UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TEXT TO ACCOMPANY:

COAL RESOURCE OCCURRENCE

AND

COAL DEVELOPMENT POTENTIAL

MAPS

OF THE

LANCE CREEK 2 SOUTHWEST QUADRANGLE,

CONVERSE AND NIOBRARA COUNTIES, WYOMING

BY

INTRASEARCH INC.

DENVER, COLORADO

OPEN FILE REPORT 79-455

1979

This report is preliminary, and has not been edited or reviewed for conformity with United States Geological Survey standards or stratigraphic nomenclature.

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CONVERSION TABLE

TO CONVERT	MULTIPLY BY	TO OBTAIN
inches	2.54	centimeters (cm)
feet	0.3048	meters (m)
miles	1.609	kilometers (km)
acres	0.40469	hectares (ha)
tons (short)	0.9072	metric tons (t)
cubic yards/ton	0.8428	cubic meters per metric ton
acre feet	0.12335	hectare-meters
Btu/lb	2.326	kilojoules/kilogram (kJ/kg)
Btu/lb	0.55556	kilocalories/kilogram (kcal/kg)
Fahrenheit	5/9 (F-32)	Celsius

I. Introduction

This report and accompanying maps set forth the Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) of coal beds within the Lance Creek 2 Southwest Quadrangle, Converse and Niobrara Counties, Wyoming. This CRO and CDP map series includes 3 figures and 9 plates (U. S. Geological Survey Open-File Report 79-455). The project is compiled by IntraSearch Inc., 1600 Ogden Street, Denver, Colorado, under KRCRA Northeastern Powder River Basin, Wyoming, Contract Number 14-08-0001-17180. This contract is a part of a program to provide an inventory of unleased federal coal in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States.

The Lance Creek 2 Southwest Quadrangle is located in Converse and Niobrara Counties, in eastern Wyoming. It encompasses parts of Townships 38 and 39 North, Ranges 67 and 68 West, and covers the area: 43° 15' to 43°22'30" north latitude; 104°52'30" to 105°52'30" to 105°00' west longitude.

Two maintained gravel roads provide access to the Lance Creek 2 Southwest Quadrangle. Minor roads and trails that branch from these maintained roads provide additional access to the study area. The closest railroad is the Burlington Northern trackage to the Black Thunder coal mine, approximately 20 miles (32 km) to the nortwest. This railroad is under construction southward, and will be located 14 miles (23 km) west of the quadrangle boundary.

Cow Creek provides the major drainage for the area and flows eastward through the central portion of the quadrangle. A maximum elevation of 5017 feet (1529 m) above sea level is located in the north-central part of the study area. Minimum elevations of 4360 feet (1329 m) above

sea level occur in the valley floor of Cow Creek at the eastern quadrangle boundary. The somber grays, yellows, and browns of outcropping shales and siltstones contrast strikingly with the brilliant reds, oranges, and purples of "clinker", and deep greens of the juniper and pine tree growth.

The ten to twelve inches (25 to 30 cm) of annual precipitation that falls in this semi-arid region accrues principally in the springtime. Summer and fall precipitation usually originates from thunderstorms, and infrequent snowfalls of six inches (15 cm) or less generally characterize winter precipitation. Although temperatures ranging from less than -25° (-32°C) to more than 100°F (38°C) have been recorded near Gillette, Wyoming, average wintertime minimums and summertime maximums approach +5° to +15°F (-15° and -9°C) and 75° to 90°F (24° to 32°C), respectively.

Surface ownership is divided among fee, state, and federal categories with the state and federal surface generally leased to ranchers for grazing purposes. Details of surface ownership are available at the Niobrara and Converse County Courthouses in Lusk and Douglas, Wyoming, respectively. Details of mineral ownership on federal lands are available from the U. S. Bureau of Land Management in Cheyenne, Wyoming. Federal coal ownership is shown on Plate 2 of the Coal Resource Occurrence maps. The non-federal coal ownership comprises both fee and state coal resources.

The Coal Resource Occurrence and Coal Development Potential program pertains to unleased federal coal and focuses upon: 1) the delineation of lignite, subbituminous coal, bituminous coal and anthracite at the surface and in the subsurface on federal land; 2) the identification of total tons in place as well as recoverable tons; 3) categorization of these tonnages into measured, indicated, and inferred reserves and resources, and hypothetical resources; and 4) recommendations regarding the potential for surface mining, underground mining, and in-situ gasification of the coal beds. This report evaluates the coal resources of all unleased federal

coal beds in the quadrangle which are 5 feet (1.5 m) or greater in thickness and occur at depths down to 3000 feet (914 m). No resources or reserves are computed for leased federal coal, state coal, fee coal, or lands encompassed by coal prospecting permits and preference right lease applications.

Surface and subsurface geological and engineering extrapolations drawn from the current data base suggest the occurrence of approximately 89 million tons (81 million metric tons) of total unleased federal coal resource in the Lance Creek 2 Southwest Quadrangle.

