UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TEXT TO ACCOMPANY:

COAL RESOURCE OCCURRENCE

AND

COAL DEVELOPMENT POTENTIAL

MAPS

OF THE

SCOTT DAM QUADRANGLE,

CAMPBELL COUNTY, WYOMING

BY

INTRASEARCH INC.

DENVER, COLORADO

OPEN FILE REPORT 79-045
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 tons
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 Scott Dam Quadrangle, Campbell County, Wyoming. This CRO and CDP map series (U. S. Geological Survey Open-File Report 79-045) includes 35 plates. The project is compiled by IntraSearch Inc., 5351 South Roslyn Street, Englewood, Colorado, under KRCRA Eastern Powder River Basin, Wyoming Contract Number 14-08-0001-17180. This contract is part of a program to provide an inventory of unleased federal coal in Known Recoverable Coal Resource Areas (KRCRAs) in the western United States.

The Scott Dam Quadrangle is located in Campbell County, in northeastern Wyoming. It encompasses parts of Townships 48 and 49 North, Ranges 74 and 75 West, and covers the area: 44°07'30" to 44°15' north latitude; 105°45' to 105°52'30" west longitude.

Main access to the Scott Dam Quadrangle is provided by Interstate Highway 90 which extends east to west across the northern half of the quadrangle. A maintained gravel road (Schoonover Road) extends east to west across the central portion of the study area. Another gravel road (Kingsbury Road) branches from Schoonover Road and extends north intersecting Interstate Highway 90, in the northwest quarter of the quadrangle. Minor roads and trails that branch from these gravel roads provide additional access to the more remote areas. The closest railroad is the Burlington Northern trackage, 6 miles (9.7 km) to the northeast near Gillette, Wyoming.

The primary drainage is provided by the westward-flowing North Prong and Middle Prong of Dead Horse Creek in the southern half of the quadrangle, and northward-flowing Kingsbury Creek in the northern half of the study area. Upper Bushnell Draw, Johnson Draw, Upper Draw, and other intermittent streams supplement the drainage throughout the quadrangle. Dead Horse Creek and Kingsbury Creek both drain into the Powder River to the west. Elevations attain heights of 5020 feet (1530 m) in the eastern half of the quadrangle, 550 to 650 feet (168 to 198 m) above the valley floors to the west. The somber grays, yellows, and browns of outcropping shales and siltstones contrast strikingly with the brilliant reds, oranges, and purples of "clinker," and the deep greens of the juniper pine tree growth.

The 12 to 14 inches (30 to 36 cm) of annual precipitation falling in this semi-arid region accrue principally in the springtime. Summer and fall precipitation usually originates from thunderstorms, and infrequent snowfalls of 6 inches (15 cm) or less generally characterize winter precipitation. Although temperatures ranging from less than -25°F (-32°C) to more than 100°F (38°C) have been recorded near Gillette, Wyoming, average wintertime minimums and summertime maximums range from +5° to +°15F (-15° to -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 Campbell County Courthouse, in Gillette, Wyoming. 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 the delineation of lignite, subbituminous coal, bituminous coal, and anthracite at the surface, and in the subsurface. In addition, the program identifies total tons of coal in place, as well as recoverable tons. These coal tonnages are then categorized into units of measured, indicated, and inferred reserves and resources, and hypothetical resources. Finally, recommendations are made 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 11.8 billion tons (10.7 billion metric tons) of unleased federal coal resources in the Scott Dam Quadrangle.

The suite of maps that accompany this report sets forth and portrays 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, including 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 in 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 Tongue River Member is composed of very fine-grained sandstones, siltstones, claystones, shales, carbonaceous shales, and numerous coal beds. The Lebo Member of the Fort Union Formation consists of light- to dark-gray very fine-grained to conglomeratic sandstone with interbedded siltstone, claystone, carbonaceous shale and thin coal beds. Thin bedded calcareous ironstone concretions interbedded with massive white sandstone and slightly bentonitic shale occur throughout the unit (Denson and Horn, 1975). The Lebo Member is mapped at the surface northeast of Recluse, Wyoming. Here, the Lebo Member is east of the principal coal outcrops and associated clinkers (McKay, 1974), and it 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 are trying to develop criteria for subsurface recognition of the Lebo-Tullock and Tongue River-Lebo contacts through the use of subsurface data from geophysical logs, no definitive guidelines are known to have been published. Hence, for subsurface mapping purposes, the Fort Union Formation is not divided into its members for this study.

