ARKANSAS GEOLOGICAL COMMISSION

INVESTIGATION OF HIGH-CALCIUM LIMESTONE DEPOSITS ALONG WHITE RIVER IN IZARD COUNTY, ARKANSAS

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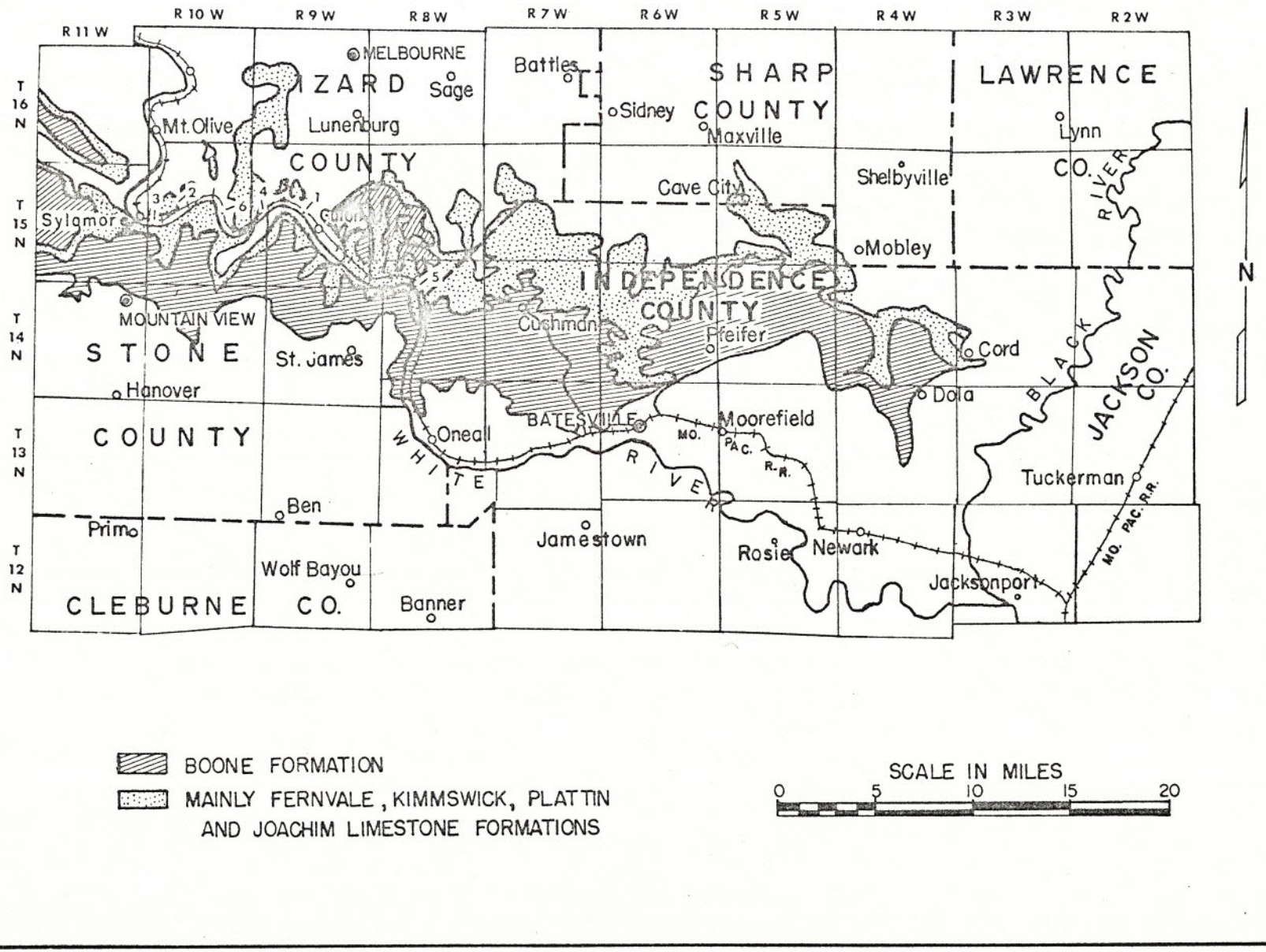
General Geology

