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TUYA RIVER COAL LICENSES

Record Numbers 390659, 390660, 390661

**Tuya River Coal Basin
Dease Lake - Telegraph Creek Area
British Columbia**

Prepared for:

ANGEL JADE MINES LTD.

By:

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SUMMARY

The three Tuya coal licenses cover a 771 hectares area in the northwestern part of the Tertiary Tuya River coal basin which is midway between the communities of Dease Lake and Telegraph Creek in northwestern British Columbia.

The license area includes a near-surface, inferred resource of 104 million tonnes of high-volatile bituminous B and C thermal coal which could be exploited for a coal-fired generating plant to provide electrical power to domestic and industrial customers.

Coals of the Tuya River coal basin also have demonstrated potential for coalbed methane. A potential resource of 40 billion cubic feet (bcf) has been estimated to be present in buried coal seams throughout the basin. A percentage of this resource may be present in deeper coal seams within the current license area.

INTRODUCTION

Angel Jade Mines Ltd. is party to an agreement for the purpose of exploring three contiguous coal licenses in the Liard Mining Division of northwestern British Columbia. The subject licenses cover a 771 hectares area in the northwestern part of the Tuya River coal basin which is 45 km southwest of the community of Dease Lake.

This summary report on the Tuya coal licenses has been prepared at the request of Angel Jade Mines Ltd. The writer holds no interest, directly or indirectly, in either the three coal licenses or in Angel Jade Mines Ltd.

LOCATION, ACCESS, INFRASTRUCTURE

The Tuya River coal basin is 1150 km north of Vancouver and midway between the communities of Dease Lake and Telegraph Creek in northwestern British Columbia (Figures 1 and 2).

Dease Lake is on Provincial highway 37 which links the Smithers - Terrace area with the Alaska highway in southern Yukon. The Dease Lake - Telegraph Creek road provides access to the general area of the Tuya coal basin. The subject coal licenses are 10 km northwest of a point on this road 52 km southwest of Dease Lake. The most convenient access to the property area is by a 15 minute helicopter flight from Dease Lake airport.

Food, lodging and a few services are available in Dease Lake which is accessible by highway or scheduled air service from Smithers. A wider variety of supplies and services are available in Watson Lake, Yukon, some 250 km north by highway.

COAL TENURE

The Tuya coal property consists of three contiguous coal licenses in the northwestern part of the Tuya River coal basin between Little Tuya River and Mansfield Creek (Figure 4). The disposition of these licenses is shown on Figure 5 and details are as follows:

<u>Coal License Tenure Number</u>	<u>Area (hectares)</u>	<u>Date of Issue</u>
390659	273	November 6, 2001
390660	273	November 6, 2001
390661	273	November 6, 2001

The coal licenses are recorded in the name of Edward F. Asp and are subject to an agreement with Angel Jade Mines Ltd.

Coal licenses in British Columbia may be renewed annually by payment of a \$7.00 per hectare rental fee during the first five years of tenure ownership after which the annual per hectare cost increases.

The rental fee due November 6, 2002 to renew the Tuya coal licenses would amount to \$5,733.00.

PHYSICAL SETTING

The Tuya coal licenses are situated near the eastern margin of the Nahlin Plateau, a subdivision of the more extensive Stikine Plateau. The area of the licenses, which is east of the 30 km diameter Level Mountain shield volcano, features gently rolling, subdued topography cut by the deeply incised valleys of Little Tuya River and Mansfield Creek (Figure 3).

Elevations average 800 metres above sea level and range from 740 metres in Little Tuya River and Mansfield Creek to about 860 metres along the western boundary of the licenses (Figure 5). Little Tuya River is a tributary of Tuya River which empties into the Stikine River 25 km northeast of Telegraph Creek.

Light to moderate tree cover, consisting mainly of spruce, is broken by swampy terrain. Bedrock exposures are confined to the canyon walls of Little Tuya River and Mansfield Creek.

