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Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

# MEMORANDUM

DAVE LEFEBURE

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Assistant Deputy Minister
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Re: COAL AND NATURAL GAS IN THE BULLMOOSE AND SUKUNDA FIELD AREAS

SUMMARY:

To assess the potential for conflict between existing and future natural gas and coal production in the area of the Bullmoose and Sukunka Fields, the nature and magnitude of the discovered and potential natural gas and coal resources were evaluated and compared. Areas of petroleum and natural gas tenure and coal tenure were also documented. Several observations regarding potential development scenarios are offered.

## NATURE AND LOCATION OF COAL AND NATURAL GAS RESOURCES

The Bullmoose-Sukunka area (NTS area Blocks E & L/93-P-3; Blocks H, I, J and K/93-P-4; Blocks A, B, and C/93-P-5) is characterized by high natural gas and coal resource values. The extent of coal seam development has been well delineated in the southeast portion of the area of interest (Bird Seam Reserve Area and Lower Chamberlain Reserve Area see Figure 1). To the northwest (North Bullmoose coal licenses on Figure 1) coal seams have been less well delineated.

Prospective coals in the Bullmoose-Sukunka area occur in the Lower Cretaceous aged Gething and Gates Formations. Gates coals are low sulphur, medium volatile metallurgical and thermal coals. All production to date has been obtained from the Gates Formation.

In the Sukunka area coals also occur in the upper portions of the underlying Gething Formation. Gething coals in the area are low volatile to high volatile bituminous rank low to medium sulphur. The economic and prospective coals on the Sukunka coal properties are basically all in the Gething Formation. (i.e. Bird and Lower Chamberlain seams are in the Gething).

The South Bullmoose and West Bullmoose pits are located mainly on the South Bullmoose licences (see Figure 1). In 1990 the Bullmoose open pit mine produced 1.6 million tonnes of clean coal - mainly metallurgical. Due to the depth of the coal seams through much of the southern portion of the area of interest, underground mining methods would be required. However, to the northwest, open pit mining methods may be feasible.

The natural gas resource in this area is under active development. Gas is produced from structural traps in Triassic aged carbonate rocks of the Pardonet and Baldonnel Formations. Although exploration costs are relatively high, discoveries in the past several years have been very significant by B.C. and North American standards.

Individual wells can produce natural gas at rates exceeding 40 million cubic feet/day. As a result, this area has received international attention and has generated significant revenue from the sale of petroleum and natural gas rights. Crown royalty income will also be very significant. Figure II indicates the extent of natural gas development (location of existing wells, pools and gas production infrastructure).

## VALUE OF COAL RESOURCES

Coal leases are subject to a gradually escalating annual rental requirement. The annual and cumulative value of coal lease rentals is documented in Figures III and IV. From 1985 to 2010 this totals $7.35 million.

This present value of the coal is more difficult to determine due to the currently incomplete delineation of coal resources - particularly in the northwest portion of the area of interest. However, coal volumes in a prospective deposit (the Sukunka deposit) in the mapped coal seam area[1] have been calculated at 178 million tonnes of mineable coal or 68 million tonnes of clean product reserves.

Based on the latter figure, assuming a price for metallurgical coal of ~$49 U.S./T. (~ $60 Cdn/Tonne) and assuming an average minehead price of $50/Tonne, coal value is $3.4 billion Cdn. (minus transportation costs) in this portion of the study area alone.

1. Coals in this deposit are of very high (metallurgical) quality and may represent the best undeveloped coal deposit in NEBC. In the Stage 2 report submitted as part of the Mine Development Review Process, Talisman indicated a planned production rate for this deposit of 3 million tonnes/year over a 20 year mine life.

## VALUE OF NATURAL GAS RESOURCES

For the period 1989-1993, the Bullmoose-Sukunka area has generated $15.65 million in rentals and bonuses for disposition of Crown petroleum and natural gas rights (comprised of $13.84 million in bonuses and $1.81 million in rentals). Unlike coal tenure which, once acquired, may be held by annual rental payments without a work requirement, P & NG tenures are time-limited and must be evaluated or surrendered to Crown within a relatively short time frame.

At present, there are no undisposed petroleum and natural gas rights within the coal seam reserve areas and coal licenses under discussion. Much of the petroleum and natural gas tenure is subject to the rights of pre-existing coal tenure holders (see Figure 1). Talisman P & NG tenure is indicated in yellow on Figure 1.

Natural gas reserves recognized to date are annotated by pool in Figure II. Based on the sum of these values, initial marketable gas reserves discovered in the Bullmoose-Sukunka field areas to December 31, 1992 total about 915 BCF. At a price of $1.50/mcf Cdn., the value of booked gas reserves equates to $1.37 billion.

Based upon examination of industry geological and seismic information, it is conservatively estimated that there is an additional 1 Tcf of undiscovered Baldonnel gas potential in this area located within seismically defined but undrilled or partially delineated geological structures. This potentially adds an additional $1.5 billion in natural gas resource value.

The potential for discovery of additional natural gas reserves in geological intervals above and below the Pardonet-Baldonnel has not been determined. However, the probability of future gas discoveries in other intervals in the area is high.

**As a consequence of the potential for future incremental gas reserves additions in the Pardonet-Baldonnel Formation and in other geological zones, virtually all of the area under discussion is considered to be prospective for natural gas.**

## OBSERVATIONS RE DEVELOPMENT SCENARIOS

1. Natural gas and coal extraction have already co-existed to some degree in the Bullmoose-Sukunka area. Coal has been extracted from the Bullmoose open pit mine located at the southeast end of the study area (see Figure 1). In addition, bulk samples have been extracted from the seam reserve areas north of the Bullmoose workings.

2. There is currently no mining activity in this area. Gaswell drilling and seismic activity is continuing at a steady pace. Eight gaswells and one abandoned well are already located within the boundaries of indicated coal license or coal seam reserve areas. A number of additional gaswells are located just outside these boundaries. It is expected that further delineation of the gas resource will result additional wells being drilled inside these areas.

3. Due to the depth and nature of the coal in the Bird Seam and Lower Chamberlain Seam areas, additional coal extraction would be by underground mining methods. Coals in the NW of the area of interest may be extractable by open pit methods.

4. The Ministry has developed guidelines for managing overlapping coal and petroleum and natural gas tenures and associated conflicts. (Appendix A-attached).

5. Access to the natural gas resource by directional drilling underneath areas of limited coal prospectiveness is technologically feasible but only within a relatively short distance from the surface location. Directional drilling would likely only access about 10% of the uncontacted natural gas resource in the area.

6. If Talisman, as holder of the coal rights in this area, can reach an agreement for evaluation of these rights by a third party, that party should agree to pay to Talisman any incremental gas exploration or production costs arising as a result of coal development. This may run counter to the prior rights granted to coal tenure holders and may require legislated removal of caveats on overlapping petroleum and natural gas tenure.

7. The non time-limited nature of coal tenures is a disincentive to early evaluation and development of the coal resource. However, since coal tenures are currently held in good standing, it will be difficult to require Talisman to accelerate coal development (either by their own program or by assigning coal rights to a third party) without statutory provision to do so.

8. There is precedence in other geographic areas for concurrent development of coal and natural gas. However, given the timing and current momentum of natural gas development and the relatively high $H_2S$ and $CO_2$ content of Triassic gas reserves in this area, concurrent development of natural gas and coal may not be advisable.

9. Delayed exploitation of the coal resource would enable extraction of coalbed methane prior to mining - assuming future economics for CBM development in this area are favorable. Early coal extraction would remove this possibility and effectively eliminate the potential CBM value to the province.

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JMM/slj