UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TEXT TO ACCOMPANY:

COAL RESOURCE OCCURRENCE

AND

COAL DEVELOPMENT POTENTIAL

MAPS

OF

THE GAP QUADRANGLE,

CAMPBELL COUNTY, WYOMING

BY

INTRASEARCH INC.

DENVER, COLORADO

OPEN FILE REPORT 79-048
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 Gap Quadrangle, Campbell County, Wyoming. This CRO and CDP map series includes 20 plates (U. S. Geological Survey Open-File Report 79-048). 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) in the western United States.

The Gap Quadrangle is located in Campbell County, in northeastern Wyoming. It encompasses parts of Townships 48 and 49 North, Ranges 71 and 72 West, and covers the area: 44° 07' 30" to 44° 15' north latitude; 105° 22' 30" to 105° 30' west longitude.

State Highway 59 extends north-south through the center of The Gap Quadrangle providing access to much of the area. Light-duty roads and unimproved roads branch from Highway 59 and constitute an avenue of access to much of the area, particularly the eastern half where the topographic relief is slight. State Highway 59 extends 3 miles (5 km) northward to Gillette, Wyoming and 26 miles (42 km) south to Reno Junction, Wyoming. Burlington Northern trackage passes through Gillette on its course eastward from Sheridan, Wyoming, to the central United States.

Duck Nest Creek in the southwest part of the area and Tisdale Creek in the southeast portion of the quadrangle flow southeastward to the Belle Fourche River, and drain terrain in the southern half of the area. Antelope Butte Creek and Shearing Pen Draw, in the northwest and northeast quadrants, respectively, flow northward to Donkey Creek and drain the northern portion of The Gap Quadrangle. The topographic relief varies from 4460 feet (1359 m) in the northeast to 5073 feet (1546 m) at the top of Antelope Butte in the west half of the quadrangle. 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 thirteen to fourteen inches (33 to 36 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 $-25^{o}F$ ($-32^{o}C$) to more than $100^{o}F$ ($38^{o}C$) have been recorded near Gillette, Wyoming, average wintertime minimums and summertime maximums approach $+5^{o}$ to $+15^{o}F$ (-15^{o} and $-9^{o}C$) and 75^{o} to $90^{o}F$ (24^{o} to $32^{o}C$), 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: 1) the delineation of lignite, subbituminous, bituminous and anthracite coal 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 5.8 billion tons (5.3 billion metric tons) of unleased federal coal resources in The Gap 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 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 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. 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 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 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 Gap Quadrangle is located in an area where surface rocks are classified into the Tongue River Member of the Fort Union Formation and the Wasatch Formation. Although the Tongue River Member is reportedly 1200 to 1300 feet (366 to 396 m) thick (Olive, 1957), only 100 to 150 feet (30 to 46 m) of section are exposed in this area. Approximately 500 feet (152 m) of the Wasatch Formation crop out in The Gap Quadrangle. 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), and Baker (1929) assigned names to the Anderson, Canyon, and Wall coal beds. The Cook coal bed was named by Bass (1932).

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 The Gap Quadrangle. 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. The Wildcat, Moyer, and Oedekoven coal beds were informally named by IntraSearch (1978b, 1979, and 1978a).

Local. The Gap Quadrangle lies on the eastern flank of the Powder River Basin, where the strata dip gently westward. The Wasatch Formation caps the higher elevations over more than ninty percent of the 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 Tongue River Member of the Fort Union Formation crops out over the remaining area. The Fort Union Formation is composed of very fine-grained sandstones, siltstones, claystones, shales, carbonaceous shales, and numerous coal beds.

III. Data Sources

Areal geology of the coal outcrops and associated clinker is derived from The Preliminary Geologic Map and Coal Resources of The Gap Quadrangle,(Galyardt, 1974).

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 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, interpreted, and coal intervals annotated. Maximum accuracy of coal bed identification 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.

In some parts of the Powder River Basin, additional subsurface control is available from U. S. Geological Survey open-file reports that include geophysical and lithologic logs of shallow holes drilled specifically for coal exploration. A sparse scattering of subsurface data points are shown on unpublished CRO-CDP maps compiled by the U. S. Geological Survey, and where these data are utilized, the rock-coal intervals are shown on the Coal Data Map (Plate 1). Inasmuch as these drillholes have no identifier headings, they are not set forth on the Coal Data Sheet (Plate 3). The geophysical logs of these drill holes were not available to IntraSearch to ascertain the accuracy of horizontal location, topographic elevation, and down-hole data interpretation.