PREVIOUS WORK

The earliest records of previous investigation of the coal resources of the Tuya River area relate to activities of the Atlin - Tuya Coal Prospecting Syndicate which held thirteen one mile square leases in the area in 1904. Work reported included prospecting and sampling and, from available descriptions (Minister of Mines Annual Report for 1904), the principal area of investigation was in the eastern part of the basin adjacent to Tuya River.

Limited follow-up work was undertaken in 1953 but the most thorough investigations to date were completed in 1979 and 1980 by PetroCanada Exploration Ltd. and Esso Minerals Canada. Esso mapped licenses adjacent to Tuya River and PetroCanada completed 10 widely-spaced, vertical, NQ-size diamond drill holes (1543 metres) within an area marginal to Little Tuya River in the western part of the basin. Five of these drill holes are situated within the boundary of the present license area (Figure 5).

GEOLOGICAL SETTING

The Tuya River coal basin is one of a number of isolated Tertiary coal-bearing basins within the Intermontane tectonic belt of central British Columbia. In addition to the Tuya River basin, these include the Similkameen, Merritt and Hat Creek basins (Figure 1). Coal rank ranges from lignite - sub-bituminous B (Hat Creek) to high-volatile C to A bituminous coal (Merritt, Tuya River).

The fault-bounded Tuya River basin, which overlies a basement of deformed Paleozoic and Mesozoic volcanic and sedimentary rocks, is bounded on the north and west by young (late Tertiary to Recent) volcanic rocks of the Level Mountain complex and by older (Mesozoic) rocks on the east (Figure 4).

As described by Ryan (1990), the coal-bearing strata within the Tuya River basin are of early Tertiary (Paleocene - Eocene) age and consist of poorly consolidated, coarse-grained sandstones, conglomerates and mudstones which exhibit yellow, orange and brown colouration on weathered surfaces. Diabase sills and basalt flows, related to the Level Mountain complex, locally cut and are intercalated with the sedimentary rocks.

The basin is comprised of two principal sedimentary units or members (Figure 4). The lower unit, possibly 200 to 300 metres thick, consists of sandstones, mudstones and chert pebble conglomerates and contains the principal coal-bearing zone which averages 100 metres in thickness. The overlying upper unit or member includes a 300 metres thickness of conglomerates, sandstones and basaltic volcanic rocks.

The Tuya River coal basin is an open, gently north-plunging syncline complicated locally by normal faults and minor folds.

GEOLOGY OF THE TUYA COAL LICENSES

The three coal licenses cover the northern half of the west limb of the broader syncline between Mansfield Creek and Little Tuya River (Figures 4 and 5). As indicated on Figure 4, much of the license area is underlain by the lower sedimentary member or unit which includes the coal-bearing zone.

Bedrock exposures are sparse throughout much of this area except in the canyons of Mansfield Creek and Little Tuya River in the southern and northern parts of the license area respectively. Minor folds thicken the coal-bearing zone along Mansfield Creek; two 5 metres thick coal seams are exposed above and below a diabase sill in this area (Ryan, 1990). The entire coal zone is about 100 metres thick and contains a cumulative 10 metres thickness of coal. A 6 metres thick coal seam is exposed in the canyon of Little Tuya River.

As noted previously, three 1979-1980 NQ diamond drill holes intersected the coal zone within the current license area (Figure 5). The northernmost of these, hole 79-01, encountered four coal seams ranging in thickness from 2.35 to 13.05 metres for a cumulative coal thickness of 30.24 metres within the 83.9 metres coal zone. Hole 79-03, drilled immediately north of Mansfield Creek in the southern license area, intersected several 1.10 to 10.30 metres thick coal seams for a cumulative thickness of about 16 metres within a 200 metres thickness of coal zone. In both holes, some of the coal seams intersected were interpreted as being fault repetitions (Coal Assessment report 242).

