandstones present in the area are silty to sandy and have low plasticity indices. Both the Ireland and the Tonganoxie Sandstones are important aquifers yielding up to 100 gpm. Usually the quality of water is excellent.

Glacial till and glaciofluvial deposits are encountered in the interstream areas in northeast Douglas County. Residual soils and those derived from glacial materials have high plasticity indices and would be classified as A-6 or A-7 by A.A.S.H.O. standards. Glacial deposits in the area are a good source of water for domestic purposes, with wells yielding up to 50 gpm.

MATERIALS INVENTORY SECTION

GENERAL INFORMATION

Pennsylvanian limestones make up a major part of the construction materials resources in Douglas County. The Plattsmouth and Toronto Members of the Oread Formation are the principal sources of limestone aggregate in western Douglas County. The Stoner and Captain Creek Members, although not widely distributed, are excellent sources of construction materials in eastern Douglas County. Alluvium in the Kansas River valley is a major source of siliceous sand and gravel. Sand and gravel has been produced from glaciofluvial deposits; however, the material is poorly sorted and the source limited.

Construction materials types, their uses, and availability are tabulated in figure 7. Test results from a limited amount of sampling and testing are presented in figure 17 page 27.

CONTENTS
MATERIALS INVENTORY SECTION

TYPE material and geologic source	USE	Page	Availability
Limestone Captain Creek and Stoner Members	Light type surfacing. Base course aggregate. Shoulder material. Concrete aggregate. Bituminous aggregate. Riprap.	17	Eastern half of northeast quarter. Not widely distributed. Plates 2 & 4.
Toronto Member	Light type surfacing material. Riprap.	19	Moderate source. Missing in southern Douglas county. Conglomeratic and unsuitable in Baldwin area. All plates.
Plattsmouth Member	Crushed aggregate. Light type surfacing material. Riprap.	20	Good source through western half of county, also, western part of southeast quarter of county. All plates.
Ervine Creek Member	Light type surfacing. Riprap. Base coarse Aggregate. Shoulder material.	22	Moderate source, northwest corner of county. Plates 1 & 3.
Sandstone Ireland Sandstone	Light type surfacing material. Fine aggregate. Filler.	23	Moderate source east quarter of county. Plate 6.
Sand and Gravel Glacial Deposits	Light type surfacing material. Fine aggregate. Coarse aggregate. Boulders. Building stone.	24	Throughout northeast quarter of county and scattered small areas in northwestern quarter of county. Plates 1, 2, 3. 4 & 6.
Alluvium	Fine aggregate. Coarse aggregate. Light type surfacing material. Filler material. Aggregate for bituminous and concrete.	25	Good source along Kansas River valley-in northern part of county. All plates.

Figure 7. Tabulation of the construction materials types and their availability in Douglas County.

DESCRIPTION OF CONSTRUCTION MATERIALS

Limestone

Stanton Limestone Formation

The Stanton Formation consists of three limestone and two shale members which are, in ascending order, the Captain Creek Limestone, Eudora Shale, Stoner Limestone, Rock Lake Shale, and the South Bend Limestone. The combined thickness of the formation is approximately 44 feet. The Stanton is exposed as a cuesta-forming formation along stream bluffs in the Eudora area and is the only source of limestone in eastern Douglas County. Because of the relative thinness and easily erodible characteristics of the upper members (the Rock Lake and South Bend), the Captain Creek and Stoner Limestone Members are the most important

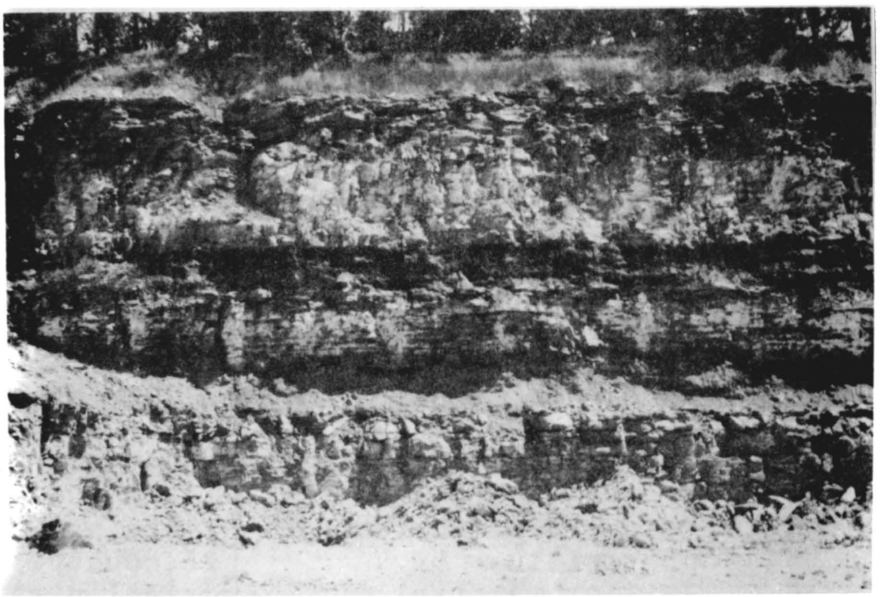


Figure 8. Exposure of the Stanton Formation illustrating the Captain Creek and Stoner Members.

source units of the formation. When the interbedded Eudora Shale between them is thin, both beds may be produced concurrently.

Materials from the Stanton Formation (Captain Creek and Stoner Members) are suitable for most highway purposes; however, the Stoner is known to have high absorption percentages in some areas in eastern Kansas. Detailed test information is shown in chart form in figure 17 page 27.

The outcrop pattern of the Stanton Formation is shown on Plates 2 and 4.

Captain Creek Limestone Member

The Captain Creek Limestone Member is a gray or blue-gray, dense, fine-grained, massive limestone with a thickness of approximately seven feet. It fractures vertically and forms erosion-resistant ridges where exposed; however, locally, the Captain Creek is overlain by thick overburden and is not as accessible as the Stoner.

Figure 9. The Captain Creek Limestone Member of the Stanton Formation in a railroad cut NW¼ sec. 4, R21E, T13S.

Stoner Limestone Member

The Stoner Limestone Member is a fine-grained, gray, wavy, thin- to medium-bedded limestone. It contains shale partings and crystalline calcite. This unit is the principal source of material in the Stanton Formation due to its surface exposure, thickness, and quality. The thickness of exposed outcrops of the Stoner varies from 15 to 17 feet.

Figure 10. The Stoner Limestone Member of the Stanton Limestone Formation in a quarry site NW¼ sec. 20, T13S, R21E.

Oread Limestone Formation

In Douglas County the Oread has an average thickness of 60 feet. It is divided into four limestone and three shale members, of which only the Toronto and Plattsmouth Members are materials source units in Douglas County. Only the Plattsmouth has been produced extensively in area.

Toronto Limestone Member

The Toronto Limestone Member is a medium-gray limestone and appears massive in fresh exposures. It weathers to a brown color and into slabby and irregular fragments. Scattered chert nodules are common in the upper part of the unit. Its average thickness is approximately 10 feet.

Figure 11. Photograph of brecciated and conglomeratic phases of the Toronto Limestone Member in the area north of Baldwin SW¼ sec. 35, T14S, R20E.

In part of southern Douglas County the Toronto is absent due to nondeposition or to post-depositional erosion. Exposures of the Toronto in the area north of Baldwin are atypical due to the conglomeratic and brecciated nature of the limestone.

Only a limited amount of Toronto has been produced in Douglas County due to its inaccessibility and because a much better quality rock is available in the overlying Plattsmouth Limestone Member. Most production has been in the Baldwin area. The Toronto

has been produced on a limited basis in other counties, and in most cases the rock has high absorption qualities. The Toronto also exhibits shaly characteristics and usually is not considered for bituminous and concrete construction. Quality tests indicate that the Toronto could be used for riprap. It has been used for light type surfacing; however, a brown-colored, dusty aggregate is produced and may not be acceptable in some areas. Detailed test information is shown in chart form in figure 17, page 27. The outcrop pattern of the Toronto is similar to that of the Plattsmouth; however, the Toronto is not present in southwest Douglas County. Both members are shown as the Oread Formation on plates 1 thru 6.

Plattsmouth Limestone Member

The Plattsmouth is a light bluish-gray, fine-grained, wavy-bedded limestone, with scattered chert nodules occuring in the middle of the ledge. Numerous horizontal partings and vertical joints occur in the Plattsmouth. Usually a prominent shale seam about three inches thick separates the upper ten feet from the lower portion of the ledge, and thinner shale seams are common throughout the ledge. It has an average thickness of approximately 18 feet.

Locally, sinkholes associated with drainage changes or faulting have developed in the Plattsmouth (O'Connor, 1960). Sinks are located at the following locations: E½ sec. 12, T15S, R18E; sec. 32, 33, and 36, T14S, R19E; and E½ sec. 12, T15S, R18E.

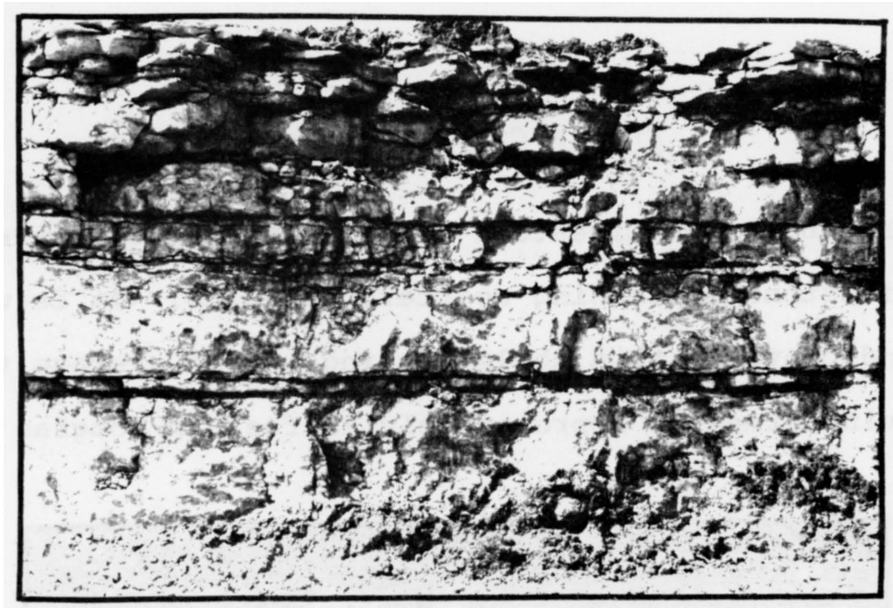


Figure 12. The Plattsmouth Limestone Member of the Oread Limestone Formation in a quarry SE¼ sec. 22, T14S, R18E.

Aggregate produced from the Plattsmouth is usually suitable for concrete, and in some cases for bituminous; however, the quality of material from some quarries is marginal. Often the lower portion of the ledge is of better quality than the upper portion, especially if the upper part has been weathered. In addition to concrete, the aggregate is used for light type surfacing and riprap. The Plattsmouth is included in the Oread Formation map unit which is shown on plates 1 thru 6.

Deer Creek Limestone Formation

The Deer Creek Limestone Formation is composed of five members. They are, in ascending order, the Ozawkie Limestone, the Oskaloosa Shale, the Rock Bluff Limestone, the Larsh & Burroak Shale, and the Ervine Creek Limestone. In Douglas County the full thickness is approximately 34 feet. Only the Ervine Creek Limestone Member is considered a source of construction materials in Douglas County.

Ervine Creek Limestone Member

The Ervine Creek Limestone is a light-gray to white, fine-grained limestone containing scattered nodules. It is wavy, thin-bedded, and contains thin shale partings. The average thickness of the Ervine Creek is approximately 15 feet in Douglas County.

Figure 13. The Ervine Creek Limestone Member of the Deer Creek Limestone Formation in a road cut in the SE¼ sec. 26, T12S, R17E.

The Ervine Creek has not been quarried in Douglas County and no quality data is available; however, it has been produced extensively in Jefferson County to the north. Quality information gathered from Jefferson County quarries shows that the material varies from quarry to quarry due to the weathering condition of the rock and the change in lithology. Some material was acceptable for concrete and bituminous construction. Material from all quarries was acceptable for light type surfacing and riprap.

The exposure pattern of the Deer Creek is shown on plates 1 and 3.

Sandstone

Lawrence Formation

The Lawrence Formation contains the Ireland Sandstone and the Amazonia Limestone. The Ireland Sandstone represents non-marine material deposited in an ancient erosional valley which is west-southwest trending in southern Douglas County. The boundaries of the Ireland Sandstone are highly variable, and neither the upper nor lower horizons need necessarily represent a single stratigraphic horizon. The Ireland Member may be up to 150 feet thick and is chiefly very fine- to medium-grained (1/16 to ½ mm), angular to sub-angular quartz. It contains mica, pyrite, and clay minerals and weathers to tan or yellow brown.

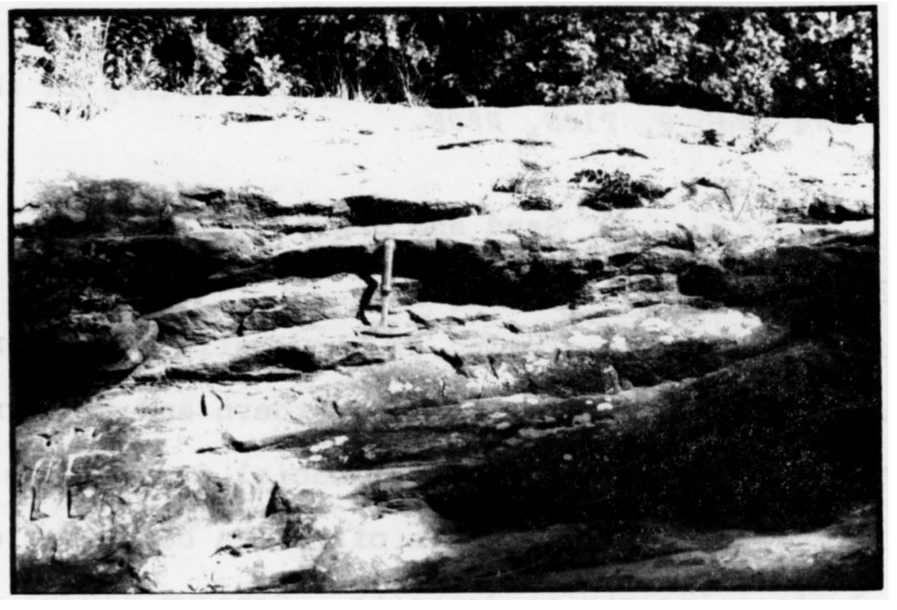


Figure 14. Ireland Sandstone Member of the Lawrence Formation in a stream bank. NE¼ sec. 2, T15S, R19E.

The Ireland has been quarried in nearby counties for fine hot-mix aggregate, and it has been used as light type surfacing in Douglas County. Coarser aggregate could be obtained from the Ireland, but it would not meet soundness requirements because of the poor binding properties of the cementing agent.

Figure 15. An Ireland Sandstone quarry in the SW¼ sec. 9, T15S, R20E.

Sand and Gravel

Glacial Drift

Glacial deposits consisting of clay, silt, sand, gravel, cobbles, and boulders cover much of northern and eastern Douglas County. The most extensive area of glacial deposits is a 50-square-mile area immediately south of Eudora comprised of glaciofluvial and glaciolacustrine deposits. Schoewe (1930) and Hoover (1936) regarded these deposits as reworked till. Dufford (1958) classed the same deposits as part of the Menoken Terrace deposits,

chiefly retreated Kansas outwash. O'Connor (1960) found both outwash and till in these deposits, and the Soil Conservation Service in Douglas County reported (personal communication) a thickness of 52 feet. The area is characterized by a lowland plain as shown in figure 16.

Only a limited amount of sand and gravel has been produced from glacial deposits in Douglas County. Material has been produced in sec. 26, T13S, R19E and in sec. 2, T14S, R18E; however, due to the poor sorting of the material and to the cemented zones, the pits have been abandoned.

Material produced from glacial deposits would probably be limited in use to light type surfacing. Glacial deposits are shown on plates 1, 2, 3, 4, and 6.

Alluvium and Terrace Deposits

The Newman Terrace deposits and alluvium were deposited in the valleys during Wisconsinan and Recent time.

Basal Newman Terrace deposits in the Kansas River valley consist chiefly of gravel, which is much coarser than sediments being presently carried by the Kansas River (Davis and Carlson, 1952). The sediments grade upward from cobbles through sand to a clayey silt at the surface. In the Kansas River valley, where Newman Terrace deposits are thickest, coarse sediments 40 to 50 feet thick are overlain by a similar thickness of dark, sandy, silty, and clayey sediments. In the Wakarusa River valley the coarse sediments generally are less than 10 feet thick, and the valley fill is composed chiefly of silt and clay (O'Connor, 1960).

Alluvial deposits in the Kansas River valley and its tributaries are late Wisconsinan and Recent in age and, together with the Newman Terrace, form the river's flood plain. They are comprised chiefly of sand and silt, similar to the sediments carried by the river at the present time.

Arkosic sand and gravel is dredged from the Kansas River at Lawrence. A large sand and gravel pit was operated during construction of the Kansas Turnpike. This site now forms Lakeview Lake and is the former site of an ancient river meander. Other dredging activities are currently in operation in the alluvial plain.

Figure 16. Glacial deposits showing cemented material, which contains cobble and boulder, NW¼ sec. 24, T13S, R17E.

Site Data Form No.	Material Type	Date Of Test	Percent Retained 3/4	3/8	4	8	16	30	50	100	Wash	G.F.	Sp.Gr. Sat.	Sp. Gr. Dry	Weight/ Cu. Ft.	% Wear	% Soundness	% Absorption	Source of Data	Type of Sample
Source of Material: Alluvium - Qal																				
SG+4	Sand and Gravel	12-30-66	0	0	1	4	14	37	90	99	0.57	2.45	2.60	2.58		-	-	0.50	SHC Lab No. 66-5754	
		4-5-67	0	0	1	9	26	50	88	98	0.62	2.72	2.60	2.58		-	-	0.81	67-1035	
		12-19-68	0	0	1	8	27	50	90	99	0.48	2.77	2.60	2.60		37.6	0.98	0.30	68-4209	
													2.52	2.47		-	-	2.09	68-4209	
		2-11-71	0	0	1	5	15	35	86	99	0.29	2.41	2.52	2.48		36.8	0.97	1.64	71-68	
													2.59	2.58		-	-	0.40	71-68	
SG+5	Sand and Gravel	1-5-66	0	0	1	9	28	56	88	99	0.33	2.81	-	-	111.97	35.4	0.97	-	65-5734	
		1-5-67	0	0	2	11	29	54	84	98	1.10	2.78	2.60	2.59		36.0	0.98	0.50	66-5752	
		4-25-68	0	0	3	10	28	56	86	98	0.97	2.81	2.60	2.58		-	-	0.50	68-1229	
		4-25-68	0	0	3	11	29	55	86	98	0.43	2.82	2.60	2.59		-	-	0.40	68-1178	
		4-25-68	0	0	3	11	28	54	82	97	0.53	2.75	2.60	2.58		-	-	0.50	68-1173	
		12-19-68	0	0	1	8	25	53	86	98	0.59	2.71	2.58	2.55		36.8	0.98	1.31	68-4196	
													2.60	2.59		-	-	0.30	68-4196	
		9-10-70	0	0	2	11	28	53	88	98	0.72	2.80	2.60	2.60		39.0	0.99	0.30	70-2432	
		2-12-70	0	0	2	10	27	52	91	99	0.24	2.81	2.60	2.60		37.6	0.98	0.30	71-67	
													2.56	2.53		-	-	1.13	71-67	
		5-26-71	0	0	2	10	27	53	88	99	0.33	2.79	2.60	2.60		36.0	0.99	0.30	71-884	
Source of Material: Oread Limestone Formation (Plattsmouth) Kop																				
LS+1	Limestone	10-2-69											2.50	2.39		31.2	0.90	4.71	69-2836	Crushed
LS+2	Limestone	1-3-61											2.52	2.42		32.1	0.89	3.76	14674	Crushed
		12-23-60											2.52a	2.43		-	-	3.64	14675	Crushed
													2.51b	2.41		-	-	4.02	14675	Crushed
													2.52c	2.44		-	-	3.55	14675	Crushed
		9-1-64											2.55	2.47		29.1	0.93	3.15	36171	Crushed
		3-14-68											2.53	2.43		31.1	0.90	3.96	68-602	Crushed
		3-30-70											2.54a	2.45		33.0	0.91	3.62	71-444	Crushed
													2.56b	2.49		-		2.56	71-444	Crushed
LS+3	Limestone	8-71											2.55	2.47		29.3	0.95	3.26	23-68	Crushed
LS+6	Limestone	6-6-61											2.51	2.42		30.3	0.98	3.55	16910	Crushed
		4-25-63											2.54	2.46		29.0	0.97	3.07	27836	Crushed
LS+7	Limestone	11-7-66											2.60	2.53		28.9	0.90	2.69	66-4957	Crushed
		3-6-67											2.60	2.53		29.6	0.84	2.73	67-426	Crushed
LS+8	Limestone	2-8-54											2.50	2.45		30.5	0.92	3.00	82124	Crushed
LS+9	Limestone	3-17-61											2.51	2.42		31.5	0.90	3.80	15718	Crushed
		3-17-61											2.53	2.43		31.4	0.87	3.88	15720	Crushed
		4-11-63											2.52	2.43		30.6	0.91	3.68	27660	Crushed
		3-11-70											2.53	2.44		34.7	0.88	3.84	70-362	Crushed
		3-11-70											2.52	2.42		-	-	4.14	70-362	Crushed
		2-11-71											2.53	2.44		30.1	0.96	3.55	71-152	Crushed
LS+10	Limestone	4-4-63											2.49	2.40		30.8	0.98	3.61	27558	Crushed
LS+14	Limestone	4-28-47											2.55	2.48		30.3	0.93	2.50	54533	Ledge
LS+15	Limestone	5-15-47											2.53	2.46		31.6	0.94	2.52	54764	Ledge
LS+16	Limestone	6-29-62											2.56	2.49		31.6	0.95	3.15	23172	Crushed
		6-25-64											2.58	2.51		31.7	0.97	2.81	34936	Crushed
		6-21-64											2.56	2.48		31.1	0.92	3.17	65-1841	Crushed
		3-27-67											2.55	2.46		32.8	0.94	3.53	67-871	Crushed
		12-18-68											2.55	2.47		32.1	0.90	3.33	68-4235	Crushed
		10-6-69											2.53	2.42		35.3	0.88	4.32	69-2862	Crushed
													2.54	2.45		-	-	3.88	69-2862	Crushed
		11-13-69											2.54	2.45		34.5	0.91	3.69	69-3349	Crushed
		12-22-70											2.53	2.43		35.2	0.86	4.07	70-3909	Crushed
													2.60	2.55		-	-	1.94	70-3909	Crushed
		4-15-71											2.56	2.48		30.4	0.89	3.51	71-550	Crushed
													2.55	2.48		-	-	2.67	71-550	Crushed
LS+17	Limestone	4-21-61											2.51	2.40		33.5	0.88	4.63	16179	Crushed
		6-20-61											2.54	2.45		30.1	0.93	3.71	17244	Crushed
		6-21-65											2.50	2.41		33.6	0.92	3.77	65-1840	Crushed
LS+18	Limestone	3-26-49											2.51	2.42		32.4	0.94	3.53	62336	Ledge
LS+19	Limestone	4-11-62											2.50	2.40		34.2	0.90	4.21	21542	Crushed
		3-15-67											2.58	2.44		33.5	0.90	3.75	67-763	Crushed
Source of Material: Oread Limestone Formation (Toronto) Kot																				
LS+20	Limestone	3-10-61											2.56	2.50		29.8	0.96	2.41	15648	Crushed
		3-10-61											2.57	2.48		32.2	0.90	3.65	15649	Crushed
		4-27-62											2.62	2.54		30.1	0.97	3.17	21946	Crushed
LS+21	Limestone	2-3-65											2.65	2.61		24.4	0.94	1.64	38403	Crushed
		7-22-68											2.63	2.57		29.1	0.92	2.42	68-2282	Crushed
		3-24-70											2.60	2.54		26.9	0.89	2.56	70-500	Crushed
		3-24-70											2.63	2.57		-	-	2.43	70-500	Crushed
Source of Material: Lawrence Formation (Ireland) Kli																				
			30	50	80	100														
SS+33	Sandstone		0	37	49	32														
			0	40	47	33														
		SHC Form 619, No. 23-27																		
Source of Material: Stanton Formation (Stoner) Ks																				
LS+11	Limestone	4-21-61											2.63	2.57		30.8	0.95	2.21	16180	Crushed
		8-16-62											2.63	2.57		29.5	0.98	2.15	23942	Crushed
		2-20-64											2.63	2.57		37.3	0.95	2.07	32823	Crushed
		2-21-64											2.59	2.53		27.3	0.96	2.36	32710	Crushed
		4-21-66											2.58	2.52		29.2	0.97	2.57	66-1272	Crushed
		5-10-66											2.59	2.53		26.7	0.95	2.30	66-1468	Crushed
		8-30-67											2.65	2.60		28.0	0.93	1.83	67-3360	Crushed
		10-21-69											2.60	2.53		30.1	0.97	2.57	69-3155	Crushed
													2.59	2.53		-	-	2.40	69-3155	Crushed
LS+12	Limestone	7-20-64											2.63	2.56		30.1	0.98	2.77	35323	Crushed
LS+13	Limestone	10-22-69											2.61	2.56		36.9	0.97	1.86	69-3156	Crushed
													2.63	2.58		-	-	1.68	69-3156	Crushed

Figure 17. Results of tests completed on samples of material from the various geologic source beds in Douglas County.

COUNTY MATERIALS MAP INDEX

On the following pages are six plates covering Douglas County as shown below.