Four high-calcium limestone formations; the St. Clair, Fernvale, Kimmswick, and Plattin, are extensively exposed in Izard, Independence, and Stone Counties in north-central Arkansas (see Fig. 1). In southern Izard County these limestones outcrop in the bluffs along White River and they are accessible to the Missouri Pacific railroad along the north side of the river from Sylamore southeastward to Penters Bluff, a distance of 20 miles. The rocks of the region have undergone little deformation, so these limestones lie in a horizontal or nearly horizontal position. The following generalized geologic column shows the stratigraphic position of the limestones.

Generalized Geologic Column of the Rocks Exposed Along White River in Izard County, Arkansas

Formation	Age	Description	Thickness in Feet
Boone	Mississippian	Chert and limestone	300-400
St. Clair	Silurian	limestone (high-calcium)	0-100
Cason	Ordovician	Shale	0-12
Fernvale	"	Limestone (high-calcium)	60-125
Kimmswick	"	Limestone (high-calcium)	12-55
Plattin	"	Limestone (high-calcium)	105-240
Joachim	"	Limestone and dolomite	20-150
St. Peter	"	Sandstone	120-200
Everton	"	Limestone, dolomite, and sandstone	0-600

Only one quarry is operating in the region at the present time, the Myersville quarry of the Batesville White Lime Company. Here the


R 11 W
R 10 W
R 9 W
R 8 W
R 7 W
R 6 W
R 5 W
R 4 W
R 3 W
R 2 W
T 16 N
T 15 N
T 14 N
T 13 N
T 12 N
MELBOURNE
IZARD
COUNTY
Sage
Mt. Olive
Lunenburg
Battles
SHARP
COUNTY
Sidney
Maxville
LAWRENCE
CO.
Lynn
Shelbyville
Cave City
Sylamore
Mobley
RIVER
INDEPENDENCE
COUNTY
MOUNTAIN VIEW
STONE
St. James
Cushman
Freifer
Cord
Hanover
COUNTY
Oneal
BATESVILLE
Moorefield
MO. PAC. R.R.
WHITE
RIVER
BLACK
JACKSON
CO.
Dota
Tuckerman
Ben
Prim
Jamestown
Rosie
Newark
Jacksonport
MO. PAC. R.R.
Wolf Bayou
CLEBURNE
CO.
Banner
N
BOONE FORMATION
MAINLY FERNVALE, KIMMSWICK, PLATTIN
AND JOACHIM LIMESTONE FORMATIONS
SCALE IN MILES
0
5
10
15
20

Fernvale and Kimmswick limestones are being quarried as a unit to supply high-calcium limestone to the Reynolds Metals Company for the manufacture of alumina.

Field Investigation

The primary purpose of the recent investigation was to check the quality of the various high-calcium limestones at several different localities in the area of accessible outcrops along the White River. Outcrops that permit surface sampling do not always offer the best quarry sites in a given locality, but it is likely that once the quality of the stone is established in a locality, a suitable quarry site could be found through additional field work. Before the recent field work was begun, analyses of samples from previous investigations indicated that the Fernvale and Kimmswick formations were too high in phosphorus to meet carbide specifications, and the St. Clair limestone was generally too thin and lenticular for quarrying, so that the recent sampling was limited almost entirely to the Plattin limestone formation. The sampling consisted of chipping the outcrops at 2 to 5-foot stratigraphic intervals, one sample combining the chips from an entire formation, except where excessive thickness of the formation justified breaking it up into several samples. Adequate topographic and geologic maps of the area were not available, so the localities sampled are plotted both on Figure 1 to show their relative position, and on Corps of Engineers sheets to show their exact location. The line indicating the sample localities on the Corps of Engineers sheets also shows the direction in

which the slope was climbed during sampling. The chemical analyses of all the samples were made by Troy W. Carney, Division of Geology Chemist, and the analyses of the samples are included in the descriptions of the individual localities that follow. All analyses were made on the burned lime (CaO) from the samples.