The suite of maps that accompany this report set forth and portray the coal resource and reserve occurrence in considerable detail. For the most part, this report supplements the cartographically displayed information with minimum verbal duplication of the CRO-CDP map data.

II. Geology

Regional. The thick, economic coal deposits of the Powder River Basin in northeastern Wyoming occur mostly in the Tongue River Member of the Fort Union Formation, and in the lower part of the Wasatch Formation. Approximately 3000 feet (914 m) of the Fort Union Formation, that includes the Tongue River, Lebo, and Tullock Members of Paleocene age, are unconformably overlain by approximately 700 feet (213 m) of the Wasatch Formation of Eocene age. These Tertiary formations lie on a structural basin flanked on the east by the Black Hills uplift, on the south by the Hartville and Casper Mountain uplifts, and on the west by the Casper Arch and the Big Horn Mountain uplift. The structural configuration of the Powder River Basin originated in Late Cretaceous time, with episodic uplift thereafter. The Cretaceous Cordillera was the dominant positive land form throughout the Rocky Mountain area at the close of Mesozoic time.

Outcrops of the Wasatch Formation and the Tongue River Member of the Fort Union Formation cover most of the areas of major coal resource Occurrence in the Powder River Basin. The Lebo Member of the Fort Union Formation is mapped at the surface northeast of Recluse, Wyoming, east of the principal coal outcrops and associated clinkers (McKay, 1974), and presumably projects into the subsurface beneath much of the basin. One of the principal characteristics for separating the Lebo and Tullock Members (collectively referred to as the Ludlow Member east of Miles City, Montana) from the overlying Tongue River Member is the color differential between the lighter-colored upper portion and the somewhat darker lower portion (Brown, 1958). Although geologists working with subsurface data, principally geophysical logs, in the basin are trying to develop criteria for subsurface recognition of the Lebo-Tullock and Tongue River-Lebo contacts, no definitive guidelines are known to have been published. Hence, for subsurface mapping purposes, the Fort Union Formation is not divided into its member subdivisions for this study.

During the Paleocene epoch, the Powder River Basin tropic to subtropic depositional environment included broad, inland flood basins with extensive swamps, marshes, freshwater lakes, and a sluggish but active northeastward discharging drainage system, superimposed on a near base level, emerging sea floor. Much of the vast areas where organic debris collected was within a reducing depositional environment. Localized uplifts began to disturb the near sea level terrain of northeastern Wyoming, following retreat of the Cretaceous seas. However, the extremely fine-grained characteristics of the Tongue River Member clastics suggest that areas of recurring uplift peripheral to the Powder River Basin were subdued during major coal deposit formation.

The uplift of areas surrounding the Powder River Basin created a structural basin of asymmetric characteristic, with the steep west flank located on the eastern edge of the Big Horn Mountains. The axis of the Powder River Basin is difficult to specifically define, but is thought to be located in the western part of the Basin, and to display a north-south configuration some 15 to 20 miles (24 to 32 km) east of Sheridan, Wyoming. Thus, the sedimentary section described in this report lies on the east flank of the Powder River Basin, with gentle dips of two degrees or less disrupted by surface structure thought to relate to tectonic adjustment and differential compaction.

Some coal beds in the Powder River Basin exceed 200 feet (61 m) in thickness. Deposition of these thick, in-situ coal beds requires a discrete balance between subsidence of the earth's crust and in-filling by tremendous volumes of organic debris. These conditions in concert with a favorable ground water table, non-oxidizing clear water, and a climate amenable to the luxuriant growth of vegetation produce a stabilized swamp critical to the deposition of coal beds.

Deposition of the unusually thick coal beds of the Powder River Basin may be partially attributable to short-distance water transportation of organic detritus into areas of crustal subsidence. Variations in coal bed thickness throughout the basin relate to changes in the depositional environment. Drill hole data that indicate either the complete absence or extreme attenuation of a thick coal bed probably relate to location of the drill holes within the ancient stream channel system draining this low land area in Early Cenozoic time. Where thick coal beds thin rapidly from the depocenter of a favorable depositional environment, it is not unusual to encounter a synclinal structure over

the maximum coal thickness due to the differential compaction between organic debris in the coal depocenter and fine-grained clastics in the adjacent areas.

The Wasatch Formation of Eocene age crops out over most of the central part of the Powder River Basin and exhibits a disconformable contact with the underlying Fort Union Formation. The contact has been placed at various horizons by different workers; however, for the purpose of this report, in northwestern Campbell County, Wyoming, the contact is positioned near the top of the Roland coal bed as mapped by Olive (1957) and is considered to disconformably descend in the stratigraphic column to the top of the Wyodak-Anderson coal bed (Roland coal bed of Taff, 1909) along the eastern boundary of the coal measures. No attempt is made to differentiate the Wasatch and Fort Union Formations on geophysical logs or in the subsurface mapping program that is a part of this CRO-CDP project.

