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## CBG (Coalbed gas) Opportunities in Southeastern British Columbia

# CROWSNEST COALFIELD



The Crowsnest coalfield is part of the East Kootenay coalfields in southeast BC. Located between the Elk River and the Alberta-BC border, it extends from southeast of Fernie to north of Sparwood. The field is 10-20 km wide, nearly 60 km long and occupies an area of about 60,000 ha (600 km<sup>2</sup>). World-class coal resources (nearly 27.7 billion tonnes) are contained in this coalfield, and Coalbed gas (CBG) in-place resource in the area is estimated to be 12 Tcf (Johnson and Smith; 1991).

Coal and surface ownership in the Crowsnest coalfield is a combination of provincial, freehold and federal. Most of the freehold coal is located in the northern part of the coalfield. Currently, surface land and coal rights in the Dominion Coal Blocks (DCB) are federally owned. The DCB consists of two parcels (parcel 73 and 82) combining an area of about 20,000 ha (200 km<sup>2</sup>) in total. Except for approximately 2,600 to 4,100 ha which is owned by Shell Canada, the province owns the petroleum and natural gas (P&NG) rights in the coalfield, including in the DCB. Where there is freehold coal, the Provincial Crown P&NG tenure may be acquired by the freehold coal owners.

The coal seams occur within the Jura-Cretaceous Mist Mountain Formation in a geological basin bounded by the Borgeau thrust fault on the west and in part by the Flathead fault on the east. Total coal thickness in the Mist Mountain Formation varies from an average of about 30 m on the east to 60 m on the west. The coal rank varies from low to high-volatile bituminous, increasing to the southwest and down dip into the center of the coalfield. Gas content is estimated to vary from 10.9 to 20.1 cc/gm (350-650 scf/t) (Dawson *et al.*; 1998).

Coal has been mined in the East Kootenay for over 100 years. Until the 1960s, most were underground coal mines, located close to the rail line along the western side of the Crowsnest coalfield. The coals at all these mines contained methane. Since 1970, large open pit mining has occurred at both the Elk View and Coal Mountain coal mines. It is estimated that about four billion tonnes of the total coal resource (~27.7 billion tonnes) may be mineable, of which only 100 million tonnes may be surface mineable (in addition to the existing two mines). Much of the surface mineable potential occurs in Dominion Coal Block Parcel 73 (76 million tonnes). Dominion Coal Block Parcel 82 has an underground mineable potential of 230 million tonnes.

CBG in-place resource in the Crowsnest coalfield is estimated at 12 Tcf (Johnson and Smith; 1991), of this 6.58 Tcf (0.65 Tcf for block 73 and 5.92 Tcf for block 82) is in the Dominion Coal Blocks (Dawson *et al.*, 1998). However, the geological complexity of the Crowsnest coalfield must be considered when projecting how much of the CBG may be recoverable. The coalfield forms part of the Lewis thrust sheet and therefore had a protracted deformational history. Initial thrusting was followed by folding in the late Cretaceous and extension on north-trending major faults in the Tertiary. The thrusting caused shearing within some seams that is unrelated to the amount of subsequent folding. This has possibly impacted permeability and generates fine coal that may make CBG production more difficult. Successful production will rely on understanding the interplay between deformation, the coal quality and the location of specific geologic structures. With these caveats in mind, the more prospective area may be where the Mist Mountain Formation is in the depth window of approximately 200 to 1000 metres. The total resource in the area where the Provincial Crown has both coal and P&NG titles is estimated in very general terms to be 2.78 Tcf (B.Ryan; 2003).