PLATE I

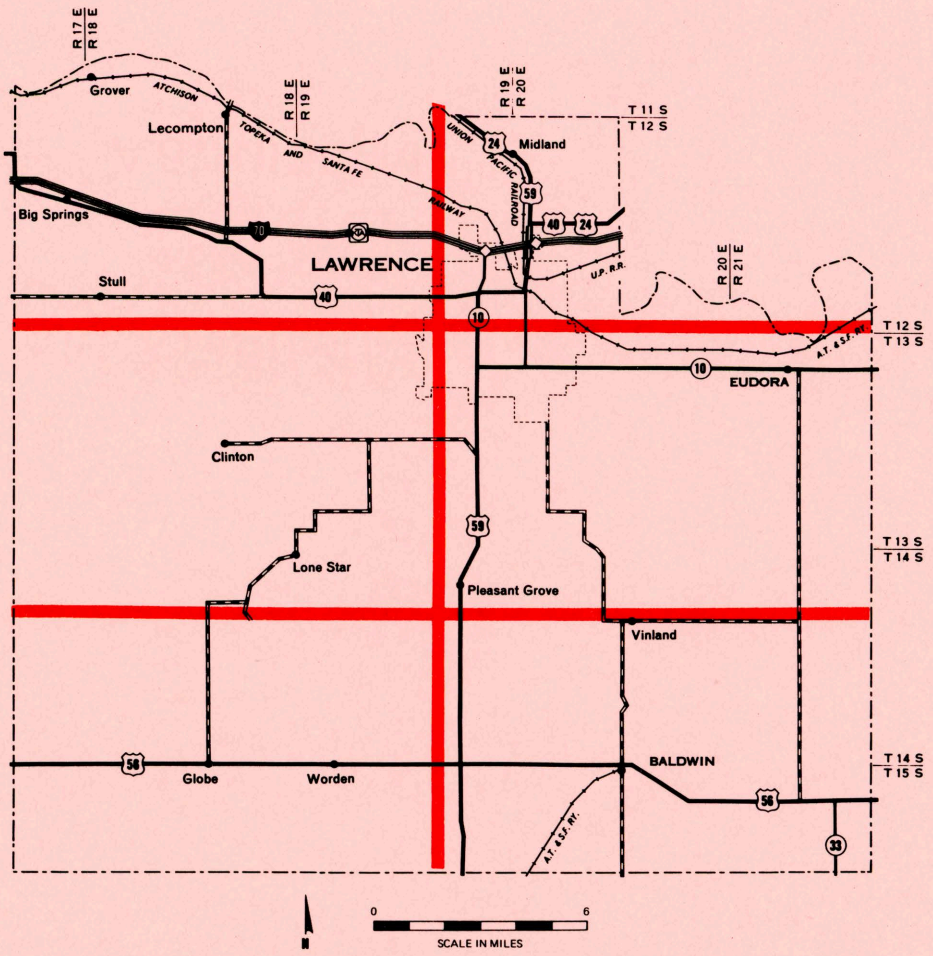
PLATE II

PLATE III

PLATE IV

PLATE V

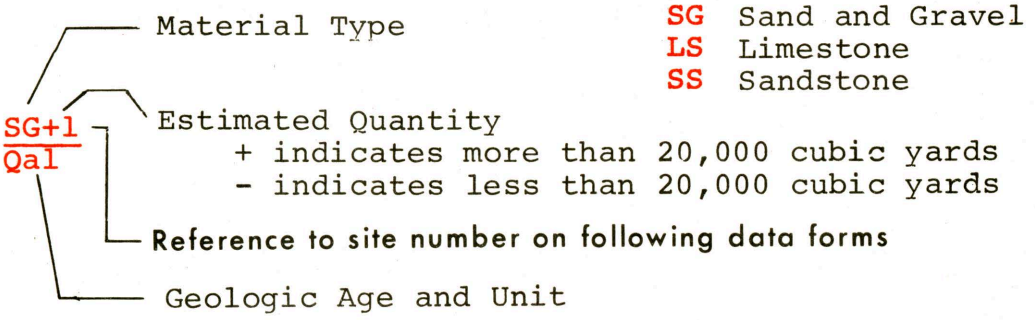
PLATE VI



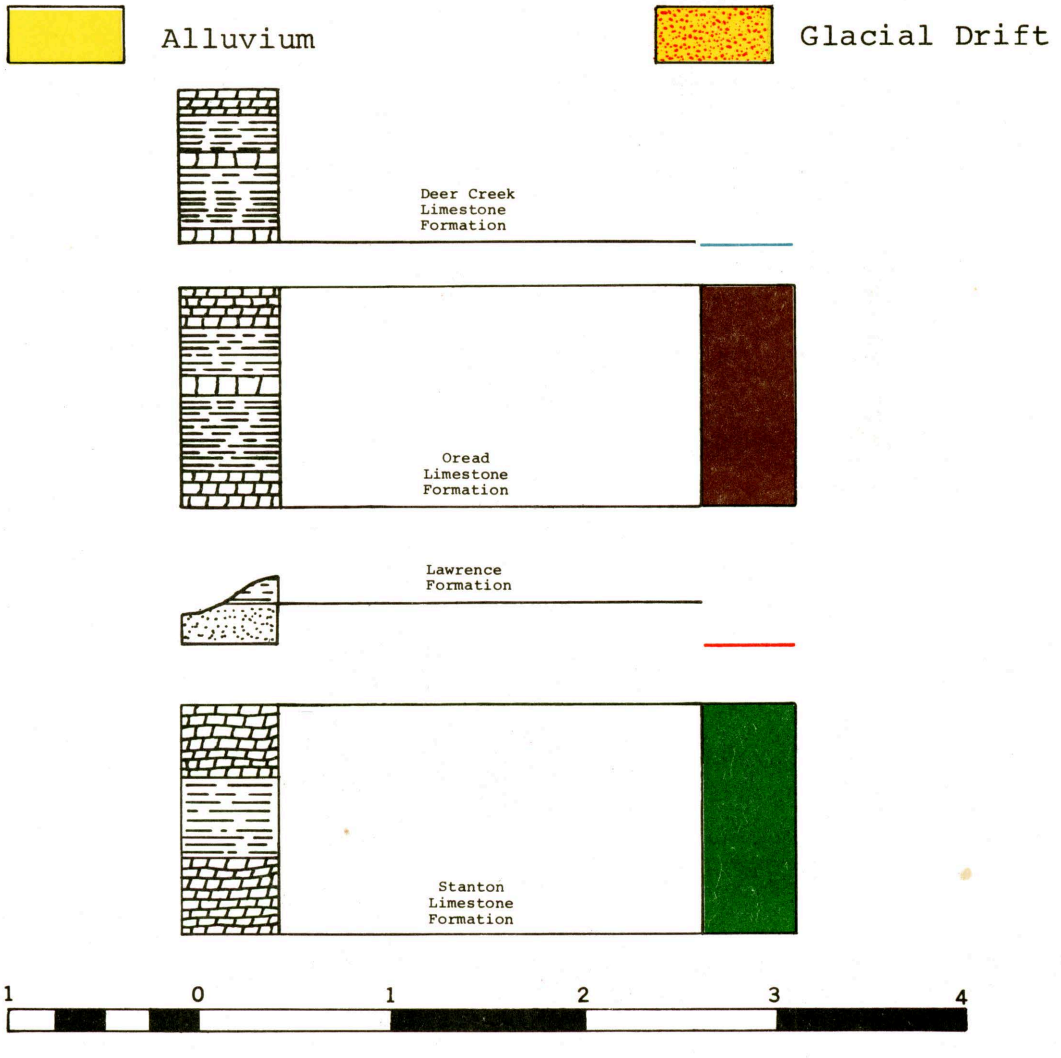
Note: The individual site data forms follow Plate VI.

LEGEND

MATERIALS SITE DESIGNATIONS



GEOLOGY



DOUGLAS COUNTY MATERIALS MAP

Plate I

R 17 E | R 18 E | R 18 E | R 19 E

T 11 S
T 12 S
T 13 S

Jefferson County

Shawnee County

Grover

Big Springs

Stull

Lecompton

LAWRENCE

Lake View

Coon Creek

Marin Creek

Dyer Creek

A. T. & S. F. RY.

K.T.

40

70

LS+34
Pdc

LS+3
Pop

LS+22
Pop

LS+24
Pop

LS+25
Pop

LS+1
Pop

LS+23
Pop

LS+35
Pdc

LS+2
Pop

Qal

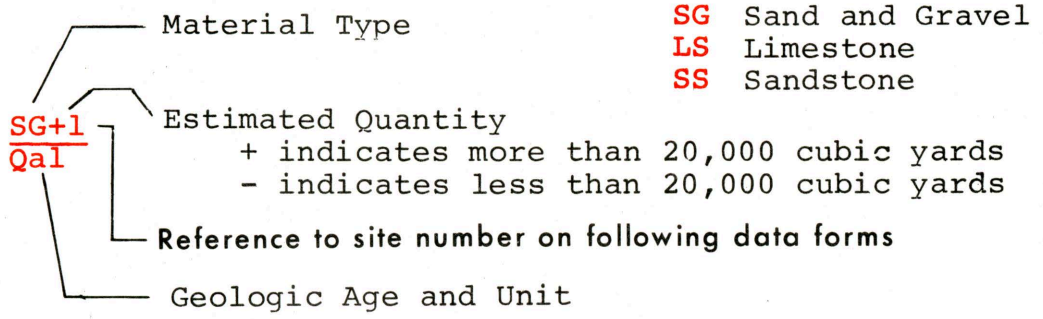
Qgd

Pdc

DOUGLAS COUNTY

LEGEND

MATERIALS SITE DESIGNATIONS



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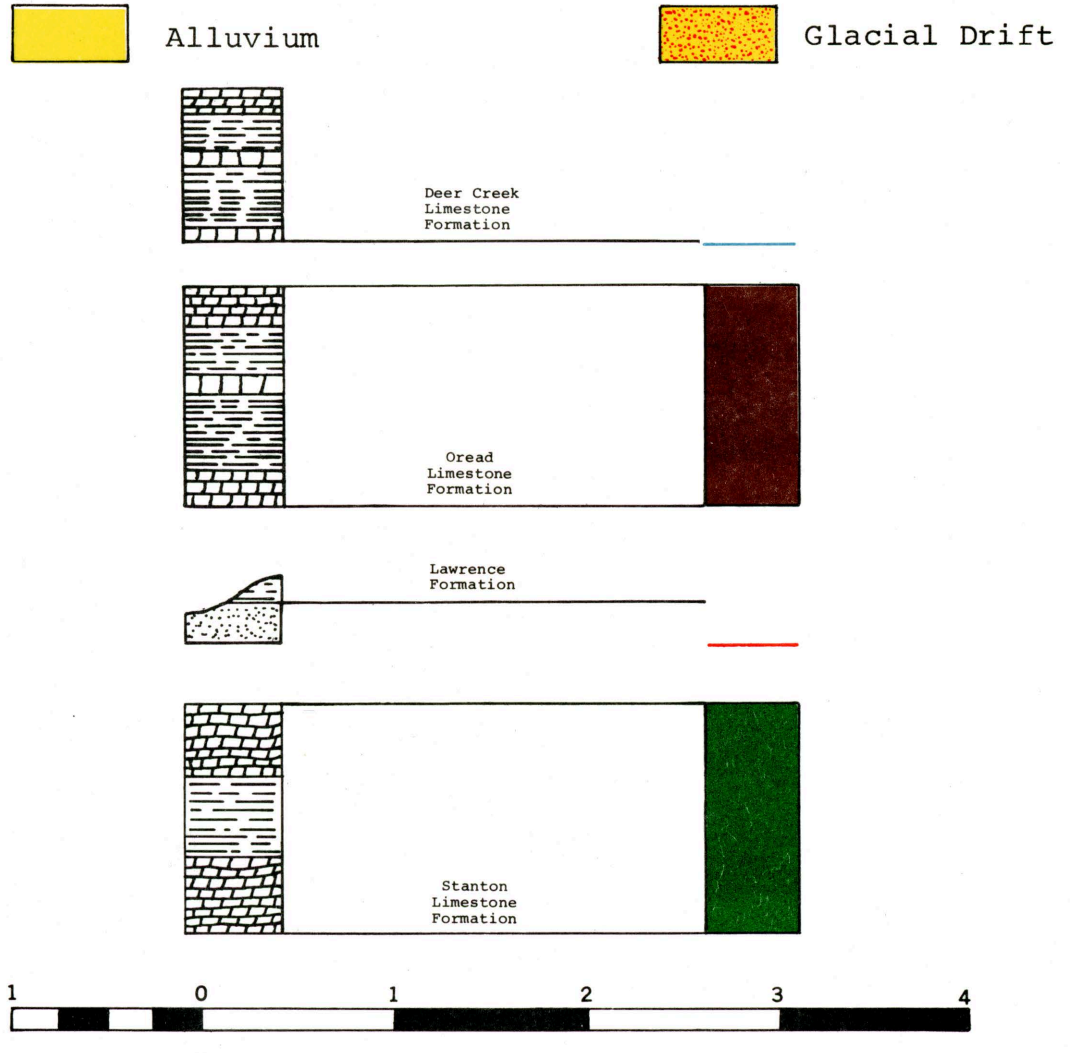
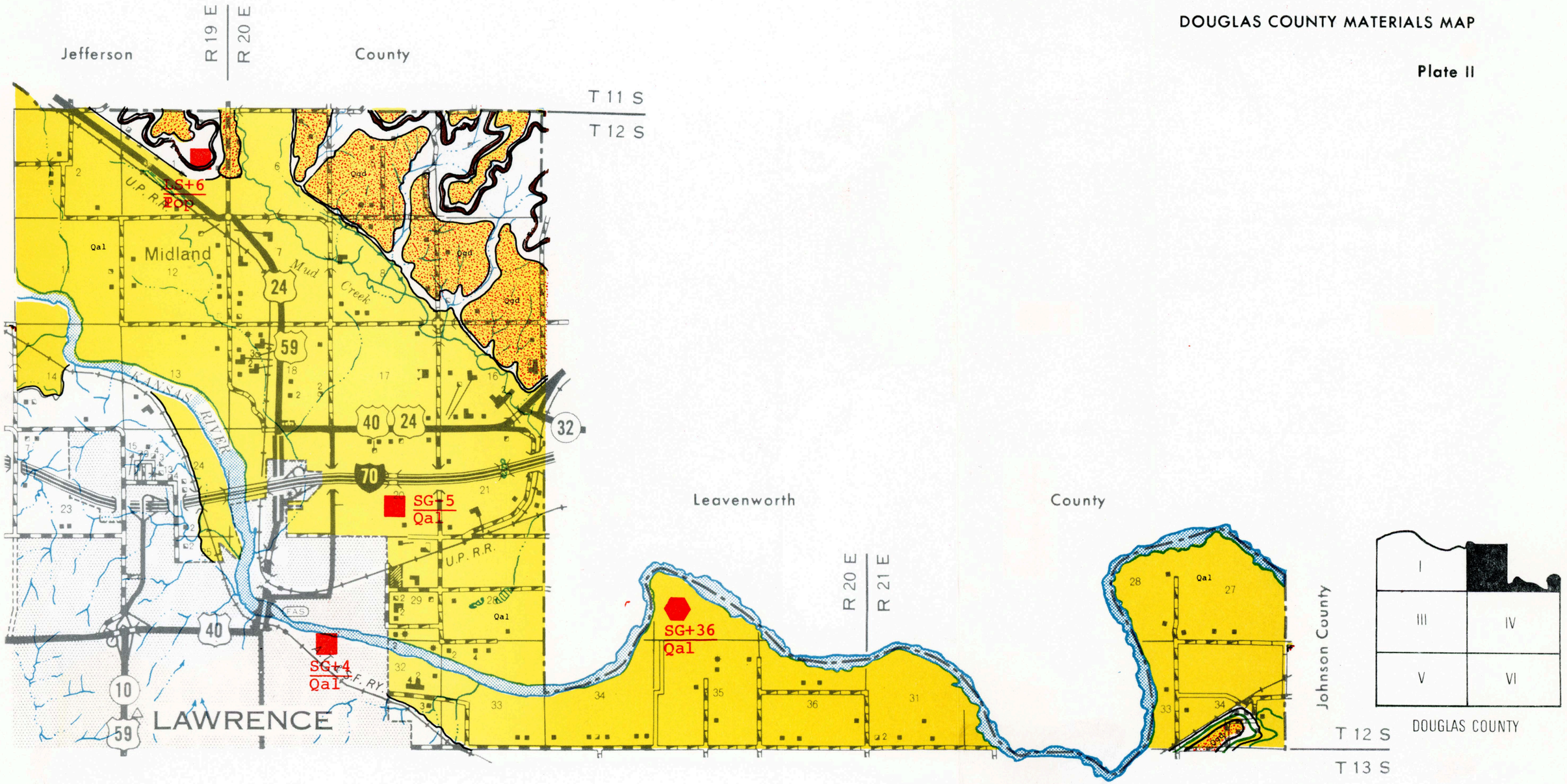


DOUGLAS COUNTY MATERIALS MAP

Plate II



LEGEND

MATERIALS SITE DESIGNATIONS

Material Type

SG Sand and Gravel
LS Limestone
SS Sandstone

SG+1
Qal

Estimated Quantity
+ indicates more than 20,000 cubic yards
- indicates less than 20,000 cubic yards

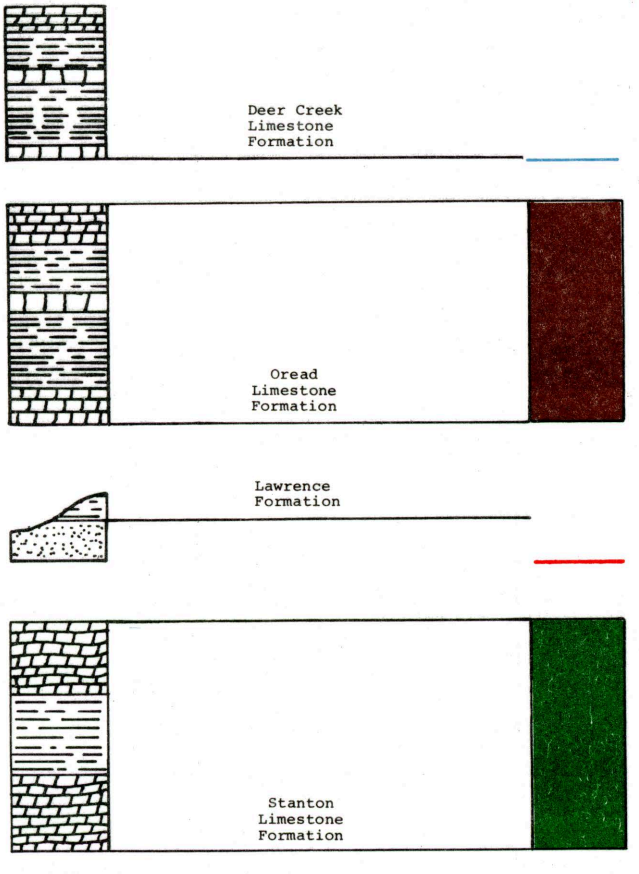
Reference to site number on following data forms

Geologic Age and Unit

GEOLOGY

Alluvium

Glacial Drift



DOUGLAS COUNTY MATERIALS MAP

Plate III

R 17 E | R 18 E | R 18 E | R 19 E

Shawnee County | Osage County

T 13 S

T 14 S

LS+37 Pdc

LS+38 Pop

LS+26 Pop

LS+9 Pop

LS+27 Pop

LS+39 Pop

LS+40 Pop

LS+8 Pop

LS+41 Pop

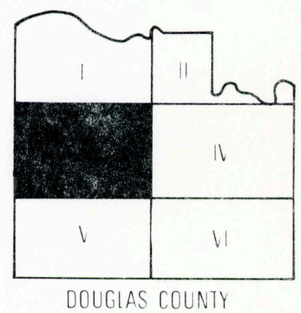
LS+1 Pop

LS+7 Pop

SG+28 Qgd

LS+42 Pop

LS+4 Pop



LEGEND

MATERIALS SITE DESIGNATIONS

SG+1
Qal

Material Type

SG Sand and Gravel
LS Limestone
SS Sandstone

Estimated Quantity
+ indicates more than 20,000 cubic yards
- indicates less than 20,000 cubic yards

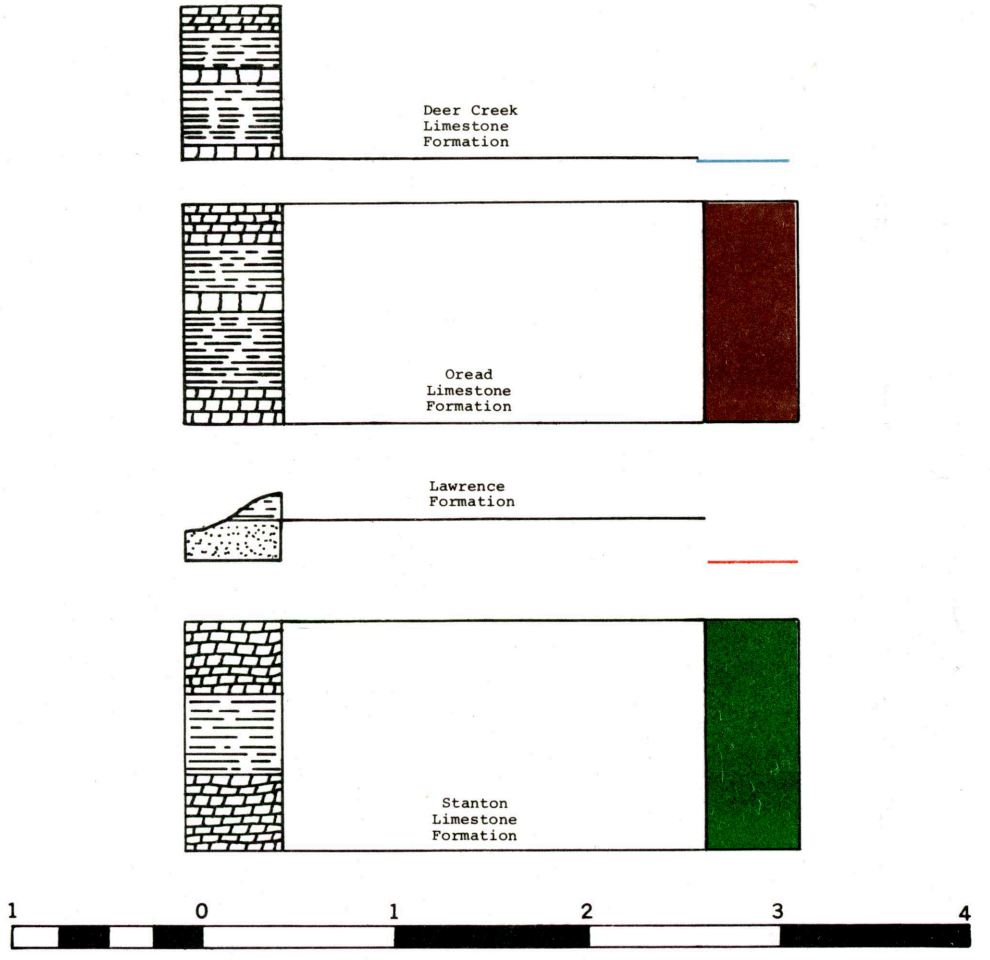
Reference to site number on following data forms

Geologic Age and Unit

GEOLOGY

Alluvium

Glacial Drift



DOUGLAS COUNTY MATERIALS MAP

Plate IV

R 19 E | R 20 E | R 20 E | R 21 E

T 12 S / T 13 S

LAWRENCE
POP. 32858

ATCHISON TOPEKA AND SANTA FE

KANSAS RIVER

WAKARUSA RIVER

Burroughs Creek

Cole Creek

Sibleyville

Pleasant Grove

LS+12
Ps

LS+44
Ps

LS+45
Ps

LS+13
Ps

LS+11
Ps

SG+29
Qgd

Qal

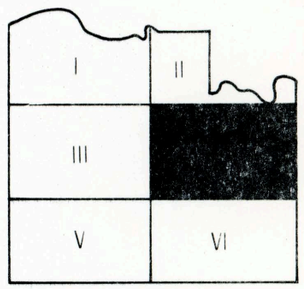
Qgd

10

Douglas County

Johnson County

T 13 S / T 14 S



DOUGLAS COUNTY

LEGEND

MATERIALS SITE DESIGNATIONS

Material Type

SG Sand and Gravel
LS Limestone
SS Sandstone

SG+1
Qal

Estimated Quantity
+ indicates more than 20,000 cubic yards
- indicates less than 20,000 cubic yards

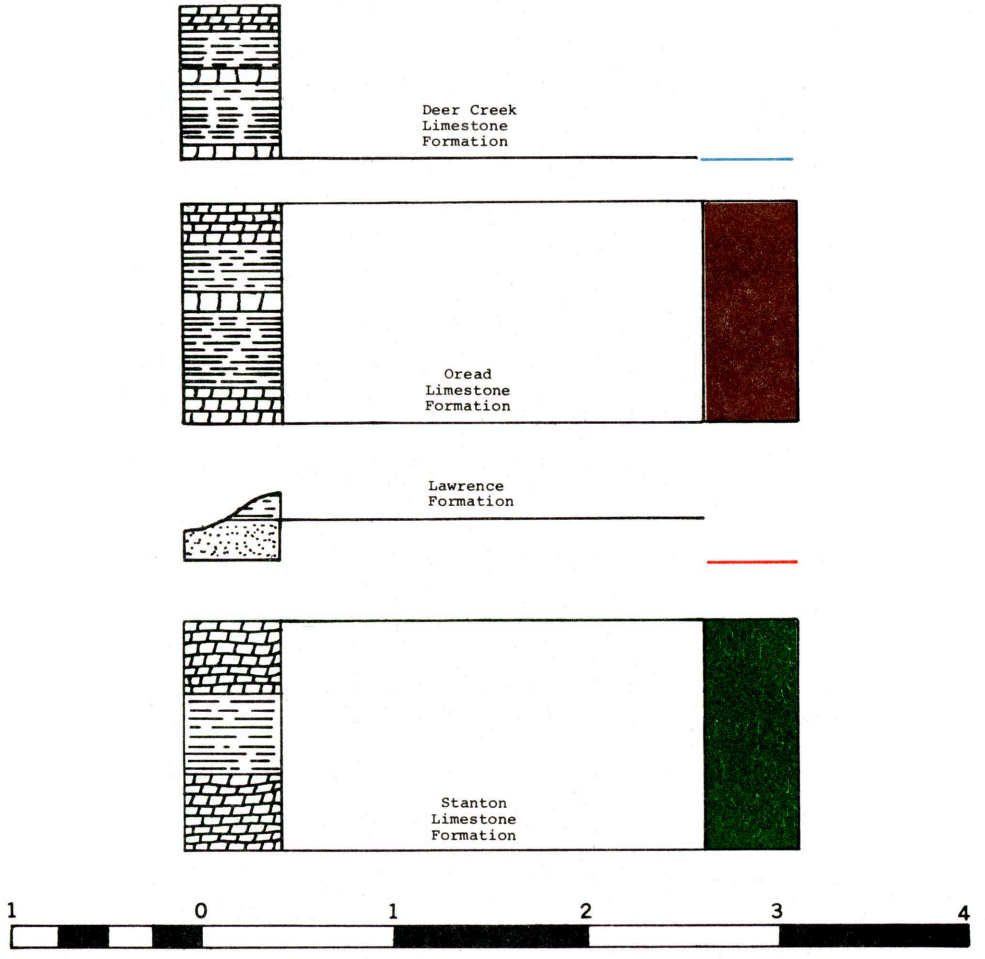
Reference to site number on following data forms

