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COAL AND COALBED METHANE RESOURCE POTENTIAL OF THE BOWSER BASIN, NORTHERN BRITISH COLUMBIA 104H/104A

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ABSTRACT

The Bowser Basin occupies a large area within the northern part of the Intermontaine Belt of British Columbia. It is defined by the outcrop extent of the Bowser Lake Group of Middle Jurassic to Early Cretaceous age. These rocks are folded and faulted in styles similar to those seen in the Rocky Mountains and the area is also referred to as the Skeena fold belt (Evenchick, 1991). The basin, which covers approximately 50 000 square kilometres, is bordered to the north by the Stikine arch and to the south by the Skeena arch.

The stratigraphy in the northern part of the basin has been investigated by a number of authors, for example, Cookenboo and Bustin (1989) and MacLeod and Hills (1990). The regional stratigraphy throughout the basin is difficult to determine because of extensive folding and faulting, facies changes and lack of stratigraphic markers.

Coal was first discovered by prospectors in the Bowser Basin in the late 1800s. Much of the early exploration was concentrated within the region bounded by the Nass and Klappan rivers on the west and by the Spatsizi and Skeena rivers to the east. This area encompasses approximately 5000 square kilometres in the north-central part of the basin and is referred to as the Groundhog coalfield.

Numerous exploration programs have been undertaken in the Groundhog coalfield since the turn of the century. The most explored coal deposit is Mount Klappan in the northern part of the Groundhog coalfield; other areas include the McEvoy Flats, Jackson Flats and Panorama Mountain areas in the south.

The main coal-bearing sequence in the Groundhog coalfield is assigned to the Currier Formation of Late Jurassic to Early Cretaceous age. This formation outcrops on all four sides of the northwest-trending Mount Beirnes synclinorium, which is the most prominent regional structure in the coalfield.

The rank of the coal varies from semi-anthracite to meta-anthracite. Coal seams are up to 7 metres thick and cumulative coal thickness in the coal-bearing section ranges up to 53 metres. There is a potential resource of 37 billion tonnes of coal within the coalfield. Much of this is in the lower part of the Currier Formation within the Beirnes synclinorium.

The Groundhog coalfield may contain a potential coalbed-methane resource of up to 230 billion cubic metres or 8 trillion cubic feet (tcf). The recoverable reserve will be considerably less. The resource value is large but the complex structure within the Beirnes synclinorium may make recovery difficult.

An adsorption isotherm on a drill-core sample of coal from Mount Klappan corroborates Kim's (1977) prediction of the high adsorptive capacity of coal of this rank. The data do not provide information on the present gas content of the coal.

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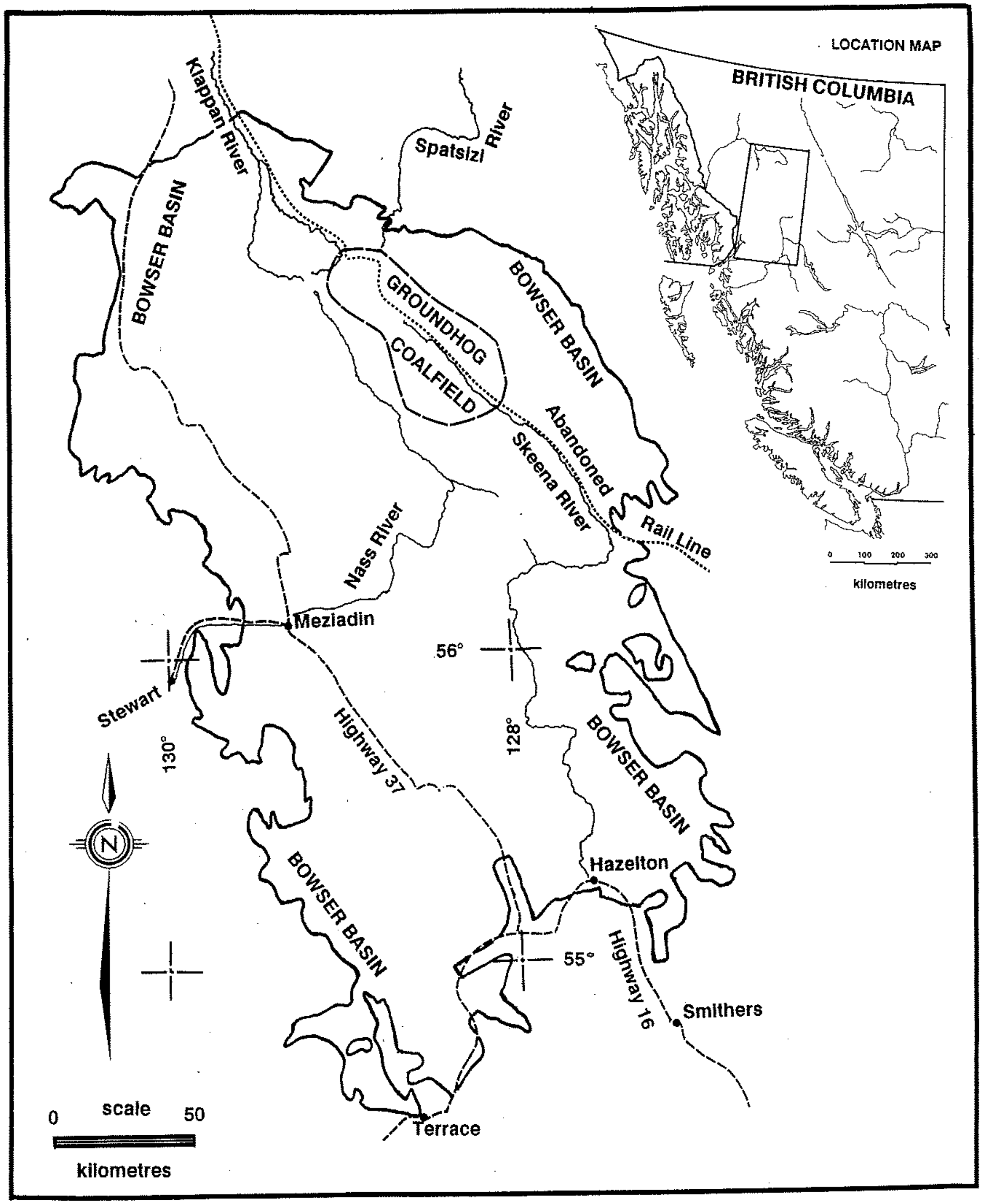

Figure 1. Location for Bowser Basin, northwest British Columbia.

INTRODUCTION

The term "Bowser Group" was first introduced by Roddick (1957) to describe sediments exposed around Bowser Lake, which is 70 kilometres southwest of the Groundhog coalfield. The less formal term of Bowser assemblage was used by Souther and Armstrong (1966) and Eisbacher (1974) for sediments in the northern part of the basin. Tipper and Richards (1976) formalized the name Bowser Lake Group and applied it to all the Jurassic sediments within the basin.

Not much is known about the ability of high-rank coals to retain methane. An attempt is made in this study to estimate possible methane retention values for the coal based on rank, reflectance gradient, depth and geothermal history. The adsorption capacity of coal at high ranks and temperatures decreases as depth of burial increases. The value obtained at maximum temperature and depth will probably control the amount of gas now held by the coal.

LOCATION AND ACCESS

The Bowser Basin is a remote region of rugged mountainous terrain in northern British Columbia, with much of the terrain over 1500 metres above sea level. Much of the area is above treeline with most of the topography consisting of alpine meadow or mountain cliffs and cirques, commonly containing areas of permanent snow or small glaciers. The area encompasses approximately 50 000 square kilometres and is bounded on the east by the Omenica Mountains and on the west by the Coast Mountains.

Large rivers such as the Nass, Skeena, Sustut and Klappan dissect the basin. Along the eastern edge of the basin several large lakes, such as Thutade and Tatlatui, form the headwaters for extensive river systems farther to the east.

Access for the most part is by helicopter or float plane. The abandoned B.C. Railway grade from Fort St. James, in the south, to Dease Lake in the north bisects the basin (Figure 1). This railway line was never completed and access along the right of way is limited to the headwaters of the Spatsizi River in the north and Mosque Mountain in the south. Northern access consists of a poorly maintained road which was built on the railway grade and serves as the main access to the Mount Klappan coal deposit (Figure 2). Along the western boundary of the basin the Stewart-Cassiar Highway links the villages of Meziadin Junction in the south to Dease Lake in the north and is the main transportation route in the northwest region of the province.

The Groundhog coalfield is approximately defined by the geographic region bounded by the Nass and Klappan rivers on the west and the Spatsizi and Skeena rivers to the east (Figure 1). It encompasses approximately 5000 square kilometres in the north-central part of the Bowser Basin (Richards and Gilchrist, 1979). In this paper the Groundhog coalfield is divided into a number of areas defined by UTM coordinates to make it easier to combine the large amounts of data available. These areas are located on Figure 2 and will be referenced in various tables in the text.

PREVIOUS COAL EXPLORATION

Much of the information about exploration in the Bowser Basin is contained in coal assessment reports prepared by exploration companies and on file with the British Columbia Ministry of Energy, Mines and Petroleum Resources. They are referenced in the text by COALFILE numbers (*e.g.*, CF 99) and listed in Appendix 1.

Exploration for coal in the Bowser Basin began in the late 1800s with the discovery by Dupont (1900) of a thick coal seam near the confluence of the Spatsizi River and Didene Creek (discovery coal trench, Figure 2). From 1904 to 1911 coal exploration programs consisting of trenching, sinking of shafts and driving adits were undertaken in the McEvoy Flats area near the south end of the Groundhog coalfield (CF 100). Many of the coal showings located were reported on by Malloch (1912), Dowling (1915) and Buckham and Latour (1950).

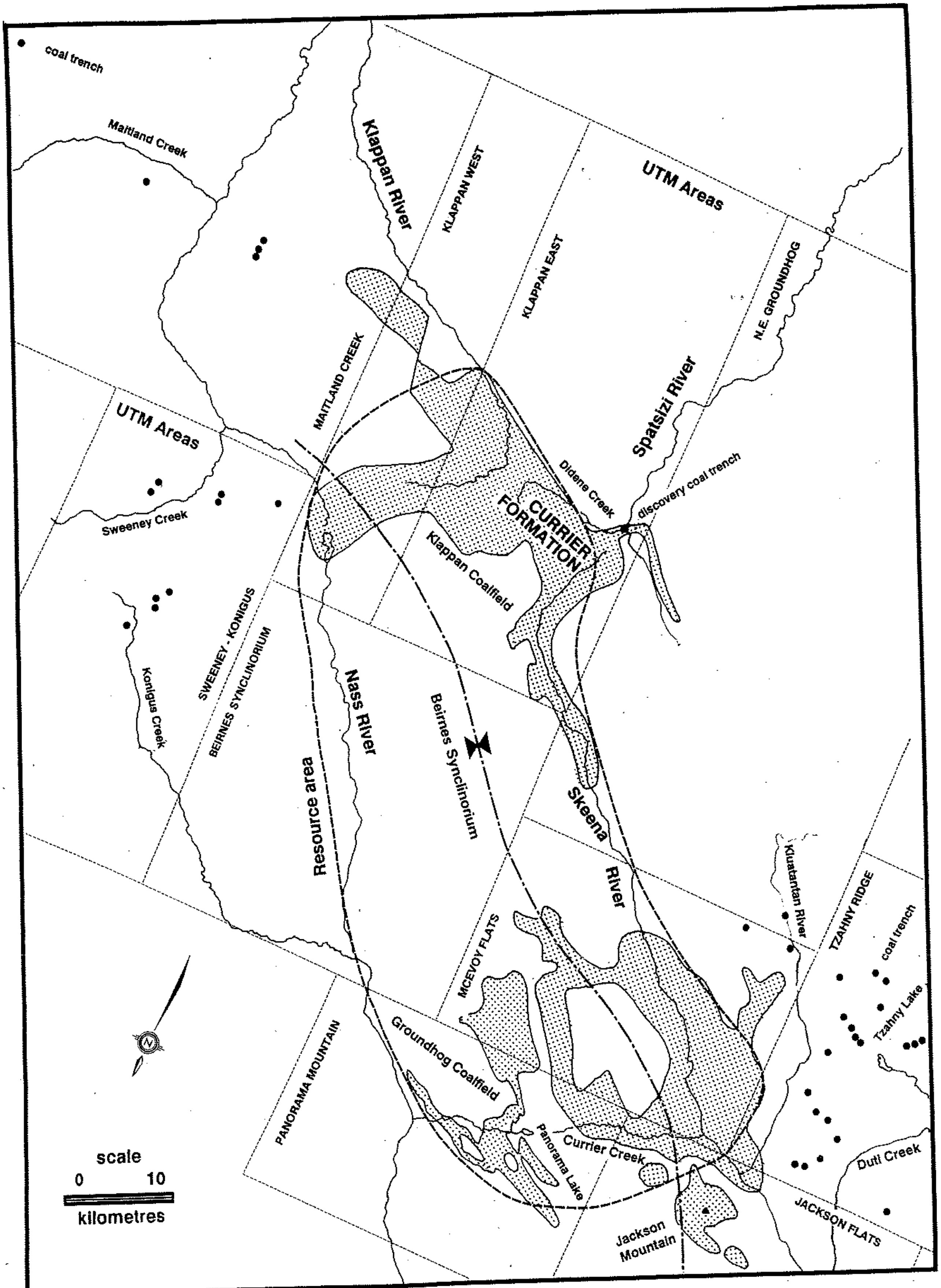

Figure 2. Location map for Klappan and Groundhog coalfields, northwest British Columbia.

Numerous coal leases were staked over the coalfield but other than the initial exploration no further work was undertaken for the next 50 years (CF 98 and CF 100).

Buckham and Latour (1950) provided a summary of all known coal showings up to 1950, most trenched or excavated in the southern part of the Groundhog coalfield at the turn of the century. When exploration activity resumed, their paper was used as a pointer to prospective areas and a number of companies started exploration in the southern part of the coalfield.

Exploration drilling and trenching in 1970 and 1977 was combined with an attempt to define a stratigraphy in the area of the Currier Creek Skeena River confluence (CF 98, CF 100 McEvoy Flats, Figure 2). This area was drilled again in 1981 by the Imperial Metals Corporation (CF 114) and remapped in 1984 (CF 105). Other companies undertook large-scale programs at this time (B.P. Canada Limited, Esso Minerals Limited, Gulf Canada Corporation, Petro-Canada Limited and Suncor Limited).

The Panorama Lake area (Figure 2) was staked and explored by Gulf Canada Corporation in 1980 and 1981 (CF 112 and 113). Suncor (CF 107, 108 and 711) explored the Jackson Mountain area south of McEvoy Flats in 1981, 1984 and 1985

In 1981 Gulf Canada Corporation extended its exploration activity to the north, exploring in the vicinity of one of the original coal discoveries at the confluence of the Spatsizi River and Didene Creek (Figure 2). The area, which is adjacent to the right-of-way for the abandoned B.C. railway line to Dease Lake is now referred to as the Mount Klappan coalfield (Koo, 1986). It had previously been looked at by Esso Minerals Canada (CF 109) and Petro-Canada (CF 106).

Gulf Canada Corporation explored in the Mount Klappan coalfield from 1981 to 1988 (CF 110, 111, 695, 706, 707, 709, 710, 722 and 723) and in 1987 submitted a Stage II environmental impact report to the British Columbia government. From 1981 to 1988 it drilled over 150 diamond drill-holes, 30 rotary drill-holes, dug over 450 trenches drove two adits and excavated a test pit. No exploration work has taken place on the deposit since 1988 and the property is for sale.

STRATIGRAPHY

The Bowser Basin contains an assemblage of Middle Jurassic to Lower Cretaceous sediments that are intensely folded and at least 3500 metres thick. It is a successor basin filled with a regressional sequence of marine to nonmarine sediments that were deposited conformably on volcanics of the Hazelton Group (Tipper and Richards, 1976). The present extent of the basin is approximately 50 000 square kilometres; prior to tectonic shortening it may have been 44% larger (Evenchick, 1991).

Bustin and Moffat (1983) worked in the southern part of the Groundhog coalfield. They introduced five informal units which, on the basis of proposed Jurassic to Cretaceous age, correlated with the Bowser Lake Group and the younger Skeena Group which outcrops along the south and southeastern margins of the Bowser Basin. These units, in order of decreasing age, are Jackson, Currier and its eastern equivalent the Prudential unit, McEvoy and Devils Claw.

Mapping was extended into the northern part of the coalfield by Cookenboo and Bustin (1989) and some of the units formalized. The upper part of the Jackson unit was included in the Currier Formation and the lower part included in the Ashman Formation, a marine sequence previously mapped in the southern Bowser Basin (Tipper and Richards, 1976).

The monotonous lithology, lack of fossils and the high rank of the organic matter made it difficult for Cookenboo and Bustin to date the formations or identify any breaks in the stratigraphic succession. However the Currier Formation and underlying sediments were assigned to the Upper Jurassic Bowser Lake Group. The overlying McEvoy and Devils Claw formations were considered to be of Cretaceous age and equivalent to the Skeena Group.

Moffat *et al.* (1988), working in the Groundhog coalfield, used macrofossils and some palynomorphs to extend the age span of the Bowser Lake Group to include Lower Cretaceous sediments of the Devils Claw Formation. The Currier Formation was considered to conformably overlie the Jackson Formation and to be Upper Jurassic. The age of the McEvoy Formation was considered to be latest Jurassic to Early Cretaceous and it was thought to be separated from the underlying Currier Formation by an unconformity.

An extensive macrofossil study by MacLeod and Hills (1990) assigned a younger age (latest Jurassic to Early Cretaceous) to the Currier Formation and an Early Cretaceous age to the overlying conformable McEvoy Formation. The Devils Claw Formation was considered to conformably overlie the McEvoy Formation. The option was left open for an unconformity in the upper part of the Devils Claw Formation.

Recent literature therefore contains a number of differing interpretations. The name Jackson Formation is retained in some papers as an Ashman Formation equivalent, whereas in others sediments of the Jackson Formation are included in the Currier and Ashman formations and the Jackson Formation ceases to exist. In some papers the main coal-bearing Currier Formation is considered to be largely Jurassic, in others largely Cretaceous in age. There may or may not be an unconformity separating the McEvoy from the Currier. The Bowser Lake Group may contain all the sediments in the northern Bowser Basin up to the Sustut Group or it may be restricted to Jurassic sediments. The stratigraphic terminology used in this paper is illustrated in Figure 3 and follows that suggested by MacLeod and Hills (1990).

Coal is found in the Currier Formation and to a lesser extent in its lateral equivalent to the east, the Prudential unit. Thin high-ash seams are found in the McEvoy Formation.

Sediments to the south and west of the Groundhog coalfield generally do not contain coal. Much of the area is covered by the marine Ashman Formation. Generally the Ashman Formation is composed of marine shales and sandstones. Around the southern edge of the basin there are indications that it might include some terrestrial facies and there are minor coal show-

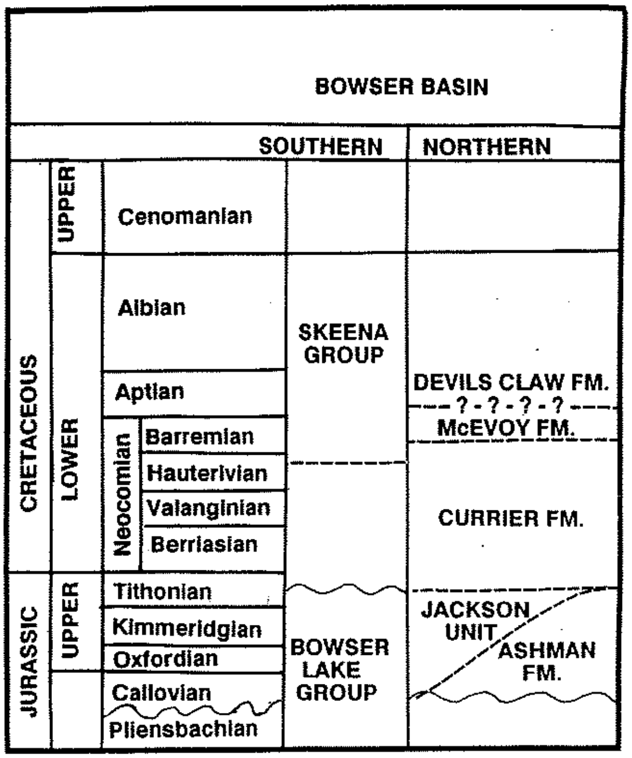

Figure 3. Bowser Basin stratigraphy.

ings. The formation conformably overlies the Smithers Formation of the Hazelton Group (Tipper and Richards, 1976).

Near the northern edge of the basin the Ashman Formation consists of dark grey shales and siltstones (Evenchick and Green, 1990) with turbidite facies and numerous conglomeratic submarine-canyon deposits near the base (Ricketts and Evenchick, 1991). The formation exceeds 800 metres in thickness and unconformably overlies the Spatsizi Group (Evenchick, 1986). The top of the formation is gradational with the overlying Currier Formation and commonly contains thin carbonaceous beds capping coarsening-upward cycles of siltstones and fine-grained sandstones.

The Currier Formation comprises a thick succession of clastic sediments that appear to have been deposited in a prograding deltaic environment at the margin of a basin (Eisbacher, 1973). Paleoflow directions (Cookenboo and Bustin, 1989) suggest a source of sediment to the north and east. The formation is up to 1100 metres thick and contains interbedded mudstones, siltstones, sandstones, minor conglomerates and up to 25 coal zones (MacLeod and Hills, 1990). The base of the formation is defined as the appearance of the first major coal bed.

Potentially economic coal seams up to 7 metres thick are present in the lower third of the Currier Formation. In the Mount Klappan area the formation is 900 to 950 metres thick (CF 111). At Panorama Mountain to the south (Figure 2) an equivalent interval of coal-bearing strata exceeds 1300 metres.

The Prudential unit outcrops along the eastern boundary of the Bowser Basin. It contains thick massive beds of conglomerate and sandstone separated by fine-grained sediments 100 to 200 metres thick which contain high-ash coal seams. Trenches (Dawson and Ryan, 1992) exposed coal zones up to 5 metres thick.

The McEvoy Formation (Cookenboo and Bustin, 1989) contains approximately 500 metres of interbedded siltstone, mudstone and sandstone with minor conglomerate and coal. The formation contains much less coal and is coarser grained than the Currier Formation. It appears that in the eastern region of the Bowser Basin the McEvoy strata are coarser grained than in the west, possibly reflecting a nearby source of sediment.

The upper part of the McEvoy Formation tends to become coarser grained with an increase in the amount of conglomerate and corresponding decrease in mudstone and siltstone contents. The contact of the McEvoy Formation with the overlying Devils Claw Formation is gradational and is placed at the first occurrence of conglomerate beds more than 5 metres thick (Bustin and Moffat, 1983).

The Devils Claw Formation outcrops are restricted to the area between the Nass River to the west and the Kluatantan River to the east. The strata are up to 500 metres thick and consist primarily of thick, massive beds of chert-pebble to cobble conglomerate, sandstone with minor siltstone, thin mudstone bands and, locally, thin seams of coal. Strata tend to coarsen upwards and the upper 100 metres of the formation is almost exclusively conglomerate.

Nonmarine rocks of the Sustut Group (Eisbacher, 1974, and 1981) unconformably overlie the Bowser Lake Group in the northeast. These strata are of Upper Cretaceous to Tertiary and are deposited in the Sustut and Sifton successor basins, generally east of the Bowser Basin and adjacent to the Omenica Mountains.

Along the southern margin of the Bowser Basin the Bowser Lake Group is unconformably overlain by the Skeena Group (Tipper and Richards, 1976).

STRUCTURE

The Bowser Lake Group has been involved in latest Jurassic to latest Cretaceous deformation associated with the Skeena fold belt as defined by Evenchick (1991). Deformation in the northeastern margin of the belt was described by Evenchick (1986), in the Groundhog area by Bustin and Moffat (1983) and in the southern Bowser Basin by Tipper and Richards (1976). Moffat and Bustin (1984) date the deformation as younger than the Devils Claw Formation, which is Lower Cretaceous and older than the Brothers Peak Formation, which is Eocene.

Fold styles in the Bowser Basin range from open upright chevron to overturned and stacked recumbent. Folds often resemble asymmetric mega-kink bands with gentle and steep-dipping limbs. The axial regions of folds are often broken by reverse faults. In the Groundhog coalfield Moffat and Bustin (1984) recognized two phases of deformation. The dominant earlier folds trend northwest and later folds trend northeast. The degree of closure and amplitude of folds both increase in less competent lithologies (Bustin and Moffat, 1984).

Bustin and Moffat (1984) divided the Groundhog coalfield into three major structural domains separated by the valleys of the Nass, Skeena and Kluatantan rivers.

The doubly plunging Mount Beirnes synclinorium, which trends southeast, dominates the area between the Nass and Skeena rivers. The core of the synclinorium contains the McEvoy and Devils Claw formations, with the underlying coal-bearing Currier Formation exposed on the east and west limbs in the Nass and Skeena valleys. This provides a west-to-east limb separation of 20 kilometres. The depth to the base of the Currier Formation below the axial trace of the synclinorium is probably between 1000 to 2000 metres, based on the thicknesses of the McEvoy and Devils Claw formations (Cookenboo and Bustin, 1989) both of which outcrop in the core of the synclinorium.

The length of the Beirnes synclinorium is estimated to be 85 kilometres (Figure 2). The Currier Formation crops out around both ends of the synclinorium. Coal-bearing rocks are therefore estimated to underlie approximately 1830 square kilometres around the synclinorium (resource area Figure 2). This represents the core of the Groundhog coalfield and is the area which will be assessed for its coal and coalbed methane resource potential.

In the core of the synclinorium, thick competent units of the Devils Claw and McEvoy formations are folded into open low-amplitude folds. Outcrops of the less competent Currier and Ashman formations on the limbs of the synclinorium are generally more complexly folded.

East of the Skeena River and west of the Kluatantan River strata of the Currier Formation are generally steeply dipping and tightly folded. Locally faults with limited displacement complicate the structure.

The region east of the Kluatantan River, is dominated by the coarse-grained strata of the Prudential unit (Currier Formation equivalent). Structures on Tzahny ridge (Dawson and Ryan, 1992) include tight overturned synforms bounded by thrust faulted antiforms.

West of the Nass River, strata belong primarily to the Ashman Formation which is comprised of fine-grained clastic sediments with minor conglomeratic layers. Deformation is particularly intense with numerous recumbent anticlines and synclines, often stacked upon each other (Dawson and Ryan, 1992). The shale sections of the formation often display a well defined cleavage.

There is little evidence for a coal-bearing west limb to the Beirnes synclinorium. Coal found in the Konigus Creek area (Figure 2) may be an extension of the coal-poor Currier Formation. A fault is mapped (CF 714) which appears to post-date coalification and may separate Currier equivalent rocks on the west from McEvoy equivalent rocks on the east and north. The

Konigus and Sweeney creeks area may represent the west limb of the doubly plunging Beirnes synclinorium, in which case the limb extends to the north to wrap around the axis in the Klappan coalfield and to the south to wrap around the axis in the Panorama Lake area (Figure 2).

Structural mapping in the northern part of the Bowser Basin (Evenchick, 1986, 1987, 1988, 1989; Evenchick and Green, 1990) reveals structural styles similar to those described by Bustin and Moffat (1984). The Ashman Formation outcrops extensively and is overlain in places by undifferentiated shallow marine to nonmarine clastics that sometimes contain thin, high-ash coal seams.

COAL DISTRIBUTION AND QUALITY

The discussion of Bowser Basin coal quality is based on a database of 237 analyses of trench data and 715 analyses of raw samples from drill core. This represents a major part of the raw coal quality data available for the Bowser Basin. The average quality for all the areas indicates a coal with moderate to high ash and low sulphur. The average coal quality of each area is presented in tables in the text. The total database used to generate the tables is in Appendix 2 which is adapted from computer datafiles which are also available on request. Appendix 3 contains information on drill holes in the Bowser Basin.

The main regional coal-bearing zone, which by definition is generally within the Currier Formation, is outlined in Figure 2.

Coal quality data for the McEvoy Flats are presented in Table 1. There are sufficient data to derive a reasonable outline of the coal-bearing unit. Data from 61 trenches provide a random sampling of the coal seam thicknesses and coal quality. Data from the twelve drill holes provide coal quality data and information on the cumulative coal in the section drilled. Seam thicknesses average about 1 metre, ash content is moderate and sulphur content is low.

It is not possible to map the coal interval in detail, but based on the twelve holes, one can expect to intersect about 6.5 metres of coal in 100 metres of coal-bearing section. In 1984 Duford (CF 105) constructed an average stratigraphic section of 450 metres containing 16.12 metres of coal. Seam thicknesses vary from 0.62 to 1.83 metres.

In the Panorama Lake area (CF 112, 113) 95 square kilometres was mapped and a local stratigraphic section established. Ninety-six hand trenches were dug and three Winkie holes drilled; some coal samples were analyzed for quality and reflectance. Two major seams (Currier 2.1 m and Leach 2.0 m thick) were identified whereas other seams in the section could not be mapped for any distance. A 230-metre section containing up to twelve coal seams and 9.1 metres of cumulative coal was identified. The coal quality for the Panorama Lake area is presented in Table 2.