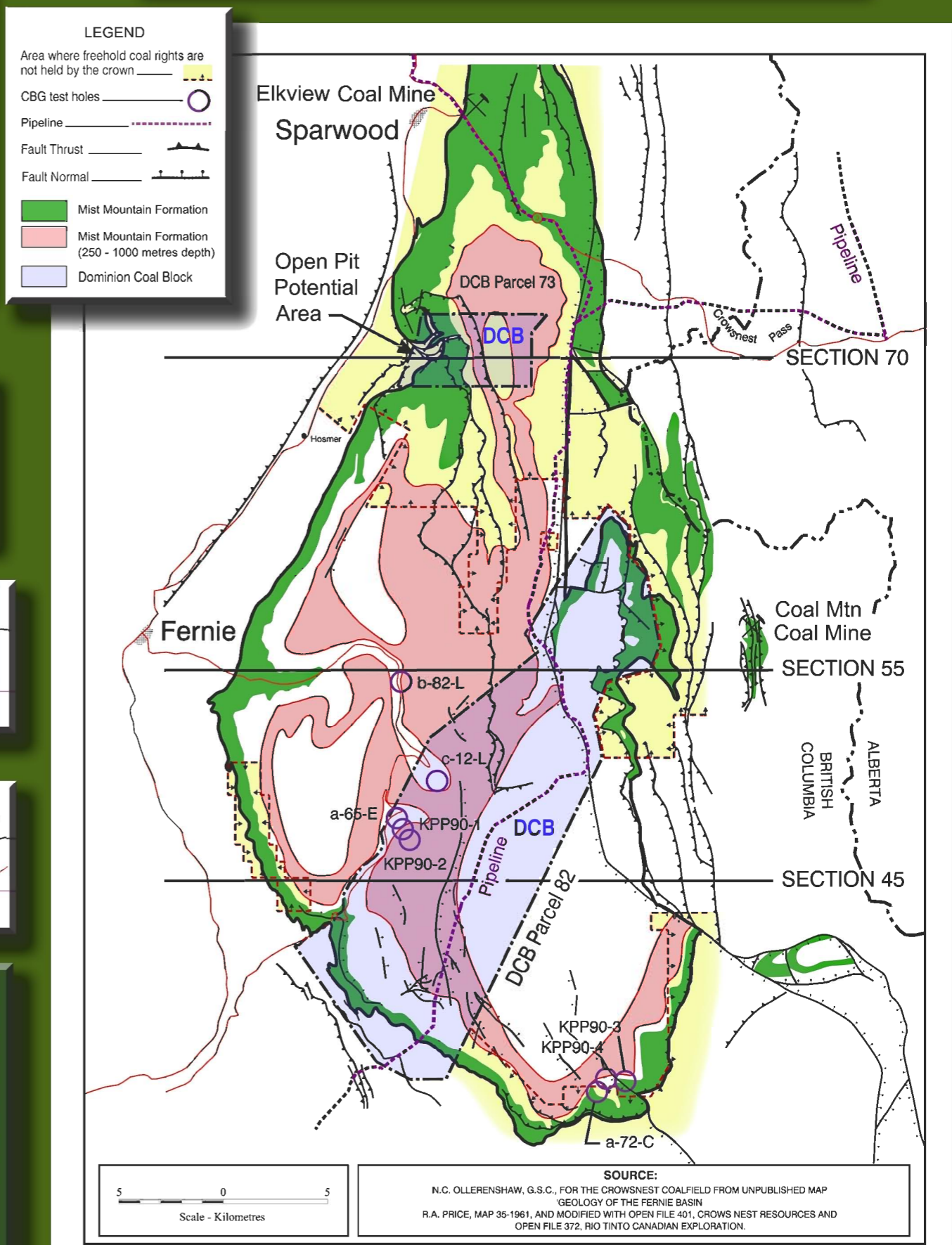
# Crowsnest Coalfield

Three companies drilled CBG exploration holes in the coalfield in the 1990s (Mobil/Chevron 2, Gulf Canada 2, Saskoil 4). CBG exploration projects were also conducted in Elk Valley (by Fording, Norcen, and Suncor in the 1990s), Greenhills (by Encana; present), and several Alberta Foothills locations.