Geologic Age and Unit

GEOLOGY

Alluvium

Glacial Drift



DOUGLAS COUNTY MATERIALS MAP

Plate V

R 17 E | R 18 E | R 18 E | R 19 E

T 14 S
T 15 S

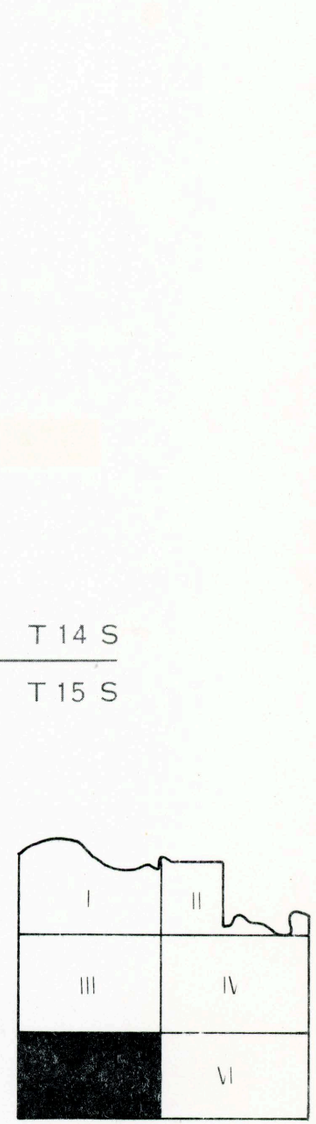
Osage County | Franklin County

Globe | Worden | Lone Star Lake

LS+30 Pop
LS+17 Pop
LS+14 Pop
LS+15 Pop
LS+16 Pop
LS+46 Pop
LS+18 Pop

Qal

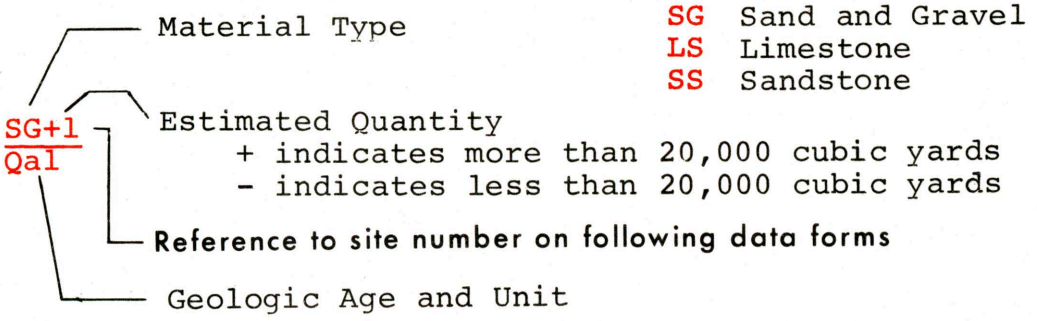
56



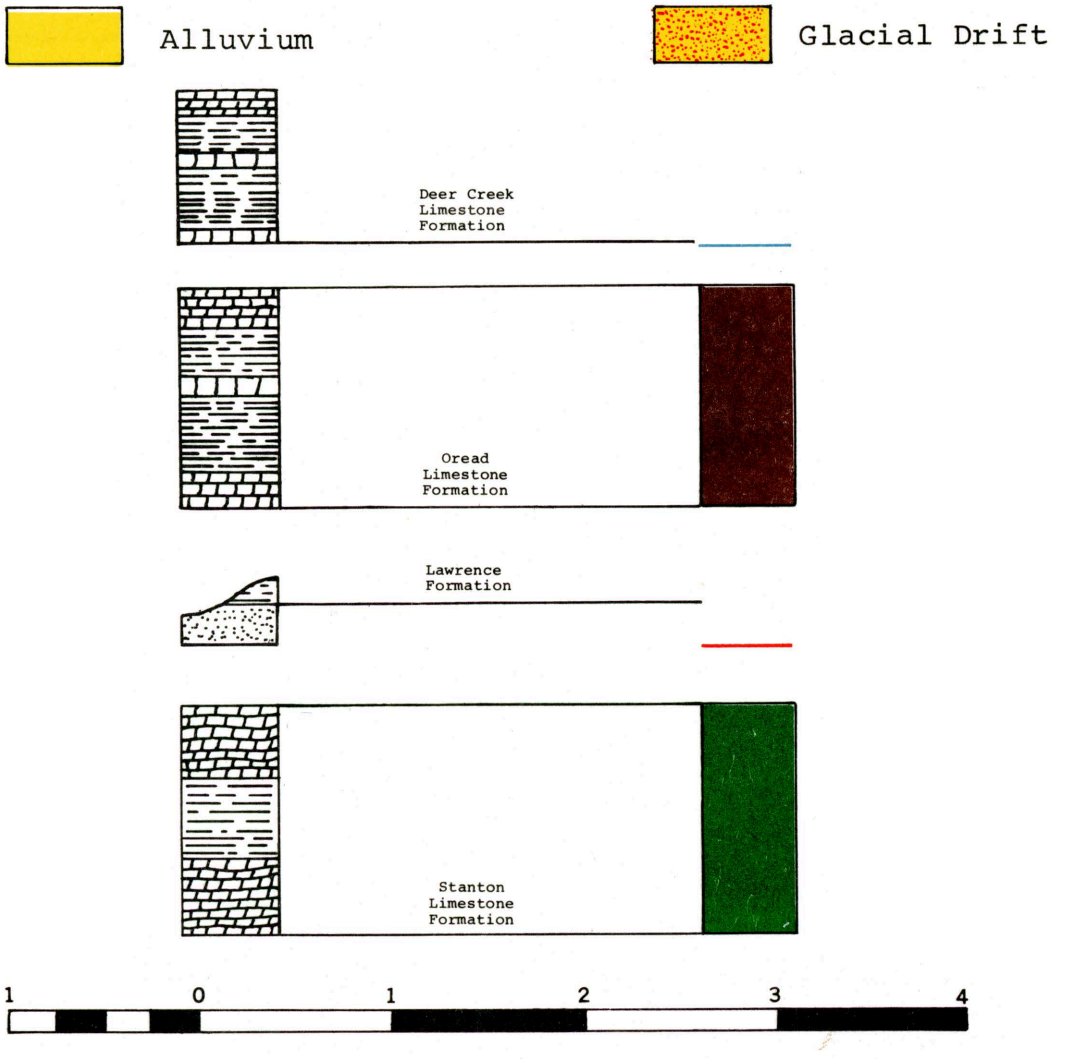
DOUGLAS COUNTY

LEGEND

MATERIALS SITE DESIGNATIONS



GEOLOGY



DOUGLAS COUNTY MATERIALS MAP

Plate VI

R 19 E | R 20 E | R 20 E | R 21 E

T 14 S
T 15 S

LS+19
Pop

LS+32
Pot

LS+21
Pot

LS+31
Pot

LS+20
Pot

SS+33
Pli

Vinland

BALDWIN
POP 1877

Qal

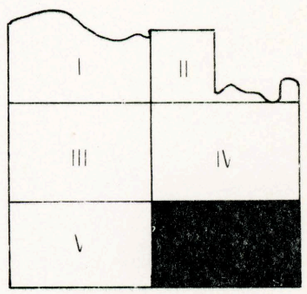
56

59

FAS 210

Franklin County

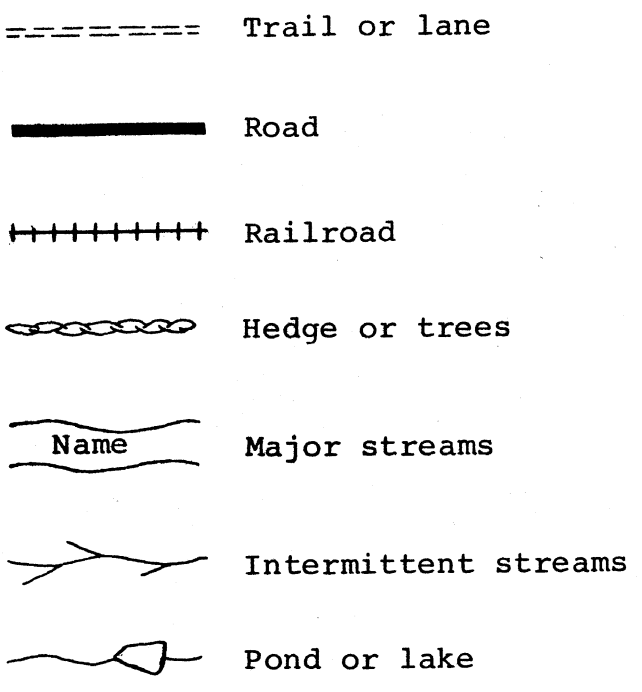
Johnson County

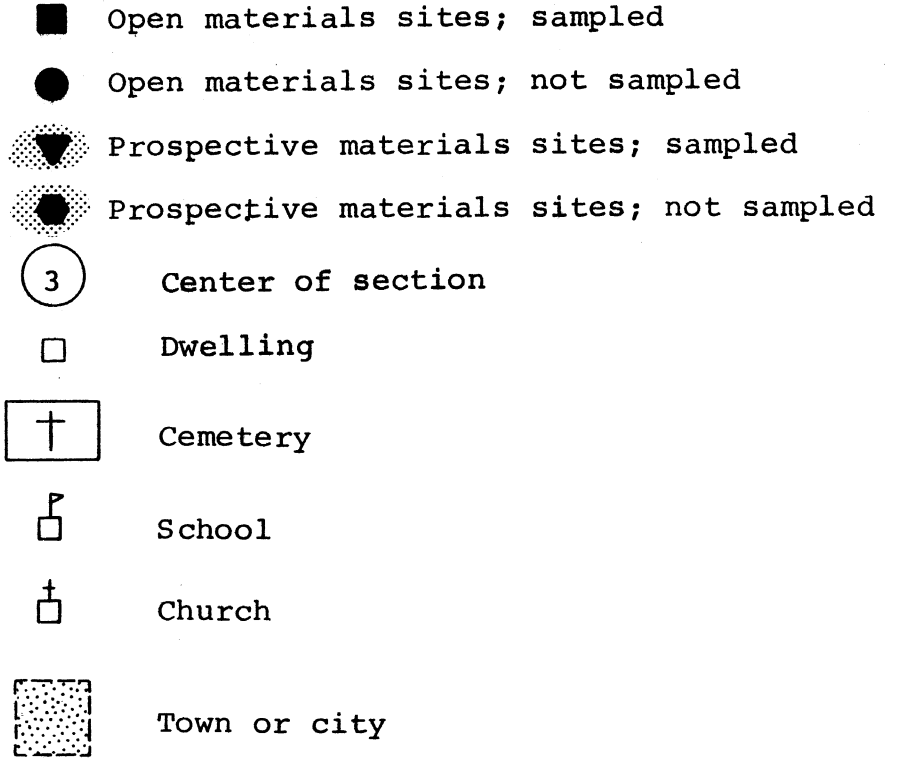


DOUGLAS COUNTY

OPEN MATERIALS SITES; SAMPLED

LEGEND





MATERIAL SITE DATA FORM

Site No. Ls+1 Pop Date August, 1971

Material Limestone County Douglas

Location $NW\frac{1}{4}$ of $NE\frac{1}{4}$ Sec. 21 Twp. 12S Range 19E

Owner Frank L. & Ethel D. Unfred (name), Route 1, Lawrence (address), Kansas

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC Lab. No. 69-2836

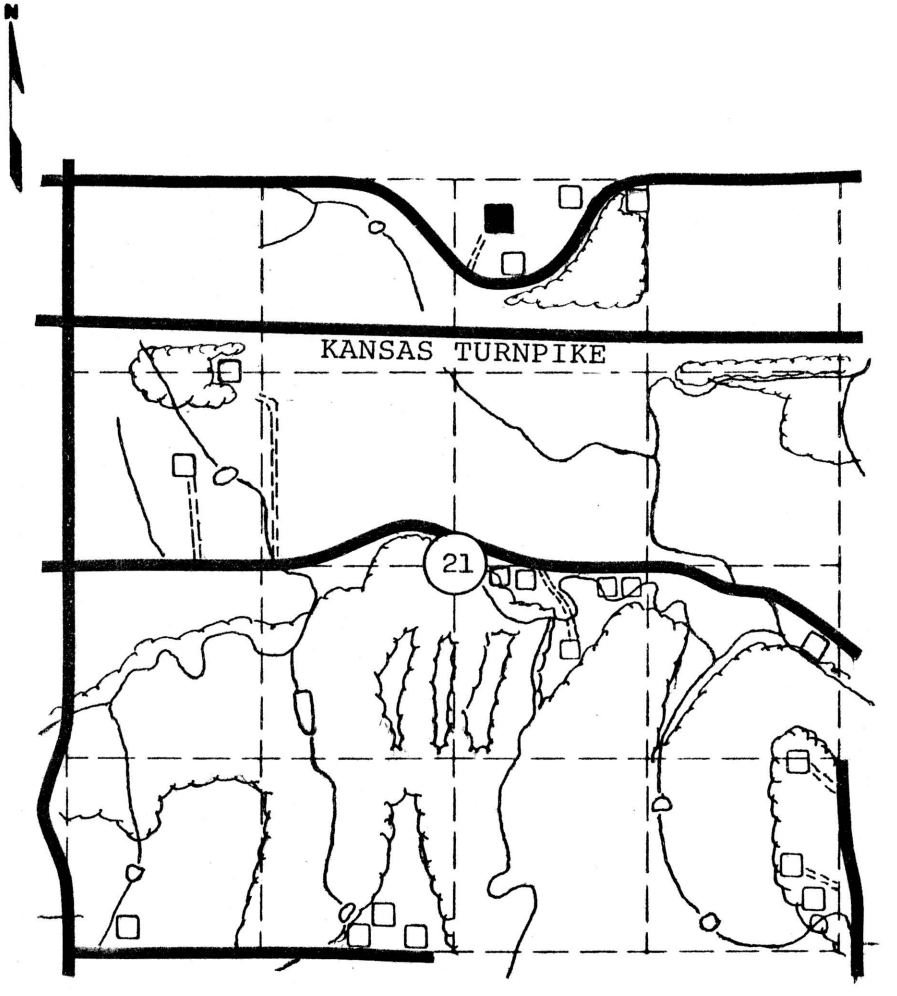
Specific Gravity (Sat.) 2.50 (Dry) 2.39

Los Angeles Wear 31.2

Absorption 4.71 Soundness 0.90

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+2 / Pop Date August 1971

Material Limestone County Douglas

Location SW¼ of SE ¼ Sec. 32 Twp. 12S Range 18E

Owner Charles A. Walter (name) RFD 1, Lecompton, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained								Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100					

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-26

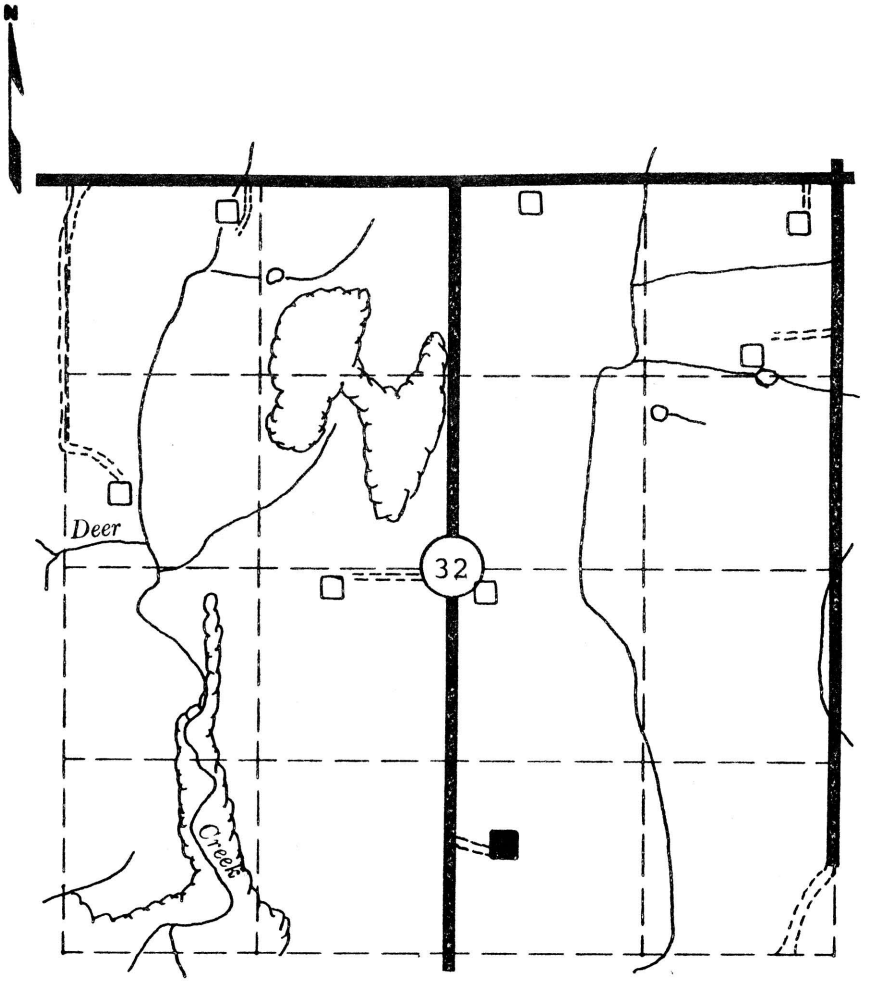
Specific Gravity (Sat.) 2.54, 2.56 (Dry) 2.45, 2.49

Los Angeles Wear 33.0

Absorption 3.62, 2.56 Soundness 0.91

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+3 / Pop Date August, 1971

Material Limestone County Douglas

Location SE¼ of SW¼ Sec. 35 Twp. 11S Range 18E

Owner James R. & Evelyn M. Hope (name), Lecompton, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23 - 28

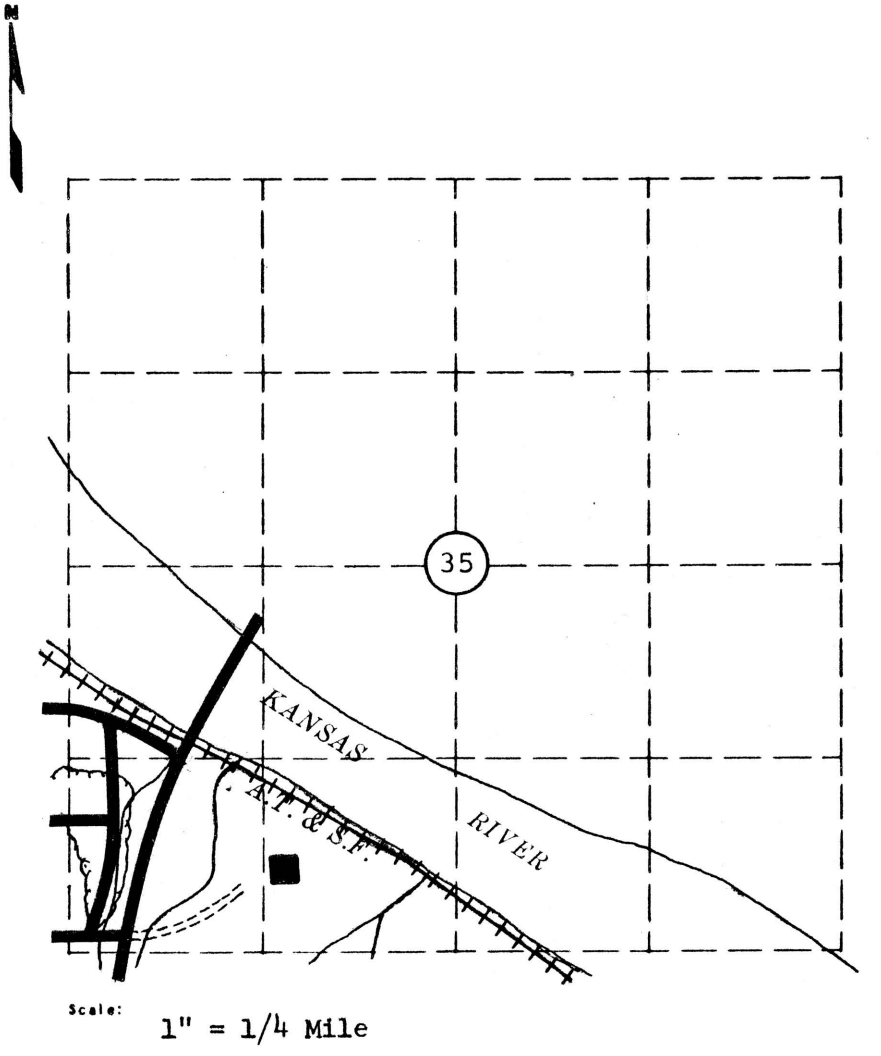
Specific Gravity (Sat.) 2.55 (Dry) 2.47

Los Angeles Wear 29.3

Absorption 3.26 Soundness 0.95

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. SG+4 / Qal Date August, 1971

Material Sand and Gravel County Douglas

Location SW¼ of SE¼ Sec. 30 Twp. 12S Range 20E

Owner City of Lawrence (name) Lawrence, Kansas (address)

Nature of Deposit Wet Accessibility Good Site Located on Plate II

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				
					0	0	1	5	15	35	86	99	0.29	2.41		

CORRELATION DATA

Geological Age Quaternary

Geological Source Alluvium

Material Similar To SHC 619 # 23 - 31

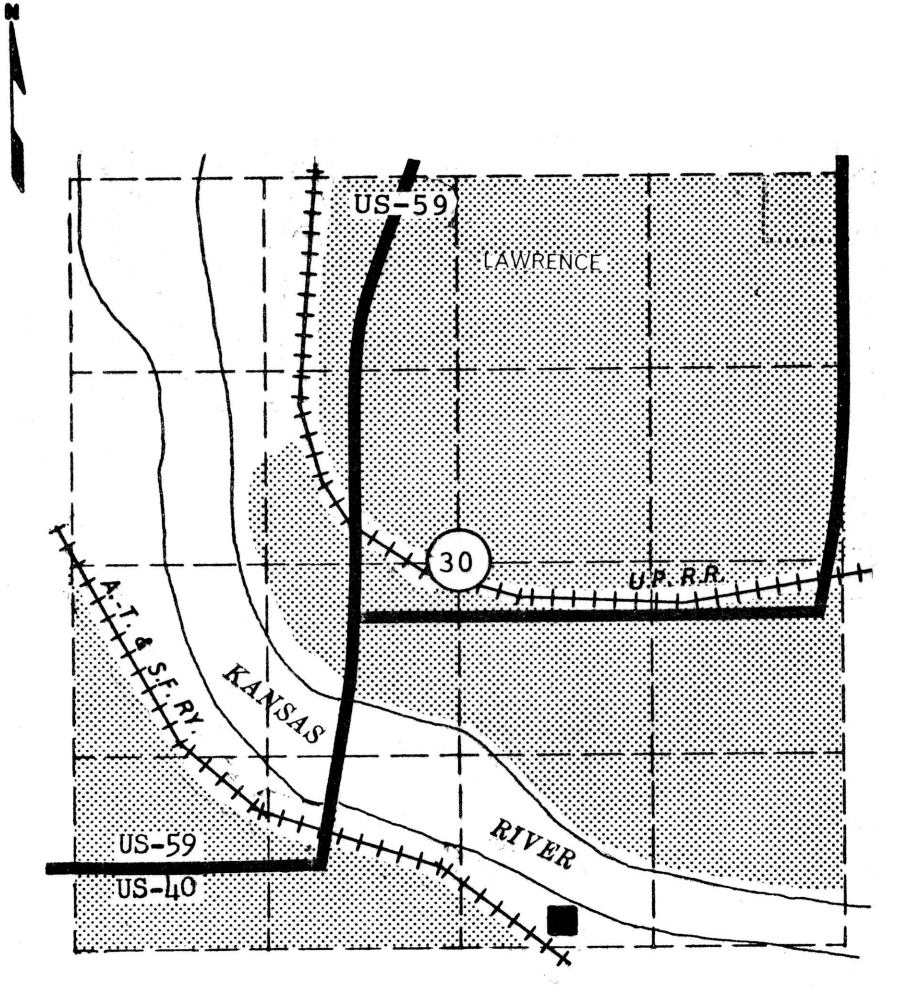
Specific Gravity (Sat.) 2.52 (Dry) 2.48

Los Angeles Wear 36.8

Absorption 1.64 Soundness 0.97

Wt. Cu.Ft. Str. Ratio

Remarks



Scale:
1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. SG-5 Qal Date August, 1971

Material Sand and Gravel County Douglas

Location NW¼ of SE¼ Sec. 20 Twp. 12S Range 20E

Owner Will H. Hayden etal (name) RFD #4, Lawrence, Kansas (address)

Nature of Deposit Wet Accessibility Good Site Located on Plate II

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				
					0	0	2	10	27	53	88	99	0.33	2.79		

CORRELATION DATA

Geological Age Quaternary

Geological Source Alluvium

Material Similar To SHC Lab. No. 71-834

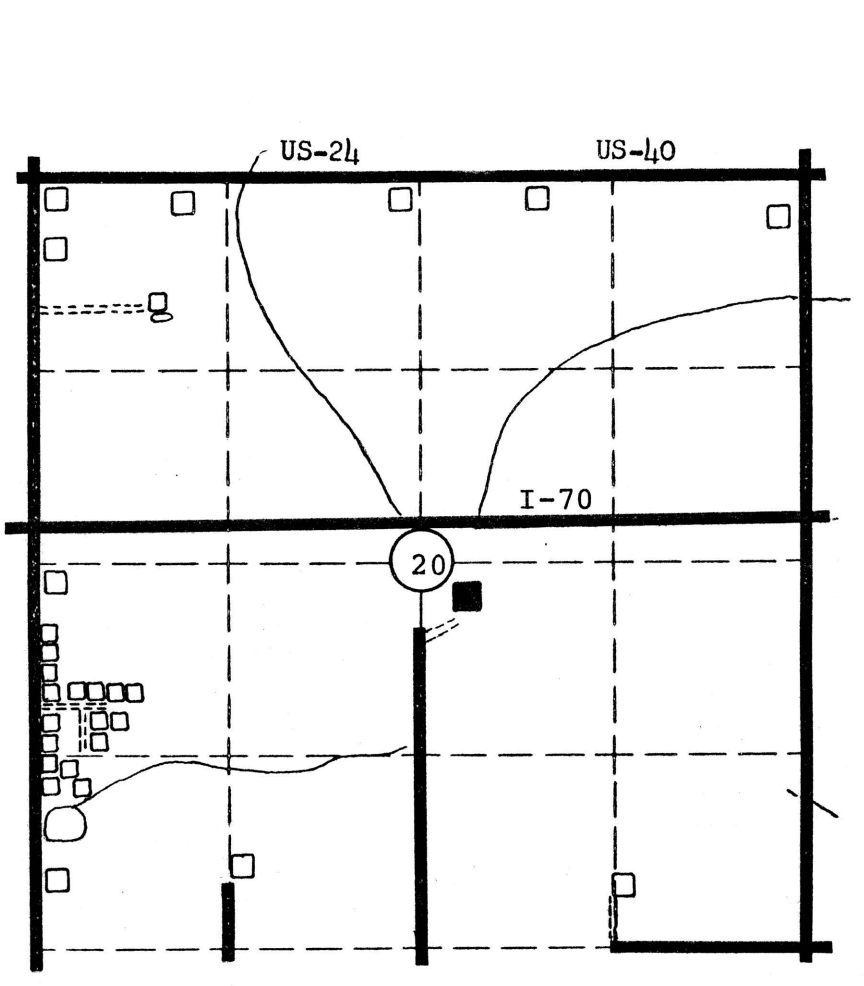
Specific Gravity (Sat.) 2.60 (Dry) 2.60

Los Angeles Wear 36.0 (D)

Absorption 0.30 Soundness 0.99

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+6 / Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of NE¼ Sec. 1 Twp. 12S Range 19E

Owner Annette S. Bumgardner (name), 2529 Moundview Dr., Lawrence, Ks. (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate II