Locality #1 - Guion

This locality is at the mouth of the first ravine above Guion that enters the river valley from the north in the SW¼ SW¼ section 22, T. 15N, R. 9W, Izard County, Arkansas (see Fig. 2). A section was measured and sampled on the east side of the ravine about 100 feet from the railroad tracks. The table below shows the formations exposed in this hillside and the analyses* of the samples collected.

Formation	Elev. From	To	Thickness in feet	Sample No.	SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
	181'	214'	33	1-E	1.52	1.23	.93	.30	95.5	.51	Tr.	.003-
	159	181	22	1-D	1.67	1.14	.73	.41	94.5	.80	Tr.	.003-
Plattin Limestone	137	159	22	1-C	1.00	..62	.32	.30	96.0	.64	Tr.	.003-
	115	137	22	1-B	1.90	1.49	1.07	.42	94.5	.83	Tr.	.003-
	93	115	22	1-A	2.10	1.32	.94	.38	94.0	.83	Tr.	.003-
Joachim Dolomite	43	93	50	Not sampled								
St. Peter Sandstone	0	43	43	Not sampled								

Missouri Pacific railroad tracks= 0 Elevation

The dip of the beds is 5° west, and it is probable that a large tonnage of Plattin limestone with no overburden could be developed here.

*Division of Geology Laboratory No. 1066

Locality #2 - Sand Hollow

This section was measured in Sand Hollow, a deep ravine about half the distance along the railroad between Twin Creek and Sylamore in section 21, T.15N., R. 10W., Izard County, Arkansas (see Fig. 3). The samples were collected on the northeast side of the ravine at a point about half a mile up the ravine from the railroad. The formations exposed and the analyses* of samples collected at this locality are shown in the table below:

Formation	Elev.# From	To	Thickness in Feet	Sample No.	SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Plattin Limestone	74	184	110	2-A	2.33	1.40	1.00	.40	93.8	.76	Tr.	.005
Joachim Dolomite	34	74	40	not Sampled								
St. Peter Sandstone	0	34	34	not Sampled								

#Missouri Pacific railroad tracks = 0 Elevation

The rocks in this locality dip 3° northeast. The Plattin limestone here has no overburden and is available in large tonnages, but due to the relatively gentle slopes of the hills in area, the Plattin outcrops are some distance back from the railroad.

Locality #3 - Ruddles Quarry

This section was measured at the site of the abandoned limestone quarry at the community of Ruddles in the NE ¼ section 30, T.15N, R. 10W, Izard County, Arkansas (see Fig. 9). The quarry is in the Fernvale and

* Division of Geology Laboratory No. 1067

Kimmswick limestones and it was operated by the Batesville White Lime Company. The Plattin samples were collected from hillside outcrops directly below the west end of the quarry at a point about 500 feet north of the railroad. Fernvale samples were a composite of fragments on the quarry floor, because this formation was inaccessible in the quarry face, and the Kimmswick sample was chipped from the quarry face. The Boone chert overburden is only present at the highest point in the quarry face. The formations exposed and the analyses * of samples collected at this locality are shown in the table below:

Formation	Elev.# From	To	Thickness in feet	Sample No.	SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Boone Chert	245'	255'	10	Not sampled								
Sylamore Sandstone	240	245	5	Not sampled								
Fernvale Limestone	180	240	60	3-C	0.39	0.80	0.60	0.20	98.0	1.58	Tr.	.032
Kimmswick Limestone	160	180	20	3-B	0.36	0.72	0.58	0.14	97.3	0.55	Tr.	.140
Plattin Limestone	55	160	105	3-A	2.17	1.50	1.18	0.32	92.6	1.09	Tr.	.003
Joachim Dolomite	28	55	27	Not sampled								
St. Peter Sandstone	0	28	28	Not sampled								

#Missouri Pacific railroad tracks = 0 Elevation

*Division of Geology Laboratory No. 1068

The dip of the formation in the quarry is 5° southeast. A moderate tonnage of Plattin limestone would be available from the hillside below the old quarry where the overlying formations have been eroded, but probably more desirable quarry sites without overburden could be found should the stone prove of suitable grade. Moderate tonnages of Fernvale and Kimmswick limestone remain in the old quarry but some stripping of Boone chert would be necessary.