Although Wasatch and Fort Union lithologies are too similar to allow differentiation in some areas, most of the thicker coal beds occur in the Fort Union section on the east flank of the Powder River Basin. Furthermore, orogenic movements peripheral to the basin apparently increased in magnitude during Wasatch time causing the deposition of friable, coarse-grained to gritty arkosic sandstones, fine-to very fine-grained sandstones, siltstones, mudstones, claystones, brown-to-black carbonaceous shales and coal beds. These sediments are noticeably to imperceptibly coarser than the underlying Fort Union clastics.

The Lance Creek 2 Southwest Quadrangle is located in an area where surface rocks are classified into the Fort Union Formation. From 600 to 700 feet (183 to 213 m) of this formation are exposed in this area.

Olive (1957) correlated coal beds in the Spotted Horse coal field with coal beds in the Sheridan coal field (Baker, 1929) and Gillette coal field (Dobbin and Barnett, 1927), Wyoming, and with coal beds in the Ashland coal field (Bass, 1932) in southeastern Montana. This report utilizes, where possible, the coal bed nomenclature used in previous reports. The Wildcat coal bed was informally named by IntraSearch (1978).

Local. The Lance Creek 2 Southwest Quadrangle lies on the eastern flank of the Powder River Basin, where the strata dip gently westward. The Fort Union Formation crops out over the entire quadrangle, and is composed of very fine-grained sandstones, siltstones, claystones, shales, carbonaceous shales, and coal beds.

III. Data Sources

Areal geology of the coal outcrops and associated clinker is derived from the Lost Spring coal field report (Winchester, 1912). The coal bed outcrops, scale 1:125,000, are enlarged and projected onto the current topographic map at a scale of 1:24,000. Numerous irregularities in outcrop elevation result from this map construction; hence, the coal bed outcrop configurations are considered to be generalized. Winchester's "E" and "B" coal bed outcrops correlate with the Middle and Lower Wildcat coal beds, respectively, of IntraSearch in this report.

The major source of subsurface control, particularly on deep coal beds, is the geophysical logs from oil and gas test bores and producing wells. Some geophysical logs are not applicable to this study, for the logs relate only to the deep potentially productive oil and gas zones. More than eighty percent of the logs include resistivity, conductivity, and self-potential curves. Occasionally the logs include gamma,

density, and sonic curves. These logs are avilable from several commercial sources.

All geophysical logs available in the quadrangle are scanned to select those with data applicable to Coal Resource Occurrence mapping. Paper copies of the logs are obtained, interpreted, and coal intervals annotated. Maximum accuracy of coal bed indentification is accomplished where gamma, density, and resistivity curves are available. Coal bed tops and bottoms are picked on the logs at the midpoint between the minimum and maximum curve deflections. The correlation of coal beds within and between quadrangles is achieved utilizing a fence diagram to associate local correlations with regional coal occurrences.

The reliability of correlations, set forth by IntraSearch in this report, vary depending on: the density and quality of lithologic and geophysical logs; the detail, thoroughness, and accuracy of published and unpublished surface geological maps, and interpretative proficiency. There is no intent on the part of IntraSearch to refute nomenclature established in the literature or used locally by workers in the area. IntraSearch nomenclature focuses upon the suggestion of regional coal bed names applicable throughout the eastern Powder River Basin. It is expected and entirely reasonable that some differences of opinion regarding correlations, as suggested by IntraSearch, exist. Additional drilling for coal, oil, gas, water, and uranium, coupled with expanded mapping of coal bed outcrops and associated clinker will broaded the data base for coal bed correlations and allow continued improvement in the understanding of coal bed occurrences in the eastern Powder River Basin.

The preliminary topographic map of the Lance Creek 2 Southwest Quadrangle is available from the U. S. Geological Survey. Land network and mineral ownership data are compiled from land plats available from the U. S. Bureau of Land Management in Cheyenne, Wyoming. This information is current to October 13, 1977.

IV. Coal Bed Occurrence

Fort Union Formation coal beds that are present in all or part of the Lance Creek 2 Southwest Quadrangle include, in descending stratigraphic order, the Middle Wildcat and Lower Wildcat coal beds. Due to the limited geographic extent of the Middle Wildcat coal bed, CRO data is shown on three 8 1/2 x 11" (22 x 28 cm) maps (Figures 1, 2, and 3). A complete suite of maps (structure, isopach, mining ratio, overburden, identified resources, and areal distribution of identified resources) is prepared for the Lower Wildcat coal bed.

No physical and chemical analyses are known to have been published regarding the coal beds in the Lance Creek 2 Southwest Quadrangle. However, an "as received" basis proximate analysis for a coal bed in the Bill 4 Northeast Quadrangle to the southwest is as follows:

COAL BED NAME	ASH	FIXED CARBON	MOISTURE	VOLATILES	SULFUR	BTU/LB
Local (1)	4.3	38.5	27.8	29.4	0.27	8410

(1) Winchester, D. E., 1912, the Lost Spring coal field, Converse County, Wyoming: U. S. Geol. Survey Bull. 471-F, p. 485.