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 + 23-15

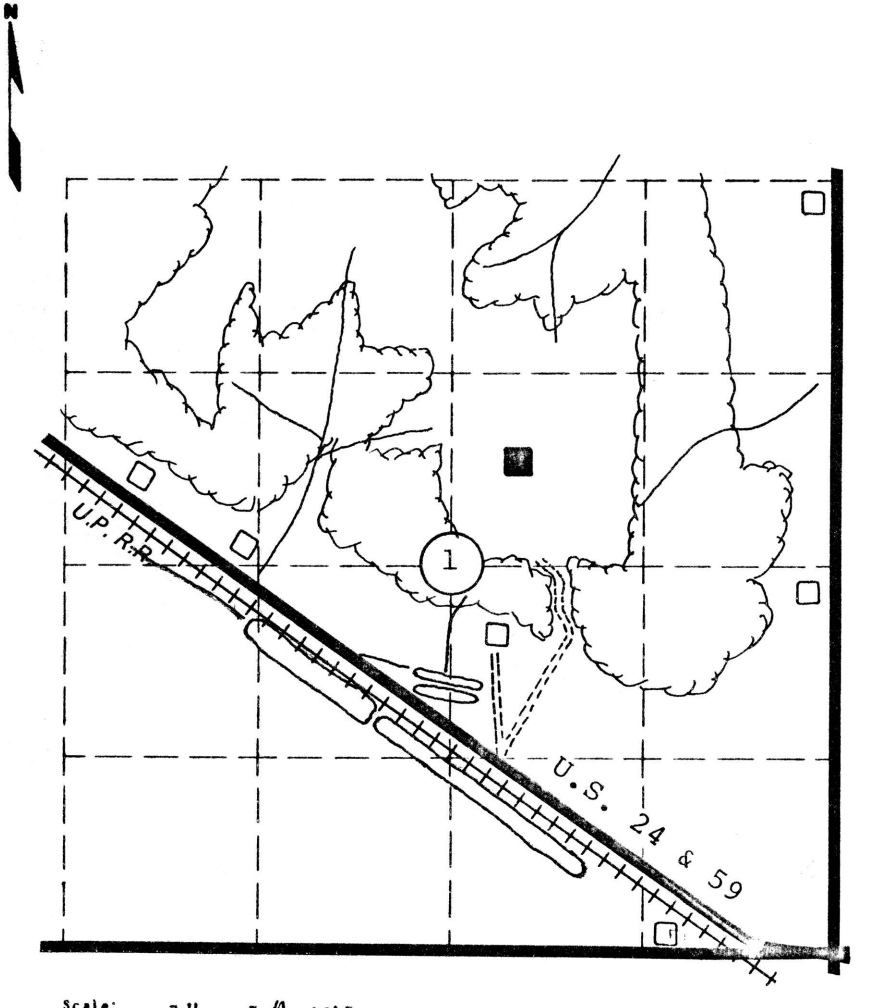
Specific Gravity (Sat.) 2.54 (Dry) 2.46

Los Angeles Wear 29.0

Absorption 3.07 Soundness 0.97

Wt. Cu.Ft. ____ Str. Ratio ____

Remarks ____



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+7 / Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of NE¼ Sec. 34 Twp. 13S Range 19E

Owner Donald Anthony & Lillie May Stitler (name) RFD #5, Lawrence (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC Lab No. 67-426

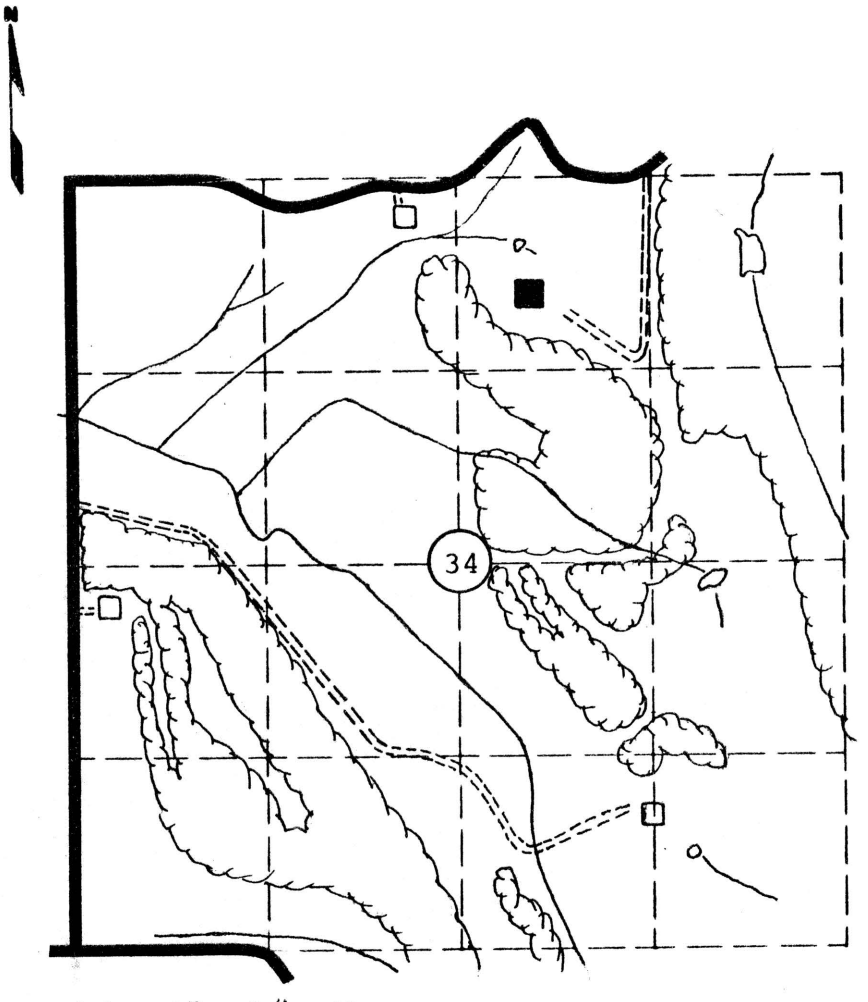
Specitic Gravity (Sat.) 2.60 (Dry) 2.53

Los Angeles Wear 29.6

Absorption 2.73 Soundness 0.84

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+8 / Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of SW ¼ Sec. 20 Twp. 13S Range 19E

Owner See below

Nature of Deposit Dry (name) Accessibility Fair (address) Site Located on Plate III

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-24

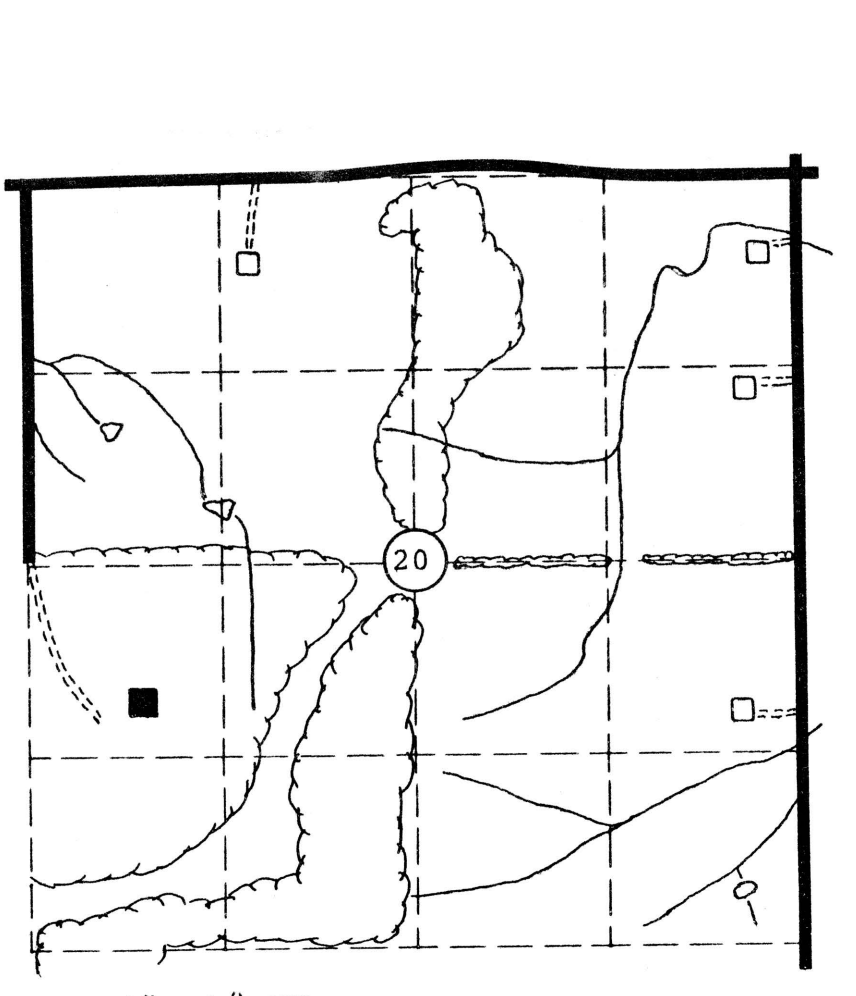
Specific Gravity (Sat.) 2.50 (Dry) 2.45

Los Angeles Wear 30.5

Absorption 3.00 Soundness 0.92

Wt. Cu.Ft. Str. Ratio

Remarks United States of America % Atty. for Corps of Engineers
601 E. 12th St., 656 Fed. Bldg., Kansas City, Mo. 64106



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+9 / Pop- Date August, 1971

Material Limestone County Douglas

Location NE¼ of SW ¼ Sec. 4 Twp. 13S Range 19E

Owner City of Lawrence (name) Lawrence, Kansas (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate III

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23 - 25 A portion of the quarry is used for a sanitary land fill

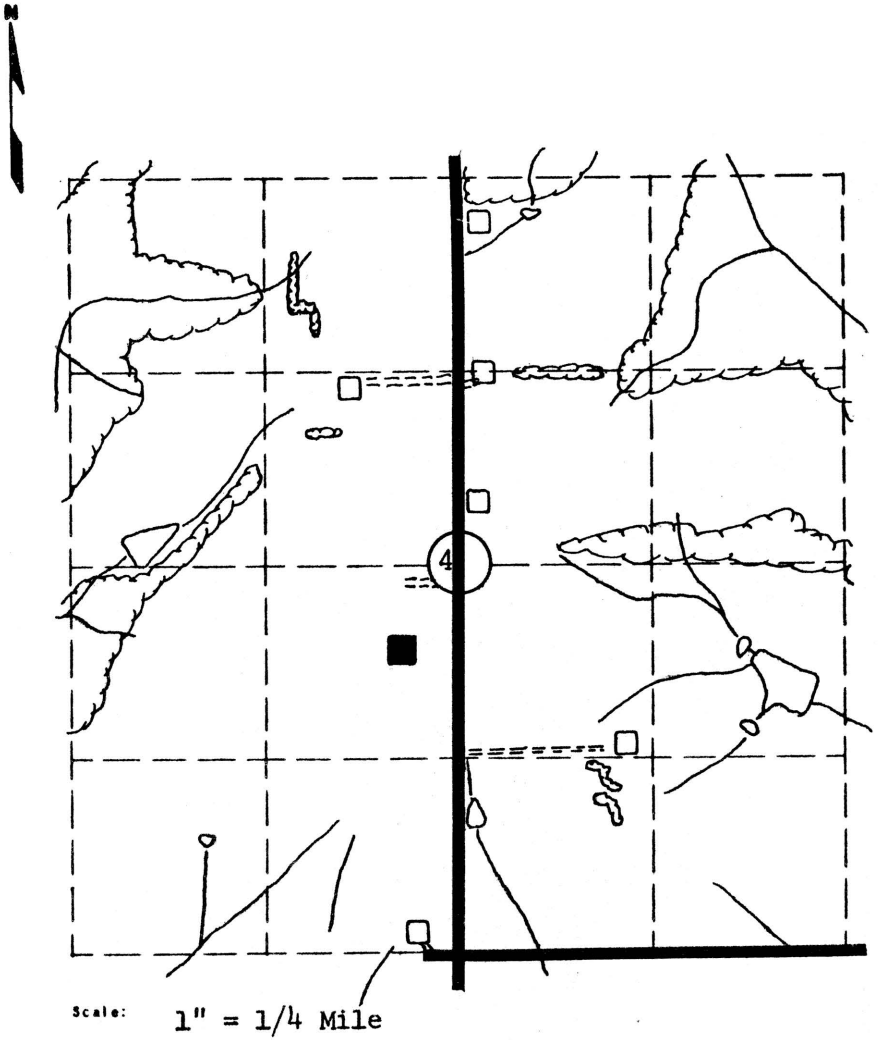
Specific Gravity (Sat.) 2.53 (Dry) 2.44

Los Angeles Wear 30.1

Absorption 3.55 Soundness 0.96

Wt. Cu.Ft. Str. Ratio

Remarks



MATERIAL SITE DATA FORM

Site No. Ls+10 / Pop Date August, 1971

Material Limestone County Douglas

Location N½ Sec. 34 Twp. 13S Range 18E

Owner Fred H. & Edna Torneden (name), RFD 5, Lawrence, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-32

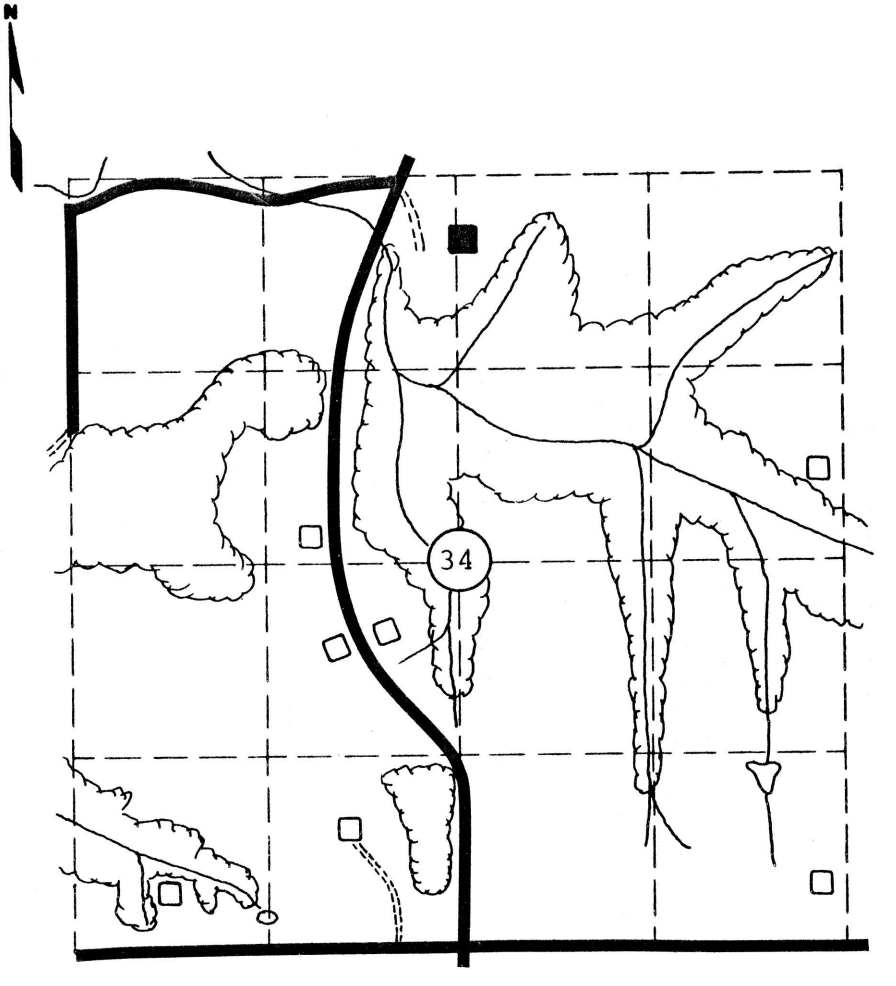
Specific Gravity (Sat.) 2.49 (Dry) 2.40

Los Angeles Wear 30.8

Absorption 3.61 Soundness 0.98

Wt. Cu.Ft. ____ Str. Ratio ____

Remarks ____



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+11 / Ps Date August, 1971

Material Limestone County Douglas

Location NW¼ Sec. 20 Twp. 13S Range 21E

Owner Fred A. Bremer (name) 412 Dakota St., Lawrence, Ks. (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate IV

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Stanton Formation - Stoner Member

Material Similar To SHC Lab. No. 69-3155

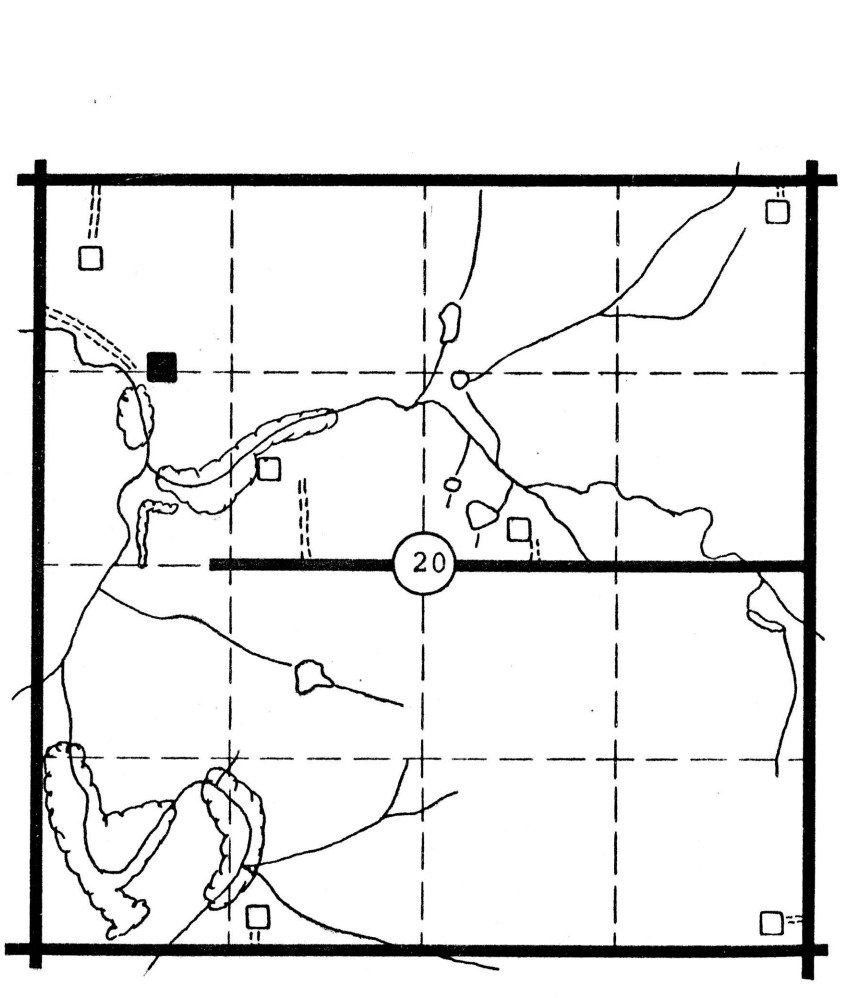
Specific Gravity (Sat.) 2.60 (Dry) 2.53

Los Angeles Wear 30.1

Absorption 2.57 Soundness 0.97

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+12 / Ps Date August 1971

Material Limestone County Douglas

Location NE¼ of NE¼ Sec. 4 Twp. 13S Range 21E

Owner Oscar Lothholz (name) Eudora, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate IV

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	S.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Stanton Formation - Stoner Member

Material Similar To SHC 619 # 23-5

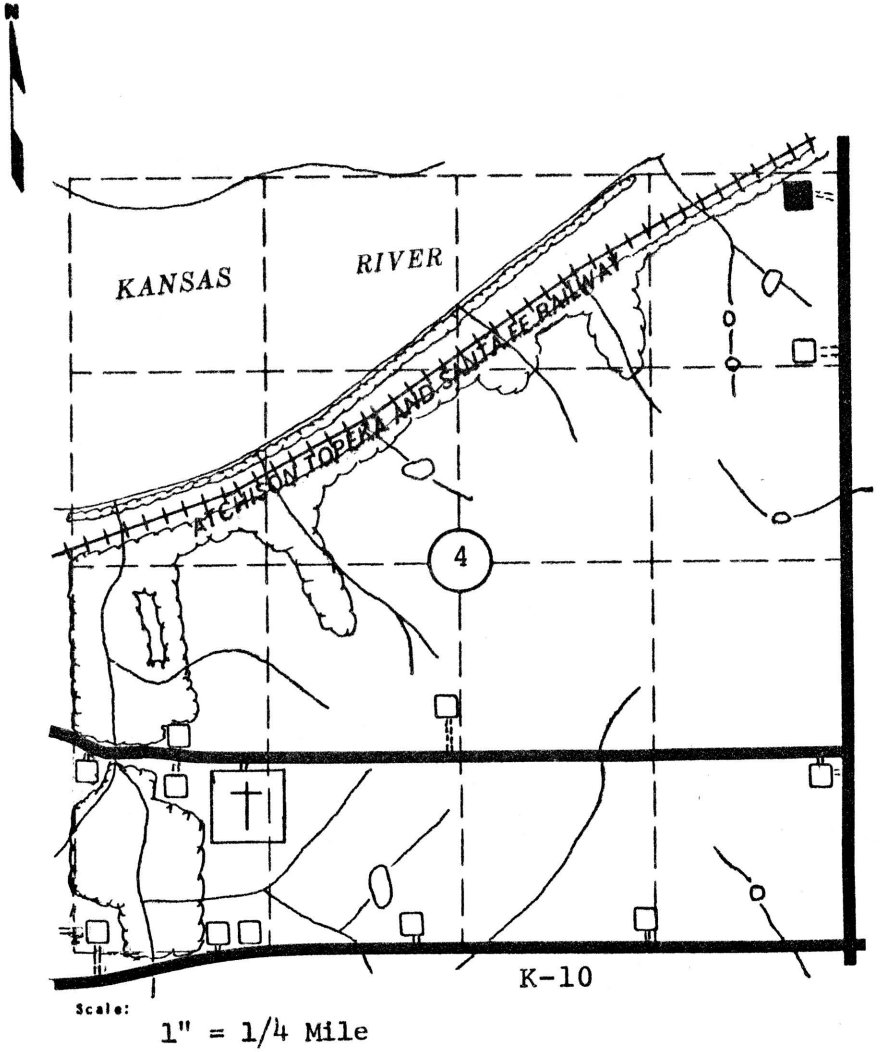
Specific Gravity (Sat.) 2.63 (Dry) 2.56

Los Angeles Wear 30.1

Absorption 2.77 Soundness 0.98

Wt. Cu.Ft. Str. Ratio

Remarks



MATERIAL SITE DATA FORM

Site No. Ls+13 / Ps Date August 1971

Material Limestone County Douglas

Location SE¼ of SE¼ Sec. 15 Twp. 13S Range 21E

Owner Howard U. & Martha K. Petefish, Rte. 2, Eudora, Kans.
(name / address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate IV

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Stanton Formation - Stoner Member

Material Similar To SHC Lab. No. 69-3156

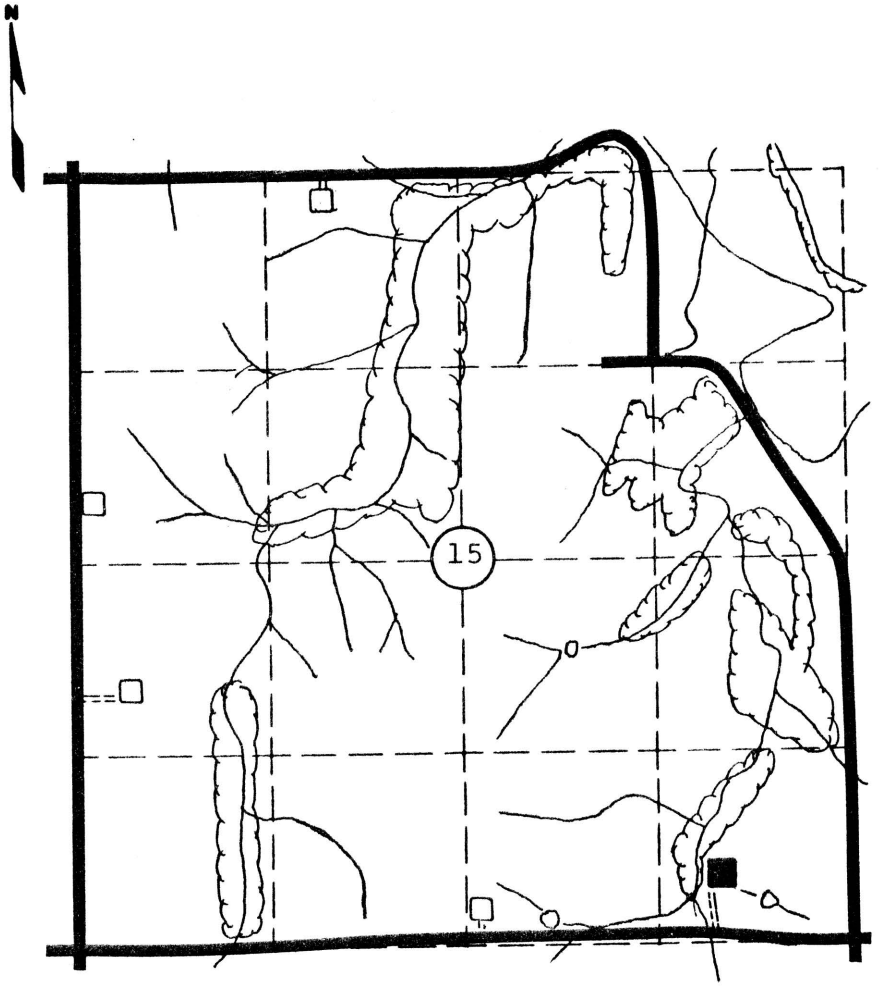
Specific Gravity (Sat.) 2.61 (Dry) 2.56

Los Angeles Wear 36.9

Absorption 1.86 Soundness 0.97

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+14 / Pop Date August, 1971

Material Limestone County Douglas

Location $SW\frac{1}{4}$ of $SW\frac{1}{4}$ Sec. 24 Twp. 14S Range 18E

Owner Bradford H. Powell Jr., RFD #5, Lawrence, Kansas
(name / address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate V

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained 1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P.I.

