STRIPPABLE COAL RESERVE STUDY

IN

SELECTED IOWA COUNTIES

Prepared by

Iowa Geological Survey

U.S. BUREAU OF MINES

Grant No. G0254008

Note: This report was retyped and reprinted in 1985. No attempt was made to reevaluate the reserve calculations as originally reported.

Note: Although undated, the original report was published as an Open File Report in 1975.

INTRODUCTION

The following report was prepared by the Iowa Geological Survey under U.S. Bureau of Mines Grant No. G0254008.

The Counties included in the study (Lucas, Mahaska, Marion, Monroe, Wapello) were selected because more information was available for those counties than in other counties in Iowa underlain by coal-bearing rocks (Fig. 1). Nevertheless, the amount of available information is not extensive.

It was the intent at the outset of the study to establish criteria for determining estimates that would impose constraints so as to produce conservative estimates. It is believed that intent was fulfilled.

Work under the grant was performed by Professor Paul L. Garvin, Cornell College, Mt. Vernon, Iowa, assisted by graduate assistants Neil Sammis and Dean Berchenbriter. The project was coordinated by Orville J Van Eck, Assistant State Geologist, Iowa Geological Survey.

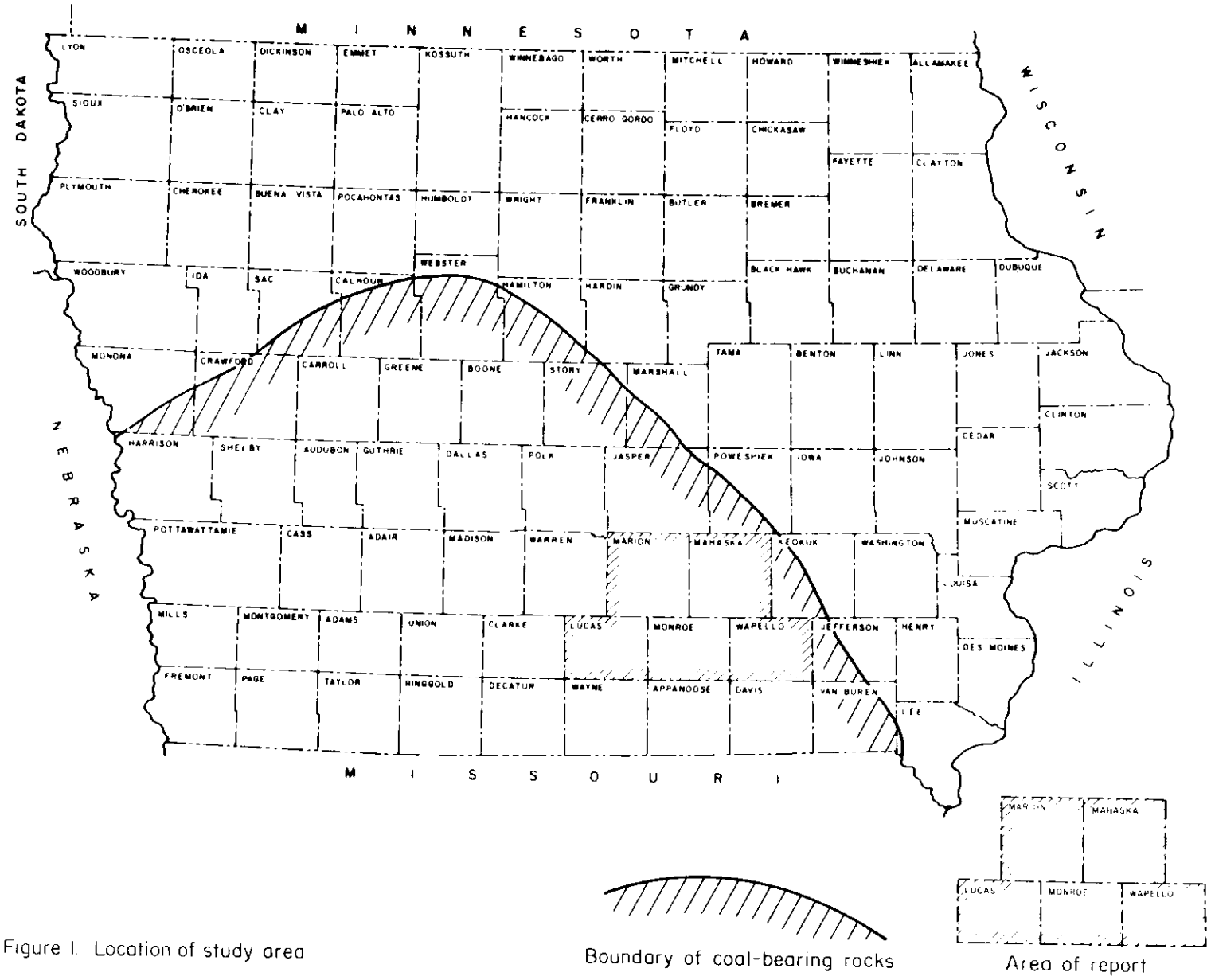

Figure 1. Location of study area

SOURCES OF INFORMATION

Data used in defining areas underlain by coal include underground mine shafts, coal-prospect drill holes, water wells, coal outcrops, and strip mines. Information was gathered chiefly from Annual Reports of the Iowa Geological Survey, Biennial Reports of the Iowa State Mine Inspectors, Iowa Geological Survey Technical Paper No. 4 Coal Resources of Iowa, and geologic logs of water wells drilled in the five counties under study. Also utilized was miscellaneous information on file at the Iowa Geological Survey, which included maps showing locations of abandoned coal mines and information concerning the activities of specific coal-mining companies. Owing to the short period of time allowed for the research, field checks of the data were not made.

CRITERIA USED IN RESERVE ESTIMATES

Coal reserves are tabulated according to coal bed thickness, thickness of overburden, and reliability of the estimate.

Coal Bed Thickness