All analyses except for BTU/LB are expressed as a percentage.

The Coal Data Sheet, Plate 3, shows the downhole identification of coal beds within the quadrangle as interpreted from geophysical logs from oil and gas test bores and producing sites. No coal beds are identified in the subsurface on geophysical logs; hence, no datum is established for geophysical log orientation.

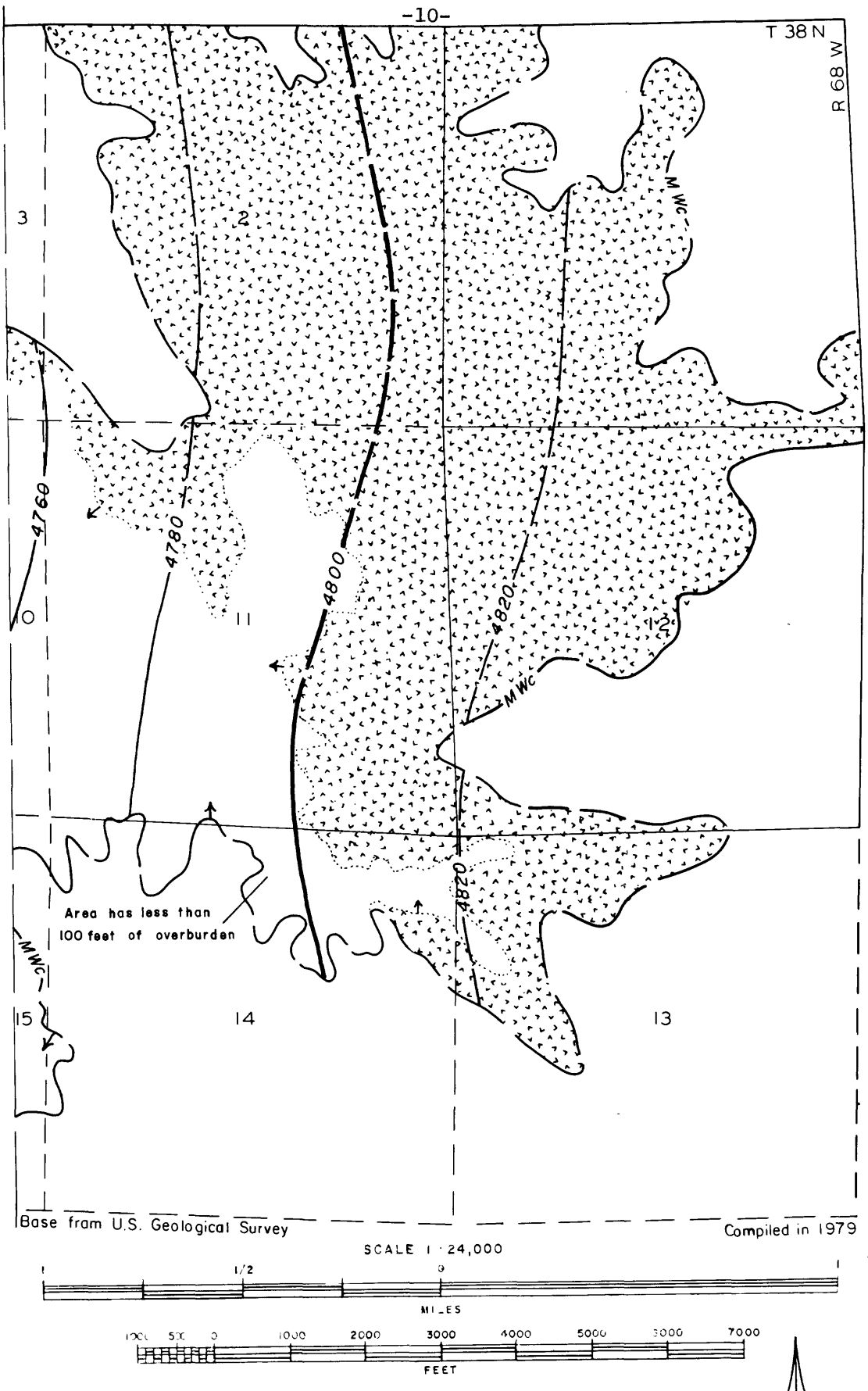
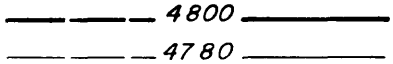


FIGURE 1
STRUCTURE CONTOUR AND ISOPACH OF OVERBURDEN MAP
OF MIDDLE WILDCAT COAL BED IN
LANCE CREEK 2 SW QUADRANGLE,
NIOBRARA AND CONVERSE COUNTIES. WYOMING
(See following page for explanation)

EXPLANATION FOR FIGURE 1



STRUCTURE CONTOURS- Drawn on top of coal bed. Contour interval 20 feet. Datum is mean sea level. Dashed where coal is burned or eroded.