TABLE 1
COAL QUALITY
MCEVOY FLATS AREA

DRILL-HOLE COMPOSITE DATA

	count	thick-ness	S.D.	high val	low val
Coal zone	12	94.3	42.8	154.2	13.4
Cumulative coal	12	8.51	6.01	22.4	2.1

DRILL-HOLE COAL INTERSECTION QUALITY

	count	average	S.D.	high val	low val
thick	52	0.9	0.47	2.29	0.3
ADM %	16	0.49	0.14	0.73	0.22
Ash %	11	32.67	7.4	47.6	22.9
VM %	16	5.48	1.5	9.4	3.02
FC %	14	51.55	13.5	71.5	30.5
S %	16	1.03	0.88	2.45	0.24
MJ/kg		19.18	5.467	26.55	9.184

TRENCH DATA

	count	average	S.D.	high val	low val
thick	61	1.17	0.53	2.21	0.17
ADM %	46	2.94	1.3	6.09	1.0
Ash %	55	30.02	14.8	62.8	4.1
VM %	55	10.36	4.8	23.6	4.0
S %	39	0.48	0.3	1.6	0.14
MJ/kg		19.70	26.52	32.12	7.233

Note:
- *Averages derived using weight of individual samples calculated using length of intersection, ash content and corresponding S.G.*
- *All thicknesses in metres*
- *All data expressed on an ADB*

Count=number of analyses
S.D.=Standard deviation
ADM=air-dried moisture
MJ/kg=megajoules per kilogram
values rejected
Ash>50%
FC<30%

In the Jackson Mountain area (CF 107, 108, 711; Figure 2) coal seams were mapped in thirty-eight trenches. The available coal quality data are summarized in Table 2. In some cases only the

TABLE 2
COAL QUALITY
PANORAMA LAKE AREA

TRENCH DATA

	count	average	S.D.	high val	low val
Thickness	47	1.37	0.85	3.8	0.28
ADM	47	0.9	0.55	3.2	0.18
Ash%	10	13.37	6.8	24.1	6.3
VM%	10	15.41	4.3	23.9	9.5
FC%	10	47.13	17.1	63.8	14.5
S%	10	0.39	0.23	1.0	0.16
MJ/kg		18.63	6.497	24.92	6.564

MOUNT JACKSON AREA

TRENCH DATA

	count	average	S.D.	high val	low val
Trench Thickness	38	1.56	1.57	8.68	0.2
Coal Thickness	29	1.63	1.76	8.68	0.2
ADM%	45	4.54	3.87	17.4	0.7
Ash%	45	27.25	81.6	43	13.3
VM%	45	11.66	7.66	33.6	3.86
FC%	45	56.53	12.1	75.2	24.1
S%	44	0.74	0.67	3.05	0.18
MJ/kg		21.24	4.521	29.42	11.14

Trench Thickness = stratigraphic thickness intersected by trench
Coal Thickness = true thickness of coal intersection
All additional abbreviations as per Table 1

trench thickness was recorded and the true thickness of the coal intersection is not known. No stratigraphic section was established, however, it appears that there is not much coal in the section prospected. It might be a coal-poor extension of the Currier Formation or a lateral equivalent to the Ashman Formation with some nonmarine, coal-bearing sediments.

Exploration in the period 1982 to 1986 in the Mount Klappan area outlined twenty potentially mineable seams, ranging in thickness from 1.0 to 6.8 metres and averaging 2.4 metres, in a 450-metre stratigraphic section. Seams were named by letter starting with A at the base of the section. Seam I is the thickest, averaging 4.5 metres. The section has a number of marker horizons which aid in regional correlation. The cumulative coal in the section ranged up to 53.62 metres (CF 111).

Raw quality data from 150 diamond-drill holes are summarized in Table 3 on a seam-by-seam basis. These holes were drilled in the eastern half of the Klappan coalfield (Figure 2). Many of the coal quality averages reported by Gulf (CF 706, 707, 709, 710, 722, CF 723) use only seams thicker than 0.50 metres with ash contents less than 45% and that outcrop in areas considered for mining. Data in Table 3 are therefore not applicable to mine studies but do give useful information of average *in situ* coal quality.

The coal quality data were composited to provide average quality for the coal section in each hole and these data were averaged based on sample weights to provide data for the average coal section penetrated by the 150 holes (Table 3). The drilling was targeted to help in defining open-pit mining potential but the average data still give some idea of the length and richness of the section that a coalbed methane hole can be expected to intersect. The data indicate that one can expect to intersect 12 metres of coal over 100 metres of coal section with an average ash of 35%.

There has not been much exploration activity in the central part of the Groundhog coalfield (Beirnes synclinorium area, Figure 2) because most of the area is covered by outcrops of the McEvoy or Devils Claw formations. Coal quality data compiled for this area are presented in Table 4.

Esso Resources Canada Limited explored in the area of Konigus and Sweeny creeks in 1984 and 1985 (CF 714) and located a number of coal outcrops (Figure 2). Most of these areas were sampled by Dawson and Ryan (1992). A thrust fault (CF 714) trending along Konigus Creek was assumed to separate upthrust strongly folded, coastal plain facies sediments on the west of the creek from less severely folded fluvial facies sediments on the east. Sediments to the west were assumed to contain paralic coal seams characterized by moderate ash and reasonable regional persistence. Coal seams to the east, in the fluvial sediments were assumed to contain more ash and to be discontinuous.

The limited coal quality data available are summarized in Table 4. The average mean maximum reflectance (R_{max}) of coals east of the fault is 2.49%, whereas the average value on the west

TABLE 3
COAL QUALITY
KLAPPAN EAST AREA

DRILL-CORE RAW QUALITY

Seam	Thickness/ Count	ADM %	Ash %	VM %	FC %	S %	MJ/kg
M	2.65	1.21	38.3	8.54	49.2	0.52	17.91
	58	41	31	40	36	35	39
L	2.48	1.02	36.9	8.0	52.8	0.52	18.89
	31	24	21	24	22	20	24
K/L	2.87	1.08	40.5	7.58	47.7	0.55	16.38
	47	35	25	35	32	30	35
K	2.73	1.14	32.8	7.95	56.9	0.68	20.10
	73	61	52	61	56	52	60
J	1.01	1.18	29.58	7.79	61.6	0.37	21.98
	25	10	9	9	8	5	9
I	3.27	1.4	23.95	6.82	67.1	0.41	24.76
	187	163	153	161	157	142	159
H	2.51	1.09	34.7	8.3	53.9	0.63	19.37
	124	114	95	114	107	103	112
G	2.26	1.53	35.6	7.36	48.2	0.82	16.44
	38	35	21	32	28	19	28
F	2.44	1.39	37.4	7.57	50.3	0.65	17.81
	18	18	14	18	16	17	17

DRILL-HOLE COMPOSITE DATA

	count	average	S.D.	high val	low val
Strat interval	150	100.0	69	292.5	0.43
Cumltve coal	149	12.54	8.37	53.14	0.43
ADM %	139	1.25	0.63	5.1	0.46
Ash %	139	34.89	9.23	63.99	12.45
VM %	138	7.79	2.39	28.48	4.89
FC %	138	56.33	9.38	75.3	27.56
S %	131	0.62	0.48	3.75	0.32
MJ/kg	138	20.96	3.22	28.74	9.892

Total No. of analyses and holes represented = 715 and 150, seam data composited based on weight of intersection.
Strat interval = Total thickness from top coal to bottom coal intesected in hole.
Cumltve coal= cumulative thickness of coal in the stratigraphic interval.
All additional abbreviations as per Table 1.

is 2.99%. This may be evidence for a post-coalification fault and could be interpreted to mean that sediments on the west are Currier Formation equivalent and those on the east are McEvoy equivalent. If this is the case, the Currier appears to be coal poor in the area; the average seam thickness in the area is 1.6 metres.

Four coal showings were sampled by Dawson and Ryan (1992). They report higher average R_{max} and seam thickness than the Esso data. Generally there does not appear to be much coal in the section.

Scattered occurrences of coal are reported to outcrop either side of Maitland Creek (Figure 2) by Evenchick and Green (1990). Two seams with thicknesses of 0.20 and 1.70 metres were sampled by Dawson and Ryan (1992). These rocks may be part of the Ashman, Currier or McEvoy formations. Based on their location with respect to the Beirnes synclinorium they are probably low in the section.

TABLE 4
COAL QUALITY
MOUNT BEIRNES AREA

TRENCH DATA

	count	average	S.D.	high val	low val
Trnch Thickness	26	1.52	0.67	2.5	0.3
Coal Thickness	26	0.6	0.36	1.53	0.3
ARB %	25	22.66	6.3	37.7	10.5
Ash %	25	24.1	8.54	39.8	10.6
VM %	25	13.69	2.93	19.7	7.8
FC %	25	39.51	6.71	53.3	25.9
MJ/kg	16	15.34	2.69	20.97	10.28

ARB = as received basis

KONIGUS AND SWEENEY CREEK AREAS

TRENCH DATA

	count	average	S.D.	high val	low val
Trnch Thickness	21	1.6	2.0	9.5	0.2
Coal Thickness	15	0.37	0.21	0.9	0.2
Water %	20	10.8	7.0	24.6	0.8
Ash %	20	25.7	19.1	90.2	4.7
VM %	20	11.43	3.36	16.7	4.48
FC %	14	55.5	14.9	75.9	16.5
MJ/kg	14	21.67	5.10	28.57	10.67

TZAHNY RIDGE AND
TABLE MOUNTAIN AREAS

TRENCH DATA

	count	average	S.D.	high val	low val
Trnch Thickness	34	4.31	6.9	22.7	0.86
Coal Thickness	18	1.63	2.03	8.3	0.2
Water %	37	15.5	10.5	34.1	3.4
Ash %	37	40.9	10.3	72.7	24.6
VM %	37	13.85	5.56	25.09	5.21
FC %	37	45.32	19.3	82.6	14.08
S %	33	0.65	0.65	2.63	0.135
MJ/kg	35	16.61	6.99	32.23	6.262

Water % is a mixture of air-dried and as-received analyses
Other analyses are reported on a dry basis
All other abbreviations as per Table 1

Coal occurs on the eastern flank of the Groundhog coalfield in the triangle formed by the Kluatantan River and Tzahny and Duti creeks (Buckham and Latour, 1950). This area is referred to as the Tzahny Creek area (Figure 2) and available quality data are in Table 4. Seam thicknesses range from 1.57 to 9.2 metres. Seams commonly contain numerous partings of carbonaceous shale and mudstone with total coal thickness ranging from 1.17 to 5.60 metres.

The area is structurally complex. It appears that there are two fine-grained sedimentary sequences which contain at least five coal horizons and are separated by thick massive conglomerate and sandstone units. The sediments have been deformed into overturned synforms causing repetitions of the coal-bearing sediments.

Most of the Bowser Basin south of the Groundhog coalfield is underlain by marine sediments of the Ashman Formation. Coal showings of Jurassic age have been reported at Boucher Creek, 105 kilometres northeast of Smithers (CF 721) and at Little Cedar River 50 kilometres north of Terrace (CF 700). Generally the coal resource potential of the southern Bowser Basin is considered to be low.

COAL RANK

Coal rank, as indicated by R_{max}, is a key factor in determining the capacity of coal to retain methane. Reflectance data for the Groundhog coalfield are available from a number of sources. Many coal assessment reports contain R_{max} measurements and UTM coordinates for the samples. There are additional data in Dawson and Ryan (1992) and Bustin (1984). A database of 217 values of R_{max}, with UTM coordinates, was constructed from these sources (Appendix 4). Additional values can only be located to within the UTM subdivisions of the Groundhog coalfield outlined in Figure 2. In the case of multiple values from a single drill hole, the stratigraphically lowest value was entered into the database, and in the case of multiple values from a single trench, an average value was entered.

An attempt was made to include only data from the Currier Formation or its lateral equivalent. In most cases this was the formation explored and as coal seams are concentrated in the lower part of the unit, most of the values are probably from the lower part of the Currier Formation or its equivalent. Much of the variability of R_{max} values from adjacent samples is a function of the different stratigraphic levels of the samples. Some of the scatter is the result of variations in the regional coalification gradient.

The R_{max} data were gridded and contoured using a variogram and kriging program. Various search parameters were set to ensure that the data were not extrapolated outside the boundaries of the Groundhog coalfield. The grid file was used to produce area-weighted averages (Table 5). The average R_{max} over the total area gridded (6600 Km^2) is 3.88%. An area of 2100 square kilometres has a R_{max} value of less than 3.5%. Figure 4 is a smoothed contoured representation of the data generated using the grid file. Contours tend to parallel the trend of the Beirnes synclinorium.

The database was subdivided based on the UTM areas in Figure 2 and numeric averages obtained for each area (Table 5). Mean maximum reflectance values are higher to the east and lower in the central and Konigus-Sweeny Creek areas. In the Tzahny Creek area the average R_{max} is 4.88%, which is high and indicates that either the rocks are low in the section or that rank increases from west to east across the Beirnes synclinorium.

The average of grid values that plot within the Klappan UTM areas (Figure 2) is 3.78% which is similar to the numeric average of 3.65% (Table 5). There are sufficient data from three holes at Klappan to calculate an average down-hole R_{max} gradient of 0.22% per 100 metres for the lower Currier Formation in the east Klappan area.

In the Panorama area there is an indication that the R_{max} gradient is 0.25% per 100 metres (CF 113). This is a steep gradient, particularly considering the absence of any nearby outcropping intrusives, but there is a major aeromagnetic anomaly which may indicate the presence of a buried intrusion.

Bustin (1984) and Bustin and Moffat (1989) discuss the regional coalification patterns for the major units in the Groundhog coalfield. They provide 18 values for the top of the Currier Formation and 44 values for the bottom. The R_{max} contours for these two surfaces trend roughly parallel to the axial trace of the Beirnes synclinorium with higher values toward the southeast and northwest limbs. This is similar to the pattern outlined above using the larger but less well controlled database.

The R_{max} data from Bustin (1984) were entered into a database and matching grids generated for R_{max} values from the top and bottom of the Currier Formation. General parameters for gridding were set to ensure that the area of influence of the data was not extended too far when generating the grid. The top of Currier grid covered 2889 square kilometres and provided an average R_{max} value of 2.9% and the base of the Currier grid covered 4083 square kilometres and provided an average value of 4.59%. The high value for the base of the Currier Formation is biased by some high values in the extreme southeast of the area.

TABLE 5
CURRIER FORMATION, GROUNDHOG COALFIELD

MEAN MAXIMUM REFLECTANCE VALUES
UTM AREAS

UTM area	Easting (metres x 1000) from	to	Northing (metres x 1000) from	to
McEvoy Flats	520	550	6300	6320
Tzahny Ridge	550	580	6300	6330
Jackson Flats	540	570	6280	6300
Panorama	510	540	6280	6300
Beirnes synclinorium	490	520	6300	6330
Sweeny+Konigus	470	490	6300	6340
Klappan West	490	500	6330	6380
Klappan East	500	520	6330	6380
Maitland Creek	430	490	6340	6380
N.E. Groundhog	520	550	6320	6380

NUMERICAL AVERAGE RMAX VALUES

UTM area	count	average	S.D.	high val	low val
McEvoy Flats	13	4.39	0.58	5.2	3.47
Tzahny Ridge	17	4.88	0.2	5.38	4.65
Jackson Flats	25	4.42	0.6	5.8	3.43
Panorama	107	3.05	0.38	5.22	2.26
Biernes syncln	16	2.83	0.2	3.33	2.53
Sweeney+Konigus	12	2.93	0.49	4.00	2.30
Klappan West	34	3.67	0.6	4.87	2.69
Klappan East	64	3.62	0.33	5.2	3.17
Maitland Creek	12	3.17	0.64	4.42	2.3
N.E. Groundhog	3	4.69	0.86	5.7	4.19

DISTRIBUTION OF VALUES FROM GRIDDED FILE OF 217 ORIGINAL MEASUREMENTS
GRID-CELL SIZE 10 X 10 KILOMETRES

R_{max} from	to	count grid cells	area km^3	average R_{max}
2.5	3.0	11	1100	2.84
3.0	3.5	10	1000	3.24
3.5	4.0	19	1900	3.71
4.0	4.5	10	1000	4.25
4.5	5.0	10	1000	4.86
5.0	5.5	6	600	5.16

area weighted average R_{max} = 3.88% over an area of 6600 km^3
UTM areas located in Figure 2

A coalification gradient was calculated by superimposing the two grids and assuming a constant thickness of 725 metres for the Currier Formation (Table 6). The superimposed grid covered an area of 1989 square kilometres and within this area the average coalification gradient was 0.20% per 100 metres +/- 0.013 for the Currier Formation. The gradient appears to be very low in the southeast, either because of misidentified stratigraphy or because the formation thins. The gradient is reasonably uniform, as indicated by the small standard deviation, despite uncertainties in stratigraphy and the presence or absence of major thrust faults.

The iso-reflectance contours in Figure 4 tend to parallel the trend of the Beirnes synclinorium, indicating that coalification preceded much of the deformation. In a number of places iso-reflectance surfaces are offset by faults (CF 113). Bustin and

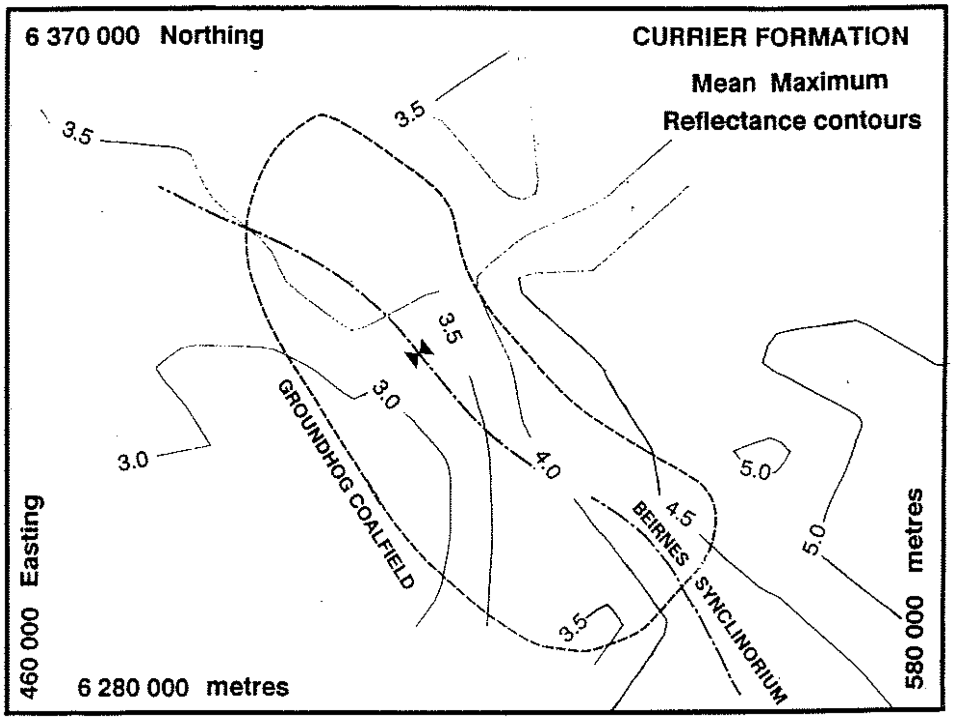

Figure 4. Currier Formation, mean maximum reflectance contours.

TABLE 6
STRATIGRAPHIC THICKNESSES OF FORMATIONS IN THE GROUNDHOG COALFIELD

Publication	Formation thickness (in metres)		
	Currier	McEvoy	Devils Claw
MacLeod and Hills (1990)	950	930	490
Cookenboo and Bustin (1990)	760	1200	??
Cookenboo and Bustin (1989)	350-600	400-800	300-600
Gulf Canada Corporation (1987)	640	??	??
Gulf Canada Corporation CF 111 (1983)	900	??	??
Average (metres)	725	880	480

Moffat (1984) studied the orientation of reflectance indicating surfaces of a number of oriented coal samples. They concluded that coalification predated most of the folding but that late layer-parallel strain related to buckle folding had reoriented the reflectance indicating surfaces.

The relationship between coalification and most of the tectonic strain is important when considering the regional permeability of the coal seams as it relates to the extraction of coalbed methane. Permeability is improved by the presence of pretectonic cleats which may be annealed by deformation. Regional permeability may be restored by the presence of late tectonic fractures.

COALBED METHANE POTENTIAL

METHANE RETENTION

The preservation limit for methane (dry gas) in terms of R_{max} is set between 3.0 and 4.0% by Dow (1977) and 4.8% by Wolfgang and McMechan (1988). This corresponds to a temperature of about 250° to 300° C. Bustin and Moffat (1989) suggest that the maximum temperature experienced by coal at the base of the Currier Formation was between 180° and 230°C

Depending on the physiochemical environment, methane dissociates into hydrogen and carbon in the temperature range 250° to 650°. Coal that has been heated to above 300° can adsorb methane once the temperature decreases, if methane is available in the surrounding rocks.

The relationship of R_{max} to temperature or depth is not linear. At shallow depths and low temperatures a gradient of 0.05% per 100 metres is common, whereas at higher temperatures or greater depths the gradient may be 0.20% per 100 metres or more. The relationship of temperature to depth is more linear over the depth represented by R_{max} values 0.2 to 4.0%. If the geothermal gradient is 40° C per kilometre then, at depth, a change in temperature of 20° C, corresponding to a change in depth of about 500 metres, can cause a change in R_{max} of 1.0%, whereas at shallow depth the change in R_{max} may only be 0.25%. It is therefore difficult to derive an accurate R_{max} value which can be used as a cut-off for resource estimation purposes.

Based on data from Bustin (1984), the R_{max} at the base of the Currier Formation averages 4.59% over 4083 square kilometres, of which 1700 square kilometres averages 4.09%. The R_{max} of the top surface of the Currier averages 2.9% over 2289 square kilometres. The average R_{max} of the coal zone, as derived from all Groundhog R_{max} data, is 3.88% over an area of 6600 square kilometres.

The retention of methane by coal is dependent on depth (pressure), temperature, coal composition and water saturation. Kim (1977) generated a number of equations that illustrate the relationship of these parameters to adsorbed gas content. These equations have been used to predict the gas content in the San Juan basin with good results (Olszewski, 1992).

A number of modifications can be made to Kim's equations. Rank (R_{max}) and volatile matter can be interchanged in Kim's equations using equations provided by Meissener (1984). The water saturation term Vw/Vd, introduced by Kim, accounts for the fact that the high equilibrium moisture of low-rank coals inhibits their ability to adsorb methane. The term, which varies from 0.12 for low rank coals to 0.8 for high rank coals, defines the ratio of coal surface area available to retain methane. Predicted adsorption values are very sensitive to the term Vw/Vd. In this paper a relationship of volatile matter to Vw/Vd was used to predict Vw/Vd, such that it increased as the rank increased. The same approach was used to predict *in situ* moisture. As rank increases *in situ* moisture decreases and there is effectively more coal per unit volume to retain gas.

Using these modifications, it is possible for Kim's equation to take account of changing rank with depth during progressive burial of a coal seam. The R_{max} value can be predicted from depth using a log-linear R_{max} *versus* depth gradient and the value then converted to an equivalent volatile matter content. Temperature can be derived using a geothermal gradient and depth. The water saturation term and *in situ* moisture terms are predicted from the volatile matter. Pressure is assumed to be hydrostatic. The result is an approach which predicts the variation of adsorption capacity of coal with depth while taking into account changing rank, coal quality and geothermal gradient.

Bustin and Moffat (1989), in their discussion of the coalification history of the Bowser Basin, use the following ranges of values: maximum depth of burial for the base of the Currier Formation 4600 to 5500 metres; maximum temperature

180° to 230° C; geothermal gradient 30° to 40° C per kilometre; R_{max} at zero depth, 0.20%.

The adsorption *versus* depth profile for coal in the Currier Formation as it is buried is modeled in this paper using equations adapted from Kim. An attempt is made to honour the constraints suggested by Bustin and Moffat (1989) as well as the rank and coalification gradient values derived for the Currier Formation in this paper.

The model results are as follows: the R_{max} profile starts at 0.25% at 200 metres and reaches 3.9% at 5200 metres with a gradient of 0.18% per 100 metres over the last 800 metres (the Currier Formation). The profile is log-linear with a gradient of 4175 metres per log cycle. The R_{max} value at the top of the Currier Formation, achieved at a maximum burial depth of 4400 metres, is predicted to be 2.58% and at the mid-point of the coal zone 3.6% (the sample analyzed for methane adsorption has a R_{max} value of 3.66%). A matching temperature gradient of 40° C which predicts a maximum temperature of 219° C for the base of the Currier Formation is assumed to accompany the R_{max} *versus* depth profile. All the depth temperature and R_{max} values assumed or predicted by the model are close to or within the ranges used by Bustin and Moffat (1989) or similar to R_{max} values derived in this paper.

The adsorption *versus* depth values predicted for coal as it is progressively buried and heated are presented in Table 7. An ash content of 35.0% (air dried basis) is assumed. The equations predict an adsorption capacity of 6.8 cubic metres per tonne (245 scf/ton) at the maximum depth of 5000 metres for the coal zone. This is only a rough estimate of the methane retention at 5000 metres but it does indicate the inter-relationships of rank, temperature, water saturation, *in situ* moisture and depth.

Table 7 provides information on the prograde history of methane retention of the coal. The adsorption capacity of coal initially increases with depth and increasing rank but eventually the effect of temperature predominates over pressure and the capacity decreases with increasing depth. This is important because it means that coals of high

TABLE 7
COALBED METHANE ADSORPTION VERSUS DEPTH

depth metres	$metres^3$ per tonne	reflectance R_{max} %	VM % DAF	temperature centigrade
200	1.08	0.25	63.5	19
600	1.96	0.32	58.7	43
1000	2.91	0.40	52.6	51
1400	4.71	0.49	45.1	67
1800	6.02	0.61	40.0	83
2200	6.7	0.77	37.2	99
2600	7.41	0.96	33.8	115
3000	8.28	1.19	29.5	131
3200	8.81	1.33	2.9	139
3400	9.45	1.48	24.1	147
3600	10.23	1.66	20.9	155
3800	11.17	1.85	17.4	163
4000	12.22	2.07	13.5	171
4200	12.71	2.31	9.06	179
4400	11.35	2.58	6.7	187
4600	10.35	2.88	6.12	195
4800	8.93	3.21	5.47	203
5000	6.82	3.59	4.75	211

Temperature gradient = 40 C/km
Ash % = 35 % ADB
R_{max} gradient = 4175 m per log cycle on R_{max} axis
In situ moisture varies based on rank
VM % varies based on rank
Methane/water saturation term varies based on rank
Hydrostatic pressure gradient assumed
Basic equations from Kim (1977)

rank, with maximum depth of burial greater than their present depth, will be undersaturated with respect to their present depth and rank.

The equations of Kim (1977) also imply that at constant temperature and depth the adsorption capacity of coal increases as R_{max} value increases up to a value of about 2.5%. As the R_{max} value continues to increase above 2.5% the adsorption capacity decreases with increasing R_{max}. This effect is plausible, but it is not clear in this case if it is real or an artifact of the equations. Kim had only one anthracite sample available to calibrate the empirical relationships at high rank.

Figure 5 illustrates the adsorption capacity of coal as it is buried and then unroofed. As depth decreases, the rank and probably *in situ* moisture content remain constant. Therefore the adsorption capacity of a coal at a given depth is higher on its uplift path than on its burial path because the rank is higher. This means that Currier Formation coal now at a depth of 1000 metres may appear to be undersaturated by 50% with respect to the appropriate desorption isotherm using present rank and depth. Coal may be able to scavenge gas from the surrounding rocks during uplift but this seems unlikely.

As the R_{max} value increases above 2.5% with increasing depth the adsorption capacity decreases. This means that at maximum depth of burial, coal higher in the coal zone will have a higher adsorption capacity than coal lower in the coal zone. This inversion is maintained until the overburden thickness is reduced to less than 1000 metres (Figure 5).

Figure 6 is an attempt to illustrate the time *versus* adsorption history for coal at the top and bottom of the coal zone. It is apparent that it is possible to produce relationships of gas content to present depth of burial and rank that are not consistent with simple desorption curves.