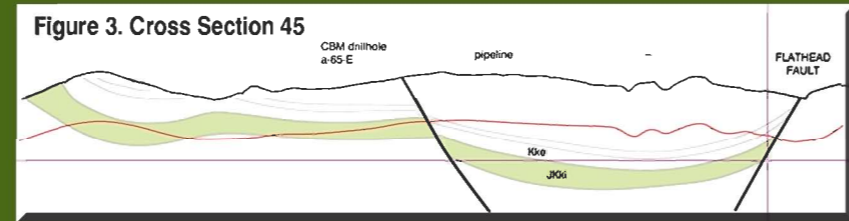
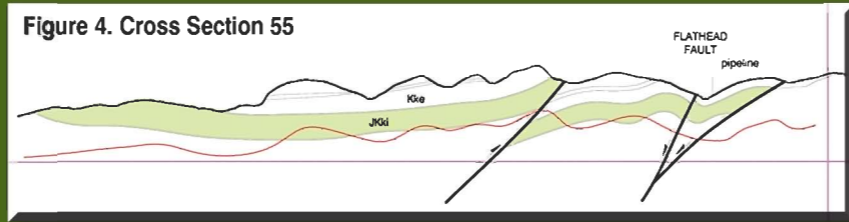
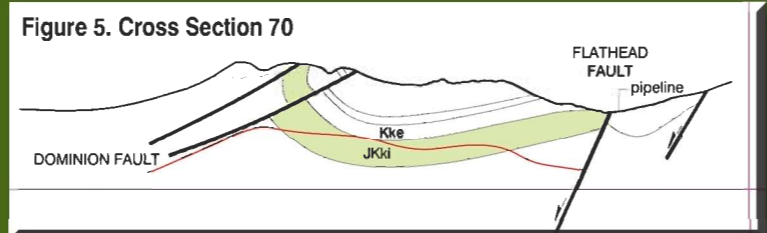
Potential CBG markets include BC, Alberta, and the US along with local markets for residential and industrial users. The TransCanada 36" pipeline, which connects Alberta gas fields with BC and the US market, trends from north to south through the coalfield. Terasen's 8" gas pipeline comes off this main line and serves the towns of Sparwood, Elkford and some of the mines. There are extensive electricity transmission systems, a major highway (Crowsnest Pass Highway #3), and a number of logging roads available in the area. Crowsnest coalfield is in the Ktunaxa-Kinbasket Tribal Council traditional territory. Treaty negotiations are progressing steadily and a specific oil and gas consultation agreement is being negotiated.

The Ministry of Energy and Mines is leading the CBG strategy, in collaboration with the Oil and Gas Commission, to facilitate and stimulate CBG projects across the province. The BC government has made various regulation and legislation changes to make CBG resource more attractive to potential developers and investors.

## GEOLOGY MAP OF THE CROWSNEST COALFIELD



### Figures 3 - 5. Cross Sections



Rocky Mountains and Foothills South		
TERTIARY	PORCUPINE HILLS FM.	
	WILLOW CREEK FM.	
	BATTLE FM.	
UPPER CRETACEOUS	ST. MARY RIVER FM.	
	BLOOD RESERVE FM.	
	BEARPAW FM.	
	BELLY RIVER FM.	
	ALBERTA GROUP	WAPIABI FM.
	CARDIUM FM.	
BLACKSTONE FM.		
LOWER CRETACEOUS	BLAIRMORE GROUP	CROWSNEST FM.
	MA BUTTE FM.	
	BEAVER MINES FM.	
	MA BUTTE FM.	
	CALCAREOUS MBR.	
	GLADSTONE FM.	
	CADOMIN FM.	
	POCATERRA CREEK MBR.	
	ELK FM.	
	KOOTENAY GROUP	MIST MOUNTAIN FM.
MOOSE MTN. FM.		
WEARY RIDGE MBR.		
JURASSIC	FERNIE GROUP	

From: Smith 1989

Figure 1. Stratigraphic Table from Smith (1989)

Resource type	Resource amount
Coal resource	27.7 bt
Mineable coal resource	22.6 bt (< 1000 m)
Surface mineable coal resource	4 bt
Undermineable coal resource	100 mt (mostly in Parcel 73)
CBG resource potential	230 mt (in Parcel 82)
	12 tcf
	6.57 tcf (in Parcel 73 & 82)
	0.65 tcf (in Parcel 73)
	5.92 tcf (in Parcel 82)
CBG resource potential where the Crown has both coal and P&NG titles (200 m < Mist Mtn Formation < 1000 m)	2.78 tcf

Source: Johnson & Smith (1991), Dawson et al.(1998), Ryan (2003)

Figure 2. Resource Summary