During the Paleocene epoch, the Powder River Basin tropical to subtropical depositional environment included broad, inland flood basins with extensive swamps, marshes, freshwater lakes, and a sluggish, but active, northeastward-discharging drainage system. These features were superimposed on an emerging sea floor, near base level. Much of the vast area 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 character, 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 it 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 delicate 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 lowland 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, the contact is positioned near the top of the Roland coal bed as mapped by Olive (1957) in northwestern Campbell County, Wyoming. It is considered to descend disconformably 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 was made to differentiate the Wasatch and Fort Union Formations on geophysical logs or in the subsurface mapping program for this 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 Scott Dam Quadrangle is located in an area where surface rocks are classified within the Wasatch Formation. 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 Felix coal bed was named by Stone and Lupton (1910). The Ulm and Smith coal beds were named by Taff (1909). Baker (1929) assigned names to the Anderson, Canyon, and Wall coal beds. The Cook coal bed was named by Bass (1932), and the Pawnee coal bed was named by Warren (1959). The Wildcat, Moyer, and Oedekoven coal beds were informally named by IntraSearch (1978b, 1979, and 1978a).

IntraSearch's correlation of thick coal beds from the Spotted Horse coal field to Gillette points out that the Wyodak coal bed, named the "D" coal bed by Dobbin and Barnett (1927), is equivalent to the Anderson, Canyon, and all or part of the Cook coal beds to the north and west of Gillette, Wyoming. Correlation of this suite of coal beds with the Wyodak coal bed south and southwest of Gillette suggest that the Anderson and Canyon coal beds equate with the upper 10 to 25 percent of the thick Wyodak coal bed, and the Cook and Wall or Upper Wall coal beds are equivalent to the major part of the Wyodak coal bed. Due to problematic correlations outside of the Gillette area, the name Wyodak has been informally used by many previous authors to represent the coal beds in the area surrounding the Wyodak coal mine.

Local. The Scott Dam Quadrangle lies on the eastern flank of the Powder River Basin, where the strata dip gently westward. The Wasatch Formation crops out over the entire quadrangle, and is comprised 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. The Fort Union Formation unconformably underlies the Wasatch Formation and is composed of very fine-grained sandstones, siltstones, claystones, shales, carbonaceous shales, and numerous coal beds.

III. Data Sources

No significant coal outcrops or associated clinker are mentioned in any known publication at the time of this report. The areal geology of the coal outcrops in this quadrangle is derived by IntraSearch from the projection of known structural data onto the current topographic base. The outcrop illustrated in this report is considered a reasonable representation of the actual outcrop configuration. An insufficient data line drawn in the northwest quarter of the quadrangle delimits the coal outcrop to the west due to the lack of reliable structural control in that direction.

Geophysical logs from oil and gas test bores and producing wells comprise the source of subsurface control. 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 80 percent of the logs include resistivity, conductivity, and self-potential curves. Occasionally the suite of geophysical logs includes gamma, density, and sonic curves. These logs are available 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 and interpreted, and coal intervals are 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, varies 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's 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 clinkers will broaden 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 topographic map of the Scott Dam Quadrangle is published by the U. S. Geological Survey, compilation date 1971. 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

Wasatch and Fort Union Formation coal beds that are present in all or part of the Scott Dam Quadrangle include, in descending strati-grpahic order: the Ulm, local, Felix, Smith, Anderson, Canyon, Cook, Wall, Pawnee, local, Wildcat, Moyer, Oedekoven, and local coal beds. A complete suite of maps (coal isopach, mining ratio where applicable, structure, overburden and interburden isopach, areal distribution of identified resources and identified resources) is prepared for the Ulm and Smith coal beds, and for the Felix, Anderson-Canyon-Cook, Wall-Pawnee, and Wildcat-Moyer-Oedekoven coal zones. Insufficient data, thickness, and areal extent preclude detailed mapping of the local coal beds.