Desorption curves that indicate high adsorption capacities for anthracites are misleading. It is unlikely that one will find a saturated anthracite seam. It is therefore important to know the depth, temperature and rank history of the anthracite in order to predict its adsorption capacity at maximum depth and temperature. This value will be a

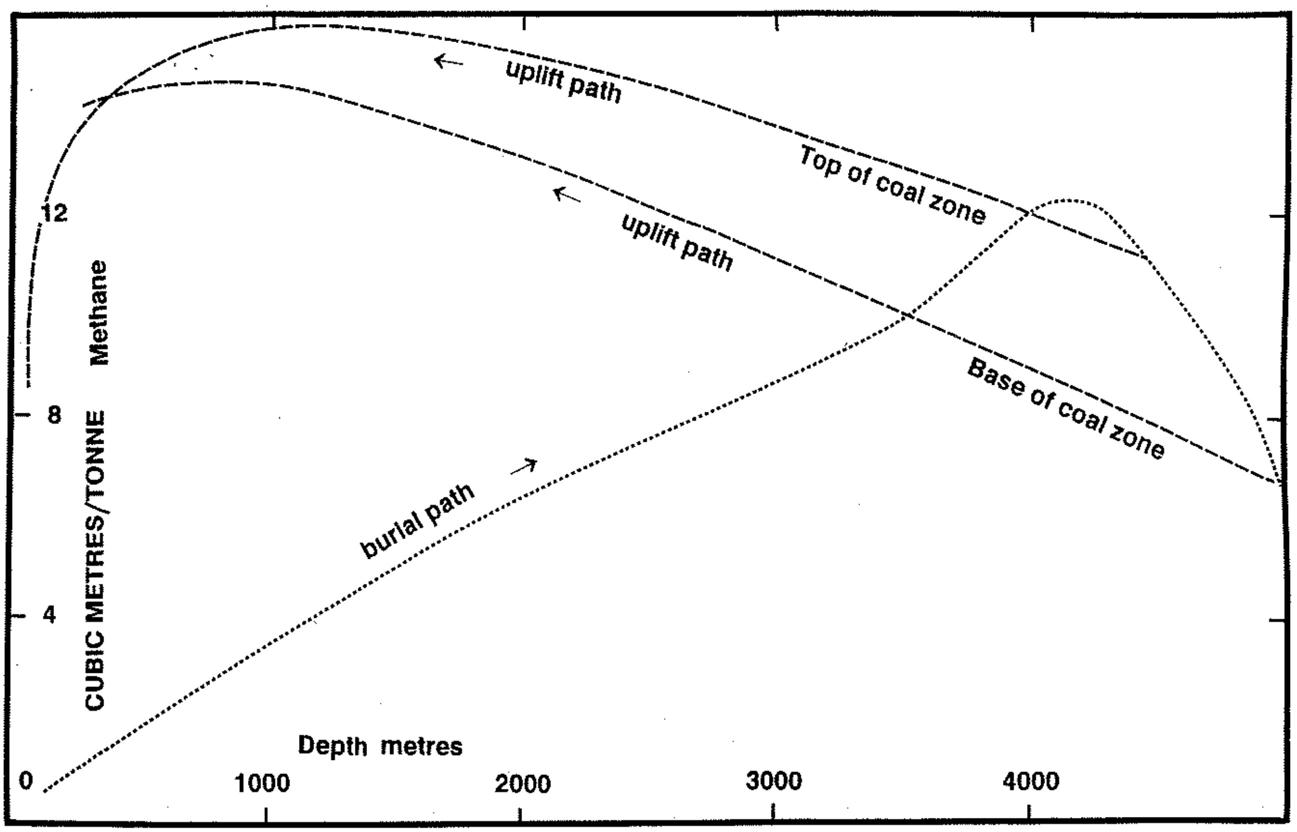

Figure 5. Potential methane adsorption *versus* depth.

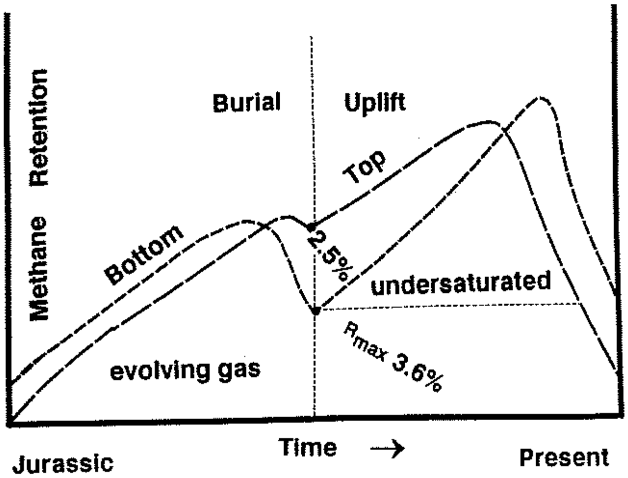

Figure 6. Skematic representation of adsorption versus time for the top and bottom of the coal zone.

better measure of its actual gas content at its present shallower depth.

Coal composition is an additional control on gas adsorption capacity of coal. Recent work (Lamberson and Bustin, 1992) indicates that adsorption capacity increases as the vitrinite content in the coal increases. Changes in vitrinite content of 20.0% have an effect equivalent to changing rank from high-volatile bituminous to low-volatile bituminous. Bowser Basin coals generally have high vitrinite contents but it is probable that at high rank the effect of varying maceral composition on gas adsorption capacity is decreased.

Adsorption curves for anthracite have very steep gradients at the origin. This means that compared to coals of lower rank, anthracite is better at retaining gas at low pressures and shallow depths. This is very important because shallow holes are much cheaper to drill. It also may be difficult to predict the location of coal seams at depth in areas of complex geology.

There have been a number of reports of "gas" in coal core from exploration drilling. In 1970 Willard Thompson (personal communication, 1992) reported that while washing drill core from the McEvoy Flats area in preparation for description, the wet surface bubbled as if the core was evolving quantities of gas. This could be methane desorbing from the coal or carbon dioxide coming out of solution from the water.

METHANE ADSORPTION ISOTHERM

An adsorption isotherm for a single sample of drill core coal from seam H, Klappan East area was measured. The results (Table 8 and Figure 7) indicate that the adsorption potential for anthracite to a depth of about 1400 metres is high. In fact it is higher than predicted by Kim's equations even after using constants in the equations derived from anthracites. The R_{max} value of the sample is 3.66%, which is similar to the general values used for resource assessment in Table 9. The adsorption curve predicts less adsorbed gas at shallow depths but more gas at greater depths than desorption curves calculated from Kim. The form of the adsorption curve fits the Langmuir equation (Langmuir, 1918).

$$V = V_l x(P/(P+P_l))$$

where V is gas volume and P is pressure. Units are either standard cubic feet per ton (scf/ton) and pounds per square inch (psi) or cubic metres per tonne (m^3/tonne) and kilopascals (Kpa). A useful hybrid pressure term is the equivalent hydrostatic depth which is the height of a water column that would generate the same pressure. In most cases the pressure in shallow oil and gas wells is close to hydrostatic so that this term gives an indication of the depth require to generate the pressure. V_l is total possible gas volume adsorbed. P_l is pressure at half total gas volume. The R squared correlation coefficient for the linearized langmuir equation is 0.992. Constants V_l and P_l are calculated to be 39.3 m^3/ tonne (1259 scf/ton) and P_l is 3310 Kpa (480 psi). Figure 7 illustrates the form of the adsorption and predicted desorption curves; the X axis is metres of depth assuming a hydrostatic gradient. The depth values can be converted to pounds per square inch by multiplying by 0.096 x 14.69.

COAL RESOURCE

The potential coal resource of the Groundhog coalfield, derived by adding local estimates in various exploration reports, is approximately 10 billion tonnes. This number is misleading as an estimate of total potential resource for the whole coalfield because the exploration reports cover only part of the coalfield.

The areal extent of the Currier Formation is about 1830 square kilometres (Figure 2). This area

TABLE 8
ADSORPTION ISOTHERM FOR KLAPPAN COALFIELD
SEAM H, HOLE 85-21, DEPTH 43.28 METRES

ANALYTICAL DATA

Moisture	5.6%
Ash	18.49%
R_{max}	3.66%

Temperature of adsorption 22°centigrade

ADSORPTION DATA
RAW SAMPLE

PRESSURE psia	DEPTH metres	ADSORBED scf/ton	METHANE m^3/tonne	P/V
175	114	344	10.7	0.513
416	272	596	18.6	0.665
592	387	734.5	22.9	0.849
894	584	815.1	25.4	1.121
1198	783	902.5	28.2	1.384
1491	974	946.5	29.5	1.604
1923	1257	990.6	30.9	1.842

Langmuir constants
Vm=1220.4 scf/ton b=2.307 x 10^{-3} PL=433.5 psia

DRY ASH FREE DATA

PRESSURE psia	DEPTH metres	ADSORBED scf/ton	METHANE m^3/tonne	P/V
175	114	422.1	13.2	0.418
416	272	731.2	22.8	0.542
592	387	901.1	28.1	0.692
894	584	1000	31.2	0.914
1198	783	1107.2	34.6	1.128
1491	974	1161.2	36.3	1.308
1923	1257	1215.3	37.9	1.501

Langmuir constants
Vm=1497.3 scf/ton b=2.307 x 10^{-3} *psia* *PL=433.5 psia*
NOTE:
Depth in metres is calculated assuming that the pressure is hydrostatic
1 m^3/tonne = 32.037 scf/ton
1 pound per square inch (psia) = 6.895 kilopascals

HOLE LOCATION

	metres
northing	6345238
easting	505628
elevation	165

is proportioned between the UTM areas identified in Figure 2 and Table 8. A number of coal reports contain estimates of the total thickness of the coal-bearing section in the Currier Formation and the cumulative coal thickness in the section. Average cumulative coal thicknesses are assigned to each UTM area and coal tonnages calculated using a specific gravity of 1.2. This specific gravity is conservative for high-rank coal with 35% ash and low bed moisture.

The cumulative potential coal resource underlying the 1830 square kilometres of Currier outcrop or subcrop is estimated to be 37 billion tonnes (Table 9). This is a speculative number and should be used only as an indication of the order of magnitude of the coal resource available for coalbed methane extraction.

POTENTIAL METHANE RESOURCE

A detailed coalbed methane resource calculation requires, as a starting point, information about the depth distribution of the coal, which does not exist for the Groundhog coalfield as a whole. As illustrated in the section on methane retention, the calculation also requires information about the burial history of the coal. This paper attempts to derive conservative estimates of the potential methane resource by taking into account as many elements of the burial history of the coal, coal quality and coal resource as possible.

The methane resource assessment is restricted to the 1830 square kilometres of outcrop and subcrop of the Currier Formation within the Groundhog coalfield. Coal outcrops outside this area are usually thin and seams are widely separated.

The potential methane resource calculation utilizes the coal tonnages calculated for each UTM area in Table 9. Average R_{max} values for the coal zone in each UTM area are reported in Table 5. The general adsorption *versus* depth model for the Groundhog coalfield predicts a methane ad-

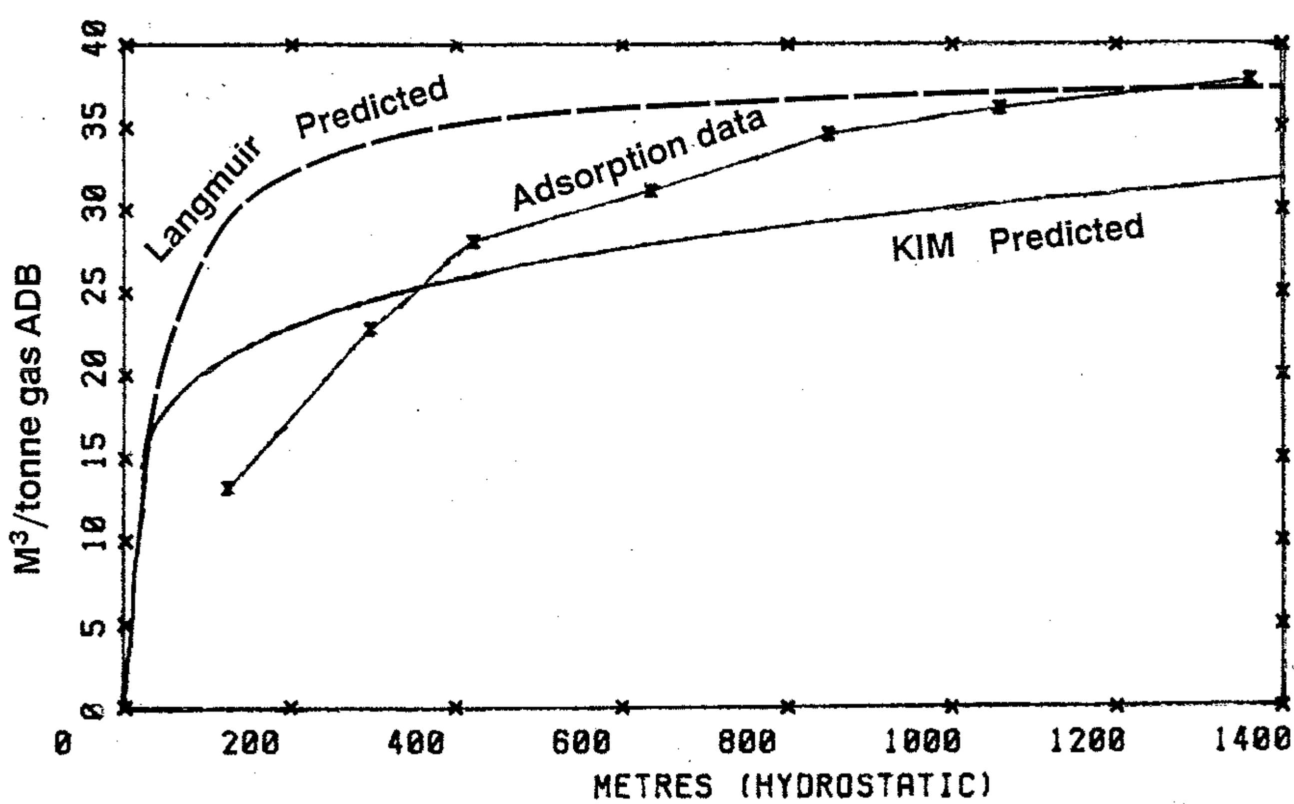

Figure 7. Adsorption isotherm for sample, Seam H, hole 85-21, and predicted desorptioon curve using Kim (1977) equations.

TABLE 9
POTENTIAL COAL AND METHANE RESOURCE GROUNDHOG COALFIELD

COAL RESOURCE

UTM area	per cent of total area	cumulative coal thickness	coal 10^9
Klappan East	20	26.25	11.53
Klappan West	11	18.9	4.57
Jackson Flats	3	9.1	0.60
Panorama	12	9.1	2.40
McEvoy Flats	27	16.1	9.55
Beirnes Synclinorium	27	14.0	8.30
Total			36.95

Cumulative coal thickness in metres averaged from stratigraphic data for each area extracted from coalfile reports.
Total area of resource assessment from Figure 1 = 1830 km^2
Relative area weighting of each area from Figure 2 approximate
Coal resource values are speculative
Specific Gravity (S.G.) of coal used in calculations = 1.2

METHANE RESOURCE

UTM area	R_{max}	cubic metres per tonne	cubic metres x 10^{10}
Klappan East	3.62	6.8	7.84
Klappan West	3.67	6.8	3.11
Jackson Flats	4.42	3.9	0.23
Panorama	3.05	9.1	2.18
McEvoy Flats	4.39	4.0	3.82
Beirnes Synclinorium	2.83	9.8	8.13
Sub total			25.31
Estimate of gas lost from near surface coal			2.531
TOTAL estimate of potential methane resource			22.8

sorption of 6.8 cubic metres per tonne for coal with a R_{max} value of 3.6% buried to a maximum depth of 5000 metres. This value is used to calculate the methane resource for the Klappan UTM areas. The R_{max} gradient was increased or decreased in the model to predict adsorption values for the other UTM areas which have R_{max} values ranging from a low of 2.8 to a high of 4.4%.

The total potential methane resource was calculated by multiplying the coal tonnage by the adsorption value for each UTM area and reducing the total by 10% to account for near-surface coal which would be totally degassed. The value derived is 228 billion cubic metres (8 trillion cubic feet (tcf), Table 9).

In order to put the potential methane resource of the Bowser Basin in perspective the potential of other areas of British Columbia is summarized. The resource of the Bowser Basin may be relatively large but its potential for development is lower than other areas in British Columbia.

The main areas of methane potential in British Columbia are in the northeast, southeast and on Vancouver Island. The resources in southeast British Columbia are estimated to be over 566 billion cubic metres (20 tcf) (Johnson and Smith, 1991). The resource in the northeast coalfield is estimated at over 2800 billion cubic metres (100 tcf) (Smith *et al.*, 1992). Estimates of the coal resource on Vancouver Island range from 200 million tonnes (Smith, 1989) to over 1 billion tonnes (unpublished Industry estimates). Estimates of methane resource on Vancouver Island range from 6.5 to 28 billion cubic metres (0.23 to 1.0 tcf). A recent internal government study by the author estimated 19 billion cubic metres (0.66 tcf). Many other small coal basins individually contribute less than 10 billion cubic metres to the total provincial resource.

The total resource for the province is probably between 3000 and 5000 billion cubic metres (100 to 200 tcf). A better estimate will require detailed studies backed up by the acquisition of desorption data.

POTENTIAL METHANE RESERVE

For the economic extraction of methane to be possible the coal must be localized in a stratigraphic section as a few thick seams that are relatively undisturbed over sufficient areas to provide enough gas to make a single well economic. The Currier Formation as it outlines the Beirnes synclinorium (Figure 2) contains the only coal-bearing section of potential interest in the Bowser Basin.

The cumulative thickness of coal within the coal-bearing section of the formation varies from 9 to over 53 metres. The 150 diamond-drill holes drilled in the Klappan area, on average, intersected 12.5 metres of coal in 150 metres of section (Table 3) and the 12 drill holes in the McEvoy area intersected 8.5 metres of coal over 94 metres of section (Table 1). These data give some idea of the amount of coal that might be intersected in a single hole and available to provide methane. The coal thicknesses are vertical and must be corrected to true thickness, based on the dip of the coal beds, before calculating the coal or methane resource surrounding a single well.

In general the Currier Formation is extensively folded but quite large flat areas exist on the gently dipping limbs of asymmetric folds. These locations could make good targets for wells. McEvoy Flats is underlain by a large area of fairly undisturbed shallow-dipping rocks (CF 105) folded into an open syncline. The interpretation is substantiated by the consistently large core-bedding angles measured in the vertical drill holes in the area. Cross-sections in the feasibility study for surface mining in the Lost Fox area (Klappan Licence Block, CF 723) indicate that the down-dip length of the flat limbs measured nearly perpendicular to the fold plunge is often more than a kilometre. Usually structural consistency down the fold plunge is better than at right angles to it. It appears that areas of moderately undisturbed fold limbs in excess of 1 square kilometre are possible.

At first sight the fold complexity in the Bowser Basin might appear to rule out opportunities for coalbed methane wells. In fact there may be potentially economic locations for wells on the relatively undeformed flat-dipping limbs of the asymmetric chevron folds.

It is possible to estimate the size of the reserve area of a single well. Cech *et al.* (1992) studied the economics of hypothetical coalbed methane wells. They indicate that the available methane resource per well should be in the range of 25 to 80 million cubic metres with recoveries varying from 25 to 50%. If the methane content of the coal averages 7.0 cubic metres/tonne then this requires a coal resource of 3.6 to 11.4 million tonnes. This amount of coal will be found in an area of 0.4 to 1.2 square kilometres if the average coal thickness is 8 metres and specific gravity is 1.2. Therefore, in terms of geology, a possible well target is an area of about 1 square kilometre that is relatively unfolded and contains about 8 metres of coal in the coal section.

Exploration for methane is constrained primarily by depth. It is difficult to maintain gas permeability to the well-head at depths greater than 2000 metres. Usually at shallow depth and especially above the water table, the methane content of coal is low and variable.

In the centre of the Beirnes synclinorium the coal-bearing zone in the Currier Formation is overlain by the full thickness of the McEvoy Formation and part of the Devils Claw Formation. Estimates of the maximum depth to the coal zone in the Currier Formation are less than 2000 metres (Table 6).

It will be difficult to assess the methane resource at depth in the axial region of the Beirnes synclinorium. Folding will be difficult to document although there are indications that there is less folding in the axial region of the synclinorium than on its limbs. Areas either side of the axial trace may contain reserves of methane at reasonable depths.

If 10% of the total potential methane resource within the Groundhog coalfield is available for extraction then this amounts to 23 billion cubic metres, or 0.8 tcf. If wells drilled to extract this resource achieve a recovery of 10 to 50% then there is a potential recoverable reserve of 2 to 11 billion cubic metres or 80 to 400 billion cubic feet. Using a maximum required well reserve figure of 80 million cubic metres (2.8 billion scf) a minimum recovery figure of 10% and a recoverable resource of 23 billion cubic meters then there is sufficient resource to support 25 wells. The upside number calculated using the more favourable figures indicates a resource sufficient for 440 wells.

The economics of single wells depends on water as well as methane production. Some data on water quality and ground water levels are available in the Stage II report submitted to the British Columbia government by Gulf Canada Corporation in 1987. In the Klappan area sandstones are often aquifers and the top surfaces of the coal seams are often zones of high permeability. Other units generally have low permeability. The report did not identify any major underground water problems for a surface mining operation.

A well has no chance of being economic unless there is sufficient regional permeability to allow the methane to flow to the area of decreased pressure at the well-head. Permeability can change by a factor 100 and have an equivalent effect on the reserve potential of a well. Such changes usually far outweigh the significance of changes in the adsorbed methane content of the coal.

Coalification in the Groundhog coalfield predates the deformation (Bustin and Moffat, 1989) therefore the permeability controlling methane flow will be structural. This may be an advantage; the geometry of tectonic joint patterns is probably closely related to the geometry of the major folds. Generally, in terrain similar to the Groundhog coalfield, prominent joint sets are either normal to the plunge of the folds or are oriented such as to contain the fold axis and remain normal to the bedding surface.

No data exist on permeability in the coal seams in the Groundhog coalfield. Some general information on the relative permeabilities of lithologies can be extracted from the geophysical logs of the Klappan drill holes. Permeability decreases with depth: in the San Juan basin it decreases by a factor of 10 for every 1000 metres and is 1 millidarcy at 1000 metres. In the Warrior basin it decreases by a factor of 10 for each 200 metres and is 1 millidarcy at 500 metres. The possibility that anthracite can retain methane at shallow depths may help shallow wells target sufficient resource while achieving good recoveries because of good permeabilities. Generally productive wells have permeabilities of between 1 and 50 millidarcies in the completed zones.

CONCLUSIONS

The Beirnes synclinorium area of the Groundhog coalfield has a potential coal resource of 37 billion tonnes of anthracite coal. Most of this coal is in the depth window suitable for coalbed methane extraction. The coal section is often folded into asymmetric chevron folds. Exploration reports indicate that the gently dipping limbs of these folds often represent relatively undeformed structural domains on the order of 1 square kilometre in area.

The methane content of anthracite is probably controlled by its adsorption capacity at maximum depth of burial. On uplift its adsorption capacity increases but the coal may not have had the opportunity to scavenge extra methane. Using information on the burial history of the coal zone that incorporates rank gradient, geothermal gradient data and coal quality, it is possible to estimate the maximum-depth adsorption capacity of anthracite in the Groundhog coalfield. This value, adjusted for regional changes in the average R_{max} of the coal zone is used to calculate a potential resource of 230 billion cubic metres (8 tcf). This number is an order of magnitude estimate.

An adsorption isotherm confirms the high adsorption capacity of anthracite at low to moderate depths. The data indicates that the adsorption capacity at shallow depths, though better than for lower rank coals, might not be as good as indicated by standard desorption curves.

If a resource of the 230 billion cubic metres (8 tcf) exists then there may be sufficient recoverable methane to support between 25 and 440 wells extracting between 2 to 11 billion cubic metres. This represents between 1 and 5% of the known natural gas reserves in the province.

Of all coal ranks, anthracite is the best at retaining methane at shallow depths. This has important implications for exploration risk, improved permeability and gas recovery. The recovery of each well will be influenced by local structural geology and its effect on regional permeability.

It is not economic to develop the Groundhog coalfield as a source for methane today. In the future, depleting conventional natural gas reserves, and pressure to switch to gas, which is perceived as an environmentally friendly fossil fuel, may cause gas prices to rise significantly. Demand for conventional gas is projected to exceed supply in Western Canada by about the year 2005 (Cech *et al.*, 1992). At this time production of coalbed methane may be economic in some coal basins. The basic framework of resource information must be in place long before that date in order to facilitate exploration which must precede development.

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APPENDICES

APPENDIX 1

PUBLIC COALFILE ASSESSMENT REPORTS FOR THE BOWSER BASIN ON FILE AT THE BRITISH COLUMBIA MINISTRY OF ENERGY MINES AND PETROLEUM RESOURCES

Area	Year	COALFILE Number	Company Author
Groundhog			
	66	96	Coastal coal; J.T. Boyd and Associates
	68	97	Coastal Coal; Dillingham Corp.
	70	98	National Coal Corp; Placer Development
	73	99	National Coal Corp; Placer Development
	77	100	B.C.Hydro; W. Thompson
	79	101	Groundhog Coal Ltd
	79	102	Petrofina
	80	103	Groundhog Coal Ltd
	81	106	Petro-Canada; M. Bustin
	81	114	Skeena Metals
	84	105	Groundhog Coal Ltd; M. Duford
Klappan			
	79	109	Esso Minerals
	82	110	Gulf Canada Resources Ltd
	83	111	Gulf Canada Resources Ltd
	84	695	Gulf Canada Resources Ltd
	84	709	Gulf Canada Resources Ltd
	84	710	Gulf Canada Resources Ltd
	85	706	Gulf Canada Resources Ltd
	85	707	Gulf Canada Resources Ltd
	86	722	Gulf Canada Resources Ltd
	86	723	Gulf Canada Resources Ltd
Panorama			
	80	112	Gulf Canada Resources Ltd
	81	113	Gulf Canada Resources Ltd
Mount Jackson			
	82	107	Suncor Resources Inc
	83	108	Suncor Resources Inc
	85	711	Suncor Resources Inc
Sweeny			
	85	714	Esso Resources Ltd
Sustut			
	80	115	Gulf Canada Ltd
	82	116	Suncor Resources Inc
	83	117	Suncor Resources Inc
	84	704	Suncor Resources Inc
Evans Creek			
	84	95	Gulf Canada Resources Ltd
	88	749	Gulf Canada Resources Ltd

APPENDIX 2

TABLE 1. McEVOY FLATS COAL QUALITY

YR	ID	THIC	EXP	SEAM	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
L50	BL22A	1.07	SURFCE	-1	T	-1	-1	3.66	35.2	7.3	53.8	-1	-1	-1
L50	BL23	1.82	TUNEL	-1	T	-1	-1	2.48	27.9	5.2	64.4	-1	-1	-1
L50	BL23	1.82	TUNEL	-1	T	-1	-1	1.17	16.6	6.05	76.2	-1	0.72	6786
L50	BL23	1.68	TUNEL	-1	T	-1	-1	1.04	22.7	8.39	67.9	-1	-1	-1
L50	BL23	1.75	TUNEL	-1	T	-1	-1	2.5	27.1	8.1	62.3	-1	-1	-1
L50	BL23	1.75	TUNEL	-1	T	-1	-1	3	24.4	6.6	66	-1	-1	-1
L50	BL24	1.63	SURFCE	-1	T	-1	-1	2.39	11.2	7.9	78.5	-1	0.99	-1
L50	BL24	1.7	TUNEL	-1	T	-1	-1	3.83	27.7	6.37	62.1	-1	-1	-1
L50	BL24	0.48	TUNEL	-1	T	-1	-1	4.12	5.85	7.43	82.6	-1	0.46	7097
L50	BL24	1.16	TUNEL	-1	T	-1	-1	3.95	4.05	8	84	-1	0.49	7219
L50	BL24	1.88	TUNEL	-1	T	-1	-1	2.62	5.93	6.96	84.5	-1	0.57	7674
L50	BL24	1.65	TUNEL	-1	T	-1	-1	2.88	10.6	7.64	78.8	-1	-1	-1
L50	BL25	1.78	SURFCE	-1	T	-1	-1	5.75	11.7	7.34	75.3	-1	-1	-1
L50	BL25	1.78	TUNEL	-1	T	-1	-1	1.45	15.8	7.51	75.2	-1	-1	-1
L50	BL25	1.65	TUNEL	-1	T	-1	-1	4.45	7.55	8.75	79.3	-1	-1	-1
L50	BL25	1.65	TUNEL	-1	T	-1	-1	1.17	8.92	6.54	83.4	-1	0.74	7404
L50	BL26E	2.21	SURFCE	-1	T	-1	-1	3.84	37.1	7.85	51.2	-1	-1	-1
L50	BL27	1.22	TUNEL	-1	T	-1	-1	1.4	21.9	6.06	70.7	-1	1.6	6549
L50	BL27	1.35	TUNEL	-1	T	-1	-1	1.57	25.4	7.55	65.5	-1	-1	-1
L50	BL28A	1.37	SURFCE	-1	T	-1	-1	4.72	12.6	10.7	72	-1	-1	-1
L50	BL31C	1.21	SURFCE	-1	T	-1	-1	6.09	14.7	13.7	65.5	-1	-1	-1
L50	BL32B	1.63	TUNEL	-1	T	-1	-1	1.08	26.9	7.06	65	-1	-1	-1
L50	BL32F	1.59	TUNEL	-1	T	-1	-1	1.35	29.1	7.69	61.9	-1	-1	-1
L50	BL36A	1.4	TUNEL	-1	T	-1	-1	3.55	21.8	4.02	70.7	-1	0.99	6656
L50	BL36C	1.3	TUNEL	-1	T	-1	-1	3.75	34.4	5.74	56.2	-1	1.57	5333
L50	BL36D	1.02	SURFCE	-1	T	-1	-1	4.5	41.5	6.25	47.7	-1	0.99	4333
L50	BL36E	1.52	TUNEL	-1	T	-1	-1	3.77	34.2	4.27	57.8	-1	0.6	5322
L50	BL36H	1.07	TUNEL	-1	T	-1	-1	5.95	34.1	13.3	46.7	-1	0.44	5200
E88	88401	0.17	0.17	-1	R	-1	-1	2.32	46.6	21.9	29.2	-1	0.29	2677
E88	88402	1.36	0.7	-1	R	4.21	-1	2.69	56.9	16.1	24.3	-1	0.16	2273
E88	88403	0.77	0.71	-1	R	5.12	-1	2.23	41.6	7.2	49	-1	0.41	4152
E88	88404	0.57	0.48	-1	R	-1	-1	3.33	34.1	13.9	48.7	-1	0.28	4304
E88	88405	1.18	0.81	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
E88	88406	1.4	0.45	-1	R	-1	-1	2.25	62.8	15.8	19.2	-1	0.27	1728
E88	88407	0.44	0.39	-1	R	-1	-1	2.63	51	18.6	27.8	-1	0.15	2476
E88	88408	0.85	0.85	-1	R	-1	-1	2.86	30.3	20.7	46.2	-1	0.23	3870
E88	88409	0.3	0.3	-1	R	-1	-1	1.38	37.1	6.74	54.8	-1	0.4	3967
E88	88410	0.67	0.67	-1	R	5.31	-1	2.25	15.2	9.29	73.2	-1	0.35	6341
E88	88411	0.3	0.3	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
E88	88412	0.43	0.43	-1	R	4.43	-1	2.03	33.8	23.6	40.6	-1	0.27	3444
E88	88413	0.87	0.75	-1	R	4.07	-1	2.17	17.9	15.3	64.6	-1	0.31	5406
E88	88414	1.22	0.84	-1	R	5.26	-1	2.57	34.9	12.6	49.9	-1	0.41	4398
E88	88415	0.45	0.39	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
E88	88416	2.01	1.62	-1	R	4.98	-1	2.84	22.6	6.88	67.7	-1	0.34	5856
E88	88417	1.9	1.49	-1	R	6.07	-1	2.42	59.2	16.2	22.2	-1	0.14	1946
E88	88418	0.56	0.43	-1	R	-1	-1	2.89	40.6	9.45	47.1	-1	0.31	4011
E88	88419	1.4	1.08	-1	R	-1	-1	2.42	46.7	20.3	30.6	-1	0.2	2459
E88	88420	0.56	0.56	-1	R	6.37	-1	2.25	42.7	11.3	43.8	-1	0.29	3587
E88	88421	1.25	0.47	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
E88	88422	0.26	0.26	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
D84	1	1.64	-1	-1	T	3.73	-1	0	38.8	11.2	50	-1	0.28	4621
D84	2	0.69	-1	-1	T	4.21	-1	0	47.9	11.7	40.5	-1	0.27	3671
D84	3	1.64	-1	-1	T	-1	-1	0	31.1	11.2	57.7	-1	0.4	5197
D84	4	0.81	-1	-1	T	-1	-1	0	28.2	19.8	52	-1	0.31	4867
D84	5	0.84	-1	-1	T	-1	-1	0	-1	-1	-1	-1	-1	-1
D84	6	0.5	-1	-1	T	-1	-1	0	62.7	12.5	24.8	-1	0.22	2348
D84	7	0.95	-1	-1	T	-1	-1	0	44	7.86	48.1	-1	0.54	4187
D84	8	1.51	-1	-1	T	3.47	-1	0	18.6	10.1	71.4	-1	0.5	6599
D84	9	0.47	-1	-1	T	-1	-1	0	41.4	8.1	50.5	-1	0.34	4397
D84	10	0.56	-1	-1	T	-1	-1	0	34.1	8.47	57.5	-1	0.7	5242