Locality #4 - Bolt Spur

This deposit is located at a railroad point known as Bolt Spur, in the NW¼ of sec. 30, T. 15 N., R. 9 W., Izard County; the spur, however, has been removed. The section was measured at the mouth of a narrow ravine that enters the river valley at Bolt Spur from the northwest (see Fig. 5). The formations exposed and the analyses* and thicknesses of samples collected at this locality are shown on the table below:

Formation	Elev.# From	To	Thickness in feet	Sample No.	Analysis Percent SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Boone Chert	209	309	100	Not sampled								
St. Clair Limestone	176	209	33	4-H	2.55	1.49	1.05	0.44	93.3	1.05	Tr.	.014
Cason Shale	175	176	1	Not sampled								
Fernvale Limestone	137	175	38	4-G	0.77	1.75	1.31	0.44	95.3	0.74	Tr.	.118
Kimmswick Limestone	115	137	22	4-F	2.44	1.57	1.08	0.49	94.3	0.18	Tr.	.175

Missouri Pacific Railroad tracks = 0 Elevation

* Division of Geology Laboratory No. 1069

(Continued from Page 6)

Formation	Elev. # From	To	Thickness in feet	Sample No.	Analysis Percent SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Plattin Limestone	88	115	27	4-E	1.11	1.41	1.18	0.23	94.8	0.41	Tr.	.003
	66	88	22	4-D	2.82	2.27	1.77	0.50	92.5	1.05	Tr.	.003
	44	66	22	4-C	3.96	1.22	0.84	0.38	92.3	0.66	Tr.	.003
	22	44	22	4-B	1.72	0.53	0.26	0.27	95.8	0.85	Tr.	.003
	0	22	22	4-A	2.76	1.23	0.91	0.32	93.3	0.58	Tr.	.003

The dip of the rocks at this locality is 7° east. It should be pointed out that the heavy Boone chert overburden (100 feet) occurs only on the tops of the highest hills well back from the railroad and the high-calcium limestones are well exposed on the lower slopes near the railroad.

Locality #5 - White River Limestone Products Company Deposit

This deposit is located at the south end of Penters Bluff on the north side of a wide ravine that enters the river valley from the east in the SW corner of sec. 10, T.14N., R.8W., Izard County (see Fig. 6). The Company has cleared the lower part of the hillside, drilled the Fernvale and Kimmswick limestones and plans to begin production of high-calcium limestone in the future. In the table below the thicknesses and samples of the Kimmswick and Fernvale formation were taken from drill cores while the Plattin samples were chipped from the outcrops on the lower slopes of the hill.

Formation	Elev.# From	To	Thickness in feet	Sample No.	SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Boone Chert	387	412	25	Not sampled								
St. Clair Limestone	377	387	10	Not sampled								
Cason Shale	375	377	2	Not sampled								
Fernvale Limestone*	255	375	120	886 2-F	0.51	0.84	0.36	0.48	$CaCO_3$ 97.2	Tr.	.05	.100
Kimmswick Limestone*	225	255	30	886 2-K	0.32	0.59	0.40	0.19	$CaCO_3$ 98.2	Tr.	.03	.064
Plattin Limestone	180	225	45	5-E	1.10	0.88	.69	0.19	CaO 95.4	0.19	Tr.	.025
	135	180	45	5-D	3.82	2.17	1.75	0.42	91.2	1.51	Tr.	.003
	90	135	45	5-C	2.63	1.58	1.35	0.23	92.5	2.16	Tr.	.003
	45	90	45	5-B	2.84	1.92	1.48	0.44	93.7	1.08	Tr.	.003
	0	45	45	5-A	2.63	.97	.79	0.18	94.1	0.70	Tr.	.003

Missouri Pacific Railroad tracks = 0 Elevation

* The analysis of this sample was on limestone rather than burned lime.