Information regarding the thickness of coal beds is not abundant. Much of it is taken from reports of the Iowa State Mine Inspectors and from annual reports of the Iowa Geological Survey, where only an average coal thickness for the mine or mining district is reported. Coal thicknesses reported penetrated in drilling water wells in Iowa often have proven unreliable, therefore this source was considered with reserve. The lenticular nature of Iowa coal complicates the problem of bed-thickness correlation and the construction of isopach maps. Reserve estimates are given for intermediate coals (28 to 42 inches) and thick coals (greater than 42 inches). Reserves of thin coals (14 to 28 inches) were not estimated. For purposes of constructing thickness isopach maps, it was assumed that coal at the outer edges of all defined coal bodies is 28 inches thick.

Thickness of Overburden

Estimated reserves are reported for three categories of overburden thickness: 0-50 feet, 50-100 feet, and 100-150 feet.

Weight of Coal

The generally accepted weight of 1800 tons per acre-foot for Iowa coal was used in calculating the tonnage.

Reliability of Estimates

Coal reserves are reported as measured-indicated and inferred. No attempt was made to distinguish between measured and indicated reserves because of the lenticular character of Iowa coal beds.

Measured-Indicated Reserves

Measured-indicated reserve calculations are based on groups of closely spaced data points for which the average thickness of the coal bed is known and for which the uncertainty in determining the thickness of overburden is ±20 feet or less. Included in these reserves are all bodies of coal at a distance no greater than one-half mile outward from such data points.

Inferred Reserves

Inferred reserve calculations are based on isolated data points for which coal thickness and depth are accurately known, and on groups of data points for which bed thickness or thickness of overburden could not be determined accurately. Areas of inferred coal often appear as halos surrounding areas of measured-indicated coal, and they extend no more than one-half mile beyond the outer measured-indicated boundary. Areas of inferred coal defined by isolated data points extend to distances not greater than one mile from the nearest data point. Inferred reserves were also extended to include areas of abandoned underground coal mines and strip pits adjacent to defined areas, for which information on coal depth and thickness was not available. Small abandoned mines isolated from data points for which coal depth and thickness information were lacking were not included in the reserve estimate.