DATA SOURCES
Buckham and Latour - 1950 for L50 series
Coalfile Assessment Report Number 749 for E88
Coalfile Assessment Report Number 105 for D84

ID = *Reference number in original paper*
Thick = *Total reported thickness*
EXP = *Type of excavation or coal intersection thickness*
SEAM = *Seam designation*
T = *Type of analysis; all analyses raw samples*
T = *total*
I = *increment*

R = *no information*
Rmax = *Mean maximum reflectance*
M = *Moisture as reported*
ASH = *Ash content*
VM = *Volatile matter content*
FC = *Fixed carbon content*
FSI = *Free swelling index*
SULF = *Sulphur content*
CV = *Calorific value in calories per gram*
MJ/kg = *calories per gram x 0.004186*

MOUNT JACKSON AREA COAL QUALITY

YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
J85	B3	0.78	-1	0.4	T	-1	100	2.6	22.7	10.5	64.2	-1	0.46	5686
J85	B3	0.78	-1	0.38	T	-1	100	2.9	27.7	8	61.4	-1	0.67	5365
J85	B3	0.78	-1	-1	T	-1	100	1.2	38.2	13	47.6	-1	0.97	4351
J85	-1	-1	-1	-1	T	-1	100	1.4	38.3	6.9	53.4	-1	0.6	4413
J85	K77	0.6	-1	0.6	T	-1	100	1.2	19.2	8.4	71.2	-1	0.46	6239
J85	K79	0.3	-1	0.3	T	-1	100	2	35.3	5.6	57.1	-1	0.56	4875
J85	K83	1	-1	1	T	-1	100	0.7	18.1	6	75.2	-1	1.78	6589
J85	GH85	-1	-1	-1	T	-1	100	2.5	21.4	15.1	61	-1	0.48	5407
J85	GH-21	0.5	-1	0.5	T	-1	100	2.1	43	5.9	49	-1	0.29	3967
J85	K-28	0.93	-1	0.93	T	-1	100	3.4	24.4	10.4	61.8	-1	0.37	5302
J85	TR-CR	-1	-1	-1	T	-1	100	1.7	38.6	4.5	55.2	-1	0.49	4586
J85	GH74	-1	-1	-1	T	-1	100	6.5	22.7	14.7	56.1	-1	0.35	5045
J85	GH-75	2.56	-1	2.56	T	-1	100	8.7	18.2	17.3	55.8	-1	0.31	5051
J85	GH-75	-1	-1	-1	T	-1	100	9.1	18.8	18	54.1	-1	0.32	4829
J85	GH-97	8.68	-1	8.68	T	-1	100	17.4	27	18.4	37.2	-1	1.28	3585
J85	GH-67	-1	-1	-1	T	-1	100	2.5	37.7	9.1	50.7	-1	0.34	4431
J85	GH-91	2.19	-1	2.19	T	-1	100	2.5	22.9	5.3	69.3	-1	0.38	5955
J84	1	2.1	-1	2.1	T	-1	100	7.6	30.3	14.2	47.9	-1	0.49	4236
J84	2	0.46	-1	0.4	T	-1	100	4.7	41.5	29.7	24.1	-1	0.24	2662
J84	3	3.48	-1	1.75	T	-1	100	4.4	34.4	17.2	44	-1	0.18	4021
J84	4	2.5	-1	2.5	T	-1	100	6.4	15.5	9.4	68.7	-1	0.5	6136
J84	5	0.46	-1	0.46	T	-1	100	1.3	19.4	31.9	47.4	-1	0.43	4433
J84	6	1.4	-1	1.2	T	-1	100	1.3	16.1	7.7	74.9	-1	0.35	6581
J84	7	0.8	-1	0.8	T	-1	100	2.6	25.3	16.2	55.9	-1	0.3	4903
J84	8	0.6	-1	0.6	T	-1	100	4.8	28.8	33.2	33.2	-1	0.19	3060
J84	9	3.4	-1	3.4	T	-1	100	2.3	31.6	33.6	32.5	-1	0.21	3093
J84	9	3.4	-1	3.4	T	-1	100	6.8	23.8	10.2	59.2	-1	0.49	5247
J84	10	1.1	-1	1.1	T	-1	100	5.2	16.5	11.1	67.2	-1	0.42	6018
J84	11	4.7	-1	4.7	T	-1	100	6.4	32.8	11.7	49.1	-1	0.36	4306
J84	12	2.4	-1	2.4	T	-1	100	10.2	25.5	14.7	49.6	-1	0.38	4502
J84	13	0.9	-1	0.9	T	-1	100	3.6	15.8	7.6	73	-1	0.57	6498
J84	14	0.4	-1	0.4	T	-1	100	2.1	21.6	4.6	71.7	-1	0.71	6117
J84	15	0.2	-1	0.2	T	-1	100	1.9	32.7	4.2	61.2	-1	0.33	5032
J84	16	1.76	-1	1.76	T	-1	100	2.9	24.8	8	64.3	-1	0.72	5820
B89	15	1.4	179680	1.3	I	3.7	-1	13.8	13.3	12.5	60.4	-1	0.42	5482
B89	16	-1	179679	0.5	O	5.38	-1	17.3	41.1	11.1	30.5	-1	0.24	2782
L50	BL11A	0.51	TUNEL	-1	T	-1	-1	3.75	27.1	6.47	62.68	-1	0.86	5717
L50	BL12	1.17	TUNEL	-1	T	-1	-1	4.52	20.8	4.75	69.93	-1	2.31	6611
L50	BL15B	1.17	TUNEL	-1	T	-1	-1	2.7	38.8	5.6	53.4	-1	-1	-1
L50	BL15C	1.14	TUNEL	-1	T	-1	-1	3.2	40.35	7.02	49.43	-1	0.99	4367
L50	BL17A	0.71	SURFCE	-1	T	-1	-1	4.42	30.04	6.58	58.96	-1	1.61	5517
L50	BL17B	0.71	SURFCE	-1	T	-1	-1	4.01	25.2	13.08	57.71	-1	2.42	5333
L50	BL18A	1.22	TUNEL	-1	T	-1	-1	2.45	29.73	3.86	63.96	-1	1.93	5711
L50	BL18B	0.81	TUNEL	-1	T	-1	-1	2.71	23.78	6.09	67.42	-1	3.05	7028
L50	BL18C	1.35	TUNEL	-1	T	-1	-1	2.97	25.84	5.59	65.6	-1	1.9	6400

DATA SOURCES
Dawson and Ryan (1990) for B89
Coalfile Assessment Report Number 112 for P80
Coalfile Assessment Report Number 108 for J84
Coalfile Assessment Report Number 711 for J85
Buckham and Latour (1950) for L50

ID = Reference number in original paper
Thick = Total reported thickness
EXP = Type of excavation or coal intersection thickness
INC = Increment coal thickness

T = Type of analysis T is total sample
Rmax = Mean maximum reflectance
M = Moisture as reported
ASH = Ash content
VM = Volatile matter content
FC = Fixed carbon content
FSI = Free swelling index
SULF = Sulphur content
CV = Calorific value in calories per gram
MJ/kg = calories per gram x 0.004186

APPENDIX 2 - TABLE 2

PANORAMA MOUNTAIN AREA COAL QUALITY

YR	ID	HIC	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
B89	10	1.3	179688	1.3	I	2.79	-1	19.4	10.8	17.5	52.3	-1	0.45	4928
B89	11	1.4	179687	1.4	I	2.85	-1	24.1	8.4	20.7	46.8	-1	0.33	4393
B89	12	2.5	179680	1.1	I	-1	-1	17.2	55.1	13.2	14.5	-1	0.16	1568
B89	12	2.5	179685	1.4	I	2.89	-1	21	45.3	13.6	20.1	-1	0.16	1905
B89	13	1.5	179684	1.5	T	2.93	-1	8.4	19.7	9.5	62.4	-1	1	5903
P80	N8001	0.28	-1	0.28	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8002	0.8	-1	0.8	R	3.16	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8003	1.27	-1	0.41	R	3.47	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8004	1.42	-1	0.92	R	2.99	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8001	1.98	-1	1.22	R	3.45	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8002	2.55	-1	2	R	2.85	-1	6.29	28.07	12.64	53	-1	0.42	4870
P80	S8003	0.48	-1	0.48	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8004	0.45	-1	0.45	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8005	3.15	-1	0.24	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8006	3.57	-1	0.18	R	2.99	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8007	2.63	-1	1.43	R	2.66	-1	15.73	16.48	23.86	43.93	-1	0.27	4288
P80	S8008	2.89	-1	0.51	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8009	1.03	-1	0.96	R	2.92	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8010	1.09	-1	0.51	R	2.45	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8011	0.72	-1	0.68	R	2.85	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8012	0.62	-1	0.59	R	2.77	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8013	1.91	-1	1.22	R	3.27	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8014	1.52	-1	1.34	R	3.18	-1	7.52	15.12	13.54	63.82	-1	0.36	5953
P80	S8015	1.6	-1	1.19	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8016	0.87	-1	0.87	R	3.21	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8017	0.97	-1	0.97	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8018	0.66	-1	0.42	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8019	0.8	-1	0.76	R	3.37	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8020	0.85	-1	0.78	R	2.9	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8021	0.64	-1	0.64	R	2.96	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8022	2.34	-1	2.08	R	2.96	-1	7.81	13.71	16.99	61.49	-1	0.39	5834
P80	S8023	0.75	-1	0.57	R	2.65	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8024	1.12	-1	1.12	R	3.02	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8025	1.16	-1	1.15	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8026	0.72	-1	0.69	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8027	1.27	-1	1.18	R	2.86	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8028	1.19	-1	0.68	R	2.89	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8029	0.52	-1	0.52	R	2.89	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8030	0.4	-1	0.4	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8031	1.04	-1	0.47	R	2.59	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8032	0.75	-1	0.55	R	2.63	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8033	0.94	-1	0.66	R	2.77	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8034	0.99	-1	0.71	R	2.59	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8035	1.75	-1	0.23	R	2.64	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8036	1.23	-1	1.05	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8037	3.8	-1	3.2	R	2.79	-1	6.29	28.07	12.64	53	-1	0.42	4870
P80	S8038	0.9	-1	0.75	R	3.04	-1	-1	-1	-1	-1	-1	-1	-1

APPENDIX 2
TABLE 2. COAL QUALITY

PANORAMA MOUNTAIN AREA

YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
B89	10	1.3	179688	1.3	I	2.79	-1	19.4	10.8	17.5	52.3	-1	0.45	4928
B89	11	1.4	179687	1.4	I	2.85	-1	24.1	8.4	20.7	46.8	-1	0.33	4393
B89	12	2.5	179680	1.1	I	-1	-1	17.2	55.1	13.2	14.5	-1	0.16	1568
B89	12	2.5	179685	1.4	I	2.89	-1	21	45.3	13.6	20.1	-1	0.16	1905
B89	13	1.5	179684	1.5	T	2.93	-1	8.4	19.7	9.5	62.4	-1	1	5903
P80	N8001	0.28	-1	0.28	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8002	0.8	-1	0.8	R	3.16	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8003	1.27	-1	0.41	R	3.47	-1	-1	-1	-1	-1	-1	-1	-1
P80	N8004	1.42	-1	0.92	R	2.99	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8001	1.98	-1	1.22	R	3.45	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8002	2.55	-1	2	R	2.85	-1	6.29	28.07	12.64	53	-1	0.42	4870
P80	S8003	0.48	-1	0.48	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8004	0.45	-1	0.45	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8005	3.15	-1	0.24	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8006	3.57	-1	0.18	R	2.99	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8007	2.63	-1	1.43	R	2.66	-1	15.73	16.48	23.86	43.93	-1	0.27	4288
P80	S8008	2.89	-1	0.51	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8009	1.03	-1	0.96	R	2.92	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8010	1.09	-1	0.51	R	2.45	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8011	0.72	-1	0.68	R	2.85	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8012	0.62	-1	0.59	R	2.77	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8013	1.91	-1	1.22	R	3.27	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8014	1.52	-1	1.34	R	3.18	-1	7.52	15.12	13.54	63.82	-1	0.36	5953
P80	S8015	1.6	-1	1.19	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8016	0.87	-1	0.87	R	3.21	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8017	0.97	-1	0.97	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8018	0.66	-1	0.42	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8019	0.8	-1	0.76	R	3.37	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8020	0.85	-1	0.78	R	2.9	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8021	0.64	-1	0.64	R	2.96	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8022	2.34	-1	2.08	R	2.96	-1	7.81	13.71	16.99	61.49	-1	0.39	5834
P80	S8023	0.75	-1	0.57	R	2.65	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8024	1.12	-1	1.12	R	3.02	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8025	1.16	-1	1.15	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8026	0.72	-1	0.69	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8027	1.27	-1	1.18	R	2.86	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8028	1.19	-1	0.68	R	2.89	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8029	0.52	-1	0.52	R	2.89	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8030	0.4	-1	0.4	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8031	1.04	-1	0.47	R	2.59	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8032	0.75	-1	0.55	R	2.63	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8033	0.94	-1	0.66	R	2.77	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8034	0.99	-1	0.71	R	2.59	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8035	1.75	-1	0.23	R	2.64	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8036	1.23	-1	1.05	R	2.76	-1	-1	-1	-1	-1	-1	-1	-1
P80	S8037	3.8	-1	3.2	R	2.79	-1	6.29	28.07	12.64	53	-1	0.42	4870
P80	S8038	0.9	-1	0.75	R	3.04	-1	-1	-1	-1	-1	-1	-1	-1

MOUNT JACKSON AREA

YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
J85	B3	0.78	-1	0.4	T	-1	100	2.6	22.7	10.5	64.2	-1	0.46	5686
J85	B3	0.78	-1	0.38	T	-1	100	2.9	27.7	8	61.4	-1	0.67	5365
J85	B3	0.78	-1	-1	T	-1	100	1.2	38.2	13	47.6	-1	0.97	4351
J85	-1	-1	-1	-1	T	-1	100	1.4	38.3	6.9	53.4	-1	0.6	4413
J85	K77	0.6	-1	0.6	T	-1	100	1.2	19.2	8.4	71.2	-1	0.46	6239
J85	K79	0.3	-1	0.3	T	-1	100	2	35.3	5.6	57.1	-1	0.56	4875
J85	K83	1	-1	1	T	-1	100	0.7	18.1	6	75.2	-1	1.78	6589
J85	GH85	-1	-1	-1	T	-1	100	2.5	21.4	15.1	61	-1	0.48	5407
J85	GH-21	0.5	-1	0.5	T	-1	100	2.1	43	5.9	49	-1	0.29	3967
J85	K-28	0.93	-1	0.93	T	-1	100	3.4	24.4	10.4	61.8	-1	0.37	5302
J85	TR-CR	-1	-1	-1	T	-1	100	1.7	38.6	4.5	55.2	-1	0.49	4586
J85	GH74	-1	-1	-1	T	-1	100	6.5	22.7	14.7	56.1	-1	0.35	5045
J85	GH-75	2.56	-1	2.56	T	-1	100	8.7	18.2	17.3	55.8	-1	0.31	5051
J85	GH-75	-1	-1	-1	T	-1	100	9.1	18.8	18	54.1	-1	0.32	4829
J85	GH-97	8.68	-1	8.68	T	-1	100	17.4	27	18.4	37.2	-1	1.28	3585
J85	GH-67	-1	-1	-1	T	-1	100	2.5	37.7	9.1	50.7	-1	0.34	4431
J85	GH-91	2.19	-1	2.19	T	-1	100	2.5	22.9	5.3	69.3	-1	0.38	5955
J84	1	2.1	-1	2.1	T	-1	100	7.6	30.3	14.2	47.9	-1	0.49	4236
J84	2	0.46	-1	0.4	T	-1	100	4.7	41.5	29.7	24.1	-1	0.24	2662
J84	3	3.48	-1	1.75	T	-1	100	4.4	34.4	17.2	44	-1	0.18	4021
J84	4	2.5	-1	2.5	T	-1	100	6.4	15.5	9.4	68.7	-1	0.5	6136
J84	5	0.46	-1	0.46	T	-1	100	1.3	19.4	31.9	47.4	-1	0.43	4433
J84	6	1.4	-1	1.2	T	-1	100	1.3	16.1	7.7	74.9	-1	0.35	6581
J84	7	0.8	-1	0.8	T	-1	100	2.6	25.3	16.2	55.9	-1	0.3	4903
J84	8	0.6	-1	0.6	T	-1	100	4.8	28.8	33.2	33.2	-1	0.19	3060
J84	9	3.4	-1	3.4	T	-1	100	2.3	31.6	33.6	32.5	-1	0.21	3093
J84	9	3.4	-1	3.4	T	-1	100	6.8	23.8	10.2	59.2	-1	0.49	5247
J84	10	1.1	-1	1.1	T	-1	100	5.2	16.5	11.1	67.2	-1	0.42	6018
J84	11	4.7	-1	4.7	T	-1	100	6.4	32.8	11.7	49.1	-1	0.36	4306
J84	12	2.4	-1	2.4	T	-1	100	10.2	25.5	14.7	49.6	-1	0.38	4502
J84	13	0.9	-1	0.9	T	-1	100	3.6	15.8	7.6	73	-1	0.57	6498
J84	14	0.4	-1	0.4	T	-1	100	2.1	21.6	4.6	71.7	-1	0.71	6117
J84	15	0.2	-1	0.2	T	-1	100	1.9	32.7	4.2	61.2	-1	0.33	5032
J84	16	1.76	-1	1.76	T	-1	100	2.9	24.8	8	64.3	-1	0.72	5820
B89	15	1.4	179680	1.3	I	3.7	-1	13.8	13.3	12.5	60.4	-1	0.42	5482
B89	16	-1	179679	0.5	O	5.38	-1	17.3	41.1	11.1	30.5	-1	0.24	2782
L50	BL11A	0.51	TUNEL	-1	T	-1	-1	3.75	27.1	6.47	62.68	-1	0.86	5717
L50	BL12	1.17	TUNEL	-1	T	-1	-1	4.52	20.8	4.75	69.93	-1	2.31	6611
L50	BL15B	1.17	TUNEL	-1	T	-1	-1	2.7	38.8	5.6	53.4	-1	-1	-1
L50	BL15C	1.14	TUNEL	-1	T	-1	-1	3.2	40.35	7.02	49.43	-1	0.99	4367
L50	BL17A	0.71	SURFCE	-1	T	-1	-1	4.42	30.04	6.58	58.96	-1	1.61	5517
L50	BL17B	0.71	SURFCE	-1	T	-1	-1	4.01	25.2	13.08	57.71	-1	2.42	5333
L50	BL18A	1.22	TUNEL	-1	T	-1	-1	2.45	29.73	3.86	63.96	-1	1.93	5711
L50	BL18B	0.81	TUNEL	-1	T	-1	-1	2.71	23.78	6.09	67.42	-1	3.05	7028
L50	BL18C	1.35	TUNEL	-1	T	-1	-1	2.97	25.84	5.59	65.6	-1	1.9	6400

DATA SOURCES
Dawson and Ryan (1990) for B89
Coalfile Assessment Report Number 112 for P80
Coalfile Assessment Report Number 108 for J84
Coalfile Assessment Report Number 711 for J85
Buckham and Latour (1950) for L50

ID = Reference number in original paper
Thick = Total reported thickness
EXP = Type of excavation or coal intersection thickness

T = Type of analysis T is total sample
Rmax = Mean maximum reflectance
M = Moisture as reported
ASH = Ash content
VM = Volatile matter content
FC = Fixed carbon content
FSI = Free swelling index
SULF = Sulphur content
CV = Calorific value in calories per gram
MJ/kg = calories per gram x 0.004186

APPENDIX 2

TABLE 3. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K82	8201	3.45	19.39	K	R	-1	-1	1.75	28.02	8.78	61.45	-1	-1	5515
K82	8201	0.94	30.08	J	R	-1	-1	1.13	22.07	9.05	67.75	-1	-1	6217
K82	8201	1.93	57.25	I	R	-1	-1	2.04	18.01	7.25	72.2	-1	-1	6521
K82	8201	0.96	59.18	I	R	-1	-1	1.93	50.42	7.78	39.87	-1	-1	3420
K82	8201	3.33	61.18	I	R	-1	-1	1.63	16.91	6.99	74.47	-1	-1	6862
K82	8201	1.7	94.16	H	R	-1	-1	1.77	40.16	7.19	50.88	-1	-1	4650
K82	8201	1.68	118.44	G	R	-1	-1	1.85	32.05	7.4	58.7	-1	-1	5400
K82	8202	3.01	36.19	G	R	-1	-1	1.43	25.59	7.75	66.23	-1	-1	5754
K82	8202	0.88	39.2	G	R	-1	-1	1.52	45.61	8.73	44.14	-1	-1	3623
K82	8202	1.13	43.42	G	R	-1	-1	1.44	48.77	6.46	43.33	-1	-1	3468
K82	8202	0.99	81.07	E	R	-1	-1	1.3	25.04	7.7	65.96	-1	-1	6057
K82	8202	0.93	86.51	E	R	-1	-1	1.06	23.43	10.44	65.07	-1	-1	6014
K82	8202	1.56	87.44	E	R	-1	-1	1.57	52.33	7.76	38.34	-1	-1	3272
K82	8202	0.54	138.38	D	R	-1	-1	1.14	25.63	9.22	64.01	-1	-1	5935
K82	8202	0.69	165.97	C	R	-1	-1	1.48	25.67	7.77	65.08	-1	-1	5890
K82	8203	3.89	28.9	K	R	-1	-1	1.67	35.46	7.8	55.07	-1	-1	4999
K82	8203	2.56	44.06	J	R	-1	-1	1.31	26.53	8.64	63.52	-1	-1	5947
K82	8203	4.37	94.57	I	R	-1	-1	1.5	34.27	7.82	56.41	-1	-1	5159
K82	8203	2.57	127.24	H	R	-1	-1	1.39	38.87	9.31	50.43	-1	-1	4698
K82	8203	4.22	155.24	G	R	-1	-1	1.41	33.19	8.04	57.36	-1	-1	5174
K82	8203	0.93	158.13	G	R	-1	-1	1.72	48.51	8.54	41.23	-1	-1	3788
K82	8203	2.17	182.38	F	R	-1	-1	1.42	37.18	10.56	50.81	-1	-1	4949
K82	8203	0.86	205.28	E	R	-1	-1	1.37	33.87	10.94	53.82	-1	-1	5071
K82	8203	1.28	208.17	E	R	-1	-1	1.23	23.11	10.98	64.68	-1	-1	6131
K82	8204	2.88	24.73	G	R	-1	-1	1.63	42.48	12.65	43.24	-1	-1	3724
K82	8204	0.75	90.39	E	R	-1	-1	1.34	27.16	7.94	63.96	-1	-1	5955
K82	8204	0.45	150.36	E	R	-1	-1	1.1	28.37	9.34	61.19	-1	-1	5759
K82	8204	0.35	114.46	D	R	-1	-1	1.25	35.82	8.92	54.01	-1	-1	5049
K82	8204	0.5	139.84	D	R	-1	-1	1.47	38.69	8.03	51.81	-1	-1	4598
K83	8301	3.17	26.9	I	R	-1	-1	2.54	25.98	6.67	64.81	-1	0.39	5728
K83	8301	2.61	30.07	I	R	-1	-1	4.17	16.66	10.73	68.44	-1	0.41	6258
K83	8301	2.37	74.73	H	R	-1	-1	1.58	38.58	6.2	53.64	-1	0.42	4689
K83	8301	1.64	77.1	H	R	-1	-1	1.47	16.74	5.39	76.4	-1	0.43	6795
K83	8301	0.64	78.74	H	R	-1	-1	1.69	49.94	9.68	38.69	-1	0.28	3523
K83	8301	4.01	133.42	G	R	-1	-1	1.33	42.75	7.21	48.71	-1	0.51	4271
K83	8301	2.3	142.45	G	R	-1	-1	1.43	53.8	6.122	38.65	-1	0.26	3299
K83	8301	4.9	180.62	F	R	-1	-1	1.42	36.68	6.3	55.6	-1	0.86	4954
K83	8301	1.34	209.6	E	R	-1	-1	1.41	17.43	6.32	74.84	-1	0.45	6714
K83	8303	3.2	44.8	G	R	-1	-1	1.62	55.49	7.25	36.64	-1	0.38	3117
K83	8303	1.29	126.95	E	R	-1	-1	1.38	61.14	5.55	31.93	-1	0.62	2494
K83	8303	1.42	137.68	E	R	-1	-1	1.49	52.42	6.71	39.38	-1	1.24	3339
K83	8302	1.48	12.41	I	R	-1	-1	1.7	19.1	7.7	71.5	-1	0.45	6292
K83	8302	3.29	13.89	I	R	-1	-1	1.7	22.1	7.5	68.7	-1	0.41	5957
K83	8304	1.65	25.69	I	R	-1	-1	1.4	15.7	6.3	76.6	-1	0.48	6782
K83	8304	3.35	27.34	I	R	-1	-1	1.5	30	7.4	61.1	-1	0.39	5257
K84	8406	6.17	16.04	I	R	-1	-1	2.32	39.83	7.82	50.23	-1	0.34	4593
K84	8406	6.95	109.99	I	R	-1	-1	1.92	20.66	5.36	72.06	-1	0.41	6449
K84	8406	5.31	154.04	J	R	-1	-1	1.37	28.85	7.76	62.02	-1	0.29	5623
K84	8406	3.41	257.54	K	R	-1	-1	0.95	45.96	9.06	44.01	-1	0.34	4070
K84	8407	5.45	56.87	I	R	-1	-1	1.4	21.27	6.3	70.53	-1	0.38	6482
K84	8407	4.18	103	H	R	-1	-1	1.81	35.73	8.01	54.45	-1	0.35	5035
K84	8407	3.13	124.73	PH	R	-1	-1	0.75	33.06	7.52	58.57	-1	0.27	5446
K84	8407	1.1	227.26	E	R	-1	-1	1.14	36.93	6.22	55.71	-1	2.86	4999
K84	8407	1.08	251.62	D	R	-1	-1	0.99	17.75	5.51	75.75	-1	0.53	6779
K84	8407	3.79	278.66	G	R	-1	-1	1.15	17.92	6.43	74.47	-1	0.37	6728
K84	8408	3.97	61.4	K	R	-1	-1	1.95	27.63	7.31	63.11	-1	0.4	5866
K84	8408	4.11	133.6	I	R	-1	-1	1.43	21.07	6.32	71.15	-1	0.29	6492
K84	8408	4.6	184.93	H	R	-1	-1	1.12	31.57	7.37	59.94	-1	0.38	5489
K84	8408	3.79	218.82	H	R	-1	-1	1.03	31.34	9.6	58.03	-1	0.37	5350
K84	8408	3.84	230.53	H	R	-1	-1	1.03	31.34	9.5	58.03	-1	0.37	5350
H84	8401	2.43	22.73	I	R	-1	-1	1.41	39.68	9.06	49.87	-1	0.34	4571
H84	8401	1.41	50.73	H	R	-1	-1	1.73	38.85	8.69	50.73	-1	0.6	4698
H84	8402	2.22	24.15	I	R	-1	-1	1.32	15.89	9.36	72.93	-1	0.48	6752
H84	8402	2	54.93	H	R	-1	-1	1.67	37.27	10.7	50.36	-1	0.45	4703
H84	8403	1.19	18.99	I	R	-1	-1	1.51	14.99	8.52	74.98	-1	0.34	6871
H84	8403	0.75	20.18	I	R	-1	-1	1.97	59.8	11.36	26.87	-1	0.2	2462
H84	8403	2.44	20.93	I	R	-1	-1	1.44	15.05	8.79	73.72	-1	0.45	6821
H84	8403	1.03	48.38	H	R	-1	-1	1.94	35.34	9.31	53.41	-1	1.25	5028
H84	8404	1.41	32.86	H	R	-1	-1	1.69	41.56	9.03	47.72	-1	0.62	4416
H84	8404	2.03	57.68	G	R	-1	-1	1.4	32.85	10.09	55.66	-1	1.55	5149
H84	8404	1.05	79.75	F	R	-1	-1	1.64	59.49	9.06	29.81	-1	0.22	2811