The dip of the rocks at this locality is about 7° to the west and a large tonnage of Plattin limestone without overburden is available on the lower slopes of the hills.

Locality #6 - Dry Creek

Dry Creek flows through a deep ravine that enters the White River valley at the north end of Handford Bluff in the NE¼ of sec. 23, T.5N., R. 10W., Izard County. The section was measured and samples taken on

the west slope of the draw that is tributary to Dry Creek about ¼ mile west of the Missouri Pacific railroad (see Fig. 5). The analyses* of the samples and the formations exposed here are shown in the table below:

Formation	Elev.# From	To	Thickness in feet	Sample No.	SiO_2	R_2O_3	Al_2O_3	Fe_2O_3	CaO	MgO	S	P
Boone Chert	335	235	100	No sample								
Fernvale Limestone	235	195	40	No sample								
Kimmswick Limestone	195	175	20	No sample								
Plattin Limestone	175	55	120	906-6	2.45	0.65	Nil	0.65	94.7	1.06	0.04	0.002
Joachim Dolomite	0	55	55	No sample								

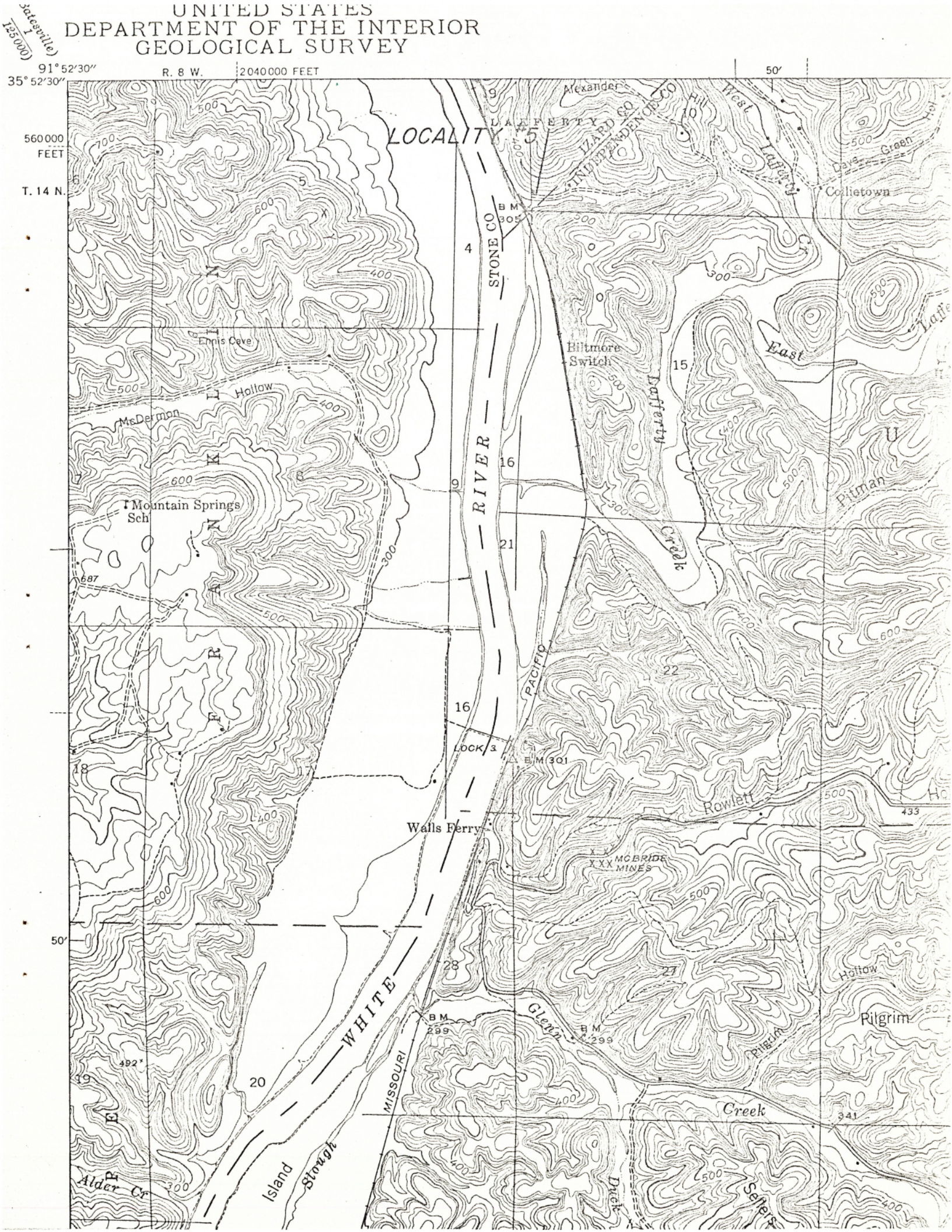
Missouri Pacific railroad tracks = 0 Elevation