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 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 Gap Quadrangle is published by the U. S. Geological Survey, compilation date, 1971. Land 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 Gap Quadrangle include, in descending stratigraphic order, the Lower Ulm, Scott, Felix, Wyodak, Wildcat, Moyer, and Oedekoven coal beds. A complete suite of maps (structure, isopach, mining ratio, overburden/interburden, identified resources and areal distribution of identified resources) is prepared for the Felix and Wyodak coal beds and the Wildcat-Moyer-Oedekoven coal zone. The Lower Ulm and Scott coal beds, approximately 260 feet (79 m) and 190 feet (58 m) above the Felix coal bed, respectively, are not mapped because of their limited lateral extent in The Gap Quadrangle.

Physical and chemical analyses from cores on the Felix coal bed, hole 7359, Sec. 26 T. 49 N., R. 72 W. are set forth below. Analyses on the Wyodak coal bed are from core hole #7363 in Section 23, T. 50 N., R. 71 W., northwest of The Gap Quadrangle. Analyses on the Wildcat, Moyer and Oedekoven coal beds are unknown.

COAL BED NAME	ASH	FIXED CARBON	MOISTURE	VOLATILES	SULFUR	BTU/LB
Felix (U) Hole 7359	9.021	29.624	31.790	29.565	0.955	7512
Wyodak (U) Hole 7363	6.830	30.574	31.710	30.885	0.652	7807

All analyses except BTU/LB are reported in percent.

(U) - U. S. Geological Survey and Montana Bureau of Mines and Geology - 1974.

The Coal Data Sheets, Plates 3a and 3b, show the downhole identification of coal beds within the quadrangle as interpreted from geophysical logs from U. S. Geological Survey drill holes, oil and gas test bores, and producing sites. Inasmuch as the Wyodak coal bed underlies the entire quadrangle, it is designated as datum for the correlation diagram.

The Wyodak coal bed is the thickest coal bed in the area. Several thin coal beds, designated as local coal beds by Intrasearch on Plates 3a and 3b, exist between the Felix and Wyodak coal beds and between the Wyodak, coal bed and the Wildcat-Moyer-Oedekoven coal zone. The upper, local coal beds may be correlative with the Smith and Upper Wyodak coal beds in adjacent quadrangles as mapped by IntraSearch. Galyardt (1974) refers to these coal beds as C' and C", and Dobbin and Barnett (1927) collectively mapped them as the C coal zone. The paucity of data on these local coal beds, plus their thinness preclude inclusion in the CRO-CDP mapping program. Where the Wildcat and Moyer coal beds merge, they correlate with the S coal bed of Galyardt (1974). Where the Wildcat and Moyer coal beds are separate units, and the Moyer coal bed is divided, the Upper Moyer and Lower Moyer coal beds relate to the T and U coal beds of Galyardt (1974). The V coal bed of Galyardt (1974) occupies the same stratigraphic position as the Oedekoven coal bed of IntraSearch.

The Felix coal bed is present in approximately twenty-five percent of The Gap Quadrangle. Minor amounts of clinker are present along the coal bed outcrop. Subsurface control indicates that the Felix coal bed attains a maximum thickness of approximately 30 feet (9 m) in the west-central part of the quadrangle and thins northward to 10 to 15 feet (3 to 5 m) (Plate 4). Structure contours on top of the Felix coal bed indicate less than one degree of westward dip (Plate 5). The Felix coal bed generally occurs less than 200 feet (61 m) beneath the surface.

The Wyodak coal bed occurs approximately 500 to 600 feet (152 to 198 m) below the Felix coal bed and varies from 37 feet (11 m) to more than 90 feet (27 m) in thickness (Plate 9). The Wyodak coal bed is burned or eroded from approximately two percent of the quadrangle in the extreme northeast corner. The Wyodak coal bed dips gently to the west (Plate 10) and is less than 500 feet (152 m) beneath the surface in the eastern three-fourths of the quadrangle (Plate 11).