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K82	8201	3.45	19.39	K	R	-1	-1	1.75	28.02	8.78	61.45	-1	-1	5515
K82	8201	0.94	30.08	J	R	-1	-1	1.13	22.07	9.05	67.75	-1	-1	6217
K82	8201	1.93	57.25	I	R	-1	-1	2.04	18.01	7.25	72.2	-1	-1	6521
K82	8201	0.96	59.18	I	R	-1	-1	1.93	50.42	7.78	39.87	-1	-1	3420
K82	8201	3.33	61.18	I	R	-1	-1	1.63	16.91	6.99	74.47	-1	-1	6862
K82	8201	1.7	94.16	H	R	-1	-1	1.77	40.16	7.19	50.88	-1	-1	4650
K82	8201	1.68	118.44	G	R	-1	-1	1.85	32.05	7.4	58.7	-1	-1	5400
K82	8202	3.01	36.19	G	R	-1	-1	1.43	25.59	7.75	66.23	-1	-1	5754
K82	8202	0.88	39.2	G	R	-1	-1	1.52	45.61	8.73	44.14	-1	-1	3623
K82	8202	1.13	43.42	G	R	-1	-1	1.44	48.77	6.46	43.33	-1	-1	3468
K82	8202	0.99	81.07	E	R	-1	-1	1.3	25.04	7.7	65.96	-1	-1	6057
K82	8202	0.93	86.51	E	R	-1	-1	1.06	23.43	10.44	65.07	-1	-1	6014
K82	8202	1.56	87.44	E	R	-1	-1	1.57	52.33	7.76	38.34	-1	-1	3272
K82	8202	0.54	138.38	D	R	-1	-1	1.14	25.63	9.22	64.01	-1	-1	5935
K82	8202	0.69	165.97	C	R	-1	-1	1.48	25.67	7.77	65.08	-1	-1	5890
K82	8203	3.89	28.9	K	R	-1	-1	1.67	35.46	7.8	55.07	-1	-1	4999
K82	8203	2.56	44.06	J	R	-1	-1	1.31	26.53	8.64	63.52	-1	-1	5947
K82	8203	4.37	94.57	I	R	-1	-1	1.5	34.27	7.82	56.41	-1	-1	5159
K82	8203	2.57	127.24	H	R	-1	-1	1.39	38.87	9.31	50.43	-1	-1	4698
K82	8203	4.22	155.24	G	R	-1	-1	1.41	33.19	8.04	57.36	-1	-1	5174
K82	8203	0.93	158.13	G	R	-1	-1	1.72	48.51	8.54	41.23	-1	-1	3788
K82	8203	2.17	182.38	F	R	-1	-1	1.42	37.18	10.56	50.81	-1	-1	4949
K82	8203	0.86	205.28	E	R	-1	-1	1.37	33.87	10.94	53.82	-1	-1	5071
K82	8203	1.28	208.17	E	R	-1	-1	1.23	23.11	10.98	64.68	-1	-1	6131
K82	8204	2.88	24.73	G	R	-1	-1	1.63	42.48	12.65	43.24	-1	-1	3724
K82	8204	0.75	90.39	E	R	-1	-1	1.34	27.16	7.94	63.96	-1	-1	5955
K82	8204	0.45	150.36	E	R	-1	-1	1.1	28.37	9.34	61.19	-1	-1	5759
K82	8204	0.35	114.46	D	R	-1	-1	1.25	35.82	8.92	54.01	-1	-1	5049
K82	8204	0.5	139.84	D	R	-1	-1	1.47	38.69	8.03	51.81	-1	-1	4598
K83	8301	3.17	26.9	I	R	-1	-1	2.54	25.98	6.67	64.81	-1	0.39	5728
K83	8301	2.61	30.07	I	R	-1	-1	4.17	16.66	10.73	68.44	-1	0.41	6258
K83	8301	2.37	74.73	H	R	-1	-1	1.58	38.58	6.2	53.64	-1	0.42	4689
K83	8301	1.64	77.1	H	R	-1	-1	1.47	16.74	5.39	76.4	-1	0.43	6795
K83	8301	0.64	78.74	H	R	-1	-1	1.69	49.94	9.68	38.69	-1	0.28	3523
K83	8301	4.01	133.42	G	R	-1	-1	1.33	42.75	7.21	48.71	-1	0.51	4271
K83	8301	2.3	142.45	G	R	-1	-1	1.43	53.8	6.122	38.65	-1	0.26	3299
K83	8301	4.9	180.62	F	R	-1	-1	1.42	36.68	6.3	55.6	-1	0.86	4954
K83	8301	1.34	209.6	E	R	-1	-1	1.41	17.43	6.32	74.84	-1	0.45	6714
K83	8303	3.2	44.8	G	R	-1	-1	1.62	55.49	7.25	36.64	-1	0.38	3117
K83	8303	1.29	126.95	E	R	-1	-1	1.38	61.14	5.55	31.93	-1	0.62	2494
K83	8303	1.42	137.68	E	R	-1	-1	1.49	52.42	6.71	39.38	-1	1.24	3339
K83	8302	1.48	12.41	I	R	-1	-1	1.7	19.1	7.7	71.5	-1	0.45	6292
K83	8302	3.29	13.89	I	R	-1	-1	1.7	22.1	7.5	68.7	-1	0.41	5957
K83	8304	1.65	25.69	I	R	-1	-1	1.4	15.7	6.3	76.6	-1	0.48	6782
K83	8304	3.35	27.34	I	R	-1	-1	1.5	30	7.4	61.1	-1	0.39	5257
K84	8406	6.17	16.04	I	R	-1	-1	2.32	39.83	7.82	50.23	-1	0.34	4593
K84	8406	6.95	109.99	I	R	-1	-1	1.92	20.66	5.36	72.06	-1	0.41	6449
K84	8406	5.31	154.04	J	R	-1	-1	1.37	28.85	7.76	62.02	-1	0.29	5623
K84	8406	3.41	257.54	K	R	-1	-1	0.95	45.96	9.06	44.01	-1	0.34	4070
K84	8407	5.45	56.87	I	R	-1	-1	1.4	21.27	6.3	70.53	-1	0.38	6482
K84	8407	4.18	103	H	R	-1	-1	1.81	35.73	8.01	54.45	-1	0.35	5035
K84	8407	3.13	124.73	PH	R	-1	-1	0.75	33.06	7.52	58.57	-1	0.27	5446
K84	8407	1.1	227.26	E	R	-1	-1	1.14	36.93	6.22	55.71	-1	2.86	4999
K84	8407	1.08	251.62	D	R	-1	-1	0.99	17.75	5.51	75.75	-1	0.53	6779
K84	8407	3.79	278.66	G	R	-1	-1	1.15	17.92	6.43	74.47	-1	0.37	6728
K84	8408	3.97	61.4	K	R	-1	-1	1.95	27.63	7.31	63.11	-1	0.4	5866
K84	8408	4.11	133.6	I	R	-1	-1	1.43	21.07	6.32	71.15	-1	0.29	6492
K84	8408	4.6	184.93	H	R	-1	-1	1.12	31.57	7.37	59.94	-1	0.38	5489
K84	8408	3.79	218.82	H	R	-1	-1	1.03	31.34	9.6	58.03	-1	0.37	5350
K84	8408	3.84	230.53	H	R	-1	-1	1.03	31.34	9.5	58.03	-1	0.37	5350
H84	8401	2.43	22.73	I	R	-1	-1	1.41	39.68	9.06	49.87	-1	0.34	4571
H84	8401	1.41	50.73	H	R	-1	-1	1.73	38.85	8.69	50.73	-1	0.6	4698
H84	8402	2.22	24.15	I	R	-1	-1	1.32	15.89	9.36	72.93	-1	0.48	6752
H84	8402	2	54.93	H	R	-1	-1	1.67	37.27	10.7	50.36	-1	0.45	4703
H84	8403	1.19	18.99	I	R	-1	-1	1.51	14.99	8.52	74.98	-1	0.34	6871
H84	8403	0.75	20.18	I	R	-1	-1	1.97	59.8	11.36	26.87	-1	0.2	2462
H84	8403	2.44	20.93	I	R	-1	-1	1.44	15.05	8.79	73.72	-1	0.45	6821
H84	8403	1.03	48.38	H	R	-1	-1	1.94	35.34	9.31	53.41	-1	1.25	5028
H84	8404	1.41	32.86	H	R	-1	-1	1.69	41.56	9.03	47.72	-1	0.62	4416
H84	8404	2.03	57.68	G	R	-1	-1	1.4	32.85	10.09	55.66	-1	1.55	5149
H84	8404	1.05	79.75	F	R	-1	-1	1.64	59.49	9.06	29.81	-1	0.22	2811

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
H84	8404	0.7	103.1	-1	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
H84	8404	7.36	143.81	D	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
H84	8404	7.15	152.59	D	R	-1	-1	1.54	47.25	11	40.22	-1	0.38	3719
H84	8404	3.87	251.22	D	R	-1	-1	1.08	28.92	7.46	62.54	-1	0.37	5715
H84	8404	5.8	301.17	D	R	-1	-1	1.31	29.66	6.96	62.05	-1	0.31	5694
K85	8501	0.36	22.1	Q	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8501	4.38	119.13	I	R	-1	-1	0.95	20.85	6.35	71.85	-1	0.38	6479
K85	8501	2.15	158.65	H	R	-1	-1	1.2	29.45	8.56	62.79	-1	0.33	5650
K85	8501	0.22	175.78	Q	R	-1	-1	1.19	31.01	-1	-1	-1	-1	-1
K85	8501	0.94	214.7	G	R	-1	-1	0.96	39.65	8.05	51.31	-1	0.37	4539
K85	8502	3.23	59.45	I	R	-1	-1	1.96	14.07	6.57	73.71	-1	0.5	7039
K85	8502	1.35	101.62	H	R	-1	-1	1.51	29.31	6.25	62.83	-1	0.7	5595
K85	8503	1.82	35.71	M	R	-1	-1	2.73	60.06	9.54	27.65	-1	0.42	2523
K85	8503	3.48	38.07	M	R	-1	-1	3.08	39.62	7.88	49.62	-1	0.47	4711
K85	8503	0.56	91.3	M/N	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8503	1.72	100.2	N	R	-1	-1	1.24	38.07	6.17	54.52	-1	2.18	4843
K85	8503	1.44	170.59	N	R	-1	-1	1.17	36.93	8.75	55.15	-1	1.34	4953
K85	8504	3.7	59.02	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8504	1	101.65	H	R	-1	-1	1.48	22.18	6.22	70.11	-1	0.82	6379
K85	8504	1.17	102.66	H	R	-1	-1	1.67	53.55	8.49	36.38	-1	0.27	3256
K85	8504	1.79	103.84	H	R	-1	-1	1.33	21.17	8.18	69.32	-1	0.38	6188
K85	8504	4.92	160.32	G	R	-1	-1	2.1	51.96	6.07	39.87	-1	0.47	3416
K85	8504	2.35	204.19	F	R	-1	-1	2.89	42.15	5.97	49.09	-1	1.07	4322
K85	8504	2.23	223.68	E	R	-1	-1	1	13.78	9.68	78.58	-1	0.46	7062
K85	8504	0.5	237.89	E	R	-1	-1	1.67	28.92	6.17	63.84	-1	0.45	5714
K85	8505	3.23	26.9	O	R	-1	-1	0.76	26.7	5.8	66.74	-1	0.54	6066
K85	8505	1.33	51.6	O	R	-1	-1	2.32	38.02	5.31	53.35	-1	0.93	4797
K85	8505	0.17	98.55	NU	R	-1	-1	1.68	22.17	8.07	70.1	-1	3.84	6835
K85	8505	3.94	106.13	NL	R	-1	-1	1.92	40.71	8.89	46.48	-1	2.85	4429
K85	8505	3.26	210.91	M	R	-1	-1	1.07	51.84	8.05	38.04	-1	0.33	3378
K85	8505	0.4	243.46	L/M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8505	0.65	255.98	L	R	-1	-1	0.86	34.45	8.05	58.84	-1	1.38	5177
K85	8505	0.73	310.83	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8505	3.36	316.12	K	R	-1	-1	2.65	22.46	5.73	69.13	-1	0.5	6195
K85	8506	2.77	23.32	H	R	-1	-1	1.15	40.48	7.56	50.83	-1	0.32	4577
K85	8506	3.54	81.93	G	R	-1	-1	1.72	56.33	5.92	36.83	-1	0.36	2879
K85	8506	2.61	85.47	G	R	-1	-1	2.18	67.74	8.34	23.74	-1	0.22	1937
K85	8506	3.18	153.47	F	R	-1	-1	1.22	38.47	7.37	55.74	-1	0.87	4964
K85	8506	0.91	178.13	E	R	-1	-1	1.15	16.72	6.39	76.74	-1	0.52	6880
K85	8507	4.81	95.5	I	R	-1	-1	0.92	20.63	7.83	70.57	-1	0.42	6866
K85	8508	0.67	48	GL	R	-1	-1	1.86	28.52	9.54	59.56	-1	0.95	5509
K85	8508	0.66	80.87	F	R	-1	-1	1.87	39.48	8.36	50.51	-1	3	3302
K85	8509	4.9	102.85	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8509	3.27	204.4	K	R	-1	-1	1.7	31.53	7.85	59.12	-1	0.45	5392
K85	8509	4.46	241.14	L	R	-1	-1	2.04	47.09	6.96	43.82	-1	0.52	3947
K85	8509	2.81	325.25	M	R	-1	-1	1.84	33.83	10.83	53.5	-1	0.78	5093
K85	8509	0.22	73.4	P	R	-1	-1	1.83	26.57	-1	-1	-1	-1	-1
K85	8509	2.03	130.04	O	R	-1	-1	1.77	44.92	9	44.31	-1	0.51	4501
K85	8509	2.69	132.07	O	R	-1	-1	2.58	30.27	7.83	58.52	-1	0.54	5480
K85	8509	1.14	134.76	0	R	-1	-1	1.71	63.81	8.05	28.83	-1	1.22	2661
K85	8509	1.81	159.22	M	R	-1	-1	1	33.87	7.17	57.96	-1	0.35	5316
K85	8509	3.96	222.56	M	R	-1	-1	2.26	38.23	7.1	52.41	-1	0.4	4761
K85	8511	3.47	36.49	K	R	-1	-1	1.03	27.81	8.07	63.09	-1	0.41	5765
K85	8511	1.75	101.42	I	R	-1	-1	1.09	33.01	7.52	58.39	-1	0.31	5089
K85	8512	1.37	23.24	L	R	-1	-1	1.2	26.63	7.53	64.64	-1	0.48	5882
K85	8512	1.49	50.16	K/L	R	-1	-1	1.01	35.06	7.96	55.97	-1	0.43	5022
K85	8512	1.74	69.59	K	R	-1	-1	1.05	17.27	8.96	72.59	-1	0.48	6842
K85	8512	1.22	151.54	KR	R	-1	-1	0.78	34.04	9.53	55.94	-1	0.4	5084
K85	8512	0.55	205.78	I	R	-1	-1	2.56	29.68	7.08	60.68	-1	0.43	6312
K85	8512	1.93	207.27	I	R	-1	-1	1.89	35.15	9.67	53.49	-1	0.34	4878
K85	8513	0.98	22.9	K	R	-1	-1	2.28	37.6	6.79	53.33	-1	0.57	4768
K85	8513	6.16	91.24	I	R	-1	-1	1.16	19.05	7.09	72.7	-1	0.38	6429
K85	8513	4.37	146.55	H	R	-1	-1	1.31	33.85	7.59	56.95	-1	0.62	5026
K85	8513	0.22	185.81	GU	R	-1	-1	1.32	34.49	-1	-1	-1	-1	-1
K85	8513	0.65	211.17	GL	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8513	0.94	271.23	F	R	-1	-1	1.35	14.9	5.83	78.12	-1	0.5	7055
K85	8513	1.01	272.18	F	R	-1	-1	1.92	72.32	5.93	19.83	-1	0.49	1651
K85	8513	2.26	273.2	F	R	-1	-1	2.04	34.74	7.82	59.4	-1	1	5249
K85	8514	5.46	102.59	I	R	-1	-1	0.97	16.26	6.94	75.83	-1	0.43	7012
K85	8514	2.09	155.53	H	R	-1	-1	1.28	38.77	7.9	51.07	-1	0.35	4742
K85	8514	2.71	247.19	F	R	-1	-1	1.23	38.85	8.58	56.33	-1	0.47	5172

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K85	8515	0.95	32.54	E	R	-1	-1	1.27	26.83	7.91	63.99	-1	0.77	5808
K85	8515	2.73	78	F	R	-1	-1	1.5	38.9	6.98	53.02	-1	0.78	2836
K85	8515	3.4	157.52	G	R	-1	-1	2.23	55.8	8.04	36.83	-1	0.27	2922
K85	8515	5.09	160.92	G	R	-1	-1	1.83	57.14	6.55	34.43	-1	2.54	2931
K85	8515	1.32	176.39	G	R	-1	-1	1.34	41.27	6.74	51.85	-1	3.73	3137
K85	8516	5.55	80.8	I	R	-1	-1	1.75	24.56	7.12	66.57	-1	0.37	6027
K85	8516	6.75	127.12	M	R	-1	-1	1.47	40.97	8.46	49.16	-1	0.35	3975
K85	8516	2.07	141.56	Q	R	-1	-1	3.64	79.03	3.68	13.65	-1	0.93	-1
K85	8516	0.79	182.72	GL	R	-1	-1	0.56	51.04	3.96	39.44	-1	0.33	-1
K85	8516	2.13	205.2	F	R	-1	-1	1.17	43.39	6.35	47.98	-1	0.32	4278
K85	8516	2.22	231.45	E	R	-1	-1	0.88	18.24	7.32	73.56	-1	0.42	6677
K85	8516	2.41	263	D	R	-1	-1	0.81	33.33	7.56	56.3	-1	0.35	5187
K85	8516	0.34	285.71	C	R	-1	-1	0.54	33.18	6.78	59.5	-1	2.19	-1
K85	8517	5.37	101.36	I	R	-1	-1	1.08	17.7	7.04	74.19	-1	0.43	6780
K85	8517	4.67	152.38	H	R	-1	-1	1.03	35.12	7.78	56.02	-1	0.35	5077
K85	8517	0.51	186.92	Q	R	-1	-1	1.17	28.2	-1	-1	-1	-1	-1
K85	8517	0.86	188.18	Q	R	-1	-1	0.96	47.11	-1	-1	-1	-1	-1
K85	8517	1.01	204.72	GU	R	-1	-1	1.02	56.59	-1	-1	-1	-1	-1
K85	8517	0.45	208.08	GU	R	-1	-1	1.13	46.32	-1	-1	-1	-1	-1
K85	8517	0.36	221.21	GL	R	-1	-1	1.08	53.93	5.91	33.08	-1	0.45	-1
K85	8517	1.93	241.48	F	R	-1	-1	1.46	35.77	7.49	55.28	-1	0.62	5127
K85	8517	2.34	261.48	E	R	-1	-1	2.3	16.39	6.17	73.34	-1	0.48	6584
K85	8518	2.61	69.08	I	R	-1	-1	0.95	19.47	7.28	72.38	-1	0.42	6534
K85	8518	3.63	109.9	H	R	-1	-1	0.94	36.91	7.06	55.09	-1	0.35	5105
K85	8518	6.02	212.26	F	R	-1	-1	0.96	30.77	8.1	40.17	-1	0.38	3560
K85	8518	0.22	238.76	E	R	-1	-1	0.72	25.98	10.22	63.04	-1	-1	-1
K85	8518	1.89	260.4	D	R	-1	-1	0.99	61.96	7.09	29.97	-1	0.62	2508
K85	8519	1.29	26.21	GU	R	-1	-1	1.29	65.17	7.87	25.67	-1	0.55	-1
K85	8519	0.52	30.5	GL	R	-1	-1	1.32	52.65	6.45	39.58	-1	0.29	-1
K85	8519	0.51	46.16	F/G	R	-1	-1	0.93	52.99	8.85	37.23	-1	1.17	-1
K85	8519	0.53	63.14	Q	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8519	4.21	65.65	F	R	-1	-1	0.82	38.8	6.5	53.58	-1	0.39	4780
K85	8519	0.33	87.38	Q	R	-1	-1	0.85	24.03	6.72	68.4	-1	0.47	-1
K85	8519	0.76	121.53	D	R	-1	-1	0.94	49.68	7.37	42.13	-1	0.34	-1
K85	8519	0.24	139.06	C	R	-1	-1	0.83	59.87	12.52	28.98	-1	4.86	-1
K85	8520	1.91	53.87	E	R	-1	-1	1.18	15.36	5.89	77.07	-1	0.48	-1
K85	8520	0.75	91.92	D	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8520	3.8	94.32	D	R	-1	-1	0.74	67.74	-1	-1	-1	-1	-1
K85	8520	4.74	98.12	D	R	-1	-1	0.95	38.47	7.04	53.32	-1	0.32	3278
K85	8520	1.69	148.72	C	R	-1	-1	0.84	33.35	7.12	58.18	-1	0.33	5208
K85	8521	1.61	32.18	I	R	-1	-1	0.83	26.36	6.94	65.63	-1	0.42	6013
K85	8521	5.55	40	H	R	-1	-1	1.27	41.59	8.06	49.61	-1	0.7	3961
K85	8521	3.43	124.4	F	R	-1	-1	1.65	43.92	8.65	43.33	-1	0.33	3815
K85	8521	1.81	150.22	E	R	-1	-1	1.09	19.7	6.27	72.94	-1	0.45	6615
K85	8522	4.69	49.04	I	R	-1	-1	2.3	18.85	5.97	74.88	-1	0.42	6887
K85	8522	3.66	90.46	H	R	-1	-1	1.41	35.27	6.76	56.59	-1	0.37	6555
K85	8523	4.47	28.93	K	R	-1	-1	3.51	26.92	8.24	61.33	-1	0.46	5650
K85	8523	4.57	63.18	L	R	-1	-1	0.77	46.07	7.82	45.34	-1	0.44	4140
K85	8523	3.41	125.84	M	R	-1	-1	0.95	47.18	8.24	43.63	-1	0.35	3992
K85	8523	1.36	133.43	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8523	3.39	135.83	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8523	3.76	140.94	M	R	-1	-1	0.85	41.08	10.89	47.2	-1	0.35	4412
K85	8523	5.86	214.32	M	R	-1	-1	0.77	41.79	9.8	47.64	-1	0.38	4484
K85	8523	6.89	221.29	M	R	-1	-1	0.77	41.79	9.5	47.64	-1	0.38	4484
K85	8523	1.49	228.72	M	R	-1	-1	0.77	41.79	9.5	47.64	-1	0.38	4844
K85	8523	1.24	230.86	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K85	8523	3.2	270.74	M	R	-1	-1	0.97	45.75	8.67	44.51	-1	0.41	4042
K85	8523	6.13	276.19	M	R	-1	-1	0.97	45.75	8.67	44.51	-1	0.41	4042
K85	8523	5.56	282.7	M	R	-1	-1	0.97	45.75	8.67	44.51	-1	0.41	4042
K85	8523	1.81	288.42	M	R	-1	-1	0.97	45.75	8.67	44.51	-1	0.41	4042
K85	8524	6.45	12.68	I	R	-1	-1	2.4	57.81	5.79	34	-1	0.61	2898
K85	8524	4.62	91.03	H	R	-1	-1	1.21	38.98	6.58	53.25	-1	0.38	5559
K85	8525	4.42	36.4	I	R	-1	-1	0.8	21.3	6.08	71.82	-1	0.36	6352
K85	8525	3.72	75.74	H	R	-1	-1	0.76	34.1	7.87	57.27	-1	0.38	4783
K85	8526	5.68	19.68	I	R	-1	-1	0.84	55.82	-1	-1	-1	0.22	-1
K85	8526	3.43	82.8	M	R	-1	-1	1.51	33.56	7.22	57.71	-1	1.13	5206
K85	8527	1.51	44.06	0	R	-1	-1	0.99	39.72	5.86	53.43	-1	1.5	3251
K85	8527	2.17	75.26	M	R	-1	-1	1.09	37.31	7.4	54.2	-1	1.01	4864
K85	8527	1.15	94.32	M/N	R	-1	-1	0.79	61.27	6.33	31.39	-1	0.22	2477
K85	8527	1.85	109.24	M	R	-1	-1	1.1	32.53	6.48	59.89	-1	0.41	5375
K85	8527	1.2	114.96	M	R	-1	-1	0.41	80.58	-1	-1	-1	-1	-1