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23 - 18

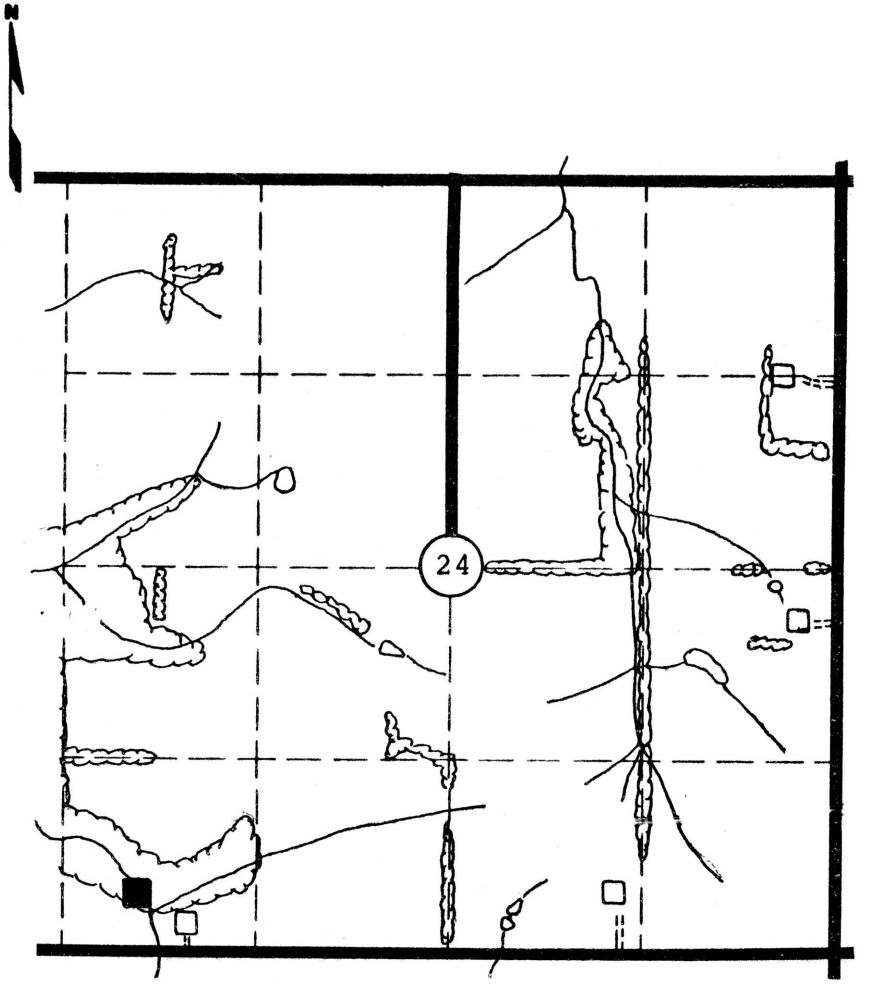
Specific Gravity (Sat.) 2.55 (Dry) 2.48

Los Angeles Wear 30.3

Absorption 2.50 Soundness 0.93

Wt. Cu.Ft. Str. Ratio

Remarks Cemetery in the Center of the Section



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+15 Pop Date August, 1971

Material Limestone County Douglas

Location NE¼ of NE¼ Sec. 2 Twp. 15S Range 18E

Owner George K. Melvin (name) 740½ Massachusetts, Lawrence, Ks. (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate V

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained 1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P.I.

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC Lab. No. 54762

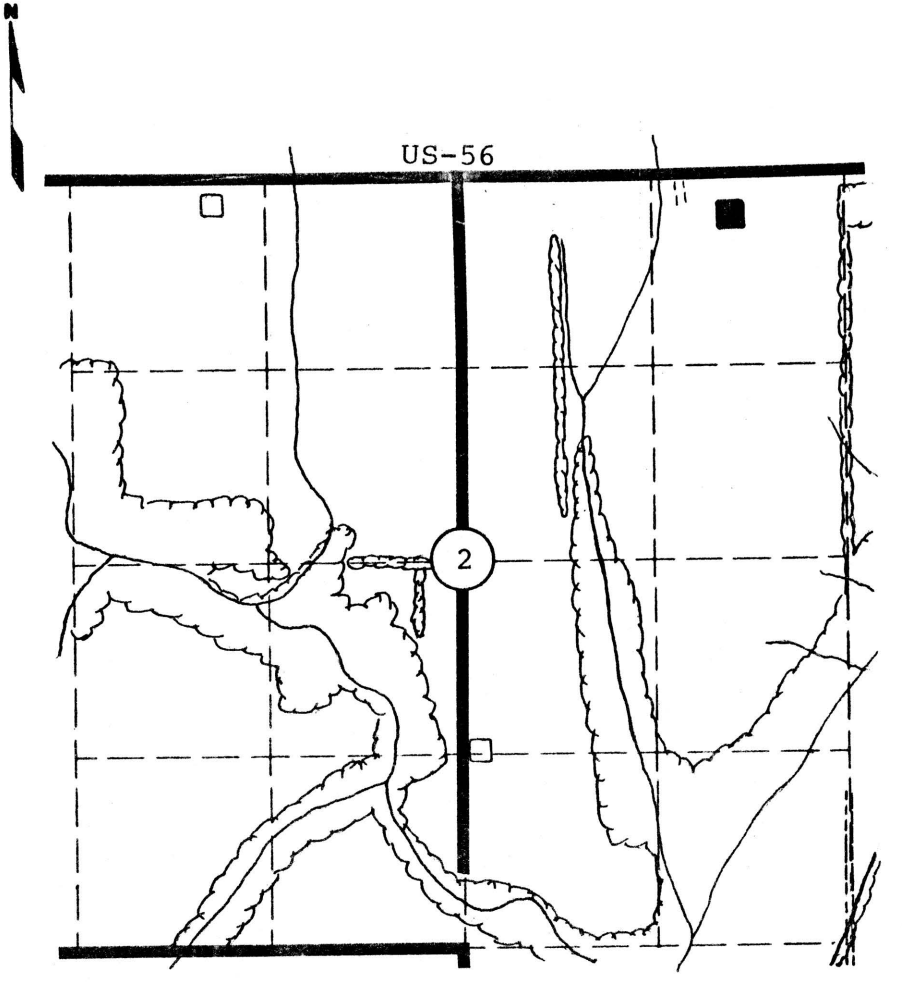
Specific Gravity (Sat.) 2.53 (Dry) 2.46

Los Angeles Wear 31.6

Absorption 2.52 Soundness 0.94

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+15 Rop Date August, 1971

Material Limestone County Douglas

Location NW¼ of NE¼ Sec. 15 Twp. 15S Range 18E

Owner Lyle W. Clark, P.O. Box 527, Baldwin, Kansas (name / address)

Nature of Deposit Dry Accessibility Good Site Located on Plate V

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-17

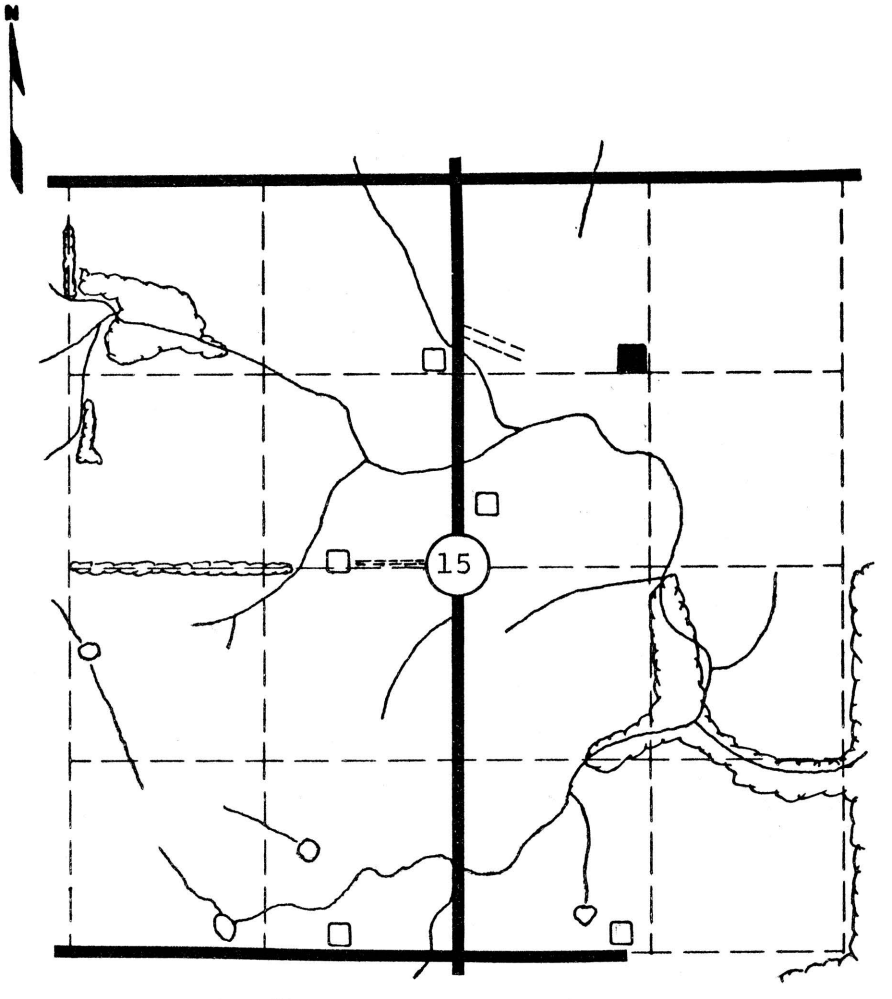
Specific Gravity (Sat.) 2.55 (Dry) 2.48

Los Angeles Wear 30.4

Absorption 3.51 Soundness 0.89

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+17 / Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of SE ¼ Sec. 22 Twp. 14S Range 18E

Owner H. L. & John Edward Dillen & John Marlin Flory (name) Rt. 5 Lawrence, Ks. (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate V

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-22

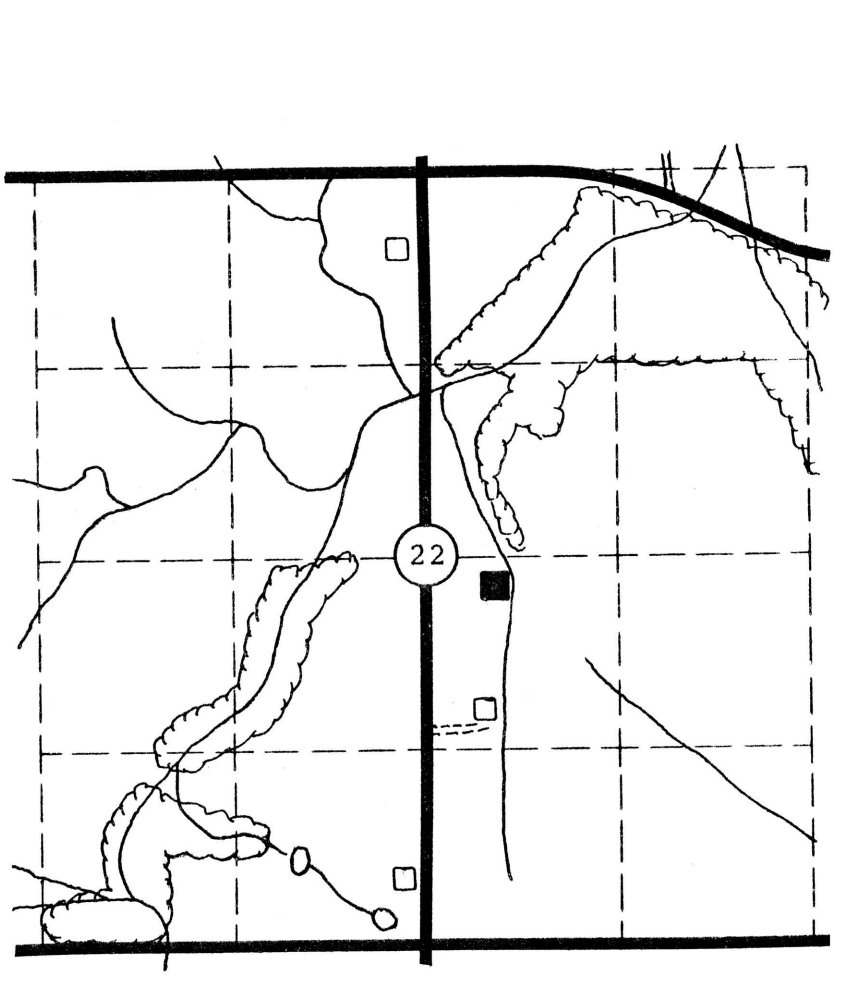
Specific Gravity (Sat.) 2.50 (Dry) 2.41

Los Angeles Wear 33.6

Absorption 3.77 Soundness 0.92

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+18 / Pop Date August 1971

Material Limestone County Douglas

Location SE¼ SE¼ Sec. 13 Twp. 15S Range 17E

Owner John W. & Lefa E. Snyder (name), Rte. 1, Overbook (address), Kansas

Nature of Deposit Dry Accessibility Poor Site Located on Plate V

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Overburden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-21

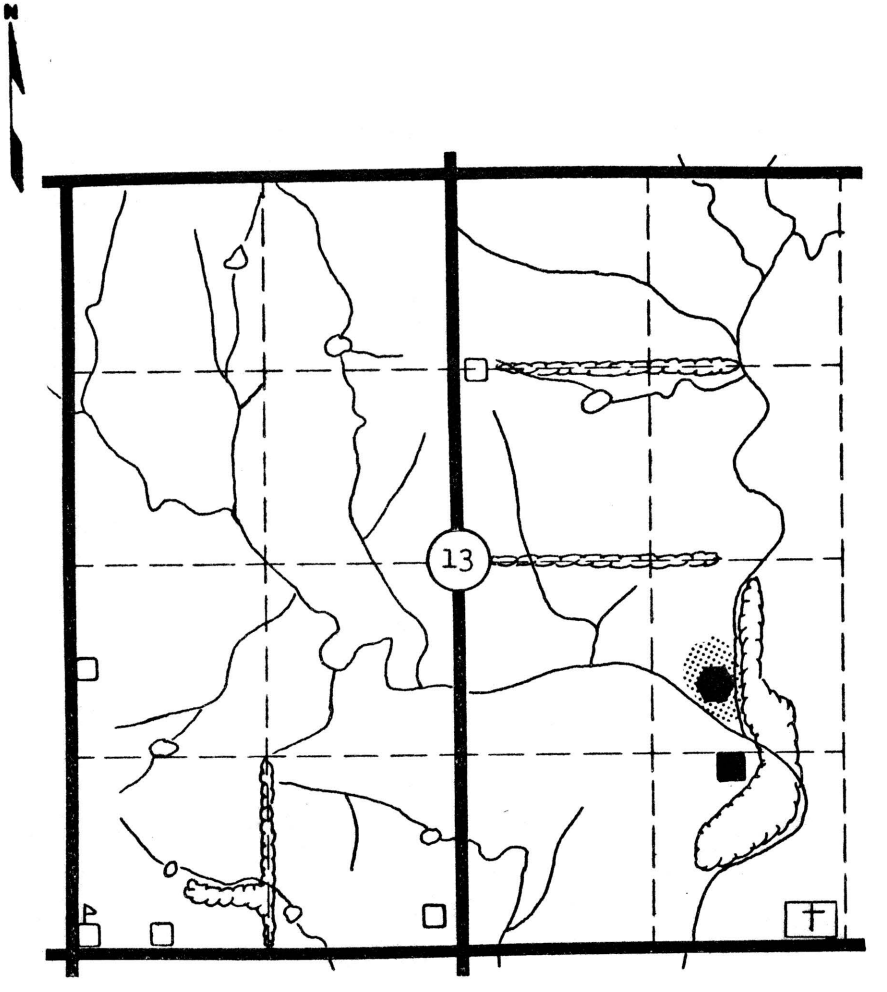
Specific Gravity (Sat.) 2.51 (Dry) 2.42

Los Angeles Wear 32.4

Absorption 3.53 Soundness 0.94

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+19 / Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of NW¼ Sec. 14 Twp. 14S Range 19E

Owner Marvin E. & Anna C. Flory, RFD #2, Lawrence, Kansas (name / address)

Nature of Deposit Dry Accessibility Good Site Located on Plate VI

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC 619 # 23-23

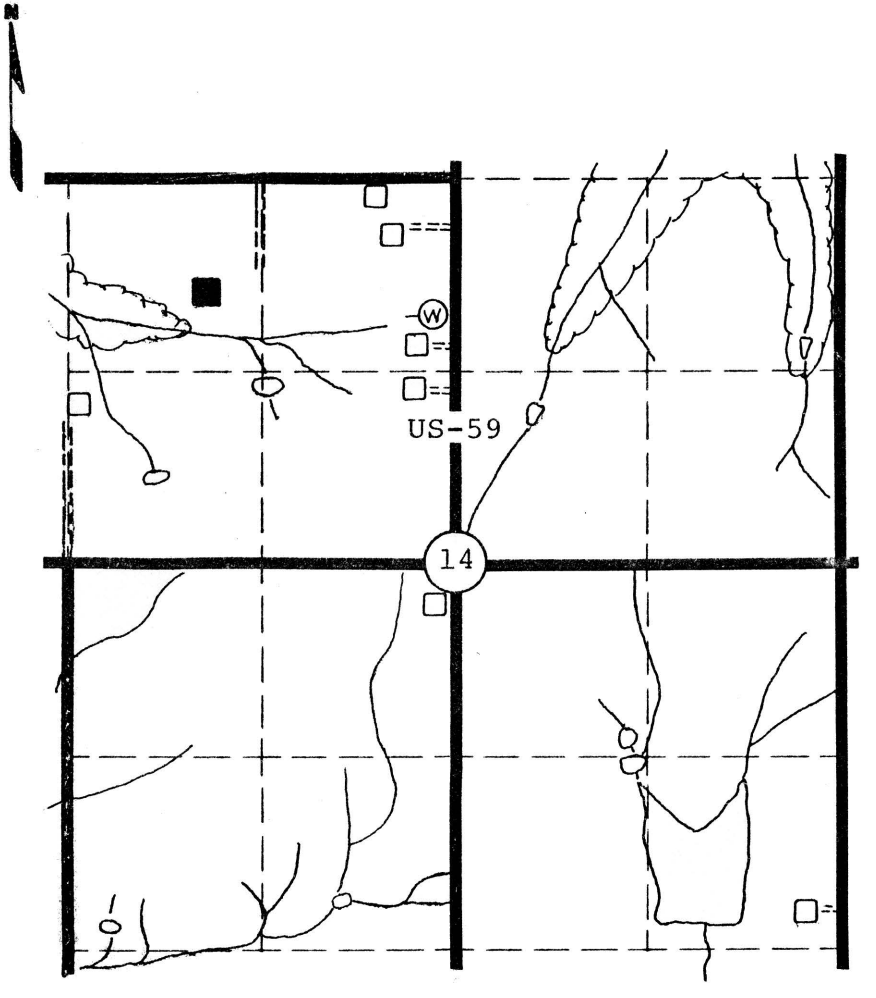
Specific Gravity (Sat.) 2.58 (Dry) 2.44

Los Angeles Wear 33.5

Absorption 3.75 Soundness 0.90

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. LS-20 Pit — Date August, 1971

Material Limestone — County Douglas

Location SE¼ of NE¼ — Sec. 28 — Twp. 14S — Range 20E

Owner Walter Kennedy (name) — Baldwin, Kansas (address)

Nature of Deposit Dry — Accessibility Good — Site Located on Plate VI

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	S.E.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Toronto Member

Material Similar To SHC No. 23-30

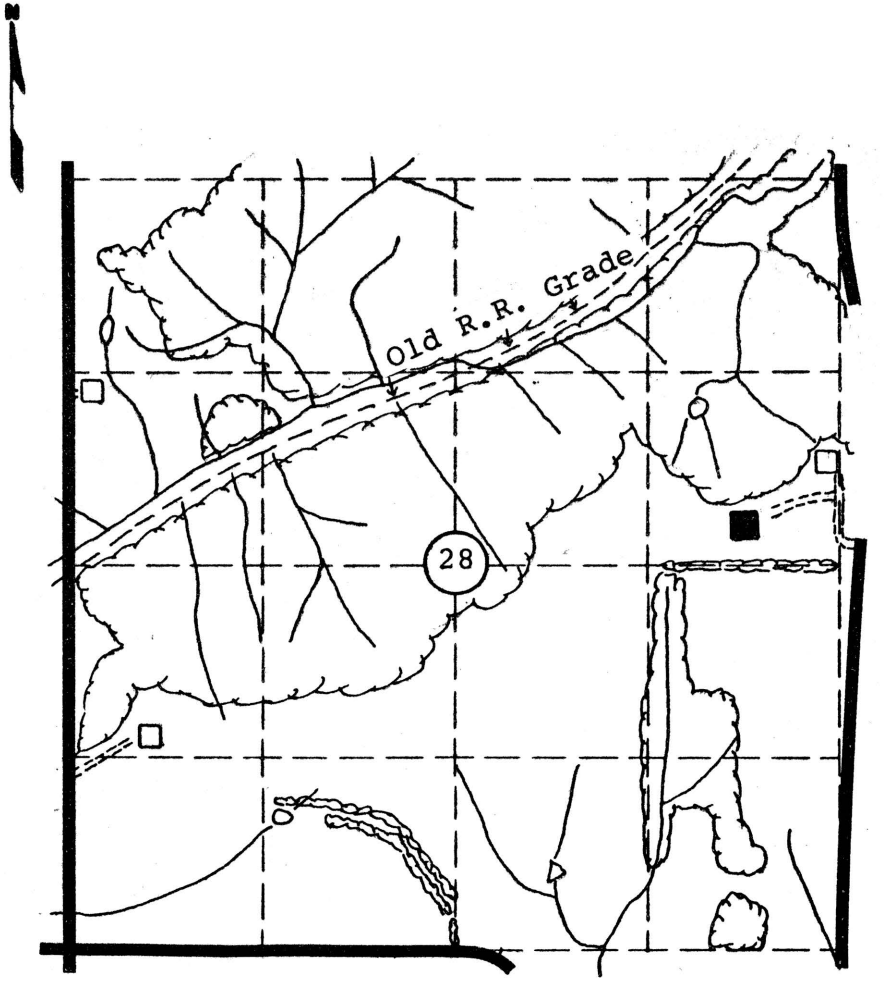
Specific Gravity (Sat.) 2.62 (Dry) 2.54

Los Angeles Wear 30.1

Absorption 3.17 Soundness 0.97

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+21 Pot Date August, 1971

Material Limestone County Douglas

Location SW¼ of SW¼ Sec. 21 Twp. 14S Range 20E

Owner Raymond & Darlene Schutz, RFD #2, Baldwin, Kansas (name / address)

Nature of Deposit Dry Accessibility Good Site Located on Plate VI

Status of Site Open Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained 1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P.I.

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Toronto Member

Material Similar To SHC Lab. No. 70-500

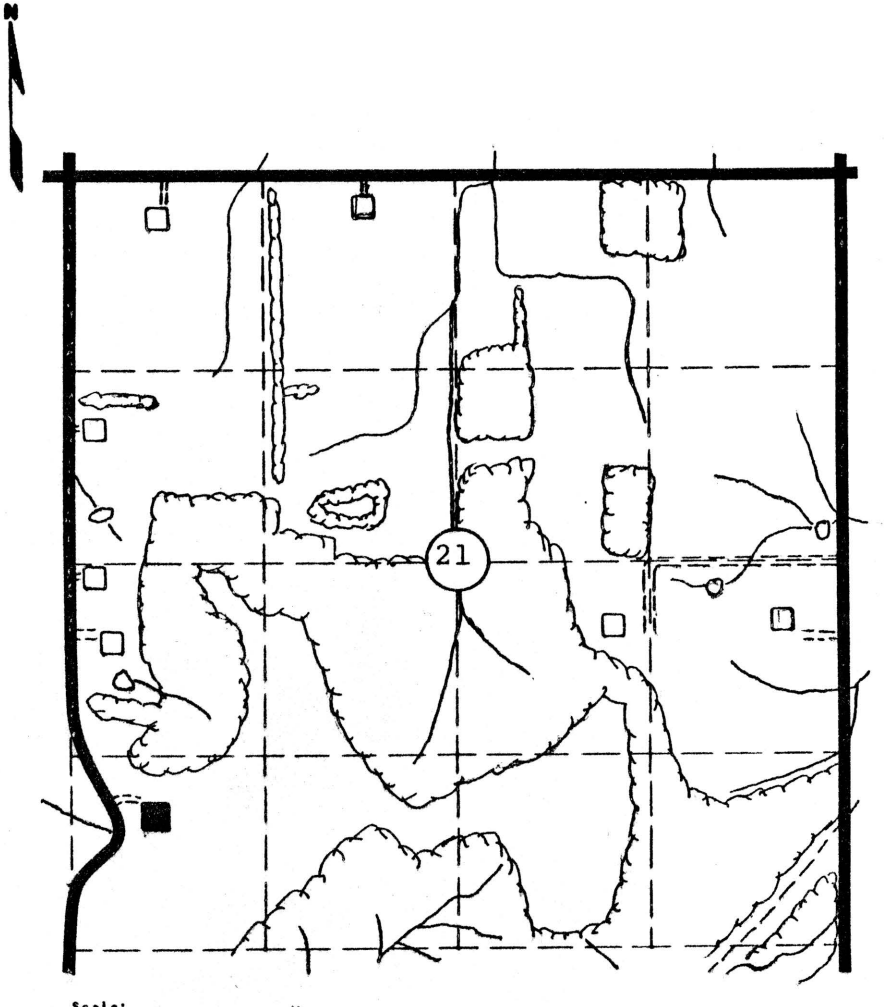
Specific Gravity (Sat.) 2.60 (Dry) 2.54

Los Angeles Wear 26.9

Absorption 2.56 Soundness 0.89

Wt. Cu.Ft. Str. Ratio

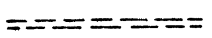
Remarks



Scale: 1" = 1/4 Mile

OPEN MATERIALS SITES; NOT SAMPLED

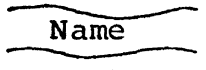
LEGEND


Trail or lane

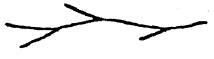

Road

Railroad


Hedge or trees



Major streams


Intermittent streams


Pond or lake


Open materials sites; not sampled

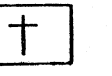

Open materials sites; sampled


Prospective materials sites; not sampled


Prospective materials sites; sampled

Center of section


Dwelling


Cemetery


School


Church


Town or city

MATERIAL SITE DATA FORM

Site No. Ls+22 Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of SW¼ Sec. 6 Twp. 12S Range 19E

Owner Lionel H. Rogers (name), Route 1, Lecompton, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

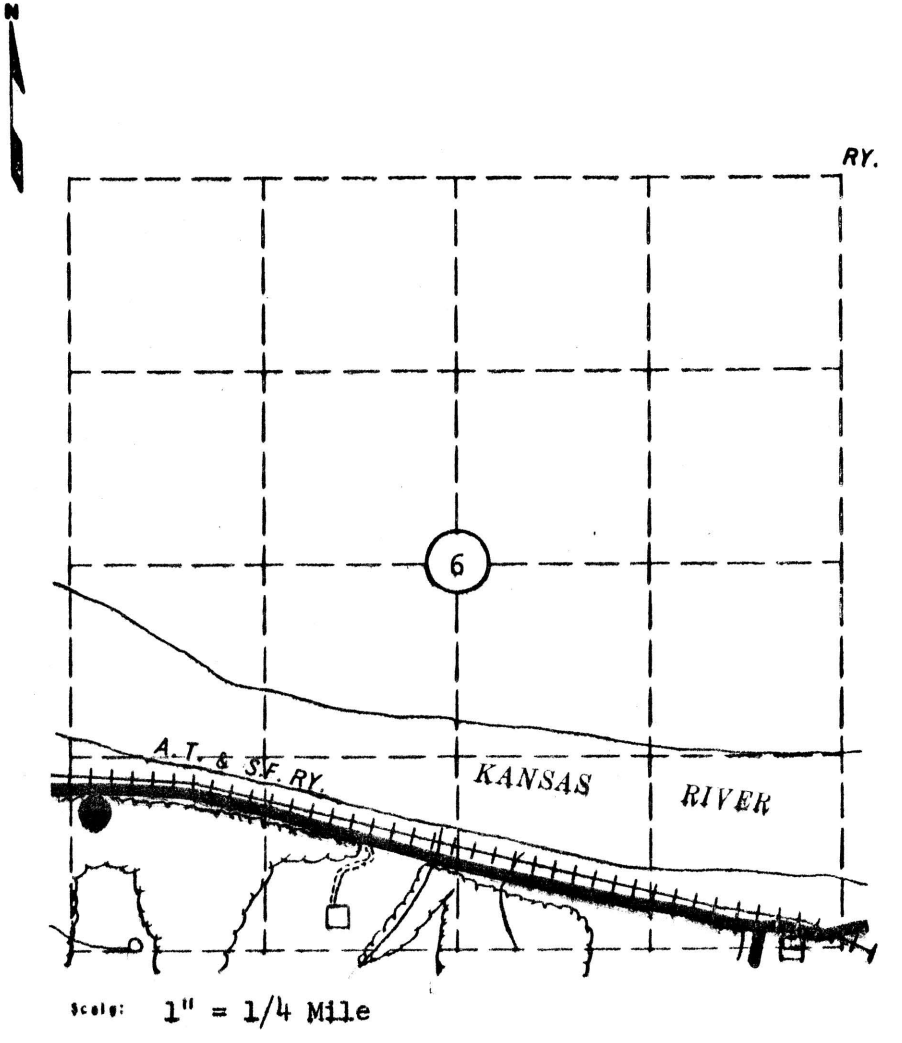
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+23 / Pop Date August, 1971