Hole 80-04, drilled in the central license area about midway between the 1979 drill holes (Figure 5), intersected seven 1.24 to 5.03 metres coal seams for a cumulative thickness of 31 metres within the 120 metres thick coal zone (Coal Assessment report 243).

In all holes, coal seams are hosted by poorly consolidated sandstones and individual seams contain <0.5 metre mudstone and carbonaceous rock partings and bentonite layers.

Results for these three holes are shown schematically on Figure 6 (Ryan, 1990).

COAL QUALITY

Coal quality was determined for cores recovered from the three previously described drill holes on an as received basis. Average values, as reported by Ryan (1990) are as follows:

Moisture	12.4%
Ash	19.1%
Volatile Matter	30.7%
Fixed Carbon	37.8%
Sulphur	0.50%
Calorific Value (range)	9680 - 11994 BTU/lb

Based on the calorific values, the rank of the coal ranges from high-volatile bituminous B to C. Mean maximum reflectances of vitrinite in oil range up to 0.79, indicative of a high-volatile bituminous B rank.

Hardgrove index values, a measure of friability, were determined on core samples. These average 52.5 which is indicative of a moderately hard coal.

COAL RESOURCE

An in-situ, inferred coal resource of 214 million tonnes (to a depth of 500 metres) was estimated to be present in the western half of the Tuya River basin by Gigliotti (1983).

Based on the three drill holes which intersected the coal-bearing zone within the present license area and using a specific gravity of 1.48 (the same figure used for the 1983 estimate), the writer estimates an inferred coal resource of 104 million tonnes (to a depth of 500 metres) within the current license area.

It should be noted that the 1979-1980 drill holes are widely spaced and additional drilling will be required to confirm and expand upon the potential coal resource.

POTENTIAL OF THE TUYA RIVER COAL LICENSES

The inferred thermal coal resource within the current license area would be sufficient to generate electrical power for the Stikine Regional District (population 1,500) for a significant period of time in view of estimates that a single house using electricity derived from coal requires between 1 and 5 tonnes of coal per year. The necessity of providing transmission lines from a central coal-fired generating station would probably preclude this scenario, particularly in view of the fact that the nearby community of Dease Lake is serviced by a small (1.5 megawatts) hydroelectric facility recently developed on the Hluey Lakes drainage 20 km southwest of the community.

However, proposed industrial developments for the general area, including the Cassiar magnesium metal plant and the Red-Chris copper-gold deposit, might well be potential customers for coal-fired electrical power generation as opposed to the conventional diesel-powered generating plants used for similar projects in the past.

The Tuya River coal basin also has potential for coalbed methane which is a clean natural gas adsorbed to buried coal seams. Wells drilled into such coal seams decrease pressure on the coal allowing the methane gas to desorb from the coal. The liberated gas flows to surface following the injection of water-based fluids to fracture the coal seam. A coalbed methane field is developed by drilling a number of wells which are connected to a central compressor station.

The amount of methane gas trapped in coal seams is proportional to the areal extent of the seams and is dependent on coal rank and depth of burial.

The amount of methane gas potentially retained by coals of the Tuya River basin has been estimated by Ryan (1990) as being as much as 40 billion cubic feet (bcf). Deeply buried portions of the coal seams within the current license area may contain 10% of the total postulated methane gas resource or 4 bcf.

REFERENCES

British Columbia Minister of Mines - Annual Report for 1904, p. G97, 98

Ministry of Energy and Mines, Coal Assessment reports 242, 243, 244

Ministry of Energy and Mines - Coalbed methane in British Columbia, miscellaneous publication

Ryan, Barry (1990): Geology and Potential Coal and Coalbed methane resources of the Tuya River Coal Basin (104J 2,7) in Geological Fieldwork 1990, Ministry of Energy Mines and Petroleum Resources Paper 1991-1, p. 419-429

Ryan, Barry (2000): Coal in British Columbia, Ministry of Energy and Mines miscellaneous publication