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K85	8527	1.62	127.56	L	R	-1	-1	0.95	39.36	9.48	50.21	-1	0.35	4630
K85	8527	3.22	147.78	K/L	R	-1	-1	0.96	50.56	7.28	41.21	-1	0.29	3672
K85	8527	1.08	163.3	K	R	-1	-1	1.03	41.57	6.81	50.56	-1	1.47	4463
K85	8527	5.03	216.16	I	R	-1	-1	1.7	21.14	5.58	71.52	-1	0.36	6907
K85	8527	2.25	265.98	H	R	-1	-1	1.3	24.09	6.21	68.4	-1	0.73	6381
K85	8528	4.74	10.8	I	R	-1	-1	0.41	41.58	-1	-1	-1	-1	-1
K85	8528	4.08	56.96	H	R	-1	-1	0.97	34.88	8.63	55.52	-1	0.68	5082
K85	8529	0.43	75	J	R	-1	-1	0.47	33.57	-1	-1	-1	0.35	-1
K85	8530	3.98	20.48	I	R	-1	-1	3.26	16.58	5.46	74.7	-1	0.45	6651
K85	8531	4.54	8.12	I	R	-1	-1	5.1	12.45	8.85	73.51	-1	0.41	6651
K85	8532	5.47	27.54	I	R	-1	-1	2.61	28.46	6.25	62.68	-1	0.37	5583
K85	8533	5.48	10.96	I	R	-1	-1	4.53	14.4	7.11	73.91	-1	0.4	6622
K85	8534	5.14	30.32	I	R	-1	-1	3.15	16.71	5.72	74.42	-1	0.42	6582
K86	8601	3.55	25.65	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8601	2.84	68.24	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8602	0.76	39.33	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8602	4.84	56.74	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8602	0.84	92.1	PH	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8603	7.25	40.08	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8603	3.34	88.03	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8604	3.76	13.97	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8604	1.09	27.14	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8604	2.03	39.38	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8604	3.44	53.2	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8604	2.29	89.27	K	R	-1	-1	0.89	19.4	7.47	72.24	-1	0.49	6558
K86	8604	2.16	91.56	K	R	-1	-1	0.98	21.39	7.28	70.35	-1	0.5	6389
K86	8604	1.13	93.83	K	R	-1	-1	1.11	51.46	8.42	39.01	-1	0.33	3413
K86	8604	1.68	135.44	I	R	-1	-1	1.27	21.54	6.62	70.57	-1	0.42	6429
K86	8604	1.7	137.12	I	R	-1	-1	1.31	32.34	7.31	59.04	-1	0.38	4507
K86	8604	1.94	138.82	I	R	-1	-1	1.02	11.3	6.81	80.87	-1	0.46	7356
K86	8604	5.13	191.5	H	R	-1	-1	0.81	43.85	8.27	47.27	-1	0.41	4184
K86	8604	2.37	196.63	H	R	-1	-1	0.81	30.69	8.67	59.83	-1	0.42	5364
K86	8605	4.79	41	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8605	1.78	90.45	H	R	-1	-1	1.01	55.75	6.63	36.61	-1	1.07	3157
K86	8605	1.3	92.23	H	R	-1	-1	0.63	25.98	7.86	65.53	-1	0.44	5904
K86	8606	5.83	28.44	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8606	5.44	34.27	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8606	2.72	39.71	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8606	4.19	78.5	H	R	-1	-1	0.8	40.98	8.05	50.14	-1	0.34	4041
K86	8606	2.26	82.69	H	R	-1	-1	0.87	32.8	8.19	58.34	-1	0.36	5252
K86	8607	1.77	98.96	I	R	-1	-1	1.16	27.94	7.56	63.34	-1	0.36	5797
K86	8607	1.89	100.72	I	R	-1	-1	1.3	28.85	7.45	62.59	-1	0.39	5730
K86	8607	2.5	102.61	I	R	-1	-1	1.35	12.94	6.91	76.8	-1	0.46	7132
K86	8607	1.41	157.89	H	R	-1	-1	0.67	38.08	7.56	53.67	-1	0.33	4839
K86	8607	2.54	159.3	H	R	-1	-1	0.65	28.69	8.82	61.84	-1	0.39	5565
K86	8608	3.64	20.92	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8608	3.89	48.74	I	R	-1	-1	1.5	27.95	7.19	83.38	-1	0.44	5844
K86	8608	1.72	52.63	I	R	-1	-1	1.18	11.17	6.79	80.88	-1	-1	7378
K86	8608	3.43	93.65	H	R	-1	-1	0.55	55.28	9.09	35.08	-1	0.38	3014
K86	8608	2.93	97.08	H	R	-1	-1	0.47	35.06	8.68	55.79	-1	0.4	5047
K86	8608	1.16	124.33	PH	R	-1	-1	0.81	50.35	11.35	37.69	-1	0.28	3446
K86	8608	1.55	125.49	PH	R	-1	-1	0.99	26.76	8.23	84.02	-1	0.37	5696
K86	8608	2.13	127.04	PH	R	-1	-1	1.04	28.56	7.88	62.72	-1	0.37	5746
K86	8609	4.49	70.29	K	R	-1	-1	1.35	28.34	8.19	82.12	-1	0.41	5770
K86	8609	1.42	74.78	K	R	-1	-1	1.4	60.99	7.97	29.64	-1	0.51	2747
K86	8609	5.8	142.13	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8609	1.35	189.15	H	R	-1	-1	1.28	32.62	6.88	59.22	-1	0.44	5321
K86	8609	3.21	190.5	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8609	2.37	193.71	H	R	-1	-1	0.95	31.7	7.21	60.14	-1	0.45	5429
K86	8609	5.44	196.08	H	R	-1	-1	1.05	38.45	7.33	55.17	-1	0.38	4977
K86	8610	6.24	55.21	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8610	2.58	62.52	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8610	3.7	66.29	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8610	1.11	94.72	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8610	2.07	134.68	I	R	-1	-1	1.24	38.92	7.45	52.38	-1	0.32	4672
K86	8610	3.26	136.75	I	R	-1	-1	0.87	9.14	8.43	83.46	-1	0.47	7588
K86	8610	2.25	171.65	H	R	-1	-1	0.44	35.53	8.17	55.86	-1	0.34	4999
K86	8610	1.72	173.9	H	R	-1	-1	0.48	39.59	9.5	50.43	-1	0.59	4655
K86	8611	5.51	25.44	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8611	1.85	56.91	K/L	R	-1	-1	0.94	40.92	9.45	48.89	-1	0.41	4521
K86	8612	2.89	20.1	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K86	8612	1.59	82.67	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8612	1.58	113.42	N	R	-1	-1	1.12	37.62	7.87	53.39	-1	2.81	4877
K86	8613	1.42	53.56	K	R	-1	-1	0.82	27.94	10.94	60.3	-1	0.39	5603
K86	8613	2.37	54.98	K	R	-1	-1	1.05	28.68	6.88	63.39	-1	0.42	5718
K86	8613	0.62	89.14	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8613	2.66	112.92	I	R	-1	-1	1.53	35.38	6.85	56.24	-1	0.31	4879
K86	8613	2.87	115.58	I	R	-1	-1	1.52	34.58	7.85	58.05	-1	0.29	4982
K86	8613	3.15	118.45	I	R	-1	-1	1.58	20.52	6.55	71.35	-1	0.43	6468
K86	8613	6.51	159	I	R	-1	-1	1.86	10.81	6.12	81.21	-1	0.44	7404
K86	8613	6.4	165.51	I	R	-1	-1	1.56	10.81	6.12	81.21	-1	0.44	7404
K86	8613	4.73	171.91	I	R	-1	-1	1.86	10.81	6.12	81.21	-1	0.44	7404
K86	8614	4.32	105.59	L	R	-1	-1	0.6	38.07	7.42	53.91	-1	0.38	4746
K86	8614	2.65	154.29	K	R	-1	-1	0.56	40.93	8.8	49.71	-1	0.36	4526
K86	8615	1.3	29.21	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8615	0.51	42.68	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8615	4	86.55	K	R	-1	-1	0.67	25.61	7.25	66.27	-1	0.4	6004
K86	8616	2.64	75.66	L	R	-1	-1	0.5	32.38	7.45	59.66	-1	0.42	5407
K86	8616	2.77	144	K/L	R	-1	-1	0.64	45.61	9.77	43.98	-1	0.56	4039
K86	8616	2.68	157.12	K	R	-1	-1	0.58	44.43	9.55	45.13	-1	1.91	4060
K86	8617	5.26	60.71	I	R	-1	-1	1.9	25.44	6.56	66.1	-1	0.4	5966
K86	8617	1.29	62.28	I	R	-1	-1	2.36	30.02	5.4	62.22	-1	0.35	5508
K86	8617	2.4	63.57	I	R	-1	-1	2.11	9.28	5.23	83.38	-1	0.46	7490
K86	8617	2	110	H	R	-1	-1	0.64	61.25	9.7	28.41	-1	1.57	2701
K86	8617	5.51	114.35	H	R	-1	-1	0.5	34	8.1	57.4	-1	0.34	5032
K86	8618	6.28	2.44	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8618	1.11	103	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8618	0.86	115.5	PH	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8619	1.53	69.31	M/N	R	-1	-1	0.4	40.48	8.48	50.64	-1	0.37	4557
K86	8619	0.7	82.7	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8619	1.89	100.07	L	R	-1	-1	0.37	39.95	9.6	50.08	-1	0.34	4586
K86	8619	4.52	120.18	K/L	R	-1	-1	0.56	37.08	7.5	54.88	-1	0.44	4984
K86	8619	1.61	139.68	K	R	-1	-1	0.45	31.82	9.92	57.61	-1	4.16	5273
K86	8619	0.74	141.29	K	R	-1	-1	0.55	49.72	6.67	43.06	-1	0.31	3475
K86	8619	1.1	142.03	K	R	-1	-1	0.56	57.06	10.52	31.84	-1	0.28	2813
K86	8619	1.72	185.15	I	R	-1	-1	1.45	26.98	7.11	64.46	-1	0.31	5703
K86	8619	3.24	186.87	I	R	-1	-1	1.59	34.72	5.96	56.63	-1	0.32	5080
K86	8619	2.27	190.11	I	R	-1	-1	1.56	15.39	5.65	77.4	-1	0.43	6835
K86	8620	0.4	24.37	B	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8620	3.52	67.77	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8621	4.73	23.82	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8621	1.4	42.8	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8621	1.15	106.79	I	R	-1	-1	0.85	35.44	7.11	56.6	-1	0.32	4996
K86	8621	2.03	107.94	I	R	-1	-1	1.09	41.16	6.9	50.85	-1	0.29	4251
K86	8621	1.79	109.7	I	R	-1	-1	0.84	9.31	5.88	83.99	-1	0.45	7528
K86	8622	2.4	36.2	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8622	3.46	64.78	L	R	-1	-1	0.57	38	8.72	52.71	-1	0.44	4836
K86	8622	5.6	88.2	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8622	1.97	104.9	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8622	1.15	140.41	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8622	3.85	175.95	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8622	4.37	179.8	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8623	3.43	24.44	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8623	1.14	40.82	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8623	5.76	55.6	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8624	3.51	46.25	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8624	1.56	98.96	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8624	2.11	102.27	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8625	0.99	7.01	P	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8625	1.94	62.22	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8625	1.11	93.61	N	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8625	3.16	131.2	I	R	-1	-1	0.95	21.87	7.61	69.57	-1	0.43	6310
K86	8625	0.49	183.47	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8625	1.63	216.24	I	R	-1	-1	0.91	24.12	7.2	67.77	-1	0.39	6131
K86	8625	1.58	217.87	M	R	-1	-1	0.86	28.47	8.46	84.21	-1	0.4	5730
K86	8625	2.27	219.45	M	R	-1	-1	0.6	10	6.57	82.83	-1	0.48	7488
K86	8626	1.11	36.63	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8626	5.46	71.33	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8627	3.44	8.56	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8627	1.95	26.53	N	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8627	4.91	73.59	K/L	R	-1	-1	0.83	35.4	7.45	56.21	-1	0.5	5197
K86	8627	1.17	76.55	K/L	R	-1	-1	1.22	32.8	6.9	59.08	-1	0.47	5207

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K86	8627	2.04	77.72	K/L	R	-1	-1	1.1	38	7.4	53.5	-1	0.38	4753
K86	8627	3	95.95	K	R	-1	-1	0.82	33.44	7.8	57.94	-1	0.88	5245
K86	8627	1.04	158.6	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8628	2.99	35.88	D	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8628	0.3	103.4	B	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8628	1.68	145.64	A	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8629	2.97	8.03	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8629	4.49	50.99	I	R	-1	-1	0.8	20.39	7.45	71.38	-1	0.44	6389
K86	8629	1.23	91.5	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8630	0.84	21.92	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8630	1.67	63.15	I	R	-1	-1	0.68	20.38	7.57	71.37	-1	0.41	6482
K86	8630	2.51	64.82	I	R	-1	-1	0.63	21.72	7.33	70.32	-1	0.38	6363
K86	8630	2.32	67.33	I	R	-1	-1	0.66	9.72	8.56	83.05	-1	0.45	7528
K86	8630	3.04	122.64	H	R	-1	-1	0.73	27.01	8.4	63.88	-1	0.4	5756
K86	8630	0.47	145.01	PH	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8631	4.64	40.72	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8631	6.83	83.44	H	R	-1	-1	0.74	43.94	8.39	46.93	-1	0.28	4129
K86	8631	2.57	117.9	PH	R	-1	-1	0.54	38.3	7.86	53.3	-1	0.39	4605
K86	8631	6.65	124	K/L	R	-1	-1	0.46	33.11	7.84	58.79	-1	0.4	5130
K86	8631	2.34	132.17	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8632	3.18	8.15	I	R	-1	-1	0.49	14.61	7.52	77.25	-1	0.43	7110
K86	8632	5.43	62.12	H	R	-1	-1	0.55	41.45	5.41	49.59	-1	0.58	4266
K86	8633	3.97	48.8	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8633	1.4	55.11	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8633	5.06	57.45	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8633	2.64	87.42	L	R	-1	-1	0.48	34.01	7.98	57.53	-1	0.43	4989
K86	8633	2.24	115.07	K/L	R	-1	-1	0.55	49.7	7.34	42.41	-1	0.52	3513
K86	8633	5.29	147.47	K	R	-1	-1	0.42	36.64	8.24	54.7	-1	0.52	4858
K86	8634	3.99	20.03	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8634	4.42	48.8	K	R	-1	-1	0.37	23.08	7.94	65.61	-1	0.45	6253
K86	8634	2.88	53.22	K	R	-1	-1	0.79	60.22	7.39	31.6	-1	0.27	2477
K86	8634	0.8	81.88	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8634	5.47	119.66	I	R	-1	-1	0.59	22.55	7.31	69.55	-1	0.4	6816
K86	8635	3.62	50.78	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8635	1.45	67.95	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8635	6.56	90.73	K	R	-1	-1	0.63	29.09	9.84	60.44	-1	0.39	5734
K86	8635	1.1	97.29	K	R	-1	-1	0.78	65.37	8.87	24.98	-1	0.34	1985
K86	8635	0.41	122.44	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8635	1.31	157.51	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8635	0.88	180.33	H/I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8635	1.32	197.19	H	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8636	1.92	8.29	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8636	1.03	32.84	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8636	2.29	78.56	I	R	-1	-1	0.59	21.49	6.84	71.08	-1	0.39	6563
K86	8636	1.18	80.85	I	R	-1	-1	0.85	32.17	8.21	58.97	-1	0.33	5305
K86	8636	2.03	82.03	I	R	-1	-1	0.34	10.13	7.26	82.27	-1	0.46	7521
K86	8636	1.38	113.22	H/I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8636	2.29	139.56	H	R	-1	-1	0.66	46.37	10.24	42.73	-1	0.33	3850
K86	8637	2.55	17.48	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8637	0.85	70.98	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8637	2.45	73.12	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8637	2.89	75.57	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8637	2.46	148.02	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K86	8637	0.68	153.27	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8701	4.27	118.78	H	R	-1	-1	0.53	34.89	7.77	56.81	-1	1.1	5159
K87	8701	1.33	125.05	H	R	-1	-1	0.44	33.93	7.94	57.69	-1	1.75	5011
K87	8702	4.02	23.27	I	R	-1	-1	0.9	30.34	7.27	61.49	-1	0.33	5219
K87	8702	2.8	27.29	I	R	-1	-1	0.32	12.49	7.09	80.1	-1	0.45	7256
K87	8702	2.87	48.8	I	R	-1	-1	0.49	15.02	6.63	77.86	-1	0.45	7084
K87	8702	4.78	51.67	I	R	-1	-1	0.51	31.47	7.75	60.27	-1	0.33	5477
K87	8702	2.48	133.26	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8702	2.42	135.74	I	R	-1	-1	1.37	27.4	7.99	63.24	-1	0.37	5754
K87	8702	3.57	138.16	I	R	-1	-1	0.89	11.2	6.07	81.84	-1	0.47	7433
K87	8702	2.24	193.89	H	R	-1	-1	1.64	48.51	9.37	40.48	-1	0.28	3585
K87	8702	1.31	196.13	H	R	-1	-1	1.38	75.1	9.32	14.2	-1	5.2	1242
K87	8702	2.6	197.44	H	R	-1	-1	1.73	32.53	7.54	58.2	-1	0.43	4932
K87	8703	3.38	38.9	I	R	-1	-1	1.39	31.81	9.09	57.71	-1	0.33	5080
K87	8703	2.14	42.28	I	R	-1	-1	1.47	13.66	6.53	78.34	-1	0.44	7206
K87	8703	2.22	90.27	H	R	-1	-1	0.81	74	7.25	17.94	-1	-1	1517
K87	8703	1.78	92.49	H	R	-1	-1	1.48	30.1	8.01	60.41	-1	0.45	5185
K87	8704	4.25	18.52	I	R	-1	-1	1.45	23.73	6.46	66.36	-1	-1	5823

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K87	8704	1.32	33.43	H/I	R	-1	-1	1.18	47.34	9.9	41.58	-1	0.48	3470
K87	8704	0.52	52.97	?	R	-1	-1	0.99	55.53	7.44	36.04	-1	-1	3177
K87	8704	1.91	69.08	H	R	-1	-1	0.82	33.82	8.79	56.57	-1	1.26	4913
K87	8704	1.47	94.8	PH	R	-1	-1	1	23.36	5.92	69.72	-1	0.56	5887
K87	8705	4.74	19	K/L	R	-1	-1	0.97	47.72	10.51	40.8	-1	-1	3735
K87	8705	5.04	49.66	K	R	-1	-1	0.95	29.26	7.18	62.62	-1	0.46	5374
K87	8705	3.05	55.88	K	R	-1	-1	1.3	40.61	6.77	51.32	-1	0.43	4449
K87	8705	2	130.23	I	R	-1	-1	1.27	35.45	7.66	55.62	-1	0.26	4822
K87	8705	1.57	132.23	I	R	-1	-1	0.64	12.6	7.06	79.7	-1	0.41	6857
K87	8705	1.9	182.4	H	R	-1	-1	1.12	68.84	9.22	20.82	-1	0.15	1806
K87	8706	3.72	93.75	I	R	-1	-1	0.8	72.84	7.54	19.02	-1	-1	1610
K87	8706	2.46	117.94	H/L	R	-1	-1	1.1	38.56	6.74	53.6	-1	3.77	4440
K87	8706	1.44	145.02	H	R	-1	-1	0.61	17.73	6.29	75.37	-1	0.51	6451
K87	8707	1.03	11.45	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8707	6.99	12.48	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8707	3.07	77.75	I	R	-1	-1	1.44	43.26	4.88	45.42	-1	0.58	3592
K87	8707	4.87	91.32	H	R	-1	-1	1.77	46.92	6.56	44.75	-1	1.21	3647
K87	8707	2.15	99.14	H	R	-1	-1	0.72	41	6.23	52.05	-1	0.81	4526
K87	8707	1.5	121.35	PH	R	-1	-1	0.59	47.13	8.99	45.29	-1	1.73	3707
K87	8707	2.88	192.62	G	R	-1	-1	0.7	38.74	8.08	52.48	-1	0.33	4332
K87	8708	1	9.5	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8708	1.96	16.8	I	R	-1	-1	1.1	52.1	8.74	38.15	-1	-1	3227
K87	8708	2.74	119.71	I	R	-1	-1	1	35.54	6.75	56.71	-1	0.31	4863
K87	8708	4.3	122.45	I	R	-1	-1	0.65	24.99	8.3	66.06	-1	0.36	5749
K87	8708	24.7	165.78	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8709	5.31	42.22	I	R	-1	-1	1.2	38.57	7.45	52.78	-1	-1	4476
K87	8709	1.76	98.57	H	R	-1	-1	1	60.64	7.68	30.88	-1	-1	2207
K87	8709	1.79	101.61	H	R	-1	-1	1.18	48.42	7.88	42.52	-1	1.5	3563
K87	8709	1.62	119.08	PH	R	-1	-1	0.93	52.13	9.23	37.71	-1	0.58	3153
K87	8710	3.13	28.85	H	R	-1	-1	0.98	46.98	42.75	9.29	-1	0.29	3602
K87	8710	2.41	31.98	H	R	-1	-1	1.1	23.79	6.63	68.48	-1	0.41	5627
K87	8711	3.15	28.85	H	R	-1	-1	1.68	53.73	8.33	38.26	-1	0.36	2591
K87	8711	2.39	32	H	R	-1	-1	1.43	23.38	7.29	67.9	-1	0.37	5775
K87	8711	0.57	68.53	PH	R	-1	-1	0.91	71.99	8.25	18.85	-1	-1	1701
K87	8712	1.6	74.45	I	R	-1	-1	0.9	32.48	7.44	59.18	-1	0.34	5102
K87	8712	2.6	119.45	H	R	-1	-1	1	8.1	52.15	38.75	-1	0.24	3176
K87	8712	2.95	122.05	H	R	-1	-1	0.99	24.1	7.42	67.49	-1	0.42	5672
K87	8713	1	14.36	J	R	-1	-1	1.14	29.16	8.09	61.61	-1	0.49	5223
K87	8713	1.44	61.83	I	R	-1	-1	1.11	40.66	7.16	51.07	-1	0.32	4182
K87	8713	4.16	63.27	I	R	-1	-1	1.09	13.28	6.01	79.62	-1	0.46	6690
K87	8713	1.64	97.42	H	R	-1	-1	0.68	18.88	5.74	74.7	-1	0.47	6293
K87	8713	1.58	128.87	PH	R	-1	-1	0.62	35.3	8.92	55.15	-1	0.31	4705
K87	8714	2.07	30.6	K	R	-1	-1	0.62	21.33	7.78	70.27	-1	-1	6432
K87	8714	4.23	57.4	I	R	-1	-1	0.81	21.35	6.67	71.17	-1	0.48	6148
K87	8715	5.92	8.8	L	R	-1	-1	0.79	41.09	8.81	49.31	-1	0.65	4127
K87	8715	2.17	25.51	K	R	-1	-1	0.55	24.09	7.72	67.64	-1	0.49	5699
K87	8715	3.79	81.8	H	R	-1	-1	1.37	36.71	8.3	53.62	-1	0.31	4430
K87	8716	1.56	48.6	I	R	-1	-1	1.03	20.99	8.31	69.67	-1	0.41	6289
K87	8716	1.64	50.16	I	R	-1	-1	1.24	28.31	7.63	62.32	-1	0.37	5484
K87	8716	1.75	51.8	I	R	-1	-1	1.3	10.49	5.8	82.41	-1	0.48	7284
K87	8717	3.46	25.34	K	R	-1	-1	1.14	31.78	7.43	59.65	-1	0.62	5030
K87	8717	2.22	28.8	K	R	-1	-1	1.14	74.83	9.71	14.32	-1	-1	1340
K87	8717	2.26	60.67	I	R	-1	-1	0.96	22.84	6.56	69.64	-1	0.42	5854
K87	8717	1.55	95.37	H/I	R	-1	-1	1.11	43.13	8.04	47.72	-1	0.27	4005
K87	8718	1.17	29.18	?	R	-1	-1	1	24.81	9.19	65	-1	-1	5933
K87	8718	1.57	53.78	?	R	-1	-1	1.07	38.24	8.79	53.9	-1	0.68	4476
K87	8719	3.48	114.39	I	R	-1	-1	1.05	12.27	5.57	81.11	-1	0.45	6824
K87	8719	6.78	117.87	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8719	6.91	124.65	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8719	3.36	131.56	I	R	-1	-1	1.23	25.92	6.77	66.08	-1	0.33	5598
K87	8719	1.9	166.02	H/L	R	-1	-1	1.45	34.99	6.86	56.7	-1	-1	5111
K87	8719	2.88	197.64	H	R	-1	-1	1.3	49.26	6.32	43.12	-1	1.03	3501
K87	8720	1.42	84.9	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8720	4.8	95.9	L	R	-1	-1	1.04	51.27	9.65	38.04	-1	1.1	3248
K87	8720	5.83	147.85	K/L	R	-1	-1	1.1	45.35	7.88	45.67	-1	0.43	3766
K87	8721	2.67	28.93	I	R	-1	-1	1.02	28.01	7.28	63.69	-1	0.3	5245
K87	8721	1.36	31.6	I	R	-1	-1	1.14	11.92	5.88	81.06	-1	0.44	6933
K87	8872	4.38	84.27	H	R	-1	-1	1.08	39.64	8.26	51.02	-1	0.32	4311
K87	8721	1.88	88.65	H	R	-1	-1	1.03	88.86	7.59	2.52	-1	-1	270
K87	8721	2.25	90.53	H	R	-1	-1	0.93	28.87	7.25	62.95	-1	0.4	5321
K87	8722	0.42	15.23	P	R	-1	-1	0.48	20.86	8.08	70.58	-1	-1	6439

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K87	8722	2.66	62.87	O	R	-1	-1	0.82	48.02	8.04	45.12	-1	0.44	3719
K87	8722	3.29	98.16	N	R	-1	-1	1.26	29.63	6.96	62.15	-1	1.43	5584
K87	8722	2.16	124.93	M/N	R	-1	-1	1.15	57.94	8.13	32.78	-1	0.41	2577
K87	8722	0.78	137.35	?	R	-1	-1	0.95	55.68	10.54	32.83	-1	-1	2911
K87	8723	1.78	20.47	K/L	R	-1	-1	0.72	58.16	7.68	33.44	-1	0.89	2620
K87	8723	0.68	104.42	K	R	-1	-1	0.45	55.1	8.14	36.31	-1	-1	3294
K87	8723	2.34	177.95	K/L	R	-1	-1	0.82	53.4	5.94	39.84	-1	1.15	3081
K87	8724	1.02	15.17	O	R	-1	-1	0.48	23.45	7.44	68.63	-1	-1	6300
K87	8724	1.23	41.87	M/N	R	-1	-1	0.87	52.24	7.34	39.55	-1	0.49	3188
K87	8724	1.26	70.09	??	R	-1	-1	0.91	38.08	6.78	56.23	-1	2.85	4748
K87	8724	2.57	86.45	M	R	-1	-1	0.97	34.26	7.64	57.13	-1	2.68	4989
K87	8724	2.3	117.5	L	R	-1	-1	0.86	22.56	6.53	70.05	-1	0.43	5990
K87	8724	3.21	152	K/L	R	-1	-1	0.92	43.81	5.63	49.64	-1	0.31	4132
K87	8725	4.55	36.89	K	R	-1	-1	0.82	24.66	7.15	67.37	-1	0.5	5818
K87	8725	3.04	102.67	I	R	-1	-1	1.17	25.73	6.12	66.98	-1	0.38	6035
K87	8725	2.26	105.71	I	R	-1	-1	1.2	8.3	5.38	85.12	-1	0.49	7645
K87	8726	4.12	18.93	H	R	-1	-1	0.75	34.93	6.73	57.58	-1	0.89	4834
K87	8726	0.66	48.69	H/I	R	-1	-1	0.67	28.54	7.33	63.46	-1	3.32	5372
K87	8726	1.11	79.06	I	R	-1	-1	0.71	28.06	6.94	66.29	-1	0.64	5553
K87	8726	1.71	138.26	H	R	-1	-1	0.78	50.84	7.77	40.83	-1	1.17	3473
K87	8726	0.94	172.84	PH	R	-1	-1	0.9	35.24	7.35	56.51	-1	0.53	4669
K87	8727	2.22	31.33	H	R	-1	-1	0.9	53.81	6.76	38.53	-1	0.51	3067
K87	8727	3.82	33.55	H	R	-1	-1	0.6	25.63	7.19	66.58	-1	0.44	5632
K87	8727	2.95	37.37	H	R	-1	-1	0.48	24.45	7.98	67.09	-1	0.51	5675
K87	8727	1.51	49.79	H	R	-1	-1	0.61	60.59	7.07	31.73	-1	0.54	2443
K87	8727	1.22	67.65	PH	R	-1	-1	0.54	70.55	9.33	19.56	-1	0.64	1251
K87	8728	0.91	40.9	N	R	-1	-1	0.48	41.4	7.04	51.08	-1	0.42	4297
K87	8728	0.88	61.55	M/N	R	-1	-1	0.82	62.37	8.72	28.09	-1	0.33	2087
K87	8728	0.47	76.43	?	R	-1	-1	0.49	18.23	7.1	74.18	-1	3.69	6241
K87	8728	1.56	89.74	M	R	-1	-1	0.81	34.76	7.96	56.67	-1	0.99	4958
K87	8728	0.83	108.67	L	R	-1	-1	0.59	24.5	8.02	66.59	-1	0.49	5443
K87	8728	6.99	139.94	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K87	8728	4.02	146.93	K/L	R	-1	-1	1.32	68.34	6.61	23.73	-1	0.29	1598
K87	8728	1.19	190.21	?	R	-1	-1	1.01	66.12	7.57	25.3	-1	4.88	1868
K87	8728	2.4	191.4	?	R	-1	-1	1.01	46.17	7.37	45.45	-1	2.7	3664
K87	8728	3.7	200.09	K	R	-1	-1	0.81	48.5	9.33	41.36	-1	1.32	3664
K87	8728	0.65	213.22	?	R	-1	-1	0.88	54.5	8.05	36.57	-1	-1	3009
K87	8729	3.63	20.65	H	R	-1	-1	0.48	23.15	7.75	68.62	-1	0.49	6047
K87	8729	1.51	49.3	H	R	-1	-1	1.16	47.41	8.02	43.41	-1	-1	3664
K87	8729	1.55	83.15	H	R	-1	-1	0.26	51.86	8.37	39.51	-1	0.4	3439
K87	8729	0.76	109.84	H/I	R	-1	-1	0.51	48.41	7.83	43.25	-1	0.52	3969
K87	8729	1.34	138.28	H	R	-1	-1	0.67	44.33	6.45	48.55	-1	0.5	4067
K87	8729	1.41	161.31	PH	R	-1	-1	0.8	38.06	7	54.14	-1	0.59	4729
K87	8729	1.74	204.73	F	R	-1	-1	0.77	56.84	9.37	33.02	-1	0.78	2840
K87	8730	2.26	34.42	M	R	-1	-1	1.71	41.82	7.04	49.43	-1	0.72	4251
K87	8730	1.98	59.98	L	R	-1	-1	1.28	17.42	6.92	74.38	-1	0.56	6740
K87	8730	0.48	75.25	?	R	-1	-1	1.2	22.13	7.34	69.33	-1	5.62	6310
K87	8730	5.02	86.6	K/L	R	-1	-1	0.9	60.52	7.4	31.18	-1	0.31	2491
K87	8730	4.03	185.12	K	R	-1	-1	1.17	48.51	8.96	43.36	-1	4.79	3841
K87	8730	3.28	241.29	I	R	-1	-1	1.25	34.57	8.78	55.4	-1	0.64	4772
K87	8731	2.27	30.45	M	R	-1	-1	1.07	40.23	7.49	51.21	-1	0.61	4404
K87	8731	1.54	46.37	L	R	-1	-1	0.79	19.75	6.11	73.35	-1	-1	6673
K87	8731	0.59	60.11	?	R	-1	-1	1.04	41.34	7.73	49.89	-1	1.56	4423
K87	8731	0.79	66.46	?	R	-1	-1	1.77	46.09	8.47	45.67	-1	0.44	4103
K87	8731	0.82	81.71	K/L	R	-1	-1	1.22	19.8	6.38	72.6	-1	1.12	6630
K87	8732	4.3	44.46	I	R	-1	-1	1.08	30.22	6.25	62.44	-1	0.48	5484
K87	8732	1.87	48.76	I	R	-1	-1	1.9	18.21	5.25	74.64	-1	0.45	6690
K87	8733	4.86	35.96	K	R	-1	-1	1.66	27.18	7.99	63.17	-1	0.43	5792
K87	8733	0.95	41.89	K	R	-1	-1	1.03	35.08	7.24	56.65	-1	0.48	5082
K87	8733	1.73	113.04	I	R	-1	-1	0.99	35.47	6.99	56.55	-1	0.33	4853
K87	8733	2.6	114.77	I	R	-1	-1	1.29	35.33	8.52	54.86	-1	0.36	4750
K87	8733	1.6	117.37	I	R	-1	-1	0.85	11.58	7.08	80.49	-1	0.47	6929
K87	8734	6.96	45.5	I	R	-1	-1	1.19	25.79	7.85	65.17	-1	0.39	5887
K88	8801	0.31	23.71	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8801	4.24	66.57	I	R	-1	-1	1.8	24.89	5.31	65	-1	0.37	5933
K88	8801	1.45	70.81	I	R	-1	-1	1.56	16.56	4.46	77.42	-1	0.42	6699
K88	8801	3.16	116.85	H	R	-1	-1	1.42	35.4	4.55	58.63	-1	0.42	5049
K88	8802	4.61	11.44	I	R	-1	-1	0.78	32.34	6.66	60.22	-1	-1	5300
K88	8803	4.9	41.11	M	R	-1	-1	1.54	32.79	5.01	60.66	-1	0.6	5295
K88	8803	2.77	46.01	M	R	-1	-1	1.54	53.13	7.05	38.28	-1	0.37	3210
K88	8803	2.63	54.54	L	R	-1	-1	1.1	39.8	8.23	50.87	-1	0.49	4507