Material Limestone County Douglas

Location NE¼ of NE¼ Sec. 27 Twp. 12S Range 19E

Owner James O. & Leota Hurley, 1524 Barker Ave., Lawrence, Ks.
(name / address)

Nature of Deposit Dry Accessibility Poor Site Located on Plate I

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

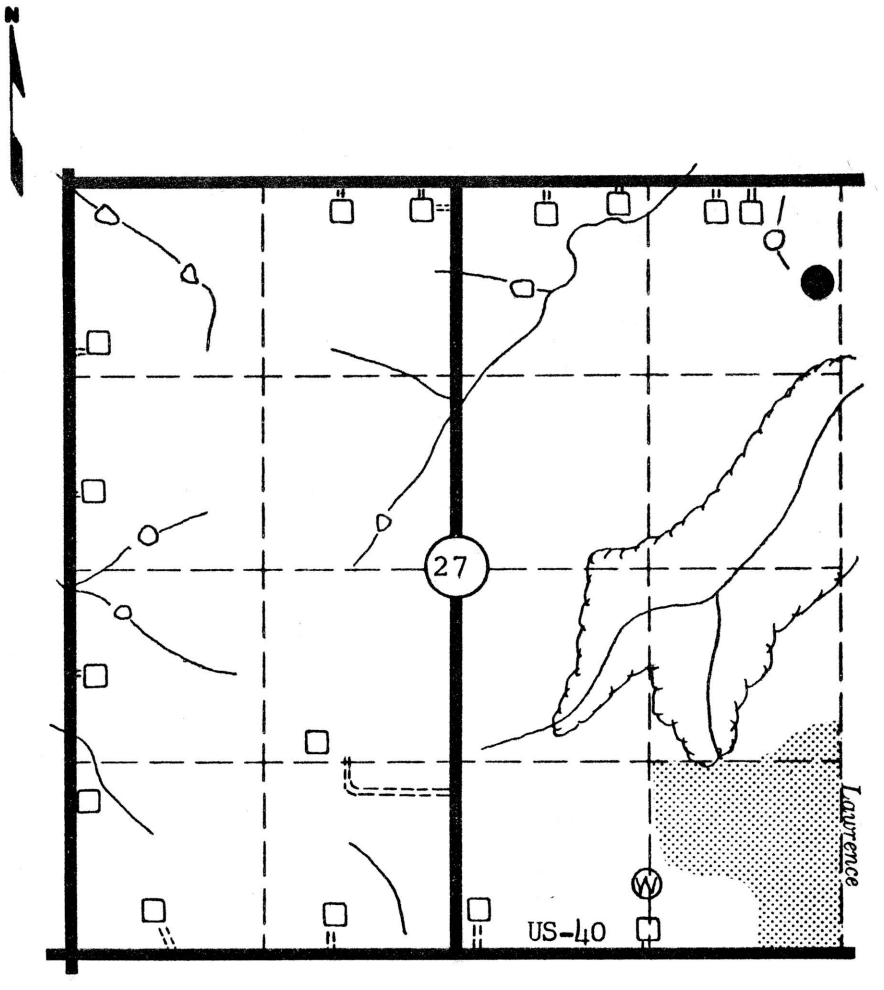
Specitic Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+24 Pop Date August, 1971

Material Limestone County Douglas

Location $SE\frac{1}{4}$ of $NE\frac{1}{4}$ Sec. 8 Twp. 12S Range 19E

Owner Karl K. & Loretta M. Lietzen, RFD 1, Lawrence, Kansas
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained								Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100					

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

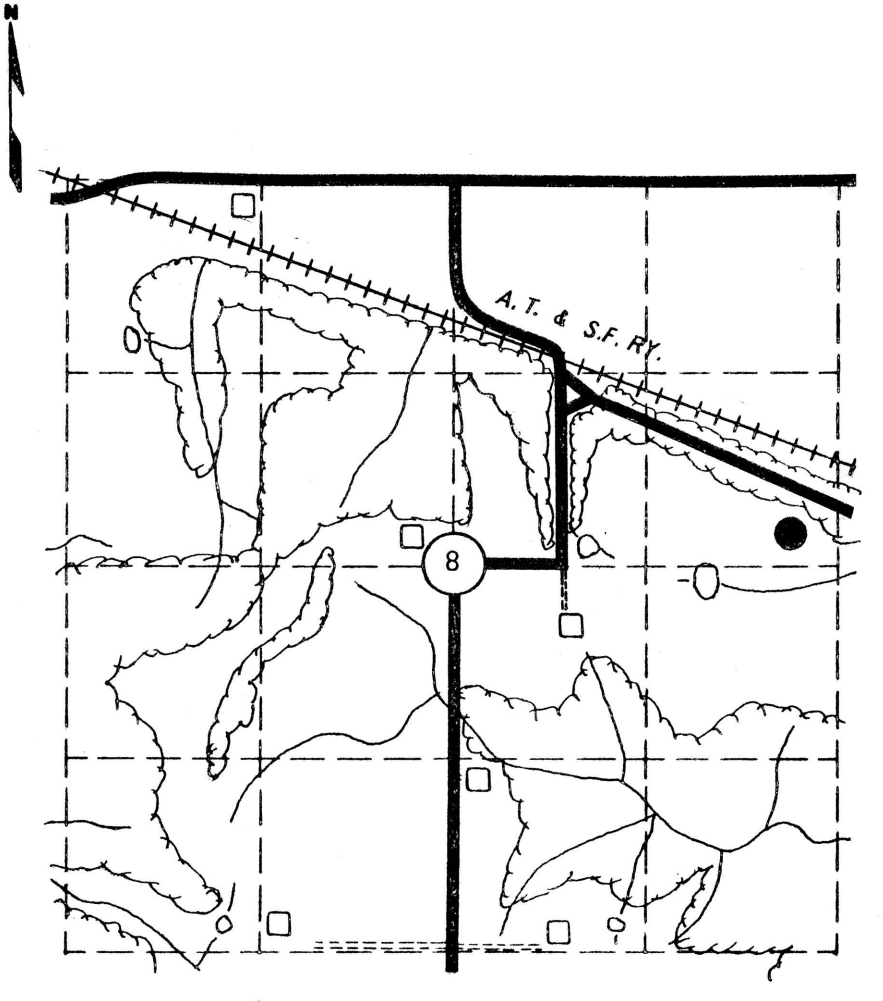
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+25 Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of SW¼ Sec. 15 Twp. 12S Range 19E

Owner Charles B. Taylor, RFD #1, Lawrence, Kansas
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	S.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

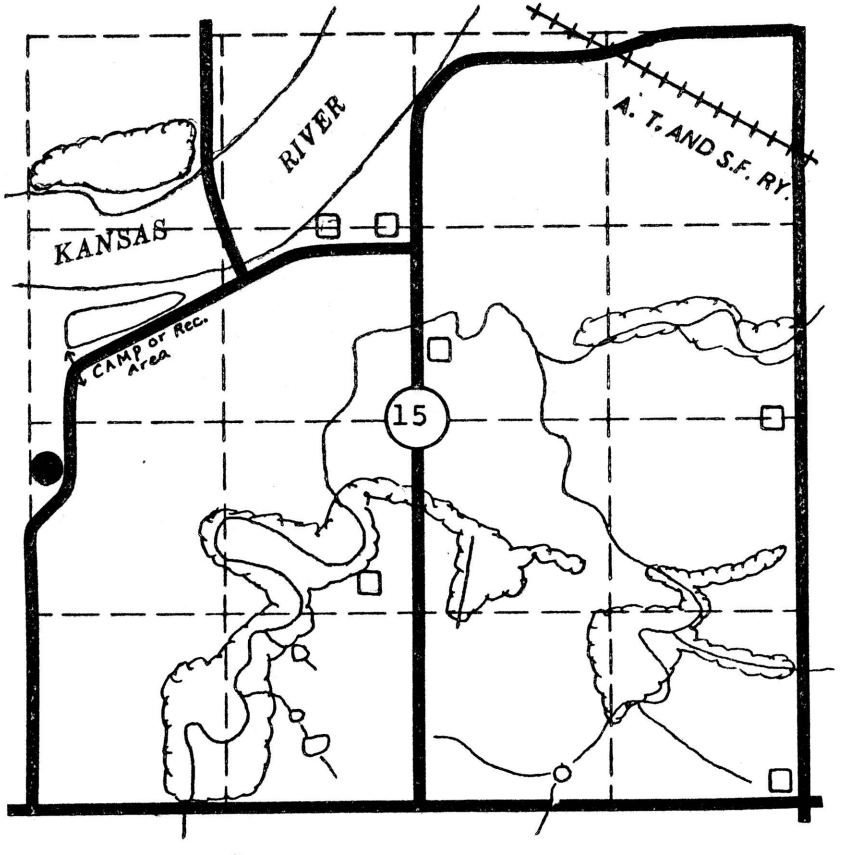
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+26 / Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of SW¼ Sec. 1 Twp. 13S Range 18E

Owner Irene E. Skinner, RFD #1, Lawrence, Kansas
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

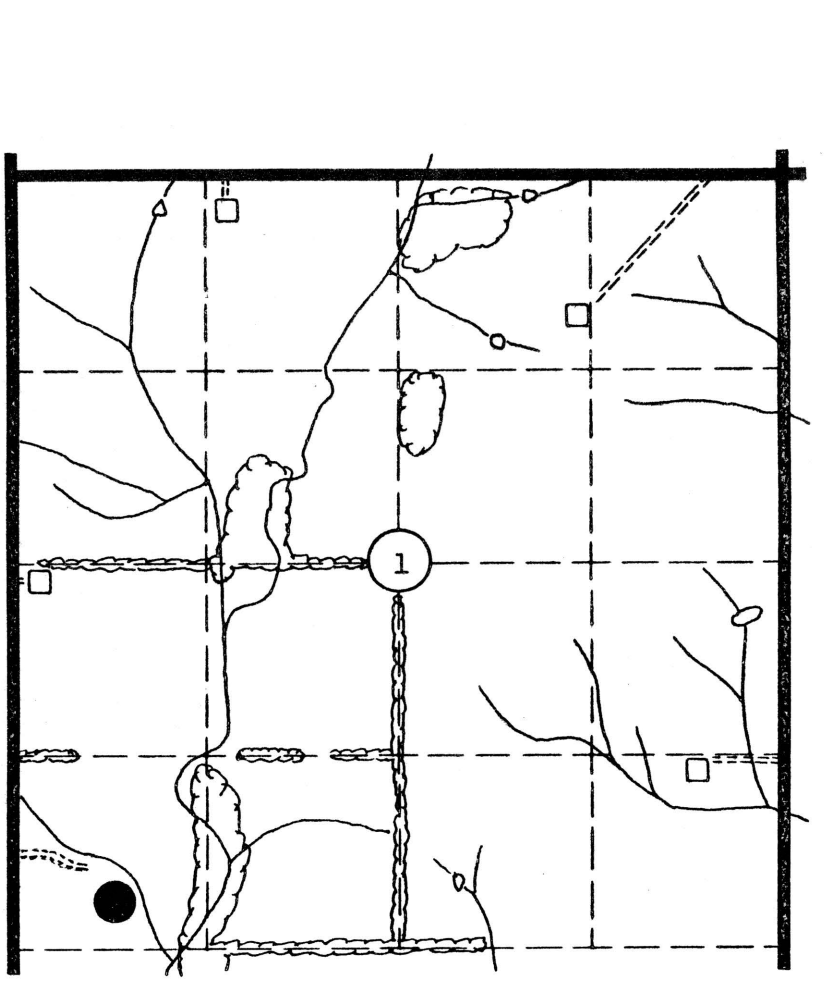
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Ls+27
Pop

Site No. _____ Date August, 1971

Material Limestone County Douglas

Location $SE\frac{1}{4}$ of $SE\frac{1}{4}$ Sec. 12 Twp. 13S Range 18E

Owner See Below
name address

Nature of Deposit Dry Accessibility Poor Site Located on Plate III

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

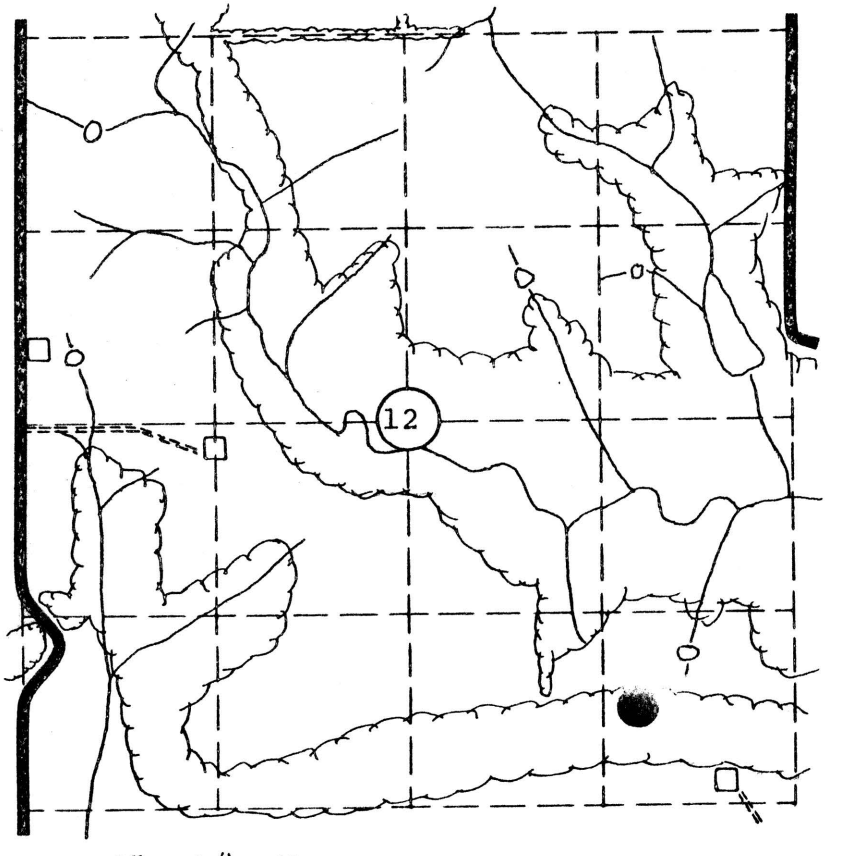
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks USA % Atty for Corps of Engineers
601 E. 12th Street, Kansas City, Mo. 64106



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. SG+28 / Qgd Date August, 1971

Material Sand and Gravel County Douglas

Location $NE\frac{1}{4}$ of $NW\frac{1}{4}$ Sec. 2 Twp. 14S Range 18E

Owner Orville R. Taylor (name), 2524 W. 91st St., Leawood (address), Kansas

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Open Materials Sites; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To

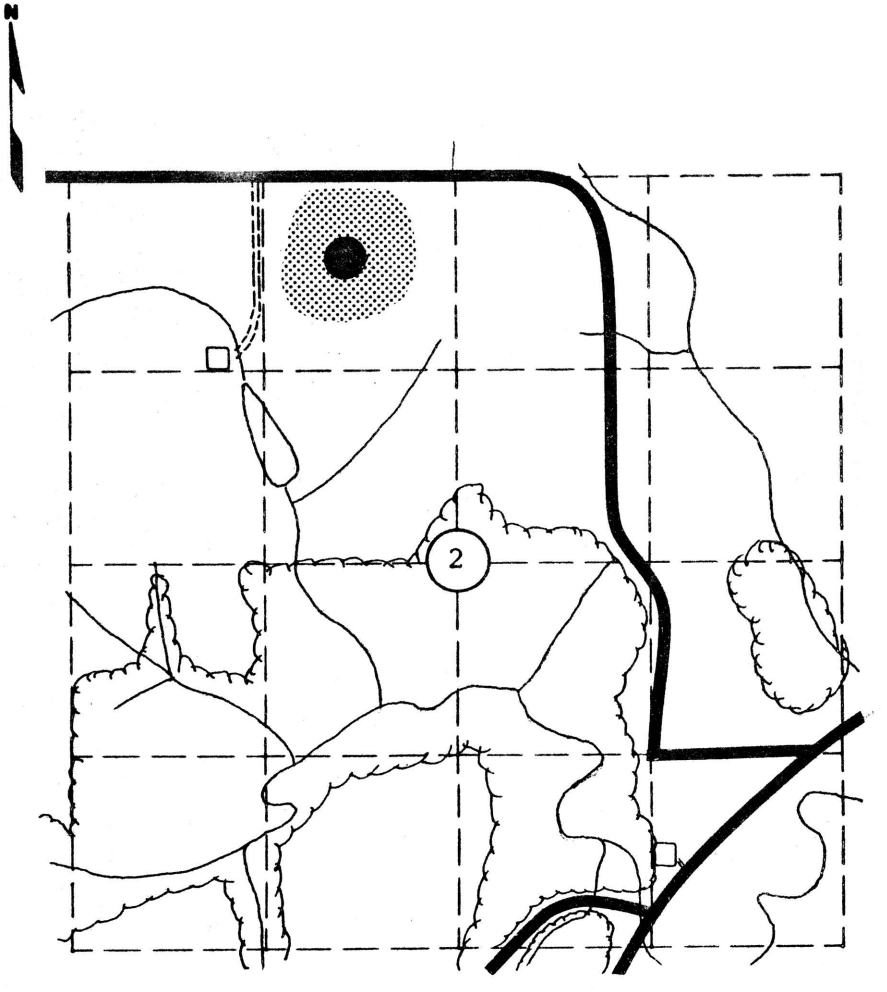
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. SG-29 Qgd Date August, 1971

Material Sand and Gravel County Douglas

Location SE¼ Sec. 26 Twp. 13S Range 19E

Owner Evan G. Griffith (name), Route 2, Lawrence, Kansas (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate IV

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To

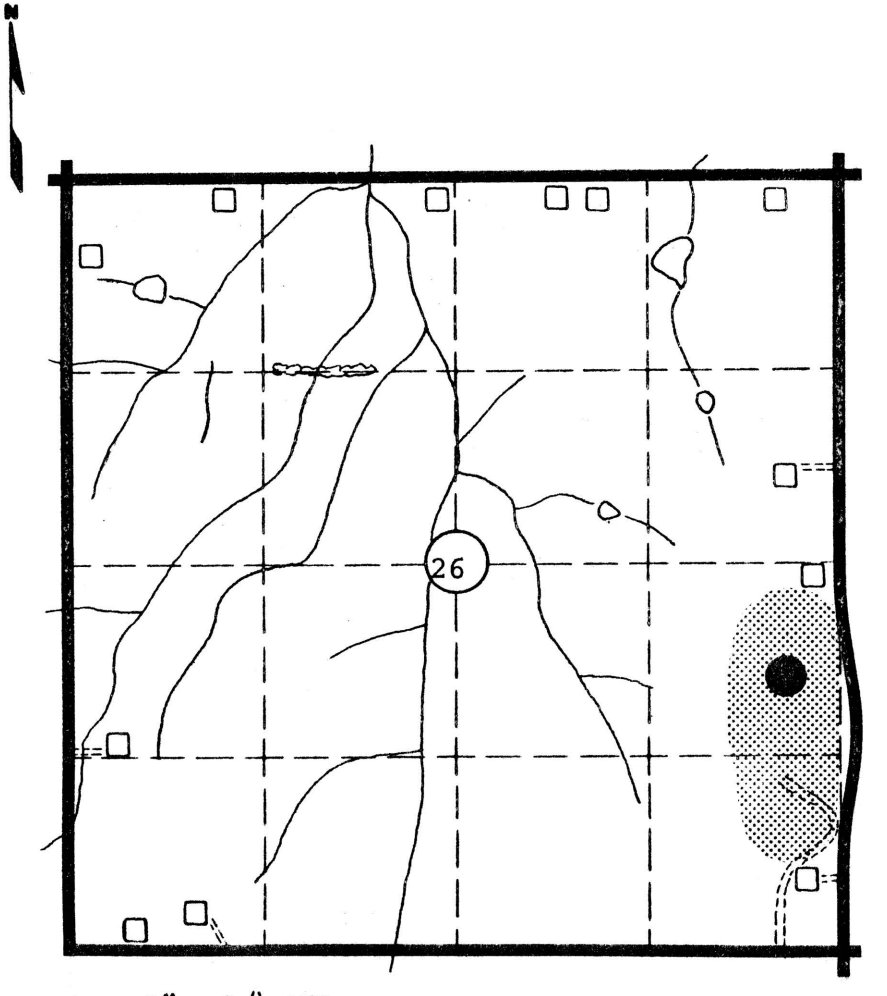
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+30 / Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of NE¼ Sec. 14 Twp. 14S Range 18E

Owner N. T. Veatch, Jr., (name) % Spring Lake Stock Farm, (address) Lawrence, Ks.

Nature of Deposit Dry Accessibility Good Site Located on Plate V

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

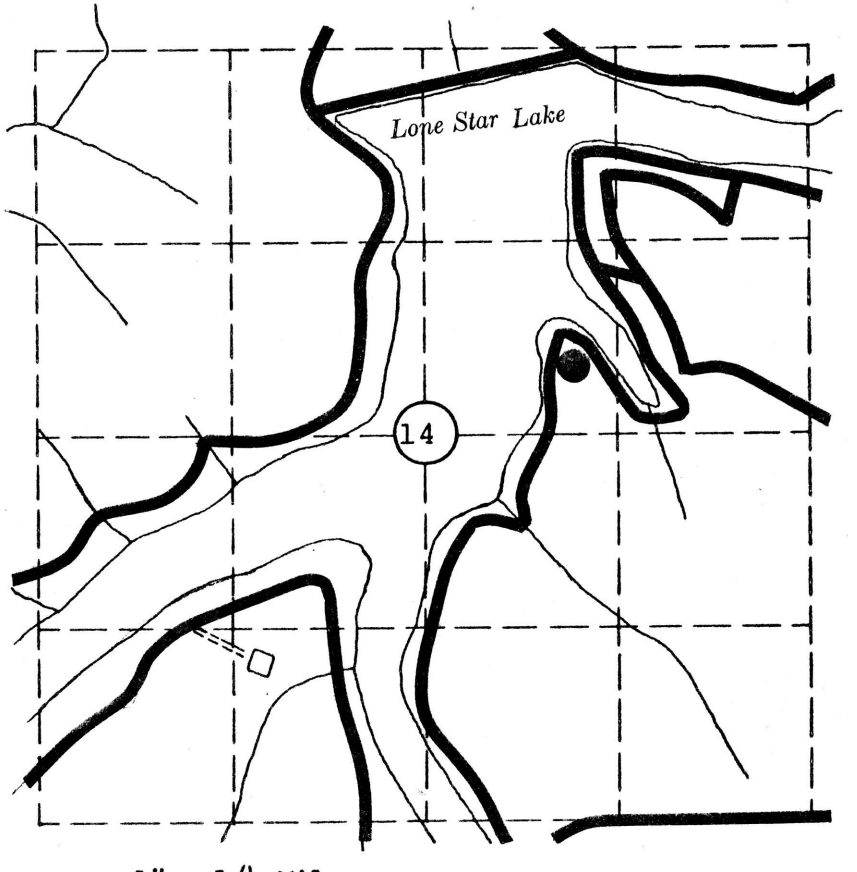
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+31 Pot Date August, 1971

Material Limestone County Douglas

Location SE¼ of SW¼ Sec. 20 Twp. 14S Range 20E

Owner Eldon D. & Betty A. Roecker (name) RFD #2, Baldwin, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate VI

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Toronto Member

Material Similar To

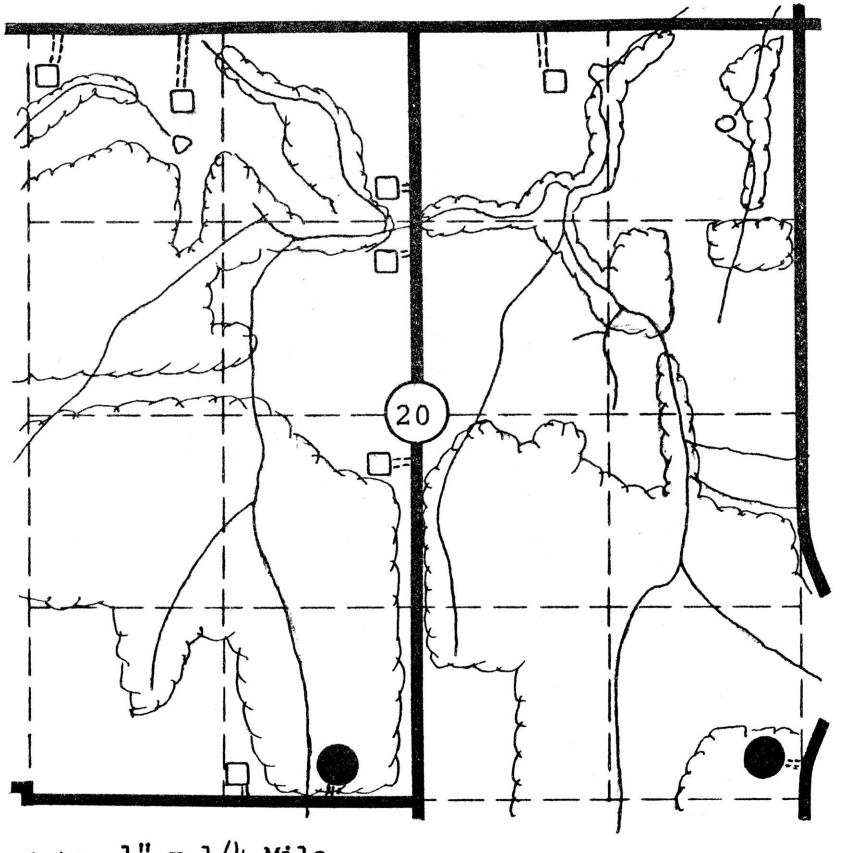
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+32 Pot Date August, 1971

Material Limestone County Douglas

Location SE¼ of SE¼ Sec. 20 Twp. 14S Range 20E

Owner Melvin E. Holmes, RFD #2, Baldwin, Kansas
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate VI