TRACE OF COAL BED OUTCROP-Arrow points toward the coal-bearing area. "V" symbol indicates baked rock with dotted line showing limit of burning. Coal bed dashed where inferred.

To convert feet to meters multiply feet by 0.3048.

This outcrop mapping is derived and enlarged from a 1:125,000 scale publication (Winchester, 1912). Numerous irregularities in outcrop elevations and the areal geology-topographic map relationship emphasize that this map presents a generalized configuration of the coal bed outcrop. Horizontal accuracy of outcrop location is estimated at + 1000 feet (305 m).

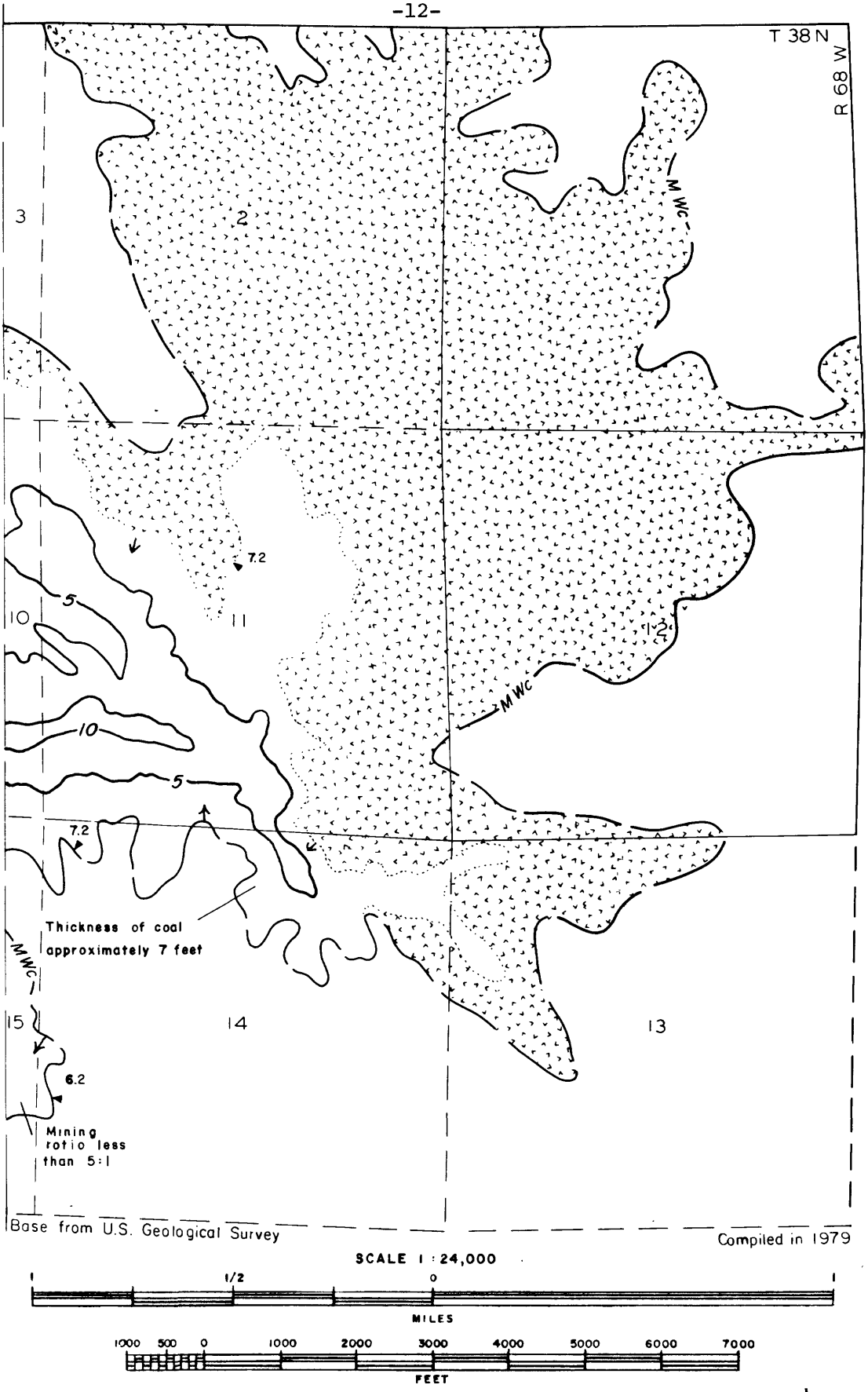


FIGURE 2
ISOPACH AND MINING RATIO MAP
OF MIDDLE WILDCAT COAL BED IN
LANCE CREEK 2 SW QUADRANGLE
NIOBRARA AND CONVERSE COUNTIES, WYOMING
(See following page for explanation)

EXPLANATION FOR FIGURE 2

MINING RATIO CONTOUR- Number indicates cubic yards of overburden per ton of recoverable coal by surface mining methods. Contour shown only in area suitable for surface mining within the stripping limit.