GENERAL PROCEDURES IN RESERVE CALCULATION

In order to determine the original reserves for each township, data points from all available sources were first plotted on topographic base maps, each point recording coal elevation and thickness where known. Using the criteria for reliability of estimates previously discussed, the areas of measured-indicated and inferred coal were outlined on working overlay maps. Thickness of overburden for each data point was determined by the difference between the surface elevation shown on the topographic base map and the elevation of the coal bed. Boundaries between the three thicknesses of overburden categories were contoured and each category was color coded for ease in recognition. Using known coal thicknesses and assuming minimum thickness at the outer edge of inferred coal (28 inches), isopachs were constructed on the working overlay maps using a thickness interval of 1 foot. Defined areas were then measured by means of polar planimeter. The planimeter measurements were converted to acre-feet and then to tonnage by computer. The calculations were tabulated according to coal bed thickness, thickness of overburden, and reliability of estimate. Coal reserves are reported by county and township (Table 2). Tabulation by individual coal bed was judged not feasible, owing to the highly variable nature of most Iowa coals, and to the extreme difficulty with coal-bed correlation.

LIMITATION OF METHODS

Estimating coal reserves in Iowa is a difficult undertaking. Subsurface information is sparse to absent in many areas. Records of mining were poorly kept, if at all. One can demonstrate the existence of a great many underground mines and strip pits, the accurate locations and/or descriptions of which are unknown. Because of the general lack of stratigraphic control and because of the great lateral variation in coal character, coal-bed correlation is at present virtually impossible. The only criterion for correlation which was employed in this study was elevation of the coal bed. Much additional drilling information is needed to define the limits of coal to any reasonable degree of accuracy.

POTENTIAL FOR FUTURE EXPLORATION

As expected, most of the target areas for exploration for strippable coal indicated by this study border formerly active or currently active mines. This is in part due to the fact that these are areas where more information is available. Some of these targets surround groups of small mines, which probably indicate that the coal in these areas is variable in character. A few target areas, particularly in Marion County, are defined by water well records only. As before mentioned, statements of coal thickness in these records have been proven generally unreliable. However, the areas probably are worthy of investigation. Maps showing areas underlain by coal reserves seem to demonstrate somewhat linear patterns trending primarily toward the southeast. Extensions of these trends beyond mined-out areas may exist. Many of the known areas underlain by coal occur along major drainage networks where stream erosion has exposed the coal horizons. There is doubtless coal underlying unexplored areas of interstream divides, although it is questionable whether much of it would be strippable because of thick overburden. In general, thickness of overburden increases toward the south in the five counties investigated. Virtually all of the coal defined in Marion and Mahaska counties is strippable, whereas much of the coal in Monroe and Lucas counties is too deep for stripping.

TABLE 1. ORIGINAL RESERVES OF STRIPPABLE BITUMINOUS COAL IN LUCAS, MAHASKA, MARION, MONROE, AND WAPELLO COUNTIES, IOWA
(values in millions of tons)

Counties	Measured-Indicated Reserves						Inferred Reserves						Total Original Reserves
	Coal Bed Thickness						Coal Bed Thickness						
	28-42 Inches			more than 42 Inches			28-42 Inches			more than 42 Inches			
	Overburden Thickness (ft)						Overburden Thickness (ft)						
	0-50	50-100	100-150	0-50	50-100	100-150	0-50	50-100	100-150	0-50	50-100	100-150	
Lucas	1.80	3.76	3.76	1.29	3.48	7.44	3.33	8.86	18.83	0.93	0.90	2.10	56.48
Mahaska	5.43	7.40	0.65	25.27	53.23	27.05	48.47	58.04	26.84	30.79	42.68	19.07	344.92
Marion	9.12	9.83	3.92	28.37	23.77	9.99	68.47	83.49	65.44	17.17	32.54	28.72	380.83
Monroe	1.23	2.85	3.31	4.00	19.99	23.04	7.57	18.77	38.49	1.87	7.22	15.12	143.46
Wapello	5.40	7.49	6.24	1.47	6.08	8.21	53.01	67.23	39.98	10.29	8.88	2.52	216.80
Totals	22.98	31.33	17.88	60.40	106.55	75.73	180.85	236.39	189.58	61.05	92.22	67.53	1142.49

TABLE 2. Original coal reserve estimates reported by county and township according to coalbed thickness, overburden thickness, and reliability of estimate.