Status of Site Open Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-burden	Depth of Material	Percent Retained									Wash 200	S.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Toronto Member

Material Similar To

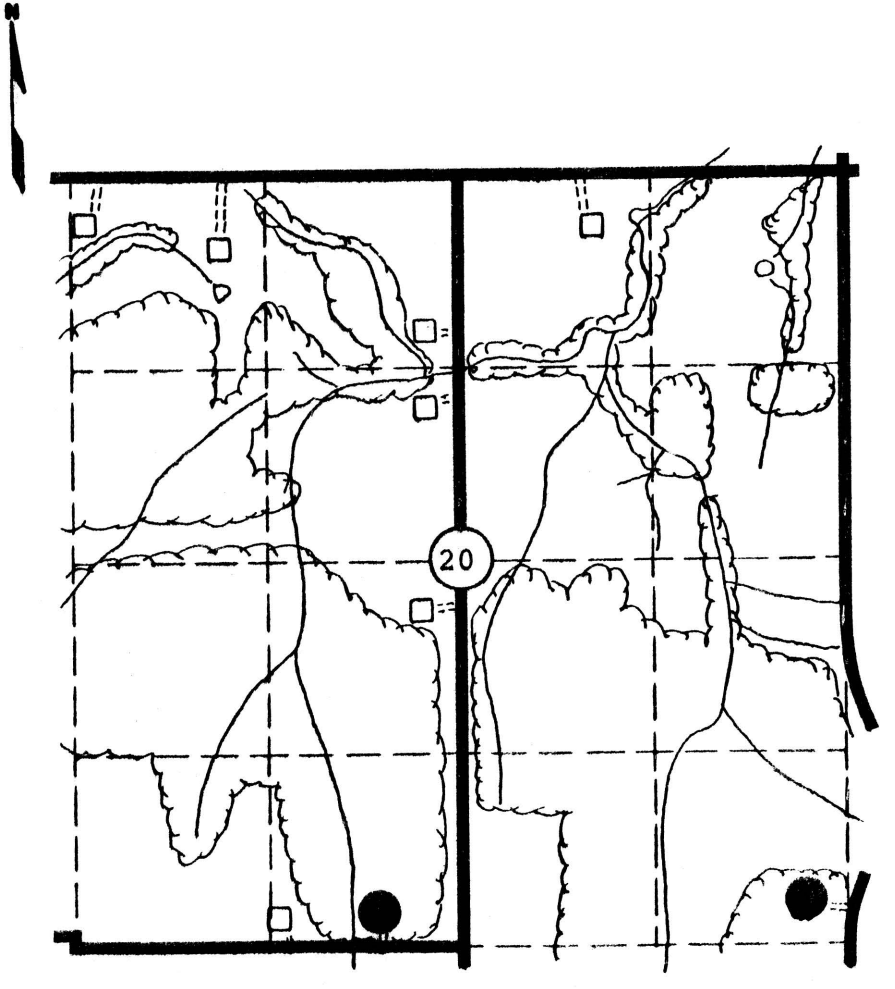
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

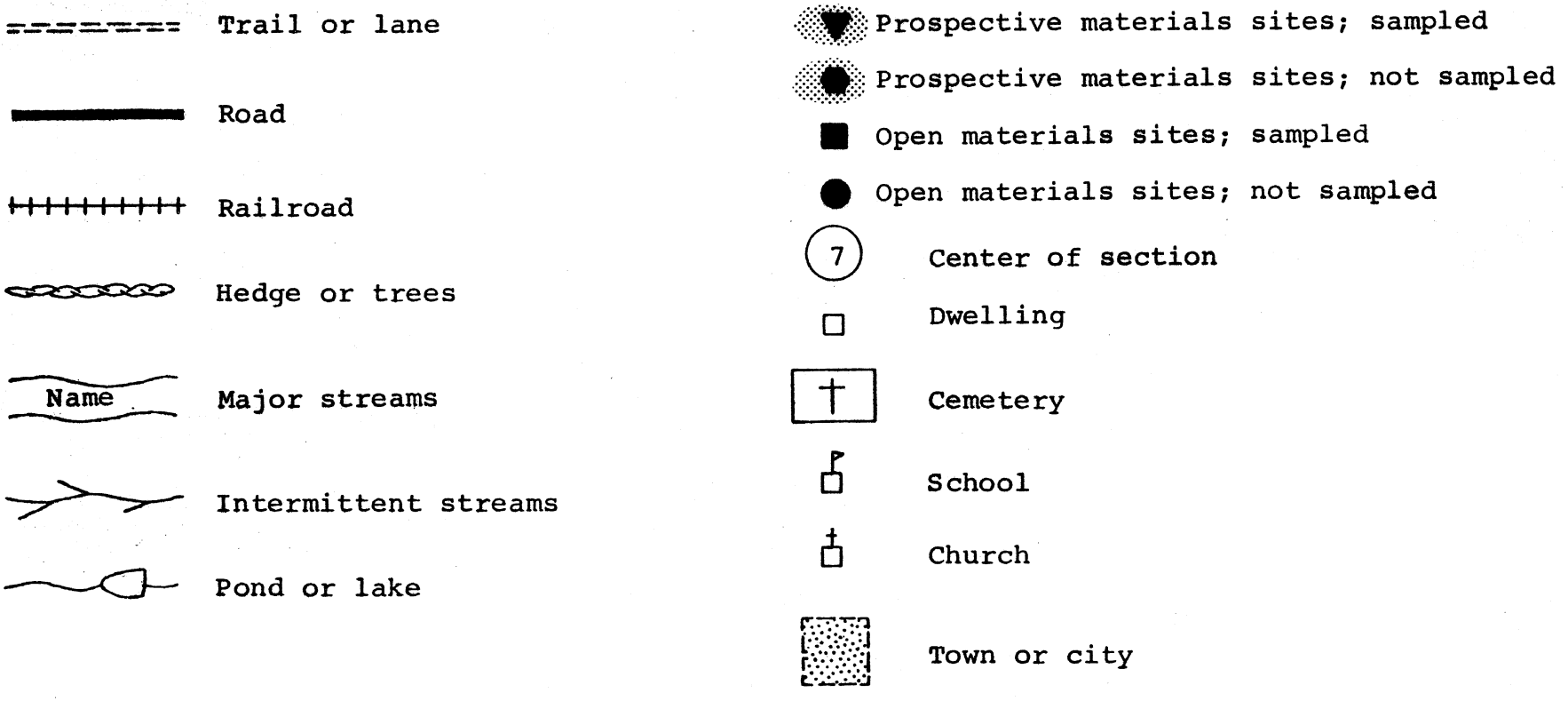
Remarks



Scale: 1" = 1/4 Mile

PROSPECTIVE MATERIALS SITES; SAMPLED

LEGEND



MATERIAL SITE DATA FORM

Site No. SS+33 / Pli Date August, 1971

Material Sandstone County Douglas

Location NE¼ of NW¼ Sec. 9 Twp. 15S Range 20E

Owner Loren A. & W. F. Wade (name), Rte. 1, Baldwin, Kansas (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate VI

Status of Site Prospective Materials Site; Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained 1 1/2	3/4	3/8	4	8	16	30	50	~~80~~ 80	Wash 200	G.F. 100	L.L.	P.I.
1	SS	0	13.7								0	37	32	49		
3	SS	0	14.8								0	40	33	47		

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Lawrence Formation - Ireland Sandstone Member

Material Similar To SHC 619 # 23-27

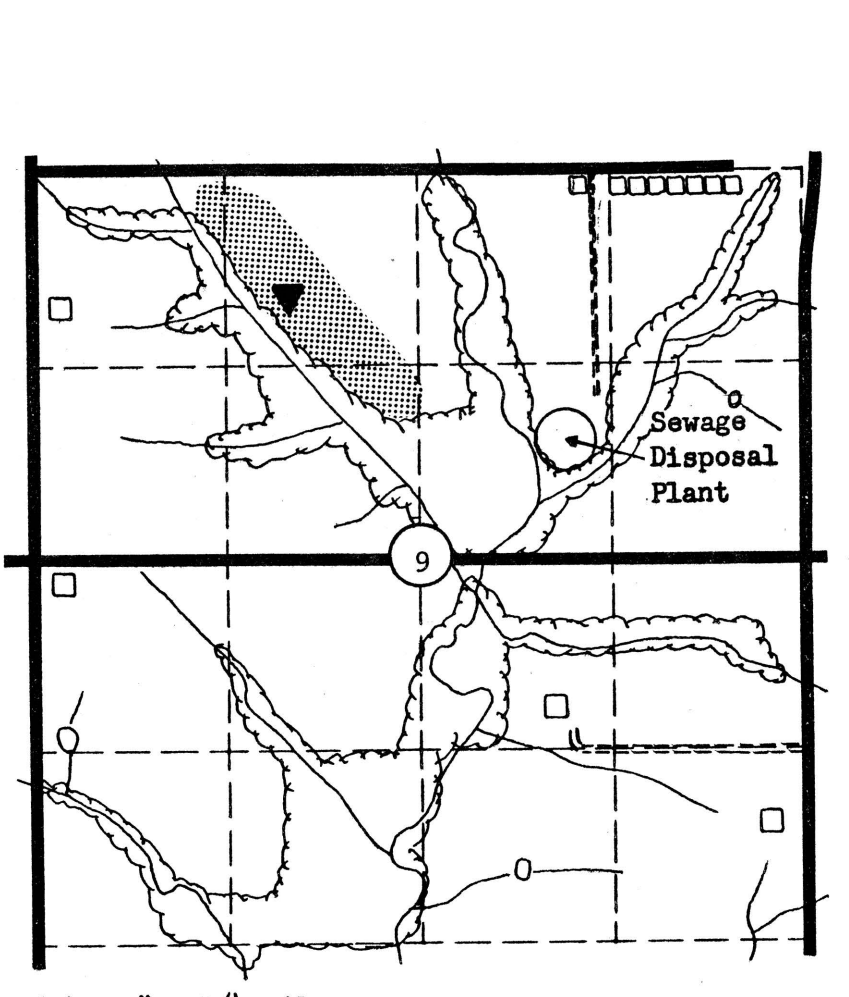
Specific Gravity (Sat.) ____ (Dry) ____

Los Angeles Wear ____

Absorption ____ Soundness ____

Wt. Cu.Ft. ____ Str. Ratio ____

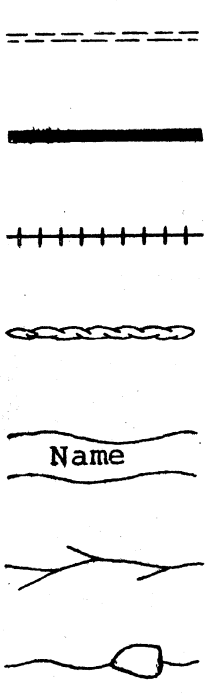
Remarks ____

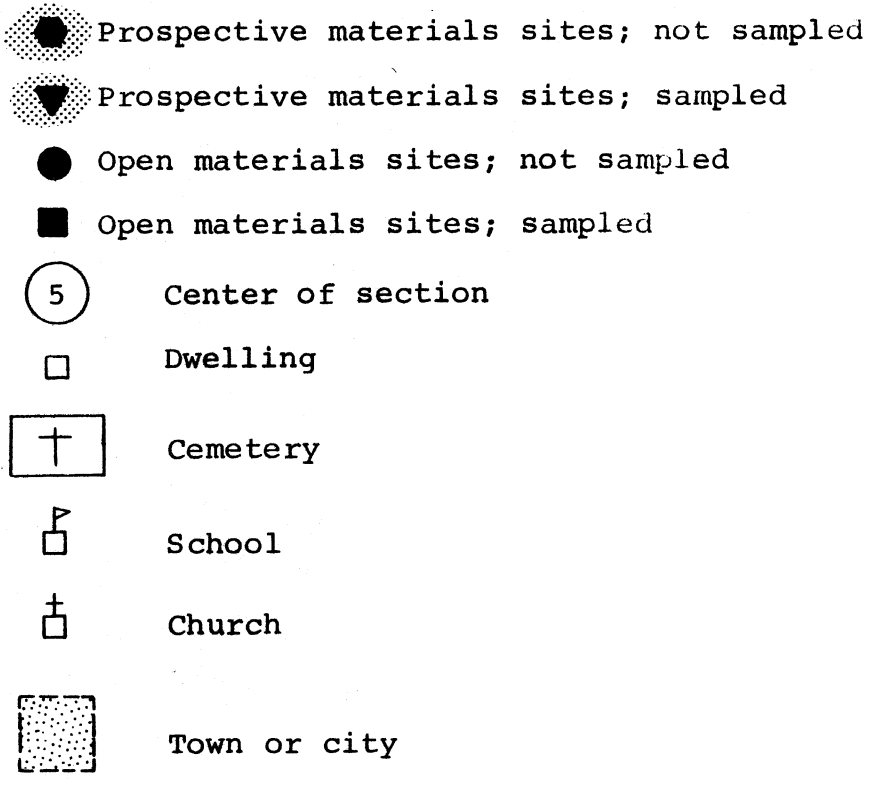


Scale: 1" = 1/4 Mile

PROSPECTIVE MATERIALS SITES; NOT SAMPLED

LEGEND





MATERIAL SITE DATA FORM

Site No. Ls+34 Pdc Date August, 1971

Material Limestone County Douglas

Location SE¼ Sec. 2 Twp. 12S Range 17E

Owner Covert C. & Bessie M. Cranwell (name), RFD 1, Lecompton (address), Kansas

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Deer Creek Limestone Formation

Material Similar To

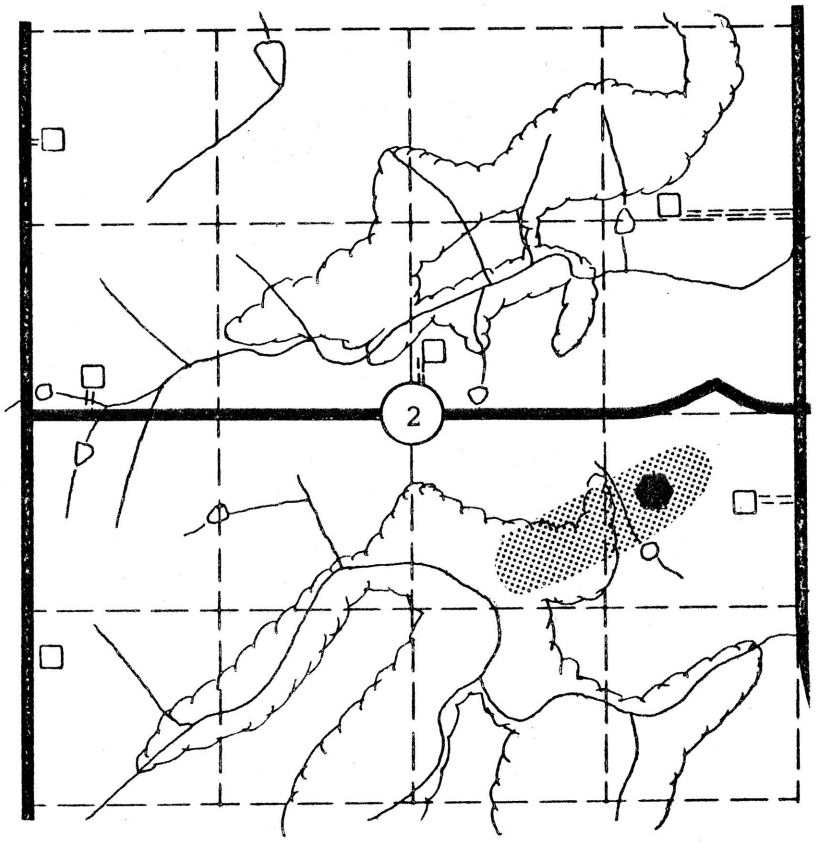
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale:

MATERIAL SITE DATA FORM

Site No. Ls+35 Pdc Date August, 1971

Material Limestone County Douglas

Location SE¼ of SW¼ Sec. 26 Twp. 12S Range 17E

Owner Charles A. & Letha Worthington, 8223 S.E. 53rd St. Tecumseh
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate I

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Deer Creek Limestone Formation

Material Similar To

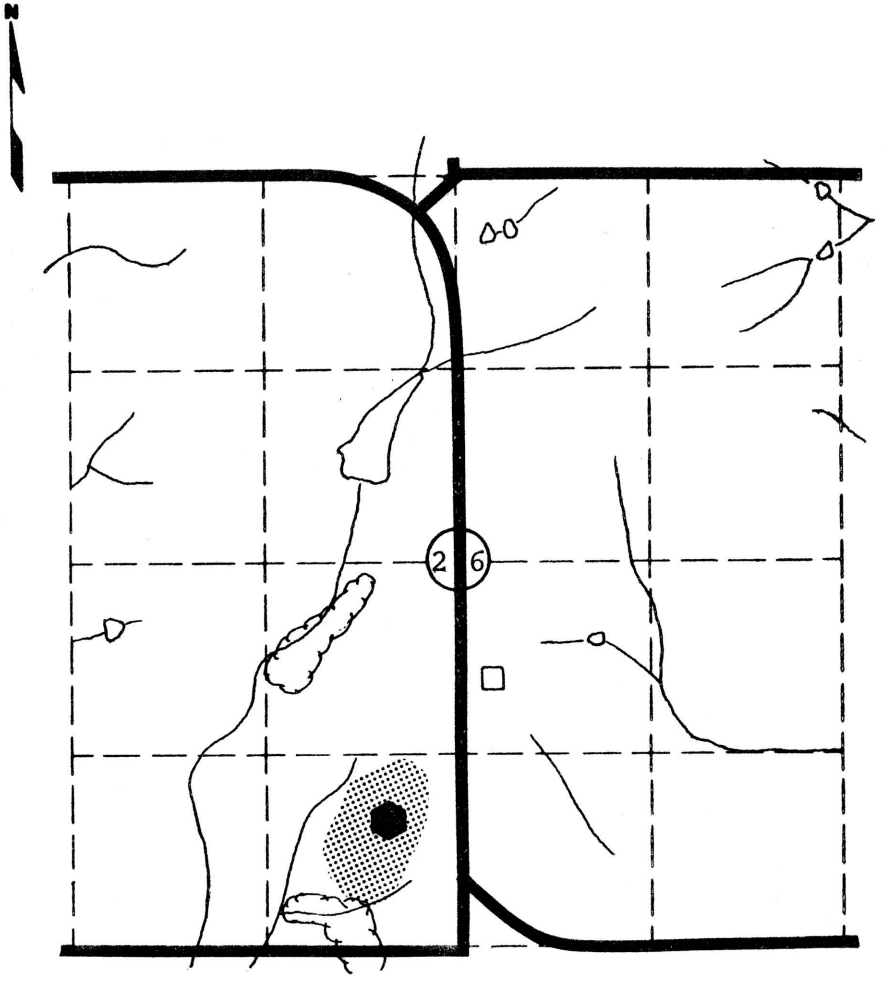
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. SG+36 / Qal Date August, 1971

Material Sand and Gravel County Douglas

Location NE¼ of SW ¼ Sec. 26 Twp. 12S Range 20E

Owner William Hughes (name), 417 Sagamore Lane, Kansas City, 16, Mo. (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate II

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Quaternary

Geological Source Alluvium

Material Similar To

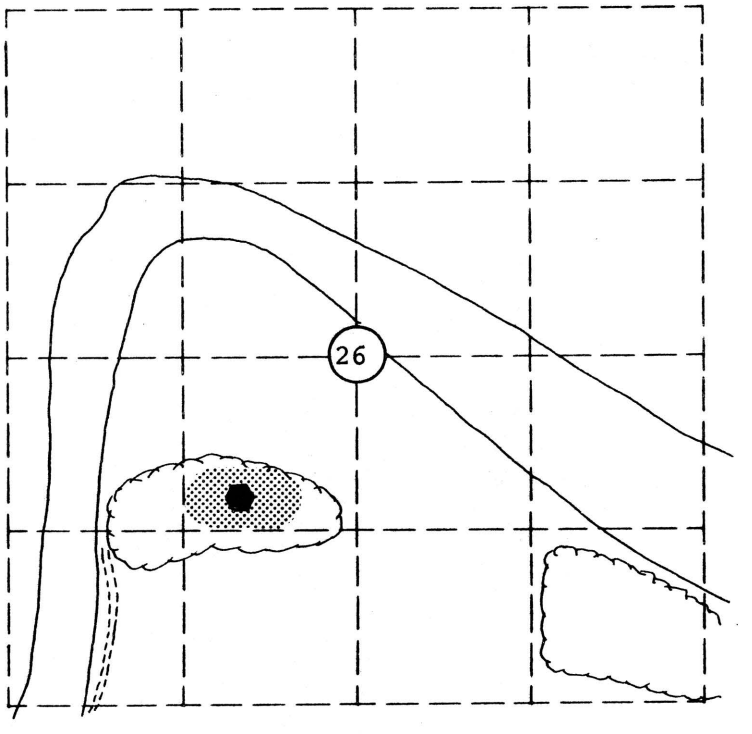
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+37 / Pdc Date August, 1971

Material Limestone County Douglas

Location SW¼ of NW¼ Sec. 1 Twp. 13S Range 17E

Owner Alan Endacott (name), P.O. Box 904, Lawrence, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Deer Creek Limestone Formation

Material Similar To

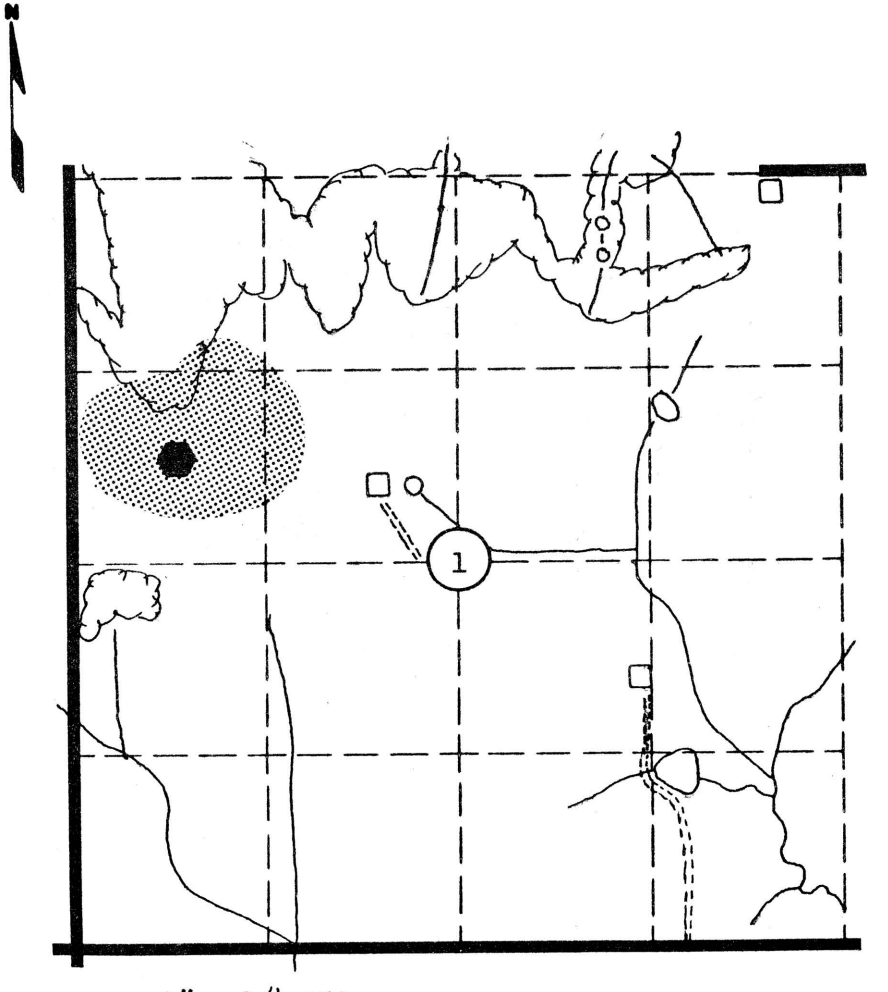
Specitic Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+38 Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of NE¼ Sec. 5 Twp. 13S Range 18E

Owner Marvin J. Houk, etal, RFD 2, Berryton, Kansas
(name) (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

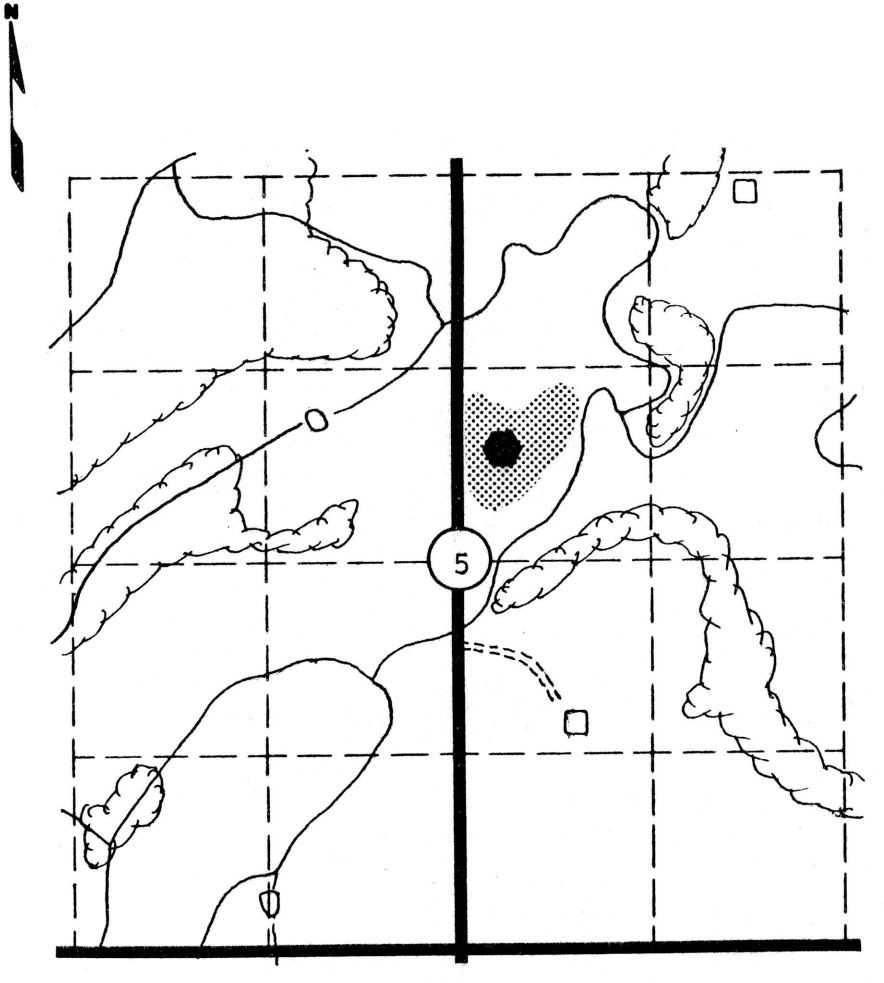
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+39 / Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ Sec. 17 Twp. 13S Range 18E

Owner Essie M. Casey (name), Route 2, Berryton, Kansas (address)

Nature of Deposit Dry Accessibility Poor Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