TRACE OF COAL BED OUTCROP- Showing coal thickness in feet, measured at triangle. Arrow points toward the coal-bearing area. "V" symbol indicates baked rock with dotted line showing limit of burning. Coal bed dashed where inferred.

To convert feet to meters multiply by 0.3048.

This outcrop mapping is derived and enlarged from a 1:125,000 scale publication (Winchester, 1912). Numerous irregularities in outcrop elevations and the areal geology-topographic map relationship emphasize that this map presents a generalized configuration of the coal bed outcrop. Horizontal accuracy of outcrop location is estimated at + 1000 feet (305 m).

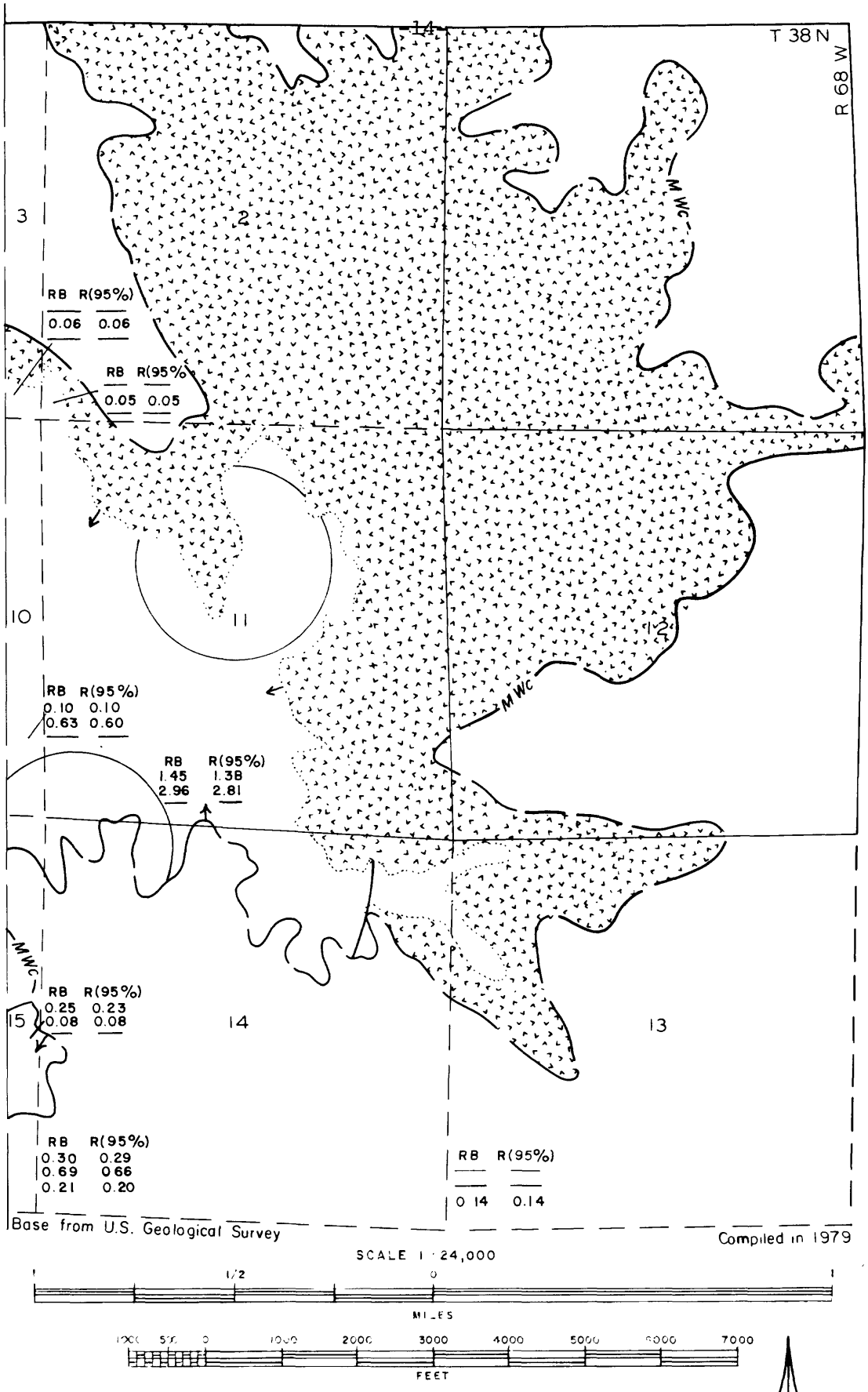
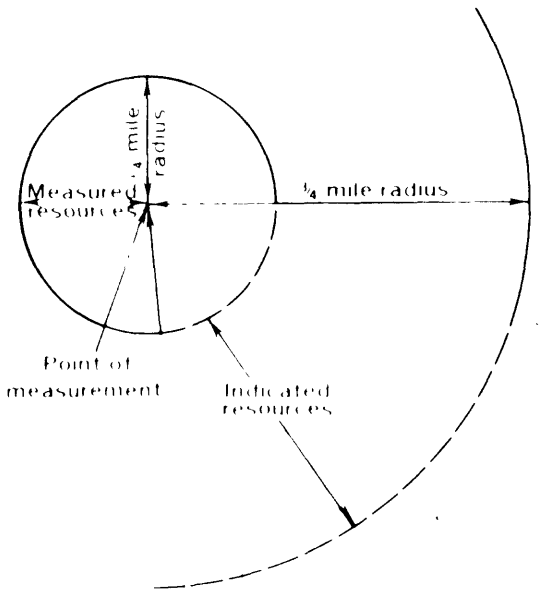