LUCAS COUNTY

ORIGINAL
MEASURED-INDICATED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R20	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R22	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R20	28-42	0.00	0.94	1.42	2.36
	>42	0.00	0.00	0.00	0.00
T72 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R22	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R20	28-42	1.80	2.82	2.34	6.96
	>42	1.29	3.48	7.44	12.21
T73 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R22	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	3.09	7.24	11.21	

TOTAL VOLUME MEASURED-INDICATED 21.53 MILLIONS OF TONS

LUCAS COUNTY

ORIGINAL
INFERRED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R20	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R22	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R20	28-42	0.00	0.14	1.42	1.56
	>42	0.00	0.00	0.00	0.00
T72 R21	28-42	0.93	1.53	1.95	4.41
	>42	0.00	0.00	0.00	0.00
T72 R22	28-42	0.00	1.94	0.22	2.16
	>42	0.00	0.00	0.00	0.00
T72 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R20	28-42	1.80	4.80	11.54	18.14
	>42	0.93	0.90	2.10	3.93
T73 R21	28-42	0.60	0.45	0.18	1.23
	>42	0.00	0.00	0.00	0.00
T73 R22	28-42	0.00	0.00	3.52	3.52
	>42	0.00	0.00	0.00	0.00
T73 R23	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	4.26	9.76	20.94	

TOTAL VOLUME INFERRED 34.96 MILLIONS OF TONS

MAHASKA COUNTY

ORIGINAL
MEASURED-INDICATED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T74 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T74 R15	28-42	0.73	0.59	0.35	1.67
	>42	1.22	2.86	1.39	5.47
T74 R16	28-42	0.09	0.22	0.00	0.31
	>42	4.68	5.38	1.02	11.09
T74 R17	28-42	0.00	0.08	0.30	0.38
	>42	2.92	12.65	17.09	32.66
T75 R14	28-42	0.00	0.00	0.00	0.00
	>42	2.21	0.21	0.00	2.42
T75 R15	28-42	0.32	2.83	2.68	5.83
	>42	0.94	5.66	4.77	11.36
T75 R16	28-42	2.70	0.00	0.00	2.70
	>42	0.82	3.15	0.00	3.96
T75 R16	28-42	1.08	1.44	0.00	2.51
	>42	11.60	20.01	7.55	39.16
T75 R17	28-42	0.83	5.07	0.00	5.90
	>42	1.62	7.77	0.00	9.38
T76 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.20	1.20	0.00	1.40
T76 R15	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R17	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R15	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R17	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	31.95	69.10	35.16	

TOTAL VOLUME MEASURED-INDICATED 136.21 MILLIONS OF TONS

MAHASKA COUNTY

ORIGINAL
INFERRED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T74 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T74 R15	28-42	4.18	5.08	2.29	11.55
	>42	8.76	4.89	1.89	15.53
T74 R16	28-42	8.07	7.26	1.63	16.96
	>42	3.11	2.56	0.48	6.15
T74 R17	28-42	0.46	5.72	11.17	17.36
	>42	1.25	3.44	5.11	9.79
T75 R14	28-42	4.70	2.30	0.00	7.00
	>42	0.60	0.48	0.00	1.08
T75 R15	28-42	10.86	9.79	1.24	21.89
	>42	6.23	10.96	1.98	19.16
T75 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T75 R16	28-42	10.15	13.33	2.60	26.08
	>42	9.04	10.03	1.51	20.58
T75 R17	28-42	1.77	1.21	3.07	6.06
	>42	0.00	0.42	1.85	2.26
T76 R14	28-42	0.82	2.41	0.00	3.22
	>42	0.69	1.74	0.00	2.43
T76 R15	28-42	0.67	2.75	0.00	3.42
	>42	0.00	2.31	0.00	2.31
T76 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R17	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R15	28-42	6.47	5.36	2.16	13.98
	>42	0.17	0.17	1.48	1.82
T77 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R17	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	77.99	92.19	38.45	