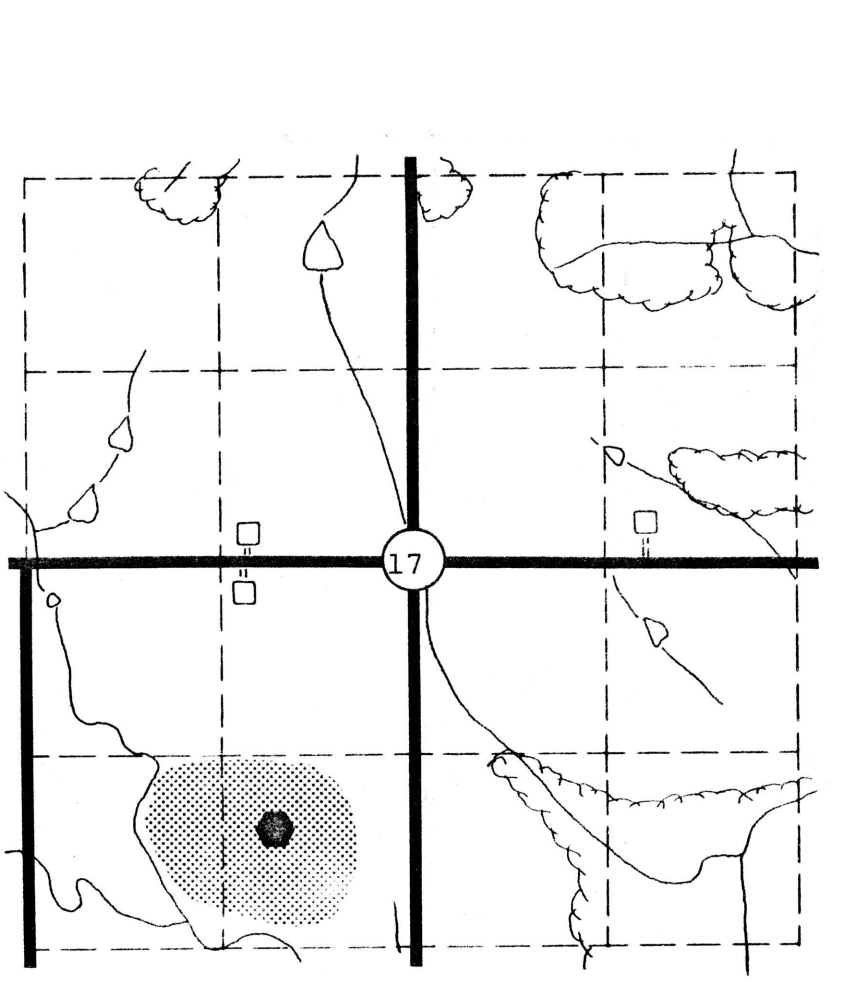
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+40 Pop Date August, 1971

Material Limestone County Douglas

Location SE¼ of NW¼ Sec. 19 Twp. 13S Range 18E

Owner Harry & Laura Kennedy (name), RFD 2, Berryton, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

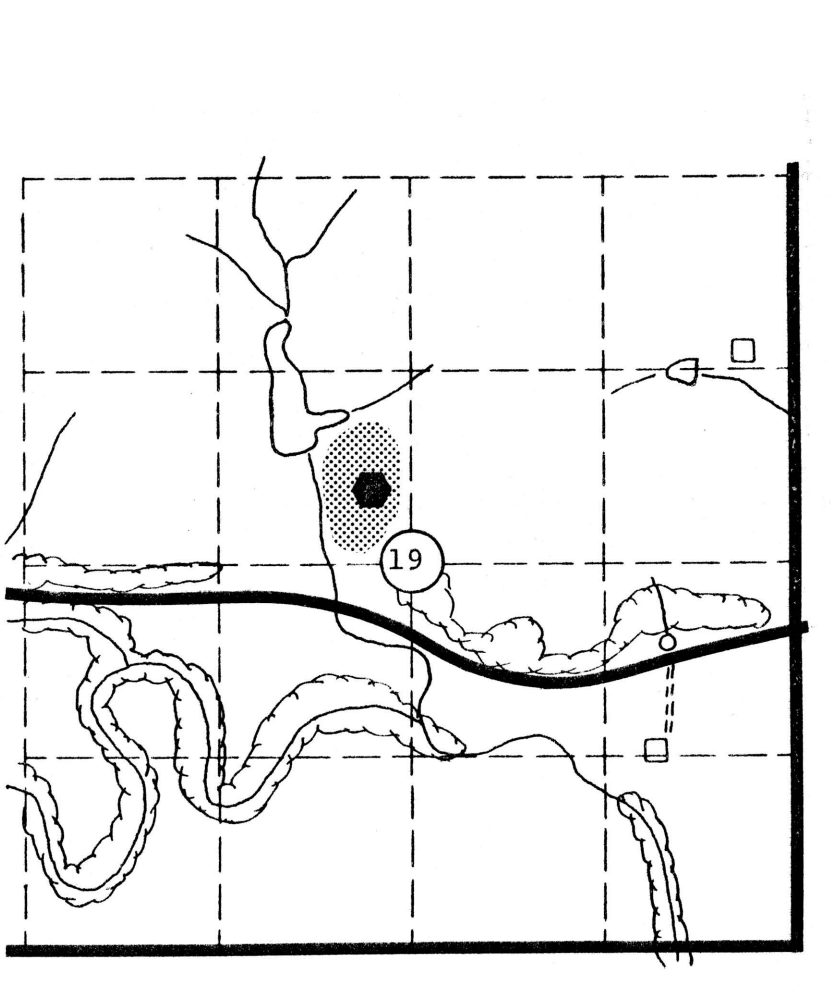
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+41 / Pop Date August, 1971

Material Limestone County Douglas

Location NW¼ of NW¼ Sec. 36 Twp. 13S Range 18E

Owner Ralph M. & Dorothy May Goff (name), RFD 5, Lawrence, Kansas (address)

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

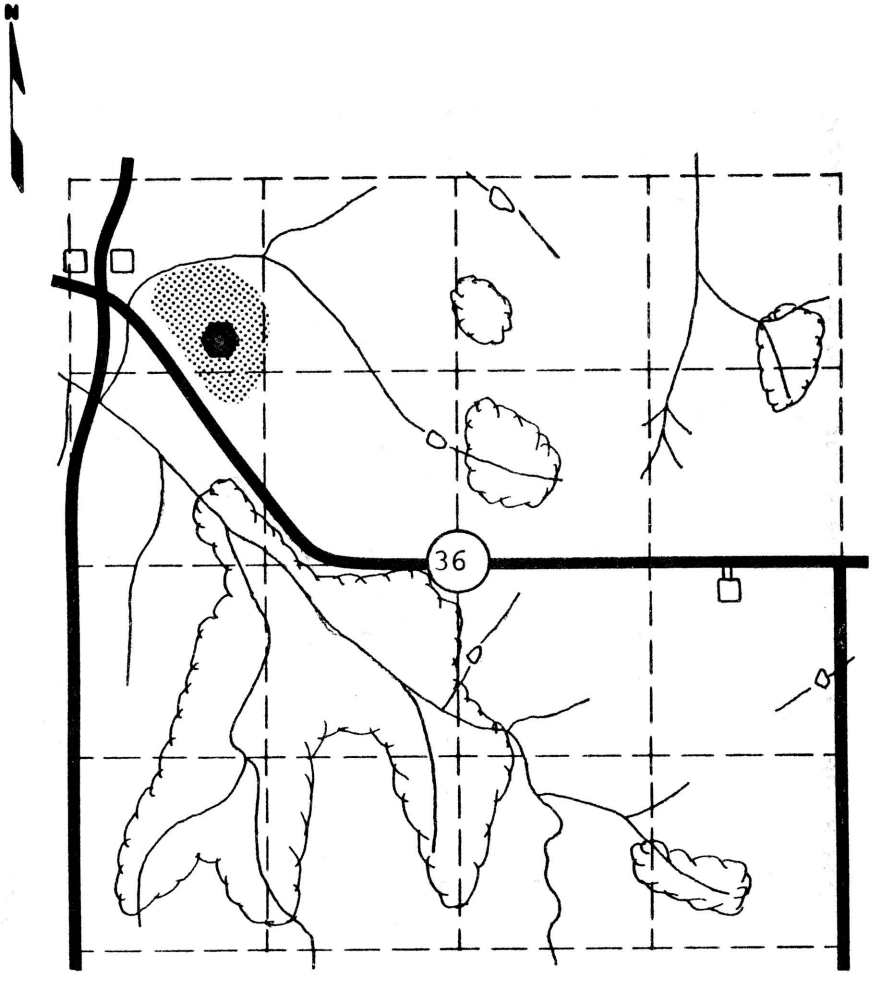
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+42 / Pop Date August, 1971

Material Limestone County Douglas

Location NE¼ of NW¼ Sec. 5 Twp. 14S Range 18E

Owner Floyd Gaines (name) Route 2 Overbrook, Kansas (address)

Nature of Deposit Dry Accessibility Fair Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

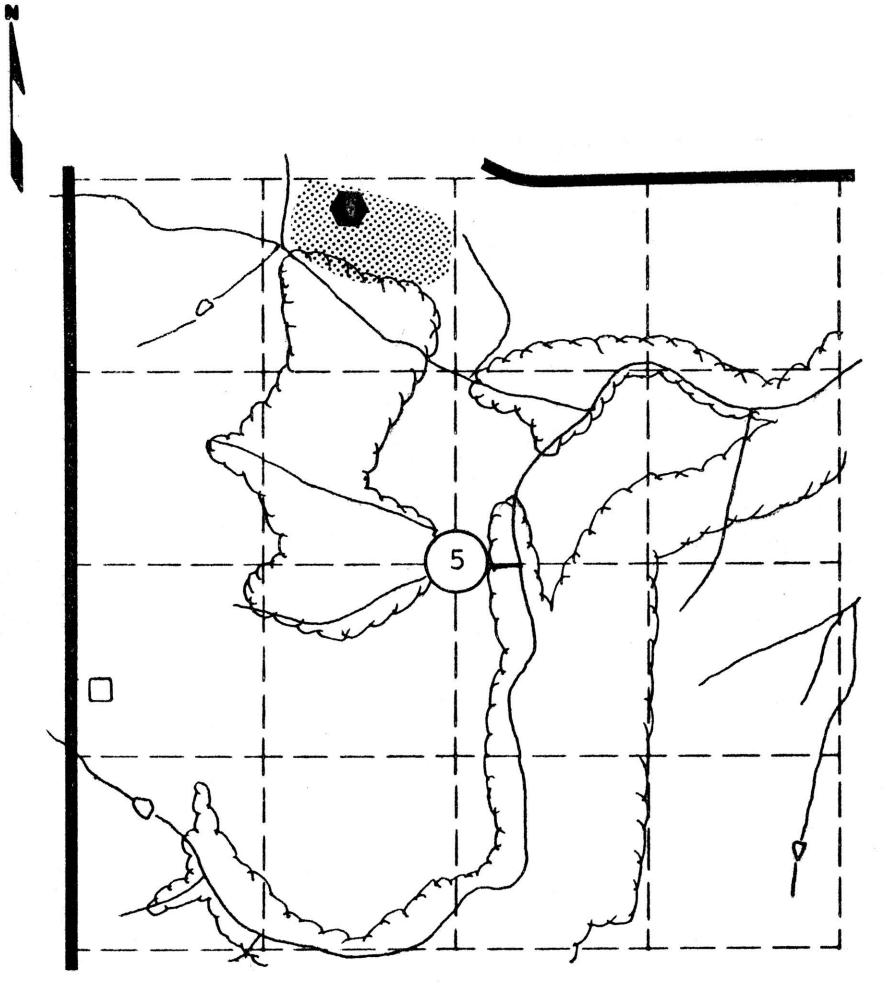
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+43 Pop Date August, 1971

Material Limestone County Douglas

Location SW¼ of SE¼ Sec. 7 Twp. 14S Range 18E

Owner James E. & Bernardina Barnes (name), RFD 2, Overbrook (address), Kansas

Nature of Deposit Dry Accessibility Good Site Located on Plate III

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To

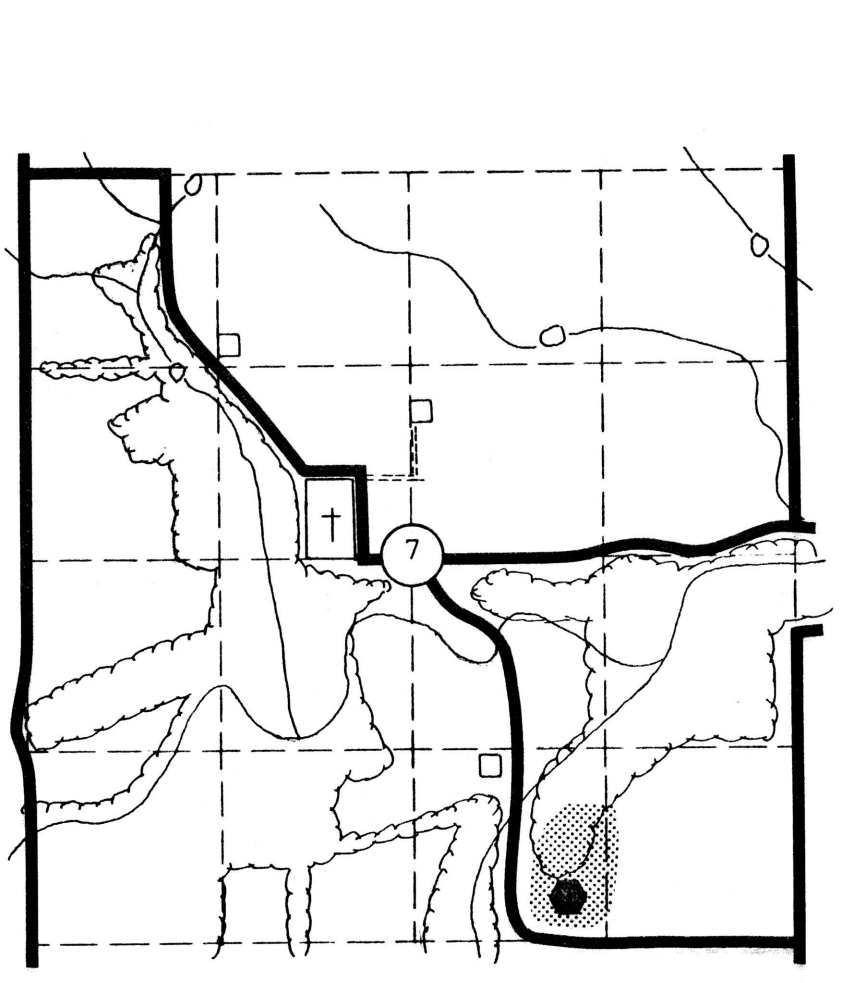
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+44 / Ps Date August, 1971

Material Limestone County Douglas

Location SW¼ of NW¼ Sec. 10 Twp. 13S Range 21E

Owner Kenneth O. Von Achen (name), Eudora, Kansas (address)

Nature of Deposit Dry Accessibility Poor Site Located on Plate IV

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Stanton Formation - Stoner Member

Material Similar To

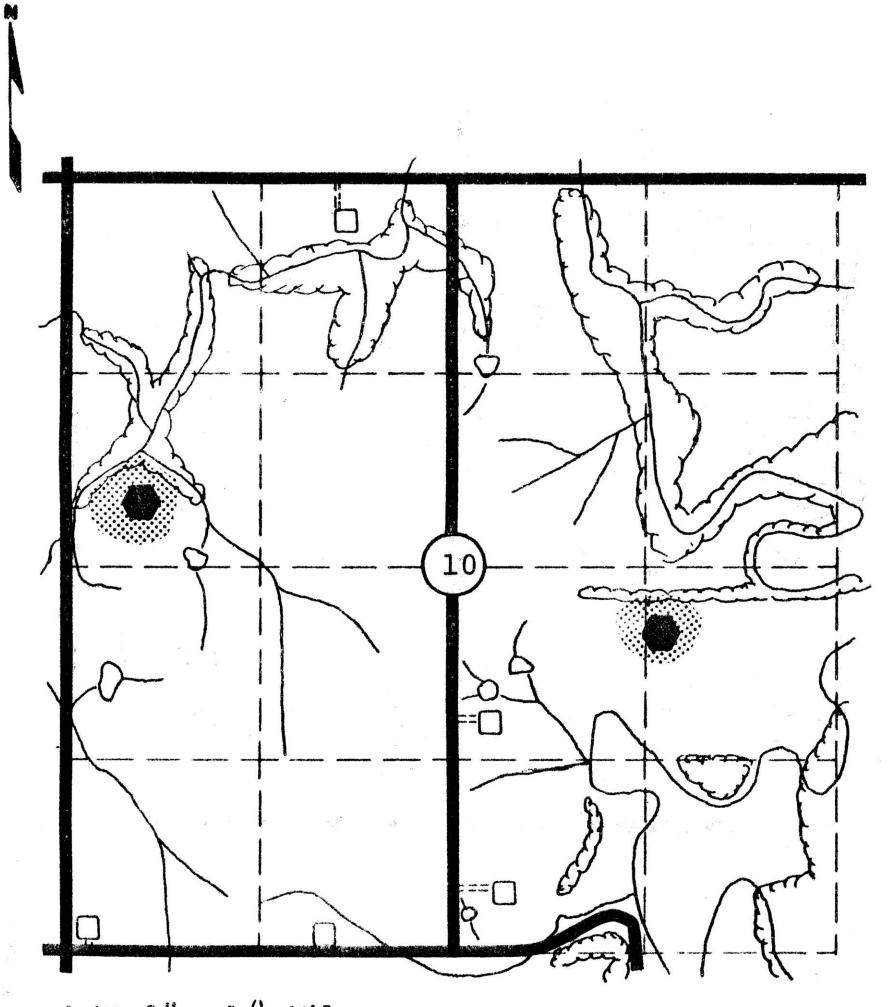
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+45 / Ps Date August, 1971

Material Limestone County Douglas

Location $NE\frac{1}{4}$ of $SE\frac{1}{4}$ Sec. 10 Twp. 13S Range 21E

Owner Herbert H. & Mable Mauffel (name), Route 2, Eudora, Kansas (address)

Nature of Deposit Dry Accessibility Poor Site Located on Plate IV

Status of Site Prospective Materials Sites; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of Over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Stanton Formation - Stoner Member

Material Similar To

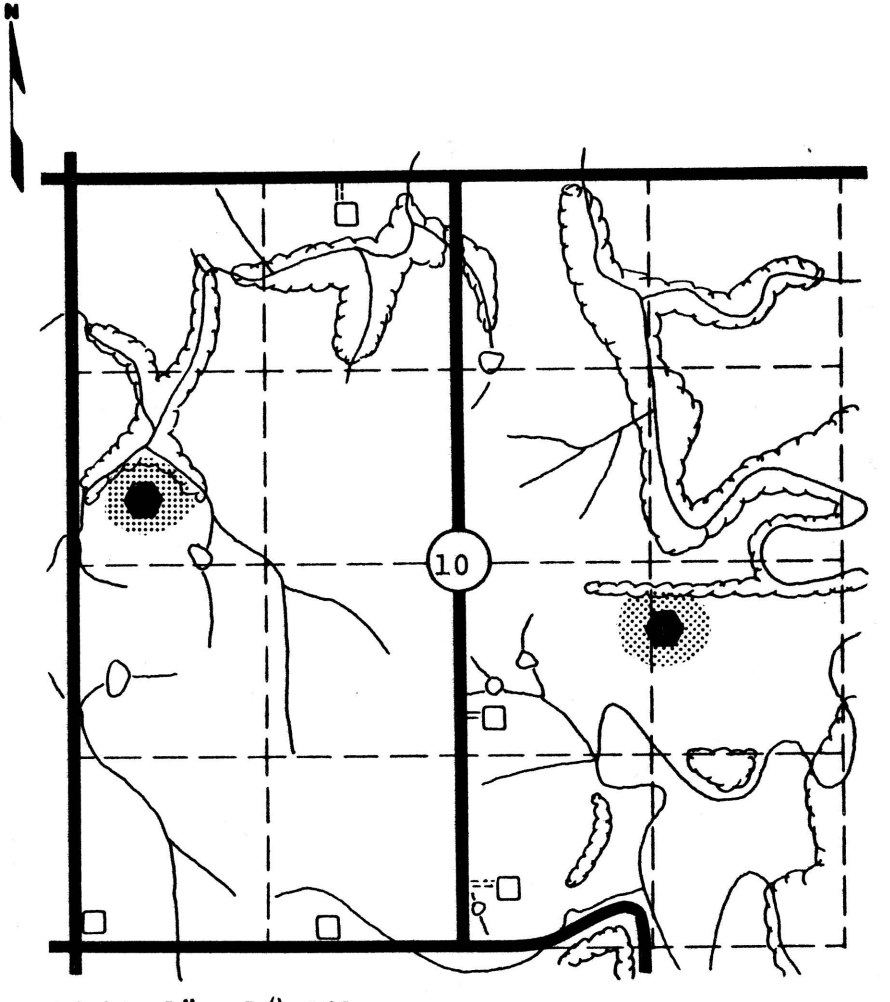
Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption Soundness

Wt. Cu.Ft. Str. Ratio

Remarks



Scale: 1" = 1/4 Mile

MATERIAL SITE DATA FORM

Site No. Ls+46 / Pop Date August, 1971

Material Limestone County Douglas

Location $NE\frac{1}{4}$ $SE\frac{1}{4}$ Sec. 13 Twp. 15S Range 17E

Owner John W. & Lefa E. Snyder (name), Route 1, Overbrook (address), Kansas

Nature of Deposit Dry Accessibility Poor Site Located on Plate V

Status of Site Prospective Materials Site; Not Sampled

EXPLORATION DATA

Test Hole	Material at Bottom of Hole	Depth of over-Burden	Depth of Material	Percent Retained									Wash 200	G.F.	L.L.	P.I.
				1 1/2	3/4	3/8	4	8	16	30	50	100				

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Oread Limestone Formation - Plattsmouth Member

Material Similar To SHC Sampled Site Ls + 18 / IPop

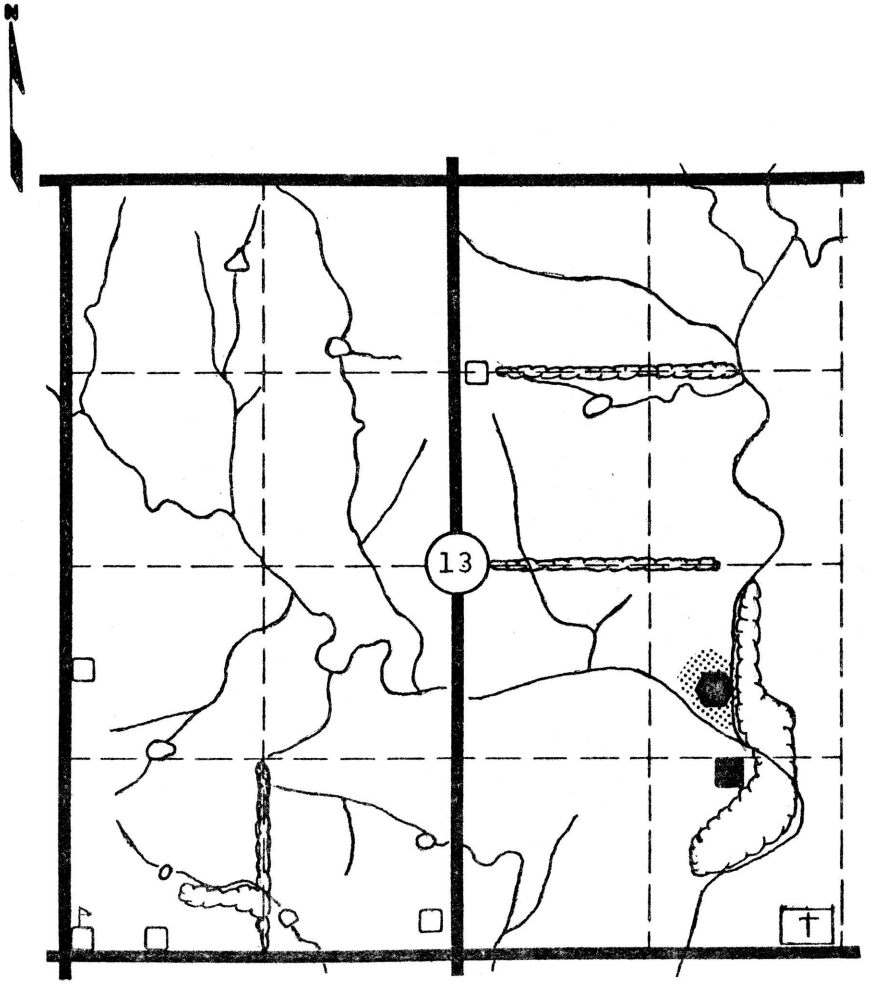
Specific Gravity (Sat.) _____ (Dry) _____

Los Angeles Wear _____

Absorption _____ Soundness _____

Wt. Cu.Ft. _____ Str. Ratio _____

Remarks _____



Scale: 1" = 1/4 Mile

GLOSSARY

Absorption: Determined by tests performed in accordance with A.A.S.H.O. specifications, designation T 85.

Alluvium: A general term for all unconsolidated material deposited by streams.

Aquifer: Geologic units that are water bearing.

Breccia: A rock made up of highly angular coarse fragments. May be sedimentary or formed by crushing or grinding along faults.

Conglomeratic: Rounded water-worn fragments of rock or pebbles cemented together by another mineral substance.

Chert: A dull, flint-like, siliceous rock.

Detrital: Material made up of pieces of other rock.

Flaggy: Thin, horizontal-bedded.

Geologic period: A unit of geologic time, shorter than an era and longer than an epoch (e.g. Cambrian, Cretaceous, and Tertiary).

Geologic system: Refers to the sediments that were laid down during a particular geologic period (e.g. the Pennsylvanian, Permian, and Quaternary).

Geologic unit: A general term used to denote a geologic formation, member, or an unconsolidated deposit.

Glacial drift: A general term for all rock debris which has been transported and deposited either directly by the ice or from the accompanying meltwater of the glacier.

Glaciofluvial: Pertains to streams flowing because of glacial influence or to the deposits of such streams.

Glaciolacustrine: Lakes derived from glacial influence, or the deposits of such an environment.

Los Angeles wear: Determined by tests performed in accordance with A.A.S.H.O. specifications, designation T 96 as modified by the State Highway Commission of Kansas Standard Specifications, 1966 edition, section Y1-14.

Plasticity index: Determined by tests performed in accordance with the State Highway Commission of Kansas Standard Specifications, 1966 edition, section Y1-18.

Pleistocene: A period of geologic time representing approximately the last ten-million years of the geologic time scale.

Pliocene: The last and youngest major subdivision of the Tertiary Period.

Residual soil: In-place material resulting from the decomposition of rocks.

Specific gravity: Determined by tests performed in accordance with Y1-7 of the State Highway Commission of Kansas Standard Specifications, 1966 edition, and A.A.S.H.O. specifications, designation T 84 or T 85.

Terrace: A plain, located above the present floodplain, which is usually made up of older stream-laid deposits.

Unconsolidated deposits: Deposits of clay, silt, sand, or gravel that are not cemented together.

SELECTED REFERENCES

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