The Wildcat-Moyer-Oedekoven coal zone lies 517 to 718 feet (158 to 219 m) beneath the Wyodak coal bed and varies from 0 feet (0 m) in the center of the quadrangle to 55 feet (17 m) in the southwest portion. The Oedekoven coal bed is 135 to 175 feet (41 to 53 m) beneath the Wildcat-

Moyer coal bed in the western part of the quadrangle and is absent to the east. Structure contours on the top of the Wildcat-Moyer-Oedekoven coal zone express gentle west dip (Plate 15). Throughout eighty percent of the area, the Wildcat and Moyer coal beds occur either together or as two coal beds separated by 2 to 8 feet (0.6 to 2.4 m) of sediments. Along the eastern edge of the study area, this non-coal interval attains a maximum thickness of 76 feet (23 m). On the Wildcat-Moyer-Oedekoven overburden/interburden map (Plate 16), interburden contours indicate the non-coal intervals between the Wildcat, Moyer and Oedekoven coal beds. East of the Oedekoven pinch-out line, interburden between the Wildcat and Moyer coal beds is not mapped. These coal beds are in excess of 500 feet (152 m) beneath the surface (Plate 16).

V. Geological and Engineering Mapping Parameters

Subsurface mapping is based on geologic data within and adjacent to The Gap 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. Structure contour maps are construced 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), and 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 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 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 (1.5m) 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:

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

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 19) 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.

A high surface mining potential exists in the eastern two-thirds of the quadrangle because the thick Wyodak coal bed is less than 500 feet (152 m) below the surface. Moderate and low-rated surface mining potential areas are mapped to the west where ratios greater than 5:1 relate to higher terrain and deeper occurrence of the coal bed. The no surface mining potential area in the northeast corner of The Gap Quadrangle relates to an area where the Wyodak coal bed is burned or eroded.

The Felix coal bed crops out in high terrain in the western sector and is less than 300 feet (91 m) below the surface. This circumstance produces the high surface mining potential in the west. The no surface mining potential areas scattered through the west-central part of the study area are located between the Wyodak coal bed 500 feet (152 m) stripping limit line and the Felix coal bed outcrop. The Wildcat-Moyer-Oedekoven coal zone underlies the quadrangle, but is deeper than 500 feet (152 m) below the surface. 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 Gap 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 buried 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 500 feet (152 m) to 3000 feet (914 m) beneath the surface, or 2) coal

beds 5 feet (1.5 m) or more in thickness that lie 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 coal development potential for in-situ gasification on The Gap Quadrangle is low, hence no CDP map is generated for this map series. The coal resource tonnage for in-situ gasification with low development potential totals approximately 2.6 billion tons (2.4 billion metric tons) (Table 3). None of the coal beds in The Gap Quadrangle qualify for a moderate or high development potential rating.

Table 1.--Strippable Coal Reserve Base Data (in short tons) for Federal Coal Lands in The Gap Quadrangle, Campbell County, Wyoming.

Development potentials are based on mining ratios (bank 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
Felix	188,630,000	—	—	188,630,000
	(0-5:1 Mining Ratio)	(5:1-7:1 Mining Ratio)	(>7:1 Mining Ratio)	
Wyodak	2,049,480,000	752,960,000	15,560,000	2,818,000,000
TOTAL	2,238,110,000	752,960,000	15,560,000	3,006,630,000

Table 2.--Coal Resource Base Data (in short tons for Underground Mining Methods for Federal Coal Lands in The Gap Quadrangle, Campbell County, Wyoming.

Coal Bed Name	High Development Potential	Moderate Development Potential	Low Development Potential	Total
Wyodak	———	———	954,780,000	954,780,000
Wildcat-Moyer-Oedekoven	———	———	1,642,430,000	1,642,430,000
TOTAL	———	———	2,597,210,000	2,597,210,000

Table 3.--Coal Resource Base Data (in short tons) for In-Situ Gasification for Federal Coal Lands in The Gap Quadrangle, Campbell County, Wyoming.

Coal Bed Name	High Development Potential	Moderate Development Potential	Low Development Potential	Total
Wyodak	—	—	954,780,000	954,780,000
Wildcat-Moyer-Oedekoven	—	—	1,642,430,000	1,642,430,000
TOTAL	—	—	2,597,210,000	2,597,210,000

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