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K88	8803	4.02	94.54	K/L	R	-1	-1	0.97	32.18	5.85	61	-1	0.76	5300
K88	8803	2.59	98.56	K/L	R	-1	-1	0.99	40.57	6.59	51.85	-1	0.38	4569
K88	8803	1.73	115.69	K	R	-1	-1	0.95	37.18	7.39	54.48	-1	1.19	4724
K88	8803	1.59	117.42	K	R	-1	-1	0.81	26.66	7.19	65.34	-1	0.57	5828
K88	8803	0.3	157.23	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8804	1.16	22.29	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8804	0.75	28.8	J	R	-1	-1	0.81	32.13	5.55	61.51	-1	-1	5161
K88	8804	0.43	39.55	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8804	0.45	56.25	?	R	-1	-1	1.09	39.08	5.25	54.58	-1	-1	4705
K88	8804	3.3	82.76	I	R	-1	-1	0.61	39.19	5.89	54.31	-1	0.31	4574
K88	8804	0.94	86.06	I	R	-1	-1	1.45	64.48	6.17	27.9	-1	0.18	2146
K88	8804	3.34	87	I	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8804	1.61	90.34	I	R	-1	-1	1.09	16.1	4.44	78.37	-1	0.45	6826
K88	8804	2.1	138	H	R	-1	-1	0.69	34.46	5.38	59.47	-1	0.54	5113
K88	8804	1.17	140.1	H	R	-1	-1	0.74	57.86	6.04	35.36	-1	-1	2837
K88	8804	1.8	141.27	H	R	-1	-1	1.05	25.76	4.51	68.68	-1	0.37	5866
K88	8805	1.35	16.82	K/L	R	-1	-1	0.84	55.3	5.49	38.37	-1	0.61	3074
K88	8805	1.22	30.58	K	R	-1	-1	0.92	24.34	5.6	69.14	-1	0.61	6212
K88	8805	0.84	85.46	J	R	-1	-1	1.01	22.63	5.37	70.99	-1	-1	6000
K88	8805	0.58	119.62	I	R	-1	-1	0.77	20.05	7.72	71.46	-1	-1	6298
K88	8805	0.87	120.2	I	R	-1	-1	0.87	89.41	6.36	3.36	-1	-1	212
K88	8805	3.04	121.7	I.	R	-1	-1	1.56	25.22	5.61	67.61	-1	0.41	5890
K88	8805	2.55	124.11	I	R	-1	-1	1.15	11.89	4.3	82.66	-1	0.48	7273
K88	8806	4.33	28.85	K	R	-1	-1	1.15	40.8	7.79	50.26	-1	-1	4421
K88	8806	2.96	33.56	K	R	-1	-1	1	39.02	10.81	49.17	-1	-1	4445
K88	8806	1.25	126.75	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8806	2.02	219	K/L	R	-1	-1	1.02	47.72	6.9	44.36	-1	3.75	3979
K88	8807	2.2	51.16	I	R	-1	-1	1.35	44.5	6.26	47.89	-1	1.13	4225
K88	8807	4.48	54.71	I	R	-1	-1	1.88	31.89	7	59.23	-1	0.68	5285
K88	8807	0.33	85.79	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8807	1.42	175.55	G	R	-1	-1	1.92	29.56	5.78	62.74	-1	1.72	5505
K88	8809	0.4	18.65	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8809	0.95	57.02	L	R	-1	-1	0.8	68.77	8.92	21.51	-1	-1	1686
K88	8809	4.29	79.8	K/L	R	-1	-1	1.81	37.96	6.28	53.95	-1	0.44	4748
K88	8809	1.77	97.42	K	R	-1	-1	1.64	42.17	5.87	50.32	-1	0.35	4349
K88	8809	1.61	146.53	I	R	-1	-1	1.49	38.15	6.17	54.19	-1	0.3	4614
K88	8809	3.04	148.14	I	R	-1	-1	1.7	11.34	4.62	82.34	-1	0.33	7160
K88	8809	2.55	192.32	H	R	-1	-1	1.5	37.3	5.78	55.42	-1	0.64	4820
K88	8810	4.66	35.41	M	R	-1	-1	1.05	0.66	10.66	45.45	-1	-1	4075
K88	8810	2.24	40.07	M	R	-1	-1	0.88	73.81	13.91	11.4	-1	-1	595
K88	8810	2.88	60.81	L	R	-1	-1	1.44	61.81	7.5	29.45	-1	0.2	2601
K88	8810	4.97	83.42	K/L	R	-1	-1	1.9	49.21	8.19	40.7	-1	0.46	3609
K88	8810	2.28	108.72	K	R	-1	-1	1.82	34.72	9.22	54.24	-1	0.35	4932
K88	8810	1.55	154.64	I	R	-1	-1	1.78	42.98	6.09	49.15	-1	0.31	4416
K88	8810	2.93	156.19	I	R	-1	-1	1.1	24.09	5.75	69.06	-1	0.39	6052
K88	8810	4.54	191.6	H	R	-1	-1	1.71	36.38	6.51	55.4	-1	0.61	4906
K88	8811	1.27	31.45	L	R	-1	-1	1.18	37.7	6.27	54.85	-1	0.45	4963
K88	8811	1.71	51.69	?	R	-1	-1	1.57	63.37	6.57	28.49	-1	0.22	2381
K88	8811	1.58	53.4	?	R	-1	-1	1.55	70.91	7.61	19.93	-1	0.41	1703
K88	8811	1.55	54.98	?	R	-1	-1	1.57	63.29	6.25	28.89	-1	0.24	2329
K88	8811	1.6	65	?	R	-1	-1	1.56	79.8	5.22	13.42	-1	0.33	1206
K88	8811	6.72	66.6	?	R	-1	-1	1.6	72.66	8.71	17.03	-1	0.31	1622
K88	8811	1.96	77.75	K/L	R	-1	-1	1.36	49.25	7.44	41.95	-1	0.49	3671
K88	8811	3.08	79.71	K/L	R	-1	-1	1.13	70.34	4.8	23.73	-1	-1	1469
K88	8811	7.29	113.41	K	R	-1	-1	1.64	37.86	8.04	52.46	-1	0.38	4700
K88	8811	1.73	179.08	I	R	-1	-1	1.44	39.17	6.92	52.47	-1	0.33	4958
K88	8811	3.45	180.81	I	R	-1	-1	1.44	14.99	6.93	76.64	-1	0.43	6995
K88	8811	1.96	234.94	H	R	-1	-1	1.81	43.34	7.5	47.35	-1	0.28	4294
K88	8811	2.22	236.9	H	R	-1	-1	1.88	26.49	6.73	64.9	-1	0.37	5911
K88	8812	5.64	4.62	I	R	-1	-1	1.33	29.35	6.54	62.78	-1	-1	5479
K88	8812	4.8	22.91	K/L	R	-1	-1	1	33.65	11.87	53.48	-1	-1	4829
K88	8812	1.02	30.1	K	R	-1	-1	1.28	31.52	7.84	59.36	-1	-1	4676
K88	8812	1	32.12	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8812	0.63	62.3	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8812	3.88	95.7	I	R	-1	-1	1.13	30.88	5.37	62.62	-1	-1	5073
K88	8812	4.36	161.73	I	R	-1	-1	1.07	15.28	5.55	78.1	-1	0.46	6905
K88	8812	2.21	166.59	I	R	-1	-1	1.29	24.1	5.3	69.31	-1	0.4	6076
K88	8813	2.65	18.8	L	R	-1	-1	1.31	41.51	9.84	47.34	-1	0.35	4275
K88	8813	1.06	37.62	K/L	R	-1	-1	1.5	51.03	6.92	40.55	-1	0.43	3666
K88	8813	3.54	95.62	K	R	-1	-1	0.93	32.94	7.4	58.73	-1	0.39	5295
K88	8813	0.91	100.09	K	R	-1	-1	1.38	36.85	5.5	56.27	-1	0.81	5023

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K88	8813	0.51	126.77	J	R	-1	-1	0.64	46.68	6.18	46.5	-1	0.54	4001
K88	8813	3.18	161.29	I	R	-1	-1	0.52	18.44	6.81	74.23	-1	0.4	6718
K88	8813	1.26	164.47	I	R	-1	-1	0.42	11.99	6.88	80.71	-1	0.53	7284
K88	8813	3.08	208.4	H	R	-1	-1	1.44	42.75	6.89	48.92	-1	0.57	4218
K88	8813	1.89	211.48	H	R	-1	-1	1.37	26.1	8.01	64.52	-1	0.37	5894
K88	8814	2.38	29.47	K	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8814	0.58	48.04	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8814	1.71	78.51	I	R	-1	-1	1.33	33.14	6.93	58.6	-1	0.38	5207
K88	8814	1.6	80.22	I	R	-1	-1	1.47	21.62	5.84	71.07	-1	0.41	6303
K88	8814	1.88	119.07	H	R	-1	-1	1.63	29.32	6.18	62.87	-1	0.49	5570
K88	8815	2.28	24.37	L	R	-1	-1	1.34	40.85	7.75	50.06	-1	-1	4495
K88	8815	2.31	35.57	K/L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8815	3.72	61.08	K	R	-1	-1	1.05	22.99	8.4	67.56	-1	0.45	6138
K88	8815	0.87	64.8	K	R	-1	-1	1.4	38.19	7.61	52.8	-1	0.41	4758
K88	8815	1.09	97.52	J	R	-1	-1	1.31	38.77	7.61	52.31	-1	0.56	4696
K88	8815	0.65	98.61	J	R	-1	-1	0.88	75.02	9.36	14.75	-1	-1	1290
K88	8815	3.31	126.73	I	R	-1	-1	1.15	31.79	6.74	60.32	-1	0.33	5436
K88	8815	3.92	130.04	I	R	-1	-1	1.43	28.45	7.32	62.8	-1	0.32	5682
K88	8815	0.69	133.96	I	R	-1	-1	1.53	12.7	6.38	79.39	-1	0.44	7146
K88	8815	0.52	203.59	H/L	R	-1	-1	1.09	36.13	6.96	55.82	-1	-1	4987
K88	8815	2.51	209.6	H	R	-1	-1	1.51	48.91	8.18	41.4	-1	0.28	3542
K88	8815	1.44	212.11	H	R	-1	-1	1.38	23.63	6.57	68.42	-1	0.42	6109
K88	8816	2.01	35.01	I	R	-1	-1	1.28	45.72	7.69	45.31	-1	-1	4012
K88	8816	3.27	37.02	I	R	-1	-1	1.14	15.46	5.1	78.3	-1	-1	6893
K88	8816	3.32	77.91	H	R	-1	-1	1.22	53.37	7.86	37.55	-1	1.16	3265
K88	8816	1.94	81.23	H	R	-1	-1	1.32	24.19	6.97	67.52	-1	0.39	6000
K88	8817	1.6	24.08	G	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8817	0.85	58.8	I	R	-1	-1	1.29	55.8	5.03	38.08	-1	0.32	2938
K88	8817	5.46	79.55	I	R	-1	-1	1.05	23.52	8.64	66.79	-1	-1	6059
K88	8817	4.02	85.01	I	R	-1	-1	0.76	23.91	9.25	66.08	-1	-1	5966
K88	8818	1.94	47.08	M	R	-1	-1	1.11	67.65	9.9	21.34	-1	-1	1901
K88	8818	2.78	49.02	M	R	-1	-1	1.11	42.59	8.41	47.89	-1	-1	4232
K88	8818	1.38	72.54	L	R	-1	-1	1.03	22.28	6.81	69.88	-1	-1	6324
K88	8818	0.93	73.92	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8818	0.72	85.53	K/L	R	-1	-1	0.94	35.33	7.25	56.48	-1	0.5	5166
K88	8818	3	143.57	K	R	-1	-1	1.19	23.23	7.46	68.12	-1	0.43	6124
K88	8818	1.09	146.57	K	R	-1	-1	1.25	62.3	7.18	29.27	-1	0.32	2766
K88	8818	1.19	147.66	K	R	-1	-1	1	43.2	6.38	49.42	-1	0.57	4309
K88	8818	0.62	170.96	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8818	4.73	196.77	I	R	-1	-1	1.12	29	7.56	62.32	-1	0.34	5625
K88	8818	1.78	199.72	I	R	-1	-1	1.11	9.99	6.08	82.82	-1	0.47	7468
K88	8818	2.49	238	H/I	R	-1	-1	1.14	36.58	7.26	55.02	-1	0.42	4975
K88	8818	1.45	250.5	H	R	-1	-1	0.52	84.21	5.72	9.55	-1	-1	779
K88	8818	1.92	251.95	H	R	-1	-1	1	55.84	5.75	37.41	-1	0.38	3179
K88	8819	2.56	18.72	G	R	-1	-1	1.07	34.84	6.67	57.42	-1	-1	5204
K88	8819	2.41	21.28	G	R	-1	-1	1.38	64.21	7.36	27.05	-1	-1	2372
K88	8819	2.46	53.04	G	R	-1	-1	0.88	30.74	7.42	60.96	-1	-1	5498
K88	8819	2.01	55.5	G	R	-1	-1	1.93	72.53	7.28	18.26	-1	-1	1476
K88	8819	6.83	57.51	G	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8819	0.47	64.34	G	R	-1	-1	1.12	41.71	6.92	50.25	-1	-1	4371
K88	8819	5.52	117.84	G	R	-1	-1	1.27	38.64	6.76	53.33	-1	-1	4760
K88	8820	0.65	27.16	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8820	0.95	80.65	I	R	-1	-1	1.08	34.64	8.43	55.85	-1	-1	5192
K88	8820	0.8	114.66	H	R	-1	-1	1.11	50.2	7.74	40.95	-1	-1	3618
K88	8820	1.28	116.75	H	R	-1	-1	0.9	42.22	9.2	47.68	-1	0.38	4330
K88	8821	1.38	29.77	I	R	-1	-1	0.85	24.34	6.13	68.68	-1	0.37	6069
K88	8821	1.58	31.15	I	R	-1	-1	0.68	38.87	7.87	52.58	-1	0.31	4707
K88	8821	1.73	32.73	I	R	-1	-1	1.66	13.29	7.09	77.96	-1	0.43	7062
K88	8821	2.91	73.16	H	R	-1	-1	1.83	33.03	6.83	58.31	-1	0.53	5242
K88	8822	0.95	52.44	O	R	-1	-1	1.33	34.32	6.2	58.15	-1	1.4	5266
K88	8823	1.63	11.35	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8823	1.87	39.39	P	R	-1	-1	0.94	41.39	10.16	47.51	-1	-1	4309
K88	8823	1.97	59.35	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8824	0.74	73.63	?	R	-1	-1	1.1	39.03	7.38	52.49	-1	-1	4779
K88	8824	1.03	74.93	?	R	-1	-1	1.29	38.42	7.01	53.28	-1	1.12	4841
K88	8824	1.85	95.82	P	R	-1	-1	1.32	31.5	7.4	59.78	-1	1.01	5445
K88	8825	1.63	30.11	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8826	1.61	35.61	K/L	R	-1	-1	1.54	48.27	6.8	43.39	-1	0.49	3731
K88	8826	1.14	87.5	K	R	-1	-1	1.44	70.49	6.74	21.33	-1	-1	1982
K88	8826	1.67	104.18	J	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8826	3.36	127.33	I	R	-1	-1	1.33	23.48	5.45	69.74	-1	0.35	6078

TABLE 3 con't. KLAPPAN RAW COAL QUALITY FROM DRILL HOLES

YR	HOLE	THICK	TOP	SEAM	T	Rmax	REC	ADM	ASH	VM	FC	FSI	SULF	CV
K88	8826	1.75	130.69	I	R	-1	-1	1.88	8.94	4.89	84.29	-1	0.43	7488
K88	8827	0.81	12.24	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8827	2.09	27.52	K/L	R	-1	-1	1.71	37.39	6.63	54.27	-1	0.58	4760
K88	8827	4.36	29.61	K/L	R	-1	-1	1.12	50.26	6.09	42.53	-1	-1	3578
K88	8827	1.9	47.97	K	R	-1	-1	1.93	43.8	8.05	46.22	-1	0.45	4141
K88	8827	1.08	109.98	I	R	-1	-1	1.16	56.23	8.42	34.19	-1	-1	5350
K88	8827	1.67	111.06	I	R	-1	-1	1.71	15.29	4.32	78.68	-1	0.54	7048
K88	8827	5.71	160.3	I	R	-1	-1	1.44	18.4	4.43	75.73	-1	0.63	6635
K88	8827	3.62	166.01	I	R	-1	-1	1.12	35.27	4.72	58.89	-1	0.33	5197
K88	8828	2.23	66.73	N	R	-1	-1	1.14	42.7	6.39	49.77	-1	0.4	4547
K88	8828	0.69	87.29	O	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8828	1.12	93.07	N	R	-1	-1	1.14	38.91	7.7	54.25	-1	0.4	5008
K88	8828	0.53	113.38	M/N	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8828	0.39	121.43	?	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8828	0.63	140.91	M	R	-1	-1	1.57	35.04	7.67	55.72	-1	-1	5168
K88	8828	2.26	143.98	M	R	-1	-1	1.95	36.38	9.02	52.65	-1	0.41	4946
K88	8828	0.33	159.78	L	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8829	2.74	43.16	N	R	-1	-1	1.65	44.8	9.04	44.51	-1	4.57	4115
K88	8829	6.98	70.84	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8829	1.25	77.82	M	R	-1	-1	1.41	42.62	7.82	48.15	-1	0.57	4149
K88	8829	3.16	79.66	M	R	-1	-1	-1	-1	-1	-1	-1	-1	-1
K88	8829	1.71	82.82	M	R	-1	-1	1.3	48.61	9.88	40.21	-1	0.48	3666
K88	8829	3.01	110.71	L	R	-1	-1	1.79	30.06	6.37	61.78	-1	0.41	5529
K88	8829	1.46	143.84	K/L	R	-1	-1	1.55	40.1	9.66	48.69	-1	0.41	4435
K88	8829	1.54	145.3	K/L	R	-1	-1	1.1	64.47	7.26	27.17	-1	-1	2066
K88	8829	3.01	149.84	K/L	R	-1	-1	1.93	38.8	10.55	50.72	-1	0.39	4540

DATA SOURCES

Coalfile Assessment Report Numbers 110,111,695,709,706,707,710,722,723

ABBREVIATIONS

YR = Year drilled
HOLE = hole designation
THICK = Vertical coal thickness
TOP = Depth to top of intersection
T = Type of analysis R=raw
Rmax = Mean maximum reflectance
REC = Core recovery
ADM = Air-dried moisture; all analyses reported at ADM
ASH = Ash percent
VM = Volatile matter percent
FC = Fixed carbon percent
FSI = Free swelling index
SULF = Total sulphur percent
CV = Calorific value in calories per gram
MJ/kg = calories per gram x .004186

APPENDIX 2
TABLE 4

MOUNT BIERNES AREA COAL QUALITY

YR	ID	HIC	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
B90	009A	2.5	190172	0.8	I	-1	-1	21.4	29.6	13.1	35.9	-1	-1	3221
B90	009A	2.5	190171	0.8	I	-1	-1	20.7	31.5	11.9	35.9	-1	-1	3250
B90	009A	2.5	190170	0.5	I	-1	-1	22.5	22.8	12.6	42.1	-1	-1	3770
B90	009B	0.6	190169	0.6	I	-1	-1	25.9	13.6	13.8	46.7	-1	-1	4248
B90	009C	0.6	190168	0.3	I	2.86	-1	23.6	27.3	9.6	39.4	-1	-1	3555
B90	10	1.5	190173	1.5	T	2.73	-1	19.8	24.2	8.3	47.7	-1	-1	4454
B90	11	1.45	190179	0.3	I	-1	-1	23.1	36.5	14.4	25.9	-1	-1	2455
B90	11	1.45	190177	0.3	I	-1	-1	33.5	21.3	15.1	30.1	-1	-1	2991
B90	11	1.45	190175	0.3	I	2.94	-1	33.5	15.4	15.6	35.5	-1	-1	3263
B90	11	1.45	190174	0.3	I	-1	-1	37.7	13.6	16.8	31.9	-1	-1	2955
B90	12	1.5	190180	0.7	I	2.76	-1	22.2	17.8	16.6	43.4	-1	-1	4097
B90	13	1.25	190181	1.1	I	2.65	-1	28.1	24.4	13.5	34	-1	-1	3210
B90	14	0.9	190182	0.9	T	2.71	-1	24.7	10.6	14.1	50.6	-1	-1	4866
B90	17	1.5	190191	0.85	I	2.53	-1	12.7	37.6	9.5	40.2	-1	-1	3769
B90	18	2.2	194156	0.3	I	-1	-1	19.7	26.2	16.1	38	-1	-1	3528
B90	18	2.2	194154	0.3	I	-1	-1	12.3	39.8	10.6	37.3	-1	-1	3184
B90	18	2.2	194153	0.3	I	-1	-1	26.4	22.2	15.4	36	-1	-1	3424
B90	18	2.2	194151	0.6	I	2.8	-1	18.9	12.3	15.5	53.3	-1	-1	4047
B90	18	2.2	194152	0.3	I	-1	-1	26.2	12.1	19.7	42	-1	-1	5010
B90	19	1.5	194160	0.4	I	2.96	-1	-1	-1	-1	-1	-1	-1	-1
B90	20	2.1	194161	0.7	I	3.09	-1	10.5	33.3	7.8	48.4	-1	-1	4505
B90	21	0.6	194163	0.6	T	2.79	-1	20.6	23.5	13.9	42	-1	-1	3891
B90	22	0.8	194164	0.8	T	2.67	-1	21.3	34.5	14.9	29.3	-1	-1	2689
B90	23	1.53	194165	1.53	T	2.95	-1	20.9	19.3	17.9	41.9	-1	-1	3928
B90	24	0.3	194166	0.3	T	2.95	-1	22.3	23.1	13.9	40.7	-1	-1	3819
B90	8	0.6	190190	0.3	I	3.33	-1	18.2	30.2	11.9	39.7	-1	-1	3481

DATA SOURCES
Dawson and Ryan (1990)

KONIGUS AND SWEENY CREEKS AREA COAL QUALITY

YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
S90	1	1.6	190185	0.3	I	-1	-1	24.6	10.3	8.6	56.6	-1	-1	5038
S90	1	1.6	190184	0.7	I	-1	-1	15.1	13.8	8.6	56.5	-1	-1	5524
S90	1	1.6	190167	0.6	I	4.02	-1	9.8	11.9	10.6	67.7	-1	-1	6089
S90	2	9.5	179699	0.5	I	-1	-1	0.8	80.5	4	14.7	-1	0.09	2275
S90	7	2.8	190186	0.2	I	-1	-1	12.6	41	7.4	39	-1	-1	3483
S90	7	2.8	190188	0.35	I	3.32	-1	-1	-1	-1	-1	-1	-1	-1
S90	7	2.8	190187	0.5	I	-1	-1	18.5	25.6	9.2	46.7	-1	-1	4213
S90	16	0.9	190189	0.9	T	3.4	-1	19.1	22.8	12.2	45.9	-1	-1	4184
C85	JFS04	0.7	-1	-1	R	2.57	-1	5.4	8.1	12.8	-1	-1	-1	-1
C85	JFS7A	0.22	-1	-1	R	3.24	-1	4.3	4.2	9.9	-1	-1	-1	-1
C85	JFS7B	0.22	-1	-1	R	-1	-1	6.7	8.1	14.9	-1	-1	-1	-1
C85	JFS7C	0.22	-1	-1	R	2.92	-1	4.9	21.8	12.4	-1	-1	-1	-1
C85	JFS08	0.9	-1	-1	R	2.96	-1	5.1	18.9	14.2	-1	-1	-1	-1
C85	JFS10	1.57	-1	-1	R	2.56	-1	5.4	6.5	13.3	-1	-1	-1	-1
C90	D9028	0.2	194174	0.2	R	2.84	-1	21.3	13.6	13.4	51.7	-1	-1	4774
C90	D9031	0.6	194180	0.3	R	2.48	-1	5.7	37.7	7.3	49.3	-1	-1	4650
C90	D9032	1.3	194187	0.2	R	-1	-1	5.5	24.6	7.5	62.3	-1	-1	5807
C90	D9032	1.3	194185	0.2	R	-1	-1	6.5	23.7	7.5	62.3	-1	-1	5851
C90	D9032	1.3	194183	0.2	R	2.56	-1	12.7	29.7	8.2	49.4	-1	-1	4535
C90	D9032	1.3	194181	0.3	R	-1	-1	10.9	26.5	8.1	54.5	-1	-1	4992
C90	D9033	0.2	194188	0.2	R	2.3	-1	21.4	29.6	13.1	35.9	-1	-1	3221

DATA SOURCES
Dawson and Ryan (1990) for S90 and C90
Coalfile Assessment Report Number 714 for C85

ID = Reference number in original paper
Thick = Total reported thickness
EXP = Type of excavation or trench designation in original report
INC = coal increment thickness
T = Analysis on Total SAMPLE (T) or coal increment (I)
Rmax = Mean maximum reflectance
M = Moisture as reported

ASH = Ash content
VM = Volatile matter content
FC = Fixed carbon content
FSI = Free swelling index
SULF = Sulphur content
CV = Calorific value in calories per gram
MJ/kg = calories per gram x 0.004186