TOTAL VOLUME INFERRED 208.63 MILLIONS OF TONS

MARION COUNTY

ORIGINAL
MEASURED-INDICATED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T74 R18	28-42	0.17	0.65	0.62	1.44
	>42	11.39	9.36	7.44	28.19
T74 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T74 R20	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T74 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T75 R18	28-42	1.66	0.52	0.00	2.18
	>42	3.85	2.43	0.00	6.28
T75 R19	28-42	2.98	4.85	1.81	9.65
	>42	5.32	7.63	1.30	14.26
T75 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T75 R20	28-42	0.81	0.14	0.00	0.96
	>42	0.54	0.10	0.00	0.64
T75 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T76 R19	28-42	0.96	1.26	0.95	3.17
	>42	0.75	0.70	0.09	1.54
T76 R20	28-42	0.53	0.38	0.00	0.91
	>42	0.44	0.33	0.00	0.77
T76 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R20	28-42	1.57	0.82	0.00	2.39
	>42	3.58	0.91	0.08	4.57
T77 R21	28-42	0.44	1.21	0.54	2.19
	>42	2.50	2.31	1.08	5.90
	TOTALS	37.50	33.61	13.93	

TOTAL VOLUME MEASURED-INDICATED 85.03 MILLIONS OF TONS

MARION COUNTY

ORIGINAL
INFERRED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T74 R18	28-42	2.29	7.14	16.92	26.35
	>42	8.22	12.72	15.68	36.61
T74 R19	28-42	0.30	0.84	1.79	2.93
	>42	0.00	0.00	0.84	0.84
T74 R20	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T74 R21	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T75 R18	28-42	7.96	9.16	2.28	19.40
	>42	0.89	2.54	0.00	3.43
T75 R19	28.42	8.37	7.68	9.38	25.44
	>42	2.81	2.89	1.12	6.82
T75 R19	28-42	1.73	2.12	3.39	7.24
	>42	0.00	0.00	0.00	0.00
T75 R20	28-42	7.64	8.05	3.01	18.70
	>42	0.00	2.89	4.73	7.62
T75 R21	28-42	6.34	14.02	8.47	28.83
	>42	0.00	1.12	0.58	1.70
T76 R18	28-42	6.47	3.26	6.08	15.80
	>42	1.49	3.12	1.98	6.60
T76 R19	28-42	1.78	1.11	0.00	2.89
	>42	0.00	0.00	0.00	0.00
T76 R19	28-42	7.12	6.93	2.17	16.21
	>42	0.11	0.00	0.00	0.11
T76 R20	28-42	3.17	3.95	0.88	8.00
	>42	0.00	0.00	0.00	0.00
T76 R21	28-42	2.33	2.93	2.98	8.24
	>42	0.00	0.00	0.00	0.00
T77 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T77 R19	28-42	4.10	5.11	2.90	12.12
	>42	0.27	1.56	1.26	3.09
T77 R20	28-42	3.01	4.87	1.42	9.30
	>42	3.38	3.98	2.08	9.44
T77 R21	28-42	7.45	6.32	3.77	17.53
	>42	0.00	1.72	0.45	2.17
	TOTALS	87.21	116.03	94.17	

TOTAL VOLUME INFERRED 297.41 MILLIONS OF TONS

MONROE COUNTY

ORIGINAL
MEASURED-INDICATED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R17	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R16	28-42	0.40	0.00	0.00	0.40
	>42	1.70	3.47	1.91	7.08
T72 R17	28-42	0.00	0.71	1.07	1.78
	>42	0.00	1.44	2.81	4.25
T72 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.52	2.14	2.66
T72 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R16	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R16	28-42	0.46	1.33	1.15	2.93
	>42	0.00	0.81	2.02	2.83
T73 R17	28-42	0.00	0.19	0.78	0.97
	>42	0.68	5.94	10.10	16.72
T73 R18	28-42	0.37	0.62	0.31	1.30
	>42	1.62	7.81	4.06	13.49
T73 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	5.24	22.84	26.35	