TUYA, KLAPPAN, GROUNDHOG AND TELKWA COALFIELD LOCATIONS

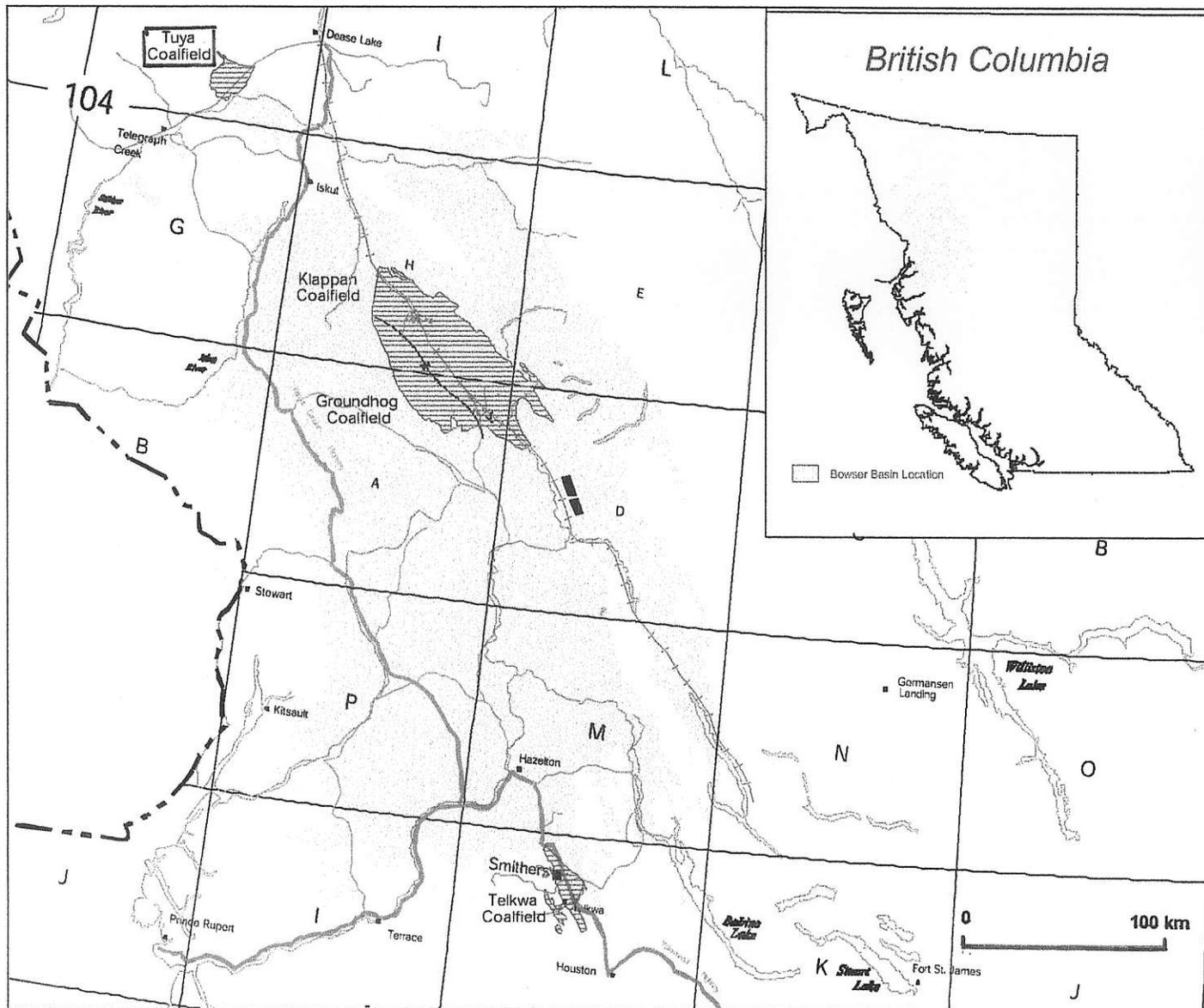


FIGURE 2

Tuya Coalfield