The dip of the rocks at this locality is 10° to the east and large tonnages of Plattin Limestone with no overburden are available on the lower slopes of the hills.

* Division of Geology Laboratory No. 1062


LOCALITY #1
WHITE RIVER
JONES
GUION
Jones Bottom
Rock Castle
Hidden
Bayou
Missouri Pacific
Jones Bottom Cem
BM 449
BM 588
BM 313
BM 451
Gujon Park
Rocky
Cem
WT
Gujon Mine
Quarry
Mines
Ferry
Beckham Hollow
Thompson Hollow
Moffett Hollow
Dugger Spring
Spring Hollow
Mike Hollow
JEEP TRAIL
T. 15 N.
R. 9 W.
17
16
15
20
21
22
7
8
18
19
30
29
28
27
34
58
319
302
562
495
772
842
808
730
786
572
504
314


Hollow
Harris Cem
BM 341
NATIONAL
BM 340
Polk Mountain Cem
866
17
16
18
Kitchen Hollow
Sylamore Cem
13
Canning
743
Bishop
Cove Hollow
Sylamore
R11W
R10W
24
BM 334
19
Cold Springs
20
21
LOCALITY #2
Ripley
Graveyard Hollow
Bailey Hollow
Sheep Hollow
Hollow
PACIFIC
SYLAMORE BOTTOM
30
Quarry
Ruddells Cem
LOCALITY #3
29
28
MISSOURI
Buck Island
T. 15 N.
17
Warren Hollow
Hutt Creek
Warren Branch
24
19
20
Glady Hollow
Lawson Hollow
25
Levisy Flat Cem
30
29


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
91°52'30"
35°52'30"
R. 8 W.
2040000 FEET
50'
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T. 14 N.
LOCALITY #5
LAFFERTY
IZARD CO
INDEPENDENCE CO
STONE CO
Alexander
Hill
West
Lafferty
Cr
Dave Green
Collietown
BM 305
Ennis Cave
Hollow
McDermon
Mountain Springs Sch
Biltmore Switch
Lafferty
East
Creek
Pitman
RIVER
WHITE
PACIFIC
LOCK 3
BM 301
Walls Ferry
Rowlett
MCBRIDE MINES
Glenn
BM 299
Pilgrim
Creek
Hollow
MISSOURI
Island
Slough
Alder Cr
Dees
Selvey
687
492'
433
341


Isaac West Mountain
Ben West Mountain
Twin Creek
East Twin Creek
Snake Hollow
Squirrel Hollow
Mountain
Dry Creek
Harper Hol
JEEP TRAIL
BM 325
Round Bottom
WHITE RIVER
LOCALITY #6
LOCALITY #4
Handford Bluff
Schoolhouse Hollow
Beckham Cem
Beckham Hollow
Falls Hollow
Bottom Hollow
MISSOURI
PACIFIC
Greasy Bottom
BM 326
IZARD CO
STONE CO
R10W
R9W
T. 15 N.
WASHINGTON
Cave Hollow
Wade Hollow
Cem
Herpel
Rocky Bayou
Spring
Gravel Pit
Condrey
GUION
(GUION) 7655 IV NW
57'30"
55'
3979
3978
3977
3976
3975
3974