FIGURE 3
AREAL DISTRIBUTION OF IDENTIFIED RESOURCES
AND IDENTIFIED RESOURCES
MAP OF MIDDLE WILDCAT COAL
BED IN LANCE CREEK 2 SW QUADRANGLE
NIOBRARA AND CONVERSE COUNTIES, WYOMING
(See following page for explanation)

EXPLANATION FOR FIGURE 3



BOUNDARY LINES- Enclosing areas of measured, indicated and inferred coal resources of the coal bed.

TRACE OF COAL BED OUTCROP-Arrow points toward the coal-bearing area. "V" symbol indicates baked rock with dotted line showing limit of burning. Coal bed dashed where inferred.

RB	R(95%)	
1.45	1.38	(Measured)
2.96	2.81	(Indicated)
—	—	(Inferred)

IDENTIFIED RESOURCES OF COAL BED- In millions of short tons. Dash indicates no resources in that category. Reserve base (RB) x the recovery factor (95%) = reserves (R).

To convert short tons to metric tons multiply short tons by 0.9072.

To convert miles to kilometers multiply miles by 1.609.

This outcrop mapping is derived and enlarged from a 1:125,000 scale publication (Winchester, 1912). Numerous irregularities in outcrop elevations and the areal geology-topographic map relationship emphasize that this map presents a generalized configuration of the coal bed outcrop. Horizontal accuracy of outcrop location is estimated at + 1000 feet (305 m).

The Middle Wildcat coal bed crops out in the southwest portion of the quadrangle, with extensive burning apparent along the outcrop (Figure 1). Thicknesses for the Middle Wildcat coal bed vary from 6.2 to 7.2 feet (1.9 to 2.2 m) (Figure 2). Structural contours drawn on top of the Middle Wildcat coal bed indicate a westward dip of less than one degree (Figure 1). The Middle Wildcat coal bed lies less than 100 feet (30 m) beneath the surface throughout the area of occurrence (Figure 1).

Approximately 200 to 300 feet (61 to 91 m) of interburden separate the Lower Wildcat coal bed from the overlying Middle Wildcat coal bed. Extensive burning is evident along the Lower Wildcat coal bed outcrop in the southwest portion of the quadrangle. Thicknesses for the Lower Wildcat coal bed vary from 6 to 10 feet (1.8 to 3 m), and average approximately 8 feet (2.4 m) (Plate 4). The Lower Wildcat coal bed dips less than one degree to the west (Plate 5), and lies less than 320 feet (98 m) beneath the surface throughout its area of occurrence (Plate 6).

V. Geological and Engineering Mapping Parameters

The correct horizontal location and elevation of drill holes utilized in subsurface mapping are critical to map accuracy. IntraSearch plots the horizontal location of the drill hole as described on the geophysical log heading. Occasionally this location is superimposed or near to a drillsite shown on the topographic map, and the topographic map horizontal location is utilized. If the ground elevation on the geophysical log does not agree with the topographic elevation of the drill site, the geophysical log ground elevation is adjusted to conformance. If there is no indication of a drillsite on the topographic map, the "quarter, quarter, quarter" heading location is shifted within a small area until the ground elevation on the heading agrees with the topographic map elevation. If no elevation agreement can be reached, the well heading or data sheet is rechecked for footage measurements and ground elevation correctness. In-

quiries to the companies who provided the oil and gas geophysical logs frequently reveal that corrections have been made in the original survey. If all horizontal location data sources have been checked and the information accepted as the best available data, the drillsite elevation on the geophysical log is modified to agree with the topographic map elevation. IntraSearch considers this agreement mandatory for the proper construction of most subsurface maps, but in particular, the overburden isopach, the ratio, and Coal Development Potential maps.

Subsurface mapping is based on geologic data within and adjacent to the Lance Creek 2 Southwest Quadrangle area. Data from geophysical logs are used to correlate coal beds and control contour lines for the coal thickness, structure, and overburden maps. Isopach lines are also drawn to honor selected measured sections where there is sparse subsurface control. Where isopach contours do not honor surface measured sections, the surface thicknesses are thought to be attenuated by oxidation and/or erosion, hence not reflective of total coal thickness. Isopach lines extend to the coal bed outcrops, the projections of coal bed outcrops, and the contact between porcellanite (clinker) and unoxidized coal in place. Attenuation of total coal bed thickness is known to take place near these lines of definition; however, the overestimation of coal bed tonnages that results from this projection of total coal thickness is insignificant to the Coal Development Potential maps. Structure contour maps are constructed on the tops of the main coal beds. Where subsurface data is scarce, supplemental structural control points are selected from the topographic map along coal outcrops.