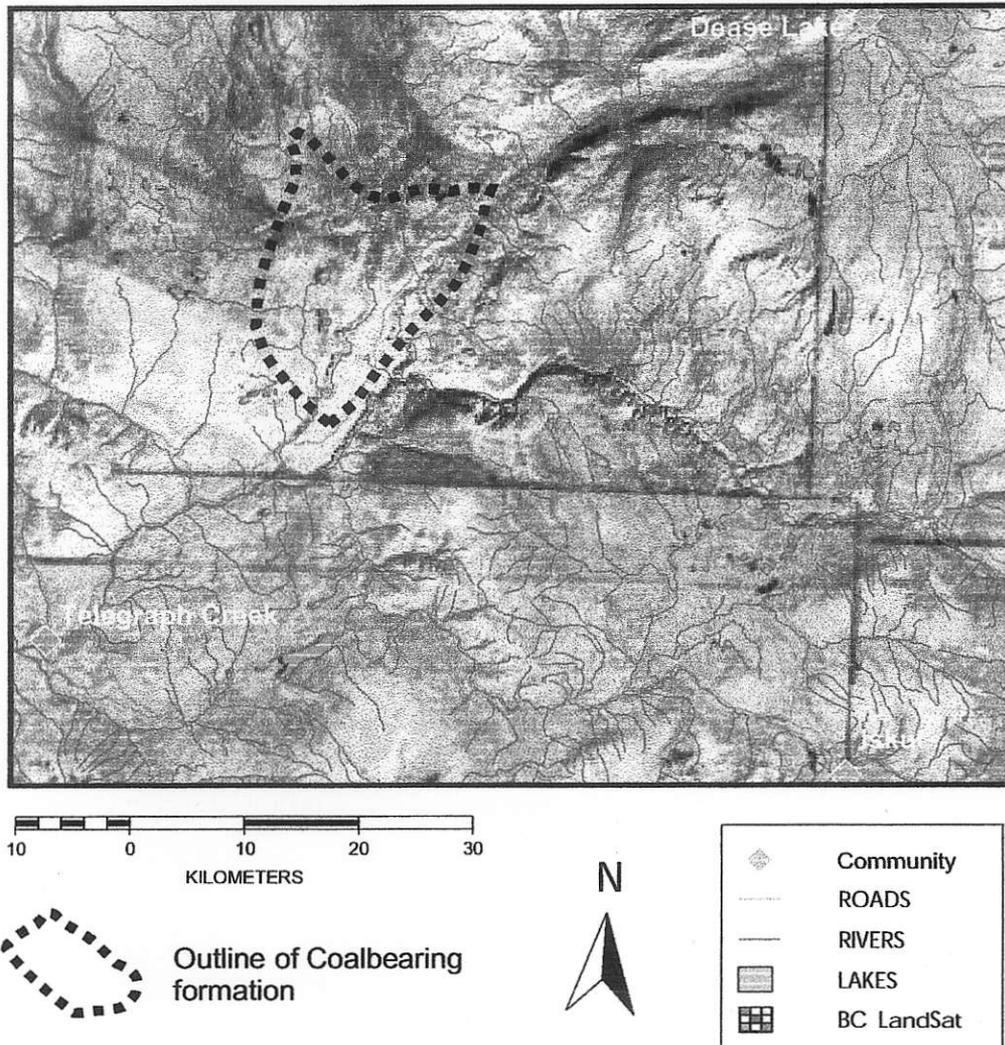
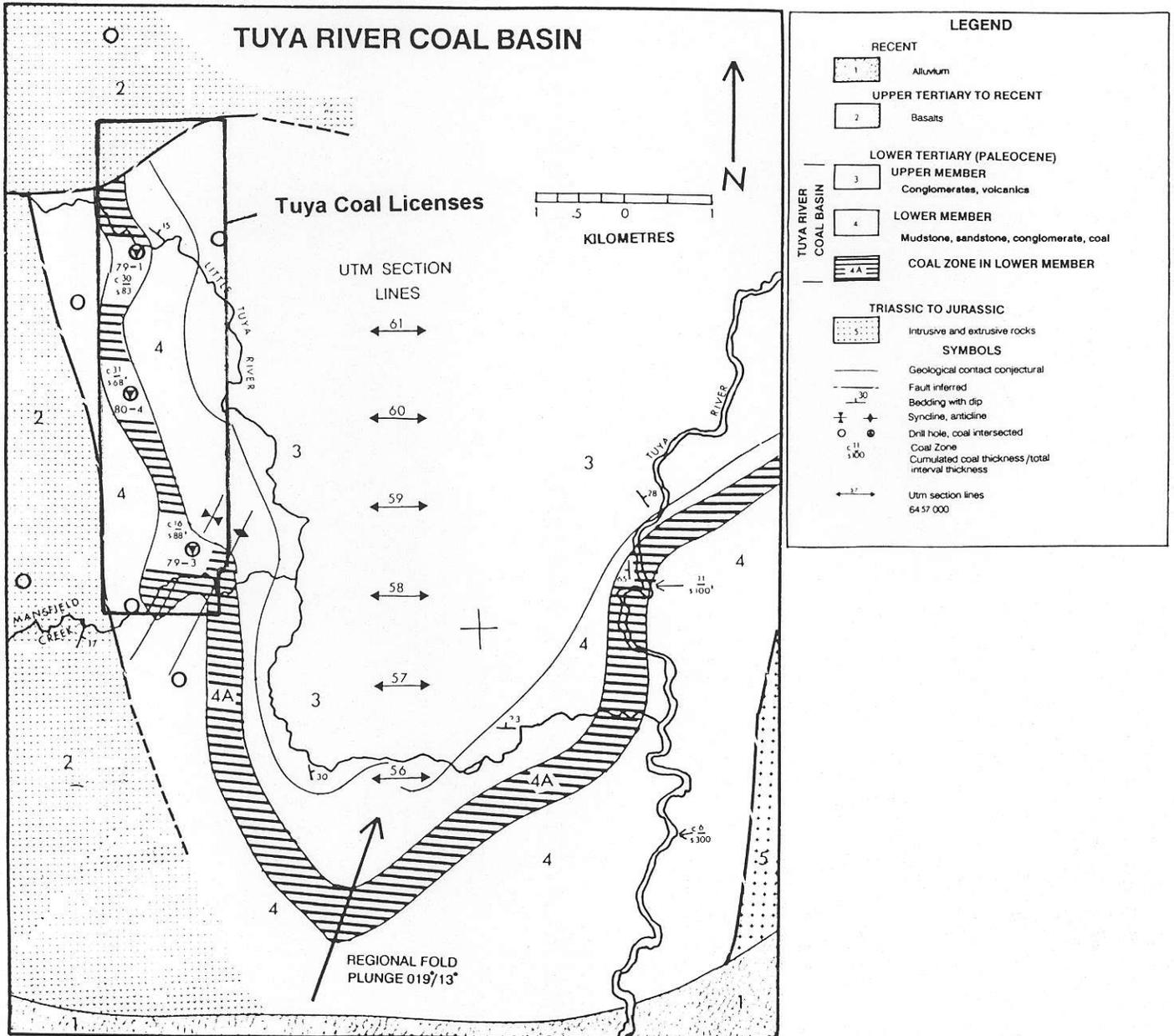