TOTAL VOLUME MEASURED-INDICATED 54.42 MILLIONS OF TONS

MONROE COUNTY

ORIGINAL
INFERRED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R16	28-42	0.10	0.48	0.44	1.02
	>42	0.00	0.56	2.31	2.88
T71 R17	28-42	0.28	1.66	3.66	5.60
	>42	0.00	0.00	0.00	0.00
T71 R18	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T71 R19	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R16	28-42	2.00	1.30	0.55	3.84
	>42	0.94	0.76	0.38	2.09
T72 R17	28-42	0.00	1.33	1.30	2.62
	>42	0.00	0.08	3.02	3.10
T72 R18	28-42	0.00	3.81	5.20	9.00
	>42	0.00	0.67	2.34	3.01
T72 R19	28-42	0.00	0.00	6.35	6.35
	>42	0.00	0.00	0.00	0.00
T73 R16	28-42	0.58	1.98	4.81	7.36
	>42	0.00	0.29	0.68	0.98
T73 R16	28-42	1.57	2.64	2.19	6.39
	>42	0.42	1.16	0.84	2.41
T73 R17	28-42	0.15	1.35	7.53	9.04
	>42	0.17	1.99	1.66	3.82
T73 R18	28-42	2.41	3.15	4.79	10.36
	>42	0.34	1.71	3.89	5.94
T73 R19	28-42	0.48	1.07	1.67	3.21
	>42	0.00	0.00	0.00	0.00
	TOTALS	9.43	26.01	53.60	

TOTAL VOLUME INFERRED 89.04 MILLIONS OF TONS

WAPELLO COUNTY

ORIGINAL
MEASURED-INDICATED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R12	28-42	0.53	0.58	0.41	1.52
	>42	0.25	0.00	0.00	0.25
T71 R13	28-42	0.77	0.33	0.81	1.91
	>42	0.32	0.38	0.54	1.24
T71 R14	28-42	0.83	1.03	2.16	4.02
	>42	0.27	1.78	2.15	4.20
T71 R15	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R12	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R13	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R14	28-42	1.30	3.18	1.32	5.79
	>42	0.39	2.03	1.42	3.84
T72 R15	28-42	1.97	1.86	1.24	5.07
	>42	0.00	0.13	0.12	0.25
T73 R12	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R13	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R14	28-42	0.00	0.51	0.30	0.81
	>42	0.24	1.76	3.98	5.98
T73 R14	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R15	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
	TOTALS	6.87	13.57	14.45	

TOTAL VOLUME MEASURED-INDICATED 34.89 MILLIONS OF TONS

WAPELLO COUNTY

ORIGINAL
INFERRED RESERVES

MILLIONS OF TONS

TOWNSHIP & RANGE	THICKNESS IN	0-50 FT	50-100 FT	100-150 FT	TOTALS
T71 R12	28-42	2.78	4.57	3.84	11.20
	>42	0.11	0.00	0.00	0.11
T71 R13	28-42	5.75	4.14	4.07	13.97
	>42	0.00	0.00	0.00	0.00
T71 R14	28-42	4.50	7.19	4.26	15.95
	>42	0.00	0.61	0.30	0.91
T71 R15	28-42	0.64	0.94	0.40	1.97
	>42	0.00	0.00	0.00	0.00
T72 R12	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T72 R13	28-42	10.58	13.03	4.37	27.99
	>42	0.93	2.47	0.88	4.28
T72 R14	28-42	5.13	7.12	5.50	17.75
	>42	1.35	1.20	1.06	3.61
T72 R15	28-42	3.75	7.99	7.08	18.82
	>42	0.00	0.00	0.00	0.00
T73 R12	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R13	28-42	0.00	0.00	0.00	0.00
	>42	0.00	0.00	0.00	0.00
T73 R14	28-42	2.63	3.66	5.48	11.77
	>42	1.29	0.11	0.28	1.67
T73 R14	28-42	9.58	13.16	3.61	26.35
	>42	2.27	2.81	0.00	5.08
T73 R15	28-42	7.67	5.43	1.37	14.47
	>42	4.34	1.68	0.00	6.02
	TOTALS	63.30	76.11	42.49	

TOTAL VOLUME INFERRED 181.90 MILLIONS OF TONS