TZHANY RIDGE AREA COAL QUALITY

YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
L50	BL39	1.07	TUNEL	-1	T	-1	-1	4.55	24.79	5.82	64.84	-1	1.73	5572
L50	BL39	0.95	TUNEL	-1	T	-1	-1	4.52	20.77	4.88	69.83	-1	2.22	6506
L50	BL39	1.07	TUNEL	-1	T	-1	-1	3.65	30.87	4.64	60.84	-1	1.73	5528
L50	BL40	1.22	SURFCE	-1	T	-1	-1	4.85	45.45	8.3	41.4	-1	0.21	3744
L50	BL40	1.22	SURFCE	-1	T	-1	-1	12.35	37.7	21.2	28.75	-1	0.82	2261
L50	BL40	1.26	SURFCE	-1	T	-1	-1	4.65	40.45	7.95	46.95	-1	0.75	2816
L50	BL40E	2.02	SURFCE	-1	T	-1	-1	7.1	38.85	13.45	40.6	-1	0.96	3656
L50	BL41	0.91	SURFCE	-1	T	-1	-1	5.1	24.25	5.82	68.43	-1	1.1	5306
L50	BL42	1.83	SURFCE	-1	T	-1	-1	8.48	22.23	15.59	56.7	-1	1.58	5744
L50	BL47	1.37	SURFCE	-1	T	-1	-1	5.85	40.95	11.27	41.92	-1	1.1	3133
L50	BL49	0.91	SURFCE	-1	T	-1	-1	10.45	44.65	21	23.9	-1	1.17	2872
L50	BL49	1.02	SURFCE	-1	T	-1	-1	6.3	40.6	14.85	38.25	-1	0.41	4261
L50	BL49	1.47	SURFCE	-1	T	-1	-1	9.95	42.15	17.45	30.45	-1	0.34	2956
L50	BL51	0.86	SURFCE	-1	T	-1	-1	8.85	43.95	18.75	28.45	-1	0.21	4344
L50	BL53	1.14	SURFCE	-1	T	-1	-1	6.6	37.45	15.1	40.85	-1	0.48	3917
L50	BL45	1.83	SURFCE	-1	T	-1	-1	5.02	21.65	6.38	66.95	-1	-1	-1
L50	BL55	-1	SURFCE	-1	T	-1	-1	4.25	27.85	4.35	63.55	-1	0.62	6350
L50	BL55	1.28	SURFCE	-1	T	-1	-1	3.4	31	5.33	60.27	-1	-1	-1
B89	16	-1	179679	0.5	O	5.38	-1	17.3	41.1	11.1	30.5	-1	0.24	2782
B89	17	2	179678	0.45	I	5.25	-1	34	34.3	13.8	17.9	-1	0.16	1647
B89	18	2.1	179674	0.5	I	4.74	-1	18.4	28.4	8.5	44.7	-1	0.41	3765
B89	18	2.1	179673	1.6	I	4.72	-1	18.6	26.8	9.4	45.2	-1	0.44	3839
B89	19	2	179677	2	T	-1	-1	27.6	36.3	13.2	22.9	-1	0.18	2109
B89	20	4.95	179676	0.9	I	-1	-1	31.5	43.1	13.5	11.9	-1	0.11	1264
B89	20	4.95	179675	0.9	I	4.97	-1	25.5	39.8	14.3	20.4	-1	0.17	1919
B89	23	22.7	179669	1.1	I	4.72	-1	34.1	22.2	16.8	26.9	-1	0.18	2498
B89	23	22.7	179668	0.9	I	4.9	-1	33.1	25.2	17.3	24.4	-1	0.17	2366
B89	23	22.7	179670	5.2	I	4.95	-1	17.3	37.6	10.8	34.3	-1	0.22	3027
B89	23	22.7	179671	8.3	I	5.02	-1	18.8	31.6	10.9	38.7	-1	0.24	3493
B89	24	1.57	179663	0.67	I	4.86	-1	25.9	38.6	11.8	23.7	-1	0.15	2057
B89	24	1.57	179665	0.2	I	4.69	-1	24.7	41.7	11.5	22.1	-1	0.16	1880
B89	24	1.57	179667	0.3	I	4.92	-1	9.9	61.4	6.3	22.4	-1	0.15	1487
B89	25	3.07	179660	2.57	I	4.81	-1	13.8	35.9	4.8	45.5	-1	0.27	3772
B89	26	3.45	179657	0.5	I	4.98	-1	32.2	32.3	15.3	20	-1	0.14	1940
B89	26	3.45	179659	1.35	I	4.65	-1	28	32.2	14.2	25.4	-1	0.15	2378
B89	27	1.7	179656	1.4	I	4.71	-1	29.3	32.1	13.9	24.7	-1	0.16	2323
B89	28	-1	179655	-1	I	4.74	-1	19.1	24	12.5	44.4	-1	0.31	3890
B90	1	1.6	190185	0.3	I	-1	-1	24.6	10.3	8.6	56.6	-1	-1	5038
L50	BL39	1.07	TUNEL	-1	T	-1	-1	4.55	24.79	5.82	64.84	-1	1.73	5572
L50	BL39	0.95	TUNEL	-1	T	-1	-1	4.52	20.77	4.88	69.83	-1	2.22	6506
L50	BL39	1:07	TUNEL	-1	T	-1	-1	3.65	30.87	4.64	60.84	-1	1.73	5528
L50	BL40	1.22	SURFCE	-1	T	-1	-1	4.85	45.45	8.3	41.4	-1	0.21	3744
L50	BL40	1.22	SURFCE	-1	T	-1	-1	12.35	37.7	21.2	28.75	-1	0.82	2261
L50	BL40	1.26	SURFCE	-1	T	-1	-1	4.65	40.45	7.95	46.95	-1	0.75	2816
L50	BL40E	2.02	SURFCE	-1	T	-1	-1	7.1	38.85	13.45	40.6	-1	0.96	3656
L50	BL41	0.91	SURFCE	-1	T	-1	-1	5.1	24.25	5.82	68.43	-1	1.1	5306
L50	BL42	1.83	SURFCE	-1	T	-1	-1	8.48	22.23	15.59	56.7	-1	1.58	5744
YR	ID	THICK	EXP	INC	T	Rmax	REC	M	ASH	VM	FC	FSI	SULF	CV
L50	BL47	1.37	SURFCE	-1	T	-1	-1	5.85	40.95	11.27	41.92	-1	1.1	3133
L50	BL49	0.91	SURFCE	-1	T	-1	-1	10.45	44.65	21	23.9	-1	1.17	2872
L50	BL49	1.02	SURFCE	-1	T	-1	-1	6.3	40.6	14.85	38.25	-1	0.41	4261
L50	BL49	1.47	SURFCE	-1	T	-1	-1	9.95	42.15	17.45	30.45	-1	0.34	2956
L50	BL51	0.86	SURFCE	-1	T	-1	-1	8.85	43.95	18.75	28.45	-1	0.21	4344
L50	BL53	1.14	SURFCE	-1	T	-1	-1	6.6	37.45	15.1	40.85	-1	0.48	3917
L50	BL45	1.83	SURFCE	-1	T	-1	-1	5.02	21.65	6.38	66.95	-1	-1	-1
L50	BL55	-1	SURFCE	-1	T	-1	-1	4.25	27.85	4.35	63.55	-1	0.62	6350
L50	BL55	1.28	SURFCE	-1	T	-1	-1	3.4	31	5.33	60.27	-1	-1	-1
B89	16	-1	179679	0.5	O	5.38	-1	17.3	41.1	11.1	30.5	-1	0.24	2782
B89	17	2	179678	0.45	I	5.25	-1	34	34.3	13.8	17.9	-1	0.16	1647
B89	18	2.1	179674	0.5	I	4.74	-1	18.4	28.4	8.5	44.7	-1	0.41	3765
B89	18	2.1	179673	1.6	I	4.72	-1	18.6	26.8	9.4	45.2	-1	0.44	3839
B89	19	2	179677	2	T	-1	-1	27.6	36.3	13.2	22.9	-1	0.18	2109
B89	20	4.95	179676	0.9	I	-1	-1	31.5	43.1	13.5	11.9	-1	0.11	1264
B89	20	4.95	179675	0.9	I	4.97	-1	25.5	39.8	14.3	20.4	-1	0.17	1919
B89	23	22.7	179669	1.1	I	4.72	-1	34.1	22.2	16.8	26.9	-1	0.18	2498
B89	23	22.7	179668	0.9	I	4.9	-1	33.1	25.2	17.3	24.4	-1	0.17	2366
B89	23	22.7	179670	5.2	I	4.95	-1	17.3	37.6	10.8	34.3	-1	0.22	3027
B89	23	22.7	179671	8.3	I	5.02	-1	18.8	31.6	10.9	38.7	-1	0.24	3493
B89	24	1.57	179663	0.67	I	4.86	-1	25.9	38.6	11.8	23.7	-1	0.15	2057
B89	24	1.57	179665	0.2	I	4.69	-1	24.7	41.7	11.5	22.1	-1	0.16	1880
B89	24	1.57	179667	0.3	I	4.92	-1	9.9	61.4	6.3	22.4	-1	0.15	1487
B89	25	3.07	179660	2.57	I	4.81	-1	13.8	35.9	4.8	45.5	-1	0.27	3772
B89	26	3.45	179657	0.5	I	4.98	-1	32.2	32.3	15.3	20	-1	0.14	1940
B89	26	3.45	179659	1.35	I	4.65	-1	28	32.2	14.2	25.4	-1	0.15	2378
B89	27	1.7	179656	1.4	I	4.71	-1	29.3	32.1	13.9	24.7	-1	0.16	2323
B89	28	-1	179655	-1	I	4.74	-1	19.1	24	12.5	44.4	-1	0.31	3890
B90	1	1.6	190185	0.3	I	-1	-1	24.6	10.3	8.6	56.6	-1	-1	5038

DATA SOURCES
Buckham and Latour (1950) for L50 series
Dawson for B89 and B90 series

APPENDIX 3

TABLE 1. LOCATION OF DRILL HOLES IN THE BOWSER BASIN

PROPERTY		HOLE	EAST	NORTH	ELEV	DPTH	AZ	INCL	YR
GRUNDHOG		DDH-1	537538	6311223	1036	176	216	60	70
GRUNDHOG		DDH-2	542115	6301528	1295	172	000	90	70
GRUNDHOG		DDH-3	543263	6302054	1158	179	000	90	70
GRUNDHOG		DDH-4	543298	6300542	1127	153	000	90	70
GRUNDHOG		DDH-5	547667	6303600	1129	176	251	60	70
GRUNDHOG		DDH-6	545410	6300958	0929	168	000	90	70
PINK MTN.		P-1	509250	6321900	1402	63	270	50	71
PR COAL*	ZERO-MT	1	513100	6285140	0899	464	245	64	71
PR COAL*		2	495200	6287060	1051	471	071		
PANORAMA		DDH-81-0	534800	6292250					
PANORAMA		DDH-81-0	534800	6292250					
PANORAMA		DDH-81-0	534100	6291750					
PANORAMA		DDH-81-0	524500	6300300					
PANORAMA		DDH-81-0	524500	6300300					
PANORAMA		DDH-81-0	528950	6292950					
SKEENA R		81-H1	547956	6302696	0216				
SKEENA R		81-H2	545618	6301847	0148				
SKEENA R		81-H3	543834	6303498	0154				
SKEENA R		81-H4	543847	6306680	0205				
SKEENA R		81-H5	542316	6308623	0159				
SKEENA R		87-H6	540521	6308194	0133				
MT KLAPP	HOBBITCK	DDH82001	514375	6343645	1400	124	000	90	82
MT KLAPP	HOBBITCK	DDH82002	515445	6345134	1342	179	000	90	82
MT KLAPP	HOBBITCK	DDH82003	515540	6343325	1271	215	000	90	82
MT KLAPP	BROATCH	DDH82004	513515	6344510	1470	158	040	60	82
MT KLAPP	LOST RDG	DDH82005	506120	6344340	1815	244	055	60	82
MT KLAPP	BROATCH	DDH82006	512650	6344865	1489	173	345	60	82
MT KLAPP	SUMMIT S	DDH82007	504420	6347475	1315	130	005	70	82
MT KLAPP	LOST RDG	DDH83001	505704	6344261	1841	299	000	90	83
MT KLAPP	L KLAP N	DDH83002	503090	6342845	1484	111	000	90	83
MT KLAPP	SUMMIT S	DDH83003	501657	6349585	1825	193	230	60	83
MT KLAPP	LOST RDG	WKD83001	505758	6344339	1827	7	000	90	83
MT KLAPP	LOST RDG	WKD83002	505758	6344340	1827	18	000	90	83
MT KLAPP	LOST RDG	WKD83003	505758	6344324	1832	21	000	90	83
MT KLAPP	LOST RDG	WKD83004	505816	6344334	1824	31	000	90	83
MT KLAPP	LOST RDG	WKD83005	504620	6344670	1675	30	000	90	83
MT KLAPP	LOST RDG	WKD83006	504625	6344675	1675	19	205	70	83
LOST-FOX		KLRDDH 8	506370	6343933	1737	161	304	89	84
LOST-FOX		KLRDDH 8	506518	6344008	1736	270	032	58	84
LOST-FOX		KLRDDH 8	507378	6345034	1588	288	322	58	84
LOST-FOX		KLRDDH 8	506520	6344710	1654	298	350	79	84
LOST-FOX		KLRRDH 8	505964	6344140	1822	55	248	80	84
LOST-FOX		KLRRDH 8	505796	6344145	1832	69			84
LOST-FOX		KLRRDH 8	504693	6342342	1652	59	297	82	84
LOST-FOX		KLRRDH 8	504318	6342797	1715	44			84
LOST-FOX		KLRRDH 8	505805	6344134	1831	6	308	82	84
LOST-FOX		KLRRDH 8	505965	6344150	1826	37			84
LOST-FOX		KLRRDH 8	506095	6344093	1777	30			84
LOST-FOX		KLRRDH 8	505969	6344283	1827	37	334	86	84
LOST-FOX		KLRRDH 8	505888	6344198	1840	76	306	83	84
LOST-FOX		KLRRDH 8	506220	6344018	1754	14			84
LOST-FOX		KLRRDH 8	505958	6344129	1820	55	324	86	84
LOST-FOX		KLRRDH 8	506068	6344088	1779	50			84
LOST-FOX		KLRRDH 8	505266	6343940	1813	87	000	88	84
LOST-FOX		KLRRDH 8	506030	6343030	1675	23			84
LOST-FOX		KLRRDH 8	506012	6343042	1676	79			84
LOST-FOX		KLRRDH 8	507440	6344498	1588	101	000	86	84
LOST-FOX		KLRRDH 8	506661	6345239	1567	78	000	87	84
HOBBT-BR		KHCDDH 8	515122	6343199	1305	57	054	80	84
HOBBT-BR		KHCDDH 8	514718	6343532	1368	67	000	90	84
HOBBT-BR		KHCDDH 8	514905	6343225	1346	54	000	90	84
HOBBT-BR		KHCDDH 8	515238	6342792	1292	312	000	90	84
LOST-FOX		DDH85001	507255	6345720	1480	233	000	90	85
LOST-FOX		DDH85002	505875	6344199	1836	103	000	90	85
LOST-FOX		DDH85003	506328	6344439	1798	177	045	70	85
LOST-FOX		DDH85004	505875	6344199	1836	253	225	85	85
LOST-FOX		DDH85005	506692	6344398	1758	345	045	80	85
LOST-FOX		DDH85006	506101	6343993	1765	263	000	90	85
LOST-FOX		DDH85007	506330	6344169	1762	102	045	60	85
LOST-FOX		DDH85008	506350	6343921	1732	153	225	60	85
LOST-FOX		DDH85009	506330	6344169	1762	344	045	65	85

APPENDIX 3

TABLE 1 con't. LOCATION OF DRILL HOLES IN THE BOWSER BASIN

PROPERTY	HOLE	EAST	NORTH	ELEV	DPTH	AZ	INCL	YR
LOST-FOX	DDH85010	506921	6344571	1753	232	000	90	85
LOST-FOX	DDH85011	507125	6344833	1626	163	045	75	85
LOST-FOX	DDH85012	506131	6344661	1666	263	010	80	85
LOST-FOX	DDH85013	506378	6344850	1644	279	010	75	85
LOST-FOX	DDH85014	505607	6344886	1605	254	020	70	85
LOST-FOX	DDH85015	505423	6344510	1669	198	045	65	85
LOST-FOX	DDH85016	505929	6344869	1634	324	010	75	85
LOST-FOX	DDH85017	506805	6344834	1635	275	360	75	85
LOST-FOX	DDH85018	505470	6344973	1593	275	010	60	85
LOST-FOX	DDH85019	506845	6345161	1574	156	360	75	85
LOST-FOX	DDH85020	505450	6344003	1820	162	225	75	85
LOST-FOX	DDH85021	505628	6345238	1540	165	120	80	85
LOST-FOX	DDH85022	506630	6343550	1678	178	000	90	85
LOST-FOX	DDH85023	506617	6344165	1742	299	045	60	85
LOST-FOX	DDH85024	506360	6343685	1710	153	000	90	85
LOST-FOX	DDH85025	506420	6343436	1684	111	000	90	85
LOST-FOX	DDH85026	506857	6343431	1642	90	000	90	85
LOST-FOX	DDH85027	506959	6343063	1630	276	000	90	85
LOST-FOX	DDH85028	506257	6343176	1669	79	000	90	85
LOST-FOX	DDH85029	506524	6343261	1662	104	000	90	85
LOST-FOX	DDH85030	505778	6344306	1826	31	000	90	85
LOST-FOX	DDH85031	505718	6344325	1827	22	000	90	85
LOST-FOX	DDH85032	505844	6344292	1825	41	000	90	85
LOST-FOX	DDH85033	506019	6344259	1809	22	000	90	85
LOST-FOX	DDH85034	505908	6344261	1820	40	000	90	85
LOST-FOX	RDH85001	505750	6347520	1325	105	000	90	85
LOST-FOX	RDH85002	506060	6347170	1355	105	000	90	85
LOST-FOX	RDH85003	505410	6346830	1350	103	000	90	85
LOST-FOX	RDH85004	506310	6348490	1295	97	000	90	85
LOST-FOX	RDH85005	504103	6344941	1437	107	000	90	85
LOST-FOX	RDH85006	503281	6344104	1426	102	000	90	85
LOST-FOX	DDH 8600	505992	6344069	1797	81	000	90	86
LOST-FOX	DDH 8600	506123	6343591	1716	101	000	90	86
LOST-FOX	DDH 8600	505846	6345041	1607	98	025	75	86
LOST-FOX	DDH 8600	507152	6344684	1633	206	350	75	86
LOST-FOX	DDH 8600	506167	6344884	1623	103	360	80	86
LOST-FOX	DDH 8600	506566	6344957	1593	92	355	80	86
LOST-FOX	DDH 8600	507446	6344780	1569	169	000	90	86
LOST-FOX	DDH 8600	507081	6344918	1614	136	350	77	86
LOST-FOX	DDH 8600	507380	6344517	1596	209	078	78	86
LOST-FOX	DDH 8601	507616	6344713	1547	182	000	90	86
LOST-FOX	DDH 8601	507835	6344537	1534	66	000	90	86
LOST-FOX	DDH 8601	507019	6344327	1718	145	000	90	86
LOST-FOX	DDH 8601	507847	6344244	1537	182	000	90	86
LOST-FOX	DDH 8601	506892	6344042	1706	164	000	90	86
LOST-FOX	DDH 8601	507602	6344290	1563	106	000	90	86
LOST-FOX	DDH 8601	506636	6343292	1647	189	000	90	86
LOST-FOX	DDH 8601	506527	6343722	1703	127	000	90	86
LOST-FOX	DDH 8601	506220	6343398	1696	127	000	90	86
LOST-FOX	DDH 8601	506835	6343215	1622	200	000	90	86
LOST-FOX	DDH 8602	504614	6345278	1435	139	290	60	86
LOST-FOX	DDH 8602	506428	6343068	1643	118	000	90	86
LOST-FOX	DDH 8602	506733	6343008	1635	202	000	90	86
LOST-FOX	DDH 8602	503627	6345300	1397	109	000	90	86
LOST-FOX	DDH 8602	503600	6344707	1439	122	000	90	86
LOST-FOX	DDH 8602	506215	6342860	1657	231	000	90	86
LOST-FOX	DDH 8602	502858	6343948	1400	156	000	90	86
LOST-FOX	DDH 8602	505969	6343060	1672	173	000	90	86
LOST-FOX	DDH 8602	506188	6346990	1366	179	000	90	86
LOST-FOX	DDH 8602	505752	6343175	1691	156	300	70	86
LOST-FOX	DDH 8603	507888	6344803	1531	158	000	90	86
LOST-FOX	DDH 8603	505509	6343071	1700	151	000	90	86
LOST-FOX	DDH 8603	507804	6345039	1519	72	000	90	86
LOST-FOX	DDH 8603	508089	6344323	1524	170	000	90	86
LOST-FOX	DDH 8603	508167	6344599	1504	158	000	90	86
LOST-FOX	DDH 8603	508452	6344512	1502	212	000	90	86
LOST-FOX	DDH 8603	508347	6344851	1508	148	000	90	86
LOST-FOX	DDH 8603	506750	6342290	1642	161	000	90	86
LOST-FOX	DDH 8603	505425	6346177	1389	123	000	90	86
LOST-FOX	DDH 87001	508063	6345007	1507	132	000	90	87
LOST-FOX	DDH 87002	508173	6345394	1481	205	000	90	87

APPENDIX 3

TABLE 1 con't. LOCATION OF DRILL HOLES IN THE BOWSER BASIN

PROPERTY		HOLE	EAST	NORTH	ELEV	DPTH	AZ	INCL	YR
LOST-FOX		DDH 87003	508294	6345149	1493	102	000	90	87
LOST-FOX		DDH 87004	508531	6345072	1480	102	000	90	87
LOST-FOX		DDH87005	508231	6345612	1452	202	000	90	87
LOST-FOX		DDH87006	508433	6345330	1462	154	000	90	87
LOST-FOX		DDH87007	505992	6343325	1694	205	000	90	87
LOST-FOX		DDH87008	507878	6345454	1485	200	000	90	87
LOST-FOX		DDH87009	508266	6345828	1455	126	000	90	87
LOST-FOX		DDH87010	505255	6342982	1705	60	000	90	87
LOST-FOX		DDH87011	505255	6342981	1705	93	000	90	87
LOST-FOX		DDH87012	507950	6345680	1466	132	000	90	87
LOST-FOX		DDH87013	504339	6342487	1674	138	000	90	87
LOST-FOX		DDH87014	507707	6345653	1474	105	000	90	87
LOST-FOX		DDH87015	504253	6342109	1632	122	000	90	87
LOST-FOX		DDH87016	506631	6343562	1679	66	000	90	87
LOST-FOX		DDH87017	507505	6345801	1472	118	000	90	87
LOST-FOX		DDH87018	508843	6342328	1629	152	000	90	87
LOST-FOX		DDH87019	507468	6345556	1487	210	000	90	87
LOST-FOX		DDH87020	508245	6343088	1583	164	000	90	87
LOST-FOX		DDH87021	507990	6345236	1501	96	000	90	87
LOST-FOX		DDH87022	508630	6343790	1555	147	000	90	87
LOST-FOX		DDH87023	508573	6345709	1461	188	000	90	87
LOST-FOX		DDH87024	509313	6344343	1536	162	000	90	87
LOST-FOX		DDH87025	507124	6344833	1525	113	000	90	87
LOST-FOX		DDH87026	508677	6346045	1444	181	000	90	87
LOST-FOX		DDH87027	508323	6346025	1441	127	000	90	87
LOST-FOX		DDH87028	508644	6346510	1419	225	000	90	87
LOST-FOX		DDH87029	508210	6346467	1421	212	000	90	87
LOST-FOX		DDH87030	508236	6347236	1377	250	000	90	87
LOST-FOX		DDH87031	508783	6346976	1394	205	000	90	87
LOST-FOX		DDH87032	505861	6345000	1616	57	000	90	87
LOST-FOX		DDH87033	506457	6344799	1644	124	000	90	87
LOST-FOX		DDH87034	506207	6344896	1620	57	000	90	87
MT KLAPP	LOST RDG	LRDDH880	506939	6344959	1622	127	000	90	88
MT KLAPP	LOST RDG	LRDDH880	504524	6342603	1689	111	000	90	88
MT KLAPP	LOST RDG	LRDDH880	505627	6342752	1672	170	000	90	88
MT KLAPP	LOST RDG	LRDDH880	504450	6342222	1650	149	000	90	88
MT KLAPP	LOST RDG	LRDDH880	505390	6342795	1683	141	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506731	6343789	1697	255	000	90	88
MT KLAPP	LOST RDG	LRDDH880	505143	6342734	1690	188	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506854	6343611	1672	157	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506557	6342938	1638	204	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507072	6343278	1615	204	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507949	6344373	1520	244	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506484	6343220	1655	175	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507700	6344117	1557	224	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506380	6343258	1670	131	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507652	6344417	1559	223	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506349	6343552	1701	103	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506441	6343811	1716	170	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507386	6344349	1603	261	000	90	88
MT KLAPP	LOST RDG	LRDDH880	505694	6344022	1814	155	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507600	6344977	1531	136	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506647	6343411	1654	100	000	90	88
MT KLAPP	LOST RDG	LRDDH880	505620	6342274	1666	99	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507900	6343396	1574	99	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506335	6342396	1639	106	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507090	6342487	1640	102	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507974	6344068	1540	222	000	90	88
MT KLAPP	LOST RDG	LRDDH880	506605	6343132	1631	176	000	90	88
MT KLAPP	LOST RDG	LRDDH880	508436	6346457	1407	168	000	90	88
MT KLAPP	LOST RDG	LRDDH880	507394	6343984	1616	158	000	90	88

DATA SOURCES

Geological Survey Branch Coalfile database

PROPERTY = *Property name*
HOLE = *Hole designation*
EAST = *UTM easting in metres*
NORTH = *UTM northing in metres*
ELEV = *Elevation in metres*
DPTH = *Total drilled length in metres*

AZ = *Azimuth of hole*
INCL = *Inclination of hole from horizontal*
YR = *Year drilled*

APPENDIX 4
TABLE 1. BOWSER BASIN REFLECTANCE DATA

EAST	NORTH	Rmax
497750	6330000	4.8
536750	6297750	4.4
542250	6295500	5.6
542000	6297250	5.8
541250	6308750	5.2
547500	6303000	4.5
547000	6307500	3.7
547750	6309250	3.7
556000	6300750	5.2
556750	6302500	5.1
557750	6306500	5.2
556500	6307000	5
536000	6311250	4.5
539500	6311500	4.7
539750	6312250	4.7
547750	6314500	4.9
547500	6319500	5.2
556250	6315250	5
556250	6316250	4.8
556000	6317500	5.6
557750	6317750	5.4
557500	6319250	4.9
524000	6325000	5.7
558500	6320750	4.5
559500	6320500	5.3
559000	631250	5.4
554750	6326250	4.8
507250	6338250	3.9
508000	6344500	5.2
511500	6343500	4.1
530500	6343250	4.2
530500	6345750	4.2
514375	6343645	3.76
515445	6345134	3.55
515540	6343325	3.44
513515	6344510	3.56
506120	6344340	3.97
512650	6344865	3.74
504420	6347475	4.22
506518	6344008	4.11
507378	6345034	3.63
506520	6344710	3.47
507255	6345720	3.61
505875	6344199	3.79
515520	6343000	3.94
514335	6343710	3.5
516000	6344645	3.44
516040	6344890	3.74
515690	6345535	3.93
515350	6343220	3.5
514910	6343700	3.55
515050	6343525	3.6
515370	6343140	3.68
513495	6345655	3.31
515650	6343920	3.56
516330	6342740	3.48
514825	6341775	3.2
516010	6344715	3.57
512615	6345115	3.48
512245	6344905	3.46
512410	6344705	3.5
512338	6344620	3.74
513425	6345600	3.17
512100	6344750	3.6
516040	6345060	3.27
514290	6343660	3.53
514170	6343710	3.41
514455	6343730	3.66
515540	6343040	3.81
516050	6342680	3.37
514550	6343780	3.56
516430	6342780	3.18
514168	6341096	3.62
514537	6341150	3.59
515014	6342169	3.43
515315	6346770	3.52
498285	6350250	3.77
498490	6350210	3.69
498150	6350355	3.69
501355	6350116	3.49
501250	6349920	3.76
501960	6349810	3.38
505560	6349845	3.48
500911	6349116	3.92
505506	6344375	3.9
505435	6344390	3.92
509987	6344135	3.38
509910	6344266	3.4
510725	6345105	3.4
513425	6345605	3.25
497625	6341535	3.08
497145	6341455	3.64
496800	6341510	3.44
496415	6341590	3.63
496330	6341860	3.6
493150	6341765	3.9
493160	6341750	4.2
492455	6340465	4.3
494830	6339880	3
492595	6344480	4.8
492700	6344335	4.8
496400	6339935	3.4
510625	6338390	3.5
498225	6350265	3.8
500235	6350760	3.1
498460	6351965	3.1
501925	6350135	3.1
501875	6349840	3.4
499275	6350175	3.5
498110	6351890	3.2
490750	6345000	3.8
503370	6340843	4.6
543150	6301820	3.7
541810	6301575	4.2
542835	6304740	3.47
488720	6312140	2.57
479060	6317360	3.24
479060	6317360	2.92
476840	6319040	2.96
490820	6312520	2.56
550200	6294000	4.64
550280	6293900	3.81
550360	6293900	3.43
550400	6293780	4.18
546200	6298100	4.17
549140	6294760	4.39
549120	6294880	4.58
549000	6295580	4.69
545240	6299160	4.43
549240	6299900	5.16
548160	6300120	4.57
550120	6295060	4.39
548520	6298860	4.6
550720	6293740	3.56
549780	6294000	3.83
549000	6294340	4.45
549960	6294540	4.05
549700	6294200	4.35
555760	6301940	5.03
554860	6300780	5.17
551340	6292120	5.44
550320	6292140	4.02
551740	6293540	4.05
546520	6299200	4.84
550000	6292440	4.28
557700	6303660	5.38
557740	6303580	5.22
558460	6301180	5.48
558000	6301000	5.37
555000	6300700	5.38
554900	6300640	5.36
477450	6356050	2.65
477870	6356260	4.42
477760	6356210	3.46
490350	6335425	2.78
482925	6336200	3.32
501150	6315775	3.33
507400	6321275	2.86
507550	6321725	2.73
507000	6321350	2.94
506879	6321130	2.76
506500	6321350	2.65
506210	6321350	2.71
482660	6336200	3.4
501125	6315690	2.53
512375	6316230	2.8
512600	6315200	2.96
512525	6315200	3.09
512440	6316020	2.79
512325	6316040	2.67
512770	6315560	2.95
512700	6315200	2.95
496925	6341535	3.4
449400	6365425	3.14
465170	6358100	3.47
480425	6321460	2.84
493220	6342350	4.62
493210	6342160	4.83
481610	6322040	2.48
481540	6322110	2.56
481710	6322150	2.3
476500	6333275	4.02
649100	6238800	3.49
617600	6292000	3.34
530850	6289500	2.79
531525	6291550	2.85
531100	6291400	2.89
533625	6290600	2.93
550100	6291000	3.7
565200	6301450	5.38
557250	6303000	5.25
558200	6304900	4.74
556150	6314400	4.97
562350	6317600	4.96
561500	6316700	4.9
557500	6318500	4.86
561700	6316750	4.81
561600	6316550	4.98
561700	6316600	4.71
562550	6316800	4.74
493950	6358890	4.43
507400	6338426	3.63
496600	6341456	3.94
498700	6346250	5.2
498960	6347660	4.95
495680	6336485	3.23
497790	6351500	3.96
499145	6350287	4.22
500670	6351350	3.44
497975	6351960	3.86
498625	6347770	4.63
498215	6346465	5.14
528250	6313750	2.2
519000	6300000	2.6
538750	6301000	3.1
537000	6302750	2.7
552000	6306500	5.7
521750	6310000	3.4
546250	6310000	3.1
514500	6311250	3.4
526000	6313500	3.2
533000	6311750	2.7
513000	6319250	2.3
509250	6321000	2.3
501500	6325750	2.1
509500	6326250	2.1
499750	6333500	2.3
505300	6338250	2.7
532000	6300000	3.4
510750	6343250	4

DATA SOURCES: Dawson & Ryan, 1990; Bustin, 1984; Coalfile Assessement Reports listed in Appendix 1.