FIGURE 3



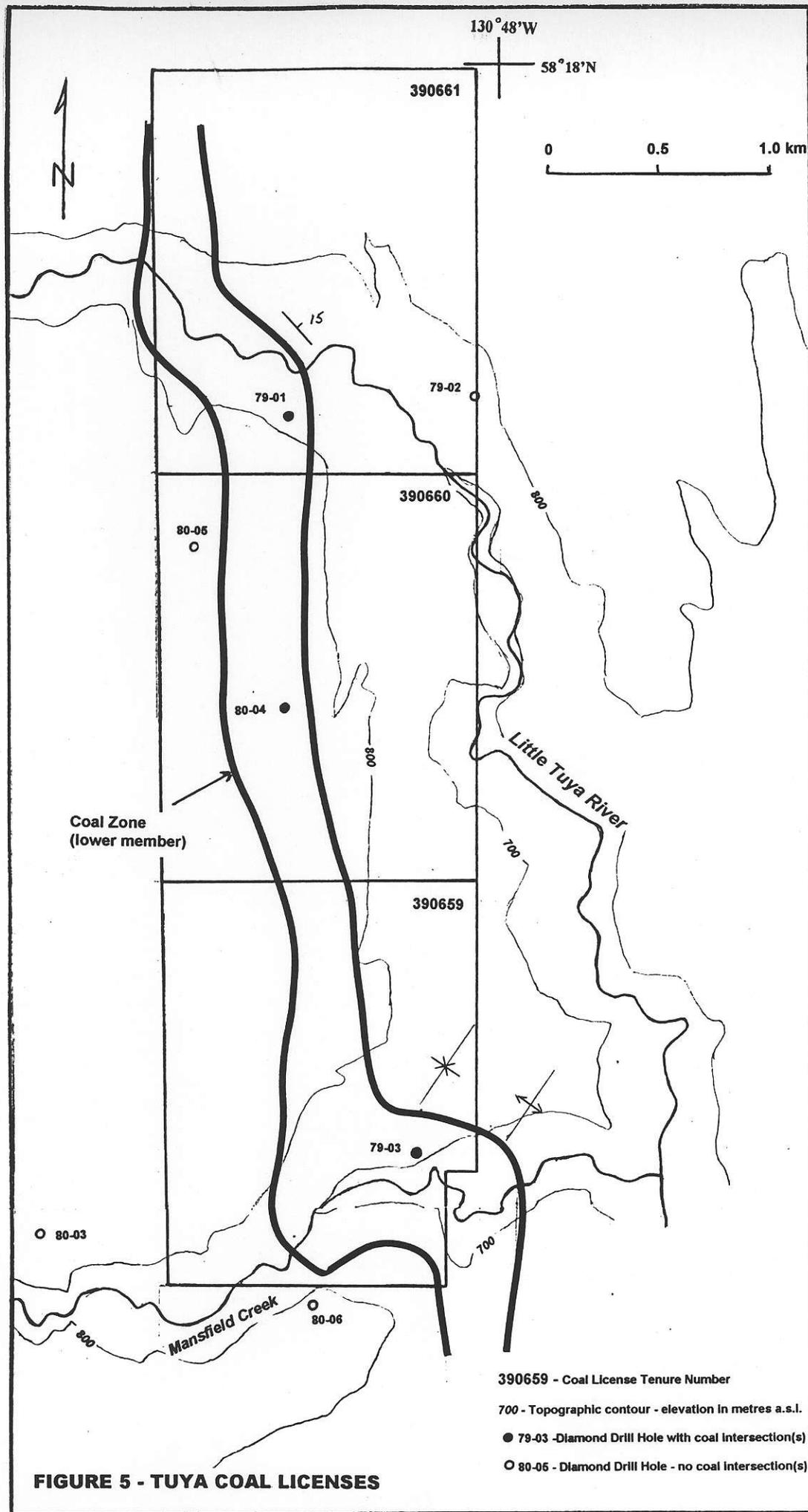


FIGURE 5 - TUYA COAL LICENSES