No physical and chemical analyses are known to have been published regarding the coal beds in the Scott Dam Quadrangle. However, the general proximate analyses performed on an "as received" basis for Campbell and Converse County coal beds are as follows:

COAL BED NAME			ASH %	FIXED CARBON %	MOISTURE %	VOLATILES %	SULFUR %	BTU/LB
Ulm	(U)	Hole 7331	8.224	30.181	31.753	29.842	1.807	7524
Felix	(U)	Hole 7335	7.384	33.777	26.162	32.670	0.797	8538
Smith	(U)	Hole 7340	3.505	38.036	29.980	28.474	0.309	8371
Anderson-Canyon-Cook	(U)	Hole 7310	5.852	33.938	29.060	31.150	0.435	8172
Wall	(U)	Hole 7426	9.542	29.322	32.150	28.985	0.500	7279
Pawnee	(U)	Hole 7424	7.880	31.029	31.910	29.183	0.386	7344
"Wildcat"	(*)	Sample No. 11447	4.3	29.4	27.8	29.4	0.27	8410

(*) - Winchester, 1912
(U) - U. S. Geological Survey and Montana Bureau of Mines and Geology - 1974, 1976

The Coal Data Sheet, Plate 3, shows the down hole identification of coal beds within the quadrangle as interpreted from geophysical logs from oil and gas test bores and producing sites. A datum coal bed is utilized to position columnar sections on Plate 3. This portrayal is schematic by design; hence, no structural or coal thickness implications are suggested by the dashed correlation lines projected through no record (NR) intervals. Inasmuch as the Wall coal bed underlies the entire quadrangle, it is designated as datum for the correlation diagram.

The Ulm coal bed has been eroded from approximately 75 percent of the study area, restricted largely to the northeast portion of the quadrangle. The coal bed thickness ranges from less than 5 feet to greater than 20 feet (1.5 to 6 m), with maximum thicknesses occurring in the southeast quarter of the area, with thinning northward. An insufficient data line extending north to south in the northwest quarter of the quadrangle delimits the inferred areal extent of the Ulm coal bed to the west. Structure contours drawn on top of the Ulm coal bed indicate a regional dip to the northwest. Minimum values for the thickness of overburden above the Ulm coal bed are less than 100 feet (30 m) and maximum values are less than 200 feet (61 m).

The Felix coal zone occurs 492 to 521 feet (150 to 159 m) below the Ulm coal bed, and is comprised of a thick upper coal bed overlying a thin lower coal bed. The total coal zone thickness ranges from 10 to 35 feet (3.0 to 11 m), with maximum thicknesses occurring in the southeast quarter of the quadrangle. The clastic interval separating the two coal beds comprising the coal zone varies from 0 to 50 feet (0 to 15 m). Structure contours drawn on top of the Felix coal zone indicate a regional northwest dip with minor structural variations. The Felix coal bed occurs at depths ranging from less than 200 feet (61 m) to more than 750 feet (229 m) beneath the surface.

The Smith coal bed lies 330 to 409 feet (101 to 125 m) beneath the Felix coal zone, and ranges in thickness from 5 to 22 feet (1.5 to 7 m). Maximum thicknesses occur in the east-central portion of the quadrangle and extend across the quadrangle into the southwest quarter. Thinner coal dominates the northern half of the area. A non-coal interval locally separating the coal bed varies from 0 to 32 feet (0 to 10 m). Structure contours drawn on top of the Smith coal bed indicate a regional northwest dip. Narrow anticlines and synclines parallel each other throughout the entire quadrangle. The thickness of overburden above the Smith coal bed varies from less than 750 feet (229 m) to more than 1250 feet (381 m).

The Anderson-Canyon-Cook coal zone occurs 83 to 404 feet (25 to 123 m) below the Smith coal bed, and is comprised of three, moderately thick coal beds that locally merge to form a single unit. The total coal zone thickness ranges from 30 to 100 feet (9 to 30 m) with maximum thicknesses occurring in the southwest quarter of the quadrangle, and the minimum thicknesses occurring in the north-central part. The coal zone occurrence varies from a single, massive coal bed separating into at least five thin coal beds.