In preparing overburden isopach maps, no attempt is made to identify coal beds that occur in the overburden to a particular coal bed

under study. Mining ratio maps for this quadrangle are constructed utilizing a ninety-five percent recovery factor. Contours of these maps identify the ratio of cubic yards of overburden to tons of recoverable coal. Where ratio control points are sparse, interpolated points are computed using coal structure, coal isopach, and topographic control. On the Areal Distribution of Identified Resources Map (ADIR), coal bed reserves are not calculated where the coal is less than 5 feet (1.5 m) thick, where the coal occurs at a depth greater than 500 feet (152 m), where non-federal coal exists, or where federal coal leases, preference right lease applications, and coal prospecting permits exist.

Coal tonnage calculations involve the planimetering of areas of measured, indicated, inferred reserves and resources and hypothetical resources to determine their areal extent in acres. An Insufficient Data Line is drawn to delineate areas where surface and subsurface data are too sparse for CRO map construction. Various categories of resources are calculated in the unmapped areas by utilizing coal bed thicknesses mapped in the geologically controlled area adjacent to the insufficient data line. Acres are multiplied by the average coal bed thickness and 1770 (the number of tons of subbituminous C per acre-foot; 13,018 metric tons per hectare-meter), to determine total tons in place. Recoverable tonnage is calculated at ninety-five percent of the total tons in place. Where tonnages are computed for the CRO-CDP map series, resources and reserves are expressed in millions of tons. Frequently the planimetering of coal resources on a sectionized basis involves complexly curvilinear lines (coal bed outcrop and 500-foot stripping limit designations) in relationship with linear section boundaries and circular resource category boundaries. Where these relationships occur

generalizations of complex curvilinear lines are discretely utilized, and resources and/or reserves are calculated within an estimated two to three percent plus or minus accuracy.

VI. Coal Development Potential

Strippable Coal Development Potential. Areas where coal beds are 5 feet (1.5 m) or more in thickness and are overlain by 500 feet (152 m) or less of overburden are considered to have potential for surface mining and are assigned a high, moderate, or low development potential based on the mining ratio (cubic yards of overburden per ton of recoverable coal). The formula used to calculate mining ratios is as follows:

$$MR = \frac{t_o \quad (0.911)}{t_c \ (rf)}$$

where MR = mining ratio
t_o = thickness of overburden
t_c = thickness of coal
rf = recovery factor
0.911*= conversion factor (cu.yds/ton)

*A conversion factor of 0.922 is used for lignite.

A surface mining potential map (Plate 9) is prepared utilizing the following mining ratio criteria for coal beds 5 to 40 feet (1.5 to 12 m) thick.

1. Low development potential = 15:1 and greater ratio.
2. Moderate development potential = 10:1 to 15:1 ratio.
3. High development potential = 0 to 10:1 ratio.

The following mining ratio criteria is utilized for coal beds greater than 40 feet (12 m) thick:

1. Low development potential = 7:1 and greater ratio.
2. Moderate development potential = 5:1 to 7:1 ratio.
3. High development potential = 0 to 5:1 ratio.

The surface mining potential is high for approximately fifteen percent of the Lance Creek 2 Southwest Quadrangle. These high potential areas relate to mining ratios less than 10:1 for the Middle and Lower Wildcat coal beds. Moderate potential areas encompass five percent of the study area and are the result of mining ratios between 10:1 and 15:1 for the Middle and Lower Wildcat coal beds. Approximately five percent of the quadrangle is classified as low development potential for surface mining. These areas of low potential are due to Middle and Lower Wildcat mining ratios of greater than 15:1. Twenty-five percent of the quadrangle is non-federal coal land. The remaining fifty percent is classified as approximately twenty-five percent no potential and about twenty-five percent unknown for surface mining, and relates to coal thicknesses less than five feet (1.5 m) or overburden thicknesses greater than 500 feet (152 m). Table 1 sets forth the estimated strippable reserve base tonnages per coal bed for the quadrangle.

Table 1.--Strippable Coal Reserve Base Data (in short tons) for Federal Coal Lands in the Lance Creek 2 Southwest Quadrangle, Converse and Niobrara Counties, Wyoming.

Development potentials are based on mining ratios (cubic yards of overburden/ton of recoverable coal).

Coal Bed	High Development Potential (0-10:1 Mining Ratio)	Moderate Development Potential (10:1-15:1 Mining Ratio)	Low Development Potential (>15:1 Mining Ratio)	Total
Middle Wildcat	6,390,000	210,000	———	6,600,000
Lower Wildcat	19,480,000	14,390,000	43,990,000	77,860,000
TOTAL	25,870,000	14,600,000	43,990,000	84,460,000

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