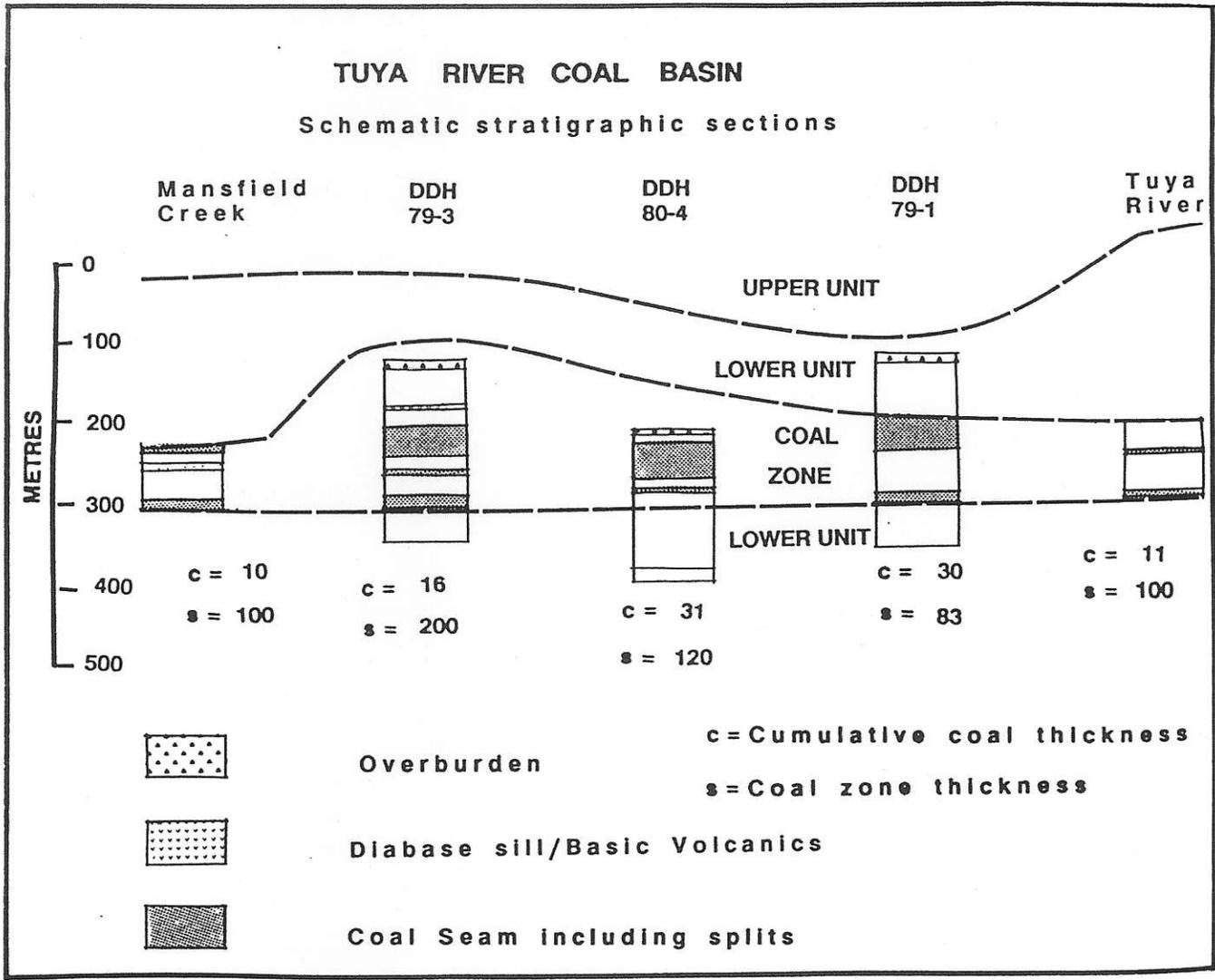


FIGURE 6 - (after Ryan, 1991)