The total clastic interval between the various coal beds comprising the coal zone varies from 0 to 457 feet (0 to 139 m), and is thickest in the central part of the area. Structure contours drawn on top of the Anderson-Canyon-Cook coal zone indicate a regional westward dip with a broad westward-plunging anticline in the eastern half of the quadrangle. The Anderson-Canyon-Cook coal zone occurs at depths ranging from less than 100 feet (30 m) to more than 1250 feet (381 m).

The Wall-Pawnee coal zone is located 141 to 290 feet (43 to 88 m) beneath the Anderson-Canyon-Cook coal zone, and is comprised of two, thick, coal beds that locally merge into a single bed. The total coal zone thickness ranges from 40 to 130 feet (12 to 40 m) with maximum thicknesses occurring in the southwest quarter of the study area. The non-coal interval separating the two coal beds varies from 0 to 333 feet (0 to 102 m). The coal beds of the zone merge into a single unit over much of the western half of the area and show the greatest amount of interburden along the east-central border. Structure contours drawn on top of the Wall-Pawnee coal zone indicate a regional northwest dip and a small, narrow anticline plunging northward along the western edge of the quadrangle with a parallel syncline to the northeast. The overburden to the Wall-Pawnee coal zone varies from less than 1250 feet (381 m) to more than 2000 feet (610 m).

The Wildcat-Moyer-Oedekoven coal zone occurs 258 to 658 feet (79 to 201 m) below the Wall-Pawnee coal zone, and is comprised of three moderately thick, uniform coal beds. The combined coal zone thickness ranges from 20 to 60 feet (6 to 18 m) with maximum thicknesses occurring in the western half of the study area, with relatively uniform thinning toward the east. The clastic interval separating the various coal beds comprising the coal zone varies from 48 to 184 feet (15 to 56 m). Structure contours drawn on top of the Wildcat coal bed indicate a gentle regional dip to the west. The Wildcat-Moyer-Oedekoven coal zone lies at depths ranging from less than 2000 feet (610 m) to more than 2250 feet (686 m) beneath the surface.

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 Inc., plots the horizontal location of the drill hole as described on the geophysical log heading. Occasionally this location is superimposed on 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 drillsite, 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 accuracy. Inquiries 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 Inc., considers this agreement mandatory for the proper construction of most subsurface maps, but in particular, the overburden isopach, the mining ratio, and Coal Development Potential maps.

Subsurface mapping is based on geologic data within, and adjacent, to the Scott Dam Quadrangle area. Data from geophysical logs are used to correlate coal beds and control contour lines for the coal thickness, structure, and overburden maps. Structure contour maps are constructed on the tops of the main coal beds.

In preparing overburden isopach maps, no attempt is made to identify coal beds that occur in the overburden above a particular coal bed under study. Mining ratio maps for this quadrangle are constructed utilizing a 95 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 at the intersections of coal bed and overburden isopach contours 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 1750, or 1770--the number of tons of lignite A or subbituminous C coal per acre-foot, respectively (12,874 or 13,018 metric tons per hectare-meter, respectively), to determine total tons in place. Recoverable tonnage is calculated at 95 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 complexly curvilinear lines are discretely utilized, and resources and/or reserves are calculated within an estimated 2 to 3 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 for subbituminous coal is as follows:

$$MR = \frac{to\ (0.911)^*}{tc\ (rf)}$$

where MR = mining ratio
to = thickness of overburden
tc = 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 development potential map (Plate 34) was 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 are 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 development potential is high for approximately 15 percent of the Scott Dam Quadrangle, primarily in the eastern half. This high rating is attributed to low overburden to coal ratios for the Ulm coal bed and Felix coal zone. Increasing overburden thicknesses above the Ulm coal bed and Felix coal zone creates moderate and low potential ratings. The moderate potential rating covers approximately 25 percent of the quadrangle, primarily in the southern half. A low potential rating, attributed to high overburden to coal ratios for the Felix coal zone, covers approximately 20 percent of the quadrangle. The remaining 40 percent is classified as non-federal coal land or as no potential for surface mining. Table 1 sets forth the estimated strippable reserve base tonnages per coal bed for the quadrangle.

Underground Mining Coal Development Potential. Subsurface coal mining potential throughout the Scott Dam Quadrangle is considered low. Inasmuch as recovery factors have not been established for the underground development of coal beds in this quadrangle, reserves are not calculated for coal beds that occur more than 500 feet (152 m) beneath the surface. Table 2 sets forth the estimated coal resources in tons per coal bed.

In-Situ Gasification Coal Development Potential. The evaluation of subsurface coal deposits for in-situ gasification potential relates to the occurrence of coal beds more than 5 feet (1.5 m) thick buried from 500 to 3000 feet (152 to 914 m) beneath the surface. This categorization is as follows:

1. Low development potential relates to: 1) a total coal section less than 100 feet (30 m) thick that lies 1000 feet (305 m) to 3000 feet (914 m) beneath the surface, or 2) a coal bed or coal zone 5 feet (1.5 m) or more in thickness which lies 500 feet (152 m) to 1000 feet (305 m) beneath the surface.
2. Moderate development potential is assigned to a total coal section from 100 to 200 feet (30 to 61 m) thick and buried from 1000 to 3000 feet (305 to 914 m) beneath the surface.
3. High development potential involves 200 feet (61 m) or more of total coal thickness buried from 1000 to 3000 feet (305 to 914 m).

The in-situ gasification map (Plate 35) was constructed using the above criteria. The coal development potential for in-situ gasification within the Scott Dam Quadrangle is high for approximately 40 percent of the study area, primarily in the western half. A moderate potential rating covers approximately 45 percent of the quadrangle, mainly in the eastern half of the study area. The low potential rating covers only about 5 percent of the quadrangle along the eastern boundary. The remaining 10 percent is classified as non-federal coal land and not evaluated for in-situ gasification development. The coal resource tonnage totals for in-situ gasification with high, moderate, and low development potentials are given on Table 3.

Table 1.--Strippable Coal Reserve Base and Hypothetical Resource Data (in short tons) for Federal Coal Lands in the Scott Dam Quadrangle, Campbell County, 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
RESOURCE BASE				
Ulm	59,090,000	9,710,000	910,000	69,710,000
Felix	56,250,000	334,970,000	277,020,000	668,240,000
TOTAL	115,340,000	344,680,000	277,930,000	737,950,000
HYPOTHETICAL RESOURCE				
Felix	-----	-----	1,810,000	1,810,000
TOTAL	115,340,000	344,680,000	279,740,000	739,760,000

Table 2.--Coal Resource Base and Hypothetical Resource Data (in short tons) for Underground Mining Methods for Federal Coal Lands in the Scott Dam Quadrangle, Campbell County, Wyoming.

Coal Bed Name	High Development Potential	Moderate Development Potential	Low Development Potential	Total
RESOURCE BASE				
Felix	-----	-----	452,230,000	452,230,000
Smith	-----	-----	634,310,000	634,310,000
Anderson-Canyon-Cook	-----	-----	2,988,360,000	2,988,360,000
Wall-Pawnee	-----	-----	4,584,040,000	4,584,040,000
Wildcat-Moyer-Oedekoven	-----	-----	2,030,980,000	2,030,980,000
TOTAl	-----	-----	10,689,920,000	10,689,920,000
HYPOTHETICAL RESOURCE				
Felix	-----	-----	123,430,000	123,430,000
Smith	-----	-----	37,200,000	37,200,000
Anderson-Canyon-Cook	-----	-----	206,160,000	206,160,000
TOTAL	-----	-----	366,790,000	366,790,000
GRAND TOTAL	-----	-----	11,056,710,000	11,056,710,000

Table 3.--Coal Resource Base and Hypothetical Resource Data (in short tons) for In-Situ Gasification for Federal Coal Lands in the Scott Dam Quadrangle, Campbell County, Wyoming.

Coal Bed Name	High Development Potential	Moderate Development Potential	Low Development Potential	Total
RESOURCE BASE				
	3,322,180,000	6,207,840,000	1,159,900,000	10,689,920,000
HYPOTHETICAL RESOURCE				
	-----	-----	366,790,000	366,790,000
TOTAL	3,322,180,000	6,207,840,000	1,526,690,000	11,056,710,000

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